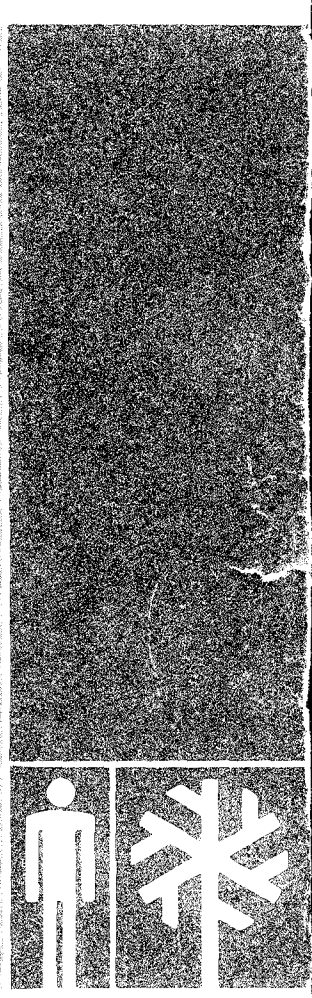
historic resource study

seacoast fortifications
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GOLDEN GATE

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HISTORIC RESOURCE STUDY

SEACOAST FORTIFICATIONS

SAN FRANCISCO HARBOR

GOLDEN GATE NATIONAL RECREATION AREA

CALIFORNIA

by

Erwin N. Thompson

DENVER SERVICE CENTER
HISTORIC PRESERVATION TEAM
NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

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PREFACE

This Historic Resource Study: Seacoast Fortifications of San Francisco Harbor, Golden Gate National Recreation Area has been based on the parameters of a task directive that did not have a final approval. Also, it has been prepared in accordance with the standards and regulations that concern historic preservation. The objective has been to complete a document that will prove useful to planning, managing, preserving, and interpreting the large number of historic resources that are located within Golden Gate National Recreation Area.

Although designated a recreation area, Golden Gate possesses a wealth of historic resources--a wealth that overwhelms one at first. The richness and variety of these resources demand our attention. To coin a phrase, Golden Gate is a historical recreation area.

ACKNOWLEDGEMENTS

The great bulk of the research on the harbor defenses of San Francisco was done in the National Archives and Records Service in Washington, D.C., and in the Federal Archives and Records Center, San Bruno, California. For information at San Bruno, my thanks go to Jo Ann Williamson and the staff of the Archives Branch. Practically the entire staff in Old Military Records, Army and Navy Branch, National Archives, came to my assistance over the months of research. My sincere appreciation goes to all of them and to the staff of the Central Search Room. The Cartographic Archives Division, National Archives, deserves praise for unstinting effort to make its huge resources of maps and plans available. Also, I am grateful to the aid given me by the staff of the Audiovisual Archives Division, National Archives.

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Dr. John A. Hussey, Piedmont, California, who many years ago gave me my first orientation into the National Park Service history program, gave generously of his knowledge of San Francisco's history. The city archivist Gladys Hansen, San Francisco Public Library, helped me sift through the treasures of the San Francisco

Room. John Langellier and the staff of the Presidio Museum, Presidio of San Francisco, shared the important historic resources that they safeguard. Joyce Berry, reference librarian, California Historical Society, kindly made available for study a large number of documents and photographs pertaining to the military posts in the Bay Area. The staff at the California State Library at Sacramento deserves praise for its extensive assistance. Dr. Robert Becker and the staff at the Bancroft Library, University of California at Berkeley, made available a large number of important papers concerning San Francisco Harbor, as well as the Muybridge photographs of fortifications. My thanks go to all these people and institutions.

Two National Park Service historians require special mention: Edwin C. Bearss and Anna Coxe Toogood. Mr. Bearss, whose knowledge of both coastal defenses and the contents of the National Archives is legendary, guided me through the maze of the Corps of Engineers' records and willingly took time to assist me whenever I came to a stumbling block. Anna Coxe Toogood, my collaborator in the historical study of Golden Gate National Recreation Area (GGNRA) shared with me the agonies and triumphs of research and field expeditions. I still recall the surprise I felt when Anna, with determination, undertook to learn the terminology of a coastal battery.

The entire staff at GGNRA gave freely of knowledge, friendship, hospitality, and enthusiasm. The park planners Doug Nadeau and Ron Treabess displayed rare understanding of problems encountered along the way. John Martini, the area's expert on fortifications, gave freely of his own time to assist me on visits to the Golden Gate. My thanks go to all these people and to the Historic Preservation Unit at the Western Regional Office, especially to Gordon Chappell who unearthed countless manuscripts pertaining to the American fortifications period.

My appreciation goes, too, to the historic architect Harold LaFleur, Denver Service Center, who almost daily gave me sound advice on architectural and preservation matters. John Jenkins, formerly of the Denver Service Center, deserves a great deal of credit for his skillful organization of a large and complex collection of historic maps and building plans.

Finally, I warmly thank Nancy Arwood and Loyce Wiist for typing the original manuscript. These people do not have the benefit of seeing the historic resources in person--I wish they could--and their devotion to their tasks is doubly appreciated.

INTRODUCTION

Seacoast defenses for San Francisco Bay are almost as old as the Presidio of San Francisco, which was founded over 200 years ago in 1776. By the turn of the 20th century, San Francisco Harbor's fortifications were exceeded in strength and number only by those of New York's. Today both the San Francisco and Marin Headlands, as well as the islands in the bay, have a profusion of remains from the coastal batteries. E. Raymond Lewis, an expert on coastal defenses, has written that the forts around the bay constitute one of the best and most extensive museums of military architecture to be found in North America.[1]

The history of these fortifications may be divided into the following periods that allow for a clear understanding of political developments, changes in warfare, and the evolution of weapons:

Spanish-Mexican period, 1776-1846, a period of 70 years

Early American, 1846-1861, when engineers of the United States Army built extensive masonary fortifications at Fort Point and on Alcatraz Island

Civil War, 1861-1865, which saw the introduction of heavy smoothbores and rifled guns and the expansion of fortifications to include Angel Island and Point San José (Fort Mason)

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1. Emanuel Raymond Lewis, A History of San Francisco Harbor Defense Installations: Forts Baker, Barry, Cronkhite, and Funston (n.p., 1965), p. 8.

Post-Civil War, 1865-1875, when engineers remodeled the batteries and installed 15-inch Rodmans to reflect lessons learned during the Civil War, which had made masonry works obsolete

Endicott period, 1890-ca. 1915, the great leap forward when numerous new batteries with large-caliber rifled guns, mortars, and rapid-fire batteries were constructed

World Wars I and II, 1915-1945, which saw the climax of coastal fortifications with the introduction of the huge 16-inch guns, antiaircraft guns, and radar

Missile Age, 1950s and 1960s, which was not concerned with the seacoast but which represented, through the Nike batteries, the continuing saga of San Francisco's defenses

I. Seacoast Fortifications, San Francisco Bay, 1776-1876

A. Spanish-Mexican Period, 1776-1846

1. Presidio of San Francisco--Fortifications

The formal act of possession having been carried out by Lt. José Joaquin Moraga, construction of the Presidio of San Francisco began, slowly, in the winter of 1776-77. The post, a walled quadrangle, was not in the true sense designed for seacoast defense. It was simply a military camp whose prime purpose was to guard the nearby missions and to control the Indians of the area. Yet it was a coastal presidio, and its commandant and garrison received instructions to regulate the coming and going of foreign ships, be they British, French, Russian, or American.

For the first 15 years or so, the commandant had little with which to back his authority. When British Capt. George Vancouver entered San Francisco Bay in 1792, he found the Presidio guarded by a three-pounder gun mounted on a rotten carriage. There had been a second gun mounted in front of the place, but it had burst. He also heard about another gun, a brass three-pounder tied to a log at Fort Point.[2]

The acting governor of California, José Joaquin Arrillaga, became alarmed when he learned that Vancouver had discovered just how weak San Francisco's defenses were. About this time the viceroy of Spain, concerned about British and Russian penetration into Alta California following the Nootka Convention of 1790, authorized the construction of a fort or battery at San

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2. Hubert Howe Bancroft, History of California, 7 vols. (San Francisco, 1886), 1:698; Berkeley, California, University of California, Bancroft Library (hereinafter cited as UC, BL), Russell C. Ewing, "The Founding of the Presidio of San Francisco, Registered Landmark no. 79," California Historical Landmarks Series edited by Vernon Aubrey Neasham, 1936.

Francisco. A new work would be built, and the Presidio itself would continue to have guns mounted. When a Russian naval ship, Rurik, visited in 1816, guns at the Presidio saluted the captain as he called upon the commandant. In 1847, Americans found two unmounted Spanish guns, said to bare the arms of Charles III and to have been cast in Spain in 1760, flanking the entrance gate.

Today four bronze Spanish guns are to be found in the vicinity of the old Presidio compound. In the square occupied by the flagstaff are two guns dated 1679 and 1693. Flanking the entrance to the officers' club (within the walls of which are adobes from the soldiers' quarters of the old Presidio) are the "Poder" and the "San Pedro," both cast in 1673 and having the coat of arms of Spain.[3]

2. Castillo de San Joaquin

The Spanish had named the point on the southern side of the Golden Gate "Punta del Cantil Blanco," or, roughly, White Cliff Point. In 1793 Governor Arrillaga acted on the viceroy's orders and directed the construction of a fort on the point, a work that was named Castillo de San Joaquin. Ensign Hermenegildo Sal, acting commandant, oversaw the construction, which was under the

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3. Denver, Colorado, National Park Service, Denver Service Center (hereinafter cited as NPS, DSC), "History of the Presidio of San Francisco, California" (n.d.), manuscript prepared at Sixth Army Headquarters, Presidio of San Francisco, p. 10; NPS, DSC, Lawrence Kinnaird, "History of the Golden Gate and its Headlands," 1962-67, pp. 63-68; Oscar Lewis, compiler, This Was San Francisco (New York: David McKay Co., 1962) p. 18; B. E. Lloyd, Lights and Shades in San Francisco (San Francisco: A. L. Bancroft and Co., 1876, p. 437; NPS, DSC, Workers of the Writers' Program of the Work Projects Administration in Northern California, compilers, "The Army at the Golden Gate, A Guide to Army Posts in the San Francisco Bay Area" (n.d.), p. 66.

immediate supervision of Francisco Gomez, superintendent of construction for the Department of San Blas.[4]

Plans called for a fort in the form of a horseshoe measuring 240 feet in length and 140 feet in width. Bancroft said that when built, the work measured only 120 by 100 feet. American engineers later measured the terreplein as having an elevation of 96.71 feet; an 1853 American map suggests that the horseshoe measured approximately 190 by 145 feet. While there were 15 gun embrasures in 1847, apparently the Spanish engineers first planned for only 8 heavy guns on four-wheel wooden carriages commanding the Golden Gate and two light pieces on two-wheel carriages on each flank commanding the bay and ocean respectively. The parapet was adobe faced with brick. Most of the parapet was 10 feet thick, but on the land side it measured only 5 feet. Behind the parapet was a wooden platform or esplanade made of heavy timbers about 20 feet wide and held together with scarce 9-inch spikes.

Plans called for a kitchen and mess building and an adobe building containing five rooms: commanding officer's room, supply room, barracks, guardhouse, and prison. Apparently both buildings were eventually constructed, as was a powder magazine farther to the south. (An American 1847 survey did not show any former buildings.) While construction was underway, the Spanish erected a temporary earthen battery containing six newly acquired cannon. Captain Vancouver returned to the bay in October 1793 and saw evidence of the improvements. At the Presidio he counted 11 dismounted guns that he guessed were nine-pounders.

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4. NPS, DSC, Kinnaird, pp. 67-70. José Garaicoclea, a master gunner, was responsible for mounting the guns.

Ensign Sal transferred in 1794 and Ensign José Perez Fernandez became acting commandant and superintendent of the works. He employed more than 70 Indians on the construction and was assisted by a sergeant, a corporal, and two soldiers. By April, the Indians were manufacturing 1,500 adobes per day. They were paid a daily wage and given a blanket and a pair of cotton trousers. Those Indians supplied by the missions did not receive their pay directly, for the army turned the money over to the padres. Fernandez had timber cut in the hills to the south and had it floated down the bay to the Presidio. He complained about a shortage of nails, but he pushed the work, and in December 1794 he reported the fort completed. Despite this report, there were odds and ends still unfinished: flooring and gun racks in the barracks, a door in the messroom, and a sentry box for the "fortified tower." The guns, whether nine-pounders as reported by Vancouver or twelve-pounders as others stated, were mounted. They had been cast in Peru in 1673 and brought to San Francisco by the Aranzazu. Each tube bore the legend

GOVERNAN
DOLOSSENO
RESDELARE
ALAYDIEN
CIADELIMA

which spelled out "Governando los Senores de la Real Audiencia de Lima," meaning "Under the direction of the magistrates of the Royal Audienca of Lima."[5]

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5. Bancroft, 1:698-99; NPS, DSC, Kinnaird, pp. 68-71; UC, BL, George Tays, "Castillo de San Joaquin, Registered Landmark #82," California Historical Landmarks Series, 1936, pp. 11-17; UC, BL, Otto W. Degen, "The Evolution of Fortifications Around San Francisco Bay," 1925. Degan is identified as an army man who was stationed apparently at both the Presidio and at Fort Mason. His branch of service is listed as both Corps of Engineers and Quarter-

Completed at a cost of over 6,000 pesos, which the viceroy considered quite a large sum, the new fort was christened and blessed on December 8, 1794. After the masses, the firing of muskets and cannon mingled with the roar of the waves. San Francisco and its Gate had become a fortified place.[6]

Rains during the winter of 1795 did considerable damage to the adobe, but repairs were made. The Presidio was damaged, and the suggestion was made that it be rebuilt nearer the new fort--a suggestion that was not approved. In 1796 still more guns, probably 24-pounders, arrived at San Francisco Bay, along with 24 Catalan infantry volunteers who became part of the garrison. Also that year about eight artillerymen were assigned to San Francisco. But all was not well at the castillo.

Engineer Lt. Alberto de Cordoba examined the new fort in the summer of 1796 and made an unfavorable report on it. For one thing the fort had been built on sand rather than rock, and when a salute was fired, the adobe walls cracked. Furthermore, the guns were badly mounted and only two of the thirteen 24-pounders then in place were serviceable. Even they could not reach across the channel. The garrison of one corporal and six artillerymen was most inadequate. And the fort was commanded by

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master Corps. He was reported to have found old Spanish records at the Presidio that have since disappeared. According to his account, the new fort was planned by Lt. José Dario Arguello and Military Engineer Miguel Costanso. The armament was eight 12-pounders. The magazines were stone. The fort was an irregular "square," measuring 210 by 140 feet. The San Francisco Morning Call, Sept. 18, 1893, reported that one of these cannon that had been lying on the ground for many years at Fort Point had recently been placed in front of the old adobe barracks at the Presidio (today's officers' club).

6. NPS, DSC, Kinnaird, p. 73; UC, BL, Tays, pp. 17-18.

a hill in the rear from which an enemy force could invest it. Cordoba recommended that a new fort be built on higher ground.[7]

The castillo remained in service, however. Each winter, rains would destroy some of the adobe fabric. The rains would be followed by orders from the governor to make repairs. In 1796 mortar was used in the roofing, and a new adobe wall was built around the magazine. In 1798 the armament was changed to three iron 24-pounders, one iron 12-pounder, and eight brass 8-pounders. Following the heavy rains of 1799, extensive repairs were made to the adobe walls. In January 1800, winds blew the flagstaff off the roof of the barracks. Following additional damage, in 1805 a stone wall was built around most of the parapet (this probably was a scarp wall around the exterior of the parapet), and a new magazine was constructed 825 feet to the south upon the hill. But when Count Nikolai Petrovich Rezanof of Russia visited a year later, only three guns were serviceable in San Francisco for firing him a salute.

In 1808 several earthquakes cracked the castillo's walls, and in 1810 heavy storms destroyed part of the parapet and the esplanade. Then in the fall of 1815, Governor Pablo Vincente de Sola visited the Presidio and ordered that the fort be repaired. This work was carried out in 1816 by Indian and Spanish convicts. Bancroft listed the materials used in this "rebuilding" of the fort: 200 beams, 600 planks, 3,600 (9-inch) spikes, and lime mortar.

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7. Bancroft, 1:692-93; NPS, DSC, Kinnaird, pp. 78-79; UC, BL, Tays, p. 20. Cordoba also recommended construction of a fort at Point Bonita on the north side of the entrance--an idea that U.S. engineers would pursue later.

That fall the commandant learned that he would receive three new cannon (eight-pounders) and 300 shot for the guns.[8]

In 1822 news reached the Presidio that Mexico had declared its independence from Spain. As far as the fort was concerned, the new regime represented a period of almost total neglect. In 1824 Otto von Kotzebue, in charge of the Russian settlement at Fort Ross, wrote on visiting the Presidio: "I found St. Joachin on his rocky throne, truly a peaceful and well disposed saint, no one of his cannon in condition to fire a single shot." He said that he had to lend the Mexicans some powder so they could fire a salute in his honor. Capt. Frederick William Beechey on board H.M.S. Blossom entered the harbor in 1826. He was only a little more impressed with the castillo.

> The fort, which we passed on our right, mounts nine guns, and is built upon a promontory on the southside of the entrance, apparently so near to the precipice, that one side will, before long, be precipitated over it by the gradual breaking away of the rock. Its situation, nevertheless, is good, as regards the defense of the entrance; but it is commanded by a rising ground behind it. As we passed, a soldier protruded a speaking-trumpet through one of the embrasures, and hailed us with a stentorian voice, but we could not distinguish what was said. This custom of hailing vessels has arisen from there being no boat belonging to the garrison, and the inconvenience felt by the governor, in

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8. Bancroft, 2:371; NPS, DSC, Kinnaird, pp. 105, 111, and 122; UC, BL, Tays, pp. 21-31. During the construction of the Golden Gate Bridge, remnants of the 1805 magazine were destroyed. Photographs of the adobe were taken and copies are on file at Fort Point National Historic Site.

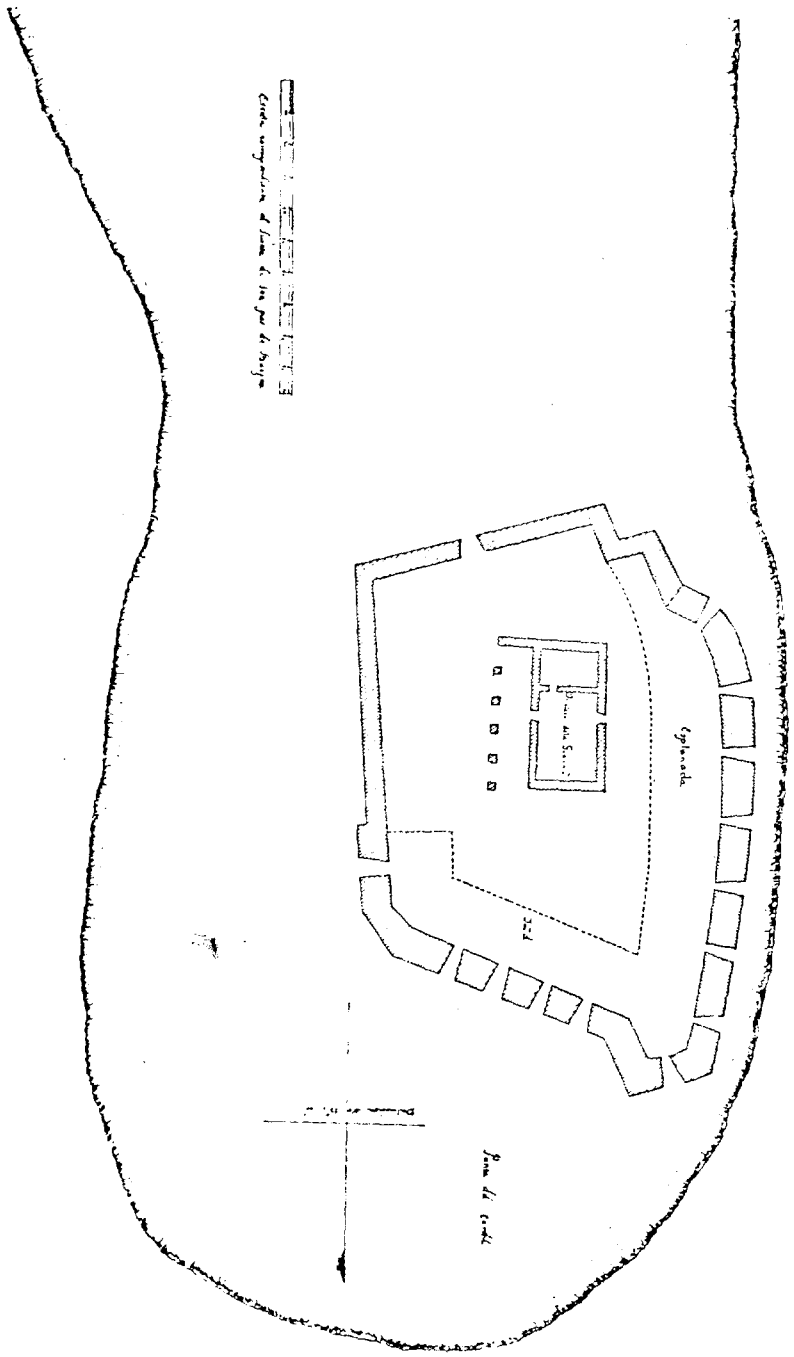
having to wait for a report of arrivals, until the masters of the vessels could send their boats on shore.[9]

By the end of 1830, the parapet was described as practically destroyed. The armament at that time consisted of three 24-pounders, two 12-pounders, eight 8-pounders, and one 4-pounder. Of these guns, eight were iron and six were brass. The heavy winter rains of 1832-33 continued to wreak havoc on the fort's adobe. Then in 1835 Governor Figueroa decided to move the Presidio's garrison north across San Francisco Bay to Sonoma. From then on Castillo de San Joaquin lay abandoned, as well as neglected. In 1837 the Presidio's lone soldier, Cpl. Joaquin Pena, reported on hand (probably for all San Francisco Bay): eight iron guns, three of them useless; eight brass guns, one of them useless; 994 shot; four muskets and a few musket balls; one pistol; and a machete. He said that the fort was in a state of "total destruction." This condition was confirmed by an American traveler that same year; Philip L. Edwards wrote in his diary on March 9: "I found the fort, which once commanded the entrance to the bay in the same serious condition [as the Presidio]. Some of the cannon bore inscriptions dated A.D. 1648."

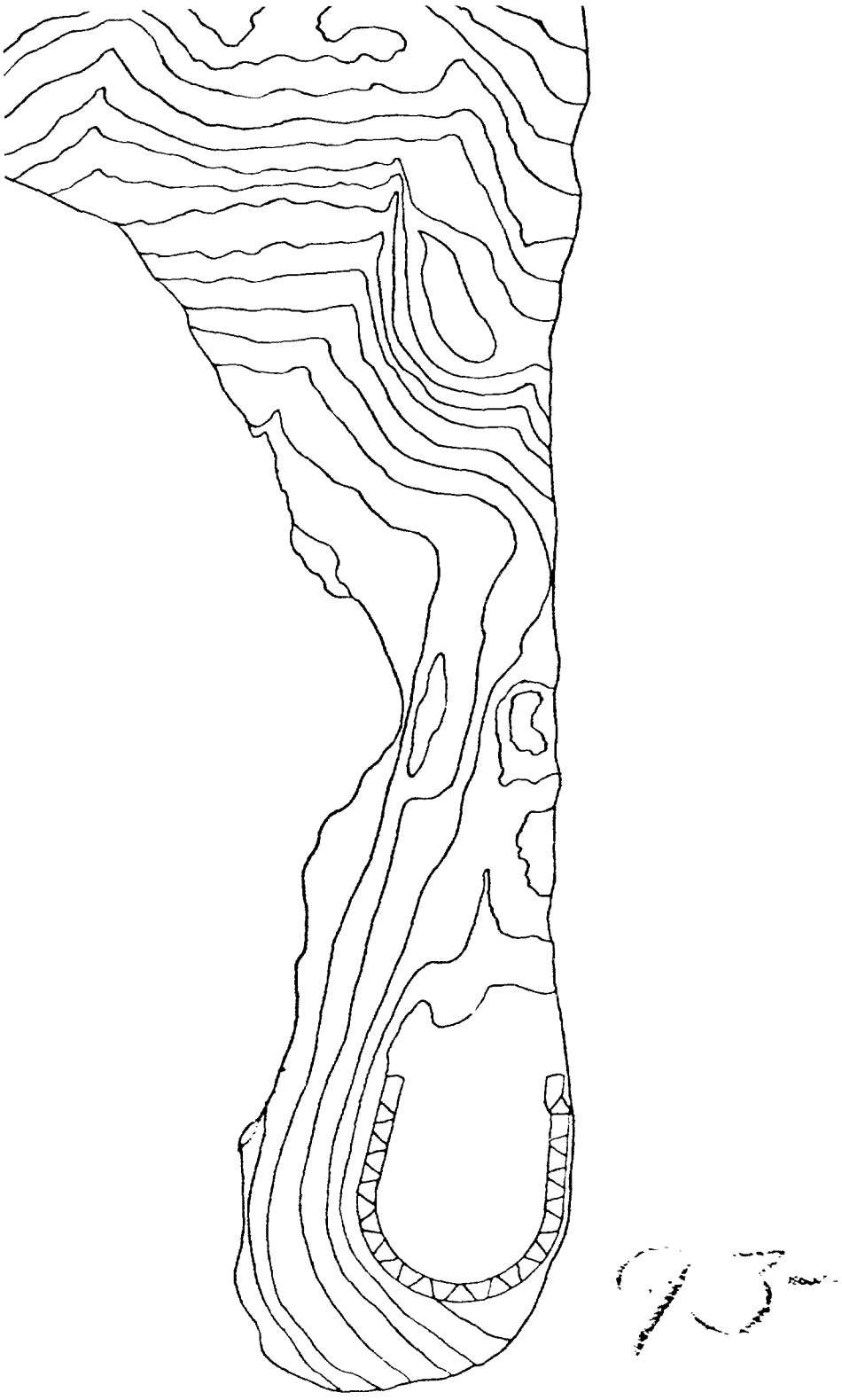
The village of Yerba Buena (today's San Francisco) was founded in 1835, the same year that the fort was abandoned. The early American residents of Yerba Buena apparently referred to the old castillo as Fort Blanco, perhaps a corruption of the earlier place name Punta del Cantil Blanco. The Mexican authorities showed no interest in reviving the old fort to defend the increasingly active port. However, when the Bear Flag Revolt occurred in 1846, John Charles Frémont and Christopher ("Kit")

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9. UC, BL, Tays, p. 38; Oscar Lewis, pp. 24-25.



Castillo De San Joaquin at Fort Point as drawn by a U.S. Army Officer, circa 1847.



Castillo De San Joaquin, 1794, from Lawrence Kinnaird, "History of the Golden Gate and its Headlands," Manuscript, Denver Service Center, NPS, p. 69.

Carson decided to "capture" the castillo. On July 1, they left Sausalito in a small boat borrowed from an American ship anchored at Sausalito, crossed the bay, and occupied the abandoned point. There, they spiked the guns with rat-tail files. Frémont would later claim that this action freed all of California north of San Francisco Bay from Mexican authority. But perhaps more important than his taking the abandoned battery was Frémont's naming the entrance to San Francisco Bay the "Golden Gate."[10]

San Francisco's first newspaper, the Daily Alta California, described the Spanish battery as of the American takeover: "The promontory joining the south side of the entrance to San Francisco Bay was early regarded by the Spaniards as a commanding position, and here a fortification was erected about the year 1805 [sic]. The works were simple, being breastworks of earth with interior facings of brick. About seven guns were mounted, but the whole affair was in a decayed and dilapidated condition when taken possession of by the United States."[11]

3. Point San José

War with Great Britain in 1797 caused a strengthening of defenses throughout Spanish California. Governor Borica directed that an additional battery be erected at San

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10. UC, BL, Tays, pp. 38, 40, and 43; NPS, DSC, Kinnaird, pp. 178-81; NPS, DSC, "History of the Presidio of San Francisco," pp. 17 and 20; Oscar Lewis, p. 36; Lloyd, p. 437; Bancroft, 5:177-78; Mary Lee Spence and Donald Jackson, The Expeditions of John Charles Frémont, vol. 2, The Bear Flag Revolt and the Court Martial (Urbana: University of Illinois Press, 1973), p. 183, wherein Frémont wrote on July 25, 1846, that he spiked "six large and handsome pieces"; John Charles Frémont, Memoirs of My Life, vol. 1 (Chicago, 1887), pp. 512 and 525-26, wherein Frémont stated that he spiked fourteen "nearly all long brass Spanish pieces."

11. Daily Alta California, Aug. 2, 1855.

Francisco Bay. Punta Medanos (sand dunes) northeast of the Presidio was selected to be the site of the battery. Lieutenant Cordoba, then at the Presidio, did not like the site because it was too far from the Presidio (1.8 miles), and the point was covered with sand dunes that could not provide a firm foundation for gun platforms. Also, he argued, there were not enough artillerymen for the castillo; a new battery would only make the shortage more severe. Nevertheless, the battery was built at the point, and it was called the Yerba Buena Battery.[12]

The Yerba Buena parapet was constructed of earth and fascines of wood. It had eight embrasures, but only five 8-pounders were mounted in the battery. No troops were stationed at the point; daily, a sentinel from the Presidio visited and inspected the work.

A commandant's daughter described the battery at the beginning of the Mexican period (1822) as being a small triangular fortification having only one gun mounted. She said there were no barracks, no buildings of any kind, and not even a guard at the point. The single gun was kept in good condition, and some shot were kept nearby--ready for use if necessary.

Like the Presidio and the castillo, Yerba Buena Battery suffered continually from winter storms. In November 1804, a storm leveled a "palisade" at the site. Commandant José

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12. NPS, DSC, Kinnaird, pp. 80-81; Bancroft, 1:701. The U.S. Army called this site Point San José most often but sometimes referred to it as Black Point, a name favored by American civilians. Apparently this latter name gained acceptance because it was the one place along the southern side of the bay where laurel grew, its dark color standing out in the sand dunes. Later, the U.S. Army renamed its post on the point from Post of Point San José to Fort Mason.

Dario Arguello thought the battery was useless in its location and should be moved to a hill that more properly overlooked the anchorage at Yerba Buena Cove (Telegraph Hill?). Governor Arrillaga disapproved the suggestion because of the cost that would be involved. But, two years later, the governor himself reported that because of exposure the guns had become useless.

The battery apparently was abandoned sometime during the Mexican period. When the Americans took over the defenses of San Francisco in 1846, they did not even mention Point San José. However, the battery's location became of great importance when U.S. Army engineers were selecting lands that would be needed for the defense of San Francisco Bay. Because of the Spanish military use of the point, it was considered by the United States to be a legitimate military reservation.[13]

B. The American Period, 1846-1876

1. The Americans Take Over, 1846-1848

On July 9, 1846, Capt. John Berrien Montgomery, United States Navy, U.S.S. Portsmouth, landed with a force of 70 sailors and marines at Clarks' Point, Yerba Buena (near the intersection of Battery Street and Broadway). He marched up Montgomery Street (then Clay) to the plaza (Portsmouth Square). There he had the Stars and Stripes raised in front of the Mexican customhouse. There were no Mexican officials present from whom to demand a surrender. Montgomery simply declared the American possession of the land, placed the marines in the customhouse as a

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13. Bancroft, 2:127-28; UC, BL, William Heath Davis, "Glimpses of the Past," pp. 208-09. Bancroft, 2:590, considered that before 1827 the term Yerba Buena applied to the area between Point San José and North Point. After that date, it was the area between North and Rincon points.

garrison, and returned to his vessel. Lieutenant Misroon of the navy, with a small party, marched to the Presidio and to the castillo, raised the U.S. flag over them, then returned to the village, reporting that he had found three brass and seven iron guns at the fort but none at the Presidio.

Montgomery ordered the construction of a battery at the foot of Telegraph Hill near the intersection of Battery Street and Broadway. The work was thereafter called Fort Montgomery, but the name seems to have been unofficial. A witness to the construction of the battery later wrote the following:

> As soon as the spot was leveled off, the work of laying the adobes commenced, and as we had some of the bricklaying craft on board, they were appoint [ed] bosses. All day long might be seen a steady stream of Jacks [sailors], each with an adobe perched on top of his head, toiling up the steep hill, while in the valley below the clang of hammer and anvil rang merrily out. . . .
>
> The fort was at last finished. The floor was planked over, the guns mounted, a beautiful flagstaff erected, and though no garrison was stationed there, an artillery company was formed and always held in readiness on board [the Portsmouth]. . . .

This same witness wrote that the battery was armed with guns from Castillo de San Joaquin, Frémont's spikes having been drilled out and the guns brought around to the town by boat.[14]

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14. Malcolm Edwards, ed., The California Diary of General E.D. Townsend (n.p., Ward Ritchie Press, 1970), p. 76; Bancroft, 5:238-41; Henry G. Carlisle, San Francisco Street Names, Sketches

On November 3, 1846, the War Department announced by a general order that California would be organized as the Tenth Military Department, with headquarters at Monterey. Brig. Gen. Stephen Watts Kearny established the headquarters in February 1847. He was replaced as commander by Col. Richard Barnes Mason on May 31, 1847. Both Kearny and Mason took steps to reserve certain parcels of land for use by the military. On March 10, 1847, Kearny (using the new name "San Francisco" instead of "Yerba Buena") gave the town all rights, title, and interest to the beach and water lots on the east waterfront between Fort Montgomery and Rincon Point, except such lots as might be selected for use by the federal government and by the senior officers of the army and navy. That same month Col. J. D. Stevenson, with nine companies of the Seventh Regiment, New York Volunteers, occupied the Presidio of San Francisco on the grounds that the United States acquired title to all the public lands of the Republic of Mexico in the ceded area.[15]

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of the Lives of Pioneers for whom San Francisco Streets are Named (n.p., 1954); Robert W. Frazer, Forts of the West, Military Forts and Presidios and Posts Commonly Called Forts West of the Mississippi River to 1898 (Norman: University of Oklahoma Press, 1965), pp. 27-28; Oscar Lewis, pp. 43-45, quoting a naval petty officer aboard the Plymouth. Bancroft said that the guns for the battery came from Sonoma. General Sherman, in San Francisco as a lieutenant in 1847, said that the battery consisted of two guns. William T. Sherman, Memoirs of General William T. Sherman (Bloomington: Indiana University Press, 1957), p. 34.

15. [U.S. Army], Outline Descriptions, Military Posts in the Military Division of the Pacific, 1879 (n.p., 1879), p. 1; Washington, D.C., National Archives, Record Group 94 (hereinafter cited as NA and RG), Office of the Adjutant General, Territorial Departments, 8-11th Military Departments, Departmental Returns, 10th Department, 1847-51; NA, Microcopy 617, Returns from U.S. Posts, 1800-1916, Roll 967, Post Returns, Presidio of San Francisco, 1847-1859; NPS, DSC, "History of the Presidio of San Francisco," p. 24; San Bruno, California, Federal Archives and Records Center (hereinafter cited as FARC, San Bruno), Microcopy 182, Letterbooks of Governors & Secretaries of State, California, Mar. 1, 1847-Mar. 9, 1848, vol. 1, Brig. Gen. S. W. Kearny, a proclamation, Mar. 10, 1847. Yerba Buena was renamed San Francisco in January 1847.

Kearny's proclamation was not immediately acted upon, but in June 1847 Colonel Mason directed his staff to cooperate with the navy in making selections of land for government purposes. The resulting reservations were later described as being "all the portion of Rincon Point not marked off into lots, which is (now) [1852] marked on the map of San Francisco 'Government Reserve.' Also all the lots bounded by Washington, Montgomery and Jackson Streets, and deep water, and also those lots bounded by Sansome, Pacific, and Broadway Streets and Deepwater. All were then as they are now marked on the Map of San Francisco, 'Government Reserve.'"

Later in 1847 Colonel Mason ordered the alcade not to dispose of any more land south of Rincon Point and east of a line through the northwest corner of Rincon Point Reserve, south, 11 degrees west. He said that the southern boundary of this area would be more fully described when the town surveys were completed. Citizens already held claims to various parts of these reserves, and in general the army would allow them to occupy these lots until the matter was later settled in Washington, D.C. To discourage squatters, the army leased the remaining lots.[16]

As for the Presidio and Point San José, Mason in early 1848 ordered his staff to set aside a reserve that would embrace both. In June a staff report recommended a reserve of approximately 10,000 acres. In November 1848 the secretaries of war and navy appointed a six-officer commission to select military sites around the bay. This commission recommended boundaries for Presidio/Point San José area that were subsequently established by President Milliard Fillmore on November 6, 1850. This executive

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16. NA, RG 77, Office of the Chief of Engineers (hereinafter cited as OCE), Land Records, Capt. E. D. Keyes, July 10, 1852, to Maj. O. Cross, Quartermaster.

order also established military reservations at Benicia, Yerba Buena Island, Alcatraz Island, Angel Island, and Mare Island.

For the Presidio, the boundary began at the water's edge east of Point San José, then ran due south for 800 yards, then in a straight line to the southern boundary of the Presidio, along the southern boundary to its western extremity, and thence in a straight line to the Pacific Ocean at Point Lobos, passing by the southern extremity of Mountain Lake. On the north side of the Golden Gate, Fillmore's order established the boundary "from the southern boundary of Sau Solito Bay, a line parallel to the channel of entrance to the Pacific." A year later on December 31, 1851, Fillmore signed a second executive order modifying the Presidio/Point San José reservation boundaries. Chief Engineer Joseph Totten wrote that "this modification was in the way of a compromise with a claimant who was in consideration thereof to resign all pretension to title within the modified reservation." This order reduced the acreage and created two separate reservations.

> 1st. The promontory of Point José within boundaries not less than [an arc of] eight hundred yards from its northern extremity.
>
> 2d. The Presidio tract and Fort Point embracing all the land north of a line running in a westerly direction from the South-eastern corner of the Presidio tract to the southern extremity of a pond lying between Fort Point and Point Lobos [Mountain Lake], and passing through the middle of said pond and its outlet [Lobos Creek] to the channel of entrance from the ocean.[17]

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17. NPS, DSC, "History of the Presidio of San Francisco," pp. 24-25; U.S. Department of the Interior, National Park Service (hereinafter cited as USDI, NPS), Historic Structure Report, Fort

2. Joint Commission for Defense of Pacific Coast, 1849-1850

In 1849 the secretaries of war and navy appointed a joint commission of three army engineer officers and three naval officers to plan the defenses of the Pacific Coast. Maj. John Lind Smith was the senior member of the board. The other two army officers were Maj. Cornelius A. Ogden and Lt. Danville Leadbetter. Representing the navy were Comdr. Lewis M. Goldsborough, Comdr. Gresham J. VanBrunt, and Lt. Simon F. Blunt. The commission assembled in San Francisco Harbor in April 1849, at the height of the excitement of the great gold rush. So numerous were the desertions of sailors that the navy was reluctant to lend men to the commission to take soundings of the bay.[18]

Three weeks slipped by without the commission being able to accomplish much. By August 1, 1849, the vessel that it was to use, the army transport Massachusetts, had arrived at Benicia where her cargo of quartermaster supplies was being unloaded. However, her crew had deserted for the gold mines, and the navy to whom the ship was now transferred had no men to spare to make up a new crew. Eventually, the commission decided to hire a civilian crew in the Hawaiian Islands, and the navy agreed to lend a skeleton crew to sail the Massachusetts there. They arrived at Oahu at the end of November 1849, succeeded in getting a crew, and returned to San Francisco on March 17, 1850. The commission then examined the Bay Area thoroughly, concluding that Mare Island would be suitable for the establishment of a naval depot. Concerning coastal defenses, Major Smith thought that the

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Point, Historical Data Section by Edwin C. Bearss (Denver, 1973), pp. 4-5; NA, RG 77, OCE, Land Papers, Millard Fillmore, Executive Orders (copies), Nov. 6, 1850, and Dec. 31, 1851, and Letters to Officers of Engrs., Totten, Feb. 24, 1855, to Col. R. E. De Russy.

18. NA, RG 77, OCE, Letters Received 1838-1866, Instructions of Secretaries of War and Navy to Joint Board of Engineers and Naval Officers (Pacific Coast), Maj. J. L. Smith, Sloop of War Warren, Sausalito Bay, Apr. 17, 1849, to Totten, and Smith, Apr. 9, 1849, to Totten.

board would probably recommend "strong works near Fort point [the American name for Punta de Cantil Blanco] on the south side of the channel and also on the north side of the channel [Lime Point] nearly opposite to Fort point." Smith continued as follows:

> Batteries at point José and on Alcatrazos Island would cooperate with the exterior works and altho' as auxilliaries they may be regarded as of secondary importance, the value of the latter is far greater than that of the former and nearly equal to that of the works at Fort point and opposite to it. A temporary battery on Angel Island opposite Alcatrazos would cooperate with the latter in defending the approach to the bay of San Pablo by the south channel--and a temporary battery on Racoon point opposite Angel Island would defend the channel leading thro' Racoon Straits to the bay of San Pablo.[19]

After visiting the Columbia River in Oregon Territory and San Diego in southern California, the joint commission prepared its final report on November 1, 1850. Primary among its conclusions was that San Francisco was the most important naval and military position on the Pacific Coast. An intelligent enemy would attempt to get possession of it or destroy it.

> The first consideration in connection with defence would be to prevent the passage of hostile vessels through the channel of entrance. This would be difficult as the narrowest part of the entrance is about a mile wide and vessels might pass through with the speed of 10 or 12 knots if favored by a strong fair wind, not unusual

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19. NA, RG 77, OCE, Letters Received 1838-1866, Smith, Aug. 1 and 29, 1849, and Mar. 31, 1850, to the Secretaries of War and Navy. It should be pointed out that in the beginning there was a point called "Fort," not a fort called "Point."

there, and the flood tide, estimated at 3 knots. The difficulty might be obviated by having, in addition to a strong battery on each shore . . . a third battery on Alcatrazos Island . . . which, although about two miles from the other batteries, would in cooperation with them and with a temporary battery on Point José . . . and another on Angel Island . . . concentrate the fire of so many guns upon any vessels that might get past the front line of batteries, that they would be destroyed. . . .

The report also mentioned the possibility of employing floating batteries, and it pointed out the necessity of land defenses for the works at Fort Point and Lime Point. The commission concluded by summarizing the following priorities and cost estimates:

Fortifications Sites	Denominations	Estimate of Costs On the Atlantic	On the Pacific
Entrance Channel	1st Class, to be built without delay		
South Shore	Battery	$400,000	$1,600,000
North Shore	Battery	400,000	1,600,000
Alcatrazos Island	Battery	150,000	600,000
None	2d Class, to be built at a later period		
	3d Class, to be built at a remote period		
Point José	Temporary Battery	20,000	80,000
Angel Island	Temporary Battery	20,000	80,000[20]

20. NA, RG 77, OCE, Letters Received 1838-1866, "Report Relative to an examination of the Coast of the U.S. on the Pacific by a Joint Commission of Navy and Engineer Officers," Nov. 1, 1850, to the Secretaries of the War and Navy Departments. Only two officers signed the report, Smith and Ogden.

3. Board of Engineers for the Pacific Coast

On June 17, 1851, the defenses of San Francisco Bay took a positive step forward when Chief Engineer Totten established a Board of Engineers for the Pacific Coast, consisting of three officers from the joint commission, Smith, Ogden, and Leadbetter, and two additional engineers, Capt. James Louis Mason and Capt. Frederic A. Smith. Eventually this board would consist of engineer officers actually assigned to the West Coast, but for the time being the new board did its planning from Washington, D.C. It began its task by planning casemated (covered) works for both sides of the Golden Gate and barbette (open) batteries for Alcatraz Island. In August 1852 the board forwarded memoirs, plans, and estimates for these three works, as well as for two redoubts to serve as land defenses for Fort Point, to the chief engineer. In addition to the barbette batteries, Alcatraz was to have a "defensive barracks," that is, a masonry barracks strong enough to withstand shot and shell from enemy ships and from which infantry troops could fend off besiegers. In its general remarks, this board differed but little from the joint commission.[21]

In February 1853, the U.S. Senate passed a resolution that asked Secretary of War Charles M. Conrad to furnish it with the costs that would be involved in constructing San Francisco's defenses. Major Smith, still the senior member, compiled two sets of figures: those agreed to by a majority of the board, and those estimated by a minority (which at that time consisted solely of himself).

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21. USDI, NPS, Bearss, p. 6; NA, RG 77, OCE, Letters Received 1838-1866, Lt. D. Leadbetter, Recorder, Board of Engineers (Pacific), Aug. 4, 1852, to Totten. This study will not discuss the fortifications at Fort Point and Alcatraz Island in detail. Thorough studies of both have already been prepared by the historian Bearss (Fort Point) and the author (Alcatraz Island).

Majority Estimates

Fort Point	107 guns	$1,000,000
Lime Bluff Point	80	600,000
Alcatraz Island	43	300,000
	230 guns	$1,900,000

Minority Estimates

Fort Point	205 guns	$1,400,000
Lime Bluff Point	80	600,000
Alcatraz Island	120	340,000
	405 guns	$2,340,000

These permanent works could be completed in five years at these estimates. If the work was speeded up, the costs would also increase.

	5 yrs.	4 yrs.	3 yrs.	2 yrs.
1854	$ 300,000	$ 500,000	$ 800,000	$1,500,000
1855	400,000	600,000	1,000,000	2,000,000
1856	500,000	750,000	1,200,000	
1857	550,000	750,000		
1858	550,000			
Totals	$2,300,000	$2,600,000	$3,000,000	$3,500,000[22]

Congress appropriated $500,000 for the defenses of San Francisco for fiscal year 1854. It was now time for Totten to appoint engineers to supervise the construction of the works. He decided that the Board of Engineers for Fortifications on the Pacific Coast should consist of five members, three to be experienced engineers assigned to San Francisco and two who would remain in Washington, D.C. As senior engineer on the Pacific Coast, Totten chose Capt. J. K. F. Mansfield, who would also directly supervise construction at Fort Point. Capt. James L. Mason was selected to

22. NA, RG 77, OCE, Letters Received 1838-1866, Smith, Feb. 8, 1853, to Totten.

oversee the works at Alcatraz Island. The third member, Capt. Henry W. Halleck, was already on the coast, being on the staff of the commanding general and also serving as the inspector of lighthouses. Before he could depart for San Francisco, Mansfield was suddenly promoted to colonel and became an inspector general. Totten then notified Mason that he would be the senior officer and that the Alcatraz position would go to Lt. Zealous B. Tower. Three junior officers were also assigned to San Francisco in the summer of 1853: 1st Lt. William H. C. Whiting, 2d Lt. Frederick E. Prime, and 2d Lt. Newton F. Alexander.[23]

Before Mason left New York, he received a letter from Totten saying that the Engineer Department was not sure that the military reservations, as ordered by President Fillmore, had been actually made or whether there were any private claims to these lands. He suggested that Mason contact the surveyor general of California and Captain Halleck, who was regarded as an expert on Mexican land law. This Mason did upon his arrival in San Francisco. He found Halleck firmly convinced of the validity of the federal government's ownership of all the reservations. But, in fact, there were or soon would be private claims against the Presidio, Point San José, Alcatraz Island, Yerba Buena Island, Angel Island, and Lime Point. In the case of Lime Point, 13 years

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23. NA, RG 77, OCE, Letters to Officers of Engrs., vol. 20, Totten, Apr. 11, 1853, to Mansfield, Apr. 18, 1853, to Halleck, and May 15, 1853, to Mason, and Letters Received 1838-1866, Mason, Apr. 25, 1853, to Totten. Halleck was placed in a rather awkward position. As a staff engineer he reported to the commanding general of the department and as a member of the board he reported directly to the chief engineer in Washington. However, he resigned from the army in 1854 without this duality ever becoming a problem for him.

would pass before the federal government finally gained possession of the land, by purchase.[24]

4. Fort Point and Alcatraz Island, 1854-1861

a. Capt. James L. Mason

On the last day of January 1852, Henry Halleck at division headquarters at Benicia worriedly wrote Chief Engineer Totten about the old Spanish battery at Fort Point. He said that Col. Ethan Allen Hitchcock, the division commander, wanted to know if that old work was to be armed and whether there were funds for the purpose. Halleck himself did not think the battery had much value: "In my opinion it would be useless to mount any guns in that battery in its present state, as from the character of the masonry, the men in working the guns would be more exposed behind the walls . . . than in an open plain. Moreover, to mount guns in barbette it will be necessary to either cut out half embrasures or to raise the earth on the inside; otherwise the guns could not be brought to bear upon the shipping entering the Bay."

On receipt of Halleck's letter, Totten asked the Board of Engineers for the Pacific Coast what its intentions were concerning the Spanish works. Major Smith, as senior member, replied that the old battery would not be included in any plan of defense for Fort Point that his board would prepare. This response sealed the castillo's fate even before plans were prepared--plans that would call for the reduction of the point to near water level.[25]

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24. NA, RG 77, OCE, Letters to Officers of Engrs., vol. 20, Totten, June 4, 1853, to Mason, and Land Papers, Mason, July 15, 1853, to Totten.

25. NA, RG 77, OCE, Letters Received 1838-66, Halleck, Jan. 31, 1852, to Totten, and Smith, Mar. 3, 1852, to Totten.

Captain Mason arrived in San Francisco in early July 1853, ill with yellow (Panama) fever that he had contracted crossing the Isthmus. Although he attempted to begin the project at Fort Point, he soon became so sick that he was bedridden. When Tower arrived in the city on August 5, he found Mason so seriously ill that he could not call a meeting of the board. On September 5, Mason died. Halleck wrote Totten: "It has become my painful duty to inform you of the death of Bvt. Lt. Col. J. L. Mason. . . . He died this afternoon about 4 o'clock, after a lingering illness of some weeks, of fever contracted in crossing the Isthmus of Panama on his way to this place. Col. Mason's death leaves the Board of Engineers for the Pacific Coast composed of only two members, who, being a minority, cannot proceed with any business."[26]

b. Capt. John G. Barnard

Not until the last day of 1853, halfway through the fiscal year, did Mason's replacement, Capt. John G. Barnard, arrive in San Francisco to take over the works at Fort Point and as senior member of the board to supervise Tower's operations on Alcatraz. Lieutenants Whiting and Alexander assisted him at Fort Point, while Lieutenant Prime served under Tower on Alcatraz. Whiting had supervised the operations at Fort Point while waiting for Barnard's arrival. Shortly after Mason's death, Whiting had informed the Engineer Department that the castillo was no more: "An old Spanish redan of brick which crowned the promontory has been removed & its material secured. The guns formerly mounted in this work have also been removed."[27]

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26. NA, RG 77, OCE, Letters Received 1838-1866, Halleck, Sept. 5, 1853, to Totten. Mason was buried at the military reservation at Benicia.

27. NA, RG 77, OCE, Letters to Officers of Engrs., vol. 21, Totten, Oct. 12, 1853, to Barnard, and Letters Received 1838-1866, Whiting, Sept. 15, 1853, to Totten.

In 1854, Colonel Mansfield did get to visit San Francisco--in his new role as an inspector general. Like others before him, he quickly concluded that San Francisco was an important harbor that should be permanently and strongly fortified: "At least two hundred guns should occupy Fort Point. The Government reservation for the purpose consists of that point of land to the northward called Fort Point extending southward about three miles to include the presidio. This is all sufficient and none too much. . . ." Mansfield said that Fort Point was "the key to the whole Pacific Coast in a military point of view, and it should receive untiring exertions." Alcatraz, too, was "a highly important point in the water defenses, where two hundred guns should be mounted." And an additional powerful battery should be erected at Lime Point.

That same year, in February, Maj. Gen. John E. Wool assumed command of the Department of the Pacific. Even before he arrived on the Pacific Coast, he ordered the erection of temporary batteries at both Fort Point and Alcatraz, knowing that considerable time would pass before the permanent works were ready for their armament. By September 1854, Alcatraz had two temporary batteries containing five navy 68-pounders and three 24-pounder siege guns, as well as a sixth 68-pounder and two more 24-pounder siege guns not in battery. Fort Point was armed with nine 32-pounders so located as not to interfere with construction.[28]

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28. Robert W. Frazer, ed., Mansfield on the Condition of the Western Forts, 1853-54 (Norman: University of Oklahoma Press, 1963), pp. 121-22; USDI, NPS, Bearss, pp. 50-51; NA, Cartographic Archives Div., RG 77, Fortifications File, Tower, "Plan of Alcatraces Island and Sections of Excavation showing amount of Work done to 1st of September 54."

Shortly after his arrival, Barnard called the first meeting of the Pacific board. The three officers concluded that the plans for Alcatraz's barbette batteries needed no changes, and they said they would continue to study Lime Point as a site for fortifications. Besides the problem of the land title, Lime Point offered a challenge to engineers due to the fact that it rose out of the water, almost vertically, to a height of 460 feet. Barnard noted that Mason's death had delayed progress at Fort Point, although Lieutenant Whiting had done a good job in keeping things going. Barnard thought he could finish construction of the fort in one year if he could have $750,000 to do it. He suggested to Totten that there be but one appropriation for San Francisco and that two thirds of it go toward the works at Fort Point and one third to Alcatraz. Tower argued strongly against this, pointing out that the barbette batteries on Alcatraz could be completed much more swiftly than the casemated ones at Fort Point; thus, efforts should be concentrated on the Rock so that San Francisco would have permanent armament as soon as possible. Barnard won the point for that fiscal year, but Alcatraz's first batteries were completed long before Fort Point's anyway. In the same report, Barnard mentioned that good building stone (blue sandstone) could be quarried at Angel Island and at Corte Madira, 15 miles away. However, good quality brick was scarce in California. Barnard thought it would be a good idea if he returned to the East Coast to purchase brick, cement, and so forth for San Francisco Bay. Totten turned down this suggestion when it reached his desk.[29]

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29. NA, RG 77, OCE, Letters Received 1838-1866, Barnard, Jan. 12, 1854, to Totten, and Letters to Officers of Engrs., vol. 21, Totten, Mar. 18, 1854, to Barnard. In succeeding fiscal years, Congress passed separate appropriations for Fort Point and Alcatraz, the latter usually being the smaller.

c. Construction Materials

In the beginning, high-quality construction materials remained a serious problem for Barnard and Tower. On Alcatraz, Tower constructed the large scarp wall of his South Battery with blue sandstone (from Angel Island) backed by cement. While this sandstone made a strong, handsome wall (which still stands), it proved to be excessively expensive and delivery of the stone was frustratingly slow. The remaining works on Alcatraz would be brick and concrete. At Fort Point, Barnard sought in vain for granite with which to face his casemated fort, both at Point Reyes to the north and on the Monterey Peninsula to the south. Finally, he purchased a shipload of 2,000 tons of granite that came from China--which was used for various purposes at both Fort Point and Alcatraz Island.

Good quality bricks were difficult to acquire in early San Francisco. Contracts were made with various brick-makers, some of the better brick coming from as far away as Sacramento. Eventually, the engineers established their own brick works at Fort Point and turned out a sufficient quantity for both projects.[30]

Barnard was not happy with his San Francisco assignment. In May 1854 Totten, not fully understanding the difficulties that Tower was having with sandstone, directed Barnard to use that same material in constructing the fort at Fort Point. Barnard replied with a blast at Tower's works, that he let it be known that he was angry about Totten's letter. He was also thoroughly upset that the auditors back East had arrived at the

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30. NA, RG 77, OCE, Letters to Officers of Engrs., vols. 21-22, Totten, Apr. 18, May 15, July 29, Oct. 26, and Nov. 10, 1854, and Jan. 9, 1855, to Barnard and to Lt. Col. R. E. De Russy, San Francisco, and Letters Received 1838-1866, Barnard, May 30 and June 15, 1854, to Totten, Whiting, Oct. 31, 1854, to Totten, and De Russy, Nov. 15, 1854, and Feb. 28, 1855, to Totten.

conclusion that Barnard owed money to the federal government. Fed up with things in general, Barnard requested a transfer to the East Coast. Totten was willing to oblige, and Barnard received orders transferring him to Charleston, South Carolina. In October 1854, ten months after his arrival, he turned over the works at Fort Point to the temporary custody of Lieutenant Whiting. Barnard's replacement as senior engineer on the Pacific Coast was the elderly, experienced Lt. Col. René E. De Russy, who arrived in San Francisco on November 1, 1854.[31]

d. Beginnings, Fort Point and Alcatraz

Both Barnard and Tower prepared their first annual reports of operations in the fall of 1854. At Fort Point, Barnard reported the virtual completion of the blasting away and excavating of the promontory at the point from an elevation of 97 feet to one of 16 feet. This, of course, had destroyed the ruins of the old Spanish battery and caused the removal of the American lighthouse that had just recently been erected inside the horseshoe of the battery. Additional employee barracks and storehouses for the Engineer Department had been constructed. Barnard also had a wharf constructed, 2,400 yards southeast of the point, for the unloading of bricks and cement. The laborers had built a plank road along the foot of the escarpment from this wharf to the fort site.[32]

On Alcatraz, Lieutenant Tower had erected a number of temporary frame structures, including quarters and

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31. NA, RG 77, OCE, Letters Received 1838-1866, Barnard, June 15, 1854, to Totten, and Letters to Officers of Engrs., vol. 22, Totten, Aug. 17, 1854, to Barnard and Aug. 21, 1854, to De Russy, and Lt. J. D. Kurtz, Dec. 5, 1854, to De Russy.

32. USDI, NPS, Bearss, pp. 46-49.

shops. His men had built two wharves: a permanent one on the northeast side of the island, destined to be the main landing throughout Alcatraz's history, and a temporary wharf at the southeast side of the island for the unloading of supplies for South Battery. Tower also had two roads constructed, one to each end of the island. A good start had been made at what later would be called South and North batteries, one at each end of the island. The sandstone of the scarp wall for South Battery was progressing despite the slowness of acquiring the stone; the concrete foundation for the North Battery scarp wall had been partly laid.[33]

Congress appropriated a much lesser sum of money for the fortifications for fiscal year 1855. Fort Point and Alcatraz Island received only $100,000 each. But the work continued, and on November 15, 1854, De Russy made his first report on the works: "The site for the Fort at Fort Point is now ready to receive the foundations of the Work, or rather the Excavations for the Foundations." And, De Russy wrote, "I have visited Major Tower's work on Alcatrazes Island and am gratified to find it progressing, in spite of the difficulty of procuring stone in this vicinity."[34]

At that same time, expansionists in the United States set up a clamor for the acquisition of Cuba from Spain, by diplomacy if possible, but by force if necessary. This activity caused Totten to advise De Russy to have emplacements constructed

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33. NA, RG 77, OCE, Letters Received 1838-1866, Tower, Sept. 14, 1854, to Totten.

34. NA, RG 77, OCE, Letters Received 1838-1866, De Russy, Nov. 15, 1854, to Totten, and Letters to Officers of Engrs., vol. 22, Totten, Aug. 9, 1854, to Tower and Barnard.

as quickly as possible to prepare for thirty-three 8-inch and 10-inch columbiads that were enroute to the Pacific Coast. Totten wrote: "I fear that with the exception of the south battery of Alcatras Island perhaps only a part of that permanent provision will not have been made for the reception of these guns in battery." De Russy was not to hesitate to spend funds on temporary batteries if an emergency presented itself. Perhaps because of this situation and a growing nervousness about instability in Europe (the Crimean War), Congress increased San Francisco's fortifications appropriations for fiscal year 1856 to $500,000--$300,000 for Fort Point and $200,000 for Alcatraz.

De Russy's annual report for the operating year ending September 1, 1855, described the progress on the fort's foundations. The stone had been laid and the concrete poured for the foundations of the scarp wall and the piers; the brick and concrete foundations for five cisterns had been laid, as well as the foundations of the magazines and the privies; and a start had been made on the magazine of the separate barbette ten-gun battery that was to be built south of the fort.[35]

e. Alcatraz Gets Permanent Guns, 1855

Over on Alcatraz, South Battery and its caponier were nearing completion, as was the adjacent three-gun battery. The brick scarp of North Battery was ready for its coping, and Tower had increased the size of the main wharf. Most importantly, by April 1855 Tower had mounted in South Battery the

35. NA, RG 77, OCE, Letters to Officers of Engrs., vol. 22, Totten, confidential, Nov. 18, 1854, to De Russy, and Mar. 7, 1855, to Tower, and vol. 23, Totten, confidential, Mar. 22, 1855, to all engineer officers; USDI, NPS, Bearss, pp. 67-68. It will be remembered that Spain, Russia, and Great Britain all had interests in the Pacific.

first permanent guns of the American period on the Pacific Coast--seven 8-inch columbiads and one 10-inch columbiad, all on the battery's left face.[36]

The international situation of 1854-55 resulted in another personnel change at San Francisco. When he learned of the possibility of war with Spain, Fort Point's Lieutenant Whiting wrote Colonel Totten in 1854 that if the United States attacked Cuba, he wanted to be with that army. He reminded the chief engineer that he had been left out of the Mexican War because his services had been required elsewhere. A few months later, Whiting heard that the United States was about to annex Hawaii (still called the Sandwich Islands). Again he wrote Totten imploring that he be sent to that scene of action. Totten promised to keep him in mind, but the islands were not annexed. Whiting brought up Cuba again in May 1855, again to no avail. Then he informed Totten that there were simply too many engineers at San Francisco, and he certainly would appreciate an assignment elsewhere. Finally, the secretary of war ordered Whiting transferred from San Francisco to Washington, D.C.[37]

f. De Russy and Tower on Defenses of San Francisco

In the spring of 1856, De Russy and Tower got together to hold a formal meeting of the Board of Engineers for the

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36. NA, RG 77, OCE, Letters Received 1838-1866, Tower, Apr. 15, and Sept. 4, 1855, to Totten. Tower was promoted to captain on July 1, 1855.

37. NA, RG 77, OCE, Letters Received 1838-1866, Whiting, May 7 and Nov. 15, 1854, and Sept. 16, 1855, to Totten, and Letters to Officers of Engrs., vols. 22-23, Totten, Dec. 14, 1854, June 4, 1855, and Dec. 15, 1855, to Whiting. Whiting had to wait another six years for a war to come along. At the outbreak of the Civil War, he resigned from the army to become a major general in the Confederacy; he was mortally wounded. Francis B. Heitman, Historical Register and Dictionary of the United States Army, from . . . 1789 to . . . 1903, 2 vols. (Urbana: University of Illinois Press, 1965), 1:1030.

Pacific Coast (apparently the two members on the East Coast were no longer considered a part of the board). The resulting report, signed by both of them, was the clearest statement yet concerning the coastal defenses of San Francisco.

> The Forts designed for Fort Point and Lime Point constitute the primary line of defense for the entrance to San Francisco Bay & Harbor. . . . They will command the straits one mile wide with a powerful array of guns and it may be presumed that no ordinary expedition of an enemy will attempt to pass these batteries in clear weather by day light-- Fogs however are quite a characteristic feature of the weather on this coast. Moreover the entrance to the Bay is not only practicable but quite easy at night being favored by the strong westerly trade winds and opposed by no natural obstruction. Further the objects to be reached, in the arsenal at Benicia, the Navy Yard at Mare Island, the City of San Francisco, and the possession of the only important harbor on the Pacific Coast would justify an extraordinary expedition on the part of a powerful maritime enemy and the risk of a very considerable loss in attaining its aim. Hence the necessity for a secondary line of defensive works. . . .
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> These [secondary] works are designed to shut up Racoon [sic] Straits the pass between Angel Island & the North Shore of the Bay--also the passage between Angel Island and Alcatrazes and that between Alcatrazes and San Francisco. The most prominent position of this secondary line is Alcatrazes Island. Its guns sweep a larger expanse of waters than those of any other point and it lies upon the two passes of ingress and egress most readily navigated. It has additional importance at this

time from the advanced state of its batteries as compared with those of the outer line. . . .

The position next in importance upon the Secondary line of defense of San Francisco Bay is Point Stewart [on Angel Island]. Batteries on this point will effectually command Raccoon Straits within short range, will prevent ships lying at anchor in Saucelito Cove, and will cross their fire with the North West Batteries of Alcatrazes Island. . . .

. . . The full system of defence requires the construction of the work designed for Lime Point and the erections of permanent batteries at Point San José & Point Blunt [Angel Island]. Point San José is within the City of San Francisco. The battery required at this point will be in barbet with earthen parapet--breast height of bricks, a small magazine & a brick building for Ordnance stores & for a guard house. It should mount 20 guns. A Similar barbet Battery will suffice to occupy point Blunt. . . . But this position being more isolated should be held by a key or defensive barracks. The battery should be prepared for 25 guns. Point Stewart should be occupied, by a permanent barbet battery so defended as to be secure against any attack that might be [waged?] against it. . . .

The Westerly trade winds . . . continue eight months of the year. They blow directly into the Bay of San Francisco and are quite strong from 9 O'clock in the morning until 11 at night. With the rapid current they would give from 10 to 12 knots speed to sailing vessels. With such speed ships will be under fire 30 minutes & under effectual range 20 minutes. The South pass be-

tween Alcatrazes and San Francisco is 1 1/3 miles wide. The North pass 1 3/4 miles. The distance from Alcatrazes to Point Stewart is 2 1/2 miles. . . .

The board now recommended the addition of more guns to Alcatraz's defenses, both as an extension to North Battery and as a new battery to be eventually known as West Battery. Upon reviewing this document, the chief engineer recommended to the secretary of war that the additional guns be placed on Alcatraz.[38]

At the end of the third year of construction, September 1856, the Pacific engineers again reported on their progress. At Fort Point the stone piers along the waterfronts had been constructed to the springing line of the communication arches, and the two service magazines for the first tier had been built. A start had been made on the elegant stone staircases to the second tier. The arches over the water cisterns had been completed, as had been the first tier storerooms, the gorge magazines, and the sally port. Among other details, the superstructure of the scarp wall on the seafronts had been raised to a height of 1 foot 6 inches.

Progress on Alcatraz had been remarkable. As of the end of the fiscal year, a total of 44 guns (8-inch and 10-inch columbiads) and eight 24-pounder flank howitzers had been permanently mounted in South and North batteries. In addition, three-gun battery was virtually completed, and excavations had begun on West Battery and on the extension to North Battery.[39]

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38. NA, RG 77, OCE, Letters Received 1838-1866, De Russy, Apr. 19, 1856, to Totten.

39. USDI, NPS, Bearss, pp. 72-73; NA, RG 77, OCE, Letters Received 1838-1866, Tower, Sept. 19, 1856, to Totten.

g. Tower at Fort Point, Prime at Alcatraz

For fiscal year 1857, Congress passed the largest appropriations yet for San Francisco Harbor: $350,000 for Fort Point and another $200,000 for Alcatraz. De Russy continued to supervise the works at Fort Point, but in January 1857 his health became so impaired (probably tuberculosis) that an army surgeon felt compelled to recommend his transfer from San Francisco. The War Department acted promptly, and Colonel De Russy left the Pacific Coast for new duties at Fort Delaware. Replacing him in charge of the Fort Point works was none other than Alcatraz's Capt. Zealous B. Tower. His former assistant, Lt. Frederick E. Prime, was now elevated to the charge of the Alcatraz works. Lieutenant Alexander transferred to the U.S. Military Academy in mid-1857, and two new engineer lieutenants arrived at San Francisco as assistants. They were Lt. George Washington Parke Custis Lee, son of Col. Robert E. Lee, and Lt. George H. Elliot.[40]

Tower and Prime submitted their annual reports for fiscal year 1857. At Fort Point the fort's scarp wall on all seafronts had been raised to the sills of the second-tier embrasures. The piers of the first tier had been raised to their full height. The communication arches between the casemates of the first tier were turned, as were the arches supporting the floor of the second tier, and the spaces between the arches had been filled with concrete. The three stair towers and their stairs had reached a height of 10 feet. Considerable work had been done on the ten-gun battery, where columbiads had been temporarily mounted in 1855.

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40. NA, RG 77, OCE, Letters Received 1838-1866, De Russy, Jan. 4, 1857, to Totten, and Letters to Officers of Engrs., vol. 25, Capt. H. G. Wright, Aug. 20, 1856, to De Russy, vol. 26, Totten, Feb. 4, 1856, to De Russy, and vol. 27, Totten, June 24, 1857, to Alexander; USDI, NPS, Bearss, pp. 99 and 123.

Prime wrote up his first report for Alcatraz in considerable detail. South Battery and Three-Gun Battery received final details of construction during the year, such as a drawbridge for the caponier and coping for all the scarp walls. At North Battery the scarp wall for the ten-gun extension was ready for its coping. The north caponier was practically completed. The new West Battery and its magazine were almost finished; one 42-pounder pintle stone had already been laid, and a start was made on the shot furnace. Construction had started on the defensive guardhouse and its sally port. Two of the three stone traverse circles for its 24-pounder howitzers had been laid. The 394-foot brick and concrete defensive wall from North Battery to the guard-house had been completed, and considerable scarping of the cliffs had been carried out in the area between the wharf and South Battery.[41]

Congress saw fit to appropriate another $550,000 for San Francisco's defenses for fiscal year 1858 ($350,000 for Fort Point, $200,000 for Alcatraz). Captain Tower transferred to the Atlantic Coast in the summer of 1858, but he prepared his annual report of operations before he left San Francisco. The fort's scarp wall was now raised two tiers, to an average height of 27 feet. Sixty embrasures had been constructed. The piers of the second tier had been carried up over 10 feet, and the arches and the communication arches had been turned upon them. Many of the third-tier piers had been carried up and some of the arches turned. The masonry work of the four magazines on the second and third tiers had been completed. The ironwork on the gallery of the officers' quarters had been positioned, and a start had been made on the counterscarp gallery.

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41. USDI, NPS, Bearss, pp. 101-02; NA, RG 77, OCE, Letters Received 1838-1866, Prime, Sept. 18, 1857, to Totten.

Tower reported to Totten that the fort would be ready for its armament by the time the guns could be shipped to the Pacific Coast. When fully armed, the fort would contain the following:

1st tier	28	42-pounder smoothbores
	2	24-pounder smoothbores
2d tier	28	8-inch columbiads
	2	24-pounder smoothbores
3d tier	28	8-inch columbiads
	2	24-pounder smoothbores
Barbette tier	9	10-inch columbiads
	17	8-inch columbiads
	11	32-pounder smoothbores
Total	127	

In addition, ten 42-pounder smoothbores would replace the columbiads temporarily mounted in the ten-gun battery; five 24-pounder flank howitzers would be mounted in the counterscarp gallery. The total number of heavy weapons in the Fort Point works would be 142.

h. McPherson on Alcatraz

Lieutenant Prime transferred from Alcatraz to Mobile Bay, Alabama, in November 1857. His replacement on the Rock was Lt. James Birdseye McPherson. McPherson's annual report for 1858 was a lengthy affair. He said that both the Three-Gun and South batteries were completed and that he was converting the wooden platforms there to stone ones. At North Battery, 486 feet of coping had been set and the parapet sodded.

Platform construction had begun for the ten-gun extension. West Battery was virtually completed, and the shot furnace and magazine were close to completion. The defensive guardhouse was almost ready for occupation. Excavations had been made for the defensive barracks (the Citadel), and the brick arches for the basement level had been turned. The brick and concrete defensive wall from the guardhouse to the wharf had been completed and made ready for coping; it measured over 400 feet in length and averaged 21 feet in height.

An armament report prepared for Alcatraz in July 1858 showed on hand: eight 10-inch columbiads, forty-four 8-inch columbiads, six 42-pounder smoothbores, and fifteen 24-pounder flank howitzers. Required to complete the existing batteries were fourteen columbiads, six 42-pounders, and four 24-pounder howitzers.[42]

i. Gilmer at Fort Point

Lieutenant Lee supervised the operations at Fort Point between Tower's departure in July 1858 and the arrival of his replacement, Capt. Jeremy F. Gilmer, in February 1859. Lee prepared a program for construction in fiscal year 1859, with Fort Point's appropriations having been cut to $112,500. However, it was Gilmer who prepared the annual report of work accomplished.

> The labor force had made and poured the concrete forming the foundations of the stone platforms and pavements of the gun casemates; set the platforms and flagging; put down iron traverse circles; built the

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42. USDI, NPS, Bearss, pp. 107-08 and 114-15; NA, RG 77, OCE, Letters to Officers of Engrs., vol. 26, Totten, Mar. 10, 1857, to Tower and Prime, and vol. 28, Capt. H. G. Wright, Oct. 19, 1857, to Prime, and Letters Received 1838-1866, McPherson, Nov. 4, 1857, and July 3 and Aug. 17, 1858, to Totten, and Prime, Jan. 2, 1858, to Totten.

remaining piers of the 3d Tier of casemates, turning 15 of the bombproof arches; completed the brick masonry of the parade wall of the land front; laid the granite cordon entirely around the work; raised the parapet walls thereon to within ten inches of the superior slope along the water fronts, and on the land front to reference (64' 9") above low water level; formed the concrete backing over the main arches; laid the foundations for the barbette gun platforms; covered a portion of the arches with asphaltum; and built the breast-height walls on the bastions.

The 1859 appropriation for Alcatraz is unknown; however, the funds were ample enough to allow McPherson to carry on the work. At South and Three-Gun batteries he continued to convert wooden platforms to stone ones. At North Battery wooden platforms were also being converted. Four 42-pounders had been mounted in the extension, and the shot furnace for these guns was partially finished. Eight 42-pounders had been mounted in West Battery. The defensive guardhouse was practically completed. (McPherson reported that he had mounted its three howitzers, but subsequent reports would reveal that this was not the case.) The walls of the defensive barracks had been raised to a height of 43 ½ feet. The cast iron girders for the roof had been set. The moat or ditch around the Citadel had been paved, and the adjacent cisterns had been completed.[43]

j. Alcatraz Gets a Garrison, 1859

Congress was not in a mood to pass a heavy appropriation for fortifications in fiscal year 1860. The chief

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43. USDI, NPS, Bearss, pp. 125 and 130-31; NA, RG 77, OCE, Letters to Officers of Engrs., vol. 29, Col. S. Thayer, Actg. CE, June 21, 1858, to Tower, and Letters Received 1838-1866, Gilmer, Dec. 13, 1858 to Thayer, and McPherson, Aug. 2, 1859, to De Russy.

engineer notified Gilmer and McPherson that their funds were limited to $50,000 for Fort Point and $30,000 for Alcatraz Island--both by far the smallest sums since work began in 1853. On Alcatraz, McPherson devoted most of his money to completing the defensive barracks. He succeeded in his task, and on December 30, 1859, Alcatraz's first garrison occupied the strongly built structure, which would be a landmark in San Francisco Bay for the next 50 years. When his Alcatraz funds were exhausted, McPherson made a thorough survey of the Lime Point area, including Point Cavallo.

Work continued on various aspects of the fort at Fort Point, including barbette platforms for columbiads on the waterfronts and platforms for 32-pounders on the land front of the barbette tier. The parade had been graded, and a shot furnace had been erected on it. Also, heavy doors had been hung at the outer end of the sally port.[44]

k. Totten to San Francisco

In 1859 a crisis occurred concerning the ownership of San Juan Island, which lay between Washington Territory and Vancouver Island. When Brig. Gen. William S. Harney, commanding the Department of the Columbia, arbitrarily landed U.S. Infantry on the island, he provoked the British authorities to send in the Royal Navy; Maj. Gen. Winfield Scott, commander in chief of the U.S. Army, was then dispatched to the Pacific Coast to rein in Harney and to reach a meeting of the ways with the British.

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44. NA, RG 77, OCE, Letters Received 1838-1866, McPherson, Mar. 2 and July 31, 1860, to De Russy, and Letters to Officers of Engrs., vol. 30, De Russy, Mar. 18, 1859, to Gilmer and McPherson; USDI, NPS, Bearss, p. 136.

Secretary of War John B. Floyd directed Chief Engineer Totten to proceed to the Pacific Coast to make a personal inspection of engineer operations there and to examine Lime Point together with General Scott to determine if it should be purchased for fortification purposes. Declining a dinner invitation at the White House that evening, Totten left Washington, D.C., on November 16, 1859. He was in San Francisco by December 12 but missed meeting with General Scott who had completed his mission and had already begun his voyage home. Totten proceeded to the Columbia River and to Olympia, Washington, returning to San Francisco by early January. He spent most of that month studying the bay's defenses.

Immediately upon returning to Washington in March 1860, Totten submitted a report on his travels to Secretary Floyd. He said he had not investigated Lime Point since he had had no authority to act on it alone. Nevertheless, it was his opinion that the price being asked for the land was much too high even though Lime Point was necessary for the defenses of California. Next Colonel Totten summarized the defense project for San Francisco Bay, commenting on its present status.

> A permanent fort at Fort Point . . .
>
> This fort is now ready for 90 guns; and in a few months the number may be increased to 120--all of heavy calibres. . . . There is no stronger, no more efficient, than this, gun for gun, in any country. . . .
>
> Permanent batteries at Lime Point . . .
>
> Plans have been prepared for these batteries to contain some 200 guns. . . . It is probable that Point Cavallo

will be included in this occupation . . . to cross fire with those of Alcatraz island and Angel island. . . .

Permanent batteries on Alcatases Island

Its batteries, already completed in a very perfect manner, to the extent of 75 guns of heaviest calibre, will have a powerful effect upon any vessels. . . .

The guns should be increased in number at this position, until all the contour of the island that looks towards the entrace, and towards Angel Island, shall be occupied making an addition to its armament of some 25 or 30 guns.

Two permanent batteries on Angel Island: One bearing upon the channel between it and Alcatrass island--the other commanding Racoon Straits.

These works may be postponed until those on Lime Point are advanced to . . . efficiency. . . .

A battery on point San José--to be thrown up in event of War

Totten was exceedingly pleased with those works already completed at Alcatraz and Fort Point, saying: "They will compare favorably with any batteries in the world."[45]

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45. NA, RG 77, OCE, Land Papers, Totten, Mar. 6, 1860, to Secretary Floyd, and Official Papers (Totten), VIII, Totten, Nov. 9, 1859, to Floyd.

5. Civil War, 1861-1865

a. War Comes

Colonel Albert Sidney Johnston assumed command of the Department of the Pacific in San Francisco on January 14, 1861. Despite his Southern sympathies, he took certain steps to protect army equipment and the safety of the harbor. The still unnamed fort at Fort Point was occupied by an artillery company in February. At the same time Johnston ordered the transfer of 10,000 muskets, their accoutrements, and ammunition from Benicia Arsenal to Alcatraz Island for safekeeping. The commanding officers at both Fort Point and Alcatraz received strict orders to be alert to any attempt by Southern sympathizers to seize their posts.[46]

Things were not going well for the engineers at this time. Because of a shortage of money in the U.S. Treasury, the secretary of war directed in January 1861 that all fortification construction in the country be discontinued. Despite this order, Gilmer proceeded with the completion of the quarters at Fort Point so that the artillerymen could move in. The order was later modified and both Gilmer and McPherson were able to proceed with their projects.

b. De Russy and Elliot Take Over

In March 1861, Colonel Johnston was replaced by a Union man, Brig. Gen. Edwin V. Sumner, as department

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46. NA, Microcopy 617, Fort at Fort Point, Post Returns, Feb. 1861-Dec. 1865; NA, RG 393, U.S. Continental Commands, Department of Pacific, and Letters Sent 1848-1866, vol. 10, AAG W. W. Mackall, Feb. 17, 1861, to Lt. J. McAllister, Benicia; U.S. Congress, The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies, (hereinafter cited as OR), 128 vols. (Washington: Government Printing Office, 1890-1901) Series 1, vol. 50, part 2, pp. 444-45 and 448, Mackall, Feb. 17, 1861, to Lt. Col. T. Swords, QM, Dept. of Pac., and Feb. 20, 1861, to CO, Alcatraz.

commander. Following the surrender of Fort Sumter on April 13, 1861, Captain Gilmer and Lieutenant Alexander resigned from the army to serve with the Confederacy. Lieutenant Lee had already transferred to the East Coast and now resigned from there. Lieutenant McPherson on Alcatraz was a Union man, and he too would soon depart for fame and death on the battlefield. Replacing Gilmer as senior engineer and engineer in charge of the works at Fort Point was none other than Colonel De Russy, who returned in November 1861. And on July 31, 1861, McPherson turned the Alcatraz accounts over to Lt. George H. Elliot, who had been an assistant to Gilmer at Fort Point.[47]

c. Land Defenses

Back in 1850 the Joint Commission for Defense of the Pacific Coast had recommended land defenses for the works at Fort Point. Nothing had come of this recommendation in the succeeding years except for the occasional reiteration of the idea. A few weeks after the war started, Totten wrote McPherson directing him to leave Alcatraz long enough to make a reconnaissance of the coast between San Francisco and Monterey. McPherson was to gain exact knowledge about all potential landing places that an enemy might use who was intent on moving on San Francisco: "In relation to the landing places, I suppose you can do no better . . . than collect opinions of the nearest residents, fishermen etc: and yet this is a very important part of the inquiry."

47. NA, RG 77, OCE, Letters to Officers of Engrs., vol. 32, Totten, Jan. 14, 1861, to all engineer officers, Kurtz, May 27, 1861, to McPherson, and Totten, July 2, 1861, to Gilmer, and Letters Received 1838-1866, McPherson, Aug. 30, 1861, to Totten; USDI, NPS, Bearss, pp. 166-67.

McPherson spent much of June making his survey and submitted a 25-page report on his findings. As to landing places, the first one he mentioned was today's Bakers Beach, about a mile south of Fort Point. Next, south of Point Lobos, came the 6-mile-long Ocean Beach. Concerning it, McPherson wrote: "The surf on this Beach is very heavy, making a landing for Light troops with their arms alone very difficult, though there are times . . . that large bodies of troops with their Artillery . . . might be thrown ashore in good surf Boats, but I should regard the operation as very unsafe and hazardous." The report went on to discuss other potential landing sites farther south; then it turned to a discussion of the land itself and what might be done in terms of stopping an enemy marching on the city.

> Immediately in rear of the city is a series of sand hills extending out in the direction of Ocean Beach, and terminating in a range of high hills SW of the mission Dolores. Running across the Peninsula in a SE direction about eight miles from the City is the San Bruno Range which terminates in a bold steep bluff on the Bay, rising from this point as you proceed NW to the highest peak called San Bruno Mountain, whence it falls off gradually until within three quarters of a mile of Lake Mercedes [Merced], when it sinks down to the level of the plain. A short distance to the south of this, commences the range of mountains which continue without interruption essentially parallel to the coast separating the Bay and the Valley of San José from the Ocean.

As to defenses

> Supposing . . . that the Enemy has effected a landing, and is about to commence his advance movement,

The plan I propose for the defence of the City is the following, which supposes of course that the entrance to the Harbor is perfectly secure, and that the outworks to Fort Point including the Redoubts on the site of the Telegraph Stations, and the hill in rear of the Presidio are finished [today's Rob Hill and Presidio Hill, both within the boundaries of the Presidio of San Francisco].

1st. To obstruct the "San Bruno Turnpike" where it winds around the [east] base of the San Bruno Mountain, establish batteries on two or three of the most favorable points for sweeping the road, and occupy a portion of the heights immediately above it.

2nd. Concentrate the main force in the vicinity of the "Abby House" [at the western foot of the San Bruno Mountains], the left resting well up on the "San Bruno Range" and the right extending down in the plain and resting on Lake Mercedes; on either side of the road are commanding heights which could be strongly occupied with Artillery so arranged as to thoroughly sweep the ground, in advance. This position I consider the most important of any south of San Francisco. It is 7 miles from the city, and in the point at which all the roads from the country below unite--except the "San Bruno Turnpike." It is easily accessible from the city and comparatively little time would be required after the alarm was given to get the troops with their guns etc. in position.[48]

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48. NA, RG 77, OCE, Letters to Officers of Engrs., vol. 32, Totten, May 7, 1861, to McPherson, and Letters Received 1838-1866, McPherson, "Memoir of a Military Reconnaissance of the Coast and the Coast routes from San Francisco to Monterey . . . June 1861." At the end of the report, McPherson gave some population statistics: Monterey County, 4,746; Santa Clara County, 11,918; Santa Cruz County, 4,949; San Mateo County, 3,221; San Francisco County, 57,033; and the state of California, 375,947.

d. Fort at Fort Point Is Armed, 1861

It fell to Lieutenant Elliot to prepare the annual report of operations at Fort Point for fiscal year 1861. He recorded the completion of the quarters within the fort, the construction of numerous gun platforms, the sodding of the "terreplein" on the barbette tier, the erection of a flagstaff, and many more details. He said that by the end of July 1861 his workmen "will have finished all that is necessary for the defence of the place, as far as the fort proper & its counterscarp gallery is concerned."

In October 1861, Elliot prepared the fort's first armament report. Some weapons had been placed on all three casemated tiers, as well as on the barbette tier and in the counterscarp gallery. Together, they amounted to forty-three 42-pounder smoothbores, six 24-pounder guns, four 24-pounder flank howitzers, two 10-inch columbiads, eight 8-inch columbiads, eleven 32-pounder smoothbores, six 10-inch mortars, and five 24-pounder Coehorn mortars, for a total of 85 heavy weapons.

At Alcatraz, Lieutenant McPherson was still present to write his annual report. During the year considerable progress had been made on a new 12-gun battery that was located between West and North batteries. The breast-height wall and six small shellrooms had been completed. The parapet had been filled with earth and covered with sod that had been brought over from the Presidio. McPherson, with some pride, had erected a flagstaff on top of the Citadel. Also, when the strength of the garrison greatly increased in the spring of 1861, the engineer had turned one of his own barracks over to the commanding officer and had supervised the construction of an additional one that was capable of housing two companies. At the time of his report, McPherson counted 86 pieces of ordnance mounted on the island.[49]

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49. USDI, NPS, Bearss, pp. 162 and 191-92; NA, RG 77, OCE, Letters Received 1838-1866, McPherson, July 26, 1861, to Totten.

e. San Francisco Bay in Danger?

Congress passed the fortifications appropriations bill for fiscal year 1862 before the bombardment of Fort Sumter. Again, because of the state of the treasury, only $75,000 was available for San Francisco ($50,000 for Fort Point and $25,000 for Alcatraz). However, the coming of war resulted in even this small appropriation being suspended. When June 30, 1862, came around, Elliot had to report: "Nothing has been done on this Work for want of Funds during the year." A similar situation was to be found at Fort Point, where the engineers busied themselves with minor matters such as painting the quarters. De Russy did succeed in acquiring funds to repair the bulkhead around the point, which was damaged heavily during a December storm.[50]

The engineers did not just sit around waiting for another fiscal year; after all, there was a war going on. Lieutenant Elliot was quite concerned that war might come to the Pacific Coast, as well as to the Atlantic states. One probability that was apparent to him was an attack by Great Britain who was sympathetic to the Confederacy. Elliot wrote Totten to remind him that the West Coast should not be ignored by the War Department: "Should there be danger of a war with a foreign power (of which it seems to us, here, there is a probability) I conceive it to be absolutely necessary, that not only the fortifications in this harbor, but those for the defences of Puget Sound and the Columbia River, should be constructed without delay." He added: "The British have recently strongly increased their naval forces at Vancouver's Island and I have heard within a few days that an additional

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50. NA, RG 77, OCE, Letters Received 1838-1866, Elliot, Oct. 20, 1862, to Totten, and Letters to Officers of Engrs., vol. 32, Totten, Mar. 9, 1861, to Gilmer and McPherson; USDI, NPS, Bearss, pp. 167-70.

regiment has been ordered from China for the re-inforcement of the land forces there."

Brigadier General George Wright had taken command of the Department of the Pacific in October 1861. A major concern to him was the security of San Francisco Bay. He asked De Russy for a report on what emergency measures should be taken to make the harbor safe from attack. De Russy's preliminary concepts called for an additional 20 guns at Fort Point located in a temporary battery on the beach between the wharf and the fort, a 20-gun battery in the cove just west of Lime Point (this cove was later called both Gravelly Beach and Kirby Beach), still another 20-gun battery at Point San José, 10 guns on Point Blunt, 20 or 30 more at Point Stewart on Angel Island, and a battery on Yerba Buena Island. To protect Mare Island, batteries could be established at Point San Pablo and Point San Pedro at the entrance to San Pablo Bay. "With these defenses," he wrote, "it is supposed that until the permanent Fort on Lime point can be constructed, the Harbor may be made quite defensive against a large fleet." As for land defenses for San Francisco, De Russy fell back on McPherson's earlier recommendations, adding several strategic points where guns could be mounted.

Wright informed the War Department of these emergency needs, saying that De Russy would prepare the plans. When Totten heard of the project, he wrote De Russy reminding him that he would have to send the plans to Washington for Totten's approval.[51]

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51. NA, RG 77, OCE, Letters Received 1838-1866, Elliot, Sept. 12, 1861, to Totten, and De Russy, Feb. 13, 1862, to Wright, and Letters to Officers of Engrs., vol. 33, Totten, Mar. 19, 1862, to De Russy.

f. Armament Mounted, 1863

Congress paid attention to San Francisco's needs and appropriated $200,000 for the works at Fort Point and, later, $25,000 for Alcatraz Island for fiscal year 1863. While his funds were not large, Elliot managed to complete three new batteries by the end of June 1863--two between West and North batteries and one between West and South batteries. There were now eight batteries ringing the island, which could mount a total of 101 guns and 19 flank howitzers. Because of the confusion caused by calling the batteries by points of the compass, Elliot now renamed them after officers in the Corps of Engineers. At Fort Point, De Russy had the permanent guns mounted in the ten-gun battery outside the fort. He also had a large force of laborers at work on a seawall. The commanding officer at Fort Point reported that only 80 heavy weapons were mounted in the works as of September 1863.[52]

General Wright, worried about the defense of the city, asked the naval commander at Mare Island if he had a vessel that could be moored in front of the city on which heavy guns could be mounted. The naval officer replied in the negative and suggested that the city of San Francisco purchase its own ship. Nevertheless, he was expecting the naval ship Cyane to arrive in a month, and its captain would be ordered to anchor in the harbor "prepared to co-operate with the fort against any attempt to enter the harbor by a rebel steamer." In February 1863, the Cyane took position in front of San Francisco.[53]

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52. NA, RG 77, OCE, Letters to Officers of Engrs., vol. 33, Totten, Feb. 22, 1862, to De Russy, and Letters Received 1838-1866, Elliot, Sept. 2, 1862, to Totten; USDI, NPS, Bearss, pp. 170-71 and 193-94.

53. OR, Series 1, vol. 50, pt. 2, pp. 294-95, 297, 315-16, 391-92, Wright, Jan. 26, to Capt. T. O. Selfridge, USN, Mare Island, and Selfridge, Jan. 29 and Feb. 17, 1863, to Wright, and Wright, Apr. 14, 1863, to AG. In April 1863 the navy said it might have to move the Cyane to Mare Island.

Rumors of a Confederate attack, either externally by a Confederate ship or internally by Southern sympathizers, swept San Francisco in the spring of 1863. However, calm prevailed and the rumors died. Wright reported to the War Department: "The apprehensions of a disturbance of the peace in this State by persons sympathizing with the rebellion, which created much alarm in the public mind, have in great measure subsided. I have lately made a thorough inspection of the forts and defenses of the harbor of this city, and find that the arrangements to meet any emergency as far as practicable are perfect." Still, nothing had yet been done about the temporary batteries. Wright said he had asked De Russy to inspect Rincon Point in the city and Yerba Buena Island for battery locations. De Russy proceeded to do so; at the same time Elliot went up to Mare Island to advise the naval commandant as to the locations of batteries at that point.[54]

g. Temporary Batteries

No less than $400,000 was made available for the fortifications for the bay in fiscal year 1864. Of this total, the largest slice went to the fort at Fort Point--$200,000. The works at Alcatraz received $100,000, and the remaining $100,000 was for the temporary batteries.

The locations for these temporary batteries became a stormy issue in the summer of 1863. General Wright, possibly irritated by the slowness of De Russy, who was now an old man of very poor health, decided to ignore the Engineer Department and build the batteries himself. He had an engineer on his

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54. OR, Series 1, vol. 50, pt. 2, pp. 391-92, and Wright, Apr. 14, 1863, to AG; NA, RG 77, OCE, Letters Received 1838-66, De Russy, Apr. 21, 1863, to Totten.

departmental staff, Maj. Robert S. Williamson, and he ordered him to proceed with the construction of a 12-gun battery on Rincon Point (near the intersection of Harrison and Beal streets and to the left of Tichnor's boat yard) and two batteries having 18 guns on Yerba Buena Island.

At this time, Totten's office was of the belief that Wright and De Russy had together decided on the battery locations and that De Russy was supervising their construction. But it was very quickly discovered that Wright had bypassed De Russy and Elliot and that he was building batteries at points other than those recommended years earlier by the Board of Engineers for the Pacific Coast. On August 11, 1863, Henry Halleck, a member of that first board and now commander in chief of the Union army, wired Wright that the first temporary batteries to be built would be at Point San José and Angel Island: "Works on Rincon Point and Yerba Buena Island will not be constructed at present." To support this decision, a special board of engineer officers was appointed in Washington, D.C., to review the matter (one of the board members being none other than John G. Barnard, now a brigadier general). The board concluded that a battery of ten heavy rifles at Lime Point was the best answer to an emergency. To strengthen the second line of defense, it recommended that a battery of ten guns be mounted at Point San José and another of ten to twenty guns on Angel Island. As for batteries at Rincon Point and Yerba Buena Island, they were "too secondary [in] importance to justify their construction while the external lines are incompleted." Perhaps, the board added, two or three powerful center-pintle guns on Telegraph Hill could contribute to the strength of both the external and internal lines.

Halleck notified Wright of the board's conclusions on August 18. Because of Lime Point's height above sea level and because the United States did not have title to it, it

was out of the question. That only left Point San José and Angel Island for temporary batteries. Major Williamson immediately stopped the work at Rincon Point, but he was thoroughly disgusted at what he considered to be a stupid decision. He went over to Angel Island and examined both Points Blunt and Stewart, saying they were suitable for batteries but constructing a road between them would be quite expensive.

General Wright took the news about Rincon Point calmly enough, but he was not willing to let the engineers take over the work of erecting the new batteries. He wrote the adjutant general that he had a good engineer, Williamson, and if he could have the money, he could get the batteries built in no time, "but under the direction of the Engineer Bureau months will elapse before the profiles are drawn." Warming up to the subject, he continued: "While we are meditating some morning, the first thing we shall know will be the enemy's guns thundering against the city."

Wright had Williamson proceed with preparations to construct the works, directing him to ask De Russy what help he could extend. The records are not clear as to who or what helped Wright to learn that the Engineer Department was still very much in charge of constructing fortifications. But a week later, Williamson was ordered to report to De Russy to work for him in the construction of the new works.[55]

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55. NA, RG 77, OCE, Letters to Officers of Engrs., vol. 35, Totten, Apr. 15, 1863, to De Russy and Elliot, and Maj. J. C. Woodruff, Aug. 8, 1863, to De Russy, and Letters Received 1838-1866, Report of Board of Officers, Washington, D.C., Aug. 17, 1863, signed by Maj. J. D. Kurtz, Brig. Gen. G. W. Cullum, and Brig. Gen. J. G. Barnard; OR, Series 1, vol. 50, pt. 2, pp. 545-47, 559-60, 573, 575, 578, 599, 600, and 609, AAG R. C. Drum, July 30, Aug. 11, and Sept. 1, 1863, to Williamson, Halleck, Aug. 17 and 18, 1863, to Wright, Williamson, Aug. 18 and 24, 1863, to Drum, and Wright, Aug. 31, 1863, to AG, and Dept. of Pac., Special Orders 204, Sept. 8, 1863.

h. Angel Island

Construction began in September 1863, with carpenters erecting quarters for engineer employees on Angel Island and a survey being made at Point San José. A company of artillery was stationed on the island on September 21, 1863, and it promptly established Camp Reynolds in the valley between Points Stewart and Knox. This company was supposed to assist the engineers in constructing the batteries. It is not known how much help it extended, but the troops did build an unofficial and unnamed battery on the waterfront at Camp Reynolds. This battery contained five 32-pounder smoothbores that were scheduled for eventual emplacement at Point Blunt. The Engineer Department never recognized the existence of this battery inasmuch as it was not part of the approved project. In February 1864, a wharf was completed at Camp Reynolds, greatly improving the unloading of supplies and equipment.[56]

In addition to engineer employees and artillerymen, contractors were involved with the construction of all or part of the new batteries. Point Stewart turned out to be much too small and narrow to contain the large battery originally contemplated for the site; consequently a third location, Point Knox, was chosen for a battery on Angel Island.

(1) Point Stewart

Construction of the battery at Point Stewart began in November 1863. While De Russy reported the

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56. NA, Microcopy 617, Roll 670, Angel Island, Post Returns, Sept.1863-Dec. 1905, Returns for Sept. 1860; NA, RG 77, OCE, Letters Received 1838-1866, De Russy, Oct. 10, 1863 and Mar. 9, 1864, to Totten; OR, Series 1, vol. 50, pt. 2, p. 902, and pp. 983-84, Capt. George P. Andrews, July 14, 1864, to AAG Drum and De Russy, Sept. 22, 1864, to McDowell. Camp Reynolds was named for Maj. Gen. John Fulton Reynolds, killed at Gettysburg two months earlier.

battery as being completed in January 1864, subsequent reports would show that he was unduly optimistic. As originally designed, this battery was to contain four front-pintle 32-pounders, but in April a change was made in the parapet to allow for the mounting of a center-pintle 10-inch columbiad that would have a traverse of 250 degrees. In reporting this change, De Russy mentioned that the parapet was revetted with planks. By June 1864, a road had been constructed from the wharf to the battery, and a start had been made on a 10- by 16-foot wooden magazine. The three 32-pounders were mounted in July 1864; the columbiad was mounted in August; and the powder was stored in the magazine at the same time. Now, indeed, the battery was finished.

(2) Point Knox

A survey for a ten-gun battery at Point Knox was undertaken in November 1863, and construction of the earthen parapet was commenced soon after. De Russy reported that the battery was completed in February 1864, but it too still required a magazine and wooden platforms. By April, a road from the wharf at Camp Reynolds to the battery was completed, and in May work commenced on a 10- by 23-foot magazine. Construction of the wooden platforms (the wood well covered with boiled coal tar) began in June. Point Knox's armament (seven front-pintle 32-pounders, one 8-inch Rodman, and two 10-inch Rodmans) were mounted by September 1864. In his annual report for fiscal year 1864, De Russy gave a few additional details on the battery's construction: "The platforms of the large guns are of pine timber . . . and there are . . . redwood sills laid under the circles of the 32 Pdrs. The revetment of the breast height is of 3" plank & heavy scantling."

(3) Point Blunt

Overland communication between Camp Reynolds and Point Blunt was next to impossible owing to the rough

terrain; consequently, supplies and material for the battery at this location were unloaded at the point itself. The site was surveyed in November 1863, but construction of the seven-gun battery did not begin until March 1864. Excavation of earth and rock and the construction of a stoneless earthen parapet were completed by April. The breast-height wall here was made of redwood planks. In July a 10- by 22-foot magazine was constructed of Oregon pine. Heavy rains in December 1864 caused heavy damage to the parapet, and repairs took until March 1865 to be completed. De Russy hoped to mount the guns in February 1865, but the barge carrying them was swamped on the beach during a storm, delaying the work. Then in May nearly all the parapet slid off toward the front, dropping 5 feet. Repairs were not attempted, and the guns for this battery were never mounted.

When the construction of the Point Blunt battery was just beginning, Gen. Irvin McDowell, then commanding the Department of the Pacific, informed the commanding officer on Alcatraz Island that he would be responsible for the battery and would send a detachment there to man it. The reason for this arrangement apparently was either because of the difficult communications on Angel Island or because Alcatraz had such a large garrison at that time, as compared to Camp Reynolds. In any case, because the guns were never mounted, Alcatraz's soldiers did not get detached duty on Angel Island.

i. Point San José

Two batteries were planned for Point San José, or Black Point, as a few army people were calling it. Each was to have six guns, and the works were to be called East and West batteries. As planned, they lay adjacent to each other and were connected by a covered way (sunken road). Although Point San José had been set aside as a military reservation in 1850, the army had done nothing to develop or to preserve the property. A

number of people had acquired claims to the land, among them being none other than Gen. John Charles Frémont and his wife, Jessie Benton. A great protest arose when plans for the batteries became known. However, Secretary of War Simon Cameron in 1863 directed that the point be occupied, saying: "The question of ownership will be determined hereafter."

Considerable excavation for the batteries was carried out in March 1864, and the parapets (of stone-free earth) and breast-height walls (of brick and concrete) of both batteries were carried up to their proper heights except for the traverse at the east end of East Battery. A month later the interior crests were revetted with tongue-and-grooved planking, which was painted. Each battery had five small shellrooms in the parapet between the six guns. The slope behind the terreplein was taken down "at 1/2 to 1." A ramp was excavated leading into West Battery, and by means of it and the covered way between the batteries the guns could be hauled into both. At the far east and west ends of the complex, a wooden magazine was constructed and covered with 10 feet of earth. The magazine for East Battery measured 10 by 16 feet, and West Battery was 10 by 14 feet.

By the end of May 1864 the batteries (including the platforms) were considered complete and ready for their armament. Six 10-inch Rodmans on front-pintle iron carriages were mounted in West Battery by June 30, 1864, and at East Battery six front-pintle iron carriages had been placed in position, but their 42-pounder-banded rifles had not yet arrived. The exact date on which these rifles were mounted has not been found but it is thought not to have been much after June 1864.[57]

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57. NA, RG 77, OCE, Letters Received 1838-1866, De Russy, Oct. 10, Nov. 10, and Dec. 5, 1863, Feb. 6, Mar. 9, Apr. 13,

j. Land Defenses, Again

De Russy learned in the summer of 1864 that Congress had passed an appropriation of $177,000 for the land defenses of San Francisco. Early in December, he called a meeting of the Board of Engineers for the Pacific Coast to prepare up-to-date land defense plans. The board retained the idea of batteries across the peninsula in the vicinity of the San Bruno Mountains and Lake Merced, with a battery on the neck of land between the lake and the ocean. But because of greatly increased and still increasing ranges and effects of artillery during the war, the board recommended that the Presidio's two hills not be occupied by redans or batteries. Instead, if war came to San Francisco, batteries should be erected at Point Lobos to the southwest of the Presidio and on Point Bonita north of the Golden Gate. Thus did this 1864 land defense plan mention the use of three parcels of land that would eventually become forts in the system of San Francisco's defenses: Fort Funston near Lake Merced, Fort Miley on Point Lobos, and Fort Barry on Point Bonita. Despite this flurry of activity, nothing further was done during the war concerning San Francisco's land defenses.[58]

May 10, June 11, July 11, Aug. 9, Sept. 8 and 22, 1864, and Jan. 10 and Mar. 10, 1865, to OCE; OR, Series 1, vol. 50, pt. 2, pp. 636 and 856, Halleck, Oct. 2, 1863, to Wright, and AAG Drum, May 20, 1864, to CO, Alcatraz. East Battery was scheduled to have six 42-pounder Parrott rifles; however, six 42-pounder banded rifles were actually mounted. An inspection of one of the 42-pounder rifles at Point San José in June 1865 showed that the weapon had been manufactured at Gen. John Mason's Columbia Foundry, Georgetown, D.C. It bore the date "1840" and had been inspected by James W. Reilly (who became an inspector in 1863). Its wrought iron reinforcement did not fit perfectly. OR, Series 1, vol. 50, pt. 2, pp. 1256-57, Col. A. L. Anderson, June 6, 1865, to Drum; Warren Ripley, Artillery and Ammunition of the Civil War (New York: Promontory Press, 1970), pp. 357 and 359.

58. NA, RG 77, OCE, Letters to Officers of Engrs., vol. 37, Delafield, July 29, 1864, to De Russy, and Letters Received 1838-1866, Capt. W. P. Craighill, Dec. 29, 1864, to Delafield,

k. Civil War's Effect on Coastal Defenses, 1864 On

Alcatraz Island's defensive capability was improved during fiscal year 1864 by the construction of 27 permanent platforms. Also, the side of the island toward the city, which was accessible to an enemy landing, was cut away to make a 30-foot-high escarpment. The perpendicular cliff is still to be found and, indeed, the top of the island remains generally inaccessible from the south and west sides. With this escarpment, Elliot was now able to place earth in front of the various retaining walls along Batteries Mansfield, Stevens, Tower, and McPherson, thus thickening and strengthening the parapets. At Fort Point, De Russy concentrated on the construction of the granite seawall and making a start on a "coverface" on the land front at Fort Point. But in July 1864, the Engineer Department ordered De Russy to stop work on the coverface. The historian Edwin C. Bearss has described the cause of this suspension:

> Unknown to De Russy, Secretary of War Stanton had convened a Board of Engineers to make a study of masonry fortifications under construction. Civil War experiences at Fort Pulaski where rifled guns had breached the scarp after a short bombardment, and at Fort Jackson where projectiles from XIII-inch mortars had battered the defenses caused many officers to question the value of expensive masonry fortifications. A technical revolution in heavy ordnance had apparently made the handsome and costly third system forts obsolete.

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transmitting report of Board of Engrs. for Pac. Coast, Dec. 2, 1864. General Totten died April 22, 1864, and was succeeded as chief of engineers by Brig. Gen. Richard Delafield.

> The Board, on meeting, recommended no more casemated works of more than one tier be built. Favored were barbette batteries, with service magazines in the traverses between each pair of guns. Under no circumstances would works under construction have stone parapets.[59]

Until 1864, the coastal ordnance at San Francisco consisted mainly of 8- and 10-inch columbiads and 42-pounder smoothbores (for firing hot shot). Back in the summer of 1863 when discussing the then proposed works for Angel Island, De Russy had noted that while rifled guns would be best for the new works, San Francisco would have to rely on the weapons it already had. However, affairs in the East had improved to the extent that in the fall of 1863 the Ordnance Department announced that it would ship to De Russy 20 of the popular Rodman smoothbores and twelve 42-pounder rifles. The Rodmans would consist of eight 8-, ten 10-, and two of the huge 15-inch guns. These would be complete with carriages, implements, equipments, and ammunition. This was but the beginning; San Francisco's coastal defenses were about to reflect the lessons learned from the war.[60]

Maj. Gen. Irvin McDowell, fresh from the Eastern battlefields, assumed command of the Department of the Pacific on July 1, 1864. One of the first things he did as the new

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59. NA, RG 77, OCE, Letters Received 1838-1866, Elliot, Aug. 17, 1864, to Delafield; USDI, NPS, Bearss, pp. 184-87.

60. NA, RG 77, OCE, Letters to Officers of Engrs., vol. 36, Maj. J. C. Woodruff, Oct. 8, 1863, to De Russy; FARC, San Bruno, RG 77, San Francisco Dist., Letterbook, Gilmer and De Russy, 1861-1864, and De Russy, Aug. 25, 1863, to Drum. It has already been noted that some of these new guns were mounted at Point San Jose and Angel Island.

commander was to make a tour of the harbor defenses. He decided to invite some prominent San Francisco citizens to accompany him so that they could see for themselves the security being afforded them. But his idea backfired: "Our excursion had an effect I was not calculating upon. It materially weakened the confidence which, to a certain extent, had heretofore been enjoyed by the residents. . . ."

McDowell found little about the works that pleased him. Lime Point could not be armed until title was secured to the land, and a million dollars had been spent on years of blasting the rocky cliffs. A water battery could have been built in the adjacent valley--but it had not been. Batteries were needed at Yerba Buena Island and Rincon Point. The troop-built water battery at Camp Reynolds should be incorporated with the harbor defenses. The battery at Point Stewart was too high for an enemy ship could pass under it. A harbor as large as San Francisco needed rifled guns of which there were none. And of the 15-inch Rodmans, there were but two in the bay.

I. France, Great Britain, and San Francisco

While McDowell grumbled, the engineers went about their business expending the small appropriations for fiscal year 1865: $90,000 for Alcatraz and $50,000 for Fort Point--the first time that the masonry fort received less money than the island. In February 1865 a board of engineers met in San Francisco to discuss the harbor's defenses. Capt. William P. Craighill, from the Office of the Chief of Engineers, attended the meetings of the board. On his return to Washington, D.C., Craighill submitted his views on the defenses of the Pacific Coast. If the United States was to go to war with either Great Britain or France, they would strike at the Pacific Coast, especially San Francisco. France, he said, virtually controlled Mexico while Great Britain was engaged in opening a communication between the

Atlantic and Pacific in the British possessions to the north. Craighill urged the completion of at least two railroads across the United States. As for San Francisco, he wrote: "No time should be lost in preparing for mounting more guns at the Golden Gate. The armament of Fort Point is weak for such an important position & the work itself is a poor concern, when we consider what might have been done there. The ground opposite Fort Point [Lime Point] should be immediately occupied, as well as Points Lobos & Boneta to form an outer line." Also, he agreed with McDowell that the armament on Angel Island was inadequate for guarding Raccoon Strait. Craighill's concept of a new outer line at Points Bonita and Lobos was ahead of its time by 40 years, but he would see it come to be in the 1890s when he himself was the chief of engineers.

m. New Armament, 1865

Three days after Craighill wrote his report, the chief of engineers telegraphed De Russy that three more 15-inch Rodmans would be shipped to San Francisco. This brought the total of new guns for the Pacific Coast during the past year to ten 15-inch and ten 10-inch Rodmans and eleven 100-pounder and three 200-pounder (pdr.) Parrott rifles. By the time of his annual report for fiscal year 1865, Elliot was able to report that two 15-inch Rodmans, six banded 42-pdr. rifled guns, and two 200-pdr. and five 100-pdr. Parrott rifles were mounted on Alcatraz. The weight of metal that could be discharged simultaneously from Alcatraz had increased 2,400 pounds during the year to a total of 6,949 pounds.

Elliot also reported the strengthening of Batteries Tower and McClellan by building earthen banks against the masonry scarp walls so as to thicken the parapets (and thereby burying the handsome 25-foot-high sandstone scarp of Battery McClellan). He had also commenced excavations for an extension to Battery Rosecrans at the northwest end of the island and for a new bombproof casemated barracks behind the wharf.

At Fort Point, Colonel De Russy was again ailing. Washington sent him an assistant in the person of Lt. Oswald H. Ernst, who arrived on December 1, 1864. Little was accomplished during fiscal year 1865 at Fort Point due to De Russy's continuing poor health. Finally on November 23, 1865, the veteran engineer died in San Francisco. Captain Elliot transferred to Fort Point and was replaced on Alcatraz Island on January 1, 1867, by Maj. George H. Mendell, who was destined to serve the rest of his army career working on the fortifications of San Francisco Bay.[61]

As assistant to De Russy, Ernst prepared a report on the amount of powder on hand at San Francisco on May 30, 1865.

	Packed as Closely as Possible			Stored in the Usual Manner		
	Capacity in Barrels	Amount on Hand	Amount Receivable	Capacity	On Hand	Receivable
Fort Point Main Magazines	1536	273	1263	672	273	399
Fort Point Service Magazines	2280	0	2280	---	---	---
Fort Point Ten-Gun Battery	175	0	175	90	0	90
Point San José	360	66	294	168	66	102
Point Blunt	300	50	250	156	60	106
Point Knox	300	220	280	156	220	44
Point Stewart	200			108		

61. NA, RG 77, OCE, Letters to Officers of Engrs., vol. 37, Delafield, July 28, 1864, to Elliot, and vol. 38, Delafield, Feb. 20, 1865, to De Russy, and Letters Received 1838-1866, Craighill, Feb.

6. Postwar Modernization, 1866-1876

a. Elliot Reviews Defenses

The Civil War had not quite run its course when Congress passed the fortifications appropriation bill for fiscal year 1866. General Delafield, who had succeeded Totten as chief of engineers, notified De Russy that the fort at Fort Point and the works on Alcatraz Island had each been appropriated $150,000. Another $50,000 had been voted for additional defenses at San Francisco, but it was not to be touched because of the continuing difficulty in getting possession of Lime Point.

After De Russy's death in November 1865, Elliot had taken over all engineer operations in the bay: Fort Point, Alcatraz Island, Point San José, and Angel Island. In addition to Lieutenant Ernst, Elliot had as an assistant Capt. Henry C. Wharton. However, Wharton was a hopeless alcoholic who caused Elliot more grief than anything and who finally was court-martialed.

A board of engineers had proposed in 1864 two additional casemated works at Fort Point. Elliot, aware of the obsolescence of this type of fortification, decided to shelve the project until he heard further word from Washington. He closed down the work at Fort Point and concentrated his attention on Alcatraz. By June 1866, workmen had made considerable progress on the first tier of the casemated barracks. The embrasures for this tier were finished, the communication arches had been turned, and the main arches had been commenced. This one was one masonry work that Elliot was anxious to complete inasmuch as the island's garrison did not have permanent quarters.

17, 1865, to ?, Ernst, May 30, 1865, to Delafield, and Elliot, Aug. 23, 1865, to Delafield; OR, Series 1, vol. 50, pt. 2, pp. 921-23 and 1137, McDowell, July 27, 1864, to Delafield, and Delafield, Feb. 20, 1865, to McDowell; USDI, NPS, Bearss, pp. 198-99.

On Angel Island, Elliot inspected the battery at Point Blunt and found that the "remarkable subsidence of the battery had ruined the major part of it." He ordered the still unmounted guns removed and the work abandoned. Elliot prepared a plan for enlarging the batteries at Point San José. However, the chief of engineers decided not to increase the number of guns there. In response to the department orders to survey the San Francisco Peninsula, as far south as the San Bruno Mountains in connection with plans for land defenses, Elliot dispatched Ernst and Wharton to reconnoiter Point Lobos. There, Wharton went on a spree that resulted in the destruction of Ernst's rented quarters, with the consequence that the latter had to continue the survey by himself.[62]

b. Personnel Changes

Soon after the Civil War a reorganization of the military took place. On the West Coast the Division of the Pacific was constituted, and Maj. Gen. Henry W. Halleck returned to San Francisco to head it. Under the division were the Department of California and the Department of Columbia. General McDowell remained in San Francisco as commander of the Department of California, which at that time included California, Nevada, and Arizona Territory.

The Engineer Department also had a number of changes that affected the San Francisco operations. In August 1866 General Delafield retired, and Brig. Gen. A. A. Humphreys took over the position of chief of engineers. On December 31, 1866, Maj. Barton Stone Alexander arrived in San Francisco as senior

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62. NA, RG 77, OCE, Letters to Officers of Engrs., vol. 38, Delafield, Mar. 14, 1865, to DeRussy, and Letters Received 1838-1866, Elliot, Aug. 23, 1866, to Delafield; USDI, NPS, Bearss, p. 206.

engineer on the Pacific Coast. Contrary to past custom he did not take over the operations at Fort Point as well; Captain Elliot remained in charge of that work, and the next day, January 1, 1867, Maj. George Mendell took over the works on Alcatraz Island. A few weeks later Mendell also took charge of the works at Lime Point--that long-disputed territory having been acquired by the United States in July 1866.[63]

Humphreys instructed Alexander to convene a board of engineers at San Francisco in January 1867 to consider the defenses of the Pacific Coast, particularly those of San Francisco Bay.

> In taking up the subject of the defence of the Entrance . . . attention should be given
>
> 1st--To the defenses on the Fort Point side with a view to determining what alterations in our additions to the works . . . is necessary to meet the changes that have taken place in naval vessels and their armament.
>
> 2nd--To the preparation of a project for occupation of Lime Point by one or more defensive works. . . .

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63. Francis Paul Prucha, A Guide to the Military Posts of the United States, 1789-1895 (Madison: The State Historical Society of Wisconsin, 1964), p. 152; NA, RG 77, OCE, Letters Received 1866-1870, Second Div., Alexander, Jan. 18, 1867, to Humphreys, and Letters Sent 1866-1870, Third Div., vol. 1, Humphreys, Apr. 25, 1867, to Mendell, and Land Papers, Elliot, Aug. 22, 1866, to Delafield.

> 3rd--. . . the consideration of the further defenses deemed necessary in San Francisco, and other important points, should be undertaken.[64]

In addition to attending meetings of the board, the engineers went about the business of constructing those works that had already been approved.

c. State of the Works, 1867

(1) Fort Point

For fiscal year 1867, Congress had appropriated $125,000 for the fortifications at Fort Point. Elliot still could not start the proposed casemated batteries inasmuch as the Engineer Department had not yet resolved the question concerning scarp walls. His efforts this year were concentrated on completing the seawall around the fort and preparing his plant for future construction. This latter included laying tracks from the wharf to the fort, increasing the storage facilities, and purchasing a sloop for transporting supplies from the city.

(2) Alcatraz Island

By the time Mendell reached Alcatraz, most of that year's appropriation of $90,000 had already been spent on the construction of the casemated barracks. The first tier of casemates with its gun embrasures and magazine was essentially completed when a telegram arrived from the department in December 1866 ordering a stop to any further construction on the casemates. Again, the fact that this type of fortification was probably obsolete outweighed Alcatraz's need for permanent barracks. The project

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64. NA, RG 77, OCE, Letters to Officers of Engrs., vol. 40, Humphreys, Dec. 4, 1866, to Alexander.

would remain alive on paper for several more years, but the bombproof batteries would not be built as much. Mendell did not have much to report in his first annual accounting for the Rock; however, he did say that his men had finally completed the excavation for the extension to Battery Rosecrans, that is, where the model industries building stands today.

(3) Lime Point

In 1858 a board of engineers had recommended the construction of a large masonry fortification at Lime Point that would contain 250 guns (8- and 10-inch columbiads and 42-pounder smoothbores). Another board modified this plan in 1864 by calling for fewer but larger guns. Now that the federal government owned Lime Point, the Pacific board of engineers came up with a third plan that called for a casemated fort and a casemated battery, both containing a total of 109 guns. The plan called for cutting away the bluff at a cost of $631,179. The board concluded its description of this elaborate, massive, and obsolete fortification by observing the following:

> After the works now proposed shall have been built, the positions of Points Boneta and Diablo, as well as the intervening shores on both sides of these two points, will furnish locations for works to defend these waters, that may keep pace with the means of attack, and the interests to be protected for many generations.

Mendell in the first annual report for Lime Point allowed that operations had not yet commenced.

(4) Point San José

Before his retirement, Chief of Engineer Delafield had informed Captain Elliot in April 1866 that the federal government did not want Point San José as part of the permanent

system of defenses for the bay. In fact, Delafield was firmly convinced that the private claims to the point were quite valid and that the government would restore the land to its owners. On receipt of that letter, Elliot decided not to mount three 15-inch guns that had been landed on the beach at Point San José. However, in November 1866 General McDowell wrote Chief of Engineers Humphreys that since the Supreme Court had decided that Point San José was federal property, the 15-inch Rodmans should be mounted. Humphreys advised Elliot to move the guns closer to the existing batteries and ordered the Board of Engineers for the Pacific Coast to take up the subject of Point San José. The Pacific board reported in February 1867 that Point San José was indeed of great importance to the second line of defense.

(5) Angel Island

The engineers made no changes in the batteries at Point Stewart and Point Knox during fiscal year 1867. Neither did they incorporate the water battery at Camp Reynolds into the defenses of the harbor as General McDowell had wanted.[65]

While Congress appropriated fortification funds for Alcatraz Island, Fort Point, and Lime Point for fiscal year 1868, it also made the stipulation that only half the money could be spent until such time as Congress chose to free the remaining half.

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65. NA, RG 77, OCE, Letters to Officers of Engrs., vol. 39, Delafield, Apr. 7, 1866, to Elliot, vol. 40, Humphreys, Aug. 18, and Dec. 19, 1866, to Elliot, and Letters Sent 1866-1867, Third Div., Humphreys, Feb. 6 and Apr. 8, 1867, to Sect. of War Stanton, and Letters Received 1866-1867, Third Div., Aexander, May 29, 1867, to Humphreys, Elliot, Nov. 14, 1866, to Humphreys, and Mendell, June 5 and Aug. 21, 1867, to Humphreys. The cove between Lime Point and Cavallo Point was now (1867) being called "Horse Shoe Cove." The Pacific board reports were signed by Alexander, Williamson, Mendell, Ernst, and Elliot. Lt. C.W. Raymond was the recorder.

This meant that Alcatraz received $50,000 to spend; Fort Point, $25,000; and Lime Point, about $24,000.[66]

d. Alexander Inspects Fortifications

Between November 1867 and April 1868, Colonel Alexander made the most thorough and critical examination and evaluation of San Francisco Bay's defenses that had yet been done. At Fort Point he found 76 heavy weapons mounted: eight 8-inch and two 10-inch columbiads, thirty-eight 42-pounder smoothbores, eleven 32-pounder smoothbores, four 24-pounder howitzers, six 24-pounder smoothbores, two 10-inch siege mortars, and five 24-pounder Coehorn mortars. Unmounted at the point were twenty-five 15-inch Rodmans, forty 10-inch Rodmans, eight 42-pounder smoothbores, two 300-pounder Parrott rifles, six 200-pounder Parrott rifles, four 8-pounder brass Mexican guns, and four 10-inch siege guns. These 89 unmounted weapons brought the number at Fort Point to 165.

Alexander noted that part of the ten-gun battery had been demolished by the construction of the western casemated battery. It was his opinion that the entire old battery should be demolished since it had not been designed very well in the first place, and its 42-pounders belonged "to an era that has passed." As for the western and eastern casemated batteries, the colonel noted that a start had been made on both but that the work had been suspended. He was dismayed at the poor condition of the ordnance at the fort, including the nine 15-inch Rodmans lying on the beach that were covered by every high tide. Alexander remarked that the Board of Engineers for the Pacific Coast had

66. NA, RG 77, OCE, Letters Sent 1866-1870, Third Div., vol. 1, Wright, Mar. 19, 1867, to Elliot. Both Fort Point and Lime Point had appropriated money left over from the previous year.

recommended that the armament at Fort Point be replaced with 10-inch Rodmans and 200-pounder Parrott rifles.

At Point San José, Alexander considered East and West batteries to be one, mounted with six 10-inch Rodmans and six 42-pounder rifles, all on iron carriages and having wooden traverse circles. An enemy vessel hugging the southern shore of the harbor to the west could enfilade the entire battery since there were no traverses. Also the rear slope of the battery was a high bank of loose friable rock. If an enemy shell hit it, the spalling would make the battery untenable. Nevertheless, the point was an admirable place for a battery, and one could be built there of any size desired and at small cost.

Alexander had a great deal to say about the works at Alcatraz. There he found 105 weapons mounted and 50 unmounted, making a total of 155:

Mounted		Unmounted	
5	15" Rodmans	4	15" Rodmans
12	10" Rodmans	35	10" Rodmans
3	8" Rodmans	1	8" Rodmans
6	10" columbiads	6	42-pdr. guns
40	8" columbiads	3	24-pdr. howitzers
12	42-pdr. guns	1	4-pdr. bronze Mexican gun
16	24-pdr. howitzers		
3	200-pdr. Parrotts		
6	100-pdr. Parrotts		
2	8" siege mortars		

He discussed each battery on the island, finding some fault or other with all of them. Battery Mansfield, for example, had no bombproof shelters and it was subject to reverse fire from the north. The guns of Battery Stevens were separated by brick traverses "which would render the battery very insecure for the gunner in time of action." Battery Tower had a steep slope of loose friable rock at its rear and because of it he doubted "if

there are any troops in the world who could be made to stand to their guns in this battery." In contrast to Fort Point, he found the ordnance well care for, with the rifled projectiles kept under cover.

Despite Alcatraz having the most guns mounted of any post in the bay, Alexander considered its defenses to be "very imperfect." The great problem was that the island was a mass of rock, "and rising as it does immediately behind the guns, it is to be greatly feared that the batteries would be so insecure from splinters of stone that the gunners could not serve the guns." Probably the only solution was to cut the whole island down to a height of 80 or 90 feet and to construct a new system of barbette batteries complete with bombproofs and traverses. He would not recommend this undertaking until modern guns were installed at Point San José and Angel Island.

At Point Stewart on Angel Island, Alexander inspected the battery of one 10-inch center-pintle columbiad (model "1854") and three front-pintle 32-pounder smoothbores ("model of 1829 31"). An enemy ship approaching from the Golden Gate could enfilade this battery. Also, it was at too high an elevation "for effective ricochet firing on the rough waters of the Bay." Even its parapet was of rock--there being no earth placed on any part of it. The colonel concluded that the work could only be looked upon as temporary and that it was useless for defensive purposes.

The water battery at Camp Reynolds contained two 32-pounders and three 24-pounders, all front-pintle with wooden carriages and wooden platforms. There was no magazine. Alexander did not think much of it: "This battery may be useful for firing salutes, for purposes of drill etc. though it could have been better located, for it fires directly over the wharf."

The battery at Point Knox (600 yards southeast of Point Stewart) was considered by Alexander to be the best of the batteries on Angel Island even though its crest was rather high, being at an elevation of 129 feet. It was armed with two 8-inch Rodmans on iron carriages and seven 32-pounders on wooden carriages. He thought the battery should be rearmed with five 15-inch Rodmans, five heavy rifles, and two or three heavy mortars.

Alexander visited the site of the destroyed battery at Point Blunt. Here, he thought, the whole head of the point could be cut down and a 20- or 25-gun water battery constructed. Since these guns would be at the proper level for ricochet firing, most of them should be smoothbores. Altogether Angel Island had 19 guns mounted and 6 dismounted.

At Lime Point, Alexander inspected the temporary quarters and shops Mendell had erected for his engineer employees. The main undertaking to date had been the construction of a road from the head of Horseshoe Cove (where Fort Baker stands today), past Mendell's area (directly under the Golden Gate Bridge today), and along the shore toward the end of Lime Point where Mendell would soon begin large-scale blasting. Mendell had also built a small wharf and breakwater from the shore to the Needles (some tall rocks) to protect it. There were no guns yet mounted at Lime Point--not even temporary ones.

Totalling up all the armament in the harbor, Colonel Alexander determined that there were 212 heavy weapons mounted and 149 unmounted, a total of 361.[67]

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67. NA, RG 77, OCE, Letters Received (A File) 1867-1870, Alexander, Nov. 8, 1867, to Humphreys, and Alexander, Apr. 8, 1868, to Humphreys. There was no model 1854 for a 10-inch columbiad. Alexander possibly meant model 1844. My thanks to John Martini, Golden Gate National Recreation Area, for noting this.

e. Lime Point and George Mendell

The Board of Engineers for Fortifications in New York reviewed the Pacific board's latest plans for Lime Point and, while generally agreeing, recommended that the amount of excavation be reduced. The chief of engineers accepted the New York board's opinion and informed the secretary of war that the amount of excavation needed would be reduced from 1,000,000 cubic yards to 300,000 and that the total cost of the works would be $3,000,000: "About half of this sum is for heavy iron coverings and protection, an item of expenditure which as not heretofore entered into our estimates."

Mendell undertook experiments at Lime Point with nitroglycerine as a blasting agent. His first attempt to use it was a failure when the liquid ran off through seams in the rock. Succeeding trials were more successful, and later he obtained a new form of the explosive that had been mixed with sawdust. He informed the Engineer Department that this explosive agent was called "dynamite" or "giant powder." In the end Mendell chose ordinary gunpowder as his blasting agent because its explosion threw a given mass in a specified direction, whereas nitroglycerine's effect seemed to be equal in all directions--breaking up the rock but not moving it.

Altogether, Mendell carried out three great blasting operations at the point, the first such large-scale noncombat blasting in the United States. In May 1868 the first of these projects involved 10,150 pounds of powder. The second blasting (the largest of the three) occurred in October when Mendell exploded 24,000 pounds. The third and last attempt took place in April 1869; this effort consisted of 16,500 pounds of powder packed into three "mines," or small rooms carved in the side of the tunnel dug deep into the rock.

Mendell was extremely proud of this blasting and in 1880 succeeded in having his report on it published by the Government Printing Office. Included in this report was a description of the first blasting operation written by Colonel Alexander:

> Here, then, we have two charges of powder, one of 4,000 pounds, the other of 3,500 pounds, placed 45 feet apart and 50 feet from the face of a rocky hill, the hill rising some 250 feet above the powder. We are going to explode them, at the same instant of time, and see what will happen. It has been our good fortune to have seen much heavy blasting in our lifetime. We have witnessed the construction of the Baltimore and Ohio and of the Hudson River Railroads, many portions of which roads were blasted out of the solid rock, and we have heard the artillery of the Central Pacific Railroad, in the Sierra Nevadas; but never before had we seen a blast like the one now to be made. The subject had been fully investigated by Colonel Mendell, and the quantity of powder duly proportioned to the work to be done, but still, before the explosion, the whole thing was looked upon as an experimental blast. Everything being in readiness, the wires were connected with the little box, the machine set in motion, and the connections make, when lo! the mountain was seen to labor. There was no explosion in the popular sense of that term. A little smoke and flame was seen to escape through the moving mass of rock, and the whole face of the hill in front of the charges was seen to move outwards, falling down into the sea. And then was seen a sight rarely witnessed, a hill without a foundation giving away and tumbling into the depths below.

> There was no noise from the powder, and not a stone was thrown 50 feet from its position by the force of the explosion. Yet the sight was grand, and being unaccompanied by any visible cause, was awful from its very silence. For about half a minute of time the masses of rock above came rolling down the face of the hill to seek their watery grave below, presenting to the mind such a prolonged period of instability that one involuntarily looked beneath him to see if he too was not in motion. When the rock above had broken away to the height of about 175 feet above the water, the motion ceased, being renewed, however, from time to time for several hours, as still other masses above, finding themselves unsupported, broke away and rolled down into the deep.
>
> The result of this experimental blast, in an engineering view, was very satisfactory. There was neither too much nor too little powder; the simultaneous explosions of the two charges were effected perfectly, and the work that was intended to be done was perfectly accomplished.

While Mendell continued to look upon his blasting as being successful and for several years thereafter anticipated additional funding for the project, no more appropriations were made. Like the casemated barracks at Alcatraz, the concept of leveling Lime Point for masonry fortifications died a lingering death. Still the undertaking was important in military circles to the history of large-scale blasting. Mendell sent a copy of his prepublication report to Field Marshal Sir

John F. Burgoyne, who had earlier been responsible for similar undertakings in England.[68]

f. Requirements for a Postwar Battery

Fiscal year 1869 was one of little activity concerning the coastal fortifications of San Francisco Bay. Congress, irked by the army's continuing failure to decide on an adequate type of coastal fortification, refused to pass any appropriation for the construction of defenses. The Engineer Department made $40,000 available to Mendell so that he could continue his blasting operations at Lime Point; on Alcatraz Island, Mendell was able to employ military prisoners free of cost in excavating and other minor undertakings around the batteries. At Fort Point, Elliot sold off surplus bricks in order to keep things moving a little. His primary endeavors were the seawall and

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68. NA, RG 77, OCE, Letters Sent 1866-1870, Third Div., Humphreys, Aug. 10, 1867, to Sect. of War Stanton, and Aug. 31 and Oct. 2, 1868, to Mendell, and Kurtz, Aug. 20, 1867, to Mendell, and Letters Received (A File), Mendell, Feb. 17, June 1, and Nov. 23, 1868, to Humphreys, Sir John F. Burgoyne, Feb. 12, 1869, to Mendell, and Mendell, Report of Operations at Lime Point for April 1869, and Mendell, Annual Report of Operations, Lime Point, for FY 1869; FARC, San Bruno, RG 77, OCE, San Francisco Dist., Journal of Operations, Lime Point, 1867-1876, and G.H. Mendell, Report Upon the Blasting Operations at Lime Point, California in 1868 and 1869 (Washington: Government Printing Office, 1880); Daily Alta California, Apr. 18, 1869. Lime Point was the only military reservation in San Francisco Bay to receive fortification funds in fiscal year 1869. The Engineer Department made $40,000 available for Mendell's blasting. The Board of Engineers for Fortifications in New York City requires a few words of explanation. It was composed of senior engineers who advised the chief of engineers. In the case of San Francisco, the Pacific board would originate specific plans for a work and send them to the chief of engineers. The latter would forward the plans to the board in New York. That board would review them and make recommendations concerning them to the chief. My colleague, Edwin C. Bearss, considers the people in New York to have been the board and that additional identification is not required. But to help myself and perhaps some of my readers, I refer to the two as the Pacific board and the New York board.

improving the armament in the fort, especially by mounting 10-inch Rodmans on the first and second tiers.

A lack of construction funds did not prevent the boards of engineers in both San Francisco and New York from developing plans for the future. These planning efforts concentrated on the difficulties with the existing batteries on Alcatraz and on the need for fortifications on the north side of the Golden Gate.

In August 1868 the New York board presented a report concerning the proper profile for postwar barbette batteries. Among the findings of the study were the following:

As a material for parapets, sand was far superior to clay.

A parapet of sand, 20 feet between the crests supported by a breast-height wall 4 feet thick, would suffice as a minimum.

A wall in the body of the parapet was not recommended.

The introduction of iron plates in parapets was inexpedient except in peculiar cases.

The minimum distance between 15-inch guns should be 34 feet, and the minimum distance between 10-inch guns should be 22 feet.

The terreplein should not be less than 30 feet in depth.

There should be a traverse for every two guns that were exposed to direct or oblique fire, and a traverse for every gun subjected to enfilading fire. When practicable, there should be a parados for guns liable to reverse fire.

Minimum dimensions for a traverse should be 14 feet in height, 12 feet in thickness at the top, and 20 feet in thickness at the bottom.

Service magazines were indispensible. Good well-rammed concrete was the best material, with no lining.

The board concluded that the use of guns in barbette batteries would be greatly modified in the future, and it recommended that the present carriages and platforms not be constructed in great numbers.

g. New Plans, Alcatraz and Lime Point

Concerning Alcatraz, the Pacific board came up with a plan in the spring of 1869 that called for a great deal of excavation of Alcatraz's rock. As for new armament, "the drawing shows places for sixty-two XV inch guns, and 5 Parrott rifles in Barbette, making sixty-seven guns in barbette, and if we add the eleven guns, of the casemated barracks, for which places are now ready, we have seventy-eight guns, leaving out of consideration the howitzers for the defense of the guard-room and caponniers. This armament is regarded as ample. It may be modified by the introduction of a few XX inch guns and heavy rifles."

On reviewing these plans, the New York board agreed that modifications would have to be made at Alcatraz, but it said that the Pacific board had not paid sufficient attention to the importance of traverses. It recommended to the chief of engineers that the matter of Alcatraz's defenses be resubmitted to the Pacific board for reconsideration: "In preparing a new project we would call attention to the importance of thoroughly traversing barbette guns, as set forth in the report of this Board of Aug. 14, 1868 [above], and to the preparation of the batteries for wooden platforms and without breast-height walls as contemplated in the

conclusions of its report of April 10, 1869, on the target firings at Forts Monroe and Delaware."

Also following the test firings at Forts Monroe and Delaware, the New York board turned its attention to the long-standing problem of how best to defend Lime Point. The point itself was most desirable for a fort inasmuch as it overlooked the water both seaward and inward and as it was the point nearest to Fort Point. Despite all that had been said about casemated works, the board still believed that such a work was needed here: "A simple barbette battery on this site should not be relied upon. . . . The site is unfavorable for an open battery by reason of the abrupt high hill slopes behind it and to the West, composed of crumbling rock. Both solid shot and shells striking these rocky slopes would throw showers of fragments in all directions. In the firings at Forts Monroe and Delaware stone splinters were thrown back 150 yards."

However, there were suitable places for barbette batteries between Point Cavallo and Point Diablo, in addition to a casemated fort at Lime Point. Furthermore these barbette batteries could be placed at heights where only a parapet would be needed for protection, thereby avoiding the expensive depressing carriage then undergoing trials. These barbette batteries should be built first rather than spend any more money in blasting at Lime Point, "as it is probable that much time will elapse before any satisfactory method of covering guns in casemate can be determined." The barbette batteries should be placed on heights not less than 100 feet in elevation except that Point Cavallo would be suitable for a low-elevation water battery. The New York board recommended to the chief of engineers that the Pacific board select

the sites for 75 guns on wooden platforms in barbette batteries between Points Cavallo and Diablo.[69]

After 19 years on the Pacific Coast, Major Elliot transferred from San Francisco in March 1870. His replacement was Lt. Col. Charles Seaforth Stewart, who would supervise engineer operations at Fort Point, Point San José, and Angel Island; Mendell continued to be responsible for Alcatraz Island and Lime Point. Alexander remained senior engineer on the Pacific Coast. Again Congress refused to appropriate construction funds for fortifications, and again the Pacific and New York boards advanced their planning for the defenses of San Francisco Harbor. E. Raymond Lewis, a fortifications historian, writes of this period as being "a distinct turning point in American fortification practice." Parapets of earth or sand were far superior to masonry walls. The new barbette batteries were larger and more durable than those of old. Magazines were heavily protected with concrete and earth, and the earthen traverses became more numerous in each battery. "Never again," writes Lewis, "would forts be built in the storybook style as single structures housing large numbers of cannon. From this time on, a fort was a piece of real estate occupied by a number of dispersed individual batteries."[70]

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69. NA, RG 77, OCE, Letters Sent 1866-1870, Third Div., Humphreys, Mar. 25, 1869, to Alexander, and Letters Received (A File) 1867-1870, Board of Fortifications, New York, report on the proper profile for barbette batteries, Aug. 14, 1868, and Alexander, Mar. 9, 1869, to Humphreys, transmitting reports on modifying the defenses of Alcatraz, and Board of Fortifications, New York, Apr. 3, 1869, report on the defenses of Lime Point, and Humphreys, Apr. 27, 1869, to Alexander, transmitting report on the project for Alcatraz; USDI, NPS, Bearss, pp. 220-22 and 233-35. The New York board at this time was composed of Col. John G. Barnard, Col. George W. Cullum, Lt. Col. Z.B. Tower, and Lt. Col. H.G. Wright. Both Barnard and Tower had served in San Francisco.

70. NA, RG 77, OCE, Letters Received 1871-1886, Stewart, Annual Report for fiscal year 1879; Emanuel Raymond Lewis, Seacoast Fortifications of the United States (Washington: Smithsonian Institution Press, 1970), pp. 67-70.

h. New Works at Fort Point

In the spring of 1870 the secretary of war sent to the chairman of the Military Committee in the House of Representatives a list of all the coastal forts in the United States showing the totals of the construction appropriations for each up to the eve of the Civil War and up to March 1870. He listed only three posts for San Francisco Bay (Fort Point, Lime Point, and Alcatraz Island), ignoring the temporary Civil War works at Point San José and Angel Island.

	Appropriations	
	To June 30, 1860	To March 1870
Fort Point	$1,645,833	$2,495,833
Lime Point	---	100,000
Alcatraz Island	921,667	1,601,667

The total to date was $4,197,500. Almost all of the resulting works would now have to be remodeled or abandoned as obsolete.[71]

From 1869 to 1871 plans for the five major military reservations in San Francisco Bay were brought to completion: Fort Point, Lime Point, Point San José, Alcatraz Island, and Angel Island. All five plans called for barbette gun batteries, mostly 15-inch Rodmans, and for mortar batteries.

In September 1870, the Pacific board recommended the construction of barbette gun and mortar batteries along the crest of the bluff south of the fort and on the bluff to

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71. NA, RG 77, OCE, Letter Sent 1866-1870, Third Div., A list of all forts prepared Apr. 5, 1870, for the Sect. of War, to be sent to the Chairman of the Military Committee, House of Representatives.

the east of the fort. The Golden Gate itself would be defended by a battery on the bluff immediately to the rear of the fort, firing toward Gravelly Beach, west of Lime Point. This last battery, because it would fire directly over the barbette of the fort, would mean the disarmament of the fort's barbette tier. Humphreys forwarded this report to the Board of Engineers for Fortifications, New York, for review. These engineers recommended approval of the project provided that the number of batteries to the south of the fort be reduced. (This collection of guns and mortars became known as West Battery. Those on the bluff to the east of the fort were considered to be part of East Battery. Apparently, the six guns behind the fort were considered to be part of West Battery.) The New York board also recommended a list of priorities in the new construction: (1) the six-gun battery, (2) the first eight guns and a mortar battery of West Battery, (3) the sixteen guns and four mortars of East Battery, and (4) the remaining six guns in West Battery.

Secretary of War William W. Belknap approved the plan for Fort Point in November 1870, and Engineer Stewart began the construction of the new batteries a month later. The brick and concrete magazines were under earthen traverses that separated each pair of guns. The parapets were solid earth; the platforms were granite and concrete. With the renewal of appropriations from Congress, Stewart made rapid progress on the new works. A suspension of the work was threatened in the summer of 1871 when the Engineer Department considered employing the King counterpoise carriage for 15-inch guns at Fort Point. However, it was soon decided that these new batteries had such a

commanding elevation as to make the yet unproved King carriages unnecessary.[72]

i. New Works on Alcatraz

In November 1869 the Pacific board submitted its second plan for remodeling the already existing barbette batteries on Alcatraz. This time it paid close attention to the matter of traverses. In its review, the New York board commented that this was a much improved project; still, it had further recommendations for change, including the placement of 25 mortars on the top of the island. Humphreys approved these recommendations; the Pacific board fell into line; and the secretary of war approved the project in February 1870. It called for thirty-five 15-inch Rodmans and 20 magazines located in 13 batteries. Colonel Alexander estimated the cost of the modifications at $323,400. In his annual report for fiscal year 1870, Mendell reported that military prisoners had already excavated 18,000 cubic yards of rock. A considerable amount of the old works had been "taken down," and 37 guns and their carriages were removed from the island.[73]

j. New Works at Point San José

Colonel Alexander and his associates forwarded a report for permanent fortifications for Point San José in March

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72. NA, RG 77, OCE, Letters Received (A File) 1867-1870, Pacific Board of Engineers, Sept. 23, 1870, to Totten, Board of Engineers, New York, Nov. 2, 1870, to Humphreys, and Letters Sent 1871-1872, Maj. T.L. Casey, July 1, 1871, an endorsement on report of Board of Engineers, New York; USDI, NPS, Bearss, pp. 239-48.

73. NA, RG 77, OCE, Letters Received (A File) 1867-1870, Alexander, Nov. 26, 1869, Jan. 13 and Apr. 14, 1870, to Humphreys, and Board of Engrs., New York, Dec. 17, 1869, Feb. 2, 1870, to Humphreys, and Mendell, Annual Report of Operations for FY 1870, Alcatraz, and Letters Sent 1866-1870, Third Div., Humphreys, Feb. 25, 1870, to Alexander.

1869. The plan called for a large "fort" enclosed by an earthen parapet that included the existing batteries. The five fronts of the fort had five different elevations-the crests ranging from 94 feet to 118 feet. The parade in the center had a reference of 106 feet. The proposed armament consisted of two 20-inch guns, sixteen 15-inch guns, eight heavy rifles, six field guns for the land side, and twelve seacoast mortars. The estimated cost for the project came to $200,000.

The New York board offered only minor criticisms of the plan. However, it noted that because Point San José was secondary to Lime Point and Fort Point, the construction of this work should not have a high priority. The differences between the two boards were swiftly resolved, and in May 1871 Secretary Belknap approved the plan. But Point San José's priority never did become high enough for this project to be undertaken before all appropriations were cut off. The "temporary" East and West batteries continued to be the point's only defense for the next 30 years.[74]

k. New Works on Angel Island

The Pacific board's project for permanent fortifications on Angel Island was completed in February 1870. The board concluded that Point Stewart was too small for modern guns, and the ridge leading from it to Hospital Cove was too high: "Were batteries built along the ridge, vessels could steam along close to the shore, and be below the plane to which the guns could be depressed." Raccoon Strait would have to be defended from

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74. NA, RG 77, OCE, Letters Received (A File) 1867-1870, Alexander, Mar. 5, 1869, to Humphreys, and Pacific Board of Engrs., June 15, 1869, report on Point San José, and Board of Engrs., New York, July 16, 1869, to Humphreys, and Stewart, Annual Report, Point San José, for FY 1870.

Peninsula Point (Belvedere Island), which the army then considered to be United States property.

On Angel Island itself the board projected four batteries at Camp Reynolds to replace the nonengineer battery thrown up in 1863, and a work having ten heavy guns and seven mortars would be built. Each pair of guns would be traversed; the interior crest of the parapet would be at a reference of 35 feet. Points Stewart and Knox would protect the battery from enfilade. It would be necessary to move a set of officers' quarters, some temporary engineer employees' quarters, and the sutler's store in order to make room for the battery.

Point Knox was still considered to be a most useful location, although the irregular ground would require several different references (heights) for the guns. Eight heavy guns would be placed here in pairs behind a 24-foot-thick parapet, with each pair being separated by a traverse 12 feet thick at the top. A 20-foot-wide covered way would pass the entire length of the battery, 10 feet below the interior crest and connected to the terrepleins by short slopes of one on two. The traverses would contain magazines. As for the field of fire, "the extreme fire . . . on the right flank is into the mouth of the straits and tangent to Point Stewart. The other flank fires as far around to the left as the shore at the foot of Mortar Hill."

At Point Blunt a battery could command the interior waters of the bay, limited only by the range of its guns. The peninsula itself was too small for a modern battery; therefore, the hill to the rear would have to be employed as well. On the peninsula the board proposed to place two 20-inch and four 15-inch guns, and on the slope of the hill there would be thirteen 15-inch guns and twelve heavy mortars. Strong parapets and magazines were provided for, and "the traverses can be further utilized as bomb proofs for the men."

The fourth work would be located on a knoll between Points Knox and Blunt. Inasmuch as this battery was to contain six heavy mortars behind a 15-foot-high parapet, this knoll was forever after called Mortar Hill. A central traverse would serve as a bombproof, and two traverses on the flanks would contain magazines.

The New York board quickly agreed with the plan except that it recommended that mortars scheduled for Point Blunt be moved elsewhere, "as both the guns and mortars could not be simultaneously served without inconvenience and risk." Again, this board thought that Angel Island should have a quite low priority. The chief of engineers agreed.[75]

I. New Works at Lime Point, 1876

Lt. Thomas H. Handbury received the task of surveying Lime Point for battery sites. His first choice was the valley west of Lime Point, which he proposed naming Gravelly Beach. This valley contained about 25 acres and was large enough for six "of our largest guns." A road to it would have to be constructed from Horseshoe Cove. If built on the front of Lime Point ridge, it would be within an enemy's view. An alternative would be to construct it over the ridge into Rodeo Valley then back out again to drop down to Gravelly Beach.

Point Diablo, Handbury found, was too small for a battery of modern guns. It could perhaps be cut down to about half its height (200 feet), and a monitor turret or something similar

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75. NA, RG 77, OCE, Letters Received (A File) 1867-1870, Alexander, Feb. 8, 1870, to Humphreys, and Board of Engineers, New York, Apr. 5, 1870, to Humphreys.

could be placed there. East of Point Bonita, the lieutenant noted a beach at which heavy guns could be landed. They would then have to be hauled up a 60-foot bluff. The road from Horseshoe Cove would have to be extended to this point for the transportation of ammunition.

Handbury considered Point Bonita a suitable location for "many" batteries of long-range guns. "Among the old native residents and shippers of that vicinity," he said, "it is known by the name of 'North Point.' It is a long narrow ridge jutting far out from the main-land and terminating in an 'L' shaped mass of rocks." There was sufficient space for a snug little post: "The Northwest portion of the ground is a very good location for quarters, barracks and storehouses. It is sheltered from the winds and entirely out of the view of an enemy. In this vicinity, or in a little valley just north of it, ground may be found which will answer very well for drill purposes." While the water of Rodeo Lagoon was brackish, Handbury located two or three "never-failing springs of excellent water." Concerning the beach at Rodeo Lagoon, he thought it possible that an enemy could land on it in calm weather. However, "a short range gun, or two, placed upon either of the adjacent slopes would be sufficient" defense.

Handbury explained how the lighthouse keepers and the few settlers in Rodeo Valley (north of the military reservation) communicated with the outside world.

> The means of communication with point Boneta are very limited. There is a road leading from there to Rodea Valley, but there it ends, or rather degenerates into a trail which leads to Saucilito. The few persons who live in this valley and cultivate the ground communicate . . . by means of this trail. There is no road, nor semblance

> of a road, leading over the hills . . . excepting a very imperfect and poorly located one leading to Tennessee Valley.
>
> In early fall, when the surplus produce is ready to be disposed of, it is hauled to a landing or platform made on the edge of the bluff to the south-east of the Light-keeper's dwelling. From here it is lowered into a sloop by means of a rude derrick, and conveyed to the city.
>
> At this landing, or perhaps further along the bluff to the Eastward, suitable arrangements could be made for disembarking large guns. . . . They could also be landed on the beach at the lower end of the Lagoon. . . .

Six months after Handbury completed his survey on September 10, 1870, Mendell received a telegram from Washington directing him to commence operations at Lime Point. Five days later his men were engaged in building a road to Gravelly Beach.

The barbette batteries at Lime Point, as finally approved, were to consist of a water battery at Point Cavallo, another water battery at Gravelly Beach, and a battery at an elevation of well over 400 feet on top of Lime Point bluff. (In his monthly reports, Mendell came to think of this last work as being two batteries: Cliff Battery at the end of the ridge, where Battery Spencer stands today; and Ridge Battery, farther back along the ridge itself.)

(1) Gravelly Beach Battery

This battery was to consist of twelve 15-inch front-pintle guns, arranged in five pairs and one flank gun at each end. There were to be six traverses, each containing a magazine. Because this battery was to sit across the natural drainage of the valley, two large masonry culverts were to be constructed under it that would lead to the sea. (Only one culvert was actually constructed.) The interior crest of this battery was to be at a reference of 39 feet.

(2) Cliff Battery

This battery was to consist of five 15-inch guns, two traverses, and two magazines. Its elevation would be greater than any other in San Francisco Bay at that time, its interior reference being no less than 473 feet.

(3) Ridge Battery

Here Mendell proposed to place four 15-inch guns and four seacoast mortars. Two of the guns would fire into the waters of the bay and two toward the sea. Two traverses containing magazines would complete the works. This battery was only slightly lower than Cliff Battery, its terreplein having an elevation of 438 feet.

(4) Cavallo Battery

This work consisted of two parts: the battery proper, which was an earthwork triangularly shaped and containing positions for 15 heavy guns, and an outwork on the point itself for which two 15-inch guns were planned. When completed this would prove to be an extraordinarily handsome earthen "fort," and today it is unquestionably the best example surviving in the area from the post-Civil War works. As constructed

the battery had nine magazines under heavy traverses, plus an additional one in the outwork.[76]

m. Construction, 1871-1876

Although the construction history of these several new works is discussed separately herein, the fortification appropriations approved for San Francisco Bay from fiscal year 1872 to fiscal year 1877 are summarized as follows: (It will be noted that for fiscal year 1877, Congress again failed to pass appropriations for constructing additional fortifications. The small sums shown came from a single appropriation of $100,000 to be applied nationally under "Contingencies of Fortifications.")

		Fort Point	Alcatraz Island	Lime Point
Fiscal year	1872	$ 50,000	$ 75,000	$100,000
	1873	85,000	42,500	75,000
	1874	65,000	50,000	75,000
	1875	30,000	20,000	30,000
	1876	25,000	25,000	20,000
	1877	886.81	1,500	1,500
Totals		$255,886.81	$214,000	$301,500[77]

n. West and East Batteries, Fort Point

Although never officially blessed with names, the new works at Fort Point quickly became known as West and East batteries. In order to write intelligently on individual gun

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76. NA, RG 77, OCE, Letters Received (A File) 1867-1870, Alexander, Apr. 6, 1870, to Humphreys; FARC, San Bruno, RG 77, OCE, San Francisco Dist., Journal of Operations, Lime Point, 1867-76, entry for September 1870.

77. NA, RG 77, OCE, Letters Sent 1871-1872, vol. 1, Casey, Mar. 22, 1871, and June 22, 1872, to Mendell, and vol. 2, 1873-1875, Casey, Mar. 18, 1873, and May 12, 1874, and Mar. 10, 1875, to Mendell, and vol. 3, 1876-1880, Casey, June 27, 1876, to Mendell. In all cases identical letters also went to Stewart. For FY 1877, Alcatraz and Lime Point together received $3,000--the above table arbitrarily divides the sum equally between the two.

positions or traverses, Stewart and his successors numbered the individual gun positions, mortars, and traverses. Unfortunately for historians, two different numbering systems crept into use. The one used herein is the same as was used by Edwin C. Bearss in his Fort Point study. In it, all the guns and mortars were numbered consecutively in one system starting with gun 1 on the extreme eastern flank of East Battery and ending with gun 63 at the southern end of West Battery. The traverses too were numbered in one system for both batteries, starting with traverse 1 at the eastern flank of East Battery and ending with traverse 30 at the southern end of West Battery.

In accordance with the priorities given him, Stewart began work on the six gun positions behind the fort and the western parapets. By June 1872, he was able to report that among other things the breast-height walls for 20 emplacements had been built and 8 front-pintle stones laid. A year later, Stewart reported that West Battery was "essentially completed." Furthermore, twelve 15-inch Rodmans had been moved from the ordnance yard to the rear of their emplacements. Also, a ramp and a covered way had been built to connect West and East batteries. Still to be done was the laying of traverse rails and the construction of a platform for a 20-inch Rodman. In an armament report dated October 6, 1873, Stewart reported that seven 15-inch guns had been mounted "on front pintle platforms in the new batteries in rear of the Fort." These seven must have been mounted in West Battery. A year later West Battery was reported to have 12 guns mounted. Construction at East Battery began in fiscal year 1873. By the end of that year (June 1873) most of the parapet had been built, as well as parts of the magazines and traverses from one through five. Construction continued at a favorable pace during the next two fiscal years. For fiscal year 1876, Stewart estimated that he could use $90,000 on East Battery;

however, Congress appropriated only $25,000, and Stewart was forced to reduce the scope of work. In addition, heavy winter rains caused erosions and many delays. By June 1876 Stewart was forced to lay off his employees, with the battery still incomplete.

By the time money was again appropriated for fortifications in 1890, batteries and guns of these types were far outmoded. West and East batteries would never be completed as contemplated. East Battery, however, would once again become important for a brief moment during the Spanish-American War. West Battery got to fire some of its 15-inch guns at least once. In 1874 Colonel Stewart carried out an experiment by firing 100-pound charges. The Engineer Department noted his findings, saying that while the carriages and platforms stood the charges better than could be expected, pneumatic buffers fastened to the carriage would have reduced the shock to the pintle and platform.

Upon the construction of the Endicott-period batteries in the 1890s, Battery West was almost wholly destroyed. Today only six of its earthen traverses and their magazines survive, four of these being greatly modified when incorporated into the Endicott batteries.

Presidio 1658 - A magazine is located on the left flank of Battery Miller with its entrance partially buried and not attached to Battery Miller as some maps indicate.

Presidio 1651 - A magazine is located on the right flank of Battery Boutelle. Its original arched entranceway has been extended, making a rather long tunnel. (The number is for Battery Boutelle itself.)

Presidio 1647 (Battery Godfrey) - A magazine is incorporated into the right flank of Battery Godfrey that can be reached only by going inside of the battery and then down a sloping brick tunnel.

Presidio 1646 - A magazine is located on the left flank of Battery Godfrey.

Presidio 1640 and 1643 - Two magazines, each standing by itself, are positioned to the south of Battery Godfrey. Inasmuch as these two have not been incorporated into later batteries, they may be regarded as the best surviving examples of Battery West. The parapets and breast-height walls of Battery East have survived to a greater extent. These will again be discussed in connection with the Spanish-American War.[78]

o. Alcatraz Island

Inasmuch as Alcatraz's defenses already consisted of barbette batteries, Mendell's work here consisted mostly of remodeling rather than new construction. In most instances, the project called for enlarging the terrepleins and building new, thicker earthen parapets on top of the old scarp walls, new breast-height walls of brick, new brick and concrete magazines under earthen traverses, and new platforms. Even during the two years of no appropriations, Mendell was able to employ military prisoners at excavating rock. When he learned that $50,000 was available for fiscal year 1871, he immediately began work on Batteries 1, 2, 3, and 4 at the northwestern end of the

78. USDI, NPS, Bearss, pp. 245-58; NA, RG 77, OCE, Letters Received 1871-1886, Stewart, Oct. 6, 1873, to Chief of Engrs., and Letters Sent 1873-1875, vol. 2, Casey, June 2, 1874, to Stewart; NPS, DSC, John Martini, GGNRA, n.d. (ca. March 1976), to writer.

island because "it is upon this part of the island that emplacements for guns may most speedily be prepared, inasmuch as considerable preparation for the work has been made here during the past year."

During that year Mendell constructed an experimental wooden platform that had been designed by Colonel Alexander in the new Battery 2, mounted a 15-inch Rodman on it, and carried out experimental firings to determine the quality of the platform. He noted in his annual report that he could have mounted six additional 15-inch guns had there been an approved wooden platform. Alcatraz's armament as of June 1871 was a mixture of the new and the old. Mounted in the different batteries were five 15-inch Rodmans, sixteen 10-inch Rodmans, three 200-pounder Parrott rifles, five 100-pounder Parrott rifles, two 10-inch columbiads, sixteen 8-inch columbiads, eight 42-pounder smoothbores, and eight 24-pounder howitzers in all, a total of 63 weapons of which 55 were in barbette and 8 in casemate.

In September 1871, the Engineer Department alerted Mendell to the possibility of employing King depressing carriages on Alcatraz. The board of engineers at New York had studied the problem and concluded that 8 of the Rock's 13 batteries could be so adapted. Although this depressing carriage was not adopted, Mendell nevertheless proceeded to construct Battery 5 for the carriage's installation. This required sinking the terreplein from 2 to 4 feet lower.

By July 1872, Mendell was able to report that there were nine 15-inch guns on the island of which five were mounted and that there were an additional two granite platforms ready. These two platforms were in Battery 5 and were center pintle. No guns could be mounted on them because they were designed for depressing carriages.

Mendell's annual report for fiscal year 1873 listed a large number of accomplishments at both ends of the island. The masonry of several magazines, bombproofs, and shellrooms had been completed. The old north caponier had been converted into a magazine and a traverse. Parapets were made and covered with sod from Fort Point. A tunnel across the northwestern end of the island, joining Batteries 2 and 4, was constructed. (This was Alcatraz's only real tunnel in its history, despite countless legends to the contrary.)

A year later, Alcatraz was stripped almost bare of armament. All that were mounted were two 15-inch Rodmans in Battery 3 (where the model industries building now stands) and one in Battery 2. The two guns in Battery 3 were still mounted on their Civil War platforms--the last two old platforms remaining on the island. Another project that Mendell carried out during the 1870s was the excavation of a large parade ground behind the batteries at the southeastern end of the island. The New York board of engineers was a little miffed that it had not been consulted on this project, but it agreed that Alcatraz did need a level space for a parade, permanent officers' quarters, and the like.

In fiscal year 1875, Mendell concentrated on the southeastern end of the island, constructing retaining walls, magazines, and traverses. Here he converted the old south caponier into a modern magazine in a manner similar to the old north caponier.

In fiscal year 1876, the last year in which funds were available for construction, Mendell succeeded in mounting two more 15-inch Rodmans, giving the island a total of five in their emplacements. As Stewart had had to do at Fort Point, Mendell sadly closed down his operations on Alcatraz on June

30, 1876: "All citizen employees were discharged at the close of the last fiscal year except the overseer and a carpenter who was employed for a few days in making some necessary repairs to the office." He retained some military prisoners for a while who tidied up some odds and ends. Then they too were given other tasks.

Of the 13 batteries projected Mendell had completed, more or less, 8 of them. Fifteen traversed magazines had been constructed. Of the projected thirty-six 15-inch platforms, he had only seven in place. Alcatraz Island had not become the strongly fortified place that it once had been; yet, next to West Battery at Fort Point, it was the most strongly fortified point in San Francisco Bay.[79]

p. Lime Point

Major Mendell renewed operations at Lime Point in September 1870 when an appropriation became available for the work. His first undertaking was to blast out a roadway to Gravelly Beach around Lime Point, as a continuation of the road that led out to the end of the point. The laborers found this to be an onerous task: "The difficulties here are considerable partly on account of the precipitous slopes of the cliffs and especially because of the refactory character of the rock." Within a month the major concluded that this undertaking was an error. He proposed to the Pacific board that he construct the road "over the hills." Although longer, it would be far less expensive: "This road will be four or five times the length of the former, and will pass through the

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79. NA, RG 77, OCE, Letters Receive (A File) 1867-1870, Mendell, July 25, 1870, to Humphreys, and Letters Received 1871-1886, Mendell, Annual Reports of Operations, Alcatraz, for FY 1871-1877, and Board of Engrs., New York, Sept. 4, 1871, to Humphreys, and Mendell, Nov. 25, 1874, to Chief of Engrs., and Letters Sent 1871-1872, vol. 1, Casey, Oct. 6, 1871, to Mendell; NA, RG 77, OCE, Cartographic Archives Div., Fortifications File, Mendell, Armament Report, Alcatraz, ca. October 1875.

Northern end of the Cliff battery. It will form the communications from this latter battery, with the landing and with gravelly beach. It is then an indispensable road. . . ." By mid-October Mendell's laborers were constructing today's road over the hills: "They were put on the line that had been surveyed from the landing in horse shoe Cove to Gravelley Beach, crossing the intervening hills at the reference (432). This road has a grade of 7½ ft. in one hundred. It is fourteen feet wide and is mainly in excavation." The road was completed in November 1870 at a cost of $5,760, and it was macadamized for two thirds of its length.

At Gravelly Beach, Mendell had sand, cement, and lime landed. By November his men had begun construction of a masonry culvert that was to run under the battery in order to drain the valley. This culvert was 170 feet in length and contained 395 yards of masonry of which 72 yards were brick and the remainder concrete. It stands today and appears to be in excellent condition. By the end of 1870, work had commenced on the battery itself: "The embankment of the terre plein and parapet . . . has been continued, the terre plein being carefully rammed in layers of six inches. The material for this purpose is obtained by blasting in the hills on either flank of the battery." In June 1871 Mendell was able to report that the masonry work on six magazines was nearing completion.

Progress was slow during the first part of fiscal year 1872 due to the still unsettled question as to how 15-inch gun platforms were to be built and whether King depressing carriages were to be used. However, Mendell was able to complete the parapet and sow it with grass seed. The breast-height wall was revetted with timber rather than the brick that was used on Alcatraz. The brick and concrete magazines also were brought to completion, being covered with earth and sodded. Mendell

described the battery as it would look when completed: "This battery is intended for 12 guns, which are arranged in pairs separated by magazine traverses. On each flank a gun is placed without a companion. The armament will be exclusively XV" guns. The reference of the interior crest of the parapet is 45 feet: the thickness of the parapet is in no place less than 30 feet."

In February 1872, the Engineer Department sent Mendell approved drawings for both front-pintle and center-pintle wooden platforms for 15-inch guns mounted on Ordnance Department carriages. As soon as he was able Mendell began constructing the Gravelly Beach platforms. In his operations report for January 1873, he described the following ironwork required for one wooden platform, full traverse, front pintle:

1 pintle	285 lbs.	
1 collar top of pintle	70	
1 washer bottom of pintle	19	
2 keys and 6 wood screws	18½	
1 center plate around pintle	468	
2 side plate around pintle	435	
2 plate joints outer traverse rail	35	
1 plate joints inner traverse rail	20	
Wood screws for traverse rails	135	
Bolts and washers for wood work	348	
	2,233½ lbs.	[sic]
2233½ lbs. @ 20¢ per lb.		$446,70
3 segments for outer traverse rails	1,140 lbs.	
@ 15¢ per lb.		171.00
2 segments for inner traverse rails	685	
@ 18¢ per lb.		123.30
Totals	4,058½ lbs.	$741.00

In his annual report for fiscal year 1873, Mendell proudly reported that "Gravelly Beach battery is ready for service." He had laid the 12 wooden platforms and as a last touch had trimmed the banks on the flanks of the battery into shape. Mendell figured the total cost of the Gravelly Beach Battery to be $72,752.89.

Total cost of materials	$18,176.95
Total cost of services	42,966.25
Total cost of culvert	4,839.69
Total cost of road	6,770.00
	$72,752.89

In March 1873, the Engineer Department had authorized Mendell to construct a wooden platform at Gravelly Beach on the plan of the experimental platform Colonel Alexander had designed for Alcatraz. Mendell was to mount a 15-inch Rodman on it and test the stability of the platform by a course of firing. Mendell had the gun mounted by September, but he could not fire it because the carriage and the platform did not match up. As it would turn out, this was the only Rodman mounted at Lime Point until the Spanish-American War at the end of the century. During the last year in which there were any fortification appropriations (1876), Mendell returned to Gravelly Beach for some modest repairs. There had been some settling despite the care with which the earth had been rammed. At this time the settling was repaired, the terreplein graded, gopher tunnels filled in, the spaces between the timbers of the platforms filled with concrete, and the platforms painted.

In the Endicott period the larger portion of the Gravelly Beach Battery was destroyed or built over by the

construction of Battery Kirby. However, at either end of Battery Kirby, a magazine traverse of the old battery survives.[80]

(1) Cliff and Ridge Batteries

Mendell had first concentrated his attention at Gravelly Beach, but when $5,000 became available for six 13-inch mortar emplacements on Lime Point ridge in November 1870, he set laborers to work excavating at the mortar site, which was at the northern end of Lime Point ridge near the road. Then in June 1871, the Engineer Department authorized him to proceed with the construction of the gun positions, it having been decided that depressing carriages would not be needed at a battery located at so high an elevation. Mendell had already had his men cut off the top of the hill for the gun positions, at some points up to 40 feet, and was ready to proceed with the work. By August he had commenced referring to the five 15-inch gun positions and two magazines on the point of the ridge as Cliff Battery and the four 15-inch gun positions and two magazines between them and the road as Ridge Battery. Both names were unofficial, but they stuck.

In his annual report for fiscal year 1872, Mendell included all the gun and mortar emplacements on the ridge

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80. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Journal of Operations, Lime Point, 1867-1876; NA, RG 77, OCE, Letters Received (A File) 1867-1870, Pacific Board of Engrs., Aug. 10, 1870, report for a work at Gravelly Beach, and Board of Engrs., Sept. 6, 1870, comments on preceding report, and Humphreys, Oct. 11, 1870, to Mendell, and Mendell, Oct. 15 and Dec. 14, 1870, to Humphreys, and Letters Received 1871-1886, Board of Engrs., New York, June 30, 1871, to Humphreys, and Mendell, Annual Reports of Operations, Lime Point, FY 1871-1877, and Mendell, Apr. 10, Sept. 22, and Oct. 10, 1873, to Chief of Engrs., and Letters Sent 1866-1870, vol. 3, Third Div., telegram, Humphreys, Sept. 8, 1870, to Mendell, and Casey, Oct. 11 and 28, and Nov. 15 and 26, 1870, to Mendell, and Letters Sent 1871-1872, vol. 1, Casey, Jan. 4 and July 10, 1871, and Feb. 21, 1872, to Mendell, and Letters Sent 1873-1875, vol. 2, Casey, Mar. 31, 1873, to Mendell.

in his report on the work completed: "The parapets, covered ways, magazines, breast height walls, drains, and four granite gun platforms [at Ridge Battery], three mortar platforms were completed; one mortar platform was nearly completed." Because all the ridge was rocky, Mendell was required to haul the earth for the parapets and magazines from farther down the hill, at distances up to 800 yards.

The entire complex was completed by the end of June 1873 except that center-pintle platforms had not yet been prepared for the five emplacements in Cliff Battery, although the timber was on hand. In late 1873 carpenters prepared the timbers for these five wooden platforms. However, Mendell decided not to lay them: "The life of a wooden platform is short with the best of care. . . . For this reason it is not considered advisable to lay [them]. . . ."

Cliff Battery was totally buried or destroyed by Battery Spencer, which was constructed on the same site during the Endicott period. No visible remains of the mortar platforms remain, but the four emplacements (which were armed in the 1890s) and the two magazines of Ridge Battery still remain. In an endeavor to prohibit visitor entry to the magazine, the state of California recently damaged the historic fabric of the traverses over the magazines by removing the earth from them to block up the magazine passageways.[81]

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81. FARC, San Bruno, RG 77, OCE, San Franicsco Dist., Journal of Operations, Lime Point, 1867-1876; NA, RG 77, OCE, Letters Sent 1866-1870, vol. 3, Third Div., Casey, Oct. 28 and Nov. 12, 1870, to Mendell, and Letters Sent 1871-1872, vol. 1, Casey, June 29, 1871, and Feb. 21, 1872, to Mendell, and Letters Received 1871-1886, Mendell, Annual Reports of Operations, Lime Point, FY 1871-77. Emanuel Raymond Lewis, in his A History of San Francisco Harbor Defense Installations, says concerning Cliff Battery (interior crest 473 feet above low water) and Ridge Battery

(2) Point Cavallo Battery

The architecturally handsome battery at Point Cavallo is the best surviving example of the San Francisco Bay fortifications built in the early 1870s. This battery was the last of Mendell's Lime Point works to be constructed. In February 1872 the Engineer Department mailed him the approved project and authorized him to commence the work.

Considering the types of guns then available and their ranges, Point Cavallo was an important location.

> The position is an admirable one for defense. It looks across the entrance through the Golden Gate, and sees all the waters inside towards Point San José, Alcatraz and Angel Islands. It likewise looks through Raccoon Straits, and covers the anchorage in Richardson's Bay, crossing its fire with the works of Lime Point, Fort Point, Point San José, Alcatraz Island, Angel Island and Peninsula Point.
>
> The important waters to be covered by the fire of guns in this position are to the Eastward of two lines drawn from the position and tangent to Lime Point and Peninsula Point respectively.
>
> It so happens, however, that these two lines are practically one and the same straight line, so that the important field of fire is embraced in a sector of 180°. . . .

(445 feet) that these works had the highest elevation of any seacoast battery in the United States before World War II and were among the two or three highest in the world.

> But, in addition to the important waters covered by the fire of the guns of these two fronts, there is an extensive anchorage at the entrance to Richardson's Bay, in the direction of Saucelito which ought to be protected by the fires of guns in this position.
>
> This requires another front. . . .
>
> In like manner, in order to cover all the waters of "Horse Shoe Cove" between Lime Point and Point Cavallo, and the landings around its shore, a similar front is required at that end of the work so that the battery becomes a lunette in shape with two faces and two flanks.
>
> As an open battery in this position might possibly be taken by a coup de main, it is believed that it will be better to close its gorge [rear] by a light parapet . . . in the form of a bastioned front.

The result of this reasoning was a symmetrical earthen "fort" roughly in the shape of a triangle. Mendell got so caught up in its resemblance to a fort that he wished at one point to construct a sally port at its rear entrance. But when money became scarce, he allowed that "a cheap gate" would suffice. A long traverse with magazines bisected the work into two equal parts; other magazine traverses separated each pair of guns. The first plan called for 19 heavy guns (2 of them in a separate work further out on the point) and 9 seacoast mortars. After a lengthy argument between the Pacific board and the New York board, the main battery was built to contain fourteen 15-inch and one 20-inch Rodmans and the outwork and two 15-inch guns. (The argument was caused by the then unanswerable question of whether the maximum caliber for seacoast guns would be a 20-inch

smoothbore or a heavy 12-inch rifled gun. Also the matter of designing the works for King depressing carriages caused some misunderstandings.)

By June 1872 Mendell had opened a road from the wharf around Horseshoe Cove to the site. By September operations were in full swing. Stonecutters were cutting sump caps. Brick masons were building a drain pipe, sumps, and magazines, and carpenters were making centers for magazines. Laborers were excavating, concreting magazines, and digging a ditch for a water pipe to the point from a new well somewhere nearby. By July 1873 Mendell had succeeded in constructing two arched passageways through the central traverse. The powder magazines were almost completed. The entire parapet had taken a rough shape, and sodding had begun on the interior slopes. In his annual report for fiscal year 1874, Mendell reported the main work completed except for the continuing problems of breast-height walls and platforms. Six months later he was able to say the same about the two-gun outwork. In October 1874 he summarized the cost of the battery proper, excluding the outer work.

Contingent Service	
Overseer, foreman, steamer crew, etc.	$10,000
Brick Masons	
9 magazines, 6-foot passageway, entrance to no. 2, through center traverse, well	4,090
Stone Cutters	224
Carpenters	1,728
Blacksmith	1,840
Laborers	58,862
Services	$76,744

Materials

barley, hay, straw, bolts, locks, lock boxes, hooks and hinges, boiled oil, putty, rivets, turpentine, ventilators, bricks (254,600), cement (2,933 bbls.), painting magazine doors with white and red lead, candles for lighting magazines in order to paint (2,000), granite, gravel, sand, lime, lumber (pine, redwood, oak, sugar pine), borax, chalk, glue, smith's coal, steamer coal, salt, steel, iron, grease (axle), fuze, copper caps, nails, spikes, screws, windmill (water supply), cement pipe, composition pipe, couplings, block tin

Materials	$31,081.17
Total cost of project:	$107,825.17

Mendell did not make clear if the above sums included the construction of eight breast-height walls in the main battery and two in the outwork that were undertaken in fiscal year 1875. Inasmuch as the Lime Point appropriation for the next year amounted to only $20,000 for all the works, very little more was done at Point Cavallo Battery. Some additional sodding was carried out, doors were hung on the two-gun magazine, and the road was repaired. As elsewhere in the nation, fortification construction came to a halt on June 30, 1876. The handsome earthwork would not have any weapons mounted on it until after the turn of the century.

Today, nothing remains of the two-gun outwork, the point having been thoroughly excavated and changed. The main battery was until very recently fairly inaccessible and very much intact. In recent times vandals on bikes have caused serious erosion to the parapets.[82]

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82. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Journal of Operations, Lime Point, 1867-1876; NA, RG 77, OCE, Letters Sent 1871-1872, vol. 1, Casey, Feb. 21 and Apr. 23, 1872, to Mendell, and Letters Received 1871-1886, Mendell, Annual Reports of

In May 1874 Mendell, in anticipation that a project for a battery at Point Diablo would be approved, had had his laborers begin work on extending the road westward from Cliff Battery toward Point Diablo, a distance of about three and three-quarters miles. By the end of June he reported that 4,200 feet of roadway had been made. He complained that the excavation involved hard rock and required heavy blasting. Approval for the proposed work came from Washington in July 1874. Then in September, Mendell wrote the chief of engineers pointing out that the Diablo project would involve an immense cutting away of a ridge that restricted the fire of the left face of the battery. The New York board restudied the project and agreed with Mendell. It revised the plan of the battery, reducing its number of guns and thus avoiding the excavations. They asked, however, that Mendell prepare cost estimates before they made any firm recommendations that the battery be built. Meanwhile, Mendell continued to extend the road westward, but he now called it the Point Bonita road in his monthly reports.

In preparing the cost estimates, Mendell described the road at some length: "The road leaves the Gravelly beach road where it crosses the neck, at the lower end of the cliff mortar battery, and ascending from this point, it crosses the divide at the head of Gravelly beach valley on a reference of (584) from which point it descends and reaches the point Diablo site by a circuitous route; the road from its point of divergence with the old

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Operations, Lime Point, FY 1872-1877, and Letters Received (A File) 1867-1870, Alexander, Oct. 4, 1869, and Apr. 9, 1870, to Humphreys, and Board of Engineers, New York, Nov. 22, 1869, remarks on plans for Point Cavallo, and Apr. 17, 1870, to Humphreys, and Letters Received 1871-1876, Board of engineers, New York, Apr. 8 and June 1, 1872, to Humphreys, Alexander, May 8 and July 20, 1872, to Humphreys, and Mendell, May 30, 1874, and Jan. 18, 1875, to Chief of Engrs.

road as just stated will be about 16,500 feet in length, of which 6000 feet remain to be constructed. It will cost about four thousand dollars to complete the road." His estimates for both the road and the battery amounted to $75,000. Mendell said that if the Diablo battery were not built, the road was still a necessity, especially in wartime when it would be needed to repel an enemy landing.

On reviewing the project one more time, the New York board agreed that the battery should eventually be constructed, but the board gave it a lower priority than even the works proposed for Angel Island. It also recommended that the entire subject of San Francisco's defenses be reviewed. The chief of engineers concurred and in January 1875 ordered that work on the road be suspended. The projected battery at Point Diablo was never constructed. Nor did Mendell have the opportunity to resume his great interest at Lime Point--blasting the cliffs in preparation for a casemated fort.[83]

q. State of the Works, 1875

The Board of Engineers for Fortifications, New York, completed its review of the defenses of San Francisco Bay in October 1875. While this review brought forth few changes in the existing plans and completed works, it provided a good summary of the state of affairs on the even of the nationwide suspension of new coastal fortifications.

> The primary or outer line of defence, consisting of barbette batteries, approved for the two shores of the

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83. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Journal of Operations, Lime Point, 1867-1876; NA, RG 77, OCE, Letters Received 1871-1886, Mendell, May 30, Sept. 3, and Oct. 24, 1874, to Humphreys, and Mendell, Annual Report of Operations 1874-1875, and Board of Engrs., New York, Oct. 10, 1874, to Humphrey, and Letters Sent, 1873-1875, vol. 2, Casey, July 24, 1874, and Jan. 6, 1875, to Mendell.

> Golden Gate . . . designed to mount 93 large guns and 22 mortars, will, when completed, guard with a reasonable show of strength this entrance. In addition, the masonry work at Fort Point will give in lower tier of casemate cover for 25 guns, bearing upon the water, which may be 8 1/2" or 9" rifles, regarded by the English as but little, if at all, inferior to the 15" smooth-bore gun. The Engineer Department has always looked upon the occupation of Lime Point Bluff by a casemated work as an essential element in the defenses of Golden Gate. The indeterminateness as to the gun to be provided for such works, as well as the excessive cost per gun they would involve . . . deters them from making any recommendations in reference to the occupation of this Point.

The outer line of batteries and those on Alcatraz were now well enough advanced to allow for the immediate construction of at least one of the proposed batteries on Angel Island, "so as to close in part that break in the second line of defense." The board recommended that Battery Knox be the first constructed, "as its fire will cross that of Point Cavallo and Alcatraz . . . and help close the passage of both to the west and south of Angel Island."

The board had investigated the suitability of Shag Rock northwest of Alcatraz Island as a possible site for one or more guns; however, it concluded it was not suitable for a turret or any other kind of fortification. Alcatraz itself was still the most important position on the second line of defense. While the proposed work on Point San José was still required, its priority should be below that of Point Knox, "as the passage to the south is narrower and already better defended." Finally, the board concluded that Yerba Buena Island should eventually have a small number of guns and mortars.

Before the close of these brief years of post-war modernization, Chief of Engineers Humphreys made an attempt to have names applied to the military reservations and works at Fort Point (then known as the fort at Fort Point), Alcatraz (then known as the post on Alcatraz Island), and the still ungarrisoned works at Lime Point. After soliciting ideas from the San Francisco engineers, he prepared his own favorites. Humphreys wrote Secretary of War Belknap that these works needed names because, "the designations they now have, are, in many cases cumbersome, and give rise to embarrassments in the consideration of the appropriation bills for their continuance." His recommended names were indeed "heavyweights" that could help when being discussed in Congress.

> Works on Fort Point to be named Fort Lincoln, after President Lincoln
>
> Works at Lime Point to be named Fort Stanton, after Secreatary of War E.M. Stanton
>
> Works on Alcatraz to be named Fort McPherson, after Maj. Gen. James B. McPherson--killed in the Battle of Atlanta and formerly an engineer officer on Alcatraz

Whatever the reasons, Belknap took no steps to name the three forts.[84]

r. Centennial of the American Revolution

Ironically, work on the defenses of San Francisco Bay came to a halt at the same time the citizens of the

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84. NA, RG 77, OCE, Letters Received 1871-1886, Board of Engrs., New York, Oct. 23, 1875, to Humphreys, and Letters Sent 1873-1875, vol. 2, Humphreys, July 15, 1874, to Belknap.

Bay Area planned a celebration of the Centennial of the American Revolution. On July 3, 1876, approximately 100,000 spectators gathered on the hills of the Presidio to witness a day-long display of military skill and power. Following a dress parade, infantry and cavalry troops put on a sham battle, the defenders of the Presidio successfully driving off the enemy invader. The 15-inch Rodmans at both Fort Point and Alcatraz Island fired at targets at Lime Point. Naval vessels, quite unsuccessfully, fired at a target fastened to a mud scow. The day's activities were a thrilling spectacle and probably nobody but the reporter from the Daily Alta California worried much if a few shells fell short and most missed their mark.[85]

85. Daily Alta California, July 5, 1876. The navy missed all its shots, but the Alcatraz gunners, after several misses, managed to hit their target on Lime Point.

II. Coastal Defenses, San Francisco, 1876-1905

A. Neglect, 1876-1890

1. The Engineers in San Francisco

During the 15 years that Congress refused to appropriate funds for the construction of fortifications, the army engineers in San Francisco had no trouble in keeping themselves busy. They continued to rent four upstairs rooms on the southwest corner of Sacramento and Kearny streets as an office. The owner, John M. Byrne, charged them $55 in gold per month for the rent. In most of these years a small sum of money, averaging around $1,500 per area, was available for "protection, preservation, and repair of fortifications." Some of this money contributed to the upkeep of the office, but most of it went toward the salary of "fort-keepers," who performed minor maintenance and housekeeping.

Each engineer periodically inspected the works in his charge: Mendell at Alcatraz and Lime Point and Stewart at Fort Point and San Diego. But in addition to his responsibilities concerning fortifications, each engineer had a number of assignments in civil works, mostly in the improvement of rivers and harbors. In his monthly report for August 1884, Colonel Mendell listed the following duties assigned to him: construction of defenses on Alcatraz Island and at Lime Point; improvement of Oakland Harbor, Wilmington Harbor, Humbolt Harbor and Bay, Redwood Harbor, Petaluma Creek, and the Colorado River; examination surveys of Islais Creek, San Mateo River, and Napa River; removal of the wreck Escambia from the entrance to San Francisco Harbor; investigation of the causes tending to decrease depth of water and diminish the commercial value of San Francisco Harbor; and a membership of the Board of Engineers for the Pacific Coast.[1]

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1. UC, BL, Letterbooks 1872-1884, Mendell, June 16, 1877, and Mar. 27, 1880, to Chief of Engrs.; NA, RG 77, OCE, Letters Sent 1876-80, vol. 3, Maj. G. H. Elliot, July 28, 1879, to Mendell; FARC, San Bruno, RG 77, OCE, San Francisco Dist., Letters Sent

2. The Board in New York City

The Board of Engineers for Fortifications in New York City kept busy these years also: reviewing and updating projects, keeping up in developments in ordnance, and considering the future of seacoast defenses for that day when appropriations would again become available. An example of the board's efforts during this period was its reexamination in 1880 of the project for Lime Point. In 1875 it had designed a masonry casemated battery having very thick walls with wrought iron shields to protect the guns. But in just five years the advances in gun development and the probability of future advances "seem to indicate the abandonment hereafter of masonry scarps."

However, Lime Point had to be defended. By a curious logic, the board now concluded that the 1875 plan might be satisfactory after all: "Still this coast is accessible only by crossing the Pacific Ocean or doubling Cape Horn and probably will not be deemed as accessible at all to the most powerful ships of the Old World now under construction. In that view the casemate battery of 1875 with its iron shields might be deemed sufficiently strong for . . . Lime Point." Having said that, the board then wondered if rock slides at Lime Point could bury and crush such a work. It postponed the agony of a decision by referring the whole matter to Colonel Mendell in San Francisco.[2]

3. Personnel, Fort Winfield Scott and Fort Mason

Several changes occurred in the San Francisco office during these interim years. In 1878 Col. Barton S. Alexander, the

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1884-1889, Mendell, Aug. 31, 1884, to AG, USA. For two years (1886-88) there were not even appropriations for fort keepers.

2. NA, RG 77, OCE, Letters Received 1871-1886, Board of Engineers, New York, June 26, 1880, to Chief of Engrs. H. G. Wright.

senior engineer, died unexpectedly of heart failure. His good friend, Colonel Mendell, took over the family's affairs and attempted to settle the estate. Alexander had had six children, all grown but all still dependent on him for support. Col. Charles S. Stewart now became the senior engineer on the Pacific Coast. He continued to be responsible for the works at Fort Point, Point San José, and Angel Island. Seven years later in 1885, Stewart transferred from San Francisco in preparation for retirement, and Mendell assumed responsibility for all the works in San Francisco Bay, as well as becoming the senior engineer on the Pacific Coast.[3]

Another change in the defenses of San Francisco occurred in November 1882 when the posts at Fort Point and Point San José were formally named Fort Winfield Scott and Fort Mason respectively. Fort Winfield Scott, of course, was named for the late commander in chief of the army who had visited San Francisco in 1859. Fort Mason was named in honor of Col. Richard Barnes Mason, First Dragoons, who was the military governor of California from 1847 to 1849.[4]

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3. UC, BL, Letterbooks 1872-1877, Mendel, Dec. 19, 1878, to James B. Eads, St. Louis, Mo.; FARC, San Bruno, RG 77, OCE, San Francisco Dist., Letters Sent 1884-1889, Mendell, Sept. 7, 1885, to Chief of Engrs., and personal report for Sept. 1885. The oldest of Alexander's four sons, Walter Stone, was then attending West Point. He graduated and went on to a successful career in the artillery.

4. Frazer, Forts of the West, p. 26; NA, M617, Roll 1446, Fort Winfield Scott, Post Return for Dec. 1882, and Roll 755, Fort Mason, Post Return for Dec. 1882. Both names were bestowed by GO 133, headquarters of the army, AGO, Nov. 25, 1882. Fort Winfield Scott was abandoned in September 1886. When it was temporarily reoccupied during the Spanish-American War, it was again called Fort Point. Then in 1912, it was reestablished as Fort Winfield Scott, an independent post from the Presidio of San Francisco, per GO 11, Western Division, June 18, 1912.

Fort Winfield Scott apparently did not received a definite boundary setting it apart from the Presidio of San Francisco at this time. But it is clear from army correspondence that the term applied to the masonry fort, West and East batteries, the engineers' building and wharf, and a collection of frame structures used by the garrison. This last included officers' quarters, barracks, noncommissioned officers' quarters, stables, bakery, commissary storehouse, and sheds. Buildings belonging to the Engineer Department included shops, sheds, employees' quarters, stables, storehouses, and mess halls.[5]

4. Odds and Ends

The engineers continued to prepare annual reports on the state of the works, even though there were few changes to comment on. Mendell pointed out that the earthworks on Alcatraz were in the best shape of any in the harbor, simply because gophers did not live on the island. Over at Lime Point things were different: "A little rodent called the Gopher is the worst enemy we have. He burrows in the parapets and destroys their shape and compactness." Poisoning them did not help because "recruits from outlying country come in."

Also at Lime Point, Mendell reported that the citizens of Sausalito wanted to build at their own expense a road crossing the military reservation from their town to the new fog signal at the tip of Lime Point. Mendell was sure that the purpose was to be a pleasure drive to attract tourists. He was certain that the government would have to build a road along the west shore of San Francisco Bay at some future date, and he urged the chief of engineers not to approve a private road, "a never ending source of

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5. [U.S. Army], Military Posts in the Pacific, 1879 pp. 92-93.

conflict, annoyance, and interference with public operations when they shall be undertaken." Despite repeated attempts by the citizens to get their road, Mendell's argument won the day. When the road was eventually built, it was constructed by the military.[6]

5. Mendell Inspects Angel Island

During the 1880s, the wooden platforms at the various works in the bay became increasingly unserviceable due to rotting of the wood. At no place was this more apparent than at the batteries on Angel Island. An aroused Colonel Mendell graphically described its batteries in the year 1887.

> Point Blunt
>
> There seems to be no reason why the indiscribable [sic] remains on point Blunt should be classified as a battery or defense of any kind, as it lacks guns parapet and platforms and as its magazine is useless. The parapet slid off years ago. . . . To speak of this battery as unserviceable is to convey an incomplete and inaccurate view. There is nothing here that can contribute to defense, while the ruins are an obstacle and an inconvenience to the occupation.
>
> Point Knox Battery
>
> It requires a photograph to represent the ruin and the desolation of this assemblage of guns and platforms. There are 10 guns, three of which are Rodman . . . .

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6. NA, RG 77, OCE, Letters Received 1871-1876, and Mendell, Annual Report, Lime Point, FY 1878, and Letters Received 1888-1889, Mendell, Jan. 30, 1888, to Chief of Engrs., and Land Papers, Mendell, May 21, 1886, to Chief of Engrs.

The remaining seven guns are 32 pdr on wood carriages in the last stage of decay. Some being blocked up to keep them in position.

Point Stewart Battery

All elements of defense are absent from obsoleteness and decay, beyond thought of repair.

Not only should these batteries be abandoned, but their guns and carriages should be dismounted and the platforms removed. They were, said Mendell, "capable of evil, in exciting amusement or contempt in the mind of every intelligent visitor. Being in a frequented island they come under the observation of many persons. They seem to me to be a reproach to the Government and especially an injury to the reputation of the Corps of Engineers." He concluded: "While the Corps may withstand criticism, it ought not to be laughed at." Soon after Mendell wrote this letter, the secretary of war had the Civil War batteries on Angel Island removed from official lists.[7]

6. Fortifications at Fort Mason

The Civil War batteries at Fort Mason fared somewhat better than those on Angel Island. As early as 1871, repairs had been made to the magazine of West Battery and three of its 10-inch Rodmans were remounted on renewed platforms. By 1880, however, the magazine was again reported to be in a decayed condition. Colonel Stewart succeeded in obtaining some funds for repairs and the permission to employ military prisoners from Alcatraz on the work. By June 1880 the magazine had been entirely rebuilt, again of timber; the other three positions in West Battery received new

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7. NA, RG 77, OCE, Letters Received 1886-1887, Mendell, Jan. 14, 1887, to Chief of Engrs.

platforms; and 10-inch Rodmans were remounted for drill and practice firing. East Battery with its six 42-pounder rifled guns at this time was considered unserviceable since its platforms had rotted and its magazine had fallen in.

In 1888 all the guns of East Battery were dismounted, and the ruins of the wooden platforms were removed. A year later, six new wooden platforms were constructed in West Battery and the Rodmans remounted on them. The reason Fort Mason could get money for these improvements in a time of scarcity became clear in a letter from the post commander to Colonel Mendell: "The fact that this Post is the residence of the Division Commander [Maj. Gen. O. O. Howard], and is often visited by foreign officers and other personages of high rank and note; that the battery referred to has, until the past season, been frequently used for saluting purposes on important occasions of ceremony; that it is now the battery most convenient to artillery troops stationed in the harbor; and that this Post is an artillery station, garrisoned by artillery troops . . . appears to make it important that, if possible, these platforms should be repaired." General Howard concurred.[8]

7. Submarine Mine Defense

In a prize-winning essay in 1913, Capt. Paul D. Bunker, CAC, gave a history of the mine defense of harbors. He wrote that the submarine mine was an American invention that was perfected by Americans. David Bushnell of Connecticut earned the title of father of submarine mining during the American Revolution. A submarine vessel invented by Bushnell actually attempted,

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8. NA, RG 77, OCE, Letters Received 1871-1876, Stewart, Annual Report, Point San Jose, FY 1871-1886, and Letters Received 1886-1887, Mendell, Annual Reports, Fort Mason, FY 1887, and Letters Received 1888-1889, Mendell, Jan. 13, 1888, to Chief of Engrs., Capt. J. A. Darling, CO, Fort Mason, Oct. 20, 1888, to Mendell, and Maj. Gen. O. O Howard, Oct. 31, 1888, to Mendell; NA, RG 77, OCE, Cartographic Archives Div., Statement of Armament, Fort Mason, June 30, 1883.

without success, to attach an explosive device to the bottom of a British ship off Staten Island. Early in the 19th century Robert Fulton improved upon Bushnell's ideas and in an experiment in France succeeded in blowing up a small vessel with an underwater charge of gunpowder.

A vast step forward in submarine mines, or torpedoes as they were then called, took place in the 1830s and early 1840s when Samuel Colt worked out the concept of using an electric current to explode mines (and inventing the first submarine cable to do so). Despite the success of his demonstrations, Colt could interest neither naval authorities nor Chief Engineer Totten. Bunker gave credit to the Confederates in the Civil War for advancing submarine mining to a position of importance in warfare and giving it an honorable place in the profession of arms, as "heretofore it had been condemned as barbarous." Following the Civil War Lt. Col. Henry L. Abbot, Corps of Engineers, carried out a long series of experiments in submarine mining at Willets Point, New York, and formulated the system that was used by the engineers in San Francisco Harbor.[9]

In March 1883, the Office of the Chief of Engineers notified Colonel Stewart that Abbot's experiments with mines (torpedoes) had succeeded to the point where a shipment of buoyant torpedoes would be sent to San Francisco in June: "The Board of Engineers for the Pacific Coast is requested to state where these torpedoes can best be stored in San Francisco Harbor and to whom they should be invoiced." Two months later, the San Francisco engineers learned that Abbot's three-volume Torpedo Manual was available. If these documents were studied,

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9. Paul D. Bunker, "The Mine Defense of Harbors: Its History, Principles, Relation to the Other Elements of Defense, and Tactical Employment," Journal of the United States Artillery 11 (1914), pp. 129-147. Submarine mining was turned over to the artillery about 1904.

officers would have "all the knowledge of our defensive torpedoes which they can acquire without actual experience with the system."

The first torpedoes did not arrive in San Francisco until 1884. It had been decided that they would be invoiced to Colonel Mendell who had prepared the magazine in the unfinished casemated barracks on Alcatraz. Six months after their arrival, Mendel inspected the torpedoes and found that due to the dampness and lack of ventilation in the casemates, many of the torpedoes had rusted on their outsides. A civilian, assisted by military prisoners, was kept busy scraping and repainting them. Mendell urged that a permanent storehouse be constructed, preferably on Yerba Buena Island.

8. Mine Depot, Yerba Buena Island

In March 1885, Colonel Abbot informed Mendell that the board of engineers had prepared the project for mine defense for San Francisco. Mines were contemplated for two areas--one in front of Alcatraz Island, the other in the rear: "The former was positively and the latter contingently recommended." Abbot enclosed a list of materials for which storage would have to be provided, advising Mendell that the electric cable and the dynamite required only temporary storage and the anchors could be stored outdoors.

	Advanced Area	Interior Line
32" torpedoes	147	42
40" torpedoes	210	210
43" torpedoes	315	63
46" torpedoes	63	63
Grand junction boxes	35	15
Triple junction boxes	245	105
Cutoff boxes	245	105
Multiple cable drums (4.5'x4.5', wt. 2 tons)	92	32
Single cable drums (like others)	26	12
Anchors	735	315
Wire-mooring rope	44,000 ft.	18,000 ft.
Dynamite	73,500 lbs.	31,500 lbs.

With this information at hand, Mendell designed a "torpedo shed." It would be a permanent building having brick walls, a metal roof, and a concrete floor. The two wooden racks were each 110 feet long, 16 feet wide, and 4 tiers high. Their capacity was 576 torpedoes--far fewer than shown in the above project. One end of the shed would have two stories for storage. The interior dimensions of the structure were 158 by 48 feet.

Funding the construction would take time in those lean years. Meanwhile Mendell supervised the scraping and painting of the torpedoes on Alcatraz: "During the month [April 1888] 128 Torpedoes were cleaned and scraped, and 153 torpedoes were painted with one coat of red lead and one coat of white lead." Then in March 1889, Congress passed an appropriation of $250,000 under the general title "Torpedoes for Harbor Defense." The new Board of Ordnance and Fortifications approved an allotment of $60,000 for two mining casemates--one at Alcatraz Island and one at Fort Mason. Funds were also made available for the storehouse on Yerba Buena Island. Mendell was placed in charge of this new construction, the first significant work on the San Francisco defenses in 13 years. In September 1889 he learned that Willets Point was planning on sending him 120 additional torpedoes. He begged that they be retained in the East until he had the storehouse on Yerba Buena completed; Willets Point was agreeable.

The torpedo storehouse as completed (about 1890) was considerably different than the one contemplated earlier by Mendell. Its interior dimensions were increased to 158 by 72 feet, with walls 24 feet high. It had a storage capacity of over 1,100 mines and 168 drums of cable. When the cost of brick in San Francisco suddenly jumped by 30 percent, Mendell recommended that the walls be built of concrete rather than brick. The chief of engineers approved of this, and the contract for a concrete building was given to the firm of Ransome and Cushing.

As the senior engineer on the Pacific Coast, Mendell visited Yerba Buena Island in April 1893 and made a thorough report on the torpedo project. He described the keeper's dwelling to be a 1½-story wooden cottage, containing six rooms. It had cost $1,972. The keeper was a former army sergeant by the name of Burke, "a faithful man." The wharf head measured 80 by 60 feet and the roadway to it was 20 feet wide. Two derricks stood on the wharf for loading torpedoes; they were operated by a portable steam engine. The cars and rails were on hand, but the rails had not yet been laid. Mendell said that 579 torpedo "shells" were then on hand and in good condition. The anchors were stored outside the shed along the wall. The station still needed a powder magazine, loading room, electrical cable, mooring cable, and dynamite.[10]

9. Mining Casemates

Controlled electric mines required a control room from which the cables ran out to the water and from which an operator sent the impulse to explode the mine. In the 1889 appropriation for torpedo defenses, Mendell received $60,000 to construct two of these mining casemates (i.e., bombproof rooms) at Alcatraz and Fort Mason. He concluded that when the mines were

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10. NA, RG 77, OCE, Letters Sent 1881-1883, vol. 4, Maj. J. M. Wilson, Mar. 27 and May 1 and 10, 1883, to Stewart, and Letters Sent 1886-1889, Capt. C. B. Sears, July 6, 1889, to Mendell, and Letters Received 1871-1886, Mendell, Jan. 23 and Sept. 17, 1885, to Chief of Engrs., and Abbot, Mar. 10, 1885, to Mendell, and Letters Received 1888-1889, Mendell, Aug. 1 and Sept. 25, 1889, to Chief of Engrs., and Mendell, Reports of Operations, Alcatraz, April 1888, and Lt. H. C. Newcomer, Nov. 28, 1889, to Mendell, and Letters Received 1890-1892, Mendell, Mar. 11, 1890, to Chief of Engrs., and General Correspondence 1893-1894, Mendell, Apr. 13, 1893, to Chief of Engrs. This substantial storehouse still stands on Yerba Buena Island, immediately under the San Francisco-Oakland Bay Bridge. It is occupied by the U.S. Coast Guard; at least, a USCG guard forbade the writer from approaching the building.

moved from Alcatraz to Yerba Buena Island the magazine in the casemated barracks could be adapted to a mining casemate. The magazine measured 28 by 15 feet; its exterior walls were 10-feet thick; and its side walls were 6 feet thick. A shaft would have to be sunk in the floor, and a tunnel or cable gallery (4½ by 3 feet) run out to the water. He estimated the cost of this work to be $1,000.

At Fort Mason the mining casemate had to be planned from scratch. Mendell selected a site at the foot of the cliff on the west side of Black Point Cove (today's Aquatic Park). Here he constructed a small temporary wharf for unloading construction material and on April 9, 1890, began constructing San Francisco Bay's first mining casemate. Twenty concrete steps led down to the concrete 12- by 22-foot arched operating room. A concrete traverse blocked the 17½-foot-long passageway from the foot of the stairs to the operating room. Two ventilating pipes led up through the thick earthen cover. An inclined concrete cable gallery measuring 2 feet 6 inches by 3 feet 6 inches ran to the water's edge. By July 1890 the casemate was complete except for plastering the interior and the construction of a path leading down from the fort proper.

When San Francisco Harbor was mined for the first time during the Spanish-American War, this first mining casemate was still in use. It still stands today behind a locked steel door.

Mendell's assistant, Lt. Henry Clay Newcomer, proposed another torpedo operating room and cable gallery in a ravine at the foot of Mortar Hill on Angel Island. It was to be the same size as the one at Fort Mason, and two lamp recesses were to be located in a wall--one over the testing table and one over the telegraph table. Concerning protection, Newcomer wrote: "The work has been designed to give a cover equivalent to 60' of earth

and 8' of concrete along the path of any projectile having a fall of 10 degrees. The vertical cover is 28' of earth and 4' of concrete." He estimated the cost at $22,223; however, this operating room was completed in November 1891 for only $9,775. An inspector general examined this casemate in 1892 and in his report gave a fuller description of it than had Newcomer: "The casemate is 22'x12'x10' on the inside. Three of the walls are 4' thick, the remaining or the most exposed, is 8' thick. The room is covered by a full arch of 6' radius and 4' thick, the entrance to which is a concrete descending gallery 43'4"x3'x7'6", whose walls are 4' thick. From the center of the casemate floor is a well 4'x2 1/2' extending to a gallery 110'x2 1/2'x3 1/2' running to the water's edge." It, too, still stands in pristine condition at Mortar Hill. The entrance is by way of a dramatic concrete staircase having 36 steps.[11]

B. The Endicott Era, 1890-1905

1. Memorial of San Francisco Chamber of Commerce, 1882

In 1882 the U.S. Senate published a memorial of the San Francisco Chamber of Commerce "praying for an appropriation by Congress for the construction of harbor defenses at the entrance to the Bay of San Francisco." Thus began a campaign by concerned citizens and army officers that led to the complete remodeling and modernization of the coastal defenses of the United States.

The time was right for in the 1880s a number of advances in heavy ordnance were made that revolutionized seacoast armament. E. Raymond Lewis in his Seacoast Fortifications of

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11. NA, RG 77, OCE, Letters Sent 1886-1889, Capt. C. B. Sears, July 6, 1889, to Mendell, and Letters Received 1888-1889, Newcomer, Oct. 7, 1889, to Mendell, and Mendell Oct. 8, 1889, to Chief of Engrs., and General Correspondence 1890-1892, Mendell, Mar. 3, July 2 and 7, 1890, to Chief of Engrs., and Newcomer, Jan. 30, 1891, to Mendell, and Lt. Col. G. H. Burton, IG, Department of Pac., Jan. 9, 1892, to the IG, War Department.

the United States lists these advances: steel in place of iron for guns, perfection of breech loading, and more effective propellants. The results were lighter, stronger, longer, and more powerful weapons; a new type of disappearing carriage; more efficient projectiles; and increased muzzle velocities. Lewis writes: "The new weapons which began to emerge from the development stage around 1890 could fire projectiles that, caliber for caliber, were four times as heavy to effective ranges two or three times as great; and they could do so with remarkably increased armor-penetration ability and accuracy."

The Senate Military Committee referred the chamber of commerce memorial to the War Department for comment. Chief of Engineers Horatio G. Wright responded: "The facts connected with the defenceless condition of the great commercial cities of our country have been fully presented to Congress in my reports for the past three years. As already stated by me it is believed that there is hardly any civilized nation so illy prepared for war, so far as maritime defences are concerned as the United States."

2. Gun-Foundry Board, 1882

At this same time the reality emerged that American industry was not equipped to produce either steel armor plate for naval ships or armor-piercing guns for coastal defense. Congress in the Naval Appropriations Act of 1883 established the Gun-Foundry Board to deal with this problem. The army and navy officers of this board toured the heavy armament industries of Europe collecting both technical data and ideas concerning the economics of production. Walter Millis describes the findings and recommendations of this board.

> After pointing to the advantages and disadvantages of each of the various combinations of government, private and "partnership" arms manufacture which it had found in Europe, it decided for a mixed system. It recommended

that government should induce private industry, with the offer of sufficiently generous contracts, to equip itself to supply the basic steels and forgings for guns and armor, while the government should assemble these materials into the finished guns in its own factories. . . . The Board's recommendations were adopted. The Bethlehem, and later the Carnegie, steel companies began to equip themselves to provide the forgings; while for many years the Watervliet Arsenal in upper New York and the Naval Gun Factory in Washington were to fabricate and finish most of our supply of heavy ordnance, ashore and afloat.[12]

3. New Project for San Francisco, 1884

In 1884 the Board of Engineers for Fortifications, New York, prepared estimates for new defensive works for five major seaports, including San Francisco. The estimates for San Francisco called for the installation of 202 rifled guns and mortars.

5 2-gun turrets @ $600,000	$ 3,000,000
10 100-ton BL rifles @ $100,000	1,000,000
20 50- BL barbette disappearing rifles @ $50,000	1,000,000
20 Emplacements for 50-ton rifles @ $40,000	800,000
71 30-ton BL barbette disappearing rifles @ $30,000	2,130,000
71 Emplacements for 30-ton rifles @ $30,000	2,130,000
5 20-ton BL barbette disappearing rifles @ $20,000	100,000
5 Emplacements for 20-ton rifles @ $30,000	150,000
96 12-in. rifled mortars and emplacements @ $17,000	1,632,000
	$11,942,000

12. U.S., Congress, Senate, "Memorial or the Chamber of Commerce of San Francisco," 47th Congress, 1st sess., Mis. Doc. no. 27; NA, RG 77, OCE, Letters Sent 1881-83, vol. 4, Wright, Dec. 26, 1882, to Sect. of War; Russell F. Weigley, History of the United States Army (New York: Macmillan Company, 1967), pp. 283-84; Walter Millis, Arms and Men, A Study in American Military History (New York: G. P. Putnam's Sons, 1956), pp. 149-51.

The estimated cost of the masonry and earthwork for the emplacement of the turrets and for the barbette batteries came to another considerable sum.

5 Turrets exclusive of armor @ $300,000	$ 1,500,000
20 Emplacements for 50-ton BL barbette disappearing rifles @ $10,000	200,000
71 Emplacements for 30-ton BL barbette disappearing rifles @ $10,000	710,000
5 Emplacements for 20-ton BL barbette disappearing rifles @ $10,000	50,000
96 Emplacements for 12-inch rifled mortars @ $2,000	192,000
	$ 2,652,000

Other than illustrating the expense of modernizing the coastal defenses, nothing came of this 1884 estimate.[13]

4. The Endicott Board

Grover Cleveland became president of the United States in 1885. Under the provisions of an Act of Congress approved March 3, he appointed these members to a special Board on Fortifications or Other Defenses. Secretary of War William C. Endicott became the president of this board, and it quickly became known as the Endicott Board. The other members were Brig. Gen. Stephen V. Benet, chief of ordnance; Brig. Gen. John Newton, chief of engineers; Lt. Col. Henry L. Abbot, CE (submarine mines); Capt. Charles S. Smith, Ordnance Department; Commander W. T. Sampson, U.S. Navy; Commander Casper F. Goodrich, U.S. Navy; Mr. Joseph Morgan, Jr., of Pennsylvania; and Mr. Erastus Corning of New York. Capt. Edward Maguire, CE, served the board as secretary, and Jay Stone was the stenographer. The board met for the first time on June 3, 1885. At this meeting committees on armor, mines, warships, and manufacturing were

13. NA, RG 77, OCE, Board of Engrs., New York, Aug. 30 and Sept. 22, 1884, to Chief of Engrs. John Newton. The New York board contemplated erecting steel turrets on huge masonry piers at Fort Point, Lime Point, and Shag Rock.

appointed. In July the board visited several forts--the Ordnance Proving Grounds at Sandy Hook, New York, and the Naval Torpedo Station at Newport, Rhode Island. In October the board visited a large number of iron and steel mills from Ohio to Massachusetts.

a. Recommendations for San Francisco

On December 21, 1885, a committee announced a list of 22 seaports in their order of importance and the urgency necessary for their defense. Not surprisingly, New York Harbor led the list, with San Francisco in second place. The final report of the board listed only the first 11 of this list, retaining San Francisco in second place. To defend these ports the board proposed floating batteries, armored turrets, armored casemates, barbette batteries, submarine mines, and special batteries of rapid-fire guns to protect the mines, searchlights, torpedo boats, and machine guns. Millis summarizes the elaborate recommendations of the board as "somewhat breath-taking." They called for 1,305 medium and light guns and estimated the total cost at over $127 million. For San Francisco specifically the board recommended 110 guns and 128 mortars--an even larger figure than the New York board's 1884 one.

> San Francisco -- This is a most exposed point, and, owing to the width across the channel, difficult to be defended by guns from the shore. Floating batteries are required to be added to the defense.
>
> Fortifications -- Turrets, barbette batteries, mortar batteries. Submarine mines will form a part of the defense. Eighteen torpedo boats are recommended for service at this harbor. Three floating batteries are recommended for the defense in addition to the land batteries.

Proposed Armament

Caliber	Kind	Number	Remarks
16-inch	110-ton guns	10	BLR
14-inch	80-ton guns	4	BLR
12-inch	50-ton guns	20	BLR
10-inch	27-ton guns	71	BLR
8-inch	13-ton guns	5	BLR
12-inch	Mortars	128	Rifled

b. Results of Endicott Board

The Endicott Board's recommendations fell on deaf ears. Congress continued to drag its feet on the matter of coastal defenses. In 1888, however, it did appropriate sufficient funds for the establishment of a Board of Ordnance and Fortifications, headed by none other than the commander in chief of the U.S. Army, Maj. Gen. John M. Schofield. The function of the board would be to review plans worked out by the board of engineers.[14]

The professor Russel F. Weigley writes that the mere act of working on the Endicott program "offered the feeling that the country now possessed a kind of military policy looking toward foreign war, and this feeling was so reassuring that in the War Department reports and military publications of the 1890s interest in the coastal defenses became almost obsessive." One of the best of these publications was Col. Henry L. Abbot's Course of Lectures upon the Defence of the Sea-Coast of the United States, published in 1888. Colonel Abbot had presented these lectures the year before at the U.S. Naval War College.

He reviewed the history of coastal defenses in the United States, giving great credit to Totten and other

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14. NA, RG 77, OCE, Board on Fortifications, Miscellaneous Papers 1885-1887 (Endicott Board); Walter Millis, American Military Thought (Indianapolis: Bobbs-Merrill Company, 1966), pp. 196-207; Millis, Arms and Men, p. 151; Weigley, p. 284; Edward Ranson, "The Endicott Board of 1885-86 and the Coast Defenses," Military Affairs, 31 (Summer 1967), 74-84; Emanuel Lewis, Harbor Defense Installations, pp. 128-29. Ranson writes that General Schofield, who was commander in chief of the army from 1888 to 1895, suggested that Congressional delay was due to a lack of confidence in Gen. Stephen Benet, chief of ordnance. Dr. Lewis states that the Endicott Board recommended 1,050 submarine mines and seven control positions on shore for San Francisco Harbor and that the estimate for San Francisco came to $27,868,150.

engineers for their pre-Civil War work. He discussed the post-Civil War works wherein masonry was abandoned and earth was substituted. The question now was, said Abbot, how to proceed when the work was resumed. He discussed materials one by one. Concerning armor he noted it would be unwise to spend defense funds on it; facilities for its production in the United States were still developing, and the argument about which kind of armor was best was still not over. He then considered masonry, saying that experiments to date showed that not less than 30 feet of good granite or 40 feet of good concrete were necessary where a seacoast fort would exposed to direct fire, "and that even these thicknesses are not sufficiently great to resist a prolonged bombardment." Lastly, Abbot discussed the use of earth. He said that a projectile traveling through earth or sand tended to change direction and to pass out at the top of the parapet. Of the two sand possessed the better resistance properties. The board of engineers, he said, had adopted 70 feet between crests as the proper thickness for sand parapets. In his conclusion, Abbot foresaw the futures as the following:

> Evidently in the future we must sacrifice neat crests and beautiful slopes, so far as the service of the guns and protection against washing by storms will permit; trees and bushes must be planted on the parapets and behind the batteries to prevent a clear definition of the guns; the latter themselves must be colored to harmonize with their surroundings in summer and winter; in a word, dispersion and concealment, as contrasted with concentration and armor, is the latest [word]. . . .[15]

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15. Weigley, p. 284; Henry L. Abbot, Course of Lectures upon the Defence of the Sea-Coast of the United States (New York: D. Van Nostrand, 1888), pp. 141-58, particularly. Abbot also gave the reasons why mortar batteries were important and, of course, much practical advice on submarine mines.

5. The 1890 Defense Project for San Francisco

In 1890 the New York board of engineers prepared a massive project for the defense of San Francisco Bay. This project consisted of at least 16 sheets of plans of which 11 were located for this study. Undoubtedly, the board also prepared a memoir and a cost estimate to accompany the plans but neither of these documents has yet been located. The board itself consisted of a most distinquished group of colonels in the Corps of Engineers. The senior member of the board was none other than George Mendell from San Francisco. The other members were Col. Henry Abbot, Col. C. B. Comstock, Col. D. C. Houston, and Lt. Col. G. L. Gillespie.

Until 1890, Fort Point and Lime Point had been considered the outer line of defense, and Angel and Alcatraz islands and Point San José were the inner line. In the new project, however, the outer line moved considerably to the west, with batteries being proposed for Point Bonita to the north of the Golden Gate and at Point Lobos and Laguna de la Merced to the south. The plans called for a total of 88 guns and 144 mortars.

Location	No.	Caliber of Guns	Manner of Mounting	Mortars
Point Bonita	3	12"	On lifts	
	4	10"	On disappearing carriages	
	--	--	---	16 (12")
Point Diablo	2	16"	In turret	
Gravelly Beach	4	12"	On lifts	
Lime Point Ridge	5	12"	On barbette carriages	
Lime Point	2	16"	In turret	
Point Cavallo	5	10"	On disappearing carriages	
Yellow Bluff	2	8"	On disappearing carriages	
	3	8"	On barbette carriages	
Angel Island	4	10"	On disappearing carriages	
	1	8"	On disappearing carriage	
	3	8"	On barbette carriages	
Alcatraz Island	5	12"	On lifts	
Point San Jose	2	8"	On disappearing carriages	
Presidio	8	8"	On disappearing carriages	

Fort Point	4	16"	In two turrets	
Fort Point Bluff	10	12"	On barbette carriages	
	5	10"	On barbette carriages	
	5	10"	On barbette carriages	
	10	10"	On disappearing carriages	
	--	--	---	64 (12")
Point Lobos	6	12"	On lifts	
	--	--	---	32(12")
Near Laguna de la Merced	--	--	---	32(12")
Total	88 guns			144 mortars

The four circular turrets at Fort Point, Lime Point, and Point Diablo did not appear on the plans themselves; but their locations and their powder rooms and shellrooms were detailed. The plan for Fort Point called for the removal of the old masonry fort and the construction of an immense (concrete) platform; the magazines would be located under the platform and the two turrets on top, both looking toward the sea. At Lime Point the turret would also stand on a huge platform at water level at the tip of the point. The powder rooms and shellrooms here would be casemated to the rear of the turret. As the plans of the 1860s had, this project called for the removal of a great amount of Lime Point itself. The fourth turret at Point Diablo called for the reduction of the point by about 100 feet in order to make a large enough platform for the turret. The turret would still be at an elevation of about 100 feet, thus making it the highest of the four. The magazines and the approaches to the works would be tunneled out of living rock.

Although the engineers had surveyed Point Lobos in the 1860s, it was not now considered to be a military reservation but private property. Also at Laguna de la Merced the site of the proposed mortar batteries was owned by the Spring Valley Water Company--a site that the army had long proposed to occupy in the event of a land attack from the south. Even before the planning of the 1890 defense project was completed, Mendell had proposed to the chief of engineers that 80 acres of city property at Point Lobos

and 50 acres at Lake Merced be acquired. However, the acquisition of these properties would take time.[16]

6. Mendell's Operations Report, 1891

Colonel Mendell must have noticed the contrast between this grand project and his annual report for fiscal year 1891. At Line Point the most significant accomplishment was rebuilding the barbed wire boundary fence. The one 15-inch gun at Gravelly Beach was now unserviceable because of its deteriorated platform. At Alcatraz the casemate magazine was converted into a torpedo operating room. The tunnel had already been built to the bay; its dimensions were 4 by 5 feet. Mendell thought it would be advisable to line the tunnel with a brick arch. In September 1890 he had mounted an 8-inch rifled gun (a converted 10-inch Rodman smoothbore) on the southeast end of the island. Although the gun had been mounted so that the troops could practice fire, it had not yet been used. Four 15-inch Rodmans still stood guard on the island. Battery West at Fort Mason had six new wooden platforms for its 10-inch Rodmans, and a wooden platform for an 8-inch converted rifle had been built in Battery East. The new torpedo station at Yerba Buena was completed, and the torpedoes were moved there from Alcatraz. A large number of torpedo anchors and junction boxes had been received from the East. Work was still underway on the mining casemate at Mortar Hill on Angel Island.

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16. NA, Cartographic Archives Div., RG 77, OCE, Fortifications File, Board of Engrs., New York, Nov. 21, 1890, Sheet B, San Francisco Harbor, General Project for Defense, Sheet C, Point Bonita, Sheet D, Point Diablo, Sheet E, Gravelly Beach, Sheet F, Lime Point Ridge, Sheet G, Lime Point, Sheet H, Point Cavallo, Sheet I, Yellow Bluff, Sheet K, Point Knox, Sheet L, Mortar Hill, Sheet M, Alcatraz, Sheet N, Point San José, and Sheet P, Fort Point; NA, RG 77, OCE, Land Papers, Mendell, Sept. 10, 1890, to Chief of Engrs.; Emanuel Lewis, Harbor Defense Installations, pp. 131-32. Neither the turrets nor the gun lifts were installed at San Francisco.

At the request of the department commander, Mendell had constructed four wooden platforms for 8-inch Rodman converted rifles at the Presidio. This gave the Presidio a total of eight 8-inch rifles that were used only for target practice. At Battery East (Fort Winfield Scott) workmen constructed a stone platform for a 15-inch Rodman. The armament at this area now consisted of twenty-eight 10-inch Rodmans in the first tier of the old masonry fort, sixteen 8-inch converted rifles and four 10-inch Rodmans in the second tier (the third tier of the casemated fort was now used by laundresses for drying clothes), and ten 15-inch Rodmans in Battery West.[17]

7. Land Acquisition at Point Lobos

Back in 1854 the president of the United States had set aside about 3 acres on the highest elevation at Point Lobos as a lighthouse reservation. But no lighthouse was ever built there. In 1887 the federal government sold the plot of ground at public auction, despite warnings that Point Lobos would one day be needed for fortifications. Two years later a bill was introduced in Congress for the purchase of a site for fortifications near Point Lobos. But not until 1890 did the army become serious about acquiring property at the point.

In September 1890 Mendell chose a 73-acre tract of land that belonged to the city of San Francisco. The city had acquired a 200-acre tract there in 1868 and had set it aside as the Golden Gate Cemetery. Mendell said that no interments had yet

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17. NA, RG 77, OCE, General Correspondence 1890-1892, Mendell, Apr. 25 and July 9, 1891, to Chief of Engrs., and Newcomer, Jan. 8, 1892, to Mendell. Mendell mistakenly stated that 8-inch converted rifles had been mounted on the new platforms of West Battery, Fort Mason. NA, Cartographic Archives Div., RG 77, Armament Reports, Ft. Mason.

been made. He held a conference with the mayor and the city attorney concerning the area, only to learn that the city did not have the power to convey any of its land. The mayor suggested that the federal government commence a suit for condemnation. When asked by Mendell how much the land was worth, the city attorney casually responded that the city should receive $25,000 for 80 acres. Although this was far below the estimated value of the land, it was too much for the War Department's budget. Mendell suggested to Washington that the land to be condemned be reduced to approximately 60 acres. The secretary of war approved of this idea.

In February 1891 Colonel Mendell was invited to lunch at the home of Adolph Sutro on Sutro Heights not far from the tract that Mendell had recommended for acquisition. Also present at Sutro's house that day were all of San Francisco's political figures from Mayor George Sanderson on down, and representatives from the press. Sutro had arranged for the party to ride around that part of Golden Gate Cemetery that was in use and not needed by the military. The Examiner described the outing: "An hour later the party rode around to the cemetery proper, where the victims of smallpox, the paupers and the Chinese are buried, and to say that all present were thoroughly disgusted with the scenes and smells of that delectable locality is to state the case very mildly. It so happened that decayed and stinking Chinese clothes were scattered about that portion of the cemetery, and a Chinese funeral, with the usual heathen rites was in progress." After lunch in his "cottage," Sutro spoke to his guests, saying that the cemetery "has become an eye-sore and a constant menace to the health of citizens. . . . The most attractive portions of the cemetery have been given over to the Chinese, who defile it by their rites and burial customs." He hoped that the federal government would purchase the entire parcel of land.

Park Commissioner W. W. Stow then addressed the group, turning the subject away from Chinese burial customs: "Away to the north lies Alaska. It belongs to our Government. . . . Between it and the United States are wedged British Possessions that don't belong to any other flag than ours. The time is not far removed when that assertion will be proved. We of California have no resources, no navy for protection." Continuing, he said: "I don't know of a better point to locate a fort than the bluff on which the City Cemetery is situated."

If Mendell felt pressured by these speeches, he did not show it. A newspaper reporter described him as one who "displayed local as well as professional pride." He stood up and informed all present that the federal government needed only the 55-acre tract at Point Lobos. Sutro did not give up the fight. He promptly wrote both the secretary of war and U.S. Senator Leland Stanford urging the entire 200 acres upon the federal government.

A few weeks later Secretary of War Redfield Proctor visited San Francisco in the company of President Benjamin Harrison. Mendell escorted the secretary over the land in question. At the conclusion of Proctor's visit, Mendell had to write to the chief of engineers: "In regard to Point Lobos, after walking over the ground, he directed me to negotiate for the whole 200 acres of the City Cemetery . . . on the basis of [its] cost to the City--about $137,000 [actually, $127,465]."

Mendell visited with the mayor only to learn that there was a great deal of local opposition to giving up the cemetery. More than Chinese had an interest in it: "The City has given permission for burial to certain Societies, who have established cemeteries on the Eastern end and have made some adornments in particular cases. These associations have political power in proportion to their numbers. . . ." Later, the U.S.

attorney in San Francisco presented Mendell with a list of associations holding interment permits. Had Sutro known, he must have blushed.

Grand Army of the Republic	German Mutual Benevolent Society
Knights of Pythias	Slavonic Illiric Benevolent Society
Congregation Beth Israel	Scandinavian Benevolent Society
Congregation Shari Zedic	Independent Order Red Men
Russian Greek Benevolent Society	Caledonic Society
St. Andrew's Society	Order Old Friends
Italian Mutual Benevolent Society	Master Mariners' Benevolent Association
French Mutual Benevolent Society	Ladies Seamen's Society

Mendell was also suspicious that the city of San Francisco was going to put a high value on even the smaller tract of 54 acres. Since the city would not be able to dispose of the balance of the property anyway, he recommended to the chief of engineers that only the smaller tract be sought at this time. He must have been startled when the secretary of war's office informed the U.S. attorney general that all 200 acres were desirable for the purposes of the government.

Mendell was right. On July 30, 1891, he notified the chief of engineers that the city supervisors had decided to ask $750,000 for the whole property, now determined to consist of 188 acres. The chief of engineers in turn recommended to Secretary of War Proctor that the proceedings of condemnation be limited to 54.05 acres. When Sutro learned of this, he tried one last time, to no avail, to have the army take over the whole cemetery. The proceedings got under way in the U.S. Circuit Court in June 1891. The verdict was announced on July 9, and Mendell wired Washington: "Verdict rendered on ninth in condemnation of fifty four acres city cemetery tract point Lobos for seventy five thousand dollars. Result favorable in a well contested case." The sum was paid to the city and county of San Francisco on December 29, 1892. In 1900 the reservation was named Fort Miley in honor of

an artillery officer, Lt. Col. John D. Miley, U.S. Volunteers, who had died in Manila, Philippine Islands, in 1899.[18]

8. The Endicott Emplacements

a. The First at Fort Winfield Scott

When Secretary of War Proctor visited San Francisco in April 1891, Colonel Mendell took him on a tour of the sites proposed for the new batteries. Proctor asked Mendell why the emplacements for disappearing carriages were being planned before those whose guns would be in ordinary barbette. The secretary said it might be a long time before a suitable disappearing carriage was finally adopted. Mendel reported this conversation to the chief of engineers, pointing out that the project called for five 10-inch guns on nondisappearing carriages on the Fort Point bluff and that he could start on them.

Probably because these five guns were eliminated from the project, Mendell began the first construction for the modern batteries at emplacements 11, 12, and 13, which were for guns mounted on disappearing carriages and which eventually were named Battery Marcus Miller.[19]

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18. NA, RG 77, OCE, Land Papers, Maj. R. S. Williamson, Mar. 28, 1868, to Gen. A. A. Humphreys, and J. E. Miles, Mar. 16, 1887, to Sec. of War, and Aug. 19 and Dec. 4, 1890, to Mendell, and Mendell, Sept. 12 and 23, 1890, Apr. 10, June 5, and July 30, 1891, and July 11, 1892, to Chief of Engrs., and Chief of Engrs., Nov. 21, 1890, and Sept. 2, 1891, to Sec. of War; newspaper clippings: Daily Evening Bulletin, Feb. 2, 1891; San Francisco Daily Report, Feb. 2, 1891; and The Examiner, Feb. 3, 1891; Adolph Sutro, Feb. 5 and Sept. 24, 1891, to Sec. of War Proctor; NA, RG 77, OCE, General Correspondence 1890-1892, Sutro, Feb. 5, 1891, to Senator L. Stanford; Mendell, Annual Reports on Acquisition of Sites for Fortifications, Sept. 29, 1892, and for FY 1893; San Francisco, Presidio of San Francisco, Presidio Army Museum, (hereinafter cited as SF, PAM), Fort Record Books Fort Miley.

19. NA, RG 77, OCE, Land Papers, Mendell, Apr. 6, 1891, to Chief of Engineers Thomas L. Casey. Mendell, by now one of the

(1) Battery Marcus Miller

On March 10, 1891, the chief of engineers allotted $201,000 for emplacements 12 and 13 of Battery Marcus Miller. Mendell officially began the new project early in June. He had new roofs put on the old engineer buildings at Fort Point and erected 12 temporary sheds and a new wharf for the unloading of materials. A steam hoisting engine and a portable steam engine were already on hand; Mendell supplemented this machinery with the purchase of a rock crusher, an engine and boiler with belting and countershafts, a steam pump with boiler, and a concrete mixer with automatic proportioner.

Mendell continued to operate out of the downtown office, visiting Fort Point as often as he thought necessary. Lt. Henry Newcomer was in direct charge of the Fort Point work under Mendell's supervision. Lt. Col. W. H. H. Benyaurd took charge of all construction north of the Golden Gate, and from time to time Mendell would inspect that work in his role as senior engineer. An inspector general, examining the work at Fort Point, wrote: "Nothing but the best material is being used, and

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most senior colonels in the Corps of Engineers, no longer addressed his letters to "The Chief of Engineers." Now he began his reports "My dear Casey." As he had for old Batteries East and West at Fort Point, Mendell numbered the earliest of the proposed gun emplacements from east to west. During their construction he referred to them by these numbers. However, it is difficult for a reader today to identify which battery Mendell was referring to by his use of numbers only. Whenever possible this report will refer to the batteries by their later names. For the record

Gun emplacements 6, 7, and 8 were Battery Lancaster
Gun emplacements 9 and 10 were Battery Cranston
Gun emplacements 11, 12, and 13, were Battery Marcus Miller, eventually
Gun emplacements 14, 15, and 16 were Battery Godfrey
Gun emplacements 18 and 19 were Battery Saffold
Gun emplacements B, C, and D were Battery Boutelle

great care is exercised in the preparation of the concrete, and the work so far done is wrought in good form and is substantial in character."

Employing the "best material" caused a momentary problem for Mendell. He wished to use only portland cement, which at that time had to be imported from England. In order to have the duty lifted on the cement's arrival in San Francisco, Mendell had to write the chief of engineers naming the ship and the amount expected. The chief of engineers in turn wrote the collector of customs requesting the lifting of the duty, who notified his personnel in San Francisco to do so. This awkward procedure was compounded by an Act of July 23, 1892, that required all material purchased for fortifications be of American manufacture, "except in cases when in the judgment of the Secreatary of War, it is of manifest interest of the United States to make purchases in limited quantities abroad." The secretary of war had difficulty in deciding what Congress had meant by "limited quantities," but he finally decided he had the authority to acquire foreign cement.[20]

Excavation of emplacement 13 began June 2, 1891, and by the end of the year ten of the old 15-inch gun platforms of Battery West had been removed. (However, a new 15-platform was built in old emplacement 16 in Battery East for target practice.) Also, the concrete plant and the cement shed now occupied the site of Battery West's mortar positions. In his year-end report, Newcomer stated the progress he had made on the

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20. NA, RG 77, OCE, General Correspondence 1890-1892, Mendell, Dec. 29, 1891, to Casey, and Lt. Col. G. H. Burton, IG, Feb. 5, 1892, to IG, War Department, and Casey, Feb. 23, 1893, to Sec. of War.

three 10-inch disappearing emplacements that would comprise Battery Marcus Miller: "At No. 11 the excavation for new parapet is about completed, and excavation about 1/3 done for the magazine rooms and the masonry around them. At Emp. 12 the excavation for masonry foundations has been completed, and the concrete built up to various levels, the thickness or depth of masonry ranging from about 10 feet in different parts of the emplacement. At Emp. 13 all the masonry of the parapet and about the magazines has been practically completed excepting a large space left void in the parapet in front of the gun position to accomodate [sic] whatever carriage may be adopted."[21]

(2) Battery Godfrey

In early 1892 excavation began on the three emplacements 14, 15, and 16 for 12-inch barbette guns, later named Battery Godfrey. Mendell reported that three of the old magazines of Battery West had been broken up to be embedded in the new concrete but that four of the old magazines were left in place to be "buried" in the new work. These last four are still to be found today: one on either flank of Battery Godfrey and two on the left flank of Battery Marcus Miller.

By June 1892, all the concrete had been laid at Marcus Miller that could be until a disappearing carriage was adopted. Newcomer then moved the machinery to Godfrey to begin the concrete work there. Rock for the concrete first came from

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21. NA, RG 77, OCE, General Correspondence 1890-1892, Newcomer, Jan. 8, 1892, to Mendell. When first named, these three emplacements along with nos. 9 and 10 were all considered to be Battery Cranston. Later, these three were declared to be a separate battery and were then named Marcus Miller. Newcomer also mentioned that while the fences around Batteries East and West were sound cattle had got in through the gates left open by teamsters hauling supplies and had wreaked havoc with the old earthen parapets.

Rob Hill (old Telegraph Hill) on the Presidio; later, it came from the army quarry on Angel Island. Gravel was taken from the beaches at the Lime Point Military Reservation (including, no doubt, Gravelly Beach). Sand came from Bakers Beach at Fort Winfield Scott. Mendell recorded his recipe for his concrete.

Average Composition of the Concrete per Cubic Yard

	lbs.	Cu. Ft.	Bbls.
Rock	2017.8	20.2	--
Gravel	734.0	7.3	--
Sand	164.3	9.6	--
Portland cement	263.2	3.2	0.7

In October 1892, the colonel brought his bookkeeping up to date and discovered that the two batteries were costing less than had been allotted.

Cost to date	$204,361.75
Yet to be spent	50,000.00
Total probable cost	254,361.75
Amount allotted	397,332.00
Surplus	142,970.25

He asked the chief engineer if this money could be used to construct one of the 16-mortar batteries projected for Fort Point. General Casey disapproved of this idea saying there was a good chance that the mortar battery would get its own appropriation.[22]

By the end of 1892 several changes had occurred in old Battery West. The eight 15-inch Rodmans still mounted received new model, strengthened, and front-pintle carriages--the work being done by artillery troops from the

22. NA, RG 77, OCE, General Correspondence 1890-1892, Mendell, Sept. 29 and Oct. 8, 1892, to Casey, and Casey, Oct. 15, 1892, to Mendell. Casey was right, funds were appropriated in 1893.

Presidio. Four of the dismounted 15-inch Rodmans were shipped acrossed the Golden Gate to be placed in Battery Ridge on Lime Point, it never having been armed since it was built in the 1870s. A complete set of platform stones, rails, bolts, and pintles were sent to Fort Canby, Washington. As for the new gun emplacements, the engineers were laying the front and rear slopes of Battery Marcus Miller. Also, 500 feet of the sunken road (covered way) at the rear of the batteries had been excavated, and the road covering and gutters had been laid on 320 feet of it.[23]

(3) Mortar Battery 1 (Howe and Arthur Wagner)

Ground was broken for San Francisco's first modern 12-inch mortar battery on April 5, 1893. It was located about 300 yards to the southeast of the new batteries, and it would be the only mortar battery in the San Francisco defenses to be shaped in a cross (+) with four mortars in each quarter. All the other mortar batteries would be linear in design. At first known as Mortar Battery 1, it was then named Battery Howe. Later, it was divided into two batteries--the two eastern pits retaining the name Howe and the two western pits renamed Arthur Wagner.

At the completion of construction in June 1895, the young engineer then in charge, Lt. Joseph E. Kuhn, prepared a lengthy memoir of the work. This is the earliest detailed description of a modern battery in San Francisco Bay defenses. Rock for the concrete came from a quarry on Fort Point Beach (Bakers Beach?) and from Presidio Hill; sand came from Fort Point Beach and the gravel from Gravelly Beach. A total of 7,339 cubic yards of concrete was used in the battery and an additional

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23. NA, RG 77, OCE, General Correspondence, 1890-1892, General Correspondence 1893-1894, Lt. C.A.F. Flagler, Jan. 19, 1893, to Mendell.

134 cubic yards in the platforms. All concrete surfaces, inside and outside, were plastered with mortar made of 1 part cement and 1½ parts sand. All exterior surfaces of masonry in contact with earth filling were coated with paraffin paint(?) except a small portion that was coated with "Maltha," a bituminous preparation, which was applied hot. (The paraffin paint was considered the better of the two.) The floors of the rooms, passageways, and pits "were finished after the manner of city side-walks. This consists in laying a 1" coating or mortar of 1 part cement and 1 part fine screened gravel upon the concrete foundation. This coating is colored with lamp-black to diminish the glare. The surface is floated smooth and divided into squares of 30" on a side, one set of joints being made by the insertion of tar-paper, and the other with a jointing tool."

A road was built from McDowell Avenue behind Battery Marcus Miller passing the battery by the north, around the eastern side, and terminating at the southeastern pit at an open space or parade. The battery was provided with a water system that included a pipe on top of the battery for irrigating the slopes. It was lighted by electricity, having an engine, boiler, and dynamo. The firing cable was carried in a 4-inch cast iron pipe laid under the floor from the center of each group of mortars to the nearest firing room and connecting the two firing rooms. The firing cable was a single conductor torpedo cable from Willets Point, New York. Each firing room was equipped with two Laflin and Rand 4 exploders, one detecting galvanometer, and a switchboard with four keys, each controlling a group of mortars. The connections were arranged so that either or both rooms could be occupied for firing all the mortars. The battery was surrounded by a 7-foot-high picket fence, having one wagon and three foot gates. A small latrine was located outside the fence on the southern side. Colonel Mendell hoped to replace this fence with a cypress hedge eventually.

The battery had been practically completed and the first four mortars mounted (September 24, 1894) when disaster struck in December 1894. Unusually heavy rains fell and saturated the 20 inches of loam that covered the clay filling of the slopes. This loam suddenly slid off the clay and "flowed" into the pits and the roadway. Most of the drains were clogged, and the removal of the muck by horse and cart proved a difficult and tedious task. In the spring of 1895, the slopes were rebuilt, with drains in them, and sodded.

Kuhn gave a long, detailed, and technical explanation as to how the platform stones, the base rings, and the index rings were set. He said that the "hold down bolts" were manufactured in San Francisco by W. T. Garratt and Company and V. Kingwell and Company. They were made of aluminum bronze with gunmetal washers. The lieutenant concluded his report with a breakdown of costs.

Concrete, 7,359 cubic yards	$ 40,711.12
Excavation, 45,173 cubic yards	18,217.62
Fill, 53,447 cubic yards	13,445.08
Drainage and water supply	5,013.67
Plastering and flooring	3,373.88
Doors, gates, windows, ventilators, and well	1,494.06
Roads and parade	2,226.26
Electric light and firing plants	2,954.85
Mounting mortars	4,007.13
Fence	1,005.89
Incidentals and office expenses, pay of time-keepers, watchmen, holidays, jobbing, etc.	19,020.17
Total	$111,519.73

Although 4 mortars had been mounted in September 1894, not until June 1895 were all 16 reported as being mounted in the battery. On February 7, 1895, the first shells were fired from Mortar Battery 1 when five shots were fired from two of the mortars.

The charges varied from 70 to 75 pounds of powder, and the shells weighed 800 pounds.[24]

b. First Endicott Emplacements, Lime Point

An allotment for modern gun emplacements at Lime Point did not become available until almost two years after construction began at Fort Point. One reason for the delay was that Colonel Benyaurd had had scarlet fever with subsequent complications and had been delayed in completing the estimates. His first major expenditure occurred about January 1893 when he purchased a steam launch, Yosemite. The old engineer buildings and wharf that Mendell had built around 1870 needed repairs. The old employee dormitory was fixed up, and a private party was allowed to board the men at a cost of $.60 a day each. As at Fort Point, Benyaurd required the lieutenants directly in charge of the work to live at Lime Point.

(1) Battery Spencer

The project called for the construction of five emplacements for 12-inch guns on nondisappearing carriages on top of Lime Point. Three emplacements, 3, 4, and 5, were to be located directly on the site of Mendell's old Cliff Battery. Emplacements 1 and 2 were to be constructed on the site of Ridge Battery to the rear. Benyaurd began excavating emplacements 3 and 4 in April 1893. Emplacement 5 was eventually built at this battery, but the remaining two were dropped from the project.

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24. NA, RG 77, OCE, General Correspondence 1894-1923, Lt. J. E. Kuhn, "Description of Mortar-Battery No. 1 . . . , " Mendell, Annual Report of Operations, FY 1895, and Mendell, Feb. 9, 1895, to Casey. The original estimate had been $115,118.50. The "well" above was probably the spring discovered when excavating the site. Three of the four pits are today covered by an artificial hill. Access to the service rooms and magazines may still be had through the fourth (northeast) pit. This battery is still under the jurisdiction of the U.S. Army.

When named, these three 12-inch guns were known as Battery Spencer.

In his first annual report, Benyaurd said that a portion of the old battery, including a concrete magazine, had been demolished. The rock had been excavated for magazines and wing walls but not yet for the parapet. Concrete work was commenced in June 1893. At first he had planned to mix the concrete at the wharf, then to haul it to the site on an inclined railway. This proved to be too expensive. The concrete plant was erected on the ridge and a pump at the wharf supplied the necessary seawater. Benyaurd noted that the four 15-inch Rodmans from Fort Point had arrived.

In March 1895 the engineer was authorized to construct emplacement 5. He began the excavations immediately and by June had commenced the concrete work. About this time he proposed using steel I-beams in the roofs of the magazines and passageways in place of the arches that were scheduled. However, he wanted to retain arches for the roof of the hoisting room and elevator shaft, their being less expensive than I-beams. By June 30, 1895, the magazine doors were hung and the floors were laid. "The outside work was plastered," he reported, "and a coat of hard finish placed upon the walls of the interior compartment and passageways." Also, 4 inches of asphaltum covered the top of the emplacements. Benyaurd considered everything "finished" except placing the machinery in the hoisting room and in the elevator shaft. Of course, as on the south side of the gate, the platforms had not yet been built. By then, too, the four 15-inch Rodmans had been mounted at old Ridge Battery.

(2) Mining Casemate, Point Cavallo

Another project at Lime Point undertaken in 1893 was the construction of the harbor's fourth mining casemate.

This was in a cove north of Point Cavallo. The bank at that point was a steep and rock bluff, and a beach was almost nonexistent. A bulkhead had to be built as a working platform. A concrete wall was built outside it, and the bluff was excavated to make room for the casemate. Concreting began in March and was completed in May. The outside walls of the casemate were covered with a coating of asphalt and coal tar; the inside was plastered and painted. The casemate was made bombproof by an earthen cover on which grass was planted.[25]

Benyaurd reported in June 1895 that the mining casemate was almost complete. An iron-folding door had been placed in the passageway inside the outer door. The gate could be locked and the wooden door left open for the circulation of air. Still to be done were the inside woodwork and the concrete channel for the cables. Although no Endicott batteries had yet been undertaken on Alcatraz Island (two were planned), Benyaurd was responsible for its armament, and he reported at this time that the Rock was armed with seven 15-inch Rodmans and two 8-inch converted rifles.

Benyaurd went on leave in August 1895, and Mendell inspected Battery Spencer to see how the work was progressing. He was struck by the fact that the wharf he had built many years ago was not the oldest wooden construction standing in seawater on the Pacific Coast. He attributed this long resistance to the teredo due to the fact that the timbers making up the cribs had been encased in "ships felt" and covered with battens. He approved of the work done at Battery Spencer. The only

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25. NA, RG 77, OCE, General Correspondence 1890-1892, Benyaurd, Oct. 13, 1892, to Chief of Engrs., and General Correspondence 1893-1894, Benyaurd, Dec. 27, 1892, to Chief of Engrs., and Mendell, Apr. 13, 1893, to Casey, and Benyaurd, Annual Reports for Lime Point and for mining casemate, FY 1893.

departure from usual practice that he noticed was "finishing the interior of the magazine in plaster of Paris, whereas it is usual to lime-wash the walls. The appearance is handsome, but it is probably secured at increased cost. Time will show whether in this damp atmosphere it proves to be equally lasting, compared with the usual white wash."

The first 12-inch gun at Battery Spencer was mounted before the end of 1896. By December of that year the second gun and its carriage were being hauled up the hill by a contractor. The third gun was mounted in July 1897. All three of these rifles were model 1888.

(3) Fort Baker Named

When the first of these guns was mounted, the War Department took note of it and the fact that additional batteries of modern guns and mortars would be erected on the Lime Point Military Reservation. It concluded "that there should be a strong garrison on that side of the harbor, as that is really the Gibralter of the Pacific Ocean." In April 1897 the War Department announced that President William McKinley had directed that "the fortification at Lime Point" be designated Fort Baker--in honor of the late Col. Edward Dickinson Baker, U.S. Volunteers, a distinguished resident of Oregon and a close friend of President Lincoln. He was killed early in the Civil War at Ball's Bluff, Virginia, while in command of California Volunteers. In July 1897 Company I, Third Artillery, arrived at Fort Baker from Angel Island and established a camp that eventually grew into the handsome post of modern times.[26]

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26. NA, RG 77, OCE, General Correspondence 1894-1923, Benyaurd, Mar. 20, Apr. 25, and July 10, 1895, to Chief of Engrs., and Mendell, Aug. 6, 1895, to Chief of Engrs., and Maj. C. Davis, CE, San Francisco, Dec. 8, 1896, to Chief of Engrs.,

c. More Batteries, Fort Winfield Scott

The semiannual inspection at Fort Point on January 9, 1894, showed that eleven 15-inch Rodmans were still mounted in Batteries West (ten) and East (one). The tops of the magazines in Batteries Marcus Miller and Godfrey had recently been plastered and coated with paraffin paint to render them waterproof. The engineers spent most of their energies this year in the construction of the mortar battery, inasmuch as nothing more could be done on the gun batteries until the matter of carriages and platforms was resolved.

(1) First 12-inch Gun Platform

In October 1893, the chief of engineers notified the chief of ordnance that the Engineer Department had prepared designs for platforms for 10- and 12-inch nondisappearing barbette carriages. It was his desire that before finally adopting these designs one platform of each caliber be built and tested. He said that emplacements were ready at San Francisco where a 10-inch platform could be built at the Fort Point bluffs and a 12-inch platform at Line Point ridge. (Apparently he had forgotten that the 10-inch nondisappearing battery at Fort Point had been changed to a 12-inch one, that is, Battery Godfrey.) The chief of ordnance replied that both types of carriages were under manufacture and that he expected to have a carriage of each caliber completed by the spring of 1894. He warned, however, that "great difficulties have been encountered by the steel makers in producing sound castings."

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and AAG S. Breck, Hdqrs. of the Army, Dec. 30, 1896, to CG, Dept. of Pac., and Brig. Gen. W. Shafter, CG, Dept. of Pac. Sept. 15, 1897, to AG, U.S. Army; NA, RG 92, OQMG, General Correspondence 1890-1914, General Orders 25, Hdqrs. of the Army, May 4, 1897, announcing an order from the War Department dated April 29, 1897, naming Fort Baker; Washington, D.C., NA, M 617, Roll 65, Post Return, Fort Baker, for July 1897.

It is not known where the experiment was made for the 10-inch barbette (nondisappearing) platform, but the first 12-inch platform in the nation was constructed at Battery Godfrey, Fort Point. In his annual report for fiscal year 1895, Mendell described the construction of a platform in emplacement 16, that is, the left flank gun in Godfrey. He noted that the platform was made of the best portland cement and had a depth of 13 feet. To reinforce it he had added several tons of streetcar (cable car?) cable arranged in coils and old streetcar rails laid in horizontal and vertical lines. By June 1895 the West Coast's first 12-inch rifle was mounted on this platform.[27]

(2) Mendell Retires

Colonel George Henry Mendell completed his last annual report as an army engineer in July 1895. After 47 years of active duty, 32 of which were on the Pacific Coast, he was preparing to retire at the age of 64. His last months of service were not without a slight taste of bitterness. His old friend Chief Engineer Thomas Casey had to retire five months earlier than Mendell on account of age. As senior colonel in the corps, Mendell thought that he should be promoted to brigadier general and be made the chief for those five months. At Mendell's request, dozens

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27. NA, RG 77, OCE, General Correspondence 1893-1894, Chief of Engrs., Oct. 25, 1893, to Chief of Ord., and Chief of Ord., Oct. 28, 1893, to Chief of Engrs., and General Correspondence 1894-1923, Mendell, Annual Report of Operations, San Francisco, FY 1895, and Lt. J. E. Kuhn, July 1, 1895, to Chief of Engrs.; FARC, San Bruno, RG 77, OCE, San Francisco Dist., Letterbooks, Reports of Operations, Lt. C. Potter, Aug. 27, 1895. In this letter Potter said that in the spring of 1895, three 12-inch rifles were shipped to San Francisco, two for Fort Point and one for Lime Point. The first of these guns to arrive was addressed to Lime Point. But as emplacement 16 was ready to receive a gun and the one at Lime Point was not, the first gun was mounted in no. 16. The second gun to arrive was sent to Lime Point and mounted in emplacement 3 (Spencer's right flank).

of prominent citizens from all over the United States wrote or wired President Cleveland saying that the colonel should be the new chief, to no avail. Five months was too short a time. The new chief of engineers was the next senior colonel and a friend, William P. Craighill.[28]

In his last annual report, Mendell took a quick look at Fort Mason. The mining casemate was in good order. Battery West was still armed with 10-inch Rodmans. He wrote that these guns were for practice only and were fired but a few times each year. At Fort Point, work had begun on ten 10-inch disappearing gun platforms at Battery Marcus Miller, as well as the platform at Battery Godfrey. A third gun battery, emplacements 18 and 19, was begun this year. It would eventually be called Battery

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28. Mendell was born in 1831 in Youngstown, Ohio. He graduated third in his class from West Point in 1852. Before the Civil War he served in the Topographical Engineers, mostly in the Pacific Northwest. He taught at the Military Academy from 1859 to 1863. He was in the battles of the First Bull Run, Gettysburg, the Wilderness, and the Petersburg Campaigns. He was placed in charge of the fortifications on Alcatraz Island in 1867 where he supervised the post-war modernization of the works. In addition to his many military duties up and down the Pacific Coast, he served as engineer to the Water Commissioners of the city of San Francisco (with special permission from the army) from 1876 to 1878. Again, from 1892 to 1893, he was a member of the San Francisco Sewer Commission. After his retirement on October 12, 1895, he was appointed president of the Board of Public Works in San Francisco. Mendell died quite suddenly of heart failure on Oct. 19, 1902. He left his widow and two sons; George, Jr., was living in San Francisco and John was then traveling in the East. He was the division engineer who supervised the erection of the first modern batteries, both mortar and rifled guns, for San Francisco Harbor. Fittingly, a 12-inch gun battery was named in his honor at Fort Barry. NA, RG 94, Adjutant General's Office, ACP File, Col. George Mendell; George W. Cullum, Biographical Register of the Officers and Graduates of the U.S. Military Academy, from 1802 to 1867, Revised . . . 1879, 3 vols. (New York, 1879), 3:305; NA, RG 77, OCE, General Correspondence 1894-1923, Mendell, June 20, 1895, to Chief of Engrs.; The San Francisco Call, Oct. 20, 1902. (Before 1889, Mendell lived at 418 Fremont; after that date he lived at 2310 Clay.)

Saffold. Mendell reported that the platform for one of the two 12-inch guns had been completed in emplacement 18 and reinforced in a manner similar to that of Godfrey's. He mentioned that the lower portion of the new platform was polygonal, while the upper part above ground level was circular.

(3) Magazines Inadequate

Mendell's replacement, Col. Charles Russell Suter was highly critical of the magazines in the two-gun batteries, Marcus Miller and Godfrey. He pointed out that all magazines were alike regardless of how large the projectiles were that were to be stored in them, whether 8 inch, 10 inch, or 12 inch. Consequently, there was hardly enough room in Godfrey's magazines for an adequate supply of projectiles in the event of a lengthy engagement. Nor did he think much of the idea of a reserve magazine, especially for a place like Fort Winfield Scott where batteries would be scattered over a large area. He proposed remodeling the power and projectile rooms of both batteries with funds then on hand.

Chief of Engineers Craighill was most courteous in his response, saying that Suter's plans were ingenious and meritorious. However, reserve magazines were a necessary adjunct at a place as large as Fort Winfield Scott, and they should be connected to the batteries by a railway: "It is therefore deemed wiser at present to employ all available funds in mounting more guns rather than to remedy faults in the accessories for those already prepared."[29]

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29. NA, RG 77, OCE, General Correspondence 1894-1923, Mendell, Annual Report of Operations, San Francisco, FY 1895, and Suter, May 29, 1896, to Craighill.

(4) Operations at All Batteries, 1896

The reports of operations at Fort Winfield Scott for the last six months of 1896 showed a great deal of activity at all the batteries.

Mortar Battery 1 - Installation of an ammunition conveyor began. Inasmuch as the magazines were on the same level as the platforms, elevators or ammunition hoists were not needed at this battery.

Battery Marcus Miller - The engineering work here was completed except for supplying iron ladders, steps, cranes, and trolleys. The trolleys were required to move ammunition out of the magazines. The cranes were needed to lift the ammunition from ground level to the platform. Two of the 10-inch guns and all three disappearing carriages had arrived. Two of the carriages were already partly mounted by troops from the Presidio.

Battery Godfrey - Two of the 12-inch rifles had been mounted in emplacements 15 and 16. The base ring had yet to be set in emplacement 14.

Battery Saffold - An extensive ledge of talc rock had to be excavated. Work on framing began December 10.

New Battery - The engineers planned a battery of three 12-inch guns on disappearing carriages directly overlooking the old masonry fort. These emplacements were numbered 6, 7, and 8 and would later be called Battery Lancaster. In October work began on the most westerly (8) of the emplacements. Three 15-inch Rodmans had to be dismounted in this area in order for the new work to proceed. By the end of December, the gun platform had been completed.

An inspection of all the works, old and new, at Fort Winfield Scott on December 31, 1896, showed the following armament mounted:

Old

32 10-inch Rodmans and 13 8-inch converted rifles in lower two tiers of the old masonry fort

7 15-inch Rodmans in Batteries East and West

New

16 12-inch mortars in Mortar Battery 1
2 12-inch rifles in Battery Godfrey
2 10-inch rifles in Battery Marcus Miller
3 Dynamite guns in Dynamite Battery.[30]

(5) Dynamite Guns

The three dynamite guns listed in the 1896 inspection report comprised one of the more unusual seacoast batteries in San Francisco's defenses. In 1888 Congress, over the army's lack of enthusiasm if not objection, appropriated $400,000 for the purchase from private industry of "pneumatic dynamite guns," their carriages, ammunition, and machinery necessary to fire them with. In nontechnical words these were guns that fired charges of dynamite by means of compressed air. A few years later the chief of ordnance recalled the army's reluctance to employ this type of weapon: "This Department reported against the bill for this purpose, and, I believe, the Engineer Corps objected to the bill for

30. FARC, San Bruno, San Francisco Dist., Letterbooks, Reports from Subordinate Engineers 1896-1902, (Lt. C. L. Potter), Jan. 18, 1897, to Suter, and Potter, Monthly Reports of Operations, Sept-Dec., 1896; NA, RG 77, OCE, General Correspondence 1894-1923, Suter, Report of Inspection, Dec. 31, 1896.

several reasons. I think the important reason with the officers of the Engineer Corps was the danger or certainty that the projectiles from these guns would fire sub-marine mines and render them useless. Notwithstanding these objections, Congress enacted the law."

The army proceeded to have two experimental batteries set up, one at Sandy Hook, New Jersey, and the other at San Francisco. In the spring of 1889, the Ordnance Department issued an order for the purchase of three of these weapons (all 15-inch caliber) for the West Coast at a cost of $187,500. However, the company that manufactured the weapons was to mount them without cost to the government.[31]

In October 1894 the Engineer Department notified Colonel Mendell to select a site for the dynamite battery. The Engineer Department did not know much about the guns, but blueprints showed that one 15-inch gun needed an area, circular in shape with a radius of about 40 feet. Also, the contract specified that the gun was required to have a range of 2,000 yards with a shell containing 500 pounds of explosive, 3,500 yards with 200 pounds, and 5,000 yards with 50 pounds of dynamite. Mendell was not to supervise the construction work, which was strictly the responsibility of the company. Mendell picked a site to the southeast of Battery Godfrey at Fort Point.

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31. NA, RG 77, OCE, General Correspondence 1894-1923, Ordnance Office, War Dept., Ordnance Orders 26, Oct. 12, 1888, and 14, Mar. 29, 1889, and Gen. D. W. Flagler, Chief of Ord., Dec. 28, 1895, to Gen. W. P. Craighill, Chief of Engrs. For a different version of this period 1888-1889 see William Addleman Ganoe, The History of the United States Army, rev. ed. (New York: D. Appleton-Century Co., 1942), p. 364. The Pneumatic Dynamite Company got the original contract for the guns (March 6, 1889). When that company failed, the Pneumatic Torpedo and Construction Company, 41 Wall St., New York, took over the contract.

Later the manufacturer prepared a description of the 15-inch pneumatic gun. It weighed about 50 tons and had a 50-foot-long gun barrel. The space required for the foundation and loading track was 50 feet in diameter. The gun was trained by electricity, and the firing and manipulation of the weapon was under the control of one man, the gunner, The gun could be traversed through a circle in 41 seconds, elevated in 8 seconds, and depressed in 8 seconds. According to tests, said the company, the gun under working pressure of 1,000 pounds could fire a full-caliber 15-inch projectile carrying 500 pounds a distance of 2,500 yards; a 10-inch subcaliber projectile carrying 200 pounds, 4,000 yards; and 8-inch subcaliber projectile carrying 100 pounds, 5,200 yards; and a 6-inch subcaliber projectile carrying 50 pounds, 5,800 yards.

The compressor had to have the capability of compressing air to 2,500 pounds per square inch. The compressed air could be conveyed directly to the firing reservoir of the gun or to storage reservoirs. It was practicable to store compressed air for any length of time sufficient for any number of shots. The power plant and the main storage could be placed away from the battery any distance up to one mile. The projectiles came in the full 15-inch caliber and three subcaliber.

15-inch caliber projectile, eleven feet long, weight when fully charged - 1,150 lbs.
10-inch subcaliber projectile, eight feet long, weight when fully charged - 570 lbs.
8-inch subcaliber projectile seven feet long, weight when fully charged - 370 lbs.
6-inch subcaliber projectile seven and one-half feet long [sic] weight when fully charged - 300 lbs.

The fuse on the projectile was mechanical in nature and could be

set to act on impact or delayed. The cost of one gun and its carriage was $60,000.[32]

The three dynamite guns were mounted at Fort Winfield Scott by December 1895. A rare photograph of the battery shows the three huge strange-looking guns standing in a row. At that time no parapet had been built for the emplacements, the guns being in the open. The guns were test-fired from December 4 to December 9, 1895, The San Francisco Call being particularly enthusiastic about the results: "Dynamite Death-Dealers," "Successful Test of the Big New Battery Above Fort Point," and "Will Probably Be Accepted."

The test was directed by a board of officers headed by Col. L. S. Babbitt, commanding officer, Benicia Arsenal, and assisted by Lt. O. M. Lissak, Ordnance Corps, and Maj. W. H. Heuer, Corps of Engineers. Mr. B. C. Bachellor, engineer from the company, operated the guns. Altogether, nine projectiles were fired: one being a weighted shell, five containing 100 pounds of dynamite, and three containing 500 pounds. The report said that all of the first four live shots fell into a rectangle measuring 52 by 70 yards. One shot was fired at Point Bonita where it stuck only a few feet from a shot fired there in an earlier test(?). As a finale, each of the three guns fired a 500-pound projectile. They fell about 1 1/4 miles out to sea. The fuses were timed for 1/2 second under water. The explosions sent up spectacular geysers of water, 50 feet in diameter and 300 feet in the air. Thousands of fish were killed, and as soon as the tests were over, San Francisco fishermen put to sea to fill their boats. The board noted that for these last three shots, the shells were

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32. NA, RG 77, OCE, General Correspondence 1894-1923, Capt. J. G. D. Knight, Oct. 11, 1894, to Mendell; Pneumatic Torpedo and Construction Company, Dec. 14, 1895, "The Pneumatic Torpedo Gun."

quite unsteady in their flight. Nevertheless, the board concluded "that the guns, carriages, appliances, etc. forming the Pneumatic Dyamite gun battery and plant . . . fulfill all the requirements specified in the contract . . . between the United States and the Pneumatic Torpedo and Construction Company."[33]

If Babbitt was happy with the dynamite guns, the chief of engineers certainly was not. In response to a Senate resolution in January 1896 asking the secretary of war if it would be possible to establish a dynamite gun battery at Fort Warren in Boston Harbor, General Craighill responded that it would be possible, "but the expediency of doing so is very doubtful." Still later that year the subject was referred to the board of engineers. The board concluded: "Notwithstanding that the dynamite gun batteries at Sandy Hook and San Francisco have fully attained contract specifications, the objections to these batteries are sufficient to cause this Board to conclude that a pneumatic dynamite at Fort Warren should not be constructed, nor should any battery of this character be built in Boston Harbor at this time." Craighill added that there might be places where a dynamite gun could be used--such as a place having a great depth or very strong currents, where it would be difficult to lay submarine mines. Nevertheless, he said, submarine mines were the best way to use high explosives.

Congress continued to express an interest in the dynamite gun, and of course the manufacturer tried hard to get the War Department to purchase more of them. But the army persisted in believing that they were not necessary to coastal defenses. In 1899 in response to a query from Senator George W.

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33. The San Francisco Call, Dec. 10, 1895; NA, RG 77, OCE, General Correspondence 1894-1923, "Report for Inspecting and Testing the Pneumatic Dynamite Gun Battery and Plant near Fort Winfield Scott, California."

McBride, chairman of the Committee of Coast Defenses, Chief of Engineers John M. Wilson wrote: "This question has been repeatedly considered by The Board of Engineers during the last four years, and in every case an unfavorable opinion has been expressed relative to the introduction of this type of weapon as an element of seacoast defense."[34]

Meanwhile the Spanish-American War came, and at San Francisco the district engineer worried over the exposed position of Dynamite Battery. It was in plain view from the ocean, especially the powerhouse to the rear when the boilers were under steam. He recommended building high earthen traverses around the guns, making each position a gun pit, and a high traverse around the power plant. By adding concrete retaining walls, the earth could be kept as near and as high as possible. The magazines and the service could be placed under the traverse around the powerhouse. Covered passageways would lead to the gun pits, between the gun pits, and from the end pits to the ground outside. The magazine would hold 90 projectiles of different sizes; separate rooms would store the dynamite charges and the detonators. Suter's estimate for the work came to $150,000.

This plan was approved and work on the traverses began in August 1898. (The Spanish Far Eastern squadron had been destroyed in Manila Bay in May.) The concrete work was completed in November. And in March 1900 the engineers

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34. NA, RG 77, OCE, General Correspondence 1894-1923, F. P. B. Sands, Attorney, Pneumatic Torpedo & Construction Company, Mar. 3, 1898, to Chief of Engrs., and Chief of Engrs. John M. Wilson, Feb. 16, 1899, to Sect. of War R. A. Alger; unsigned, undated document, "The Situation as to the Pneumatic Dynamite Gun Batteries," bearing endorsements dated Mar. 23 and 25, 1898. The army had a dynamite field gun in Cuba that fired into Santiago from San Juan Hill. It was considered basically a terror weapon, for its blast did not cause much damage to infantry in open order--lack of shell splinters. Eric Morris, et al., Weapons & Warfare of the 20th Century (Seaucus, N.J.: Derbibooks, 1976), p. 43.

announced the completion of the parapets of the large and complex battery. One year later, in response to a request from the commanding officer of the Presidio for repairs to the battery's powerhouse, the Board of Ordnance and Fortifications, Washington, D.C., declared the pneumatic dynamite batteries to be obsolete. Secretary of War Elihu Root agreed. The engineer's operations report for December 1904 noted that all the guns and machinery at Dynamite Battery had been sold.[35]

The complex at Dynamite Battery underwent many different uses after it was disarmed. About 1912 the engineers were using its corridors and rooms for storage. The power plant became a power unit for Fort Winfield Scott. In 1919 the artillery fire control switchboard and the post telephone switchboard were installed in one of its rooms. Two adjoining rooms were converted into sleeping quarters. During World War II, the complex served as the harbor defense command post; today, the power plant building serves as a classroom. The battery complex is still used for communications and for storage of different materials. Being located to the east of Lincoln Boulevard (McDowell) and well within Fort Winfield Scott, this fascinating old fortification is still under the army's jurisdiction.[36]

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35. NA, RG 77, OCE, General Correspondence 1894-1923, Suter, May 9, 1898, to Chief of Engrs., and Lt. L. Wolf, CE, Aug. 31, 1898, to Suter, and Nov. 30, 1898, to Col. S. M. Mansfield, CE, and Maj. C. E. G. B. Davis, CE, Mar. 26, 1900, to Chief of Engrs., and Col. J. B. Rawles, CO, Presidio, Feb. 23, 1901, to AG, Dept. of Pac.; FARC, San Bruno, RG 77, OCE, San Francisco Dist., Subordinate Officers: Fort Winfield Scott, Correspondence Received 1902-1907, Supt. (Deacon), Report of Operations, Fort W. Scott, Dec. 1904.

36. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortification File 1884-1944, incomplete correspondence, 12th Endorsement, Col. C. L. Potter, CE, July 8, 1919, to Chief of Engrs. (Potter had been an engineer lieutenant at San Francisco in the 1890s.), and Letterbook no. 12, July 9-Oct. 29, 1912, Maj. S. A. Cheney, Aug. 28, 1912, to Santa Cruz Portland Cement Co., San Francisco.

(6) Operations, Fiscal Year 1897

The annual report for fiscal year 1897 recorded the advances made on the various works during the year. In old Battery East, four platforms were completed for 8-inch converted rifles. Another landslide in Mortar Battery 1 required repairs. The ammunition carriers were installed at that battery, and a new casemated firing room was built across the road on the southwestern side of the battery.

All six rifles (three 10-inch disappearing and three 12-inch nondisappearing) had been mounted in Batteries Marcus Miller and Godfrey. On the right flank of Godfrey between emplacement 14 and an old magazine from the 1870s, excavation had begun for guard and relocator rooms. The 12-inch guns position (no. 8) on the left flank of Battery Lancaster was "practically" completed (it was not armed until February 1899), as was Battery Saffold with its two 12-inch platforms for nondisappearing guns. At this latter battery, the terreplein still needed concreting. And to the south of Rob Hill a site had been cleared in June 1897 for the construction of Mortar Battery 2. When completed, this battery would have four pits in a straight line rather than the cross shape of Mortar Battery 1. The total number of 12-inch mortars would be the same--16. When later named, the battery would be known as Stotsenburg; still later, this name would apply to only the two pits on the right flank. The pits on the left would be organized as a separate battery named McKinnon.[37]

C. Spanish-American War

Fiscal year 1898 brought a fresh sense of urgency to the efforts to provide a defense for San Francisco Bay. On February

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37. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortification Files 1884-1944, Letterbooks, Reports from Engineers 1896-1902, Potter, June 30, 1897, to Suter. A relocator was an instrument used to provide range and position data.

15, 1898, the U.S.S. Maine blew up in Havana Harbor, Cuba. "Remember the Maine. To hell with Spain," became the cry of the time. In March Congress voted $50,000,000 for defense, and before April was over the United States and Spain were at war. A small, decrepit Spanish squadron (six small cruisers and a gunboat) was stationed in the Philippines, and there was always the possibility that it would steam eastward toward San Francisco. Then, too, it was learned that Spanish cruisers were heading eastward through the Mediterranean toward the Suez Canal. However, Commodore George Dewey, commander of the U.S. Asiatic Fleet, entered Manila Bay and on May 1 destroyed the Spanish ships. The Spanish squadron in the Mediterranean promptly returned home. After the Battle of Manila Bay there was not the slightest danger of a Spanish attack on the West Coast, but the defensive measures already taken were carried on.[38]

A new lieutenant, Louis C. Wolf, was in immediate charge of construction at Fort Winfield Scott and on Angel Island, where the first of the Endicott batteries was begun in 1898. Wolf wrote detailed reports that gave excellent word pictures of the multitude of aspects of battery building. During fiscal year 1898, he undertook four major projects: emplacements 9 and 10, Fort Point, known today as Battery Cranston; emplacements B, C, and D, Fort Point, later called Battery Boutelle; Mortar Battery 2, Fort Point; and an 8-inch emplacement on Mortar Hill, Angel Island, that was eventually called Battery Drew.

1. Battery Cranston

Work began on emplacements 9 and 10 on June 10, 1897; its two 10-inch disappearing rifles were mounted by March 31,

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38. Russell F. Weigley, The American Way of War, pp. 183-84; E. B. Potter, The Naval Academy Illustrated History of the United States Navy (New York: Galahad Books, 1971), pp. 120-25.

1898, thus showing a great increase in the speed with which these batteries could now be built in comparison with earlier days. Wolf described the progress as follows:

> Work was commenced on these emplacements about the 10th of June, 1897, and the excavation completed by the end of the month. The material encountered . . . was loam and clay. . . . The material [was] removed by carts and used in the construction of parapets.
>
> The framework for the concrete mixer and approaches thereto were also partly erected during the month of June. On the 6th of July the foundation was finished, the concrete being made by hand. By the 28th of July the forms for magazines etc. had been completed and the bridging for concrete mixer had been put up. The making of concrete by machine was commenced that day . . . . On the 28th of August the rough concrete work of the magazines etc. was completed. . . . The erection of forms for loading platform at No. 10 was commenced August 30th. Both loading platforms and gun platforms were completed by the 19th of October. . . . Back filling over magazine commenced Sept. 1st. and was continued . . . until completed. By the end of November the main work was finished, leaving only such work as the pointing of interior walls, laying of floors and hanging of doors. . . . The base rings of the two carriages were set in December and a detachment from the various garrisons . . . were soon engaged mounting the carriages. The guns were mounted by the end of March, some delay having occurred in their shipment. . . .
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> The following is a statement of expenditures made from allotment for emplacements 9 & 10.

Excavation 4910 cu. yds. at 42 1/2¢	$ 2,085.12
Concrete plant	1,356.80
Six mining cars and turn-table	506.00
Forms for magazines and gun platforms	3,957.95
Concrete work, 5623 cu. yds. at $5.23	29,437.80
Taking down forms and mixer	554.58
Plastering, paraffine painting, & painting walls	885.99
Painting I beams, whitewashing, & cement washing	225.00
Top finish of floors	750.13
Tools, supplies, etc.	181.13
Gun aprons	508.20
Cement testing	302.20
Asphalt covering	677.85
Making survey	225.00
Backfill & top dressing 3800 cu. yds. at 56¢	2,165.50
Drains, sewers, & grates	276.11
Road, excavation & macadam	904.65
Gutter	209.84
Repair of McDowell Ave [Lincoln]	668.30
Iron ladder	6.33
Wooden stairs	151.43
Doors	1,856.36
Latrine	167.82
Setting base rings	100.00
Triplex blocks	263.90
Shot trolleys	375.87
Cranes	219.60
Speaking tubes	61.19
Water system	64.51
Sharpening tools	202.17
Repair of carts & wagons	104.46
Stables	1,473.24
Handrails	131.04
Policing	171.75
Holidays	33.00
Field Office	1,262.00
Town Office	941.88
Office expenses	475.00
Tools & materials (smithy)	158.30
Sundries	229.84
I Beams	968.85
Forage, shoeing & repairs	109.21
Rubble rock	298.00
Total	$55,702.50

2. Mortar Battery 2 (Stotsenburg and McKinnon)

Excavation of the battery commenced July 6, 1897. On October 27 the concrete mixer began operating, reaching a production of 200 barrels per eight-hour day. Concreting of the four magazines was competed by November 19. Wolf discussed the construction of the "administration building." Apparently this was the collection of concrete, bombproof rooms located in the traverse between pits 2 and 3: two rooms for storage batteries, a relocator room, a telephone room, and two guardrooms. The backfill over the magazines and the administration building was completed on February 12, 1898, which was the date Wolf considered to mark the "practical completion" of the battery. The last of the base rings was set in March, and the artillerymen mounted the carriages. But as of June 30, 1898, the mortars had not yet arrived from the East. Again, Wolf gave a detailed breakdown of expenditures. The total cost of constructing Mortar Battery 2 amounted to $126,195.

3. Battery Boutelle

In February 1898, Colonel Suter forwarded to Washington plans for a battery of four 5-inch rapid-fire (RF) guns on balanced pillar mounts at Fort Point. This battery was to be placed in the 540-foot gap between Batteries Marcus Miller and Godfrey. Suter considered this to be an important position because of its proximity to the channel through the Golden Gate. It had a good command over the entire outer harbor except Bakers Beach and the space immediately under the bluffs of Fort Point. It would stand on the site of two 1870 mortar batteries, and the old magazines, 21, 22, 23, would be useful for storage of nonexplosive articles or even as shelters for the gun crews. He estimated that the four emplacements could be built for $19,300.

The chief of engineers authorized the construction of the two center emplacements B and C on March 8, 1898. Lieutenant Wolf started the work promptly and by the end of April reported

that the floors, the foundations for the platforms, the retaining walls, a relocator room, and a passage to an old magazine had all been completed. He was unable to proceed further with the construction until cylinders for the mounts arrived.

4. Battery Drew

Under the appropriation "National Defense, War," Wolf began construction of a single 8-inch emplacement at Mortar Hill, Angel Island, on April 1, 1898. A great deal of preparatory work was necessary, involving the building of stables, quarters, cookhouse, blacksmith shop, and repairs to the Camp Reynolds' wharf and to the road from Camp Reynolds. Excavation was completed May 13: "Rock was encountered near the front end of the magazine, but since it was solid it was allowed to form part of the wall of the magazine." On May 6 the foundation for the magazine was put in, and ten days later the main concrete work was commenced. Wolf said that the emplacement was completed by June 20, but the gun and carriage had not yet been received. The cost of this inner-harbor battery came to $32,500. At the same time he worked on Battery Drew, and because of the emergency, Wolf had three platforms for 8-inch converted rifles constructed at old Battery Knox and had its old timber magazines repaired.[39]

5. Modifications

Minor work carried out in fiscal year 1898 included removing the macadamite covering on the terrepleins of Batteries Marcus Miller and Godfrey and replacing it with concrete. The relocator room and guardroom at Godfrey were completed, and an observation platform and outside stairs leading from the entrance of the relocator room to the terreplein were finished. At several of

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39. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Letterbooks, Reports of Operations by Sub Engineers 1896-1902, Lt. L. C. Wolf, June 30, 1898, to Suter.

the batteries the names of the various rooms were painted on their doors. In constructing the batteries at Fort Point, Lt. Charles Potter came up with an idea that worked so well it was forwarded to the chief of engineers. The Engineer Department like the concept and had it distributed throughout the corps via mimeograph 19, dated September 15, 1897.

> The attention of officers of the Corps of Engineers, having charge of the construction of fortifications, is invited to a simple device for facilitating the work of mounting sea-coast guns and carriages, suggested by Lieut. C. L. Potter, Corps of Engineers,and introduced in certain emplacements recently constructed on the Pacific Coast [Batteries Lancaster, Cranston, and Saffold].
>
> The device consists in setting a number of ring bolts in the vertical masonry walls of the parapet and transverses to serve as points of attachment for lines. . . .
>
> Those used in the Pacific Coast emplacements were made of 2-inch iron, the ring being 6 inches interior diameter and the bolt 4 feet long, with nut and washer at one end and an eye of 2 1/4 inches . . . at the other. . . . A convenient height for disappearing emplacements is 3 1/2 feet above the loading plat-forms, and for simple barbettes just below the level at the interior crest.

Potter's rings may still be seen today at his and all his successors' batteries, including the great 16-inch batteries of the 1930s.

During target practice at Mortar Battery 1 in 1897, Lieutenant Potter learned that the new firing room, built just the year before, was "entirely inadequate for administrative purposes."

It was proposed now to enlarge the facilities in a manner similar to those at Mortar Battery 2. This involved adding a general "chart-room," a telephone room, a commanding officer's room, and a guardroom, and converting the firing room into a relocator room. The new arrangements were completed by April 1898.

6. Armament, Fort Winfield Scott

By the end of 1897, the armament at Fort Winfield Scott included a mixture of old and new, standard and novel weapons. In the old masonry fort there were still thirty-two 10-inch Rodmans and thirteen 8-inch rifles, all mounted in the two lower tiers. No Rodmans remained in old Battery West at all; but Battery East now sported five 15-inch Rodmans and four 8-inch converted rifles, all in good condition. All three of Battery Marcus Miller's 10-inch disappearing rifles stood guard, as did the three 12-inch guns in Battery Godfrey and the two in Battery Saffold, all five being nondisappearing. Mortar Battery 1 had its 16 mortars in operating order. And the three dynamite guns, still without parapets or traverses, looked otherwise impressive.

7. Inspection of the Defenses

In March and April 1898, as war approached, Colonel Suter inspected all the fortifications in the San Francisco defenses. At Fort Winfield Scott another battery, Cranston, had been armed with its two 10-inch disappearing rifles by April 1898. At Fort Mason he found six 10-inch Rodmans in old Battery West and one 8-inch converted rifle in Battery East. All their wooden platforms were again rotten, and once again the timber magazine had collapsed. Alcatraz Island had seven 15-inch Rodmans and two 8-inch converted rifles mounted. No guns were mounted on Angel Island at the moment, but the works at Point Knox were still sound. And at Fort Baker, Battery Spencer bristled with its three 12-inch rifles, while Ridge Battery still retained its four 15-inch Rodmans. With the guns on hand and the various works around

the harbor, Suter concluded that with a little effort he could establish a system of twenty-three 8-inch converted guns and six 10-inch Rodmans to cover the inner harbor minefield from end to end. He estimated that $9,000 was needed to construct 25 concrete platforms and 2 magazines. At least 12 platforms for 8-inch converted rifles were built: four in emplacements 13, 14, 17, and 18 of Battery East, Fort Winfield Scott; three in emplacements 10, 11, and 13 of old Cavallo Battery; two at Fort Mason; and three at old Battery Knox, Angel Island.[40]

8. Mining the Harbor

In the national defense appropriations of March 1898 and subsequent acts, a sum of almost $2 million was set aside for torpedo defenses. By the end of the "emergency" 28 harbors had been mined. On the Pacific Coast only San Francisco Harbor would be so defended.

It will be recalled that the mine storage had been established on Yerba Buena Island. Four mining casemates had been constructed: at Fort Mason, the casemated barracks on Alcatraz, near Mortar Hill on Angel Island, and north of Point Cavallo. The year before in the summer of 1897, a fifth torpedo casemate was constructed at Quarry Point on Angel Island. Torpedo defense was still a responsibility of the Corps of

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40. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Letterbooks, Reports of Operations by Sub Engineers 1896-1902, Potter, July 31, Aug. 23 and 31, Sept. 30, and Oct. 4, 1897, to Suter, and Wolf, Apr. 30, 1898, to Suter; NA, RG 77, OCE, General Correspondence 1894-1923, Capt. J. E. Kuhn, Mineograph 19, Sept. 15, 1897, and Wolf, Dec. 31, 1897, to Suter, and Suter, Feb. 23 and Apr. 6, 1898, to Chief of Engrs., and Maj. W. H. Heuer, Report of Operations, Defense of Alcatraz and Torpedo Defense, San Francisco, FY 1898. Chief of Engrs. J. M. Wilson, Apr. 26, 1900, to Sect. of War E. Root. Emplacement D at Battery Boutelle was completed in August 1899; emplacement A was never built.

Engineers, and at San Francisco all activities relating to it were placed under the supervision of Maj. William Henry Heuer. In March 1898, Heuer contracted for 60,000 pounds of dynamite, notified the chief of engineers that he needed 32 miles of multiple cable and 65 miles of single cable, and said that he needed $100,000 for the torpedo defense of San Francisco Harbor. He was authorized to purchase 600,000 feet of rubber-covered wire in San Francisco, but when he tested this in seawater tanks, over half of it failed to meet insulation standards.

Of the five mining casemates, Heuer decided he needed only the two at Fort Mason and Point Cavallo to operate the proposed groups of mines. He soon discovered, however, that the concrete casemate at Point Cavallo was already outdated. At Fort Baker, he set up a makeshift arrangement farther north, toward Sausalito. And at both places he erected a corrugated iron shed to house the engines, rotary transformers, and storage batteries. At Baker a trough was built from the casemate in which about 70 covered wires, each about 1,500 feet long, were laid to a small shed on the shore in which the submarine cables were gathered. Heuer said that this arrangement saved much submarine cable. In an interesting document, Heuer estimated the daily expense of maintaining the minefield once it was laid.

Two casemate crews, each consisting of three electricians and one general electrician (total, 7)		$ 30.00
Unskilled labor: 4 engine runners, 6 watchmen, and 4 boatmen		37.00
1 Tug for patrol duty, 24 hours	$ 20.00	
2 Captains	8.33	
2 Engineers	8.34	
2 Deckhands	3.33	
Coal	16.67	
Oil, waste, and ropes	3.33	
	60.00	
15%	9.00	
	69.00	69.00
	Total	$136.00

Heuer was ready to plant the mines by June 1898. He placed Lt. Francis R. Shunk in charge of the 6 enlisted men and 20 civilians (boatmen, riggers, and laborers). The major was rather proud of his navy: "We have a fine tug-boat, derrick, scow, scow schooner, and different kinds of boats." The first mine was planted on June 11, 1898; by June 30, 42 mines were in position, grand junction boxes located, and the cable laid for two more grand groups.

Skunk's labor force set up camp at Fort Baker, near one end of the minefield (the other end was near the Presidio wharf). They continued to plant mines until July 16 when mine 63, the last mine of the third grand group, was placed in position. Orders arrived that day directing that mine planting cease (Santiago surrendered July 17). However, Shunk continued to lay cables and on August 13 completed the entire first line across the bay. Three days later, the crew began picking up mines and cables (an armistice had been signed August 12). The cables and the mines were cleaned and stored again on Yerba Buena Island, the work being completed in November 1898.

Although the probability of a Spanish attack on San Francisco was remote, especially after Dewey's victory in Manila Bay on May 1, laying the minefield had not been without value. In the first place, the war had caused Congress to appropriate the necessary funds to complete the equipment needed to lay the mines. Secondly, it had given the San Francisco District Engineers experience and knowledge for the future. Only through laying the mines did they learn that the control casemates were inadequate. Perhaps the most important outcome of the exercise was the results it had on future planning for the defense of San Francisco Bay. Colonel Suter, reflecting on the lessons learned, concluded: "With the progress of the outer works, the actual placing in position of the mines, and the experience gained during the last War, it seems

to me to be next to an impossibility that any heavy armament will ever be seriously needed on these inner waters. The protection of the mine--fields is the only obvious requirement, and this is a matter for small guns."

The colonel continued:

> The space inside of Fort Point and outside the mine-fields is so small, that is so small, that manuvering of heavy ships would seem out of the question, and the probabilities reduce themselves to raids of small vessels and boat parties directed against the mines. If a fleet of heavy vessels ever had nerve and endurence enough to run the gauntlet of the outer batteries, they would never stop for the minefield, nor for any artillery that could be mounted near it, and besides the City would then be fairly under their guns as soon as Fort Point had been passed. Moreover, with the modern long-range guns, a serious engagement in the inner harbor would do as much damage to the city as a genuine bombardment, perhaps more so, as our guns would reinforce those of the enemy.

Suter had a good picture of the future. Recommendations would be forthcoming for smaller rapid-fire guns for the inner harbor. On Alcatraz Island, for example, plans for five 12-inch rifles would be discarded in favor of a project calling for six 6-inch rapid-fire guns for protecting the minefields against small enemy craft. Farther into the future, improvements in mine defense would lead to abandoning the inner harbor minefield, placing the mines in the swift channels outside the Golden Gate, and greatly reducing the need for inner harbor defenses at all.

But that was too far distant to be seen in 1898; the construction of the Endicott batteries would go on.[41]

D. More Construction

1. Batteries Kirby and Duncan

At the end of the 19th century several additional Endicott-era batteries were begun at various places around San Francisco Bay. At Fort Baker, north of the Golden Gate, approval was given in August 1898 for two 12-inch rifle emplacements at Gravelly Beach. When named this battery would be known as Kirby. Another battery at Fort Baker, two 8-inch rifles on Yellow Bluff, was approved under the war-generated appropriation Act of May 7, 1898. It would later be named Duncan. In March 1900 the engineers reported it completed and recommended that it be turned over to the care of troops even though its guns had not yet been mounted.

Battery Kirby when first planned was to have four 12-inch rifles on lifts. Later this plan was modified to place the guns on disappearing carriages. Colonel Suter explained why he desired large guns at this site: "The peculiar location and the conditions surrounding this battery, that is the short range and the limited opportunity for action, render it an open question whether lighter and more rapidly firing guns would not be more suitable than the armament proposed. This view has considerable

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41. USDI, NPS, Charles W. Snell, "A Brief History of the Construction of the Endicott System of Seacoast Defenses in the Continental United States, 1885-June 30, 1912," MS, Nov. 1975, p. 10; NA, RG 77, OCE, General Correspondence 1894-1923, Heuer, Mar. 26, and May 23, 1898, to Chief of Engrs., and Report of Operations Defense of Alcatraz and Torpedo Defense of San Francisco, FY 1898, and Reports of Operations for National Defense (War), FY 1898 and 1899, Submarine Mine Defense, San Francisco, and Suter, Mar. 28 and Oct. 14, 1898, to Chief of Engrs., and Lt. Col. T. H. Handburg, Jan. 13, 1905, to Chief of Engrs.

weight, but against it is to be set the moral effect due to the knowledge that such a formidable armament is hidden away beyond risk of damage from distance fires." However, Suter also thought that powerful batteries of light rapid-fire guns should be erected on the ridges on either side of Kirby.

After the narrowness of the cove's mouth was considered, the engineers decided to reduce the number of 12-inch guns to three. In August 1898 Suter estimated that the three emplacements would cost $83,731. His plans were approved, but construction of two emplacements only was authorized--the Ordnance Department did not have a third 12-inch gun available at that time. Thus, Battery Kirby never had more than two 12-inch guns on disappearing carriages. And, thus, were some works from old Gravelly Beach Battery preserved, including the arched culvert underneath. The engineers proposed closing the culvert with a gate to prevent an enemy from crawling up it with a "mine."

In January 1899 the division engineer visited the site and noticed a break in the mass of concrete forming the magazines. The cause was the same as that that had affected old Gravelly Beach Battery--building the work as a monolith on a poor foundation of irregular settlements. However, much of the battery was on stable ground and the break was not considered serious. Repairs could be made by grouting.

The two 12-inch disappearing carriages arrived in San Francisco in the fall of 1899. But the Quartermaster Department failed to inform the engineers until after it had contracted for them to be landed at the Fort Baker wharf. In vain, the Engineer Department tried to persuade the contractor to deliver them directly to Gravelly Beach. The problem was finally settled by a second contract for $420 to move the carriages. On July 5, 1900, the chief of engineers notified the secretary of war that the battery was completed.

Construction of Battery Duncan on top of Yellow Bluff was approved June 1, 1898. While the reports of operations for the work have not been found, the engineers must have worked speedily, for Suter reported three months later that the two 8-inch barbette emplacements were substantially completed. He could not finish the work, however, because he had run out of money. Battery Duncan required $4,000 more to complete the work.[42]

2. Battery Lancaster

At Fort Winfield Scott the war brought several changes. On June 1, 1898, the secretary of war approved the construction of emplacements 6 and 7, the two remaining 12-inch disappearing carriages and guns at Battery Lancaster. Suter thought the three guns of this battery had an important role in that they too bore on the Golden Gate Channel, and they covered water from Point Lobos nearly to Black Point (Point San José). One shortcoming was that Lancaster was subject to flanking fire. He proposed to carry the traverses well back, and the road in rear of these emplacements would lead through tunnels under two of them. Before work could start on 6 and 7, Lieutenant Wolf had to remove four 15-inch Rodmans from the site. That left but one 15-inch Rodman standing at Fort Point--probably in emplacement 16, Battery East.

The operations report for March 1899 showed much progress at Lancaster: "The concrete steps around both guns were

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42. NA, RG 77, OCE, General Correspondence 1894-1923, Chief of Engrs. J. M. Wilson, May 31, 1898, to Sect. of War R. A. Alger, and Suter, Aug. 4 and Sept. 10, 1898, to Chief of Engrs., and Potter, Aug. 7, 1898, to Suter, and Manfield, Jan. 25, to Chief of Engrs., and Davis, Nov. 21, 1899, and Mar. 20, 1900, to Chief of Engrs. Battery Duncan (two 8-inch guns) and Battery Drew (one 8-inch gun) on Angel Island bear a great similiarity in appearance. This is undoubtedly due to the fact that they were built under the same appropriation, at the same time, by the same engineers.

put in, the backfill for terreplein no. 7 was made and the concrete terreplein and the steps leading to same put in and top-finished; the backfill for terreplein no. 6 was begun . . . the backfill over magazines was completed . . . a considerable part of the cut necessary for field of fire was made, the grading in rear of emplacements was begun, fireplaces were placed in various rooms."[43] By October 1899 the battery was considered to be complete except for electricity. The guns had not yet been mounted.

3. Battery Slaughter

Another battery under construction by the end of 1898 was Slaughter, consisting of emplacements for three 8-inch disappearing rifles that would cover the inner minefield. Because of its location close to the national cemetery at the Presidio, this battery and others close to it were often referred to as the national cemetery batteries. The operations report for October 1899 reported that Battery Slaughter also was completed except for its electricity.[43]

E. A Fire Control System

In the early 1890s, the artillery was still organized into five regiments, without any distinction being made between field artillery and coast artillery. The Act of March 8, 1898, added two more regiments, the Sixth and Seventh. Each regiment had 12 batteries (companies) of soldiers. As the number of new, powerful seacoast batteries grew, it became ever more apparent that a system for controlling the fire of modern weapons had to be evolved. In 1896 a group of young artillery officers, organized as the Board of Regulations of Seacoast Artillery Fire, made public a proposed

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43. NA, RG 77, OCE, General Correspondence 1894-1923, Chief of Engrs., Wilson, May 31, 1898, to Sect. of War, and Suter, Sept. 5 and Oct. 14, 1898, to Chief of Engrs., and Wolf, Dec. 3 and 31, 1898, to Davis, and Lt. H. Deakyne, Mar. 31, Oct. 3, and Nov. 1, 1899, to Davis.

system of fire control and direction. Much too long to be dealt with herein, this proposal does assist in one's understanding of the operations of harbor defense at that time.

According to the board, an area of land and sea provided with works of defense and artillery armament was termed a fort, and its commander was the fort commander (Ft.C.).

A fort was organized into one or more fire commands, the size of which was governed by the character of the area to be defended and by the number of guns of one kind that it was possible for one officer to direct in action. The commanding officer was the fire commander (F.C.).

A fire command was subdivided into a number of groups, each group containing that number of guns as could be supervised efficiently in action by one officer and regulated by one position finder. The commander of a group was called a group commander (G.C.).

For the proper supervision of the group of position finders, a range-finder commander (R.F.C.) was necessary; he was subordinate to the fire commander.

The officer in charge of a position-finding station was called a position-finding officer (P.F.O.).

Under the group commander came the gun director (G. D.), who was in immediate command of one of the guns of the group.

1. Duties of a Fort Commander

He was responsible for the condition of the armament, ammunition, etc., and for training and discipline. He

had to be conversant with the capabilities of his command for artillery offense and defense. During action he assigned targets to the fire commanders and made changes in the successive stages of the action. His station was a position-finding station where he had an unobstructed view of the whole scene of action. He was in direct communication with his fire commanders. (In most cases, the fort commander was the fire commander.)

2. Duties of a Fire Commander

He was responsible to the fort commander for the condition of all the artillery condition and for instruction and discipline. His duties in action were to carry out the orders of the fort commander. If a breakdown in communications occurred, he acted on his own responsibility. He had to be acquainted with the general plan of defense for any particular course of action. He was in direct communication with the fort commander and with each gun group and position finder of his command. His station was in a position-finding station that had a clear view of the water area covered by his guns.

3. Duties of a Group Commander

His responsibilites were the same as those of a fire commander. His duties in action were to carry out the orders received from his fire commander, to lay and fire his guns in accordance with the information received from the range or position finder assigned to his group, and to see that the proper ammunition is supplied to his group. His station was with his group.

4. Duties of the Range-Finder Commander

He was responsible to the fire commander for the condition of the range-finder material, for the lines of communication, and for the instruction of his personnel. Duties in action were general supervision of the range-finding group and the lines of communication. His station was wherever it was most

convenient for his duties and for communication with the fire commander and the range-finding group.

5. Duties of a Position-Finding Officer

He was responsible to the fire commander for the proper working of his station.

6. Duties of a Gun Director

He had the immediate command, under the group commander, of the gun--the smallest unit of seacoast defenses. He was responsible for the care of the gun, for the training of his detachment, and for his men's discipline when at the gun. His duties in action were to see that his gun was properly loaded, laid, and fired in accordance with the directions received from the group commander. His station was at the gun.

To lay his gun correctly, the gun director had to know two things: the direction of the target, and the distance or range to the target from his gun. These two variable elements, referred to the position of the gun itself as a center, formed the system of polar coordinates and were obtained from the corresponding elements at the position finder by some method of conversion. The gun was laid in direction by means of a properly graduated traverse circle and quick-reading vernier (or, in case of direct laying, by means of a sight with or without reference to the traverse circle graduations) and was given the elevation corresponding to the given range by whatever means might be provided for the purpose.

Compensation also had to be made for drift, wind, and other atmospheric conditions. The methods of conversion available (in 1896) were the following:

By a relocator or converter board at the gun
By a replotting arm at the position-finder station
By tabular conversion
By combinations of 1 or 2 with 3

The board concluded by admitting that artillerymen still had a few things to learn about the best ways for making corrections for atmospheric condition, etc.

So impressed with this proposed system was the Board of Ordnance and Fortification (then headed by Nelson A. Miles) that it recommended its approval to the chief of engineers within a week. This board also recommended that such a system be provided at Fort Monroe, Virginia, and at San Francisco, California.[44]

F. Firing 10-inch Guns, Cranston and Marcus Miller

Two years later at the outbreak of war with Spain, Battery E, Third Artillery, was ordered to Fort Point from Fort Mason and assigned to the care of the five 10-inch guns later known as Batteries Cranston and Marcus Miller. The commanding officer of the battery, Capt. Sedgwick Pratt, prepared a most important and detailed account of how his men manned the battery and how they then practiced fire control. There being as yet no permanent quarters at Fort Point, the 2 officers and 45 men present were quartered in tents and in an empty engineer's lime shed. Then, as Captain Pratt described the following:

Old telegraph poles, stumps, loose stones, the old plotting house, etc., were removed from the parapet, and

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44. NA, RG 77, OCE, General Correspondence 1894-1923, Board of Regulation of Seacoast Artillery Fire May 27, 1896, Proposed System of Fire Control and Direction, and Nelson A. Miles, President, Board of Ordnance and Fortifications for the Chief of Engineers, Extract from Proceedings, June 2, 1896.

everything in rear of the guns of no use was also removed. The grass on the parapets was cut. . . . Magazines and galleries were all cleaned and cleared.

Powder charges were removed from packing boxes, put in storage cases, marked, and stored in the magazines, front sections on one side thereof and rear sections on the other with primers attached to each section. Candle-lamps and matches were always in place in their nitches in magazine gallery in front of magazine doors.

Magazine doors were numbered and marked with contents of magazine and velocity of powder.

Projectiles were all cleaned, oiled and skidded.

Ten armor-piercing shot and ten common shot were placed on loading platforms for each gun, the former on the left, the latter on the right, and were always kept cleaned and oiled, ready for loading.

Armament chests, magneto-firing-boxes, rubber hose, gunners' lanterns and matches, gun commander's table, and wrench chests were in places assigned in entrance-galleries near the doors. All cleaning material, oils, cosmic, etc., not in armament chests were in oil-rooms near guns.

Kerosene lamps and matches were in their niches in all galleries and relocator-rooms

Sponge-tubs filled with water, sponge and rammer-props, and sponges and rammers were kept in their places on loading platforms night and day ready for use at any time. Crane-falls with shot-hooks were also ready night and day, and retraction-ropes kept in oil-rooms near the guns.

Four pair rubber shoes were always ready outside the magazine doors for men of the magazine details.

All wood coverings to parts of carriages were removed and not allowed to be used, as experience in one instance proved that the men might forget to remove them in a hurried manning of the guns.

All rammer staves were marked with a brass plate showing the normal distance of the base of the projectile from the face of the breech with a scale of tenths of an inch for one inch on either side of normal mark.

Telescopic sights to all guns were adjusted by Captain [Edwin B.] Babbitt of the Ordnance Department, so also were the elevation indicators.

The Azimuth circles and index plates were carefully adjusted under the superintendence of Mr. Von Geldern of the Engineer Department. . . .

Keys to magazines were numbered and always in the pocket of the senior officer present.

Each officer and the armament sergeant had keys to the doors of all galleries and oil-rooms, and a set of these keys for each emplacement was kept on a key-board near the manning-detail-board where the gun-cleaners could obtain them, and when not on the key-board all knew that they were in use and would be found in the door of the entrance gallery. There was never an instance of delay for want of keys even when "to arms" were sounded.

Ranges to all permanent and prominent objects from each gun were painted on boards and permanently hung on flank walls of each emplacement where they could easily be seen and read by the gunner and the gun commander.

In order to bring the guns mounted on the 1894 carriages to the loading position by the levers, iron cross-bars were made and put on by the Engineer Department at end of levers so that the men heaving on this bar would all have the greatest leverage and easily and rapidly bring the gun to down position.

Three men who had served in the Navy were detailed for duty in the watch-tower over the guard-house with orders to report all vessels coming in having the appearance of war vessels. They were in telephonic communications with the disappearing guns and Headquarters Harbor Defenses.

Field pieces were placed at the guard house and it was understood that two guns fired in quick succession was a call "to arms."

The Pneumatic guns were "blown" every week. . . .

Sentinels were posted on the parapet along the whole line to guard the emplacements and to watch for and report war vessels coming in. . . .

A pair of firing lines ran along in rear of the five guns with a leg to each gun and to each relocator-room. This line was put up by Lieutenant [William S.] McNair, and with one magneto-firing-box would explode primers in the five guns simultaneously.

A horizontal base was selected extending from point "C" [at Fort Winfield Scott, across South Bay] to the point "W" [on Point Lobos]. . . . The length was 3499.3 yards. The direction of the line [almost east-west] was not what was desired but was the best obtainable. At C and W pits were dug about 8 x 10 feet to a depth of 6 feet. These were floored, lined with two inch plank and covered with a shingled pent-roof having a sky-light over the base-end. . . .

The observers at pit W were quartered in a house built for them and were rationed for ten days at a time. . . . The pit C, 1008 yards from Gun No. 11 [right flank, Marcus Miller], was the "principal station. . . "

Pratt included a sketch of plotting room 2, showing the location of tables, instruments, telephones, and even the people. He wrote that while there were nine persons in this plotting room, six or seven men were sufficient.

The strength of the battery increased greatly after arriving at Fort Point, finally reaching 175 men. These Pratt divided into two reliefs, each consisting of five gun detachments, five ammunition details, and five reserves. There were also two plotting details, each consisting of one range officer, two plotters, one ballistic-board operator, two telephone men, one speaking-tube man, one blackboard man, and one clerk. There was also a speaking-tube man at each gun.

Pratt went on to describe in considerable detail how the daily drill was carried out, two hours each morning and two each afternoon. He said that vessels and boats of all kinds were practiced upon (but not fired upon), some for ranges of 12,000 yards. He was quite proud of the efficiency gained by his battery: "Time was taken in one instance with the following result. From

the signal 'to arms' [the men in quarters and not anticipating the signal] to getting range was 5 minutes, and to firing the two guns mounted, each scoring a 'hit', was 5 minutes and 45 seconds." Small wonder that the Journal of the United States Artillery saw fit to print his account.[45]

G. More Batteries, Inside and Outside the Harbor

1. Rapid-Fire Guns

A board of engineers had recommended in 1894 some eighteen 8-inch breech-loading guns distributed at the Presidio, Fort Mason, Angel Island, and Yellow Bluff. All these rifles were to bear on the inner harbor and its minefields. This caliber was recommended because the Ordnance Department had not yet adopted any type of lighter rapid-fire gun. One half of these 8-inch batteries were constructed: four guns at Battery Slaughter, Presidio; one gun each at Batteries Drew and Wallace, Angel Island; two guns at Duncan, Yellow Bluff; and one gun at Burnham, Fort Mason. But by 1898 rapid-fire guns had been developed, and in October of that year Colonel Suter recommended that 21 of them be installed about the inner harbor instead of heavier batteries planned but not yet built. His successor in San Francisco, Col. S. M. Mansfield, agreed that the harbor itself needed only rapid-fire guns; the main defense would have to be made outside the Gate. Instead of completing the inner harbor defenses as originally planned, Mansfield recommended the placement of forty-two 5-inch, 6-inch, and 15-pounder rapid-fire guns at Lime Point, Fort Point, Presidio, Black Point, Alcatraz Island, Angel Island, Yellow Bluff, and Point Cavallo. Not all these recommendations would see reality; but a number of rapid-fire batteries would be built, both in the harbor and (outside?) the Gate.[46]

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45. Sedgwick Pratt, "Service of the 10-Inch Disappearing Guns at Fort Point, Cal., During the War with Spain," Journal of the United States Artillery 12 (July-August 1899): 1-17.

46. NA, RG 77, OCE, General Correspondence 1894-1923, Suter, Oct. 14, 1898, to Chief of Engrs., and Mansfield, Feb. 21, 1900, to

2. Batteries Sherwood, Baldwin, and Blaney

Plans for a battery of two 5-inch nondisappearing rapid-fire guns, near the national cemetery at the Presidio, were approved at the end of 1899. These guns were to be of the navy pattern for the Brown segmental wire gun, on pedestal mounts. Work got under way promptly and in October 1900, the battery was reported complete except for setting the base rings. By May 1901 the battery, which was to be called Sherwood, was turned over to the artillery, although the guns and pedestals had not yet arrived.

Even as the engineers released Sherwood, they had begun on still another battery in the national cemetery area. This was for two 15-pounder, 3-inch rapid-fire guns on pillar mounts. When named it would be called Baldwin. It too was considered completed in 1901. Then in July 1901, work started on a fourth battery in front of the national cemetery. It began with three emplacements for 15-pounder, 3-inch rapid-fire guns on pillar mounts. Later, a fourth gun was added on the left flank. The completed battery was named Blaney. In contrast to earlier construction at San Francisco, the various major parts of this battery were built as separate monoliths in order to guard against unequal setting.

Concerning other works at Fort Winfield Scott, the commanding general of the Department of California learned in March 1900 that the engineers had completed four additional works: Mortar Battery 2, including its electric light plant; emplacements 6 and 7 at Battery Lancaster; an electric light plant for Batteries Lancaster, Cranston, and Godfrey; and an electric light plant for

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Chief of Engrs. Concerning heavier guns, Mansfield said (of Battery Kirby): "I have a very high opinion of the value of low sites for our heaviest guns, and rank the Gravelly Beach battery the superior of all in the defense thus far projected."

Batteries Saffold and Crosby, the latter being a battery containing two 6-inch rifles on disappearing carriages. At Battery Boutelle work had been suspended on emplacements B and C in May 1898 because the pillar cylinders had not arrived. They did arrive in January 1901; work was resumed on these two emplacements, and excavations were completed for emplacement D, whose cylinder was also on hand.[47]

3. Fort Mason's Batteries

During the 1898 emergency it was decided to construct two platforms and a magazine for 8-inch converted rifles at Fort Mason. This battery was to be located to the left (west) of Battery West, where a few unmounted mortars had once been placed. All things take time, and not until April 1900 was the district engineer able to report that the battery was constructed. Meanwhile plans had been approved for Fort Mason's one and only Endicott battery, Burnham. It was to have a single 8-inch gun on a disappearing carriage, and its cost was estimated at $28,700. The site chosen was the very top of Point San Jose, above and behind old Batteries East and West. The battery was completed in late 1899, and an inspecting officer, writing in December of that year, said that the gun would "soon" be mounted.[48]

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47. NA, RG 77, OCE, General Correspondence 1894-1923, AAG J. A. Johnston, AGO, Mar. 29, 1900, to CG, Dept. of Pac., and Maj. C. Davis, Oct. 20, 1899, and Oct. 30, 1900, to Chief of Engrs., and Col. J. A. Smith, Pacific Div., June 10, 1901, to Chief of Engrs., and Lt. Col. D. P. Heap, Pacific Div., Nov. 15, 1901, to Chief of Engrs.; FARC, San Bruno, RG 77, OCE, San Francisco Dist., Letterbooks, Reports of Operations, 1896-1902, Lt. ? , and CE, Reports of Operations, Ft. Winfield Scott, January and May 1901, and Supt. Frank C. Deacon, Report of Operations, Ft. Winfield Scott, July 1901.

48. NA, RG 92, OQMG, General Correspondence 1890-1914, Lt. J. P. Hains, QM, Ft. Mason, July 25, 1899, to QMG, and Lt. Col. M. P. Maus, Dec. 18, 1899, Inspection of Ft. Mason; NA, RG 77, OCE, General Correspondence 1894-1923, Davis, Jan. 17, 1899, to Chief of Engrs., and Chief of Engrs. J. M. Wilson, Apr. 26, 1900, to Sect. of War E. Root.

4. Batteries Ledyard and Wallace

The one and only rapid-fire battery on Angel Island was approved in December 1899. The plans called for two 5-inch guns mounted in a battery at Point Knox. The estimated costs came to $20,093. It would occupy the site of the old Civil War Battery Knox and where three platforms for 8-inch converted rifles had been built during the recent war. And when the batteries were named, this one would be called Ledyard.

About 450 feet behind it was the site for a second 8-inch gun battery authorized for Angel Island; its name would be Battery Wallace. About the time construction of these new works got under way, the chief of engineers reported that Angel Island's first Endicott battery, Drew, was completed (March 1900). The division engineer announced that Batteries Ledyard and Wallace were completed in May 1901 but that the guns and pedestals for Ledyard had not yet arrived. Wallace's gun and carriage were on hand, but they had not yet been mounted.[49]

5. Batteries at Fort Baker

Fort Baker's fourth Endicott battery was also for rapid-fire guns. It was located on a bluff about half way between Batteries Kirby and Spencer. The plans for these emplacements were generally the same as those for Battery Boutelle at Fort Point except that the site was large enough for only two 5-inch rapid-fire guns on pillar mounts. The battery was reported completed on July 3, 1901; when it was named, it was called Orlando Wagner. The engineers were quite pleased with their work. One of them wrote: "I may here remark that the battery as a whole, and especially the surfaces of concrete masonry present a remarkably fine appearance."

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49. NA, RG 77, OCE, General Correspondence 1894-1923, Davis, Oct. 20, 1899, Mar. 20 and Oct. 30, 1900, to Chief of Engrs., and Col. J. A. Smith, June 10, 1901, to Chief of Engrs.

They still do today. When this battery was still under construction, an inspector general visited all the fortifications at Fort Baker. He noted that the guns would soon be mounted at Battery Duncan. The carriages for Battery Kirby were still on the wharf at Horseshoe Bay, exposed to the weather and improperly cared for: "One of the counter-weights was in such a position that the wheels of passing vehicles had already defaced and injured it." At that time (March 1900) there were seven heavy guns at the fort ready to be mounted. The temporary garrison amounted to only 24 enlisted men, not nearly sufficient for the work. The inspector said that twice as many men were needed:

Mounting guns	1	20 privates
Guard	1	12
Ordnance Detail	1	3
Post Fatigue	--	2
Cooks	--	2
Clerk	--	1
Teamster	--	1

He also recommended the construction of permanent buildings for the garrison, a recommendation that the War Department approved.[50]

6. Point Bonita Reservation

In 1901 the Engineer Department prepared to construct fortifications at the western end of Fort Baker, an area that was commonly, but unofficially, called the Point Bonita Reservation. Land transportation from Fort Baker was still difficult

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50. NA, RG 77, OCE, General Correspondence 1894-1923, Davis, Apr. 27, 1899, Oct. 30, 1900, and July 3, 1901 to Chief of Engrs.; NA, RG 92, OQMG, General Correspondence 1890-1914, IG J.C. Breckinridge, Mar. 17, 1900, to the Major General Commanding the Army (Nelson A. Miles).

despite Colonel Mendell's road building of 30 years earlier. Now, the engineers constructed a wharf in a small cove east of Point Bonita. The wharf measured 208 by 20 feet, and the pier head measured 100 by 50 feet. A 250-foot trestle supporting a single track led from the wharf to the top of the cliff. A quarry was opened below the crest of the hill, and a steam-driven derrick lifted the stone 92 feet to a crusher. A 1,600-foot tramway led from the concrete mixer to Rodeo Beach for hauling sand, and a 20,000-gallon water reservoir was constructed. In the winter months a steam engine pumped water to the reservoir from a gulch; in the windy summer months a windmill was used.

The engineer buildings consisted of an office, mess-house, two bunkhouses holding 150 men, cement shed, stable for 24 horses, storehouse on wharf, and a combination carpenter and blacksmith shop. This last contained a drill press and a circular saw, both driven by a gasoline engine. How times had changed since the engineers had begun constructing fortifications on lonely Alcatraz Island in 1854.

7. Batteries Mendell and Alexander

In July 1901, excavation began for a battery containing two 12-inch guns. This battery had a dramatic location near the edge of a high cliff, looking out over the sea. When it came time to name this work that of Col. George Mendell was chosen, one month after his death in San Francisco. In October workmen began excavating for a battery of eight 12-inch mortars. This was the smallest mortar battery in San Francisco's defenses. It was eventually named Battery Alexander after Mendell's friend and San Francisco associate, Col. Barton S. Alexander. It was the Quartermaster Department's responsibility to deliver the mortars for Alexander to Point Bonita. The depot quartermaster let a contract to one George Davis to transport the mortars via an Engineer Department barge to Bonita Cove. There the engineers had blasted

out some rocks and Davis built a "gridiron" on which to float the barge at high tide; two successful landings were made. But during a severe storm on April 6, 1902, the barge broke from its moorings, wrecked on the beach, and lost the ordnance overboard. Most of the material was recovered but many parts of the carriages were lost and others were broken beyond repair.[51]

8. Batteries Chester and Livingston, Fort Miley

Fortifications were begun at Point Lobos well before those at the northern counterpart, Point Bonita. On September 23, 1899, an engineer lieutenant cleared the ground, laid out a battery for two 12-inch guns on disappearing carriages, and graded a road to the site. He also erected a blacksmith shop, carpenter shop, office, two cement sheds, and a concrete mixer. The site being close to the city, employee quarters were not needed. Sand for the concrete was hauled from Ocean Beach. The sand on the reservation was another matter: "About 25 acres of sand dunes have been planted with Bermuda grass and oats for the purpose of controlling drifting sand."

A 16-mortar battery had been approved for Fort Miley (as the Point Lobos Military Reservation was named in April 1900), at the same time as the 12-inch guns. Work on excavating its site was begun in January 1900. In order to break the wind and reduce the drifting sand, 2,000 eucalyptus trees were planted in front of the battery and around the buildings. Also, 300 young spruce trees were transplanted from the Presidio for the same purposes.

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51. NA, RG 77, OCE, General Correspondence 1894-1923, Lt. Col. D. P. Heap, CE, Nov. 15, 1901, and July 2, 1902, to Chief of Engrs., and Lt. Col. T. H. Handbury, CE, Apr. 17, 1902, to Chief of Engrs.

The operations report for August 1900 said of the 12-inch gun battery, which would eventually be named Chester: "Engineering work completed except putting in concrete aprons in front of parapet, setting base-rings, installing electric motors for hoists, white-washing rooms and passages." The mortar battery, eventually named La Rhett Livingston, had its concrete work completed at this same time. One hundred yards west of Battery Livingston, the engineers dug a 34-foot-deep well, lined it with wood, and had a windmill installed to supply water. An engineer added another botanical note in January 1901. He said that the ground around Livingston had been planted with Bermuda grass and "the interior slopes were planted with cuttings of Mesembreanthenum, a creeping plant having a vigorous growth in this locality, which it is expected will thoroughly protect them." In 1901 it was decided to add a third 12-inch gun to Battery Chester but in simple barbette rather than on a disappearing carriage. Work began on this emplacement in July 1901. Funds from this project were used to develop the road into the fort from 43rd Avenue.[52]

9. Test Firing, Fort Winfield Scott

Captain William Crozier, Ordnance Department, test-fired a number of Fort Winfield Scott's heavy weapons in the fall of 1900. The three 8-inch guns at Battery Slaughter, the five 10-inch rifles at Batteries Cranston and Marcus Miller, two of Battery Godfrey's and one of Battery Saffold's 12-inch guns, all

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52. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Letter-books, Reports of Operations 1896-1902, Lt. H. Deakyne, Oct. 3, 1899, Report of Operations for September 1899, and Lt. W. Kelly, Reports of Operations for January, March, and April, 1900, and F. C. Deacon, and July 30, 1900, to Maj. C. Davis, and Report of Operations for July 1901, and Lt. G. B. Pillsbury, Reports of Operations for August and October, 1900, and Lt. unsigned, Report of Operations for January 1901; NA, RG 77, OCE, General Correspondence 1894-1923, Gen. A. R. Buffington, Chief of Ord., May 23, 1901, to Gen. G. L. Gillespie, Chief of Engrs., and Col. J. A. Smith, June 10, 1901, to Chief of Engrs.

three of Lancaster's 12-inch guns, four of Mortar Battery 1's, and all sixteen of Mortar Battery 2's 12-inch mortars were fired at least once. Apparently the tests went satisfactorily enough but not the latrines. Few of the early batteries had latrines built into them; instead, wooden latrines were built fairly close to the guns. The shock of the firing badly wrecked two of the four latrines at Battery Lancaster and knocked out the doors and windows of those at Battery Stotsenburg. Even a second lieutenant could figure out that future emplacements would have to have more substantial facilities.

10. State of Old Armament, 1900

At the end of 1900, Maj. C. Davis at San Francisco prepared an annual armament report for San Francisco Bay. Because he made some errors of omission in it, the follow-up correspondence disclosed the disposition of many of the older guns in the Bay Area. At Alcatraz three dismounted 15-inch Rodmans and three 200-pounder Parrott rifles had been sold by the Ordnance Department. At Fort Point, 10 out of the 19 dismounted 15-inch guns had been disposed of by sale. All the guns and carriages in the old brick fort were dismounted and most of them sold. There were still a few 15-inch Rodmans and 8-inch converted rifles mounted at Alcatraz, Lime Point, and Fort Point, but their usefulness was swiftly coming to an end.[53]

11. Seacoast Searchlights

In January 1901 the report of operations for Fort Winfield Scott stated that a powerhouse and a shelter for a

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53. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Letterbooks, Reports of Operations 1896-1902, U.S. Engr. Office, San Francisco, June 27, 1901, List of Guns Fired by Capt. William Crozier, and Lt. G. Pillsbury Report of Operations, Fort W. Scott and Presidio for November 1900; NA, RG 77, OCE, General Correspondence 1894-1923, Maj. F. V. Abbot, CE, Jan. 23, 1901, to Maj. C. Davis, and Davis, Jan. 30, 1901, to Chief of Engrs. One year after test firing these guns, Captain Crozier was promoted to brigadier general and made chief of ordnance.

searchlight were nearing completion. The searchlight was designed to be employed at night against enemy ships. The operations report for May said that the light had been installed but had not yet been tested. At that same time, May 25, Davis forwarded a searchlight project for San Francisco Harbor defenses. It called for 26 lights in three sizes: 24, 30, and 36 inches. The estimated cost for the lights, power plants, and underground wiring came to $127,206. The project called for the following distribution:

Laguna de la Merced	1	30-inch
Beach south of Cliff House	1	24-inch
Fort Miley	1	36-inch, 2 24-inch
Golden Gate Cemetery	1	24-inch
Bakers Beach	1	24-inch
Fort Winfield Scott	5	24-inch
Presidio	2	24-inch
Fort Mason	1	24-inch
Alcatraz	1	24-inch
Fort McDowell (Angel Island)	1	24-inch
Fort Baker	1	36-inch, 8 24-inch

This searchlight project was not implemented as it was planned at this time. But 1901 did mark the beginning of searchlights in the harbor defenses of the Pacific Coast.[54]

12. Last Five Endicott Batteries

The last of San Francisco's Endicott batteries were constructed between 1902 and 1905. These consisted of Battery Chamberlin at Fort Winfield Scott, Battery Yates at Fort Baker, and Batteries O'Rorke, Rathbone, and Guthrie at Point Bonita.

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54. FARC, San Bruno, RG 77, OCE, San Francisco District, Letterbooks, Reports of Operations 1896-1902, Lt. ?, Reports of Operations, Ft. W. Scott, for January and May 1901; NA, RG 77, OCE, General Correspondence 1894-1923, Davis, May 24, 1901, to Chief of Engrs.; Emanual Lewis, Harbor Defense Installations, pp. 192-93. Lewis describes the installation of a second searchlight in 1901 at Fort Baker.

Battery Chamberlin, located at Bakers Beach, was designed for four 6-inch rapid-fire guns mounted on disappearing carriages. Work commenced on these emplacements in June 1902; however, at the completion of the excavation, construction was suspended until new plans for the battery were approved. These plans were eventually accepted and by March 1, 1904, Chamberlin was reported to be ready for its guns, which had not yet arrived.[55]

In March 1903 plans were prepared for a battery of six 3-inch rapid-fire guns on pedestal mounts to be located on Point Cavallo, Fort Baker. The engineer, Lt. Col. T. H. Handbury, proposed to construct the four emplacements on the right at first, the other two later on. The estimate for all six came to $43,150. One year later the battery was reported completed except for its guns which also had not arrived. When named the battery was called George Yates.[56]

In March 1904 excavation began for a battery of four 6-inch guns at Point Bonita. This probably was the work that became Battery Edwin Guthrie; but shortly thereafter construction began on a second battery of the same type. When named this latter was called Battery Samuel Rathbone. Both these batteries were completed in 1905 except for electricity, for which there were no funds, and their guns which had not yet arrived. On June 8, 1905, all the batteries at Point Bonita (including these two) were

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55. NA, RG 77, OCE, General Correspondence 1894-1923, Lt. Col. D. P. Heap, Pacific Div., June 6, 1902, Mar. 3, 1903, and Mar. 3, 1904, to Chief of Engrs., Gillespie, and Lt. Col. T. H. Handbury, May 18, 1903, to Chief of Engrs.

56. NA, RG 77, OCE, General Correspondence 1894-1923, and Handbury, Mar. 6, 1903, to Chief of Engrs., and Maj. F. V. Abbot, Mar. 6, 1903, to Handbury, and Heap, Mar. 3, 1904, to Chief of Engrs.

transferred to the artillery. By then the Point Bonita area had officially been named Fort Barry in honor of a Civil War veteran, Bvt. Maj. Gen. William F. Barry (Colonel, Second Artillery, U.S. Army), who had died in 1879. Battery O'Rorke at Fort Barry was also completed in 1905. It was at first planned to have four 15-pounder, 3-inch guns on balanced pillar mounts. Before its completion, however, the plans were changed to mount the guns on pedestals. At the time the guns were mounted (circa 1910) the change of plans required some modifications of the gun platforms.[57]

H. Names and Descriptions of Endicott Batteries

Beginning in 1902, each of the Endicott batteries was formally awarded a name by the War Department. These names have already been used herein as a means of identification; now that all the batteries of that period have been accounted for, there follows a list of the batteries, their armament, the War Department general orders (GO) that named them, and an identification of the persons for whom named.

1. Fort Winfield Scott

a. Lancaster

Three 12-inch BL rifles were manufactured by Watervliet Arsenal. Two were model 1895, nos. 5 and 6; the third was model 1888 MI, no. 40. Two of the 12-inch disappearing carriages (nos. 6 and 7) were manufactured by Robert Poole & Sons Company. Morgan Engineering Company manufactured the third, no. 25. The battery was named by GO 16, February 14, 1902, in honor of Lt. Col. James M. Lancaster, Third Artillery, who died at

57. NA, RG 77, OCE, General Correspondence 1894-1923, Heap, Mar. 3, 1923, to Chief of Engrs., and Heuer, Annual Report on Defenses of San Francisco, FY 1905; FARC, San Bruno, RG 77, OCE, San Fancisco Dist., Letterbooks 1909-1910, vol. 18, Lt. Col. J. Biddle, May 11, 1910, to Col. J. A. Lundeen, CO, Artillery Dist. of San Francisco.

Fort Monroe, Virginia, in 1900. Lancaster was a graduate of West Point and had fought in the Civil War.

b. Cranston

Two 10-inch BL rifles (model 1888 MII, nos. 7 and 13) were fabricated by Bethlehem Steel Company. They were mounted on disappearing carriages (model 1896, nos. 2? and 29), also made by Bethlehem. The battery was named in GO 16, February 14, 1902, in honor of Lt. Arthur Cranston, Fourth Artillery, who was killed in the Lava Beds in 1873 during the Modoc War. He had been stationed at the Presidio of San Francisco when the Modoc War began.

c. Marcus Miller

Three 10-inch BL rifles (model 1888, nos. 5, 15, and 18) were manufactured by Watervliet Arsenal. Two of the three disappearing carriages (model 1894, nos. 27 and 34) were manufactured at the Watertown Arsenal; the third (model 1894, no. 24) was made by William Cramp & Sons Company. Originally considered to be part of Battery Cranston, this battery was considered a separate one by the War Department about 1907 and was called at first "Cranston 2." This designation was most unsatisfactory, and in October 1907 the adjutant general announced that GO 210, c.s., had changed the battery's name to Marcus Miller in honor of Brig. Gen. Marcus Miller, Artillery. He was a West Point graduate and had fought in the Civil War, the Modoc War, and the Nez Perce War. In 1898 he had been the commanding officer of the Presidio of San Francisco. This battery was the first Endicott work undertaken in the San Francisco defenses.

d. Boutelle

Three 5-inch rapid-fire guns (model 1897, nos. 3, 15, and 17) were manufactured by the Bethlehem Steel Company. They were on Bethlehem Steel balanced pillar mounts (model 1895,

nos. 12, 13, and 14). This work was named in GO 105, October 9, 1902, in honor of Lt. Henry M. Boutelle who had entered on active duty in 1898 and was killed in action near Aliago, Philippine Islands, in 1899.

e. Godfrey

Three 12-inch BL rifles (model 1888, nos. 4, 6, and 9) were manufacture at Watervliet Arsenal. They were mounted on Watertown Arsenal nondisapperaing carriages (model 1892, nos. 2, 3, and 6). This battery, the first Endicott work to be completed and armed in San Francisco, was named in GO 16, February 14, 1902, in honor of Capt. George J. Godfrey, 22d Infantry, who was killed in action at Cavite, Island of Luzon, Philippine Islands, in 1899.

f. Dynamite

Three pneumatic 15-inch dynamite guns were not a part of the defenses of San Francisco and were mounted by the manufacturer for firing tests. The weapon was not adopted by the army, and it was named unofficially for the type of gun it had.

g. Saffold

Two 12-inch BL rifles were manufactured at Watervliet Arsenal; one rifle was model 1888 (no. 3) and the other was model 1888 MII (no. 19) Watervliet. They were mounted on Watertown Arsenal nondisappearing carriages, model 1894 (nos. 7 and 8). This work was named in GO 16, February 14, 1902, in honor of Capt. Marion M. Saffold, 13th Infantry, who, along with Godfrey above, was killed in action at Cavite, Philippine Islands, in 1899.

h. Crosby

Two 6-inch BL rifles (model 1897 MI, nos. 28 and 30) were fabricated at Watervliet Arsenal. They were mounted

on Watertown Arsenal disappearing carriages, nos. 5 and 6. This battery was named in GO 16, February 14, 1902, in honor of Lt. Franklin B. Crosby, Fourth Artillery. Crosby was killed in the battle of Chancellorsville, Virginia, in May 1863.

i. Chamberlin

Four 6-inch disappearing guns (model 1903, nos. 26, 27, 28, and 52) were manufactured at Watertown Arsenal. The disappearing carriages were (model 1903, nos. 27, 28, 29, and 30) made by Wellman, Seaver, Morgan Company. These emplacements were named in GO 194, December 27, 1904, in honor of Capt. Lowell A. Chamberlin, First Artillery, who had served with distinction in the Civil War and died in 1899. (In 1920, Battery Chamberlin was modified to receive two 6-inch guns on simple barbette carriages.)

j. Baldwin

Two 3-inch, 15-pounder rapid-fire guns on masking parapet (balanced pillar) mounts (model 1898, nos. 73 and 74) were manufactured by Driggs-Seabury Gun and Ammunition Company. This rapid-fire battery was named in GO 105, October 9, 1902, in honor of Lt. Henry M. Baldwin, Fifth Artillery, who died of wounds received at Cedar Creek, Virginia, in October 1864.

k. Sherwood

Two 5-inch guns (model 1900, nos. 2 and 13), Watervliet Arsenal, were mounted on barbette carriages, pedestal mounts (model 1903, nos. 16 and 17) Morgan Engineering Company. This battery was named in GO 16, February 14, 1902, in honor of Lt. Walter Sherwood, Seventh Infantry, who was killed in action in a battle with Seminoles in Florida, 1840.

l. Slaughter

Three 8-inch BL rifles (model 1888, nos. 2, 3, and 8) were fabricated at Watervliet Arsenal. These were mounted on disappearing carriages, model 1896. Carriage 30 was manufactured by the Walker Company; carriage 25 was made by Morgan Engineering Company; and carriage 2 was made by the Pond Machine Tool Company. The battery was named in GO 16, dated February 14, 1902, in honor of Lt. William A. Slaughter, Fourth Infantry, who was killed by White River (Wenatchee?) Indians at Brannons Prairie, Washington Territory, 1855.

m. Blaney

Four 15-pounder rapid-fire guns on balanced pillar mounts were manufactured by Driggs-Seabury (model 1898). Two of them, nos. 23 and 75, were manufactured at the Frankford Arsenal; the other two (nos. 12 and 95) were made at the Watertown Arsenal. These emplacements were named in GO 105, October 9, 1902, in honor of Lt. Daniel Blaney, Third Artillery, who was killed by the British at Fort Oswego, New York, 1814.

n. Howe

Originally four pits of sixteen 12-inch BL mortars, were then reduced to two pits having eight mortars. The mortars were models 1886 and 1886M, nos. 33, 38, 39, 43, 44, 46, and 47, manufactured by Builder's Iron Foundry, Providence, R.I. The carriages were model 1891. Four of them nos. 21, 22, 23, and 26 were made by Builder's Iron Foundry; the other four, nos. 45, 47, 48, and 51, were manufactured by Robert Poole and Sons Company. When the battery was divided, the name Howe continued to be applied to the two eastern pits. The 16-mortar battery was named in GO 16, February 14, 1902, in honor of Col. Albion P. Howe, Fourth Artillery, vetern of both the Mexican and Civil wars, who died in 1897. Colonel Howe served at San Francisco. (His son of the same name was killed in the Modoc War at the same time as was Lieutenant Cranston above.)

o. Arthur Wagner

Eight 12-inch BL mortars originally were a part of Battery Howe (the two western pits). Four of them were model 1886 (nos. 5, 6, 7, and 8) and made by Builder's Iron Foundry. The other four (nos. 36, 40, 42, and 53) were model 1886M and also came from Builder's. That same company provided four of the model 1891 carriages, nos. 31, 32, 33, and 34; Robert Poole and Sons provided the other four, nos. 45, 67, 71, and 78. This battery was named in GO 20, January 25, 1906, in honor of Col. Arthur L. Wagner, military secretary, U.S. Army, who served with distinction in the Spanish-American War. For several years he was a professor at the Infantry and Cavalry School, Fort Leavenworth, Kansas, and he wrote several military textbooks.

p. Stotsenburg

Originally four pits having sixteen 12-inch BL mortars were model 1890 MI. In 1906 it was reduced to two pits (A and B) and eight mortars. Mortars nos. 35, 47, and 49 were made at the Watervliet Arsenal; nos. 22a, 30, 31, and 33 were manufactured by Builder's Iron Foundry; and mortar no. 6 came from Niles Tool Works Company. The carriages were model 1896 converted to 1896 MI. All eight came from Southwark Foundry and Machine Company--nos. 60, 61, 62, 63, 64, 65, 66, and 67. This work was named in GO 16, February 14, 1902, in honor of Capt. John M. Stotsenburg, Sixth Cavalry, who was killed in action at Timgua, Luzon, Philippine Islands, in 1899.

q. William McKinnon

Eight mortars were in pits C and D of the original Battery Stotsenburg. All eight mortars were model 1890 MI. Three of them (nos. 28c, 39, and 46) were constructed at Watervliet Arsenal; four (nos. 23, 28d, 34, and 36) came from Builder's Iron Foundry; and Bethlehem Steel Company made the eighth, no. 22b. The carriages were model 1896 converted into

1896 MI, nos. 79, 80, 85, 86, 91, 94, 95, and 96, all coming from Robert Poole and Sons Company. The battery was named in GO 20, January 25, 1906, in honor of Chaplain William D. McKinnon, Third Cavalry, who served with distinction in the Spanish-American War and the Filipino Insurrection. He died on active duty in 1902.

2. Fort Mason

Burnham - One 8-inch BL rifle (model 1888) was mounted on an 8-inch disappearing carriage (model 1896). This battery was named in GO 16, February 14, 1902, in honor of Lt. Howard M. Burnham, killed in action at the battle of Chickamouga, Georgia, September 1863. Construction of this battery was essentially completed by September 1899, although the gun had not yet been mounted.

3. Fort Miley

a. James Chester

Two 12-inch BL rifles (model 1894, nos. 22 and 24) were fabricated at Watervliet Arsenal. These two guns were mounted on Watertown Arsenal disappearing carriages (model 1896, nos. 26 and 27). The third 12-inch gun (model 1888 MII, no. 3) came from the Bethlehem Steel Company. It was mounted on a nondisappearing carriage (model 1892, no. 22), Watertown Arsenal. The battery was named in GO 194, December 27, 1904, in honor of Maj. James Chester, Third Artillery, who had served with distinction in the Civil War and who died May 27, 1903.

b. La Rhett Livingston

The battery originally had sixteen 12-inch BL mortars, but the battery was reduced to two pits (A and B) and eight mortars in 1906. All eight mortars were model 1890, nos. 140, 142, 143, 149, 153, 154, 156, and 161 and were manufactured at the Watervliet Arsenal. The carriages were model 1896, converted into 1896 MI. Three of them (nos. 292, 293, and 300)

were made at the Rarig Manufacturing Company; the other five (nos. 234, 235, 236, 238, and 239) came from the Watertown Arsenal. This battery was named in GO 194, December 27, 1904, in honor of Col. La Rhett L. Livingston, Third Artillery, who also had served with distinction in the Civil War and who died in March 1903.

c. Anton Springer

Eight mortars originally were pits C and D of of Battery La Rhett Livingston. All eight were model 1890 (nos. 95, 163, 164, 165, 166, 167, 168, and 169) and came from the Watervliet Arsenal. Their carriages were model 1896 altered into 1896 MI. Three (nos. 299, 301, and 302) came from the Rarig Engineering Company. The others (nos. 230, 231, 232, 233, and 290) were made at the Watertown Arsenal. This part of old La Rhett Livingston was redesignated in GO 20, January 25, 1906, in honor of Capt. Anton Springer, a native of France and a West Point graduate. As a captain in the First Infantry, Springer was killed in action near Lipa, Philippine Islands, in 1901.

4. Fort McDowell (Angel Island)

a. Drew

One 8-inch BL rifle (model 1888, no. 36) came from the Watervliet Arsenal and was mounted on a nondisappearing carriage (model 1892, no. 6) from Watertown Arsenal. This rifle was named in GO 16, February 24, 1902, in honor of Lt. Alfred W. Drew, 12th Infantry, who was killed in action at Angeles, Luzon, Philippine Islands, in 1899.

b. Wallace

One 8-inch BL rifle (model 1888, no. 11) came from the Bethlehem Steel Company and was mounted on a disappearing carriage (model 1896, no. 26) that was manufactured by the Walker Company. This battery was named in GO 16,

February 14, 1902, in honor of Lt. Robert B. Wallace, Second Cavalry, who died of wounds received at Caloocan, Luzon, Philippine Islands, in 1899.

c. Ledyard

Two 5-inch rapid-fire guns (model 1900, nos. 1 and 7) came from Watervliet Arsenal, mounted on barbette carriages, pedestal mounts, model 1903, nos. 14 and 15, Morgan Engineering Company. The battery was named in GO 16, February 14, 1902, in honor of Lt. August C. Ledyard, Sixth Infantry, who was killed in action on the Island of Negros, Philippine Islands, in 1899.

5. Fort Baker

a. Spencer

Three 12-inch BL rifles (model 1888, nos. 10, 16, and 17) came from the Watervliet Arsenal, mounted on nondisappearing carriages (model 1892, nos. 1, 4, and 5), Watertown Arsenal. This battery was named in GO 16, February 14, 1902, in honor of Maj. Gen. Joseph Spencer, Continental Army, 1775-1778, who died in 1789.

b. Kirby

Two 12-inch BL rifles (model 1894, nos. 12 and 16) came from the Watervliet Arsenal, mounted on disappearing carriages (model 1897, nos. 14 and 15) and manufactured by the Morgan Engineering Company. This battery was named in GO 16, February 14, 1902, in honor of Lt. Edmund Kirby, who died on May 28, 1863, from wounds received on May 3 at the Battle of Chancellorsville, Virginia. Kirby was promoted to brigadier general of volunteers on the day he died.

c. Duncan

Two 8-inch BL rifles (model 1888, no. 8) came from the West Point Foundry, and no. 24 from Bethlehem Iron Company. There were mounted on nondisappearing carriages (model 1892, nos. 2 and 4), Watertown Arsenal. The work was named in GO 16, February 14, 1902, in honor of Col. James Duncan, a West Point graduate, who had a highly distinguished record in the Mexican War. In 1849 he became a colonel in the Inspector General Department but died that same year.

d. Orlando Wagner

Two 5-inch rapid-fire guns (model 1897, nos. 19 and 21) were manufactured by Bethlehem Steel Company and mounted on balanced pillar mounts (model 1896, nos. 10 and 11) also from Bethlehem Steel Company. This battery was named in GO 194, December 17, 1904, in honor of Lt. Orlando G. Wagner, Topographical Engineers, who was mortally wounded at the Civil War siege of Yorktown, Virginia, in 1862.

e. Yates

Six 3-inch 15-pounder guns and barbette carriages (on pedestal mounts, model 1902, nos. 18, 19, 20, 21, 22, and 23) came from the Bethlehem Steel Company. This battery was named in GO 94, dated December 27, 1904, in honor of Capt. George W. Yates, Seventh Cavalry, killed in action by Sioux Indians on June 25, 1876, at the Little Big Horn River, Montana (the Custer debacle).

6. Fort Barry

a. Mendell

Two 12-inch BL rifles (model 1895, nos. 4B and 6, Bethlehem Steel Company; mounted on disappearing carriages, model 1897, nos. 30 and 31) were manufactued by the Midvale Steel Company. This first battery at Point Bonita was named in GO 120,

dated November 22, 1902, in honor of Col. George H. Mendell, Corps of Engineers, who had more to do with the defenses of San Francisco than any other engineer officer. He died in San Francisco in 1902.

b. Alexander

Eight 12-inch BL mortars (model 1890, nos. 145, 147, 148, 150, 151, 155, 159, 160) came from the Watervliet Arsenal mounted on carriages, model 1896 (converted into model 1896 MI), nos. 227, 278, 279, 280, 281, 282, 283, and 284, made by Rarig Engineering Company. This mortar battery was named in GO 120, November 22, 1902, in honor of Col. Barton S. Alexander, Corps of Engineers. Alexander served with distinction in both the Mexican and Civil wars. At the time of his death, 1878, he was the senior engineer on the Pacific Coast and the friend and associate of Colonel Mendel above.

c. Edwin Guthrie

Originally four 6-inch rapid-fire guns (model 1900, nos. 2, 3, 5, and 12) came from the Watervliet Arsenal, mounted on barbette carriages (model 1900, nos. 13, 14, 15, and 16) made at the Rock Island Arsenal. These emplacements were named in GO 194, December 27, 1904, in honor of Capt. Edwin Guthrie, 15th Infantry, who died of wounds received in action at La Hoya, Mexico, in 1847.

d. Hamilton A. Smith

In 1922, Battery Edwin Guthrie was divided for better mangement of the weapons, the two guns on the left flank becoming Battery Hamilton A. Smith in accordance with GO 13, dated March 22, 1922. Smith was a West Point graduate who was killed in action at Soissons, France, in 1918. He was awarded the Distinguished Service Cross posthumously.

e. Samuel Rathbone

Originally four 6-inch rapid-fire guns (model 1900, nos. 19, 29, 33, and 34) were manufactured at the Watervliet Arsenal. They were mounted on barbette carriages (model 1900, nos. 42, 43, 44) from the Builder's Iron Foundry and no. 26 from the Watervliet Arsenal. This battery was named in GO 194, December 27, 1904, in honor of Lt. Samuel B. Rathbone, U.S. Artillerists, who died of wounds received in the attack on Queenston Heights, Upper Canada, in 1812.

f. James F. McIndoe

In 1922, Battery Samuel Rathbone was divided, the two guns on the left flank becoming James F. McIndoe in accordance with GO 13, March 22, 1922. McIndoe, an engineer officer, was a brigadier general serving in France where he died in 1918.

g. Patrick O'Rorke

Four 15-pounder, 3-inch guns on pedestal mounts, barbette carriages (model 1903, nos. 68, 69, 70, 71) came from Watertown Arsenal. (The guns had not yet arrived in San Francisco in 1909, when the document from which much of this material has been taken was written.) This battery was named in GO 194, December 27, 1904, in honor of Col. Patrick Henry O'Rorke, born in Ireland and a West Point graduate, who was killed at the battle of Gettysburg, Pennsylvania, in July 1863.[58]

I. Maintenance and Repairs

The maintenance of the batteries was a never-ending process. A proper accounting of such activity would require a

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58. SF, PAM, "Historical Record of Presidio Batteries, January 12, 1975"; Emanuel Lewis, Harbor Defense Installations, Appendix II, pp. 3-8; FARC, San Bruno, RG 77, OCE, San Francisco Dist., Letterbooks 1909-1910, vol. 16, "Report of Completed Batteries, Etc., Defenses of San Francisco," Dec. 31, 1909; Heitman, 1: numerous pages.

volume by itself; this study will recount only a few items in the category of maintenance, simply to indicate how the engineers solved their problems and to determine how some features of the batteries came about.

By 1902 the engineers were concerned about the number of batteries that had developed serious leaks. Nearly every battery at Fort Winfield Scott and Battery Drew on Angel Island were so afflicted. The causes were not difficult to determine: insufficient drainage of foundations and improper location of drain pipes, failure to plaster properly the outside walls underground, flat roofs, defective plastering and top finish over porous concrete, poor foundations resulting in unequal settling and cracks, and building the battery in one monolith that joined large and small masses that caused cracking because of unequal contraction and expansion.

The engineers tried a number of techniques to cure the leaks. At Battery Kirby they simply laid a tin roof over the concrete. At Spencer, a disintegrating asphalt cover was removed and the concrete surface roughened with a pick. A 5-inch layer of concrete (1 part cement, 2 parts sand, and 5 parts fine gravel) was put down; over that 1-inch granolithic finish (1 part cement and 1½ parts fine gravel) was placed; and the surface was painted with two coats of brown paint consisting of pure boiled linseed oil and Prince's metallic paint. A distinctive feature to be seen today at Battery Marcus Miller came about because of leaks. There, the asphalt was removed from the almost flat superior slope, and a new concrete pavement with an increased slope was laid down. This concrete was divided into many different monoliths, with caulked joints between, as it was otherwise impossible to preserve the integrity of so large and comparatively thin slab of pavement--a perfect bond with the old concrete being almost impossible to obtain.

Whitewashing rooms and painting woodwork were endless tasks. In 1903, the engineers prepared wooden signs for all the batteries. These contained each battery's name in black letters, 6 inches high, on a white background. When an inspector general criticized that drainage plans were not posted at the batteries, the engineers proposed to supply each battery with "a neat 3" wooden frame with a light board back, and fitted with 21 oz. glass." In 1905 on the northern side of the Golden Gate at least, the name of each room in all the batteries was painted on its door, and the number of each gun emplacement was painted on the parapet (gun emplacements were numbered from right to left).[59]

Mortar Battery Livingston at Fort Miley received a special allotment in 1905 to alter its slopes. At the front, the slope was taken out 6½ feet and reduced to a slope of 2 in 3. Two pits were planted with ice plant ("Mesembryan") and the other two with Australian rye grass seed. Elsewhere, the 10- and 12-inch gun platforms were modified, experience showing that they had been constructed too small. The modification provided an extension to the rear of each platform, resulting in a straight parade wall. The cost of this change for Batteries Mendell, Kirby, Lancaster, Cranston, Marcus Miller, and Chèster was estimated at $75,000.[60]

Battery Spencer, high above the Golden Gate at Fort Baker, had been one of the first batteries built at San Francisco in

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59. NA, RG 77, OCE, General Correspondence 1894-1923, Heap, June 6, 1902, to Chief of Engrs., and Handbury, July 10, 1902, Apr. 16, 1903, and July 20, 1904, to Chief of Engrs., Heuer, Annual Report on Defenses of San Francisco, FY 1905, and Supt. Frank Deacon, July 3, 1905, to Heuer, and Brig. Gen. W.F. Randolph, Chief of Artillery, c. July 1903, to Chief of Engrs.

60. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Fort W. Scott, Correspondence Received 1902-1907, Deacon, July 3, 1905, to Heuer; NA, RG 77, OCE, General Correspondence 1894-1923, Col. C.R. Suter, President, Board of Engrs., Feb. 23, 1904, to Chief of Engrs.

the Endicott period. Although the Engineer Department had planned its construction carefully and on the basis of what then was known about requirements for 12-inch emplacements, the battery was considered to be "structurally out of date" as early as 1904. The battery commander, Capt. Eugene T. Wilson, prepared a list of 20 major deficiencies:

Shot rooms had insufficient capacity.

Powder magazines had insufficient capacity.

There was only one powder magazine for guns 1 and 2.

Galleries were too narrow.

Galleries were too crooked.

No storage space was available for armament chests, sponges, etc.

Only one ammunition hoist was needed per gun.

There was means of returning empty shot trucks to magazine with sufficient rapidity.

There were no latrines.

There was no commanding officer's room.

There was no guardroom.

There was no place to install telephone or other booths where they would be protected in action.

There was no communication by speaking tube, or other means, between guns, magazines, etc.

Battery parade should be on level with magazine floors to enable ammunition to be hoisted from the parade in an emergency.

There should be an entrance to the galleries from each gun to afford more light and freer access to the parade.

Ammunition hoists were mechanically unsatisfactory.

There was no permanent lookout for battery commander (BC station).

There was no storage space for waste, cleaning material, spare emergency parts, and policing tools and implements.

There were no conduits for telephone and other wires.

There were too few magazines to allow proper segregation of loaded shells.

Wilson's complaint bore results. The artillery inspector for the Pacific Division visited Spencer and, while agreeing with the battery commander, shed some more light on the shortcomings. The shellrooms, for example, could hold only about 90 armor-piercing shells instead of the 200 that should be on hand for each gun (an AP shell then had a length of 49.04 inches). The powder magazines could store only 120 four-section cartridges out of the 400 required. The galleries were too narrow to allow trucks to pass. The shot hoist, an old platform lift type, was absurdly inefficient; it took four minutes to deliver ammunition. As bad as anything was the situation wherein the shot truck was hoisted with

the shot to the loading platform. However, it could not return by the same route because the gallery underneath was too narrow for two trucks to pass. Consequently, the truck had to be returned by way of two flights of stone steps.

A year later, the engineers completed plans for a number of improvements at the battery. The road leading up to it was to be cut down to the level of the parade. On the right of the road, at the entrance to the battery, four service rooms were to be built: a commanding officer's room (12 by 14 feet), a guardroom (12 by 14 feet), a transformer room (12 by 20 feet), and a storeroom (12 by 12 feet). On the left side of the battery parade two rooms were planned: a storeroom for all rammers and sponges (7 by 25 feet) and an oil room (7 by 10 feet). A crow's nest was to be built on each flank of the battery. Other improvements planned included a latrine, enlargement of the magazines, and for installation of Taylor-Raymond chain ammunition hoists. The estimated cost for everything came to no less than $36,670.

Meanwhile, the artillerists continued target practice at Spencer, regardless of its deficiencies. In the summer of 1905 during the firing of gun 1, a bolt at the front of the base ring sheared off. The Engineer Office in San Francisco dispatched its junior engineer to cross the bay to inspect the damage, his name: 1st Lt. Douglas MacArthur. Young MacArthur (his father, Arthur, commanded the Pacific Division at that time) had been assigned to the San Francisco Engineer Office since November 1904, but since January 1905 his duties had apparently been mostly concerned with rivers and harbors. At any rate, his report of inspection of the damage to Battery Spencer is the only document by MacArthur concerning the defenses of San Francisco that has yet been found. The future general concluded that the bolts holding down the base ring had been designed for the old black powder charge and simply were not strong enough to withstand the new nitrocellulose powder.

As a result of his findings, the Engineer Department issued a "mimeograph" on the subject, altering all engineers nationwide.[61]

J. Interlude

1. Arthur MacArthur and Alcatraz Island

Shortly before Douglas arrived in San Francisco, his famous father, Maj. Gen. Arthur MacArthur, worried about plans for a new military prison on Alcatraz Island. If the prison was built, he was afraid it would materially interfere with the modern batteries that were planned for the island. He believed that all of Alcatraz should be devoted to fortifications: "Personally, I favor high power guns and as many of them as can be installed on the island." However, MacArthur was behind the times. Alcatraz's role in the defenses of San Francisco had already diminished greatly. A new temporary prison was authorized immediately and within three years the secretary of war would approve a permanent military prison on the island. The Engineer Department would then sever all relations with it.[62]

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61. NA, RG 77, OCE, General Correspondence 1894-1923, Wilson, Feb. 26, 1904, to Post Adjutant, Fort Baker, and Handbury, Mar. 27, 1905, to Chief of Engrs., and Maj. F.V. Abbot, Apr. 1, 1905, to Lt. Douglas MacArthur, and Douglas MacArthur, June 20, 1905, to Heuer. Douglas MacArthur graduated from West Point in 1903. After a year's duty in the Philippines, he was assigned to the Engineer Office, San Francisco, where his duties included both fortifications and the California Debris Commission. For three months in 1905 he was acting chief engineer officer for the Pacific Division--his father was absent from San Francisco during that time. In October 1905 he was appointed an aide-de-camp to the commanding general, Pacific Division, and left San Francisco almost immediately for a year's confidential duty in the Far East and India. Cullum, Biographical Register, 5:690.

62. NA, RG 92, OQMG, General Correspondence 1890-1914, Maj. Gen. A. MacArthur, Nov. 9, 1903, to AG, Washington, D.C.

2. Salvo Firing, Fort Winfield Scott

In 1903 the army carried out experimental salvo firing of both the big 12-inch guns and the 12-inch mortars at Fort Winfield Scott to determine blast effects. This data was needed by a board of officers that had been charged with selecting the locations of fire and battery commander stations at Fort McDowell, Point Bonita, and Fort Miley. The board had concluded that no data existed for determining the distance from the guns required to guarantee the safety of the delicate instruments that these stations would have. The Engineer Department was also greatly interested in this firing to learn how its structures would withstand the shock. The charges for all the firing were "full service," these for the guns being 247 pounds of smokeless powder with cast-iron projectiles weighing 1,000 pounds and those for the mortars consisting of 53.4 pounds of smokeless powder with 800-pound cast-iron projectiles.

The first experiment involved the three 12-inch guns at Battery Lancaster, directly above the old brick fort. The board decided to fire first a single shot from each of the three guns, this to be followed by a salvo from the three guns. The second test was more extensive. After a single shot from the left gun of Godfrey, the five 12-inch guns of Godfrey and Saffold fired two salvos, one battery after the other. The experiments concluded with a salvo from the 16 mortars in Stotsenburg, all firing at an elevation of 59° 17'.

The results were impressive. At Battery Lancaster the closed door of the battery commander station split along an old crack, the door of an instrument box swung open, and the hinges broke. All the latrines were damaged, with broken windows and doors. A watchman's house, 100 yards away, had several windows broken and boards torn off. And a window was reported broken at Fort Miley, over two miles away. On the Godfrey-Saffold salvos, windows broke, steps were destroyed, and there was much minor

damage. The light keeper on Alcatraz Island, 3½ miles distant, reported: "The lighthouse dwelling was shaken by heavy jar at 12:15 p.m. June 5th, supposed to be from Presidio guns. 1 plate glass in tower was badly split, and two others were chipped." That was the date and time of one of the salvos from Battery Godfrey. The 16-mortar salvo at Stotsenburg caused the most damage. Again, windows were broken and wooden latrines damaged. Two heavy double doors on magazines were broken and the hinges strained. The powerhouse for Dynamite Battery, 800 yards in front, had glass broken. The Marine Hospital, 800 yards in the rear, had windows broken and plaster cracked, and a private residence, 1,000 yards away, had glass broken. Also, the blast set fire to the grass about the battery, and the artillerymen had to beat it out with their coats.

The board's conclusions from these experiments were obvious: all doors and windows must be open when guns are fired; the battery commander station should be at least 100 yards from the guns; positions to one side of a gun were safer than those in the rear; position-finding instruments must be on a firm and solid base; and other instruments such as TelAutographs, telephones, barometers, and clocks should be freely suspended.[63]

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63. NA, RG 77, OCE, General Correspondence 1894-1923, Heap, June 8, 1903, to Chief of Engrs., and Supplement to Mineograph 43, "Experimental firing of high-power guns and mortars at Fort Winfield Scott," confidential.

III. Taft Board to World War I, 1904-1914

A. Taft Board

1. Los Angeles Chamber of Commerce

In the fall of 1904 Harrison Gray Otis, president of the Los Angeles Times-Mirror Company and a veteran of both the Civil and Spanish-American wars (Philippines), wrote Secretary of War William H. Taft, saying that the Los Angeles Chamber of Commerce had approved Otis's suggestion of assembling a "Fortifications Congress" in Los Angeles to discuss coastal defenses of the Pacific Coast. At the same time, Otis published a number of editorials in the Los Angeles Times that noted the rise of Japan as a military power, the ambitions of Germany, and the apathy of Americans. He observed that only San Francisco was adequately defended, and he praised General Arthur MacArthur's recommendation for a military post at Los Angeles.

Taft directed Chief of Engineers Alexander Mackenzie to respond to Otis. Mackenzie pointed out there were "extensive" defenses at Admiralty Inlet, mouth of the Columbia River, San Francisco, and San Diego. He said that these works were as good as any to be found in Europe or Asia and that the newest batteries were much better than those the United States built in the early 1890s at the beginning of the Endicott period. The U.S. Congress had appropriated over $28 million more than half of what the Endicott Board had estimated for the fortifications. To this, one should add the expenditures of the Ordnance and Quartermaster departments.

2. Roosevelt Forms the Taft Board

What influence, if any, Otis's recommendations had on President Theodore Roosevelt is not known, but in the following year Roosevelt formed a board headed by Taft to review the Endicott program and to bring it up to date. The historian E.R. Lewis has described the updating in technology that resulted from

the Taft Board's findings: "While it proposed few if any entirely new kinds of equipment, the Board's report did have the effect of accelerating the installation of many features which had been projected by the Endicott Board, but which had been neither fully developed until around 1900 nor yet installed except in limited numbers." Among the more important of these were the organizing of searchlights in batteries for the illumination of harbor entrances and electrification of fortifications, including lighting, communications, and ammunition handling, and a modern system of aiming.

Of this last, Lewis writes that it was the most significant advance made in harbor defense fire control until the introduction of radar. Until now aiming had been done from individual guns with elementary instruments.

> The new system, in contrast, was based on a combination of optical instrumentation of great precision, the rapid processing of mathematical data, and the electrical transmission of target-sighting and gun-pointing information. Of the several methods of fire control devised about this time, the most elaborate and precise made use, for a given battery, of two or more widely spaced sighting structures technically known as base-end stations. From these small buildings simultaneous optical bearings were continuously taken of a moving target, and the angles of sight were communicated repeatedly to a central battery computing room. Here the successive sightings were plotted and future target positions were predicted. . . . The computed products were then translated into aiming directions which were forwarded electrically to each gun emplacement or mortar pit.

Some experimentation and planning had been made in these several technological advances in San Francisco's harbor

defenses (the searchlight project and salvo firing have already been noted herein), but the effect of the Taft Board may be seen in the engineers' future work.[1]

B. Technical Advances

1. Electrification

Prior to December 1904 a few small electrical plants had been installed at some of the batteries of Fort Winfield Scott, and a small plant generated electricity for the searchlight mounted near Battery Spencer, Fort Baker. During that month a board of officers met in San Francisco to consider the electrical needs of the harbor defenses. It pointed out that the Endicott Board had ranked San Francisco as the second most important point in the United States to be defended. However, concerning electric installation, San Francisco fortifications "are thought to be behind those of every other fortified port on the Pacific Coast and far behind the defenses of many eastern harbors." The present plants were inadequate in supply and unsatisfactory in operation. The wiring was temporary and a constant source of trouble. If an emergency arose, the existing system would probably not operate for more than 24 hours without a serious breakdown.

After analyzing the needs of the area, the board concluded that a central power station at each post was preferable to numerous isolated plants. A central plant would be more economical, require fewer skilled technicians, and permit better and closer supervision. An individual unit of the plant could be shut down for repairs without interfering with the supply of light and power. The officers also thought that the machinery and other

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1. Emanuel Lewis, Seacoast Fortifications, pp. 89 and 93; NA, RG 77, OCE, General Correspondence 1894-1923, Harrison G. Otis, October. 13, 1904, to Sect. of War Taft, and Brig. Gen. A. Mackenzie, Dec. 6, 1904, to Otis. The Taft Board was more properly called the National Coast Defense Board. Los Angeles eventually got its coastal fortifications--Fort MacArthur.

material should be standardized throughout the harbor, there being few counterparts in the present collection of plants.

Realizing that funds were inadequate for installing central power plants in all posts at once, the board suggested a priority list. Since Fort Winfield Scott was then the artillery district headquarters and contained the largest amount of armament, it should be the first to acquire permanent equipment. An excellent building, well protected, was already available--the brick power plant that had supplied energy to the now obsolete Dynamite Battery. It was sufficiently large, centrally located, and thoroughly protected from enemy fire. Although the board did not think it advisable for this plant to supply electricity to the post at the Presidio, it would certainly be able to light a new artillery post at Fort Winfield Scott.

Once this plant was operative, the smaller plants at Winfield Scott could be sent to the other posts in the harbor: one to Fort Baker to provide additional power for the 36-inch searchlight and another to Fort Miley for a proposed 36-inch searchlight. The remaining forts (McDowell, Mason, and Point Bonita), not then having artillery garrisons, could affort to wait for permanent equipment.

The board's recommendations were generally approved, and Fort Winfield Scott was the first post to acquire a central power plant. However, before the old dynamite plant could be put to use, the earthquake of 1906 demolished the building by causing the retaining wall about it to collapse. Not until 1910 was a central power plant installed in a new concrete building on the same site. So important a step forward was this that an account of the installation of the plant appeared in the Journal of United States Artillery. This account described the building as having a boiler room, engine room, shop, storehouse, and lavatory. The

equipment consisted of two 200-horsepower Keeler water-tube boilers; two Buffalo Forge, single cylinder, noncondensing steam engines; two 100-KW, DC Western Electric generators; a four-panel Walker electric switchboard; and two oil storage tanks. But for years to come, the other posts continued to rely on small 25-kilowatt sets supplying electricity for a battery or two.[2]

2. Chain Hoists

In the earlier Endicott batteries at San Francisco, ammunition was lifted from the magazines to the platforms by inefficient lifts, such as at Battery Spencer, or by cranes, such as at Battery Cranston. An engineer described the situation at Cranston's 10-inch emplacements. There the floors of the magazines and the back of the gun platforms were on the same level. The ammunition was brought to the rear of the platform by truck and then hoisted to the platform by using iron davits, chains, and pulleys. At Marcus Miller the floors of the magazines were lower than the floors in the rear of the gun platforms. There trolleys carried the ammunition to a point in the magazines adjacent to the gun platform; from there it was hoisted by chains and pulleys and placed on trucks; and then the trucks hauled it to the rear of the platform and it was raised by davits as at Cranston.

Some of the later batteries, such as Wallace, Mendell, Burnham, Crosby, and Chester, had a newer and more

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2. NA, RG 77, OCE, General Correspondence 1894-1923, Col. Charles Morris, Artillery Dist. of San Francisco, Presidio, Dec 20, 1904, to Chief of Engrs; Maj. George W. Goethals in "Electricity in Permanent Seacoast Defenses," Journal of the United States Artillery 19(1903):47, pointed out that engineers realized from the beginning of the Endicott period the importance of electricity but had not supplied it because of the limited appropriations. J. C. Johnson "The Electric Lighting and Power Plant for Fortification and Fire Control Purposes, Fort Winfield Scott, California," Journal of the United States Artillery 36(1911):44.

efficient method of delivering ammunition. This was the Taylor-Raymond chain hoists. In January 1905 the chief of engineers announced an army-wide program to install Taylor-Raymond hoists in all batteries where needed. Engineer Handbury prepared plans and estimates for those batteries requiring the new equipment at San Francisco: three emplacements at Spencer, one emplacement (3) at Lancaster, three emplacements at Godfrey, and two emplacements at Saffold. These hoists were installed as funds allowed over the following years.

Another change in the ammunition delivery service occurred in 1907 on the recommendation of F. C. Deacon, the civilian superintendent of engineer works at Fort Winfield Scott. He observed that projectiles of different sizes were piled separately in the magazines. If a dead-end trolley track serving one kind of projectile should become blocked, or if more projectiles of the same kind were needed than one track could deliver, the service of the gun would be greatly hampered. Deacon would eliminate these problems by joining the ends of the tracks, making a "U," and installing additional trollies with blocks as a reserve. Deacon's recommendations were promptly accepted. For the next two years at all batteries in the harbor defenses the tracks were joined, and additional trollies and blocks were installed.[3]

3. New Mine Depot

When San Francisco Harbor was mined during the Spanish-American War, the Engineer Department was responsible for

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3. NA, RG 77, OCE, General Correspondence 1894-1923, Heap, Dec. 9, 1903, to Chief of Engrs., and Handbury, Apr. 16, 1903, and Jan. 24, 1905 to Chief of Engrs.; FARC, San Bruno, RG 77, OCE San Francisco Dist., Letters Received at Fort W. Scott 1902-1906, Deacon, Jan. 22, Feb. 4 and 15, 1907, to Maj. C. H. McKinstry, and McKinstry, Report of Operations, Feb. and Apr., 1907, and McKinstry, Mar. 19, 1907, to Chief of Engrs. These changes were funded under preservation and repair of fortifications appropriations.

the operation. After the war the decision was made to transfer submarine mining responsibilities to the Artillery Corps. Engineer Heuer in San Francisco, who had been responsible for the mines, reported that on April 1, 1903, "the submarine-mine defense was yesterday transferred to the Artillery. All structures. . . were in good order. . . ." Perhaps the structures were in good order, but it did not take the local artillery commanders long to decide that they were obsolete and poorly located for practice.

These commanders tentatively selected a new mine depot site on the Presidio shore on the south side of the bay. The engineers were not impressed: "It is low, adjacent to a swamp, and the wash from a comparatively large watershed has to be taken care of." Colonel Handbury thought it would be a bad mistake to move the depot from Yerba Buena Island, where it was behind all the defenses including its own mines. Moreover, $60,000 had already been spent on the existing depot. Nevertheless, Handbury developed an estimate for a new depot that would contain a storehouse, mining casemate, loading room, wharf, cable tracks, hoisting engine, derrick, railroad, trolley, etc., at a total cost of $91,750.

One year later, 1904, another board of officers met again to discuss mine defense. This board concluded that the existing depot on Yerba Buena was suitable for general stores and supplies, but two new depots should be constructed at the Presidio and Fort Baker. In addition, there should be four new mining casemates--one each at Fort Winfield Scott, Fort Baker, Fort Barry, and Fort Miley. Each of these posts should also have position-finding stations to serve the mining casemates.[4]

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4. The unofficial name, Point Bonita Military Reservation officially became Fort Barry, named in honor of Brig. Gen. William F. Barry, who during the Civil War served as Chief of Artillery, Army of the Potomac; Chief of Artillery, Defenses of Washington; and Chief of Artillery, Army of the United States, per GO 194, War Department, Dec. 27, 1904.

In the following several years, a number of modifications were made to this mining project. For example, in 1908 it was decided to eliminate mining casemates and position-finding stations at Fort Winfield Scott and Fort Baker. (Although the reasons for this particular modification have not yet been ascertained, it would seem to be related to a decision to plant the minefields outside the Golden Gate rather than in the harbor.) Although apparently not dropped from the project, a depot at Fort Baker was not constructed at this time and would not be until the eve of World War II.

Construction of a new mining casemate and a primary position-finding station at Fort Barry was well underway by April 1908. And between 1907 and 1910 a new mine depot at Fort Winfield Scott was completed. This facility was transferred to the Coast Artillery Corps on September 1, 1910. It consisted of a wharf that was built in 1907 by the construction quartermaster rather than the Engineer Department; a tramway, 1,330 feet long, leading from the wharf to the loading rooms, the cable tanks, and the main storehouse; eight platform cars, each having a capacity of 10,000 pounds; a mine storehouse, 1500 by 30 feet, made of galvanized iron on structural steel frame and having a 3,000-pound handpowered traveling crane; two torpedo loading rooms, each measuring 43 feet 8 inches by 21 feet 8 inches, galvanized iron on wooden frame walls and roof and each containing a cable tank; two adjoining explosive rooms, each measuring 7 feet 7 inches by 9 feet 8 inches, also galvanized iron on wooden frame walls and roof; and a cable tank building, containing three tanks, galvanized iron on a wooden frame.

Most of these historic structures stand today, although all have suffered modifications. The mine wharf has been rebuilt (structure 984); the cable tank building (977) was recently demolished; but still standing (1977) are the mine storehouse (979),

the two loading rooms (985 and 986), and the two explosive rooms (987). Nearby are a few other historic buildings, including an engineer storehouse (983) built in 1908 and an engineer plumbing shop (989) built in 1909 and currently the headquarters of Fort Point National Historic Site.[5]

4. Fire Control

Well before the Taft Board's formation, artillery commanders and engineers had been experimenting with fire control stations for the various batteries. Then in January 1906, a board of officers was formed in San Francisco to discuss the proposed fire control installation in the artillery district. Two months later, Brig. Gen. Samuel M. Mills, chief of artillery, made his recommendations on this same subject. A year later Col. J. A. Lundeen, commanding the artillery district, and Maj. C. H. McKinstry, CE, held a conference in San Francisco that resulted in a joint memorandum showing a fire control organization for the district. Finally, in June 1907 the new Chief of Artillery Brig.

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5. NA, RG 77, OCE, General Correspondence 1894-1923, Heuer, Apr. 2, 1903, to Chief of Engrs., and Handbury, Oct. 28, 1904, to Chief of Engrs., and Proceedings of a Board of Officers, San Francisco, Oct. 3, 1905, concerning mine defenses, and Brig. Gen. Arthur Murray, Chief of Artillery, Jan. 25, 1908, to Chief of Engrs., and Capt. J. C. Johnston, Presidio, Sept. 1, 1910, certificate of receipt of certain structures; FARC, San Bruno, RG 77, OCE, San Francisco Dist., Letters Received 1902-1906, Ft. W. Scott, Deacon, Oct. 13, 1904, to Handbury, and Letterbooks, no. 3, Aug. 24-Oct. 24, 1907, Maj. C. H. McKinstry, Sept. 13, 1907, to Chief of Engrs., Letterbooks no. 7, Apr. 17-June 24, 1908, Mckinstry, Report of Operations for April 1908, and Main Office, Fortifications Files 1884-1944, Reports of Completed Works. General Orders 108, War Dept., June 20, 1904, designated the 60th Company, CAC, Artillery Dist. of San Francisco, as a Torpedo Company for San Francisco's defenses. General Orders 21, War Dept., Feb. 6, 1908, changed this designation to "mine company."

Gen. Arthur Murray, issued a memorandum that set the pattern for a comprehensive fire control project for San Francisco.[6]

General Murray's memorandum was much too lengthy to present in detail, but certain important observations in his study should be noted. He pointed out that the high sites of San Francisco offered exceptional opportunities for the use of depressing position finders, whereas the irregular configuration of the shoreline made it difficult to lay out horizontal baselines covering the proper fields of fire. He proposed, therefore, to install a depression position-finding system with each fire control station.

Murray recommended separate battery commander (BC) stations for each battery except where existing primary stations (B^1) were so located that the battery commander could use them and yet personally supervise the work at the batteries. In many cases the existing primary stations had but one room that was only for observation. It would be necessary the general said to provide additional rooms for plotting: "It is of advantage to have the plotting room as close to the battery commander as is practicable and as is consistent with quiet and protection. In the cases mentioned, therefore, existing rooms in the battery have been recommended for use as plotting rooms, where such rooms are

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6. NA, RG 77, OCE, General Correspondence 1894-1923, Col. Charles Morris, CO, Artillery Dist. of San Francisco, and Col. W. H. Heuer, CE, Jan. 17, 1906, Proceedings of a Board of Officers relating to the proposed fire control installation in the Artillery Dist. of San Francisco, and Brig. Gen. S. M. Mills, Chief of Artillery, Mar. 7, 1906, Memorandum giving his recommendations as to Fire and Mine Commands and the Number and Location of Position Finding Stations, and Memorandum showing fire control organization of the Artillery Dist. of San Francisco, May 18, 1907, and Brig. Gen. Arthur Murray, Chief of Artillery, June 10, 1907, Memorandum, Fire Control System, San Francisco.

available; and if there are no such rooms available, it has been recommended that plotting rooms be constructed in conjunction with B. C. stations either below them or in rear on a lower level."

The prevalence of fog in San Francisco, particularly the kind known locally as "high fog" (under which one has good visibility), made it necessary to provide horizontal baselines auxiliary to the vertical ones, with stations low enough to see under the fog. These baselines were called "fog bases," and General Murray recommended one fog base for each fire command for each water area covered by its guns. He said that these base end stations should be observing rooms only, not more than 10 by 10 feet in size, and as inconspicuous as possible. All fog base stations were to have type A depression position finders because of their superior telescopes, necessary for penetrating the fog.

Whatever number of baselines established for any battery, only one plotting room should be provided. Should a fog base station supply data to more than one battery, the data telephone and the intelligence telephone should each be on party lines so that the information sent would go simultaneously to all primary stations (B^1). Also, each fog base station should have a third phone to provide an intelligence line to the other end of the fog base.

General Murray then set forth an organization for the San Francisco Artillery District:

> First Battle Command - Consisted of the fire and mine commands at Forts Miley and Barry; the existing B^1 (Chester) used as the battle commander's station and to be thereafter designated as C_1 (Miley)

First Fire Command - Batteries Livingston, eight 12-inch mortars, and Springer, eight 12-inch mortars, Fort Miley

Second Fire Command - Battery Chester, three 12-inch guns, Fort Miley

Third Fire Command - Battery Alexander, eight 12-inch mortars, Fort Barry

Fourth Fire Command - Batteries Mendell, two 12-inch guns, and Guthrie, four 6-inch guns, Fort Barry

Second Battle Command - Consisted of the fire commands at Forts Winfield Scott, Baker, and McDowell, and the mine commands at Fort Winfield Scott and Baker; the battle commander's station, C_2 (Winfield Scott), constructed over emplacement 1, Dynamite Battery

Fifth Fire Command - Batteries Stotsenburg, eight 12-inch mortars, and McKinnon, eight 12-inch mortars, Fort Winfield Scott

Sixth Fire Command - Batteries Howe, eight 12-inch mortars, and Arthur Wagner, eight 12-inch mortars, Fort Winfield Scott

Seventh Fire Command - Batteries Lancaster, three 12-inch guns; Cranston, two 10-inch guns; Marcus Miller, three 10-inch guns; Godfrey, three 12-inch guns; and Saffold, two 12-inch guns, all at Fort Winfield Scott

Eighth Fire Command - Batteries Chamberlin, four 6-inch guns; Crosby, two 6-inch guns; and Boutelle, three 5-inch guns

Ninth Fire Command - Battery Slaughter, three-inch guns; Fort Winfield Scott and Battery Burnham, one 8-inch gun, Fort Mason

Tenth Fire Command - Batteries Spencer, three 12-inch guns; Kirby, two 12-inch guns; Orlando Wagner, two 5-inch guns; and Duncan, two 8-inch guns

Eleventh Fire Command - Batteries Drew, one 8-inch gun; Wallace, one 8-inch gun; and Ledyard, two 5-inch guns, all at Fort McDowell, Angel Island

This proposal stated the numbers and locations of fire control stations for each fire command. A recital of these stations would be much too lengthy for this report, but the specifics for one, the eighth fire command, are presented as an illustration of the general's proposal:

Fire Commander's Station: Present B^{1} (Saffold) to be used as F_{8}^{1} (Winfield Scott). Plotting room for one board to be added.

A fog-base for this fire command to extend from [point] C to H, F_{8}^{11} (Winfield Scott) at C, F_{8}^{111} (Winfield Scott) at H. Fire commander to furnish ranges to Batteries Crosby and Boutelle, and, in case of fog, to Battery Chamberlin.

Battery Chamberlin: Observing room, B_{11}^{1} (Chamberlin), to be built in rear of left flank of battery, retired a

sufficient distance to obtain an instrumental height of about 50' above mean high water.[7]

For the next several years, the engineers' annual reports of operations recorded the construction of a considerable number of fire control stations at San Francisco. In contrast to the simple frame structures of earlier days, the new structures were made of concrete or brick, with a variety of materials for roofing. Wherever possible they were built into the ground, with only the observation windows and the roof projecting above. The engineers made these stations as inconspicuous as possible but without the elaborate camouflage techniques of later years, particularly of World War II. A typical example of progress in erecting new stations may be found in the annual report for fiscal year 1908: surveys made of various sites, detailed working plans prepared, building materials purchased, profiles of conduit lines made, harbor charts prepared, and so forth. By June 1908 over 25 new stations had been completed, several existing ones modified, and a large amount of conduit line finished.[8]

C. Earthquake, 1906

A week after the great earthquake of April 18, 1906, a Baltimore newspaper published an alarming article concerning the

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7. NA, RG 77, OCE, General Correspondence 1894-1923, Brig. Gen. Arthur Murray, Chief of Artillery, Memorandum, Fire Control System proposed for the Artillery Dist. of San Francisco, June 10, 1907. Murray said that the four mine commands (Forts Miley, Barry, Baker, and Winfield Scott) were to be organized and equipped as recommended by the Murray Board of 1905. A Murray Board document has not yet been located. It will be noted that by 1907 Alcatraz Island no longer played a role in San Francisco's defense.

8. FARC, San Bruno, OCE, San Francisco Dist. and Letterbooks, no. 8, June 25-Aug. 21, 1909, McKinstry, Annual Report on Defenses of San Francisco, FY 1908.

destruction of the coastal batteries at San Francisco. The headline announced that the big "13-Inch" guns had been put out of commission:

> The big fortifications at the entrance to the Golden Gate did not escape from serious injury during the great shakeup.
>
> At Lime Point the emplacements of the big guns have been cracked and twisted. The heavy concrete both on the floor and in the walls of the emplacements, bears unmistakable evidence of having been given a bad shaking.
>
> Conditions are said to be equally bad at the fortifications back of Old Fort Point. The great 13-inch guns on both sides of the gate, constituting the main defense, are practically useless.

Besides the fact that San Francisco defenses had no 13-inch guns, the newspaper had vastly exaggerated the effect of the quake. Major McKinstry, the district engineer, undertook a careful examination of all the fortifications in the Bay Area. He assured the chief of engineers that the rumor that Battery Chamberlin was "wrecked" was wholly untrue. In fact, the battery was practically uninjured--one surface drain had been cracked. Where cracks had already existed in the concrete work of the batteries, most of these had been widened by the shock. A few new but quite fine cracks had appeared here and there. Battery Burnham at Fort Mason was practically unaffected, only $60 being required to repair some old cracks. McKinstry found it interesting that none of the reinforced concrete structures, such as mortar booths, TelAutograph booths, and platform extensions were injured. He estimated the total cost of repairs to all the works on both sides of the Golden Gate to be under $5,000.

Much more serious to the engineers was the loss from the fire of the total contents of their office in downtown San Francisco. Colonel Heuer described the conditions. His office safe looked quite sound from the outside, and he had high hopes that his papers were intact. But on forcing its door open,

> the papers, consisting of vouchers, pay-rolls, contracts, all nicely packed, together with the War Department telegraph code, transportation request books, etc., were so badly charred that in trying to remove them many of them crumbled into small bits. From an aggregate of perhaps a thousand pages . . . a dozen or more could be deciphered . . . but on trying to unfold them they would break or crumble. . . .

Years would pass before the local records were built back up by copies from Washington. For now, a new office was rented at 1392 Golden Gate Avenue. The office staff at this time consisted of a chief clerk, a clerk (Miss L. J. Brenham), one draftsman, and one messenger.[9]

D. Modifications and Maintenance

1. General

No more Endicott-period batteries were built at San Francisco after 1905, although there was still a number of batteries awaiting the mounting of weapons. The operations reports and the reports of inspections over the years gave an excellent picture of improvements, modifications, and routine maintenance of the batteries. No attempt is made herein to recount all these activities,

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9. NA, RG 77, OCE, General Correspondence 1894-1923, newspaper clipping from The Sun, Baltimore, Apr. 25, 1906, and Heuer, May 15, 1906, to Chief of Engrs.; FARC, San Bruno, RG 77, OCE, San Francisco Dist., Letters Received at Fort W. Scott 1902-1906, McKinstry, May 8, 1906, to Chief of Engrs.

rather, a few representative reports will show the nature of the work.

At the quarterly inspection of Battery Chester, Fort Miley, in September 1905, the engineer noted that the interior rooms had all been painted or whitewashed. The commanding officer there wanted 1,000 feet of shelving put in the rooms. The engineer warned that if this was approved, every battery would want shelves. He noted the concrete pedestal for a range finder in the fire commander's station had been strengthened and enlarged. The department quartermaster observed that the horses that hauled the portable searchlights around at Fort Miley were kept in the quartermaster stables. Therefore he thought that proposed searchlight shelters should be built near the stables.

An inspection of Battery Anton Springer, Fort Miley, in 1906 showed bad leaks in the shotrooms of pits A and B, but no funds were available for repairs. At Battery Godfrey, Fort Winfield Scott, three armament chest niches had been cut in the walls of the passages to the shellrooms. The cattle fence around Battery Drew on Angel Island had been repaired at a cost of $25. In 1907 an inspector general noted that "trees have not been started to conceal the rifle batteries from the sea. This is a post [Winfield Scott] noted for its forestry. In some cases a battery is marked by the break in the forest on the hills." The engineer replied that none of the battery commanders had brought this up with him, "presumably because there is a forestry board at Fort Winfield Scott that has these matters in hand." The same inspector said that the concrete firing aprons on the parapet of Battery Godfrey were badly torn by firing. Major McKinstry replied that the only practical solution would be to build new aprons supported by pillars extending down to the natural ground.

A sign of the times was McKinstry's request in 1907 to purchase a $3,000 automobile and to hire a chauffeur at $4 a day. He needed this transportation because of the installation of the new fire control system. Besides, he pouted, the surgeon in charge of the General Hospital at the Presidio and the depot quartermaster had four automobiles between them.

At Fort Barry, the engineers complained that the old lighthouse at Point Bonita would obstruct the view of the new fire control station. They received approval to remove the historic old tower, and work on its demolition began July 17, 1907. Also in 1907, a landslide on the slope at the rear of Battery Burnham, Fort Mason, covered the battery parade. The engineers agreed to make repairs as quickly as possible. By 1908 splinter-proof roofs had been constructed over the ammunition hoists at all 12-, 10-, and 8-inch emplacements except at Battery Burnham.

The battery commander at Orlando Wagner, Fort Baker, complained in 1908 that there were no bombproof quarters for his 34 men at the battery. The engineer disagreed saying that the battery parade, being 116 by 11 feet not counting a 4-foot sidewalk, was amply large to hold the manning detail and that it was hidden from enemy view. He carried the argument; no quarters were built.[10]

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10. NA, RG 77, OCE, General Correspondence 1894-1923, Heuer, Sept. 5, 1905, to Chief of Engrs., and Chief QM J. L. Clem, Dept. of Pac., Mar. 12, 1906, to QM, Ft. Miley, and McKinstry, July 31, 1908, to Chief of Engrs., and Capt. R. H. Fenner, Battery Orlando Wagner, Oct. 7, 1908, to Fire Commander, Third Fire Command, Fort Baker; FARC, San Bruno, RG 77, OCE, San Francisco Dist., Fort W. Scott, Correspondence Received 1902-1907, McKinstry, June 4, 1906, to Chief of Engrs., and Letterbooks, no. 1, Jan. 1-May 18, 1907, McKinstry, Feb. 14, 1907, to Dept. of Pac., no. 2. May 18-Aug. 23, 1907, McKinstry, May 18, 1907, to Chief of Engrs., and May 24 and July 16, 1907, to himself, as Engr., 12th Lighthouse Dist., and Lt. J. Bain, Fort Mason, May 28, 1907, to?

2. Additional Searchlights

Between 1910 and 1912 plans were prepared for three more searchlights in San Francisco Harbor. One of these at Fort Mason had to be relocated when the first site selected proved to be composed of soft clay about 20 feet deep. Also the department quartermaster had to be persuaded not to erect a 145-foot tower on the Fort Mason wharf (today's pier 4). The searchlight was finally located on the point outside the road that led up from the wharf. Its shelter remains today.

At Lime Point a searchlight shelter was erected at the fog signal station. It was incorporated unobtrusively into the existing structures already at the point. The shelter no longer stands, but its foundation may still be discerned. A second searchlight in that area was planned for the extreme end of Point Cavallo. The engineers made a radical departure here as to the type of shelter for the light. It was to be kept in a pit when not in operation, and it was proposed to raise and lower the light by means of a counterweight, hand-powered winch, and balance weight. Work began on this site in March 1912, but there is no visible evidence of its existence today.[11]

3. Departmental Rifle Range

In 1904 military prisoners from Alcatraz constructed the first modern small arms range on the Pacific Coast. Located at Fort Barry, this outstanding piece of work came to be called the departmental rifle range, and troops from all posts in the Bay Area

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11. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Letterbooks, 1909-1910, vols. 16-18, Lt. Col. J. Biddle, CE, Mar. 15, 1910, to CO, Artillery Dist., Presidio, and Chief Clerk?, May 25, 1910, to Biddle, and vols. 21-23, 1910-11, Biddle, Feb. 10, 1911, to Chief of Engrs., and vols. 25-27, 1911-13, Lt. Col. T. H. Rees, CE, Oct. 25, 1911, to Chief of Engrs., and Letterbook no. 11, Dec. 9, 1911-Mar. 25, 1912, U.S. Engr. Office, San Francisco, Mar. 21, 1912, to Chief Signal Officer, Western Div.

made an annual pilgrimage there for target practice. One aspect that was overlooked during construction of the range was that if a man raised his rifle too high, he shot over the backstop ridge directly toward Battery Kirby in the Golden Gate. An alarmed district engineer wrote in 1910 that some half-dozen bullets had penetrated the tin roofing over the concrete traverse of the battery. From then on no repairs or practice firing were carried on at Kirby during rifle practice.[12]

4. 1910 Estimates for Updating Batteries

By 1910, 20 years after the first planning for the Endicott batteries, experience had taught both the artillerymen and the engineers a great deal about the design and construction of concrete emplacements for high-powered guns. In the autumn of that year the artillery district compiled a comprehensive estimate for improvements to the fortifications at San Francisco. In that many of these proposals came to be, these estimates are outlined as follows:

a. Fort Barry

The removal of North Bonita Hill was necessary. This hill, located to the right (north) of Battery Mendell, restricted the fire of the 12-inch guns--the only heavy guns bearing on North Channel. The estimated cost was $35,542. Approval of this project was secured and a start made in excavating it by the end of 1912; however, in 1916 note was made that very little had been accomplished toward this end and nothing at all done since 1914. Finally, in 1919 funds were made available for completing the work.

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12. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Letterbooks, vols. 16-18, 1909-1910, Biddle, Apr. 26, 1910, endorsement, to Chief of Engrs.

(1) Battery Rathbone

The estimate for the removal of the hill on the right flank was $1,000.

(2) Battery Mendell

The loading platforms should be widened 11 feet, estimate $6,300. Also, the concrete tables should be built in the passages at the side of the hoists for both emplacements.

(3) Batteries Rathbone and Guthrie

The loading platforms should be widened 3 feet; the estimated cost was $2,500 for both.

b. Fort Baker

(1) Battery Yates

The loading platforms should be widened 3 feet at an estimated cost of $1,200.

(2) Battery Kirby

The concrete tables should be built in the shellroom; the floor of the shellroom should be raised to the same level as the passage; and a new combination of Yale and Towne triplex blocks and trolleys should be installed--total cost, $1,978.

(3) Battery Duncan

A concrete table should be built across the dividing wall between the passage and the shotroom at a level that would allow shells to be rolled directly upon the trucks. The present small guardroom should be converted to an oilroom, and a new larger guardroom and a much needed toolroom should be built.

(4) Battery Spencer

A latrine still had not been constructed at this battery; the estimated cost was $2,000.

c. Fort McDowell

(1) Battery Wallace

The loading platform should be widened 2 feet at an estimated cost of $900. A concrete table capable of holding 15 projectiles should be built in the shellroom, and it should be connected to the receiving table of the hoist by a portable section.

(2) Battery Ledyard

The loading platforms should be widened 2½ feet at an estimated cost of $300. Its guns were out of level because of settlement, which had caused cracks. The concrete should be repaired and the guns relaid. (Today, this battery is badly fractured because of continuing settlement. In this regard, it is the most deteriorated of all the Endicott batteries.)

(3) Battery Drew

Its rooms were very damp and required waterproofing.

d. Fort Winfield Scott

(1) Battery Lancaster

Its loading platforms should be widened 11 feet, and a plotting room should be constructed under emplacement 3. Total cost was estimated at $7,820. At emplacement 3, a table to hold 15 projectiles should be built adjacent to the shellroom, and the trolley rail extended over the same. At emplacements 1 and 2, a concrete table to hold 15 projectiles should be placed in each shellroom. The floor of the shellrooms should be raised to the same level as the passage. On account of the decreased headroom, new combination Yale and Towne triplex blocks and trolleys should be supplied to each shellroom. Concrete cutting would be required at emplacement 3 for a powder hoist.

(2) Battery Cranston

Two concrete tables for 15 projectiles should be built in the passages in rear of the hoists and be connected to the receiving tables with portable sections. If the projectile room should be modernized, additional trolly rails would be needed.

(3) Battery Marcus Miller

At emplacements 2 and 3, the loading platforms should be widened 8 feet at an estimated cost of $4,934. The existing magazines should be enlarged to store the required number of cartridges. To improve and shorten the hand powder service to the guns, a doorway should be cut through the wall in the vicinity of the magazine and steps provided. This would shorten the route by 100 feet. A table for storing 20 projectiles in each shellroom should be built. Each table should be connected to the receiving table by a portable platform--estimated cost, $8,429. If the projectile rooms were modernized, additional trolley rails would be needed. Splinter-proof roofs should be built over the hoist delivery opening, and the walks to the gun platforms should be widened.

(4) Battery Godfrey

The powder magazines needed enlarging. Concrete tables, each for 15 projectiles, should be built in the passages and be connected to the receiving tables of the hoists with portable sections. Type C hoists could be installed at this battery. To do so would necessitate building splinterproofs over the hoist delivery openings and widening the walks to the gun platforms. Trolley rails should be installed leading from the shotrooms to the foot of the runway in rear of the traverse.

(5) Battery Sherwood

The loading platforms should be widened 2½ feet at a cost of $280.

(6) Battery Saffold

Concrete tables to hold 15 projectiles should be built in shellrooms and be connected to the receiving tables of the hoists with portable sections.

(7) Battery Slaughter

Concrete tables should be built so as to allow shells to be rolled directly onto trucks, cost estimated at $396.

(8) Batteries Howe, Wagner, Stotsenburg, and McKinnon

The pits needed to be widened and the mortars spread out--estimated cost, $187,950. (What actually happened was that the pits remained the same size, but the number of mortars per pit was reduced from four to two.)

e. Fort Miley

At emplacements 1 and 2, Battery Chester, the loading platforms should be widened 11 feet--estimated cost, $3,600. Concrete tables should be built in the passages at the side of the hoists and be connected to the receiving tables with portable sections.

Altogether 58 additional trolleys and blocks were required in the district, and these would cost $3,770. At that time, the district had 8,720 linear feet of 2- by 2-inch oak skids for the projectiles, but the needs were for 30,100 linear feet of 2- by 4-inch skids. Five different groupings of fire control stations were in dire need of latrines. Almost every battery needed a

better firing apron, of reinforced concrete, than it now had. Fort Barry needed a fog base, with a station near Point Bonita and one near Tennessee Point, the latter still being private land. Last, a wireless station should be constructed in pit 2, old Dynamite Battery at Fort Winfield Scott.[13]

5. Chain Hoists

In 1910 accidents involving chain ammunition hoists at both Forts Hancock and Wadsworth in New York led to a thorough listing of chain hoists at San Francisco. At Batteries Chester and Mendell (both 12 inches) there were Hodges chain hoists, each of which was equipped with six carriers and on each of which it was possible to have three consecutive carriers loaded at the same time. Theoretically, these carriers were strong enough to carry three shells at a time. In order to alter them to prevent more than one shell being loaded at a time, it would be necessary to take out three of the carriers. At present these hoists at Chester and Mendell could deliver shells at the rate of 4 and 5.4 per minute respectively. If reduced to three carriers, Chester could deliver two per minute and Mendell, three--both rates being fast enough.

The 12-inch Taylor-Raymond hoists in the district were designed to handle projectiles only, and no changes were necessary from the standpoint of safety.

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13. NA, RG 77, OCE, General Correspondence, Fortification Estimate Data Sheets, Artillery Dist. of San Francisco, Oct. 27, 1910, and Office of the Post Commander, Fort Barry, Sept. 7, 1909, to Adjutant, Artillery Dist. of San Francisco; FARC, San Bruno, RG 77, OCE, San Francisco Dist., Letterbooks, vols. 16-18; 1909-1910, Lt. Col. John Biddle, CE, Sixth Endorsement, Jan. 28, 1910, and Letterbooks, no. 11, Dec. 19, 1911-Mar. 24, 1912, Lt. Col. T. H. Rees, CE, Feb. 14, 1912, to Commandant, Military Prison, Alcatraz, and Letterbooks, vols. 25-27, 1911-1913, Rees, Report of Operations, December 1912.

DESCRIPTION OF AMMUNITION HOISTS AT SAN FRANCISCO

Battery	Guns	Type of Hoist	No. of Carriers	Driven By	No. of Carriers Passing Delivery Table per min. - 1 Hoist Loaded	Hoists Originally Intended to Handle	No. of Carriers To Be Taken Out	No. of Carriers Passing Delivery Table per min. After Change
Chester	3 12"	Hodges	6	2 hp. motor	4	Powder & Projectile	3	2
Lancaster #3	1 12"	Taylor-Raymond	7	7½ hp. motor	11.3	Projectile	0	11.3
Godfrey	3 12"	Taylor-Raymond	8	7½ hp. motor	5.1	Projectile	0	5.1
Saffold	2 12"	Taylor-Raymond	7	7½ hp. motor	5.8	Projectile	0	5.8
Cranston	2 10"	Taylor-Raymond	7	5 hp. motor	6.4	Projectile & Powder	0	6.4
M. Miller	3 10"	Taylor-Raymond	7	5 hp. motor	5.7	Projectile & Powder	0	5.7
Mendell	2 12"	Hodges	6	5 hp. motor	5.4	Projectile & Powder	3	3 (nearly)
Spencer	3 12"	Taylor-Raymond	6	7½ hp. motor	3	Projectile	0	3
Wallace	1 8"	Hodges	7	Hand power	Variable	Projectile & Powder	0	Variable
Burnham	1 8"	Hodges	7	Hand power	Variable	Projectile & Powder	0	Variable

The 10-inch Taylor-Raymond hoists at Batteries Cranston and Miller were successfully tested for the continuous delivery of projectiles, and it was not thought any alterations were necessary.

The hoists at Batteries Wallace and Crosby were of Hodges type and were equipped with seven carriers each. Since their loads were comparatively light (8 inches and 6 inches) and they were operated with hand power, no changes were thought to be necessary.

6. Burnham Abandoned

Although Burnham was shown in the above list, it no longer played a part in the defenses of San Francisco. Completed by the engineers in 1899, it was considered obsolete only eight years later--the first of the Endicott batteries to be so regarded. In May 1908, the commanding officer of the artillery district wrote the Department of California asking why Fort Mason was omitted from the forts comprising his district. The War Department responded that because of the character of its armament (one 8-inch gun) and its unimportant field of fire, Burnham did not justify either a fire control or a searchlight installation, and a manning body should not be assigned to it. The battery was assigned to the commanding officer at Fort Mason, and its ammunition was transferred to Battery Slaughter. In 1909 Burnham was abandoned. Its gun was dismounted and removed.[14]

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14. NA, RG 77, OCE, General Correspondence 1894-1923, Brig. Gen. C. Davis, Ret'd., Engs. Office, San Francisco, Dec. 16, 1900, to Chief of Engrs., and Dept of Pac. with endorsements. At the end, Burnham's ammunition consisted of

20	armor-piercing shot, filled with explosive "D" reserve
18	armor-piercing shell, filled with explosive "D" reserve
28	C.I. shot [cast iron?]
16	propelling charges, smokeless powder
45	propelling charges, smokeless powder

San Francisco defenses made the newspapers several times in 1911. The San Francisco Call was always ready to publish any news item concerning the fortifications. In March it announced that eight new fire control stations and five new 60-inch searchlights were being rushed to completion. In May several unloaded submarine mine shells went adrift at the practice mine planting grounds near the Presidio. Unfortunately, not everyone knew they were unloaded. Captain Mason of the ferry, Rose City, arrived at Meigs wharf one day, white around the gills, reporting that he had narrowly escaped from hitting a mine and that his vessel was crowded with passengers. The next day, The Call had fun with a fisherman, Felipe Lubuzo. Lubuzo, said the paper, was a brave man. Yesterday he encountered a mine off Point Reyes. He made a line fast to it, towed it to port, and turned it over to military authorities at the Presidio. Lubuzo did not know that it did not have explosives. He did not know that it was a submarine mine.[15]

7. The Army and the Panama-Pacific Exposition

By the summer of 1912, the military authorities in San Francisco were turning their attention to the army's role in the forthcoming Panama-Pacific Exposition. The commanding officer at Fort Winfield Scott, Col. John P. Wisser, was recommending that the old masonry fort at Fort Point be restored and tours through it be given during the exposition. It fell to an employee in the Engineer Department, Lee S. Griswold, to inspect the old fort and make a recommendation. He was not optimistic concerning restoration.

> Old Fort Point is an irregular, pentagonal structure of the type constructed at various places throughout the

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15. The San Francisco Call, Mar. 21, May 31, and June 1, 1911.

country during the early and middle part of the last century. (Castings in the ground tier embrasures of the structure bear the date '1856'). It consists of three casemate tiers, a barbette tier, and a counterscarp tier, and . . . provision for mounting 133 guns of various sizes.

Prior to 1906, the portion of the fort designed for living quarters was occupied by one of the Coast Artillery companies stationed at the post. That particular part of the structure was damaged so severely by the earthquake as to render it uninhabitable, and since that time the fort has been unoccupied except as follows:

(a) The Lighthouse Establishment maintains a light and fog station on top of the structure, and a certain amount of space in the 2d and 3d casemate tiers has been partitioned off for use as store rooms etc.

(b) A 60-inch searchlight has been installed in one of the emplacements of the barbette tier, on the western face of the fort, and a 25 kw. gasoline set, to furnish current for the light, has been installed in a portion of the ground tier, on the eastern side of the fort.

Under existing orders, visitors are not allowed within the structure, and enlisted men [enter] only when engaged on duty in connection with the searchlight.

All the guns were dismounted prior to 1908 (probably a considerable time before that) and all except eight have been disposed of. These latter (8-inch cannon) are at present stored on the ground in rear of the fort. . . .

> Except the southern or rear wall of the fort, the masonry throughout the structure is in good condition. This southern wall was built separate from the adjoining portions of the work (walls, floors, etc.) and at the time of the earthquake it moved out at the top sufficiently to permit a portion of the earth fill forming the parapet of the barbette tier to fall through into the 3d and 2d story rooms. . . . Immediately after the earthquake the building was vacated by the troops, and since that time all material of value, such as plumbing fixtures, lumber in partitions, marble mantles, fire gates, window sash, etc., has been stripped from the rooms. . . .
>
> It is not known what the policy of the War Department is concerning the preservation and upkeep of structures of the character in question, but unless the building was needed for use or unless provision was made for its future care, it appears to be inadvisable to spend any great amount of money on its restoration. It is probable that the rooms, etc., could be cleared of earth and debris for approximately $200, or less. . . . This is not recommended, other work being considered more important.

The grand old fort was later "rehabilitated" but not "restored," but as the historian Bearss writes, it was "butchered" in an effort to turn it into a detention barracks.[16]

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16. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Letterbooks, no. 12, July 9-Oct. 29, 1912, Lee S. Griswold, Asst. Engr., Aug. 13, 1912, an endorsement; USDI, NPS, Bearss, pp. 325-43.

Planning for the 1915 exposition also caused a small debate between the engineers and Arthur Murray, the commanding general of the Western Division. For many years the engineers had maintained fences around the various batteries as a means of protection. In 1912 the engineers, with the support of the district artillery commander, prepared an estimate for fencing around the Fort Winfield Scott batteries, fences that would be 6-feet high and would have strands of barbed wire on top angling out at 45 degrees. General Murray was agreeable to some fencing, but he saw the exposition as a means to gain public goodwill for the army by throwing open all the batteries and the mine facility.[17]

8. Mining Casemates

An early mining project had called for mining casemates at Forts Winfield Scott, Baker, Barry, and Miley. The army had not succeeded in acquiring the land it needed at Point Lobos for the Miley casemate. In the meantime, a temporary frame casemate was constructed at Bakers Beach not far from Battery Chamberlin. Then in 1912, a more permanent mining casemate was constructed at the beach. This was considered to be completed on November 27. It was described as being a concrete structure measuring 24 by 56 feet. Surprisingly, it was not then made bombproof; its roof consisted merely of wood, tar, and gravel.[18]

Similarly, the original site for a casemate at Fort Baker was rejected in favor of the northern part of old Battery Cavallo, Mendell's pride and joy of the 1870s. The engineers did

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17. NA, RG 77, OCE, General Correspondence, Maj. S. A. Cheney, CE, Aug. 29, 1912, to Chief of Engrs.

18. FARC, San Bruno RG 77, OCE, San Francisco Dist., Letterbooks, no. 12, July 9-Oct. 29, 1912, Rees, Sept. 18, 1912, to Chief of Engrs., and Letterbooks, vols. 25-27, 1911-1913, Rees, Dec. 6, 1912, Report of Completed Batteries.

not refer to the battery by its early name; in their memory it was the 8-inch converted rifle battery from the Spanish-American War. A 1909 report on the defenses listed the casemate's cost as having been $9,228 and described its condition as being good. (Its plans have survived.) In addition to its function as a mining casemate, it was used as the terminal for a communications cable to Fort Baker from Fort McDowell (Angel Island). The third-mining casemate at Fort Barry was shown in the same report as being finished as regards to engineer's work but not yet transferred to the artillery.[19]

9. Electrification and Searchlight Project

Earlier in this study, the findings of a board of officers concerning the electrification of batteries were presented. It will be recalled that the board concluded that central power plants were more efficient than small sets at each battery, and as a result Fort Winfield Scott was the first post to acquire a central plant in 1910. Two years later in August 1912, Chief of Engineers Brig. Gen. W. H. Bixby reversed that concept, which was also the original concept of the Taft Board. Bixby now said that the efficiency of the 25-kw. generator set (which was developed to serve as a reserve set) had demonstrated that for all-round artillery use it was better than the central power plant.

It is not known what effect, if any, Bixby's pronouncement had on the electrical installations at San Francisco's defenses. But on the day after Christmas (1913) the district engineer Thomas H. Rees prepared a lengthy report on the

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19. FARC, San Bruno, RG 77, OCE, San Francisco, Letterbooks, no. 3, Aug. 24-Oct. 24, 1907, McKinstry, Sept. 11, 1907, to CO, Artillery Dist. of San Francisco, and Letterbooks, vols. 16-18, 1909-1910, Report of Completed Batteries, Defenses of San Francisco, Dec. 31, 1909.

electrical plants for both the batteries and the proposed searchlight project. This report is quoted from at length, not because of its fascinating reading, but because it helps explain the different generator rooms to be found in the batteries today.

a. Electrification

(1) Fort Barry

There was no central power plant. Power for fortification purposes was furnished by three separate battery plants: Mendell Plant supplied current to Mendell, a type B switchboard, the mining casemate, four fire control stations, and a meteorological station. It was located on the left flank of Mendell in rooms beneath the loading platform of emplacement 2. It consisted of three 25-kw., 125-v., dc. gasoline sets. Guthrie Plant supplied current to Guthrie, Battery Alexander, Battery O'Rorke, and one fire control station. Located in the traverse between emplacements 3 and 4, it consisted of two 25-kw., 125-v., dc. gasoline sets. Rathbone Plant supplied current to Rathbone. Located in the traverse between emplacements 1 and 2, it consisted of two 25-kw. sets. The post power for Fort Barry was commercial, coming from a substation at Fort Baker.

(2) Fort Baker

There was no central power plant. Power for fortification purposes was furnished by three separate battery plants: Kirby Plant supplied current to Kirby and to one fire control station. Located in the rear portion of the traverse between the two positions, it consisted of two 25-kw. sets. Spencer Plant supplied power to Spencer, Battery Orlando Wagner, four fire control stations, a meteorological station, and a type A switchboard. Located in a brick engine house at the entrance to Spencer, it consisted of three 25-kw. sets. Duncan-Yates Plant supplied current to Duncan, Yates, one fire control station, and searchlight 11. Located in an engine house (wood frame covered

with sheet iron) within old Battery Cavallo, it consisted of two 25-kw. sets. The post power at Fort Baker was commercial.

(3) Fort McDowell

There was no central power plant. Power for fortification purposes was furnished by two separate battery plants. Drew Plant supplied current to Drew; it consisted of a five hp. Hornsby-Akroyd oil engine belted to a 2.65-kw., 125-v., dc. Westinghouse generator. Wallace Plant supplied current to Wallace, Battery Ledyard, one fire control station, and a type A switchboard. It consisted of a 10-hp. Hornsby-Akroyd oil engine belted to a 6-kw., 125-v., dc. Eddy generator. A plan existed to replace both plants with a single one at Battery Wallace, consisting of two 25-kw., 235-v., dc. General Electric gasoline sets. No post power was available at West Garrison (old Camp Reynolds); East Garrison was supplied with commercial power via submarine cable.

(4) Fort Winfield Scott

There was a central power plant and also a proposal at this time to place reserve plants at most of the batteries. Post power was commercial.

(5) Fort Miley

There was no central power plant. Power for fortification purposes was furnished by two separate battery plants. Chester Plant supplied current to Chester, a type B switchboard, four fire control stations, and an abandoned engine room that was then being used as an office and storeroom by the artillery engineer. This plant, located at the rear of the battery's right flank, was not yet complete; when it was, it would have three 25-kw. sets. Livingston Plant supplied current to Livingston and Springer. When completed, it would have two 25-kw. sets. Post power at Fort Miley was commercial.

b. Searchlight Project

(1) Fort Barry

Lights 16 and 17 were to be installed on Tennessee Point. The two generating sets would probably be in one room, along with a third set to be a reserve. Light 15, near Bird Island, had its own 25-kw., 125-v., dc. gasoline set; there was no reserve. Light 14, Point Bonita, had an independent 25-kw. gasoline set in a nearby powerhouse, no reserve. Light 13 was to be installed on the north shore of the Golden Gate. The generator was to be installed in a powerhouse to the rear.

(2) Fort Baker

Light 12 was located at Lime Point. An independent 25-kw. gasoline set was located in a neaby powerhouse, no reserve. Light 11 was located at Point Cavallo. Current was supplied from the Duncan-Yates plant.

(3) Fort McDowell

Light 10 was to be installed about 200 yards east of Point Knox. The generator was to be located in a powerhouse about 500 feet north of the light.

(4) Fort Mason

Light 9 was located at Point San Jose. The generator was to be an independent 25-kw., 125-v., dc. gasoline set located in abandoned Battery West.

(5) Fort Winfield Scott

Light 8 was to be installed near the mine wharf. The generator was to be located in old Battery East. Light 7 was located at Fort Point. The 25-kw. gasoline set was located in the ground tier of the old brick fort. Light 6 was to be installed on the beach 300 yards north of Crosby. The generator was to be located in an independent powerhouse near the light. Light 5 was

to be installed near the mouth of Lobos Creek. The generator probably was to be located adjacent to the mining casemate.

(6) Fort Miley

Light 4 was temporarily installed near the northwest corner of the reservation. A gasoline set was in the right flank of emplacement 1, Battery Chester. Light 3 was to be on the bluff west of Fort Miley. The generator was to be located next to 4's light.

Lights 1 and 2 were located on Ocean Beach, below Golden Gate Park, and were installed near the junction of the Great Highway and J Street. Both generators were to be located in a nearby powerhouse.[20]

10. Tennessee Point Land Acquisition

The searchlight project called for the installation of two lights, nos. 16 and 17, on Tennessee Point north of Rodeo Lagoon and Fort Barry. This property, part of the ancient Rancho Sausalito, was now owned by Antoine Borel and Company of San Francisco. In the fall of 1909, Borel agreed to sell 5 acres at Tennessee Point and a right-of-way to the tract from Fort Barry for $2,000. Two years later, this matter was still a subject of correspondence inasmuch as Borel had refused to furnish a warranty deed for the land. The district engineer Lt. Col. T. H. Rees informed him that it would be necessary to institute condemnation proceedings in order to secure a clear title and asked Borel if he would agree to a consent verdict in the sum of $2,000.

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20. NA, RG 77, OCE, General Correspondence 1894-1923, Brig. Gen. W. H. Bixby, Aug. 23, 1912, to Chief of Staff; FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortification Files 1884-1944, Correspondence 1913-1920 and 1922-1939, Rees, Dec. 26, 1913, to Chief of Engrs.

Borel responded that he could not accept the suggestion. Rees concluded that Borel wanted to cancel the agreement and was out to make a showing in a condemnation suit that could result in a price that would be prohibitive. The engineer now turned to the U.S. district attorney recommending that rather than institute a condemnation suit, the government accept a bargain-and-sale deed. It seemed clear to Rees that the California statute of limitations established the title of Borel to the land in question.

In the spring of 1912 the Engineer Office in San Francisco informed Borel that it was authorized to accept a "grant, bargain and sale" deed for the tract, the agreed price being $2,000. Still the matter dragged on. In February 1913, Colonel Rees urged the U.S. district attorney to speed up the negotiations and settle the difficulties that centered on restrictions that Borel wished to impose on the right-of-way. Eventually, all issues were resolved and the United States acquired the property by July 28, 1914.[21]

11. Firing the Guns

Of necessity, this report tends to concentrate on the batteries and the other physical structures that made up the defenses of San Francisco. It is, therefore, all the more worthwhile to pause for a moment to remember that artillerymen actually fired the big coastal guns and mortars at least annually. The San Francisco Call ran two articles in 1910 describing this target practice. In July, Capt. Samuel F. Bottoms, CAC, led his

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21. NA, RG 77, OCE, General Correspondence 1894-1923, Lt. Col. J. Biddle, Oct. 13, 1909, to Chief of Engrs.; FARC, San Bruno, RG 77, OCE, San Francisco Dist. Letterbooks, vols. 25-27, 1911-1913, Rees, Sept. 27, 1911, to Borel, and Rees, Oct. 4, 1911, and Feb. 11, 1913, to U.S. Dist. Attorney, San Francisco, and Letterbooks, no. 11, Dec. 19, 1911-Mar. 25, 1912, W. B. Thomas, Chief Clerk, Mar. 20, 1912, to Borel. Borel's address was 440 Montgomery St.

161st Company in some remarkable shooting at Battery Mendell. The newspaper exclaimed "Six Shots In Jig Time All Hits." The company fired six shots from the two guns in two minutes, forty-three seconds at a target moving at seven miles per hour, and at a range of 4,500 yards. So accurate were the 12-inch guns that difficulty was experienced in getting the shattered target to shore. In September 1910, Capt. John B. Murphy and his 65th Company and the 38th Company practiced firing the 12-inch mortars of Battery McKinnon, Fort Winfield Scott. Murphy had an outstanding reputation for efficiency, said the paper, and this day's practice was excellent. Ten rounds were fired at a target moving at seven miles an hour, at a range of 6,000 yards. Four rounds were fired at a stationary target at the same range. The reporter must have had a deadline to meet, for he concluded the article saying that the results of the firing were not yet known. But, he concluded, San Francisco's guns had been destroying a lot of targets.[22]

12. Sharp-Pointed Projectiles

More than once the engineers had had to remodel the hoist wells, the passages, the receiving tables, and so forth, in order to improve the efficiency of delivering the ammunition to the loading platform. In 1909 it was the projectiles themselves that caused the engineers to reach again for their drafting instruments. The chief of ordnance wrote the chief of engineers that his department had "practically" decided to adopt the sharp-pointed design of projectiles for seacoast weapons of 6-inch caliber and upward. He said that the new projectiles would be from one-third to one-half caliber longer than the present type (one caliber equals the diameter of a bore--i.e., one caliber for a 16-inch shell would be 16 inches). At San Francisco, this decision resulted in making

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22. The San Francisco Call, July 19 and Sept. 21, 1910.

it necessary to widen the wells of no less than 12 batteries. The pointed projectiles also took more space in the magazines, resulting in some rather crowded conditions, and in the case of Mortar Batteries Howe and Arthur Wagner, the authorized number of projectiles could no longer be stored there.[23]

One last improvement of the batteries between the Spanish-American War and World War I must be noted. After years of requesting, pleading, begging, asking, even demanding, the artillerymen assigned to Battery Spencer, Fort Baker, one of the first of the Endicott batteries to be built, finally, in April 1911 got a latrine.[24]

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23. NA, RG 77, OCE, General Correspondence, Brig. Gen. William Crozier, Apr. 23, 1909, to Chief of Engrs., and Morton L. Tower, Jr., Engr., June 14, 1909, to Chief of Engrs., and Lt. Col. J. Biddle, CE, Mar. 7, 1910, to Chief of Engrs.

24. NA, RG 77, OCE, General Correspondence 1894-1923, Col. J. Biddle, Apr. 26, 1911, to Chief of Engrs.

IV. Coastal Defenses, World War I - 1938

A. The Japanese and Battery Call

The last of the Endicott batteries had been constructed in San Francisco in 1905. During the following ten years many modernization projects had taken place--projects in electrification, fire control, and so forth. By 1915 the nations of Europe had gone to war, and the United States was maintaining a wary neutrality. In 1914 the San Francisco engineers prepared plans and estimates for a new rapid-fire 5-inch battery at Fort Miley--but not because of the war in Europe, rather because of a crisis involving relations with Japan.

Anti-Japanese sentiment had long been an important force in the politics of California, particularly in San Francisco. In 1913 the California legislature, with the support of Governor Hiram Johnson, passed the Alien Land Law. This law limited the Japanese from leasing or purchasing agricultural land within the state. The Japanese government protested vigorously. And the United States Army took emergency measures to strengthen its Pacific defenses. From May to September, a steady stream of personnel, weapons, ammunition, and supplies moved through the army's port at Fort Mason.[1]

For many years the engineers had seen a need for rapid-fire guns at Point Lobos. Repeatedly, they urged Washington to purchase additional land west and north of Fort Miley for locating these weapons, to no avail. Now, however, Colonel Rees came up with a plan for moving two 5-inch rapid-fire guns from

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1. Roger Daniels, The Politics of Prejudice, The Anti-Japanese Movement in California and the Struggle for Japanese Exclusion (Gloucester, Mass: Peter Smith, 1966), pp. 45-63; NA, RG 92, OQMG, General Correspondence 1890-1914, Item 456 507, which consists of about 10 inches of documents concerning the crisis.

Battery Ledyard, Angel Island, to Fort Miley, where they would be placed close to Battery Chester. The Engineer Department approved the plan, saying that the battery should have its own rooms (magazines and plotting room) placed under the traverse between the two guns.

Construction of this new and extremely simple battery was completed in September 1915, but the work was not turned over to the Coast Artillery Corps until June 1916. General Orders 23, War Department, April 27, 1915, named the battery "Loren H. Call" in honor of First Lt. Loren H. Call, Coast Artillery Corps, who was killed on July 8, 1913, while making an airplane flight in the line of duty. Battery Call continued to function throughout World War I. Then in 1921, its guns were dismounted and shipped to the Watervliet Arsenal in New York. The carriages were dismounted, scrapped, and sold to John W. Smith, San Francisco. The date that the army considered the battery abandoned is unknown. With the establishment of a veterans' hospital at Fort Miley in later years, the emplacements of this battery were destroyed.[2]

B. Obsolescence and New Weapons

1. Weapons for the Future

Just as the Civil War had shown the masonry forts to be obsolete, the modern guns of Germany in 1914 demonstrated that the Belgian fortifications of the 1890s were out of date. Also alarming the American officers was the British production of the Queen Elizabeth class of battleships in 1914, with its 15-inch guns. The chief of engineers informed the chief of staff that America's

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2. NA, RG 77, OCE, General Correspondence 1894-1923, Rees, Sept. 30, 1914, and Apr. 4, 1916, to Chief of Engrs., and Capt. E.R. Vilton, June 13, 1916, certificate of receipt; NPS, DSC, Robert C. Prindle, "Fort Miley Record Book," Presidio of San Francisco, Nov. 26, 1954, pp. 10 and 20.

coastal guns must be at least as great a caliber and must have at least as great a range as the naval guns. He recommended that Congress authorize a certain number of new seacoast emplacements each year just as it then authorized a certain number of new warships annually. The major caliber direct-fire gun, he said, would be the immense 16-inch rifle. And he recommended an annual appropriation of $5,500,000 for fortification construction.[3]

While the 16-inch gun might be the major direct-fire weapon of the future, that did not mean that the 12-inch rifles were obsolete. The War Department noted that by changing the carriage of the 12-inch guns so as to increase its elevation to a minimum of 15 degrees and by decreasing the weight of the projectile to about 800 pounds, an effective range of 22,000 yards could be achieved. This range would make the 12-inch guns practically equal to that of any guns that might be brought against them.[4]

2. Batteries Abandoned

At the beginning of 1915, the Chief of Coast Artillery Corps Maj. Gen. E. M. Weaver prepared a document showing which batteries in San Francisco could be abandoned--providing certain new works were constructed. Just as Fort Mason and its Battery Burnham had been dropped from the harbor defenses a few years earlier, Weaver now concluded that Fort McDowell (Angel Island) and its three batteries (Drew, Wallace, and Ledyard) no longer had a tactical role in the defenses.

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3. NA, RG 77, OCE, General Correspondence 1894-1923, Chief of Engrs. D.C. Kingman, Nov. 27, 1914, memo for the Chief of Staff; Emanuel Lewis, Harbor Defense Installations, p. 205.

4. NA, RG 77, OCE, General Correspondence 1894-1923, Maj. Gen. _____, Washington, D.C., Dec. 18, 1914, Seacoast Defenses.

Also, because both Forts Barry and Miley had 12-inch mortar batteries on the outer line and a similar battery was proposed for Fort Funston, the mortar batteries of Howe and Wagner at Fort Winfield Scott (the first 12-inch mortar battery at San Francisco) need no longer be manned.[5]

3. Modernizing the Defenses

On June 1, 1915, Colonel Rees prepared a lengthy, thoughtful scheme for modernizing San Francisco's defenses. At the beginning, Rees noted that because of the deepness of the water an enemy dreadnought could approach to within 4,000 yards of any battery in the Bay Area. An advantage that some batteries had, however, was that of their elevation. It was impossible for an enemy ship's guns, firing from close range, to strike a battery at a fair elevation because the projectile would still be climbing as it passed over the battery.

Rees proposed strengthening the existing batteries by several means: adding very thick steel-reinforced firing aprons to the parapets; adding vertical concrete slabs to the fronts and sides of magazines, where needed; increasing the earthen mass and adding concrete slabs to mortar batteries; and adding up to 11 feet of concrete (or the equivalent in earth) to the tops of magazines, where needed. He then listed the following batteries and the particular needs of each:

Kirby - a thick concrete apron, additional concrete over the central traverse, and raising the BC station 3½ feet

Spencer - no work necessary

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5. NA, RG 77, OCE, General Correspondence 1894-1923, Jan. 26, 1915, table showing existing armament that in the opinion of the Chief of CA may be abandoned. Weaver would retain the mortars in Howe and Wagner but would not man them.

Alexander - additional earth on top and in front of the powder rooms and shellrooms, and additional concrete cover along the top and sides of existing work

Mendell - additional protection to the front and both flanks

Chester - a small amount of extra cover for magazines and shellroom for emplacements

Livingston - necessary to increase the earth cover over the powder rooms, shot galleries, and passages; also, extra concrete along the south side of the shot gallery

Springer - same as for Livingston

Cranston - satisfactory

Godfrey - additional concrete needed on parapet walls; an extension to form an apron

Lancaster - additional protection over the powder rooms and shellrooms of emplacement 2

Marcus Miller - a thick slab in front of the parapet wall of this emplacement and a firing apron for emplacement 1

Saffold - extra protection in front of and on top of parapet walls and powder rooms and shellrooms; since this battery no longer covered the inner harbor, certain large recesses in the parapet walls could be filled in.[6]

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6. NA, RG 77, OCE, General Correspondence 1894-1923, Rees, June 1, 1915, to Chief of Engrs.

4. Board of Review's Proposals

The War Department constituted a new "Board of Review" in 1915 to make recommendations concerning new armament needed in U.S. coastal defenses. Concerning San Francisco, this board met on June 8 and 17, 1915, recommending the installation of two 16-inch guns in the vicinity of Lake Merced--two 16-inch guns at either Fort Miley or Fort Barry and eight additional 12-inch mortars. While the board did not at this time select a site for the additional mortars, Colonel Rees had a place for them. He pointed out that a hostile fleet could now lie offshore and enfilade the line of land defenses 8,500 yards south of Lake Merced. However, a mortar battery supplemented by a 6-inch rapid-fire battery at Lake Merced would force a hostile fleet to remain at least 13,000 yards away from the land defenses. Furthermore, searchlights 1 and 2, now scheduled for Ocean Beach just south of Golden Gate Park, should be moved to Lake Merced.[7]

The Board of Review met again in July 1915. At this meeting the board moved that two of the 16-inch guns be placed on land to be purchased south of the existing Lake Merced Military Reservation and the other two at Tennessee Point, north of Fort Barry, and that four mortars were to be located at Lake Merced and four at Fort Barry. All these (including Rees' two 6-inch guns at Lake Merced) were approved by the secretary of war. Two months later, the Board of Review had second thoughts about San Francisco Harbor, and it now recommended dropping the two 16-inch guns for Tennessee Point, the four 12-inch mortars

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7. NA, RG 77, OCE, General Correspondence 1894-1923, Extracts from Proceedings of the War Dept. Board of Review, June 8 and 17, 1915, and Chief of Engrs. D. Kingman, June 7, 1915, to Chief of Staff; FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortifications File 1884-1944, Rees, June 19, 1915, to Chief of Engrs. It would take more than 20 years before the first 16-inch guns were installed.

proposed for Fort Barry, and the substitution of two 12-inch guns mounted on new carriages for long-range firing at Fort Barry.

The Board of Review made a comprehensive report to the secretary of war on November 26, 1915. It called for a four-year program to modernize the coastal defenses at a projected cost of over $96 million. In the continental United States, the board called for twenty-two 16-inch guns, twenty-four long-range 12-inch guns, twenty-three 6-inch guns, four 3-inch guns, forty-eight 16-inch mortars, and one hundred thirty-four antiaircraft guns. There were recommendations too for the Panama Canal Zone and overseas possessions. For San Francisco, per se, this project called for two 16-inch guns, two 12-inch guns (mounted on barbette carriages for long range), two 6-inch guns, and four 16-inch mortars. The Engineer Department estimated that these works at Lake Merced and Fort Barry would cost $1,258,500.[8]

5. Battery Wallace, Fort Barry

Of the several projected works, the two long-range 12-inch guns at Fort Barry were the first to be undertaken. In December 1915 the Board of Review decided to submit an estimate for this battery in 1917. Meanwhile, Colonel Rees had already begun planning the battery. He selected a site on a flat, sandy hill about 400 feet southeast of Battery Alexander. He considered this to be an ideal site, with the one exception that it was rather

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8. NA, RG 77, OCE, General Correspondence 1894-1923, Proceedings of the Board of Review, July 20, 1915, and Summary of projects adopted by the Board of Review and approved by Sect. of War, n.d., and Extract from Proceedings of Board of Review, Sept. 14, 1915; Report of the Board of Review of the War Department to the Secretary of War (November 26, 1915) on the Coast Defenses of the United States, The Panama Canal, and the Insular Possessions (Washington: Government Printing Office, 1916, confidential, published by the 64th Congress, First Session); and Comparative Statement of Estimates.

near to Alexander and already there were complaints that the batteries at Fort Barry were too close together. Each of the two emplacements was designed for 360-degree fire. A "house," located between and to the rear of the two guns, contained two plotting rooms, a power plant, a storeroom, an officer's room and toilet, a switchboard room, and a storage battery room. Opposite this building on the rear side of the road was a guardroom and an enlisted men's latrine. Two BC stations stood above the plotting rooms; these were connected by a walk along the top of the rear wall. The magazines were also located between the two guns in front of the "house." Their roofs would have 11 feet of concrete and, in addition, not less than 5 feet of earth. Rees estimated the cost of the battery at $214,158.

Construction of the platforms was reported as "nearly" completed in May 1917. Then in August, the chief of ordnance said that the two 12-inch barbette carriages (model 1917) would be emplaced in November. The battery was named in General Orders 63, War Department, May 12, 1919, in honor of Col. Elmer J. Wallace, Coast Artillery Corps, who died at Somlly, France, November 5, 1918, as a result of wounds received at Fransvaal, Ferme, France.

The date for mounting the guns has not yet been determined, but Battery Wallace had its proof fire in 1928. On that occasion the gun in emplacement 2 (serial no. 68) was damaged and had to be removed. It was replaced by gun 75 in 1929.[9]

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9. NA, RG 77, OCE, General Correspondence 1894-1923, Rees, Nov. 6, 1915, to Chief of Engrs., Maj. Gen. H.L. Scott, Chief of Staff, Dec. 7, 1915, Extract from Proceedings, Board of Review, and Brig. Gen. _____, Pacific Coast Artillery District, Fort Miley, Feb. 20, 1917, to Col. E. Burr, CE, and Burr, May 15, 1917, and Brig. Gen. W. Crozier, Chief of Ord., Aug 18, 1917, to Chief of Engrs.; FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office,

6. New Works at Fort Funston

At the beginning of the Endicott period in 1890, two mortar batteries were proposed on a tract of land between Laguna de la Merced (Lake Merced) and the ocean. The Spring Valley Water Company, which had a monopoly on providing water to San Francisco, owned this land. While the company was agreeable to selling the land at $1,000 per acre, a friendly condemnation suit was required because of the existence of three mortgages on the land by which the company had secured bonds. Before his retirement Colonel Mendell had selected a tract of 45 acres west of the north arm of the lake. The condemnation suit was completed in December 1900, with the federal government acquiring 44.95 acres at $900 per acre. However, from that date until World War I the army undertook no construction nor development at the new reservation.[10]

In 1915 the Board of Review had recommended two 6-inch guns and four 16-inch mortars for the Lake Merced Military Reservation. While neither of these batteries was constructed as such, the reservation did acquire a mortar battery and a rapid-fire battery during World War I. In February 1917 the Engineer Department made available $20,861 for the purpose of constructing temporary emplacements at Lake Merced for four 12-inch mortars to come from Batteries Stotsenburg and McKinnon (pits 3 and 4) at Fort Winfield Scott and two 5-inch rapid-fire guns to come from Battery Sherwood, also at Fort Winfield Scott. The four mortars,

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Fortifications Files 1894-1944, Rees, Dec. 31, 1915, to Chief of Engrs.; SF, PAM, Fort Record Book, Fort Barry.

10. NA, RG 77, OCE, General Correspondence 1894-1923, Maj. C. Davis, June 26, 1899, and Dec. 15, 1900, to Chief of Engrs.

arranged in a straight line, were turned over to the Coast Artillery Corps troops on January 30, 1919. The work to that date had cost $8,356. The concrete work consisted of the platforms only. The plotting room was a wooden building, measuring 12 by 19 feet with a tar and gravel roof, situated about 200 feet to the southeast of the mortars. General Orders 135, War Department, dated October 25, 1917, named the new battery in honor of Brig. Gen. Walter Howe, Artillery Corps, who had died in 1915.

The two platforms of the 5-inch guns on pedestal mounts were completed at a cost of $3,572 and turned over to artillery troops also on January 30, 1919. The work truly was temporary; the ammunition storage consisted of a wooden shelter between the two emplacements, covered with a thin layer of earth. The same general orders that named Battery Howe named this battery in honor of Col. Lawrence L. Bruff, an ordnance officer who had been an instructor at West Point and the author of texts on ordnance and gunnery. He had died in 1911. The historian E. Raymond Lewis points out that Battery Bruff may have had the shortest active life of any seacoast battery in the history of San Francisco's defenses. Six months after the engineers turned the battery over to the troops, the War Department declared it obsolete, July 22, 1919.[11]

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11. NA, RG 77, OCE, General Correspondence 1894-1923, Lt. Col. E.E. Winslow, Feb. 17, 1917, to Dist. Engr. Officer, 2d Dist., San Francisco; FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortifications Files 1884-1944, Reports of Completed Works, San Francisco Harbor; Emanuel Lewis, Harbor Defense Installations, p. 212, and Appendix I, pp. 9 and 10. This made the third set of twins in San Francisco as far as battery names were concerned: Howe, Wallace, and Wagner.

7. Establishment of Fort Funston

Meanwhile, General Orders 76, War Department, dated June 26, 1917, had named the Lake Merced Military Reservation in honor of Maj. Gen. Frederick Funston, who had fought with the rebels in Cuba before the Spanish-American War, won the Medal of Honor for action in the Philippines, captured the insurrection leader, Emilio Aguinaldo, and had come to San Francisco's aid during the 1906 earthquake. Funston had died in February 1917. In July of that year, the post was enlarged by the purchase of 150 acres to the south, also from the Spring Valley Water Company at a cost of $226,151. Enlisted men lived in tents while they constructed their own barracks and other buildings. On August 21, 1917, Fort Funston's flag was raised for the first time, an event witnessed by the San Francisco Chronicle, which said that the post looked more like a frontier reservation than anything else.[12]

8. Mining Project

By 1915 the mine facilities at San Francisco consisted of the mine depot at Fort Winfield Scott, the old mine storehouse and the other facilities on Yerba Buena Island, and mine casemates at Fort Barry and Bakers Beach. In the summer of 1915, an inspector general made a report on the shortages in equipment in the depot and on mining operations and training over the past year. The shortages were alarming: antimony for one group (19 mines); buoy anchors for three groups (57 mines); sister hooks, clips, and thimbles for four groups (76 mines); buoys and cement for six groups (114 mines); raising rope for seven groups (133 mines); tape for eleven groups (209 mines); mine buoys for twelve

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12. Emanuel Lewis, Harbor Defense Installations, p. 208 and Appendix I, pp. 4-5; San Francisco Chronicle, Aug. 22, 1917; NA, RG 77, OCE, General Correspondence 1894-1923, Heuer, Aug. 28, 1917, to Chief of Engrs.

groups (228 mines); distance weights and distance weight ropes for fourteen groups (266 mines); anchors for nine groups; and nineteen conductor cables.

Since his last inspection, the companies in the coastal defenses had been trained by planting a total of 373 mines, 58 of which had been planted in or near the projected minefield outside the Golden Gate. Earlier, most of the mines had been planted southeast of Mile Rock Lighthouse; lately, however, they were being planted in the inner harbor, close to the exposition grounds, for the benefit of visitors.[13]

A month later a board of officers unveiled its proceedings for a new submarine mining project for San Francisco. While the board considered the mining casemate at Fort Barry to be satisfactory, it concluded that the Bakers Beach casemate was too far from the mines. The board was about to recommend that the latter casemate be moved to Fort Miley when it learned that the mine planter, Armistead, could not approach the shore there to land cable closer than a half-mile because of the rocks and reefs. For the time being at least, the Bakers Beach casemate should remain where it was. As for the cable terminal at Fort Barry, the board concluded that it should be moved to Rodeo Beach where it would be much easier to land the cable. (It was not moved at that time.)

Because there were three channels approaching the Golden Gate from the sea (North, Middle, and South channels), there should be three baselines, either horizontal or vertical. Because of the fog, the base end stations (all to be at Forts Miley

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13. NA, RG 77, OCE, General Correspondence 1894-1923, Actg. IG G.H. McManus, July 24, 1915, to CG, Western Dept., San Francisco.

and Barry) should not have an elevation exceeding 100 feet, concluded the board.

The old rapid-fire batteries of Chamberlin, Crosby, Boutelle, and Orlando Wagner then used to cover the mines were too far removed, and the board thought they should be abandoned. Batteries Guthrie and O'Rorke at Fort Barry covered the North Channel well; Battery Rathbone covered the South and Main channels; and Battery Call (when it was built) at Fort Miley could cover the South Channel. The board thought it wise to place a second two-gun 6-inch battery at Fort Miley for covering the Main Channel.

The board was not impressed with the mine depot at Fort Winfield Scott. For one thing the wharf was poorly located, being always in a heavy swell and undertow. Not only was dredging a continuous necessity, the mine planters often could not berth there. Both the cable tank and the storeroom at Fort Winfield Scott were too small, and much material still had to be stored on Yerba Buena where the facilities were antiquated. Both should be abandoned in favor of a new depot at Fort Baker that would be large enough to store 342 no. 28 mine cases, 342 3,000-pound automatic anchors, all the accessories, 50 miles of multiple cables, and 75 miles of single conductor cables. Three loading rooms capable of loading a group of 19 no. 48 mines simultaneously should be built; the old Battery Cavallo would make a suitable magazine for storing the explosives. Finally, the board said there should be boat houses at Fort Baker capable of holding two "D.B." boats similar to the present "L-34," four power yawls and several rowing yawls. There would also be two mine planters. The estimated cost for the new depot came to $580,300.

When the Acting Secretary of Navy, Franklin D. Roosevelt, learned that the army might leave Yerba Buena Island in favor of Fort Baker, he quickly reached an agreement with the secretary of war for the army's 8 acres on Yerba Buena to be transferred to the navy when the new depot at Fort Baker was completed. However, despite the board's carefully thought-out project, a mine depot would not be constructed at Fort Baker until the eve of World War II. Meanwhile, the existing facilities had to suffice.[14]

Throughout the 1920s and 1930s, frequent repairs were made to the Fort Winfield Scott mine wharf, despite the swells and the undertow. In 1924, for example, the sum of $1,246 was expended on new piles and stringers; $4,813 was spent in 1928 for the same; and $4,400 was spent in 1929. In 1927 the engineers reported that the corrugated iron roofs at the Fort Winfield Scott depot had deteriorated greatly and were leaking. There were no funds at the moment, but the Engineer Department hoped to be able to finance roofing in fiscal year 1929, preferably roofing of corrugated asbestos called "Transite."[15]

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14. NA, RG 77, OCE, General Correspondence 1894-1923, Proceedings of a Board of Officers concerning a submarine mine project for San Francisco, Aug. 25, 1915, and Actg. Sect. of the Navy, F.D. Roosevelt, Oct. 5 and Nov. 18, 1915, to Sect. of War; FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortification Files 1884-1944, Heuer, Jan. 26, 1918, to Chief of Engrs. The navy had acquired all of Yerba Buena Island except the 8 acres by an Act of Congress, April 24, 1896, which established a naval training station there.

15. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortification Files 1884-1944, Maj. J.W.N. Schulz, CE, Feb. 16, 1927, to CO, Harbor Defense of San Francisco; FARC, Suitland, Md., RG 77, OCE, Completion Reports, Fort W. Scott, Lt. Col. I.L. Fredendall, Constr. QM, Completion Report, Mine Wharf repairs, July 27, 1922, etc.

New depot or not, the mining casemates did receive increased protection during the war years. The original casemate at Bakers Beach had 8-inch concrete walls and a flat frame roof covered with tar and gravel. Located inland 200 feet from high tide, an earthen embankment hid it from the sea. In 1918 the engineers proposed increasing the seaward wall and the north and south end walls to a thickness of 5 to 5½ feet of concrete. A 5-foot-thick slab of concrete was to be added to the roof and 9 feet of sand placed over that. A similar plan was prepared for the Fort Barry casemate. Here the new wall proposed for the north side of the casemate was to be removed 5 feet from the existing wall so as to form a passageway to the various rooms. The estimated costs came to $22,245 for Bakers Beach and $24,830 for Fort Barry. The work was carried out in the fall of 1918.

A description of the Fort Barry casemate, after it was strengthened, has come to light.

First constructed, 1909
Turned over to the troops, November 11, 1910
Bombproofed, September 1918
Number of operating panel, seven
Outside dimensions, 58 feet 5½ inches by 23 feet 8 inches
Inside dimensions
- Dormitory, 9 by 22 feet
- Operating room, 18 by 22 feet
- Engine room, 12 feet 9 inches by 22 feet
- Toilet, 4 feet 7 inches by 10 feet 7 inches
- Cabinets, 4 feet 7 inches by 6 feet 1 inch and 4 feet 7 inches by 4 feet 7 inches
- Storage battery room, 10 by 22 feet

The final cover

Concrete

Expanded metal

1 foot of concrete

8 feet of earth

2 feet of burster slab of concrete

2 feet of earth[16]

9. More Armament Changes

Besides transferring the four mortars and two rapid-fire guns to Fort Funston, the Pacific Coast Artillery District witnessed many more armament changes in San Francisco after the United States entered the war against Germany in April 1917. Almost immediately the artillery district commander notified Washington that it was necessary to transfer four 12-inch mortars from Fort Winfield Scott to Gray's Harbor and four others to Willapa Bay, both in Washington; four 3-inch rifles from Fort Baker to Fort MacArthur, Los Angeles; and three 5-inch guns from Battery Boutelle, Fort Winfield Scott, to Fort Rosecrans, San Diego. The chief of Coast Artillery Corps replied that it would not be necessary to send the 3-inch guns to Fort MacArthur, as field pieces were to be used there. Boutelle's guns should be dismounted but not for San Diego since they had been listed for service abroad. As far as it may be determined, the mortars were not sent up to Washington either. All told, this planning seems to

16. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortifications File 1884-1944, Col. C.L. Potter, CE, Mar. 21, 1918, to Chief of Engrs.; S.F., PAM, Fort Record Book, Ft. Barry. The final cover (described above) sounds as if it were placed on the roof around the eve of World War II; the term "burster" did not come into San Francisco correspondence until the construction of Battery Davis, Fort Funston, in the late 1930s.

have been the result of the excitement caused by the beginning of hostilities for the United States.[17]

The army did not commence to dismount weapons of the San Francisco defenses for use elsewhere until late 1917. Those batteries affected during both the war and the postwar years were the following:

Chamberlin, Fort Winfield Scott - Four 6-inch guns and carriages were dismounted in 1917 and forwarded to the Watervliet Arsenal in New York. (In 1920 Chamberlin was rearmed with two 6-inch guns on barbette carriages, model 1900.)

Slaughter, Fort Winfield Scott - Three 8-inch guns were dismounted and shipped to Watervliet Arsenal in November 1917.

Marcus Miller, Fort Winfield Scott - When an engineer officer undertook to modify the powder rooms and shellrooms of emplacement 3 in the summer of 1917, the work was disapproved on the basis that the battery was obsolete and of very little military value. However, Miller's three 10-inch guns were not dismounted until 1920.

Orlando Wagner, Fort Baker - Two 5-inch guns were dismounted in late 1917 and sent to the Morgan Engineering Company, Alliance, Ohio, for remounting as field artillery. These two guns were sent to France in 1918.

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17. NA, RG 77, OCE, General Correspondence 1894-1923, Brig. Gen. W.L. Sibert, Pacific Coast Artillery Dist., Fort Miley, Apr. 11, 1917, to AG, USA.

Duncan, Fort Baker - Two 8-inch guns were dismounted and shipped to the Watervliet Arsenal, New York, for overseas duty. Their barbette carriages were sold as scrap in San Francisco.

Rathbone, Fort Barry - Two of its four 6-inch guns (nos. 3 and 4) were removed in December 1917 and shipped to the Morgan Engineering Company. Following the war, these guns were returned to San Francisco and remounted in Battery Rathbone (these two emplacements being made into a separate battery named McIndoe).

Guthrie, Fort Barry - Here, too, the 6-inch guns in emplacements 3 and 4 were shipped East. Following the war they were remounted and redesignated Battery Smith.

Boutelle, Fort Winfield Scott - After it had been decided that Boutelle's three 5-inch guns were not required at San Diego, they were dismounted for service as field artillery abroad. This removal occurred before February 1918. (It must be noted that the fort record book for Fort Winfield Scott states that Boutelle's guns were not dismounted until 1920. However, this latter date appears to be an error.)

Lancaster, Fort Winfield Scott - Two of Lancaster's big three 12-inch guns were dismounted and shipped to the Watervliet Arsenal in May 1918. The third gun was dismounted in June 1918 and moved to Battery Chester at Fort Miley. There it replaced one of Chester's 12-inch guns of a later model, which was shipped East. The magazines at Lancaster continued to store reserve ammunition.

Spencer, Fort Baker - In June 1918 one of the three 12-inch guns (gun 3) was dismounted and moved to Battery Chester, Fort Miley, where it too replaced a 12-inch gun of a later model for service elsewhere. Emplacement 3 at Spencer was converted into the fire control switchboard room for Fort Baker and the battery power plant for Spencer itself.

Alexander, Fort Barry - In the summer of 1918, the four forward of the eight 12-inch mortars were dismounted and shipped to the Morgan Engineering Company. The four carriages were not scrapped until 1920.

Livingston, Fort Miley - Four of the eight 12-inch mortars were removed in May 1918. The four carriages were not taken down until 1920-21; two of them were shipped to Benicia Arsenal, and two were sold as scrap.

Springer, Fort Miley - Like the other mortar batteries, four of the eight 12-inch mortars were dismounted in 1918. Here, too, two carriages were sold in 1920, and two were shipped to Benicia in 1921.

Baldwin, Fort Winfield Scott - Its two 3-inch guns were removed in 1920.

Blaney, Fort Winfield Scott - All four 15-pounder, 3-inch guns were dismounted in 1920. Along with the Endicott batteries of Fort Mason and Angel Island, the disarming of Baldwin and Blaney concluded the removal of weapons from the inner harbor except for Battery Yates at Fort Baker.

Howe, Fort Winfield Scott - All eight 12-inch mortars were dismounted in 1920.

Wagner, Fort Winfield Scott - This other half of the original Mortar Battery 1 had all eight 12-inch mortars dismounted in 1920 also. Not only were these weapons removed, but the garrison of Forts Funston, Baker, and Barry were reduced to a mere caretaker status by 1921. However, during the 1920s and early 1930s the engineer and artillery officers continued to plan for the future defenses of San Francisco Harbor, and they contained to maintain the surviving batteries around the bay.

Fort Funston

Walter Howe (four 12-inch mortars)

Fort Miley

Chester (three 12-inch guns)
Livingston (four 12-inch mortars)
Springer (four 12-inch mortars)

Fort Winfield Scott

Stotsenburg (eight 12-inch mortars)
McKinnon (four 12-inch mortars)
Cranston (two 10-inch guns), dismounted in 1941
Godfrey (three 12-inch guns)
Saffold (two 12-inch guns)
Crosby (two 6-inch guns)
Chamberlin (two 6-inch guns)

Fort Baker

Spencer (two 12-inch guns)
Kirby (two 12-inch guns), one gun to the Philippines in 1933, the other removed in 1941
Yates (six 3-inch guns)

Fort Barry

Mendell (two 12-inch guns)
Alexander (four 12-inch mortars)
Guthrie (two 6-inch guns)
Smith (two 6-inch guns)
O'Rorke (four 3-inch guns)
Rathbone (two 6-inch guns)
McIndoe (two 6-inch guns)
Wallace (two long-range 12-inch guns)[18]

10. Antiaircraft Guns

The district engineer Thomas Rees prepared plans and estimates for antiaircraft guns for the defense of San Francisco in January 1916, more than a year before the United States entered the war. His project called for six 3-inch antiaircraft guns: two each at Forts Barry, Winfield Scott, and Miley. The emplacements proposed were somewhat like those that would be planned for the long-range guns at Battery Wallace a year later. Each concrete circle was to be 30 feet in diameter so as to facilitate sponging the guns. The floors of the rooms between the two emplacements were to be 3 feet lower than the gun platforms.

At Fort Barry, Rees proposed to locate one of the guns on Rodeo Hill, the hill between Bonita Cove and the post of Fort Barry and the other on a slope northwest of this hill. One

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18. FARC, San Bruno, RG 77, OCE, Presidio Museum, Fort Record Books, Forts Winfield Scott, Miley, and Barry; Emanuel Lewis, Harbor Defense Installations, pp. 216-17 and 231; FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortifications Files 1884-1944, Rees, Apr. 26, 1920, to Chief of Engrs., and Potter, Mar. 28, 1919, to Chief of Engrs.; NA, RG 77, OCE, General Correspondence 1894-1923, Heuer, July 27, 1917, to CO, Coast Defenses of San Francisco, Fort W. Scott, and Col. W. [Hase?], Actg. Recorder, Board of Review, Feb. 4, 1918, memo for Board of Review.

of the guns at Fort Winfield Scott would be located on an open slope northwest of Battery Howe and the other on a flat area south of Battery Stotsenburg. At Fort Miley, Rees picked a site on the flat area in front of Battery Livingston for one of the guns and a location behind the fire control stations at the western end of the fort for the other. He estimated the cost of the six emplacements at $32,400. The chief of engineers did not approve Ree's project saying it was too expensive. The colonel was directed to keep the cost of each emplacement below $1,000. He did this by reducing the concrete emplacement to a small gun "plug," the area outside it to be either sodded or macadamized. He also reduced the thickness of the concrete used in the magazines. His revised cost came to less than $6,000.

Two years later, the first appropriation for 3-inch antiaircraft guns became available. The adjutant general informed the commanding general of the Western Department that San Francisco would receive 6 of the 159 guns authorized. They would be 3-inch Ordnance Department antiaircraft guns, 2,600 feet/second, M.V. on fixed pedestal mounts, model 1917 (Seacoast). It was anticipated that these weapons could be used against aircraft flying up to an altitude of 8,000 feet anywhere within a horizontal range of 5,000 yards.[19]

Another two years passed and World War I was over; in 1920 Colonel Rees came up with a new project for the still

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19. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortification Files 1884-1944, Rees, Jan. 22, 1916, to Chief of Engrs.; NA, RG 77, OCE, General Correspondence 1894-1923, Maj. ?, AGO, Mar. 15, 1918, to CG, Western Division, San Francisco. Most of the AA guns were assigned to the East Coast, e.g., 30 for New York City and 16 for Boston. However, both San Diego and Los Angeles got two guns each. The guns when they arrived were model 1917 MI.

promised but not yet delivered antiaircraft guns. This project called for eight 3-inch guns on fixed mounts--two each at Forts Barry, Winfield Scott, Miley, and Funston. This plan proposed new locations for most of the emplacements, sites that actually were used. At Fort Barry the two sites were on Rodeo Hill, 500 feet apart and at elevations 345 and 360. At Fort Winfield Scott both emplacements were located on the left flank of Battery Godfrey. At Fort Miley the new sites were in the northeast corner of the reservation about 300 feet in front of the right flank of Battery Livingston. And at Fort Funston, Rees proposed placing the guns on a knoll near the center of the reservation, the two guns being about 75 feet apart. In May 1920 the War Department gave approval for building the following gun plugs but not the parapets or magazines.[20]

a. Fort Winfield Scott

The gun plugs were constructed in 1920, but the date that the guns were mounted has not been established. The guns were nos. 97 and 116, and the mounts were nos. 86 and 89. These two antiaircraft weapons were dismounted in November 1925 and moved to Fort Funston.

b. Fort Barry

The two emplacements were constructed in 1920, and the base rings were set in 1925, but again the date the guns were mounted has not been determined. These guns were nos. 68 and 196, and both come from the Watertown Arsenal. In 1933 they were dismounted and sent to the Watervliet Arsenal in New York.

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20. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortification Files 1884-1944, Rees, Apr. 19, 1920, to Chief of Engrs. Nearly all these emplacements may still be found today.

A year later two new guns (nos. 142 and 151) were received and mounted.

c. Fort Miley

Work on the battery commenced in 1920 and was completed in 1925 (setting the base rings?). As of 1929 two carriages had been supplied: AA model 1917, serial nos. 130 and 159, Watertown Arsenal; but no guns had yet arrived. It is not known if any guns were mounted during this period.

d. Fort Funston

As noted above, Fort Winfield Scott's two antiaircraft guns were moved to Fort Funston in 1925. Before that date, however, troops at Fort Funston had received training in firing mobile antiaircraft guns. The San Francisco Chronicle carried an article in 1922 describing a drill in which five "enemy" aircraft attempted an attack. They were routed by five "friendly" craft and the 75-mm. mobile guns at Funston. The troops had camouflaged the guns with brush, set off a smoke screen around the balloon hanger, and, somehow or other, used their searchlights as well. In May 1925 at another drill, members of the 63rd Company fired mobile antiaircraft guns at a range of over 2 miles at a 3- by 10-foot muslin target towed by a Crissy Field airplane. The sixth shot hit the target and fluttered into the sea. The newspapers called this an exceptional record. No account has been found of the troop firing the fixed guns after 1925.[21]

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21. FARC, San Bruno, RG 77, OCE, Presidio Museum, Fort Record Books, Forts Winfield Scott and Barry; SF, PAM, "Historical Record of Presidio Batteries, January 12, 1975"; FARC, San Bruno, RG 77, OCE, San Francisco, Main Office, Fortifications Files 1884-1944, Reports of Completed Works, Fort Barry, Dec. 1927-Aug. 1929, and Reports of Completed Works, Fort Miley, corrected to Aug. 1, 1929; San Francisco Chronicle, Nov. 23, 1922; San Francisco Examiner, May 10, 1925.

C. Fortification Estimates for 1921

Although a lull in defense measures followed World War I, the engineers at San Francisco had no lack of projects to undertake if approval were ever given. An example of these was the following fortification estimates for 1921:

One 16-inch gun at site A, Fort Funston	$449,900
One 16-inch gun at site B, Fort Funston	414,000
Four 16-inch mortars at Fort Funston	333,500
Two 6-inch guns at Fort Funston	230,000
Additions to platforms, emplacements 2 and 3, Battery Chamberlin, to provide for 6-inch guns on barbette carriages	5,220
Additional earth and concrete protection over powder rooms and shellrooms, Battery Alexander, and over corridors connecting these rooms with mortar pits	6,900
Widening wells and altering existing Hodges hoists at Crosby to accommodate long-pointed projectiles	144
Additional plotting rooms and primary stations at Batteries Gurthrie and Rathbone to provide for operating each as two batteries of two guns each	9,020
Primary and secondary stations for Battery Elmer J. Wallace, Fort Barry, on private property	25,500
Low-elevation fog base stations at Mendell and Alexander	6,300
Fire control system for projected works at Fort Funston	83,121
Portable searchlights 1, 2, 3F, and 4F, Fort Funston	20,200
Searchlights 3M and 4M, Fort Miley	1,100

Searchlight 5, Fort Winfield Scott	340
Searchlight 11, Fort Baker	10,760
Moving existing 25 kw sets and installing additional battery power plants	19,386
Purchase of land for secondary fire control stations for Wallace and cable right-of-way	7,987
Submarine mine depot, Fort Baker	850,000
Enlarging firing aprons at Battery Chester	5,175
Removing hill, right flank, Battery Rathbone	2,645
Emergency fort commander's station, Rodeo Hill, Fort Barry	4,500
Moving plotting rooms for Stotsenburg and McKinnon and Fort Winfield Scott switchboard 1 from Rob Hill	11,420
Protecting plotting room and BC station, Battery Godfrey	4,485
Protecting plotting room, Battery Saffold	6,123
Storehouse and workshop for the artillery engineer to be constructed in one of the pits of old Dynamite Battery	4,456
New guardroom, Battery Saffold	2,300
General maintenance	25,000
Supplies	6,500[22]

D. Spotter Planes and Balloons

The changing times for artillerymen were noted in a newspaper account in January 1921. The reporter discussed the target practice carried out at a 12-inch battery (Mendell?) at Fort

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22. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortification Files 1884-1944, Col. C.L. Potter, Sept. 2, 1919, to Chief of Engrs.

Barry in 1920. Airplanes from Crissy Field were used to report immediately the exact distances from the target the projectiles hit the water. This allowed for a much more rapid correction of fire than plotting by terrestrial observation. Further, observers in army balloons made it possible to train accurately on vessels far out to sea and hidden from land by haze or fog. Another change made possible by balloon observers was increasing the length of a target towline from 300 feet to more than one-half mile. The use of balloon observers, said the paper, that was accomplished at Fort Barry had "never before been duplicated at any land fort in the United States on a prior occasion." The article concluded with the announcement that three companies of artillerymen from Fort Winfield Scott would begin the 1921 practice at Fort Barry on January 21. It was expected that airplanes would be allowed to drop 500,000 candle power flares for night practice.[23]

The 24th Balloon Company, U.S. Air Service, arrived in San Francisco sometime in early 1920. In April the 14th Balloon Company joined it from Fort Omaha, Nebraska. The two outfits worked together for a month developing a system of tracking moving vessels. The balloons were stationed at each end of a baseline about 7 miles long. A sextant in each balloon measured the angle between the balloon and the target; this procedure, however, was not considered successful. The 14th Balloon Company went on to the Pacific Northwest for the summer. When it returned, on October 1, an exercise was carried out whereby 12 rounds were fired by Fort Barry's guns using only balloon data. Nine of the rounds were hits, and the exercise was considered a success. Additional exercises were held in December 1920; they too were considered successful.

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23. San Francisco Chronicle, Jan. 17, 1921.

In January 1921, the 24th Balloon Company was stationed at Fort Baker but maintained its balloons at Fort Barry. The 14th Balloon Company kept its balloons at Fort Funston. Near disaster occurred on New Year's Eve (1920) during a night exercise. One balloon dropped flares, one of which landed on an airplane passing below and set it on fire. The pilot dove his plane in a successful effort to shake off the flare, but he almost hit a second balloon that had not been illuminated by searchlights.

The steady winds of San Francisco Bay were a source of constant trouble for balloonists. On several occasions gusts of up to 50 miles per hour turned balloonists' knuckles white. In January 1921 each company lost an inflated balloon to high winds, there being no proper storage for them at any of the posts. Construction was begun on balloon hangars at Forts Barry and Winfield Scott on July 27, 1920, and completed by June 26, 1921, at a cost of $199,787. In addition to the hangars, the project included hydrogen generator houses and fields for maneuvering the winds to which the balloons were attached.

Crissy Field came into full operation in 1921; from then on airplanes regularly assisted the Coast Artillery Corps in tracking and observing during target practice. Both balloon companies were stationed at Crissy Field in November 1921, assisting in beautifying the area. It is not known when they left San Francisco; no reference to either of them has been found in the U.S. Air Service News Letter after that date. Perhaps the winds drove them away.[24]

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24. FARC, Suitland, RG 77, OCE, Completion Reports, Ft. W. Scott, Lt. Col. I.L. Fredendall, Constr. QM, June 30, 1921, Completion Report of Balloon Hangars at Forts Barry and W. Scott; U.S. Air Service News Letter 1920-21, microfilm, USAF Academy Library, Colorado Spring, Colo. A project for the balloon hangar at Fort Funston has not been located. As noted earlier, it was in existence by 1922.

E. The Army and the Golden Gate Bridge

When the idea of bridging the Golden Gate came to the fore about 1923, a great deal of opposition developed. Among the opponents were officers of the U.S. Army and U.S. Navy. These officers were greatly concerned that enemy bombing might destroy the structure, which would bottle up the harbor. Besides, nowhere in the world had the entrance to a great harbor ever been bridged. Nonetheless, in December 1924 the secretary of war issued a provisional permit to the Golden Gate Bridge and Highway District granting it authority to proceed pending later plans. Such a permit was required, of course, because the approaches to a bridge on either side of the Golden Gate would run through military reservations: Fort Baker on the north and Fort Winfield Scott and the Presidio of San Francisco on the south.

In August 1929 Joseph B. Strauss was appointed the chief engineer of the bridge project. One of his first actions was to establish a field office at Fort Point as headquarters for his resident engineer. Unfortunately, no one mentioned exactly where at Fort Point this office was located. Strauss's plans for a suspension bridge were far enough along in 1930 for the secretary of war to form a special board of officers, consisting of three members of the Corps of Engineers, to consider issuing a final permit. The board held hearings in San Francisco in June then forwarded its findings to Maj. Gen. Lytle Brown, the chief of engineers. Immediately thereafter the War Department held an extended hearing in Washington, D.C., which Strauss attended. General Brown said that he was opposed to granting a permit "but that the provisional permit of 1924 left him no alternative" but to do so. The War Department issued the permit on August 11, 1930, on the basis that the bridge have a 4,200-foot span and a vertical clearance of 220 feet at midspan and 210 feet at the towers.

Construction of the Golden Gate Bridge began officially on January 5, 1933. Several weeks later a ground-breaking ceremony was held at nearby Crissy Field, "the like of which for pageantry and enthusiastic support of the citizenry had never before been witnessed in the bay region."

By the terms of the permit, the bridge district was required to replace and make good any damage to military structures and facilities that the construction caused. Many of these replacements and improvements were handled as Works Progress Administration projects. Strauss complained mildly that due to the government's requirements this aspect of the project was "a most exacting and trying phase of the work, and for the same reason its cost was an item which constantly grew larger." As a result of building two viaducts on the Presidio and the Marin approaches, the district found itself constructing several fire control stations, a $125,000 powder magazine, a rifle range, machine and other shops, drainage and sewage systems, living quarters, roads, and even gas stations for the army.

The magazine, now known as the Central Reserve Magazine, was required because the bridge touched the San Francisco side precisely on top of old Battery Lancaster, long since disarmed, but whose magazines were still being used for storage. Further inland, the approach road destroyed old Battery Slaughter and its magazines as well. The new magazine was bombproof and was designed to include the space and the handling equipment for storing 1,200 rounds of antiaircraft ammunition, 1,600 rounds of 155 mm. shell, 1,600 155 mm. propelling charges, small arms ammunition, and 200 rounds of reserve 16-inch ammunition for Fort Funston. Located immediately north of old Battery Stotsenburg, this magazine still stands and is one of the few military structures at the Presidio having a guard mounted.

Another major undertaking was to divert Lincoln Boulevard just south of the toll plaza and to reconstruct a quarter mile of it, depressing it and constructing an overpass across it to connect the Presidio approach with the toll terminal. All told, Strauss listed the cost of these military replacements and improvements at $575,000.

Strauss's place of honor in the court of historic preservation was not his building of magazines or fire control stations but in retaining all of the old masonry fort except its counterscarp at Fort Point. He described his feelings for the grand old structure.

> Old Fort Scott, dating back to the late fifties as we have seen, and still in a good state of preservation, now nestles between two pylons and beneath the 319-foot steel arch which at this point supports the bridge floor. While the old fort has no military value now, it remains nevertheless a fine example of the mason's art. Many had urged the razing of this venerable structure in order to make way for modern progress and provide an uninterrupted working area for the bridge during construction. In the writer's view it should be preserved and restored as a national monument, and that was the primary reason for the arch.

Commemorating another historic structure, Strauss had a bronzed starred disk set into the center line of the roadway 180 feet south from the south abutment of the bridge. He said that

this marker was located over the center of a former fire control station at Battery Lancaster, but perhaps Strauss had placed a marker for himself. It was from that crow's nest that he had initiated his first reconnaissance for the Golden Gate Bridge.[25]

F. Constructing 16-inch Batteries

1. Battery Richmond P. Davis

As early as 1915 the chief of artillery explained why it was necessary to emplace 16-inch guns and 16-inch mortars at Fort Funston. Without these weapons, a hostile squadron could lie off San Pedro Point beyond the extreme range (20,000 yards) of the only gun that bore south along the beach (the left flank 12-inch gun at Battery Chester, Fort Miley) and with the range of naval ordnance (21,000 yards) effectively bombard the greater part of the city of San Francisco. If the ships "be heeled," or if more powerful naval guns were used, say a range of 25,000 yards, the entire city would be covered. Sixteen-inch guns at Fort Funston would preclude this; 16-inch mortars would also cover the South Channel approach to the Golden Gate. Two years later in 1917, the first set of plans for two 16-inch gun emplacements at Fort Funston were prepared in the District Engineer's Office at San Francisco. But these plans gathered only dust.[26]

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25. Joseph B. Strauss, The Golden Gate Bridge, Report of the Chief Engineer to the Board of Directors of the Golden Gate Bridge and Highway District, California (San Francisco, 1938; reprint 1970), pp. 26, 31, 39, 48, 49, 51, 52, 58, and 62; NA, RG 407, Office of the Adjutant General, San Francisco Harbor Defenses, Annex A, Seacoast Guns, 1937.

26. NA, RG 77, OCE, General Correspondence 1894-1923, Heuer, Aug. 24, 1917, to Chief of Engrs., table showing seacoast armament additional to that emplaced deemed necessary by the Chief of Coast Artillery, Jan. 20, 1915. This table stated that the number of personnel required for the two guns and four mortars would be 20 officers and 307 enlisted men. A year later, the adjutant general

The Washington Naval Conference (1921-22) resulted in a ten-year moratorium on capital-ship construction and, for the United States, the scrapping of 15 battleships and battle cruisers. One of the results of this international agreement was a surplus of 16-inch guns that had been manufactured by the navy. Many of these would be diverted to American coastal defenses, including those 16-inch guns eventually installed at San Francisco.[27]

In 1924 the San Francisco district engineer, Col. Herbert Deakyne, carried out the next serious planning for a battery of two 16-inch guns on army barbette carriages, model 1919. At that time, engineers employed the principle of dispersion for guns of this size; this meant placing the guns far apart from each other and from their magazines also. While Deakyne thought the battery was probably scheduled for Fort Miley, he realized that Miley was too small and that Fort Funston was much more appropriate. The two platforms, Deakyne wrote, were to be at least 300 yards apart. A central service magazine was to be placed between the two guns, and two other service magazines were to be on the outer flanks of either gun platform, at a minimum distance of 200 yards. These three service magazines would contain 90 projectiles and 360 powder cases. A railroad would connect the three magazines and the gun platforms.

A reserve magazine having space for 410 rounds was to be built at some distance from the battery. An alternative to

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stated that the number of personnel required to operate two 16-inch guns was 4 officers and 127 enlisted men. NA, RG 77, OCE, W.M. Wright, AG, Feb. 15, 1916, an endorsement to CG, Western Dept., San Francisco.

27. Weigley, The American Way of War, p. 244. The 10-year moratorium was extended another five years by the London Naval Treaty of 1930.

this, said Deakyne, would be to store the reserve ammunition in the abandoned batteries at Fort Winfield Scott and carry it by truck to Fort Funston when needed.[28]

San Francisco's 16-inch gun project took another small step toward reality in 1925 when the Office of the Chief of Engineers drew up a priority list for the placement of these weapons. Of the first seven locations, San Francisco ranked fourth and sixth.

Priority	Location	No. of 16-Inch Guns
1	Panama Canal, Pacific Entrance	4
2	Panama Canal, Atlantic Entrance	4
3	Hawaii Department	4
4	San Francisco	2
5	Narragansett, Rhode Island	6
6	San Francisco	2
7	Chesapeake Bay	2

In 1926 the San Francisco District Engineer prepared a new set of plans for a two-gun battery mounted on barbette, (model 1919) carriages. He placed them in the south half of Fort Funston because of its higher ground. He too followed the principle of dispersion, and in general his plan was similar to the 1917 one. The Office of the Chief of Engineers returned the plans to San Francisco, commenting only to the effect that navy guns on army carriages would be used in this project and that the maximum range of these was 44,600 yards (25.3 miles).[29]

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28. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortification Files 1884-1944, Col. Herbert Deakyne, Apr. 11, 1924, to CO, Coast Defenses of San Francisco, Fort W. Scott.

29. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortification Files 1884-1944, Maj. J.W.N. Schulz, Sept. 14, 1925, to Chief of Engrs.

By 1927 the chief of engineers was against the purchase of any more land north of Fort Barry, and the San Francisco District Engineer then attempted a revision of his project so as to place all four 16-inch guns at Fort Funston. However, the commanding officer of the San Francisco Harbor Defenses did not agree. He believed that two of the guns should be on the north side of the Golden Gate, either crowded onto Fort Barry or, if that was not satisfactory, on privately owned Tennessee Point. The commanding officer of the Ninth Coast Artillery District, Presidio of San Francisco, agreed. So did the commanding general of the Ninth Corps Area, Presidio, who pointed out that North (or Bonita) Channel was preferred by the U.S. Navy for the movement of capital ships, and both it and Middle Channel should be covered by 16-inch guns. The whole issue was resolved in July 1928 when the Adjutant General's Office announced that there would be two batteries, one on either side of the Golden Gate.

Between 1930 and 1932 the army had defense projects drafted for each of the 18 coastal areas for which permanent defenses were considered essential. It also established a harbor defense board to supervise these projects. At San Francisco in March 1932, the engineers submitted no fewer than four alternative plans for placing two 16-inch guns on Tennessee Point. Now began a new discussion when the engineer of the Pacific Division stated that all four plans were too expensive and that railroad guns should be adopted rather than fixed emplacements. Still others argued that railroad guns were just as expensive as fixed batteries. The Adjutant General's Office attempted to call a halt to the arguments in 1933 by writing the commanding general, Ninth Corps Area: "It is desired . . . every effort be made to complete the plans for these two batteries in the near future, so that if in a subsequent distribution of funds under the Emergency Public Works Program, opportunity is presented to construct these batteries . . . advantage may be taken of the opportunity."

Things were made easier for the San Francisco District Engineer in 1934 when he was visited by an officer from the Construction Section, Office of the Chief of Engineers. That officer informed him that Washington no longer felt that the dispersion principle was important. Now that he did not have to scatter the batteries all over the place, the district engineer picked new sites for them and began his planning over again.[30]

In January 1935 the district engineer submitted a new plan for the Fort Funston battery. While there would be future changes to it, the concept now was essentially that followed in constructing the emplacements. The two guns were placed 768 feet apart (later reduced to 600 feet). Between them was a single, centrally located magazine having a capacity of 200 rounds. Immediately to the rear of the magazine was a powerhouse. The plotting and switchboard rooms were located in a separate structure 750 feet distant. Still another plan for Fort Funston, dated January 24, 1936, showed concrete and earth casemates over each gun. The engineers had come full circle. These were the first casemates at San Francisco since work was halted on the barracks on Alcatraz Island at the close of the Civil War. Now the engineers had the airplane to contend with.[31]

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30. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortification Files 1884-1944, Maj. W.A. Johnson, June 30, 1925, to Dist. Engr., First Dist., San Francisco, and Maj. W.N. Schulz, Dist. Engr., San Francisco, Jan. 12, 1927, to CO, Harbor Defenses, and the accompanying 27 endorsements dated from 1927 to 1934; Stetson Conn, Rose C. Engleman, and Byron Fairchild, Guarding the United States and Its Outposts, U.S. Army in World War II: The Western Hemisphere (Washington: Department of the Army, 1964), pp. 46-47.

31. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortification Files 1884-1944, Lt. Col. H.A. Finch, CE, Jan. 15, 1935, to CG, Ninth Corps Area, Presidio. All plans from January 1936 on showed casemates for the guns. In the actual construction, however, the casemates were not built until after the guns were mounted.

The appropriation "Seacoast Defenses, United States, 1937" made available an initial funding for San Francisco's 16-inch guns. The approved expenditure program allotted $318,500 for the purchase of land at Tennessee Point and $300,000 to initiate construction of the battery at Fort Funston. This latter sum was broken down as follows:

Construction plant	$25,000
Two gun blocks, less paving and approaches	90,000
Water supply, sewage, latrine	15,000
Plotting/switchboard room	50,000
Camouflage tree planting	5,000
Overhead and contingencies	18,000
Purchase of power equipment	89,500
Reserved by OCE	16,000

Camouflage for the battery involved much more than the $5,000 worth of tree planting. Plans called for camouflage nets over the gun openings, camouflage painting, dummy casemates, and false roads leading nowhere. The district engineer explained it well when he said that the camouflage was to follow the "principle of confusion."[32]

Construction of the huge battery began in October 1936. At the same time plans were developed for shipping the carriages from Watertown Arsenal, Massachusetts, and the guns from Aberdeen Proving Grounds, Maryland. The Engineer Department worked out a shipping schedule in order of priority for the different elements.

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32. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortification Files 1884-1944, Col. W.T. Hannum, May 26, 1936, to Dist. Engr., San Francisco, and Lt. Col. J.A. Dorst, CE, June 23, 1936, memo to Mr. Letts; NA, Cartographic Archives Div., RG 77, Fortificatins File, "Tentative Layout, Battery of 2-16 in. Guns on Barr. Carr. in Casemates," Jan. 24, 1936.

Base rings (including leveling plates, leveling screws, and traversing rack)

Racers (including rollers, distance rings, platform complete)

Side frames and accessories

Cradles

Rifles and counterweights

Power units (including electrical motors and cables)

Shell and powder cars, railroad (Actually, this battery had overhead trolleys for delivering ammunition.)

Accessories

The carriages were transported to the Brooklyn Naval Yard around the end of 1936. At Aberdeen the two barrels were loaded and blocked on railroad cars and also taken up to Brooklyn. At the naval yard the weapons were placed on board the army transport, Ludington. The hatch openings on the vessel were shorter than the barrels, making it necessary to sling them at a quite sharp angle. This loading procedure was considered to be difficult and highly hazardous; had a barrel dropped at that angle, it would have gone clear through the bottom of the ship and sunk it. But the navy cranes successfully placed the barrels along either side of the propellor shaft alley in the hold.

The Ludington arrived at Fort Mason in March 1937. After unloading her regular cargo, the ship went to the Mare Island Navy Yard. There the barrels were unloaded and placed on the deck of a floating crane. The crane took them to an unloading

dock and placed the guns on flatcars. (There had not been any flatcars on the West Coast capable of carrying such heavy loads as this, and the Quartermaster Department had had to rent special cars for the occasion.) The barrels were then hauled to the railroad station nearest to Fort Funston. Trucks hauled them the 4½ miles to the post. Recalling this awkward means of transportation two years later when the guns for Tennessee Point were about to be shipped west, the commanding general of the San Francisco Port of Embarkation urged they be shipped all the way to Sausalito by rail. The army agreed.[33]

A decade later when these two mighty guns were being scrapped, the San Francisco Chronicle said that both of them had been manufactured to be mounted on the Saratoga, a 35,000-ton battle cruiser undergoing construction in 1916. The Washington Naval Conference had stopped construction of the ship, which was then converted into an aircraft carrier. In the latter function, the Saratoga played an illustrious role in the Pacific during World War II.[34]

Contrary to earlier construction, the building of this two-gun battery was well recorded by the engineers. A huge number of detailed plans poured forth in 1936 and 1937. Photographers took a set of pictures showing each major step in the construction. Even a two-reel motion picture was made during the work. Unfortunately, this movie cannot be located today. When the battery was completed on February 15, 1939, someone, perhaps

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33. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortifications File 1884-1944, Col. W.T. Hannum, Oct. 21, 1936, to Chief of Ordnance, and Brig. Gen. D.K. Major, Fort Mason, Feb. 4, 1939, to QMG.

34. San Francisco Chronicle, Dec. 5, 1948.

Lt. Col. J.A. Dorst who was the district engineer in San Francisco during construction, prepared a "Description of General Features, Battery Davis," which summarized the highlights of the work. Also, when the casemates were built over the already installed guns (being, along with Townsley at Tennessee Point, the first casemated batteries of this type in the United States), the associate engineer Norman W. Haner prepared a special report on their construction. Long before the battery was completed, as early as August 1937, it was officially named Battery Richmond P. Davis after a distinguished Coast Artillery Corps officer who had during his career served at San Francisco.[35]

Construction of Battery Davis began in October 1936 and was completed on February 15, 1939. The work involved the excavation of 113,598 cubic yards of sand and the placing of 24,933.6 cubic yards of concrete and 1,868,549 pounds of reinforced steel. The cost of the project, including the installation of the guns, amounted to $860,440.24. The following is a breakdown of the construction and costs:

Roadway - The road ran from Skyline Boulevard outside the post boundary to casemate 2; it was 3,000 feet long and cost $18,051.91.

Pumphouse and Pumping Station - They were located near the entrance to Fort Funston.

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35. Emanuel Lewis, Seacoast Fortifications, p. 117, points out that Battery Davis was the model for all later heavy-caliber seacoast batteries. Its casemates had been planned before construction began but were not built until after the guns were mounted. Dated construction photographs show that these casemates were built between April and December 1938. The casemates at Battery Townsley were built at this same time but as a part of the whole work and before the guns were mounted.

Reservoir - It was located immediately to the rear of the battery commander's station to the south of the battery. The reservoir could hold 30,000 gallons of water.

Battery Commander's Station - It was located to the south of the battery. Its construction took 47.5 cubic yards of concrete and 3,400 pounds of reinforcing steel; its cost amounted to $3,285. Neither it nor the reservoir have survived.

Latrine - The one latrine called for in the original plans stood on the edge of the roadway 280 feet northeast of gun 1. It was divided into officers' and enlisted men's sections. Even before it was occupied, the latrine was regarded as inadequate in size and located at too great a distance from gun 2 and from the plotting/switchboard room. Eventually two additional latrines were authorized (one at the power plant and one near the fire control stations).

Fire Hydrants - Fire hydrants were constructed at the front and rear of both casemates and in the rear of the powerhouse.

Gun Blocks - Together the two gun blocks required 2,117 cubic yards of concrete and 61,500 pounds of reinforcing steel; the two of them cost $59,638. Each block weighed 2,142 tons. Drainage for the blocks was provided for by the installation of terra cotta tile.

Plotting/Switchboard Rooms - This structure was located on the side of the road to the east of the battery. It required a cut of 16,100 cubic yards of sand. Almost 2,000 cubic yards of concrete and 171,600 pounds of reinforcing steel went into its construction. The interior was made both sound-proof with

acoustic tile and gas-proof. The concrete roof over the main unit was 8½ feet thick; in addition to the reinforcing steel, it had a layer of expanded metal mesh for armor. The roof over the vestibule had 2 feet 9 inches of concrete. The backfill between the roof and the burster course varied from 5 feet over the vestibule to 16 feet on the seaward edge of the building. The burster course, which was a slab of concrete on which an incoming projectile would explode before penetrating to the main work, was 2 feet thick and had two layers of expanded metal mesh for armor. Over everything was a 2-foot-thick layer of sand for planting.

Planting - A comprehensive plan for planting was drawn up that called for a covering of ice plant interspersed with native growths. Native seeds planted included sagebrush, wormwood, "baccaris," and lizard leaf. In front of the battery and extending for a considerable distance to both the north and south were 60 "planting groups," consisting of various combinations of leptospermum, acacia, pine, budzic, and eucalyptus. The engineers were particularly pleased about the tree on the right side of the entrance to the plotting/switchboard building. They received many inquiries about it and announced that it was an acacia (albizzie lophanta). This handsome tree still stands (1976). For immediate concealment and erosion control the engineers planted such things as lupine, barley, and mustard.

Radio Room - The radio room was located northeast of gun 1 in the vicinity of the balloon hangar. This small building required only 88 cubic yards of concrete and 12,183 pounds of reinforcing steel. Its roof was 1½ feet thick and had one layer of reinforcing steel and one of expanded metal mesh. The backfill varied from 0 at the entrance to 8 feet on the edge. It did not have a burster course.

Power Room and Magazines - This unit contained all the central traverses between the casemates. The excavation amounted to 28,300 cubic yards of sand. The concrete used amounted to 8,322 cubic yards, and the reinforcing steel weighed 238 tons. The total cost came to $191,121. The concrete roof over the corridor between the two guns was 7½ feet thick. The roof over the magazines, storerooms, and power plant that stretched along the land side of the corridor was 5½ feet thick. Sixteen feet of sand lay between the concrete roof and the burster course. This latter was 2 feet thick and was covered with 2 feet of sand. The seaward wall of the corridor was 8 feet of concrete except near the casemates where it widened to 12 feet.

Power Equipment - The power plant equipment consisted of three 100-kw. generating sets, one 35-kw. generating set, an air compressor, a motor generator set, four fans, and a fire pump. The equipment was supplied by the Cummins Diesel Engine Company at a cost of $76,080. Two 2,000-gallon fuel tanks stood in the vestibule. These were filled by means of a pipeline that extended to the paved road.

Casemates - The apparent reason for delaying the casemates until after the guns were mounted appears in a letter written by an engineer in April 1937. In discussing the design of the overhead cover, he wrote: "This design is based on the probability that the guns and carriages would be mounted before the overhead structure was built, and it was agreed that as such a design would permit of more freedom in gun mounting prior to overhead construction, the gun mounting should proceed as originally planned, that is, promptly after July 1, 1937, and as a small amount of savings from the current year's program was available, the District Engineer

was authorized to begin the gun mounting at once." Although the district engineer believed that casemating such large guns would produce an air blast dangerous to the gun crew, he followed his orders and built the casemates according to plan. The sand on which the casemates were to stand was capable of supporting four tons per square foot when in an undisturbed state. However, the sand had been very much disturbed during construction of the gun blocks and simply was not capable of supporting the large footings required for a 14,000-ton casemate. Also, it was very important not to allow the gun blocks to settle, for it would require $15,000 per gun to dismantle and reset them--money that was not available.

The areas around the gun blocks were excavated to undisturbed sand, great precautions being taken to avoid movement of the almost totally exposed gun blocks. A concrete ring filling the step in the gun block was then poured in octant sections. Next the workmen put in a cement solidifed backfill in layers 6-inches thick. This was done by putting in 6 inches of sand, spreading dry cement over it, mixing the two with a harrow, adding water with a hose, mixing it in, and compacting with a sheepsfoot roller. Despite the delicacy of the operation, everything proceeded smoothly and the design and construction of the concrete footings on the solidified backfill proceeded as if it were sandstone.

The two casemates consumed 7,816 cubic yards of concrete and 690,000 pounds of reinforced steel. Their cost amounted to $182,938. Each canopy was supported by a large concrete beam that included two large steel trusses weighing 20 tons each. The canopy was 5 feet thick on the outer edge and tapered to 11 feet at the retaining wall. The roof of the casemate in rear of the canopy was 13 feet thick and continued

at this depth for a distance of 14 feet from the retaining wall. It then reduced to 8 feet for the rest of the casemate proper. The rear entrance corridor to the casemate had a roof that was 5½ feet thick.

The roof over the casemate proper was supported by thirty 6-inch I-beams, 60 feet long, and on 2-foot centers. These I-beams weighed 280 pounds per foot and were the wide-flange type. The sand between the roof of the casemate and the burster course varied from 2 feet in the front and the rear to 12 feet in the center. The burster course was 2 feet thick and had two layers of expanded mesh in it and 2 feet of sand over the top.

Guns - The cost of mounting the two 16-inch guns amounted to $45,296. The first gun took five months to install; but only half that time was needed for the second gun. Later, this cost was considerably increased by the addition of steel shield closures, which involved drilling in the racer section in order to mount the shield.

Characteristics of the Guns

Maximum range--48,000 yards at 47° angle of elevation
Effective range--44,000 yards at 40° 52' angle of elevation
Minimum range--6,000 yards at 1° 45' angle of elevation
Field of fire--145 degrees
Weight of barrel--146 tons
Weight of cradle--39 tons
Weight of base ring--84 tons
Weight of racer--86 tons
Guns--600 feet apart

The specifications for constructing Battery Davis have survived. A few items have been culled from the voluminous pages: Concrete--all concrete was to be deposited in horizontal layers, not to exceed 24 inches in thickness, and the concreting was to be carried on as a continuous operation until the course, section, panel, or monolith was completed.

Hardware for interior doors was to be standard commercial grade, steel, and bronze finish. Locks were to be upright knob mortised locks, complete with escutcheons and keeper. Doors were to be provided with three hinges each, wrought steel, loose pin type. Ammunition service materials and equipment were to be similar and equal to that illustrated in Richards Wilcox Manufacturing Company catalog 50. There was even a detailed specification for mixing red lead paint for metal work.

In the fall of 1938, the engineers discovered that the membrane waterproofing that they had applied to vertical concrete walls was "creeping" (i.e., slipping) under its own weight. They solved the problem by cutting the waterproofing away and resealing it with a coating of "Laykold Trowel Coat," which they felt would prove superior.[36]

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36. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortification Files 1884-1944, War Dept., Seacoast Defenses 1937-1938-1939, Specifications for Constructing Emplacements for a Battery of Two 16-inch Seacoast Guns at Fort Funston, 119 pp., and Col. H.T. Burgin, CO, 6th CA, Harbor Defenses of San Francisco, Fort W. Scott, Aug. 5, 1937, to AG, and Capt. F.B. Butler, CE, Sept. 27, 1938, memo for the Dist. Engr., and Norman W. Haner, Assoc. Engr., Dec. 6, 1938, Report on Foundation Development for Casemates, Davis, with comments by Lt. Col. J.A. Dorst, Dist. Engr., and unsigned, "Description of General Features, Battery Davis, Fort Funston, California," ca. Nov. 28, 1939, and Fortification Project Files 1924-44, Lt. Col. H.E. George, CE, Jan. 8, 1944, to Div. Engr.; FARC, Suitland, RG 77, OCE, Harbor Defense Files, J.C. Letts, Principal Engr., Constr. Sec.,

When it came time for the engineers to turn Battery Davis over to the Coast Artillery Corps in September 1940, they prepared a 56-page booklet entitled "Instructions for Maintenance and Operation of Battery Richmond P. Davis, Fort Funston, California." The instructions began with a general description of the battery and the fire-fighting equipment that had been provided.

Central Traverse Magazine - It consisted of two large-caliber guns mounted in casemates, two magazines for battle ammunition, several storerooms, and a power room.

Plotting/Switchboard Room - This room included an enclosed plotting room, spotting room, switchboard room, storeroom, and an air lock.

Radio Room - It consisted of a power room, a gas-proofing equipment room, and a radio room.

Water Supply System - The 4-inch supply line was connected to a city main near the entrance to the reservation and a 36,000-gallon storage reservoir.

Battery Commander Station - This was located approximately 1,000 feet south of gun 2.

Fire-Fighting Equipment - The new equipment consisted of five hydrants, hose reels, and four carbon dioxide fire extinguishers. A hose reel was placed in each casemate and in the power room.

Apr. 27, 1937, to Chief, Mil. Div., and Col. J.J. Ringman, Div. Engr., South Pacific Div., San Francisco, Aug. 2, 1937, to Chief of Engrs.

Painting - The exposed concrete inside the buildings should not be painted unless absolutely necessary. If it was desired to paint walls or ceilings not previously painted, the following was suggested: mix standard white portland cement, while dry, with black iron oxide for gray paint, or yellow iron oxide for cream paint (other colors of iron oxide may be procured if desired). The mixture should be run through a piece of window screen to remove lumps. Then mix the cement and oxide with water to a consistency that can be worked with a paint brush. The walls should be wet before the paint is applied. Not more than two hours' worth of paint should be mixed at any one time.

If the surface was previously painted with a portland cement or oil paint, the paint should be removed with at least two applications of muriatic acid and the surface thoroughly scrubbed and inspected to see that no particles of paint still adhered. Usually three coats of the desired paint would be required.

Exposed concrete outside the buildings was painted for protective concealment purposes and was supposed to have a mottled appearance. Therefore, the engineers felt that maintenance painting here was not required.

Steel Work - Steel work, said the engineers, should be rubbed frequently with wire brushes to remove all scale and rust. After that, two coats of red lead and one or two coats of the finish paint similar to the existing should be applied.

Drains - The structures were built with a drainage course of split furring tile on the roofs and sides. These courses drained into open tile drains that traversed usually in the

vicinity of the footings. Special attention was directed to the drains along the ammunition service corridor.

Ammunition Service - This system consisted of overhead tracks, switches, and army hoists. The main track extended from casemate 1 through the main corridor to casemate 2, with a side track to each shellroom. A second overhead track extended from the shellrooms to the corresponding gun that they served. The switches were so arranged that the hoists could operate between any one of the shellrooms and either gun or between shellrooms. The switches were hand operated from overhead chains. It was desired that the hoists should be stored in the shellrooms when not in use. Later the artillery troops decided that the overhead trolleys were slow, cumbersome, and dangerous. They obtained permission to move ammunition by means of ammunition trucks.

Camouflage Nets - Ordinarily, the camouflage nets were to be kept in storage and only used in time of hostilities or for drill purposes. The "Instructions for Maintenance" gave a lengthy description on how to carry out a drill with the nets, a drill that took 20 men and 1 sergeant for each net. Photographs show that the nets were emplaced and that they quite effectively hid the emplacements from aerial observation.

Gas-Proofing Equipment - While none of this equipment is to be found at Fort Funston today, gas-proofing material may still be found in the new mine casemate at Fort Winfield Scott. At Battery Davis there is the "collective protector units" that ventilated the rooms and removed toxic or irritant gases, smoke, or foreign matter from the air or from clothing and hair. The units, designated CWS-05-19-200 assemblies, consisted of electrically driven blowers that drew air through

intake pipes, purified it, and introduced it into the rooms. To decontaminate clothing, a soldier entered the air lock where he worked a treadle with his foot while standing in front of the air jets.

In 1937 a fire control system was worked out for Battery Davis. The battery commander's station (BC B^1S^1) was located just to the south of the battery, as has already been noted. There were five additional observation and spotting stations: B^2S^2 at Fort Miley, elevation 350 feet; B^3S^3 at Mussel Rocks, elevation 500 feet; B^4S^4 on Wolf Ridge, Fort Cronkhite, elevation 700 feet; B^5S^5 at San Pedro Point, elevation 600 feet; and B^6S^6 at Frank Valley, elevation 425 feet. These stations in various combinations made up the following eight different baselines:

Long-range baselines:

BC B^1S^1 with B^5S^5, 15,600 yards
B^2S^2 with B^3S^3, 13,700 yards
B^2S^2 with B^6S^6, 12,300 yards

Medium-range baselines:

B^3S^3 with B^5S^5, 10,000 yards on the south
BC B^1S^1 with B^2S^2, 8,000 yards in the center
B^2S^2 with B^4S^4, 7,500 yards on the north

Short-range baselines:

BC B^1S^1 with B^3S^3, 5,800 yards on the south
B^4S^4 with B^6S^6, 4,300 yards on the north

The project called for the station at San Pedro Point (B^5S^5) to provide vertical base tracking for targets in the vicinity

of Half Moon Bay that were not visible from the other stations. A T-5 seacoast director was to be provided as the normal means of computing and transmitting firing data. Radar (radio detection and ranging) was installed for Battery Davis during World War II.

As far as it can be determined, the big guns of Davis were fired once in 1938 for the purpose of settling the bases and only periodically after that. However, a 35-man gun crew was assigned to the battery during World War II, waiting for a call that never came. Atomic bombs and missiles made the great 16-inch guns obsolete as a means of defending harbors. Toward the end of 1948, "Operation Blow-torch" got underway when the Richard Pierce Industrial Engineer Company of San Francisco began cutting the huge barrels into 5-foot sections, each weighing about 23 tons. The steel "scrap" was sold to the Pacific States Steel Company for resmelting. A chapter in San Francisco's history had come to a close.[37]

2. Battery Townsley

The appropriation, "Seacoast Defenses, United States, 1937," approved the expenditure of $318,500 for the purpose of about 800 acres of land to the north of Rodeo Lagoon. This tract included Tennessee Point (where the army already owned 5.5 acres), Wolf Ridge, Tennessee Valley, and the headlands farther north. In General Orders 9, December 17, 1937, the army

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37. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortification Files 1884-1944, "Instructions for Maintenance and Operation of Battery Richmond P. Davis, Fort Funston, California"; NA, RG 407, Adjutant General's Office, Special Projects, Annexes to Harbor Defense Project, Harbor Defenses of San Francisco, 1937 (hereinafter cited as Annexes 1937); San Francisco Chronicle, Dec. 5, 1948.

named this new reservation Fort Cronkhite in honor of Maj. Gen. Adelbert Cronkhite, an old artilleryman who had recently died.[38]

As early as 1929 estimates had been prepared for 16-inch guns on Wolf Ridge, and in 1935 the district engineer at San Francisco, Lt. Col. H.A. Finch, had begun working on plans for a battery of 16-inch guns there, for the day when it would become a military reservation. By the end of 1937, these plans had been revised several times and brought to completion, the engineers having been able to incorporate several things already learned in the ongoing construction of Battery Davis at Fort Funston. Here at Cronkhite the gun casemates and the firing platforms would be built as one continuous operation. The two would not be monolithic in nature because, said the engineers, gun-firing impacts were instantaneous, whereas machinery vibrations were continuous. Furthermore, the engineers wanted to "shock-insulate" the casemate-firing platform combinations from the remainder of the magazine structure by an inset of 4 inches of creosoted lumber in key between the casemates and the magazine. Another modification called for placing the radio station in the same structure as the plotting/switchboard rooms rather than in a building by itself, as Davis's had been planned under the old principle of dispersion. Also, as a result of tests at Battery Strong, Fort Rosecrans, San Diego, the engineers no longer wanted a sunken gallery at the entrance of the plotting/switchboard rooms. Such a gallery served to trap gas around the air lock door.

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38. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortification Files 1884-1944, Col. W.T. Hannum, May 26, 1936, to Dist. Engr., San Francisco; Emanuel Lewis, Harbor Defense Installations, Appendix I, pp. 3-4; NPS, DSC, Kinnaird, p. 282.

While a geological report stated that tunneling would be feasible providing it were done in the summer, the engineers decided it would be costly and hazardous. When in March 1938 excavation of the firing platforms began, the engineers found that most of the rock was badly shattered chert; this convinced them that cut-and-cover was desirable for the magazine traverse. The excavated material, although rock, was approved for backfill, there being no problem concerning flying rock at a casemated work.

Although it is sometimes said that Battery Townsley did not have a burster course as part of its cover, a completion report showed such a course over the casemates and the traverse, as well as over the plotting/switchboard/radio structure.

At that time, Colonel Dorst made some last minute changes in the plans. He noted that the approved layout had the power plant lying along a fault. He proposed moving it forward of the fault line and to place a plant alongside the main corridor to provide adequate air for cooling the radiators (the same arrangement had been made at Battery Davis). Because this battery had less storage space than Davis, Dorst wrote that "the otherwise wasted angle between the powerhouse and magazine No. 2 has been formed as a storehouse by the extension of the rear wall of magazine No. 2." Mindful of the complaints caused by the location of Davis's latrine, the engineers had this battery's latrines incorporated with the main work.

It will be recalled that Battery Davis's reserve ammunition was stored in the Central Reserve Magazine, built by the Golden Gate Bridge Authority, at Fort Winfield Scott. Because of its isolated location, Battery Townsley got its own reserve magazine. This large five-room structure was located behind a hill some 700 yards to the east. The center room was to contain 200

shells piled 4 feet high, and each of the other four rooms held 150 powder cans. After World War II when the battle allowance of ammunition for Townsley had been reduced, this magazine became a Central Reserve Magazine for all the batteries north of the Golden Gate.

Battery Townsley's fire control system was designed to be similar to Davis's. A BC station was sited near the battery. The five observation and spotting stations were situated as follows: B^1S^1 on Wolf Ridge, elevation 700 feet; B^2S^2 at Fort Funston, elevation 200 feet; B^3S^3 on high ground north of Gull Rock, Bolinas Bay, elevation 300 feet; B^4S^4 at Fort Miley, elevation 300 feet; and B^5S^5 on the Frank Valley Military Reservation, elevation 480 feet. The following stations provided the total of seven baselines:

Long-range baselines:

B^1S^1 with B^2S^2, 15,300 yards
B^3S^3 with B^4S^4, 16,200 yards

Medium-range baselines:

B^1S^1 with B^3S^3, 8,500 yards to the north
B^1S^1 with B^4S^4, 7,500 yards in the center
B^2S^2 with B^4S^4, 8,000 yards to the south

Short-range baselines:

B^1S^1 with B^5S^5, 4,300 yards
B^3S^3 with B^5S^5, 4,200 yards

Like Battery Davis, Battery Townsley was officially named before it was completed (in fact, before construction

started). In a secret letter dated December 31, 1937, the adjutant general wrote that the battery would honor Maj. Gen. Clarence P. Townsley, another artilleryman. At one time, Townsley had been superintendent at West Point and, later, the commanding officer on Corregidor in Manila Bay. In World War I he was one of the first American officers to arrive in France, where he later commanded the 30th Infantry Division. Townsley died in 1926.

The battery and its reserve magazine were both transferred to the artillery in July 1940--before Battery Davis. And on July 1, 1940, the first 16-inch round ever fired from the Pacific Coast of the continental United States was fired here.[39]

In order to fire that first 16-inch gun, the army had had to move it across the nation. That long trip began in April 1938 when Adm. William D. Leahy notified the secretary of war that early action would be taken to transfer two 16-inch 50-caliber naval guns to the War Department for use at Tennessee Point. In the fall

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39. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortification Files 1884-1944, Proceedings of a Board of Officers regarding location of a 16-inch battery, Sept. 12, 1929, and Lt. Col. H.A. Finch, CE, Jan. 15, 1935, to CG, Ninth Corps Area, Presidio, and Capt. M.W. Gilland, Dec. 4, 1937, to Captain Butler, and Lt. Col. J.A. Dorst, Jan. 10 and Mar. 2, 1938, to Chief of Engrs., and Maj. F.M.S. Johnson, CE, Mar. 2, 1938, to Chief of Engrs., and Specifications for Construction of Battery Elements at Fort Cronkhite, Seacoast Defenses 1938, 1939, and 1940, and Specifications for Townsley, revised to May 16, 1939; NA, RG 407, AGO, Annexes 1937, Annex A, Seacoast Guns, and Annex B, Fire Control Installations; FARC, San Bruno, RG 77, OCE, Presidio Museum, Fort Record Book, Fort Cronkhite; Golden Gate Guardian, Apr. 2, 194?; Emanuel Lewis, Harbor Defense Installations, p. 245, and Appendix I, p. 14; "Military Reservations, California," War Dept., Apr. 20, 1940; FARC, Suitland, RG 77, OCE, Battery Plan, Report of Completed Works, Battery Townsley, corrected to July 24, 1943, Entry A52-87.

of that year, the army prepared to transport one of the two carriages from Watertown Arsenal, Massachusetts, on board the Ludington, the army ship that had earlier carried Battery Davis's guns to San Francisco. The quartermaster general was informed that the carriage weighed over 1 million pounds and occupied 17,632 cubic feet of space.

When the commanding general of the San Francisco Port of Embarkation learned that the Ludington was transporting a carriage, he recalled the problems that were experienced when that ship brought out the two 16-inch guns for Fort Funston in 1937. He now urged that the guns for Townsley be shipped all the way to Sausalito by rail, saying that the Southern Pacific Railroad had the necessary equipment. The general's recommendation was acceptable to the War Department, and in May 1939 the Quartermaster Department announced that the guns would go by rail in two shipments on a government-owned gun car.[40]

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40. FARC, San Bruno RG 77, OCE, San Francisco Dist., Fortification Project Files 1924-1944, Fort Cronkhite, Gun Batteries, 1928-1940, Adm. W.D. Leahy, Actg. Sect. of Navy, Apr. 21, 1938, to Sect. of War, and Main Office, Fortification Files 1884-1944, Maj. H.C. Minton, Oct. 29, 1938, to QMG, and Brig. Gen. D.K. Major, San Francisco Port of Embarkation, Fort Mason, Feb. 4, 1939, to QMB, and Maj. W.S. Elliott, OQMG, May 9, 1939, to Chief of Engrs. It is not known when the second carriage arrived at Fort Cronkhite. Gun 88 was moved to emplacement 1 in July 1939. A photograph is extant of one of Townsley's 16-inch guns firing on July 1, 1940 (FARC, San Bruno, RG 77, OCE).

V. The 1937 Project, San Francisco Harbor Defenses

In 1937 the Adjutant General's Office prepared a secret document, titled "Annexes to Harbor Defense Project, Harbor Defenses of San Francisco," the same year that civil war raged in Spain, Japanese troops captured Peking and Shanghai, Japanese bombs sank the U.S. gunboat Panay, and Hitler repudiated the war guilt clause of the Treaty of Versailles.

That same year Maj. Gen. Johnson Hagood published a book entitled We Can Defend America. Chapter Six in that book, "The Seacoast Defenses Are a Pile of Junk," was a bitter attack on the decline of America's coastal defenses since World War I. Before that war, about 1910, the modern system of defense employed by the United States, said Hagood, was considered to be the best in the world. It employed breech-loading guns; smokeless powder; high explosive, armor-piercing shells; mechanical, motor-driven ammunition service; telescopic range finders; searchlights; and telephonic communication. But now

> In order to hold on to the railroad artillery and the heavy mobile artillery that it brought back from France, the Coast Artillery troops were, in effect, taken out of the fortifications and organized into brigades at . . . inland posts . . . . Some of them were formed into antiaircraft regiments and sent for duty with the mobile Army at Fort McKinley in the Philippines and Fort Sheridan near Chicago. Congress soon began to trim down the Army, and most of these extraneous Coast Artillery outfits were done away with.
>
> Thus the forts were left bare. In 1916, New York Harbor had thirty-eight companies of Coast Artillery assigned exclusively to gun defense and two companies assigned exclusively to mine defense. Today there is not a single company assigned . . . to either . . . .

> We have a few guns scattered here and there that could shoot out to ranges of twenty or thirty miles. But they could not hit anything because we have developed no system of searchlights or range finders that could reach to any such distance.

What was needed, said Hagood, was another board like the Endicott Board of the 1880s. There probably was no connection between Hagood's polemics and the 1937 annexes (which were actually prepared in 1936), but the annexes were the nearest thing around to findings of the old Endicott Board.[1]

A. Annex A, The Seacoast Guns

This annex began with an outline of the tactical organization as then existed for the seacoast guns at San Francisco. The seacoast guns were organized into three groupments, which in turn had two or more groups.

Barry Groupment: This groupment consisted of all the seaward defenses at Fort Barry except for two secondary batteries (Rathbone and McIndoe) that were sited for the defense of the Main Channel minefield. This groupment had two groups: Group 1 consisted of Batteries Townsley, Wallace, Mendell, and Alexander, and group 2 was made up of mines I (North Channel) and Batteries Smith, Guthrie, and O'Rorke. Miley Groupment: This groupment consisted of all seaward armament that was at Forts Miley, Winfield Scott, and Baker (except Battery Yates) and Batteries Rathbone and McIndoe (above). Miley Groupment had three groups: Group 3 consisted of mines II (Main Channel) and Batteries Chamberlin, Crosby, McIndoe, and Rathbone; group 4 was made up of Batteries

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1. Johnson Hagood, We Can Defend America (Garden City: Doubleday, Doran and Company, 1937), pp. 40-51.

Saffold, Godfrey, and Spencer; and group 5 consisted of Batteries Chester, Springer, and Livingston. Funston Groupment: All armament was in the vicinity of Fort Funston. It had two groups: Group 6 consisted of Batteries Davis and Howe, and group 7 would have the proposed 8-inch railway guns and the 155-mm. battery.

Battery Yates (six 3-inch guns) was directly under harbor defense; its function now was to cover the submarine net across the entrance. There was also an antiaircraft groupment that included all fixed and mobile antiaircraft weapons. It was also divided into two groups: Group 11 consisted of Batteries 1 AA and 2 AA; two searchlight platoons, 3 AA and 4 AA; and two machine gun platoons, 5 AA and 3 AA; and group 12, which had Batteries 3 AA, 4 AA, and 5 AA; three searchlight platoons, 1 AA, 2 AA, and 5 AA; and three machine guns platoons, 1 AA, 2 AA, and 4 AA.

The principal navigable waters were considered to be well covered by the existing primary armament within the restricted limits of its range. In view of the proposed installation of 16-inch guns with their increased range (Davis and Townsley), no further modifications were recommended. On the other hand, the existing secondary armament did not give the desired flexibility in covering the minefields and failed to give enough fire power on the beaches in the area. This situation would be remedied by cutting away banks at Batteries Smith and Guthrie (which had been proposed for years) and the installation of an 8-inch railroad battery and a 155-mm. battery, both already proposed.

Under "additional armament required" and "modernization project," the report listed the 16-inch guns at Batteries Davis and Townsley, already described in this study. Two additional 16-inch batteries were called for--Construction 129 at Fort Barry and Construction 130 at Milagra Ridge, south of Fort Funston. Also two new 6-inch batteries were in the modernization project, Construction

243 at Fort Miley and Construction 244 at Milagra Ridge. As a temporary measure only, plans were made for two 8-inch railroad guns and a battery of four 155-mm. howitzers. The railroad guns were to be moved to the Presidio until a time of hostilities when they were to be sent to prepared positions at Daly City, immediately to the south of San Francisco. The site selected at Daly City for these guns was on the San Francisco Golf and Country Club at Ingleside, about 900 yards from the Southern Pacific Railway line and 100 yards from Junipero Serra Boulevard. The four concrete platforms for mobile 155-mm. guns were to be constructed at Fort Funston (this battery being eventually called Battery Bluff).

When the modernization project was completed, no fewer than 12 batteries were to be abandoned, including all the 12-inch works from the Endicott period.

Saffold, two 12-inch guns, Fort Winfield Scott
Godfrey, three 12-inch guns, Fort Winfield Scott
Crosby, two 6-inch guns, Fort Winfield Scott
Alexander, four 12-inch mortars, Fort Barry
Mendell, two 12-inch mortars, Fort Barry
Livingston, four 12-inch mortars, Fort Miley
Springer, four 12-inch mortars, Fort Miley
Chester, three 12-inch guns, Fort Miley
Spencer, two 12-inch guns, Fort Baker
Walter Howe, four 12-inch mortars, Fort Funston
Four 155-mm. guns, Fort Funston
Two 8-inch railway guns, Daly City and Presidio

The batteries remaining in use after completion of the modernization project were to be ten in number.

Chamberlin, two 6-inch guns, Fort Winfield Scott
Wallace, two 12-inch guns, Fort Barry
Guthrie, two 6-inch guns, Fort Barry
Rathbone, two 6-inch guns, Fort Barry
Smith, two 6-inch guns, Fort Barry
McIndoe, two 6-inch guns, Fort Barry
O'Rorke, four 3-inch guns, Fort Barry
Yates, six 3-inch guns, Fort Baker
Davis, two 16-inch guns, Fort Funston
Townsley, two 16-inch guns, Fort Cronkhite

Of course the four proposed batteries, Construction 129, 130, 243, and 244, were included.

The annex then went on to discuss specifically each of the batteries that would be retained at least temporarily.

Wallace (two 12-inch guns) - The only long-range battery then in the San Francisco defenses would be retained.

Mendell (two 12-inch guns) - This battery covered the Main Channel by direct fire and covered the South Channel by indirect fire due to high ground south of the battery; only gun 1 reached the North Channel.

Spencer (two 12-inch guns, one emplacement then empty) - Its location limited both its range to seaward and its direct fire to the Main Channel. Using "Case III," one gun could cover the outer part of North Channel and both guns, South Channel. The dead space caused by the high land at Point Lobos was minimized by the great height of Spencer.

Godfrey (three 12-inch guns) and Saffold (two 12-inch guns) -Direct fire of all five guns was limited to Main Channel, but

with indirect fire all the guns could cover the entire water area. High ground to the south caused a dead area along the south shore varying from 500 yards for Saffold to 1,500 yards for Godfrey.

Chester (three 12-inch guns) - All three guns covered the Main Channel and the water area west of Bonita Channel. Two guns covered Bonita Channel, and one gun covered South Channel.

Alexander, Livingston, Springer, and Howe (four 12-inch mortars each) - All four batteries were capable of all-around fire, and they covered the entire water area within their range as well as beaches and land.

Smith and Guthrie (two 6-inch guns each) - Tactically, the two were considered a single battery. The right limit of traverse barely permitted covering the Bonita Channel minefield, and it did not permit covering the shoreline to the north or adjacent water areas. The left of the field of fire missed South Channel, but the Main Channel minefield was almost in the center of the field of fire. The usefulness of these guns, said the report, could be increased greatly by cutting away the emplacement on each flank by 20 percent. This would permit the guns to cover the beaches beyond Fort Barry to the north, which were not then covered by any secondary armament except no. 1 gun of Rathbone, and South Channel, and the beaches south of Point Lobos augmenting the fire of Rathbone and McIndoe.

Rathbone and McIndoe (two 6-inch guns each) - These were also considered to be one battery tactically. Except for no. 1 gun of Rathbone, the right limit of fire barely included the Main Channel minefield and failed to cover the approaches thereto. The four guns covered South Channel by direct fire and the beaches south of Point Lobos by indirect fire. The report recommended cutting away the emplacement of gun 2 of Rathbone and of both

guns of McIndoe so as to increase the right limit of fire by 20 degrees. This would permit all guns to cover the Main Channel minefield and its approaches.

Chamberlin and Crosby (two 6-inch guns each) - The direct field of fire for both batteries was limited to Main Channel. Indirect fire covered Bonita Channel and the water area south of Main Channel to a line southwest of the batteries. The batteries did not cover South Channel.

O'Rorke (four 3-inch guns) - High ground near Point Bonita and Tennessee Point limited the direct fire of these guns to the area from the north and of the Main Channel minefield on the left, to include the Bonita Channel minefield, to "North Bank" on the right.

Yates (six 3-inch guns) - While the carriages provided for all-around fire, Lime Point limited the field of view. The mission of this battery was primarily the defense of the submarine net. Should the net have been moved to the new Golden Gate Bridge or west thereof (it was not), the battery could not have performed its mission.

The annex then summarized the armament and the characteristics of all these batteries except the 16-inch emplacements and those proposed but not yet built:

Armament and Characteristics

Battery	Tac. No.	Piece Model	Carr. Model	Type	Trun. Elev.	Max. Range	Traverse in Azimuth Left	Right
Wallace	1	1895MI	1917	B.C.	239	29,300	all-around fire	
2-12" R	2	1895MI	1917	B.C.	239	29,300	all-around fire	
Mendell	1	1895MI	1897	D.C.	236	17,400	320	132
2-12" R	2	1895MI	1897	D.C.	236	17,400	322	100
Spencer	1	1888	1892	B.C.	476	17,600	327	111
2-12" R	2	1888	1892	B.C.	476	17,600	249	85
Godfrey	1	1888	1892	B.C.	271	17,600	15	216
3-12" R	2	1888	1892	B.C.	271	17,600	15	216
	3	1888	1892	B.C.	275	17,600	10	199
Saffold	1	1888MII	1892	B.C.	317	17,500	11	263
2-12" R	2	1888MII	1892	B.C.	317	17,500	11	263
Chester	1	1888MI	1897	D.C.	338	17,500	33	200
3-12" R	2	1888MI	1897	D.C.	338	17,500	18	157
	3	1888MI	1892	B.C.	320	17,500	349	133
Alexander	A1	1890MI	1896	Mor.	175	15,000	all-around fire	
4-12" M	A2	1890MI	1896	Mor.	175	15,000	all-around fire	
	B1	1890MI	1896	Mor.	175	15,000	all-around fire	
	B2	1890MI	1896	Mor.	175	15,000	all-around fire	
Livingston	A1	1890MI	1896MI	Mor.	351	15,000	all-around fire	
4-12" M	A2	1890MI	1896MI	Mor.	351	15,000	all-around fire	
	B1	1890MI	1896MI	Mor.	351	15,000	all-around fire	
	B2	1890MI	1896MI	Mor.	351	15,000	all-around fire	
Springer	A1	1890MI	1896	Mor.	351	15,000	all-around fire	
4-12" M	A2	1890MI	1896	Mor.	351	15,000	all-around fire	
	B1	1890MI	1896	Mor.	351	15,000	all-around fire	
	B2	1890MI	1896	Mor.	351	15,000	all-around fire	
Howe	A1	1890MI	1896MI	Mor.	29	15,000	all-around fire	
4-12" M	A2	1890MI	1896MI	Mor.	29	15,000	all-around fire	
	B1	1890MI	1896MI	Mor.	29	15,000	all-around fire	
	B2	1890MI	1896MI	Mor.	29	15,000	all-around fire	
Smith	1	1900	1900	B.C.	237	16,650	2	119
2-6" R	2	1900	1900	B.C.	237	16,650	2	119
Guthrie	1	1900	1900	B.C.	237	16,650	2	119
2-6" R	2	1900	1900	B.C.	237	16,650	2	119

Battery	Tac. No.	Piece Model	Carr. Model	Type	Trun. Elev.	Max. Range	Traverse in Azimuth Left	Right
McIndoe	1	1900	1900	B.C.	371	17,000	289	47
2-6" R	2	1900	1900	B.C.	371	17,000	289	48
Rathbone	1	1900	1900	B.C.	371	17,000	all-around fire	
2-6" R	2	1900	1900	B.C.	371	17,000	290	48
Chamberlin	1	1900	1900	B.C.	45	16,600	36	190
2-6" R	2	1900	1900	B.C.	45	16,600	36	190
Crosby	1	1897MI	1898	D.C.	176	14,600	42	180
2-6" R	2	1897MI	1898	D.C.	176	14,600	41	181
O'Rorke	1	1903	1903	Ped.	199	15,500	300	167
4-3" R	2	1903	1903	Ped.	199	15,500	300	167
	3	1903	1903	Ped.	199	15,500	300	167
	4	1903	1903	Ped.	199	15,500	300	167
Yates	1	1902MI	1902	Ped.	75	11,100	all-around fire	
6-3" R	2	1902MI	1902	Ped.	75	11,100	all-around fire	
	3	1902MI	1902	Ped.	75	11,100	all-around fire	
	4	1902MI	1902	Ped.	75	11,100	all-around fire	
	5	1902MI	1902	Ped.	75	11,100	all-around fire	
	6	1902MI	1902	Ped.	75	11,100	all-around fire	
155 mm.	1	1918MI		T.D.		17,500		
Btry.	2	1918MI		T.D.		17,500		
	3	1918MI		T.D.		17,500		
	4	1918MI		T.D.		17,500		

Of interest too in annex A was a table showing the size of the projectiles, the battle allowance of ammunition, and the location of magazines. In the column headed "Class," the initial "A" indicated the ammunition to be procured and installed in peace time; "B" to be procured in peacetime and installed when an emergency arose; and "C" to be procured and installed when an emergency arose. In the column "Weight of Projectile," AP stood for armor piercing and HE meant high explosive. A footnote to the table stated that the Central Reserve Magazine at Fort Winfield Scott had space for 1,200 rounds of antiaircraft ammunition, 1,600 rounds of 155-mm. shells, 1,600 155-mm. propelling charges, 200 rounds of 16-inch ammunition for Battery Davis, and small arms ammunition:

Battery	No. of Guns	Cal.	Class	Fort	Wt. of Proj.	Battle Allow-ance	War Reserve	Place of Storage
Townsley	2	16" BC		Barry	2100	200	400	At Btry.
Davis	2	16" BC		Funston	2100	200	400	At Btry. & at Ft. Scott
Wallace	2	12" LR	B	Barry	975 1070	300 200	400 200	At Btry. At Btry.
Mendell	2	12" DC	B	Barry	870	400	400	At Btry.
Spencer	2	12" BC	C	Baker	870	200	200	At Btry.
Saffold	2	12" BC	C	Scott	870	200	200	At Btry.
Godfrey	3	12" BC	C	Scott	1070	300	300	At Btry.
Chester	2 1	12" DC 12" BC	B	Miley	1070	600	600	At Btry.
8"Ry. Daly City	2	8" Ry LR	F -	Funston		0	500	Central Reserve
Smith	2	6" BC	A	Barry	108AP 90HE	1200 0	1200 400	At Btry. Central Reserve
Guthrie	2	6" BC	B	Barry	108AP 90HE	1200 0	1200 400	At Btry. Central Reserve
McIndoe	2	6" BC	B	Barry	108AP 90HE	1200 0	1200 400	At Btry. Central Reserve
Rathbone	2	6" BC	C	Barry	108AP 90HE	1200 0	1200 400	At Btry. Central Reserve
Chamberlin	2	6" BC	C	Scott	108AP 90HE	600 0	600 200	At Btry. Central Reserve
Crosby	2	6" DC	C	Scott	108AP 90HE	600 0	600 200	At Btry. Central Reserve
155 mm.	4	155 mm.		Funston	95HE	1600	1600	Ft. Scott
Yates	6	3"	B	Baker	15	2400	2400	At Btry.
O'Rorke	4	3"	B	Barry	15	1600	1600	At Btry.
Alexander	4	12" M	C	Barry	700 1046	320 160	320 160	At Btry. At Btry.
Howe	4	12" M	A	Funston	700 1046	640 320	640 320	Ft. Scott At Btry.
Livingston	4	12" M	C	Miley	700 1046	320 160	320 160	At Btry. At Btry.
Springer	4	12" M	C	Miley	700 1046	320 160	320 160	At Btry. At Btry.

The following summarizes the seacoast guns: Until the modernization project was completed, the harbor defenses of San Francisco would consist of four 16-inch guns, two high-angle 12-inch guns, twelve older 12-inch guns, twelve 6-inch guns, ten 3-inch guns, sixteen 12-inch mortars, four 155-mm. guns, and two 8-inch railway guns. Not counting antiaircraft guns, the number of heavy weapons would amount to sixty pieces.

After the modernization project was completed and the obsolete batteries abandoned, the harbor defenses would consist of eight 16-inch guns, two high-angle 12-inch guns, fourteen 6-inch guns, and ten 3-inch guns, the total amounting to thirty-four guns.[2]

B. Annex B, Fire Control Installations

The fire control system for the San Francisco Harbor defenses had grown slowly over the years since the first Endicott batteries had been constructed. Most of the first stations, all simple wooden structures, had long since deteriorated. Concrete, or concrete and brick dug-in structures replaced those early ones. Quite often the roofs of these were simply of metal, and no attempt was made to make them splinterproof. Until the 1930s little attempt was made to camouflage the stations--their only means of concealment being their low profile and, where possible, a rising slope behind them. In summing up the state of affairs as of 1937, the report said that the available observation stations were barely sufficient to meet the requirements of the batteries. Some batteries had more stations than they needed, while others did not have enough to allow them to fire over their entire field.

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2. NA, RG 407, AGO, Annexes 1937, Annex A, Seacoast Guns. The 8-inch railway guns were not brought to San Francisco.

The annex noted that visibility conditions in San Francisco Bay presented great difficulties. Dense fog was prevalent for a large part of the year and heavy haze was not unusual. High fogs, 100 feet or higher above the water, were common. On occasions it was possible to see a target clearly from the north shore, while fog hid it from southern shore stations. "Bearing these conditions in mind," the report stated, "it is desirable to supply a right and left handed baseline for all major armament, and for the extremely long range armament, supplementary flank stations in addition to the normal baselines. For the same reasons all batteries should be supplied with at least one low station each."

Long-range armament, such as Battery Wallace, required a minimum of five observation stations located between San Pedro Point to the south and Gull Rock to the north. Other primary armament, such as Battery Mendell, needed four stations so as to provide northern and southern baselines and a low-fog station fairly close to the battery. For the mortar batteries, this low-fog station would also serve as a secondary battery commander (BC) station. The old 12-inch guns on the inner line, such as Battery Godfrey, required only three stations--one of which should be an outside station. For the 155-mm. and the 6-inch batteries, it was essential to provide a secondary station for observation over indirect fire areas.

Due to the heights available on the California coast, towers were not needed. All new stations should be dug-in, combined observation and spotting (BS) stations. To complete the project, four parcels of land would have to be purchased: 10 acres at San Pedro Point, 10 acres on the cliffs and the high ground one-half mile north of Mussel Rocks, 5 acres on the cliffs and the high ground north of Gull Rock (Whitegate Ranch area and later called Hill 640), and 3 acres on Point Lobos outside Fort Miley.

The annex proceeded to describe all existing and required structures from the harbor defense station to Battery O'Rorke.

1. Harbor Defense Station

This was a large two-story concrete station located at Fort Winfield Scott at an elevation of 307 feet. It had ample room. Despite a lack of overhead cover and its distance from the expected battle area, it was considered to be a satisfactory structure. An observation telescope was available, but a Lewis depression position finder (DPF) was required.

2. Barry Groupment Station

A two-story concrete station at an elevation of 278 feet on Point Bonita had served as the B^1 station for Battery Mendell, but that function would be removed. A Swasey DPF, type A, and an observation telescope were available.

3. Miley Groupment Station

Situated at Fort Miley at an elevation of 366 feet was a two-story concrete structure that was satisfactory as it was. A Swasey DPF, type A II, and an observation telescope were available.

4. Funston Groupment Station

No building was available; one was to be constructed at Fort Funston.

5. Group 1 Station, Primary Armament at Fort Barry

There was no structure available; however, it was recommended that one be built on Wolf Ridge above Tennessee Point at an elevation of 300 feet. An observation telescope was available, but a Lewis DPF MI, Class 4, was required.

6. Group 2 Station, North Channel Mine Command

The station was located on Point Bonita at an elevation of 278 feet, and no changes were required. A swasey DPF, type A II, and an observation telescope were available.

7. Group 3 Station, Main Channel Mine Command

A new structure was recommended to be erected on the right flank of Battery Chester. A DPF and a telescope were available.

8. Group 4 Station, Primary Armament at Forts Winfield Scott and Baker

Fort Winfield Scott was located on Robb Hill at an elevation of 378 feet. Its field of view covered only a part of the field of fire for the group. It was recommended that a new station be erected on the left flank of Battery Chester at Fort Miley.

9. Group 5 Station, Primary Armament at Fort Miley

It was recommended that this station be moved into $BC^1B^1S^1$ Battery Livingston located at an elevation of 372 feet at Fort Miley.

10. Group 6 Station, Fort Funston

It was recommended that a new station be built for this group at southern Fort Funston.

11. Group 7 Station, RR and 155-mm. Batteries

Here, too, it was recommended that a station be erected at southern Fort Funston.

12. Fort Baker Command Station

It was located on Lime Point at an elevation of 431 feet (just below Battery Spencer). No changes were required.

13. Battery Chamberlin

BC B^1 was a standard concrete station located on the left flank of the battery at an elevation of 54 feet. An azimuth instrument M1910 and a Swasey DPF, type A II, were available. B^2S^2 was a single dug-in station on Point Bonita at an elevation of 233 feet. The station needed to be enlarged to permit the installation of a spotting instrument. B^3 was a single dug-in station at Fort Point at an elevation of 134 feet. The length of the baseline from BC B^1 to B^2S^2 was 5,400 yards. Spotting was provided for at stations BC B^1 and B^2S^2. The plotting room was located within the battery and was equipped with a M1904 Whistler-Hearn plotting board. However, a 110° M1915 plotting board was required.

14. Battery Crosby

The one existing station was BC B^1. It was a standard dug-in station located behind the battery at an elevation of 245 feet. The report recommended that a second double dug-in station be situated on Point Bonita at an elevation of 221 feet on the site of an old wooden station that was to be torn down.

15. Battery Saffold

The BC station was a single concrete station located between the two guns at an elevation of 317 feet, and B^1S^1 was a double concrete station on the left flank of the battery at an elevation of 309 feet. B^2S^2 was a double concrete station to be constructed by the Golden Gate Bridge Company at Tennessee Point at an elevation of about 190 feet. (Apparently a former B^2S^2 had been demolished during construction of the Golden Gate Bridge.) B^3S^3 was to be constructed at Point Lobos. This was to be a double dug-in station at an elevation of approximately 80 feet. It would double the water area over which horizontal base tracking would be possible. The report also recommended the abandonment of a station, formerly B^3, which was a wooden structure located on Bakers Beach and which was in very poor repair.

The completion of this project would provide Battery Saffold with horizontal base tracking over the entire field of fire and vertical base tracking in the North and South channels. The two baselines would be B^1S^1 with B^2S^2, approximately 7,900 yards, and B^2S^2 with B^3S^3, 7,500 yards. The plotting room was located in B^1S^1 and was equipped with a 110° M1915 plotting board.

16. Battery Godfrey

BC B^1 was a double concrete station located at the battery and having an elevation of 275 feet. B^2S^2 was a single dug-in station at an elevation of 88 feet at Tennessee Point. The station needed to be enlarged to permit the installation of a spotting instrument. S^1 was a single dug-in station at Fort Point, having an elevation of 142 feet. It was the spotting station for BC B^1.

The annex recommended the construction of a new station for Godfrey (B^3S^3), a double dug-in station to be located at Point Lobos at an elevation of 80 feet. Combined with B^2S^2 this station would provide for horizontal base tracking and indirect fire into areas blind to the battery. An existing wooden station (B^3) on Bakers Beach was recommended for abandonment. The length of the baseline from B^2S^2 with B^3S^3 would be approximately 7,500 yards. The plotting room was located in BC B^1 and a Cloke plotting board M1923 was available.

17. Battery Spencer

BC was a standard station located between the guns at an elevation of 475 feet. B^1S^1 was a brick station at an elevation of 372 feet on Lime Point below the battery, and B^2S^2 was a single dug-in station at Tennessee Point, elevation 183 feet. The station should be enlarged to permit the installation of a spotting instrument. B^3S^3 was a standard double station at Fort Winfield Scott at an elevation of 377 feet.

Former B^3 was destroyed in the construction of the Golden Gate Bridge. B^4, a standard concrete station at an elevation of 50 feet on the left flank of Battery Kirby, was to be abandoned. This station had no value except for targets in the harbor entrance.

The completed project would provide two baselines: B^1S^1 with B^2S^2, 3,900 yards, and B^2S^2 with B^3S^3, 7,900 yards. The plotting room was located at the battery and was provided with a 110° M1915 plotting board.

18. Battery Yates

This battery of 3-inch guns was provided with an open crow's nest BC station and an open coincidence range-finder (CRF) station, having a 15-foot CRF. There was no plotting room, and none was needed.

19. Battery Mendell

BC was a standard station located between the guns at an elevation of 235 feet. B^1S^1 was a double concrete wooden station at an elevation of 74 feet at Point Bonita. And B^2S^2 was located at Fort Miley. This station was to be rebuilt by the Golden Gate Bridge Company on its existing site as a double dug-in station at an elevation of 354 feet.

B^3S^3 was to be constructed at Frank Valley at an elevation of 480 feet. It was to be a double dug-in station for covering the northern water areas. B^4S^4 was to be constructed at Point Bonita at an elevation of 227 feet. It was a temporary wooden structure that was to be rebuilt as a double dug-in type on the same site, so as to provide a primary station of a relatively high-site and low-site arrangement at Fort Barry (B^1S^1), either of which would serve in case of damage to the other.

The two baselines would be B^1S^1 or B^4S^4 with B^2S^2, approximately 5,200 yards; and B^1S^1 or B^4S^4 with B^3S^3, 7,000 yards. The plotting room was located at the battery and was equipped with a 110° M1915 plotting board.

20. Battery Alexander

BC^1 B^1S^1 was a double concrete station on Point Bonita at an elevation of 269 feet, and B^2S^2 was located at Fort Miley. This station was not actually in existence at the time of the report; it was to be constructed by the Golden Gate Bridge Company at an elevation of 350 feet. B^3S^3 was to be constructed as a double dug-in station at Frank Valley at an elevation of 480 feet and was to provide a northern baseline; BC^2 B^4S^4 station was to be a double dug-in station at an elevation of 80 feet located on the tip of Point Bonita, immediately below the lighthouse. This station was to serve as an emergency BC and observation station and as a fog station.

The length of baselines were BC^1 B^1S^1 or BC^2 B^4S^4 with B^2S^2, approximately 5,200 yards; BC^1 B^1C^1 or BC^2 B^4S^4 with B^3S^3, approximately 7,100 yards. The plotting room was located at the battery and was equipped with a 110° M1915 plotting board.

21. Battery Guthrie

BC B^1 was a concrete station located between the guns at an elevation of 246 feet. This station was subject to blast, dust, and smoke during firing. B^2S^2 was a single dug-in station at Tennessee Point at an elevation of 88 feet. It was recommended that this station be enlarged to permit installation of a spotting instrument. No additional stations were required. The baseline (BC B^1 with B^2S^2) was 1,800 yards long. The plotting room was located within the battery and was equipped with a 110° M1915 plotting board.

22. Battery Smith

BC, an open crow's nest between the guns, was subjected to smoke and blast during firing. B^1S^1, a single dug-in station, was located 600 yards distant on the left flank and forward of the battery at an elevation of 217 feet. This station was to be enlarged to allow the installation of a spotting instrument.

A new station (B^2S^2) was to be built at Frank Valley at an elevation of 450 feet with a view that would cover the entire water area and the beaches. It would be a double dug-in station. This project would provide Battery Smith with horizontal or vertical base tracking over the entire water area and the beaches (length of baseline: B^1S^1 with B^2S^2, 6,300 yards). The plotting room was located within the battery and was equipped with a Whistler-Hearn M1904 plotting board.

23. Battery Rathbone

BC, an open crow's nest situated between the guns, was subjected to smoke, blast, and dust. Elevation was 378 feet. B^1 was a single dug-in station on the right flank of the battery at a distance of 300 yards, elevation 342 feet. One new station (B^2S^2) was to be constructed in connection with both Battery Rathbone and Battery McIndoe--see below. The BC and B^2S^2 stations could be used for spotting. The plotting room was located within the battery and was equipped with a Whistler-Hearn M1904 plotting board.

24. Battery McIndoe

BC, an open crow's nest located between the guns, was subjected to blast, smoke, and dust during firing. The elevation was 378 feet. B^1 was a single dug-in station on the left flank of the battery, 160 yards distant and at an elevation of 375 feet. A new station (B^2S^2) was to be constructed at Tennessee Point at an elevation of 200 feet. It would be a double dug-in

station. This station was to serve either McIndoe or Rathbone, or both, as a single four-gun battery. This B^2S^2 would provide Rathbone and McIndoe ample observation for horizontal or vertical base tracking over the entire water area and vertical base tracking over the beaches (length of baseline: B^1 with B^2S^2, 7,200 yards). The plotting room was located within the battery and was equipped with a Whistler-Hearn M1904 plotting board, which should be replaced with a 110° M1915 plotting board.

25. Battery O'Rorke

This 3-inch gun battery was provided with an open crow's nest BC station and an open CRF station. There was no plotting room, and none was needed.

26. Battery Wallace

BC^1 and BC^2 stations were standard concrete structures located at the battery at an elevation of 255 feet. B^1S^1 was a double dug-in station located at Fort Barry at an elevation of 358 feet. B^2S^2 was to be rebuilt at Fort Miley by the Golden Gate Bridge Company as a double dug-in station at an elevation of 360 feet. B^3S^3 was a single dug-in station at Fort Funston and at an elevation of 204 feet. This station was to be enlarged to permit adding a spotting instrument.

Two new stations were to be erected: B^4S^4, a double dug-in station at an elevation of 482, was located at Frank Valley, and B^5S^5, also a double dug-in type, was located on Point Bonita at an elevation of 85 feet. This latter would serve as a low-fog station and as a Point Bonita station in case of damage to B^1S^1.

Four baselines would be established in this project: B^1S^1 or B^5S^5 with B^2S^2, 5,200 yards; B^1S^1 with B^3S^3, 12,600 yards; B^1S^1 or B^5S^5 with B^4S^4, 7,100 yards; and B^2S^2 with B^3S^3,

8,000 yards. Battery Wallace had two plotting rooms both at the battery. Plotting room 1 had a Cloke plotting board M1; room 2 had a 110° M1918 plotting board. The report recommended the provision of a T-5 seacoast director for use as the standard means of fire control.

27. Battery Chester

BC B^1S^1, a standard double concrete station, was located at the battery at an elevation of 356 feet. B^2S^2, a wooden station on Point Bonita, had an elevation of 85 feet. (Strangely, the report did not recommend replacing this with a concrete dug-in type.) Two stations were to be constructed for Battery Chester. B^3S^3 was a double dug-in station at an elevation of 190 feet on southern Fort Funston; B^4S^4 was a similar station on the face of Point Lobos at an elevation of 80 feet--to provide a fog station.

The length of baselines were BC B^1S^1 or B^4S^4 with B^2S^2, approximately 5,200 yards, and BC B^1S^1 or B^4S^4 with B^3S^3, 8,000 yards. The plotting room was located within the battery and was equipped with a 110° M1915 plotting board.

28. Battery Livingston

BC^1 B^1S^1, a double concrete station, was located behind Battery Chester. B^2S^2 was a wooden station at an elevation of 259 feet on Point Bonita. Two additional stations were recommended: B^3S^3, a double dug-in station on southern Fort Funston at an elevation of 170 feet. This station would provide horizontal base tracking for South Channel. And BC^2 B^4S^4, a dug-in BC observation station on Point Lobos at an elevation of 80 feet, was to serve as an emergency BC and fog station.

The length of the two baselines was BC^1 B^1S^1 or $BC^2B^4S^4$ with B^2S^2, 5,200 yards; BC^1 B^1S^1 or BC^2 B^4S^4 with B^3S^3, 8,000 yards. The plotting room was located within the battery and was equipped with a 110° M1915 plotting board.

29. Battery Springer

This battery had but one existing station to be retained, BC^1 B^1S^1, a double concrete station located at Fort Miley above Battery Chester at an elevation of 377 feet. Three new stations were to be erected: B^2S^2, a double dug-in one to replace a single wooden station at an elevation of 73 feet on Point Bonita; B^3S^3, a double dug-in type at an elevation of 180 feet at southern Fort Funston, to provide horizontal base tracking for South Channel; and BC^2 B^4S^4, on Point Lobos at an elevation of 80 feet, to serve as an emergency BC and fog station. This project would provide two baselines: BC^1 B^1S^1 or BC^2 B^4S^4 with B^2S^2, 5,200 yards; BC^1 B^1S^1 or BC^2 B^4S^4 with B^3S^3, 8,000 yards. The plotting room was within the battery and was equipped with a 110° M1915 plotting board.

30. Battery Howe

BC^1 B^1S^1 was a wooden station located on the left flank of the battery at an elevation of 98 feet. B^2S^2 was a single dug-in type on Sutro Heights at an elevation of 145 feet. Its field of view was restricted by trees on private property (Sutro's daughter was still living in the residence). Two new stations were to be erected: B^3S^3, a double dug-in type on the face of the cliffs, one-half mile north of Mussel Rocks, at an elevation of approximately 500 feet; BC^2 B^4S^4, to be built on the site of a wooden station on southern Fort Funston at an elevation of 214 feet. Two baselines were provided: BC^1 B^1S^1 or BC^2 B^4S^4 with B^2S^2, 7,000 yards; and BC^1 B^1S^1 or BC^2 B^4S^4 with B^3S^3, 5,800 yards. The plotting room was then located in a temporary wooden structure on the left flank of the battery and was equipped with a 110° M1915 plotting board. The annex recommended construction of a bombproof plotting room.

31. Battery Bluff

Undoubtedly this battery of four 155-mm. guns received its unofficial name from its location--on a bluff at Fort Funston. The platforms for the guns, called Panama mounts, were constructed at the same time the secretary of war approved the annexes of 1937. The report called for no permanent fire control station for this battery. However, concrete monuments were to be placed and orientation data determined at three locations: at a fire control station marker for another battery 150 yards southwest of the guns, at another station marker on Point Lobos at an elevation of 100 feet, and at a station marker near Mussel Rocks at an elevation of 500 feet (B^3S^3 Howe, above).

32. North Channel Minefield

Only one station (MI^1) existed at this time. It was a double concrete station on Point Bonita at an elevation of 262 feet. Two new stations were to be built: MI^2a single dug-in type station at Tennessee Point at an elevation of 180 feet, and MI^3, another single dug-in type on the Frank Valley Military Reseration at an elevation of 450 feet. These three stations would provide vertical base tracking over the minefield in times of foggy weather and the following three horizontal bases: MI^1 with MI^2, 2700 yards; MI^1 with MI^3 7,100 yards; and MI^2 with MI^3, 4,300 yards. The plotting room was located in the MI^1 structure and was equipped with a MI906 plotting board that should be replaced with a 110° M1915 board.

33. Main Channel Minefield

The existing station MII^1 was at Fort Winfield Scott at an elevation of 295 feet. MII^2 was a single dug-in station at Fort Point at an elevation of 127 feet. This station covered the approaches to the minefield from the south.

Two additional stations were to be constructed: MII^3 was a single dug-in station at Point Lobos at an elevation of 80 feet; MII^4 was a single dug-in type at an elevation of 217 feet on Point Bonita near B^1 Smith. The two inside stations provided vertical base tracking and general observation, while the two outside stations provided an excellent baseline covering all approaches to the minefield. The length of the baseline, MII^3 with MII^4, was 5,400 yards. The plotting room was located in MII^1. (The 1937 annexes did not call for a minefield in South Channel.)

34. Battery Davis

The fire control stations for this 16-inch battery were listed earlier in this report in the section describing the construction of the battery. In summary, there was a BC B^1S^1 at the battery and five stations stretching from San Pedro Point to Frank Valley.

35. Battery Townsley

Its fire control system, which was similar to Davis's, was also discussed in the section describing construction of the battery.

A considerable number of these fire control stations still exist. One or two of them to which access has been sealed still have the curved wooden benches that the observers used for seats. From the estimates in annex B, one may learn of the contents of a fire control station. An example of this would be the B^4S^4 station for Battery Wallace that was to be constructed at Frank Valley. The ordnance material to be employed consisted of two instruments: an azimuth instrument M1910 and a Lewis depression position finder M-1-5. The cost of both was $6,300. To build the station the engineers needed $900 for material and $350 for labor. Signal equipment consisted of three wall telephones with headsets and one small time interval (TI) bell. The total cost of the station came to $8,869.

The BC B^1S^1 for Battery Davis's 16-inch guns required considerably more equipment: one Lewis DPF, M-1-3; two azimuth instruments, M1910; nine wall telephones with headsets; one small bell, TI; one telephone for the post system; and one firing signal. A typical group station's equipment consisted of a DPF, M-1-4; an observation telescope; twelve wall telephones with headsets; two switchkey sets, six lines each; one small bell, TI; and two telephones, handsets.[3]

C. Annex C, Searchlights

The mission of the coastal searchlights was to provide illumination for the minefields, the channels and approaches, and the beaches. Nine searchlights had already been installed by 1937; annex C had recommendations for all of these, and the new project called for a total of 17 lights.

Existing lights that should be retained (from north to south) were the following:

1. Searchlights 1 and 2

These two lights were located at Tennessee Point at elevations of 149 and 129 feet respectively. These were to be redesignated nos. 3 and 4. The controller booth for no. 4 was to be relocated on higher ground 100 yards east of its existing position in order that the operator could have a view of his light in the northern half of its field. The mission of these two lights was to illuminate North Channel, North Bank, and Main Channel.

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3. NA, RG 407, AGO, Annexes 1937, Annex B, Fire Control Installations.

2. Searchlights 3 and 4

Both lights were located at Fort Barry at elevations 146 and 91 feet respectively. They were to be redesignated nos. 5 and 6; otherwise, no additions or alterations were required. Their mission was the searching and illuminating of North Channel minefield.

3. Searchlight 7

This light was located at Lime Point adjacent to the lighthouse at an elevation of 43 feet. Its mission was to illuminate the submarine net and the inner harbor.

4. Searchlight 8

This light was situated at Fort Point at an elevation of 74 feet (on the old brick fort). Its mission was the illumination of the bay and the shoreline between the Main Channel minefield and the Golden Gate Bridge.

5. Searchlight 5

This light was located at northern Fort Miley. It was recommended that this light be moved about 600 feet to the west of the Fort Miley boundary in front of the automobile parking plateau at an elevation of 100 feet (on city property). It should be redesignated no. 9. It was a searching and illuminating light for the Main Channel minefield.

6. Searchlight 6

This light was located in the southern portion of Fort Miley at an elevation of 302 feet. Other than being redesignated as light 10, no alterations were required. It too had the mission of searching and illuminating the Main Channel minefield.

7. Searchlight 9

This searchlight and power plant (then located on the point at Fort Mason) should be moved to the south end of Fort Funston at an elevation of 160 feet and redesignated as no. 13. Its mission in the new location would be the searching and illuminating of South Channel and South Bank.

8. Searchlight 14

A new 60-inch searchlight and power plant should be installed at the southern end of Fort Funston at an elevation of 50 feet and designated no. 14. A shelter for the power plant should be erected in a ravine behind the light. Its mission would also be a searching and illuminating light for South Channel and South Bank.

Seven portable 60-inch searchlights were to be located as follows: (However, they should not be emplaced until an emergency occurred. Towers were required for lights 12 and 16.)

No. 1, Rocky Point, elevation 100 feet

No. 2, Gull Rock, elevation 300 feet

Mission of nos. 1 and 2 would be searching and illuminating of approaches to North Channel.

No. 11 on Sutro Heights above Cliff House, elevation 150 feet

No. 12 on the beach in the vicinity of Golden Gate Park (A 30-foot tower would give the light an elevation of 40 feet.)

Mission of nos. 11 and 12 would be the searching and illuminating of Main Channel and South Bank.

No. 15 on the proposed reservation one-half mile north of Mussel Rocks (Its mission would be to serve as the connecting light between Point San Pedro and Fort Funston and to illuminate the beaches south of Fort Funston.)

No. 16 at the end of the road that crossed the face of the cliff (A 30-foot tower would be required to clear the top of the island opposite it, and its elevation would be 100 feet.)

No. 17 also at Point San Pedro at the southern extremity of the proposed reservation, elevation 600 feet

The mission of lights 16 and 17 was the searching and illuminating of the southern approaches.

Summary of Searchlights

New S.L. No.	Location	Old S.L. No.	To be Retained or Moved from Present Location	To be Procured	Remarks
1	Rocky Pt.	1		1 portable	
2	Gull Rock			1 portable	
3	Tennessee Pt.	1	Retained		Construction of new booth
4	Tennessee Pt.	2	Retained		
5	Ft. Barry	3	Retained		
6	Ft. Barry	4	Retained		
7	Ft. Barry	7	Retained		
8	Ft. Barry	8	Retained		
9	Ft. Miley	5	To be moved to West of Ft. Miley		
10	Ft. Miley	6	Retained		
11	Sutro Heights			1 portable	
12	Beach, Golden Gate Park			1 portable	
13	Ft. Funston	9	To be moved from Ft. Mason		
14	Ft. Funston			1 standard fixed	
15	Mussel Rocks			1 portable	
16	Pt. San Pedro			1 portable	
17	Pt. San Pedro			1 portable	

4. NA, RG 407, AGO, Annexes 1937, Annex C, Searchlights.

D. Annex D, Underwater Defense

The underwater defenses for San Francisco Harbor consisted of two elements: a mine project and a net project.

1. Net Project

An antisubmarine net was to be stretched across the Golden Gate: "Northern end 500 yards bearing 84° from Yellow Bluff Light and extending to the eastern end of the Presidio, on a line bearing 155°; the northern end to be cut into the beach north of Yellow Bluff, on a line bearing 279°, net to have a gate of the 'Sinking Type.' " Associated with the net were three fixed listening posts, one located in each of the three channels outside the Golden Gate. Later, about 1940, an antimotor boat boom was projected for the harbor defenses, but its location has not been determined.

2. Mine Project

The mine project was described as a continuous barrage of contact and controlled mines. There were two controlled minefields (i.e., mines controlled from the shore electrically: Bonita, or North, Channel--8 groups of 19 mines each in two lines across the channel, 1,000 yards to seaward from the line drawn between Tennessee Cove and Whistling Buoy 4 and Main Ship Channel--6 groups of 19 mines each in two lines across the channel at Whistling Buoy.

Contact mines, or mines that exploded automatically when hit, connected the controlled minefields with each other and with the shore as follows: Twelve mines in two lines, 300 yards apart, between Bonita Channel controlled the minefield and the shore. Two lines, 300 yards apart, containing 168 mines, connected the two controlled minefields. Two lines 300 yards apart contained 264 mines in a direction 93 degrees true to the mainland, thus closing South Channel to all shipping.

3. Shore Installations

The annex went on to discuss the shore installations at length saying that since San Francisco would probably be the anchorage of the fleet during the first few weeks of mobilization, it was vital that the underwater defense project be made effective at the earliest possible moment. The project contemplated using the old mine storehouse on Yerba Buena Island for central storage, the mine depot at Fort Winfield Scott as the assembly plant for the Main Channel minefield (MII), and a new installation at Fort Baker (long since proposed) as the assembly plant for the North Channel minefield (MI). The explosive material would continue to be stored in the magazine of abandoned Battery Drew on Angel Island. This dispersion of facilities would minimize the effect of a hostile air attack.

The installations at Forts Baker and Winfield Scott should each be able to plant at least one group every 24 hours; if training and weather permitted, the time could be reduced to 12 hours. Each depot would require cable tanks sufficient to store all the cable for one minefield, a storehouse large enough to handle material for two or three groups, loading rooms large enough to assemble two groups simultaneously, and wharfage for two vessels of the size of a mine planter and two or three small boats. During peacetime, all the equipment except cable and explosives required for the Main Channel minefield would be stored at Fort Winfield Scott; Fort Baker would keep on hand the equipment for at least one group for North Channel.

The project then described the following existing structures:

a. Yerba Buena Island

This island was then called Goat Island by the army.

(1) Mine Storehouse (dimensions, 76 x 162 feet)

A traveling crane, 5-ton capacity, was used in the southeast quarter of the building only. The narrow gauge track extended the length of the building.

(2) Cable Tanks (12 tanks, each 23 x 14 x 6 feet, capacity 116 reels; one repair tank, 38 x 23 x 6 feet)

Tanks were constructed in 1897. Water was supplied from a navy hydrant by a fire hose. Reels were handled by a traveling crane over each of the two rows of tanks. The narrow guage track entered the building and extended between the two rows to the repair tank, with branches to the left and right of the center track. The maximum weight that could be handled was 20,000 pounds. The condition of the track was poor, and the location was unsatisfactory.

(3) Mine Wharf

It was constructed in 1934 by the Oakland Bay Bridge Company. It was 83 feet wide (parallel to shore) and 72 feet long. The narrow gauge track and hand-operated derrick was considered adequate.

b. Fort Winfield Scott

(1) Mine Storehouse (dimensions, 50 x 30 feet)

The narrow gauge track extended the length of the building. There were two storerooms, a testing tank, and a cyclops-traveling crane, 3,000 pounds capacity, with a S.M. triplex block, 2-ton capacity. The condition was good and adequate for the Main Channel minefield.

(2) Cable Tanks (capacity 24 reels, three tanks, each 19 by 17 by 7 feet)

It was constructed in 1909-10. The water was supplied by a fire hose from a mine planter pump. The reels were handled by a traveling crane via a narrow gauge track. The maximum weight that could be handled was 20,000 pounds. The condition of the cable tanks was good but the size was inadequate.

(3) Mine Wharf (length, 290 feet, 80 feet wide at the head; and a 20-foot roadway)

It had a narrow gauge track and two davits, capacity 8,300 pounds. The mine wharf was constructed in 1907, and the size of the wharf was inadequate.

(4) Loading Rooms (two rooms, constructed in 1909-10, each 24 by 46 feet)

The narrow gauge track extended the entire length of each room. The traveling crane had a 1-ton capacity with a S.M. triplex block having a 2-ton capacity. The testing tank was 33 by 7 by 5 feet in each room--condition good. The loading rooms were adequate to serve one minefield.

(5) Boat House (dimensions 29 feet 8 inches by 31 feet 3 inches by 8 feet 10 inches to eaves)

It was adequate for its purpose.

c. Fort Baker, Mine Wharf

Despite many years of discussion concerning a mine depot for Fort Baker, only a wharf had yet been built there for mining purposes. It had been built in 1921; the approach measured 216 by 32 feet, the wharf proper, 102 by 89 feet. Even it was now considered to be inadequate in size, and a replacement was necessary.

d. Other Structures

(1) Mine Casemate, MI (North Channel Minefield)

It was located on Point Bonita near Battery Mendell. This site was considered unsuitable due to distance from it to a satisfactory cable landing.

(2) Mine Casemate, MII

It stood on the eastern side of Point Bonita. This location was considered undesirable due to the distance from it to the minefield.

(3) Cable Hut, MI

It stood on the eastern side of Point Bonita. This location was considered undesirable due to the distance from it to the minefield.

(4) Cable Hut, MII

Its location on Bakers Beach was satisfactory.

(5) Boats

The estimated number and types of boats required to plant and maintain two controlled minefields were three mine planters, three distribution box boats, nine yawls, and three freight-carrying vessels or barges and tugs. Of these, the harbor defenses then had but one distribution box boat (L-34) and two yawls (nos. 271 and 272). The annex went on to give specifications for the various boats. The mine planters should have large forward decks capable of carrying 19 mines, 19 anchors, and accessories. There should be sufficient aft deck space to handle 19 coils of single conductor cable. The dimensions were length, 145 feet; beam, 30 feet; draft, 12 feet; and gross tons, 487.

Recommendations to bring the mine project up to a satisfactory state of preparedness included the following:

> A new mine casemate for North Channel minefield was to be constructed in the rear of Battery Guthrie and connected to a new terminal hut at Rodeo Beach.
>
> At Fort Baker there was to be a new cable tank capable of holding 50 reels, two loading rooms similar to those at Fort Winfield Scott, a mine storehouse large enough to handle two or three groups, and a boat house.
>
> Reconstructing the wharf at Fort Baker was to permit the berthing of a mine planter and a harbor tug.
>
> At Fort Winfield Scott both the wharf and the cable tank were to be enlarged.[5]

E. Annex E, Antiaircraft Gun Defense

The antiaircraft defense of San Francisco Harbor consisted of a groupment having two groups, nos. 11 and 12. Each group was capable of independent action in the event there was a rupture of communication between the forts north and south of the Golden Gate (group 11 being north of the Golden Gate and group 12 being south). Group 11's command post was to be in the fort command station for Fort Baker. Both the groupment command post and the command post for group 12 were located in the old brick fort (Fort Point) at Fort Winfield Scott.

1. Gun Defense

In 1937 three antiaircraft gun batteries of two guns each guarded San Francisco's skies. These were located at Forts

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5. NA, RG 407, AGO, Annexes 1937, Annex D, Underwater Defense.

Funston, Winfield Scott, and Barry. Two more guns were in storage. All eight weapons were 3-inch M1917 M1 A2 on fixed mounts (M1917). The two weapons in storage were to be added to the batteries at Forts Funston and Winfield Scott, while a gun would be shipped north from Los Angeles to bring Fort Barry's battery up to three weapons.

The complete gun defense would consist of these nine fixed 3-inch AA guns and an additional six guns on mobile mounts. Each of the five batteries, whether fixed or mobile, required a shelter for the director and the switchboard and a tool and oil house. The five batteries were to be numbered and located as follows: AA Battery 1, Fort Cronkhite; AA Battery 2, Fort Barry; AA Battery 3, Fort Winfield Scott; AA Battery 4, Fort Miley; and AA Battery 5, Fort Funston.

2. Machine Gun Defense

The antiaircraft machine gun defense for San Francisco Harbor consisted of 18 machine gun platoons of 4 guns each, 17 machine guns for the 17 seacoast searchlights, and 15 machine guns for the 15 antiaircraft searchlights, making the total number of machine guns 104. All the machine guns were .50 caliber and mounted on tripods. Although an accompanying map showed sites for the machine gun platoons, the annex pointed out that these locations were not obligatory and that the harbor defense command was free to site the guns as he desired.

3. Antiaircraft Searchlights

The project called for a total of 15 complete antiaircraft searchlight units, none of which were then on hand. Six of the 60-inch lights were to be mounted on the north side of the Golden Gate, one on Angel Island and the rest south of the Golden Gate. The annex said that lights 9 (Fort Winfield Scott) and 10 (Point Lobos) would require portable steel towers that should be acquired and stored during peacetime.

4. The Batteries and Their Components

a. AA Battery 1

It was located on Wolf Ridge, Fort Cronkhite. It had three 3-inch guns on mobile mounts. The director was located on a hill 1,000 feet east of the battery. It consisted of AA searchlights 1, 2, and 3; observation posts 1, 2, and 3; and AA machine gun platoons 1, 2, 3, 4, and 5. A magazine was to be constructed.

b. AA Battery 2

It was located at Fort Barry on Rodeo Hill, with three 3-inch AA guns on fixed mounts. The director was located on a hill 800 feet north of the battery. The battery had AA searchlights 4, 5, 6, and 7; observation post 4; and AA machine gun platoons 6, 7, and 8. The magazines were to be constructed.

c. AA Battery 3

It was located at Fort Winfield Scott, with three 3-inch guns on fixed mounts. The director was to be located 500 feet southwest of the battery, near old Dynamite Battery. The battery had AA searchlights 9, 10, 11, and 12; observation post 5; and AA machine gun platoons 9, 10, 11, and 12. No magazine was required.

d. AA Battery 4

This battery was located on Lincoln Park Golf Course adjacent to Fort Miley, with three 3-inch guns on mobile mounts. The director was to be located on high ground in the vicinity of the battery. The battery had AA searchlight 10. No observation post was listed, but it had AA machine gun platoons 13 and 14. No magazine was required.

e. AA Battery 5

It was located on high ground northeast of Battery Davis, Fort Funston, with three 3-inch AA guns on fixed mounts. The director was to be located on Black Bluff 1,500 feet south of the battery. The battery had AA searchlights 11, 12, 13, 14, and 15; observation posts 6, 7, and 8; and AA machine gun platoons 15, 16, 17, and 18. A magazine was to be constructed 200 feet north of the battery.

Pointing out that the ammunition for fixed and mobile antiaircraft guns was not interchangeable, the annex listed the ammunition allowances:

	Battle Allowance	Central Reserve	War Reserve
Each battery, regardless of type	1,800	1,800	1,800

When received, this ammunition was to be stored in the Central Reserve Magazine at Fort Winfield Scott.[6]

F. Other Annexes

The remaining annexes of the harbor defense project for San Francisco were lettered F through M. All of these were short and may be readily summarized. Annex F, supporting aircraft, stated that aircraft were to be used in fire control and in local surveillance. It called for one flight consisting of three observation airplanes. An accompanying map showed the location of all airdomes in the Bay Area, including the recently abandoned Crissy Field adjacent to Fort Winfield Scott.

Annex G, gas defense, called for the installation of a collective protector unit in each plotting room, restroom, switchboard room, and radio room at the seacoast batteries and mine casemates. Each

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6. NA, RG 407, AGO, Annexes 1937, Annex E, Antiaircraft Gun Defense.

unit was to have four cannisters. The unit had a rated capacity of 200 cubic feet of air per minute and could support 20 men in a room with 10 cubic feet of air per man per minute.

Annexes H through M contained cost estimates by the chiefs of arms and services for the harbor defense of San Francisco:

Annex	Chief	Estimate
H	Coast Artillery	$6,255,986
J	Engineers	3,189,986
K	Ordnance	2,282,597
L	Chemical Warfare Service	111,540
M	Signal Officer	514,318
	Total	$12,354,427

Three more years would pass before the United States' international relations worsened sufficiently for an intensive modernization program to begin in earnest. Nonetheless, the engineers undertook to implement the projects so far as scanty funds would allow.[7]

7. NA, RG 407, AGO, Annexes 1937, Annexes F-M. Apparently there was no annex lettered I.

VI. World War II

A. The War Approaches

Hitler occupied Austria in March 1938; later that year Britain and France yielded to Nazi demands for the Sudetenland. In Asia Japanese troops continued their invasion of China. War broke out in Europe in 1939. And in 1940 the British retreated from Dunkirk, Nazi bombers pounded Coventry, and Japan invaded French Indochina.

1. Mining Project

At San Francisco the army engineers undertook to implement the 1937 harbor defense project with the meager funds at their disposal. The 1937 annexes had urged that the underwater mining project be brought to completion as quickly as possible. By the fall of that year construction of a new mine wharf at Fort Baker was underway. This L-shaped wharf, which partly encompassed the old quartermaster wharf, was completed early in 1938. The annexes had stated that a new mine casemate (MI) was needed at Fort Barry because of the poor location of the existing one. However, the old casemate was retained, and in October 1939 plans were approved for bombproofing the structure by a concrete and earth casemate complete with burster course. But the small frame radio station adjacent to the mine casemate was left without any additional protection.

The Military Appropriations Act, approved April 26, 1939, made funds available for additional work on shore facilities for the mining project. The district engineer prepared the necessary plans, giving priority to the existing depot at Fort Winfield Scott. He proposed discarding the track system of moving mines and replacing it with tractors and trailers. Plans were prepared for a new $155,000 wharf large enough to berth and load two mine planters. Specifications and a "notice to bidders" for this wharf were issued in January 1941.

The mine depot proposed for Fort Baker was also constructed in 1941. It consisted of a mine storehouse, a cable tank building, an auxillary power plant, a detonator storage magazine, a TNT storage magazine, and two mine loading rooms. Most of these facilities were placed in cut-and-fill sites along the base of Lime Point Bluff between the post proper and the wharf. All of them still exist. Battery F, Sixth Coast Artillery, was activated August 1, 1940, to serve as the mine battery at Fort Baker. In general, the mining project for San Francisco Harbor was completed before Pearl Harbor.[1]

2. AA Battery, Fort Cronkhite

The 1937 annexes had called for a mobile three-gun antiaircraft battery at Fort Cronkhite. Upon further reflection, however, Coast Artillery Corps officers concluded that a fixed battery was preferable. There was no road leading to the proposed site on top of Wolf Ridge, and the cost of building one would be excessive. There was not sufficient level ground on the ridge to rest the outriggers of mobile guns. Moreover, the 16-inch guns of Battery Townsley should be protected by a fixed battery as were those of Battery Davis at Fort Funston.

A board of officers meeting in March 1939 reaffirmed these conclusions and recommended the transfer of Fort Winfield Scott's fixed antiaircraft battery to Fort Cronkhite. At the same time plans were prepared for three concrete pads for the guns, a

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1. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortifications Files 1884-1944, Lt. Col. J.A. Dorst, Sept. 22, 1937, to Chief of Engrs., and Maj. R.C. Hunter, Nov. 21 and Dec. 22, 1939, to Chief of Engrs.; FARC, San Bruno, RG 77 42 photographs of constructing mine wharf, Fort Baker; FARC, San Bruno, RG 77, drawings for mine casemate, Fort Barry, 1939; Specifications for mine wharf, Fort Scott; SF, PAM, Fort Record Book, Fort Barry.

concrete well for the director, a bombproof magazine, and a combination storage and power plant shelter.[2]

3. Estimates for 1940

Colonel Dorst, the San Francisco District Engineer, prepared his fortifications estimates for fiscal year 1940. As he saw it, work was required in three areas: the 16-inch batteries, the submarine mine installations, and the fire control installations. Considering the nature of the times, Dorst's estimate was the rather modest figure of $962,057.

Project 13, the Batteries	
Fort Funston, protective concealment	$111,000
Fort Cronkhite, mount 16-inch guns	30,000
install power plant	15,000
construct fence	40,000
protective concealment and restore vegetation	150,700
install AA battery	33,500
Project 14, Submarine Mines	
Fort Baker, cable tank, storehouse, and loading rooms	160,000
boathouse	25,000
storm mooring, Yellow Bluff	1,000
Fort Winfield Scott, enlarge cable tank	9,500
wharf and boathouse	9,500
Project 34, Fire Control Installations	179,940[3]

2. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortifications Files 1884-1944, Lt. Col. H.T. Bungin, CO, Sixth CA, May 5 and July 26, 1938, to CG, Ninth CA Dist., Presidio, and Proceedings of a Board of Officers pursuant to 3" AA Battery at Battery Townsley. Also in 1939 plans were approved for the AA battery at Fort Barry. Six sheets of these plans and the specifications are in San Bruno. The lack of a road to Wolf Ridge was not really a problem. The engineers wanted the road to Battery Townsley extended past the battery as a matter of deceptive concealment, and the district engineer included such a road in his 1939 estimates.

3. FARC, San Bruno, RG 77, OCE, San Francisco Dist. Main Office, Fortifications File 1884-1944, Lt. Col. J.A. Dorst, Apr. 27, 1939, to Chief of Engrs. The above figures do not add up to agree with the total estimate, but they do give an idea of the plan to improve the harbor defenses.

4. Harbor Defense Board's Recommendations, 1940

The War Department's Harbor Defense Board came forth with a new report in July 1940 that recommended the adoption of the 16-inch gun as the primary weapon and the 6-inch gun as the secondary weapon in seacoast armament. The board proposed for national defense the construction of 27 new 16-inch two-gun batteries (two for San Francisco had already been recommended in the 1937 annexes), casemating primary batteries already installed or approved (this included Battery Wallace at Fort Barry but not Batteries Davis and Townsley, which were already casemated), and construction of 50 new 6-inch two-gun barbette batteries of a new design having a 15-mile range (two 6-inch batteries for San Francisco had already been recommended in the 1937 annexes). The general staff approved this report in September 1940.

The 16-inch battery proposed for Milagra Ridge south of San Francisco (Construction 130) was never begun, and the project was cancelled in 1942. The other 16-inch battery (Construction 129) proposed for Fort Barry was commenced in 1942 but as it will be noted was never armed. The two 6-inch batteries (Construction 243 at Fort Miley and Construction 244 at Milagra Ridge) were built during World War II, but the war was over before their guns arrived in San Francisco.[4]

B. After Pearl Harbor

1. Army Organization

The National Defense Act of 1920 had established nine corps areas in the United States and had given each corps area fixed boundaries and its commander full tactical and administrative control. The Ninth Corps Area was headquartered at

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4. Conn, p. 48; Emanuel Lewis, Harbor Defense Installations, pp. 256-259; NA, RG 407, AGO, Special Projects, Harbor Defense, Annexes to Harbor Defense Project, Annex A, Seacoast Guns. These new batteries will be discussed again in more detail.

the Presidio of San Francisco. In the fall of 1942 the War Department established four armies without fixed boundaries in the United States. Of these, Fourth Army was headquartered at the Presidio. After the outbreak of war in Europe, the army commander's authority increased, and at San Francisco Lt. Gen. John L. DeWitt commanded both the Fourth Army and the Ninth Corps Area.

Undoubtedly confusing to a layman, the War Department also divided the United States into four strategic areas in March 1941. One of these was the Western Defense Command and its headquarters too were at the Presidio of San Francisco. Until Pearl Harbor the Western Defense Command served only as a planning agency. The day before Pearl Harbor on December 6, 1941, the War Department directed that the command of harbor and coastal defense units pass from the army commanders to the defense commanders by January 1, 1942.

At San Francisco these orders meant only that General DeWitt changed hats, for on December 11, 1941, the Western Defense Command was designated a theater of operations with DeWitt in charge. As a theater Western Defense Command commanded Fourth Army, Ninth Corps Area, and the Second and Fourth Air Forces. Geographically, it consisted of California, Oregon, Washington, Nevada, Idaho, Arizona, Utah, Montana, and Alaska. And, of course, it commanded the harbor defenses and the land defenses of San Francisco.

The Western Defense Command was divided into geographical sectors--the one that included San Francisco within its boundaries being the Northern California Sector. As soon as news of the Japanese attack on Pearl Harbor reached California, the Northern California Sector was organized, and the "Joint Pacific

Coastal Frontier Defense Plan, Rainbow No. 5, 1941" was put into effect. The official history of the Northern California Sector, Western Defense Command, stated that all harbor defense stations and installations at San Francisco were manned by noon, December 7.

During the first few weeks after Pearl Harbor, there was a certain amount of confusion and reorganization concerning the Northern California Sector; but on May 1, 1942, it was reorganized under Maj. Gen. Walter K. Wilson with its command post at the Presidio of San Francisco.[5]

2. Harbor Defenses of San Francisco (HDSF)

The harbor defenses of San Francisco involved Point Reyes, Tamalpais (or Marin Headlands), San Francisco, San Mateo, and Half Moon Bay. From Point Reyes on the north to Pillar Point on the south approximately 50 miles of coastline were involved. Headquarters for HDSF, as the army liked to call it, was at Fort Winfield Scott. The mission of the harbor defenses was to protect harbor facilities and shipping in the harbor from enemy naval gunfire, to ensure freedom of movement to friendly ships entering and leaving the harbor, to deny enemy ships access to the harbor, and to support the defense against a landing attack.

A key element of the harbor defenses was the harbor entrance control point (HECP), also located at Fort Winfield Scott. Its mission was to collect and disseminate information on all activity in the "defensive sea area" (approximately the water area east of an arc from Duxbury Reef to Mussel Rock), to control unescorted commercial shipping in the "defensive coastal area" (the water area

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5. Conn, pp. 17-33; Washington, D.C., Library of Congress, U.S. Army, Western Defense Command, "Historical Record--Northern California Sector, Western Defense Command, 1 May 1942--September 1945," microfilm of typescript, pp. 2-5 and 19.

included in a circle of 30 miles radius from Point Lobos), and to take prompt action to deny enemy action in the defensive coastal area.

The missions of the other elements in the harbor defenses were those that might be anticipated.

Seacoast artillery, to carry out the mission of the command

AA artillery and automatic weapons, primarily to provide AA defense for the harbor defense installations; secondarily to supplement antimotor torpedo boat (AMTB), beach, and land defenses

AMTB, primarily to deny access to the harbor to torpedo boats, landing barges, etc., secondarily to supplement the AA defenses

Submarine mine defense, to deny hostile vessels access to the Port of San Francisco

Land defenses, to defend the harbor defense installations from attack by land or from airborne troops, and to deny access to harbor defense installations to any fifth column attacks.

Similar to Civil War days, defensive positions against overland approaches to San Francisco Harbor were selected. To the north the "final" defensive position was a line running east and west just to the north of Mount Tamalpais; on the south the final position was to the south of Crystal Springs Lake.

It will be recalled that the 1937 annexes presented the tactical organization for the harbor defenses. They called for three groupments having seven groups for the seacoast guns and

an antiaircraft groupment consisting of two groups. With the outbreak of hostilities, however, the tactical organization was considerably modified. The historical record described the tactical organization that was in effect from December 7, 1941, to January 27, 1944, when it was greatly reduced due to the movement of the battle lines to the Western Pacific.

Groupment	Group	Assignment
Command Post		Harbor entrance control post
Mine Groupment	2	Mines I and rapid-fire batteries
	3	(Left blank in the historical record, probably assigned to mines II and III)
Funston Groupment	4	Mortars
	5	155-mm. battery
	Separate	16-inch battery
AA Groupment	15	AA searchlights
	Separate	AA guns and automatic weapons
Separate	1	Major caliber batteries[6]

3. Emergency!

Among the emergency measures taken in the first weeks of the war was the addition of field artillery to the defense. At "several" unspecified locations 75-mm. guns were employed to cover gaps between Coast Artillery Corps units, particularly at possible landing beaches. Mobile and semimobile Coast Artillery

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6. Washington, D.C., Library of Congress, U.S. Army, pp. 17-19. The tactical organization from January 1944 to September 1945 was as follows:

Group	Assignment
Command Post	Harbor Entrance Control Post
Group 2	Rapid-fire batteries
Group 3	Mines I, II, and III
Group 6	AMTB weapons and searchlights
Detection and Security Group	

Corps units, particularly 155-mm. guns, were used both to augment the harbor defenses and to provide protection for Drakes Bay, Monterey Bay, Exterro Bay, and San Luis Obispo Bay. The land area beach defenses were augmented by the addition of two battalions of infantry, one in the Fort Barry area and the other south of the Golden Gate. The land defense was strengthened by entanglements, slit trenches, and clearing fields of fire for automatic weapons. During the weeks following Pearl Harbor many reports came in of enemy ships or submarines near San Francisco Harbor, but the official history noted, "none of these reports were verified from other sources although the information appeared to be very positive at the time." The difficulty experienced in identifying planes resulted in frequent antiaircraft alerts and blackouts of the harbor defenses.[7]

4. Submarine Mine Project

The submarine mine project was only partly installed on December 7, 1941. Exhaustive efforts were made to place additional groups of mines during the first months of the war. Extremely bad weather in December and January hampered the work. On the night of December 14, mine vessel L-74 was grounded and sunk by heavy seas; yet, the mines were laid and the channels defended.

In June 1942 a navy blimp reported that an enemy mine-laying submarine was operating at the west end of Main Channel outside the American minefield. The blimp did not see the submarine itself; it "saw" many submerged mines in the area. The army closed Main Channel for five hours while it conducted sweeping operations in the area. The report remained silent on the results of the sweep.

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7. Washington, D.C., Library of Congress, U.S. Army, pp. 4, 12, and 19.

Main Channel was closed a second time in 1943 when a small vessel, Espanosa, loaded with dynamite, sank in that area "due to natural causes." Until the wreck was successfully cleared, North Channel was opened to traffic.

To prevent entry of undetected surface vessels or submarines into the harbor during periods of reduced visibility or after dark, the mines in North and South channels were placed on contact power during those times. That is, they were switched from being mines controlled from shore to mines that would explode on contact. This procedure lasted for about a year, from early summer 1942 to early summer 1943. During that time, 13 of the mines exploded without contacting anything; the cause was attributed to faulty arming.

The mines in use early in the war were the buoyant type that rested only 15 feet below the surface of the water. These caused considerable trouble because passing ships fouled the connecting cables all too frequently. In 1943 the army replaced the buoyant mine with a new "ground" mine, which all friendly ships could clear without harm. Presumably, the mines at San Francisco were changed to the new type at that time.[8]

C. Modernization Program, 1940-1943

A secret letter from the War Department, subject "Modernization of Harbor Defense Projects, Continental United States" dated

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8. Washington, D.C., Library of Congress, U.S. Army, pp. 19-20; Conn, p. 50; Emanuel Lewis, Harbor Defense Installations, p. 254, says that a battery of four 155-mm. guns was dispatched to Drakes Bay prior to midnight, Dec. 7, 1941. Later a second battery was installed at Granada, near Princeton Beach, Half Moon Bay, and a pair of 155-mm. guns was sent to old Battery Kirby, Fort Baker. These guns probably came from Fort Cronkhite where they were kept on the north side of Rodeo Lagoon. Two batteries remained at Fort Cronkhite, one at Tennessee Point and one at the West Parade Ground.

September 26, 1940, marked the beginning of an intensified modernization program for the harbor defenses of San Francisco that continued to December 1943. It included among other things: completion of the mine project that has already been discussed; radar for antiaircraft, seacoast fire control, and seacoast surveillance projects; antimotor torpedo boat defense; revision of underwater defense project; modernization of Batteries Wallace, Smith, Guthrie, Rathbone, and McIndoe, all at Fort Barry; construction of the 16-inch battery (Construction 129 at Fort Barry), and the 6-inch battery (Construction 243 at Fort Miley); construction of four Panama mounts for 155-mm. guns at Fort Funston; and even a barrage balloon project. After the war it was estimated that all these modernizing projects for San Francisco had amounted to approximately $10 million.[9]

1. New Seacoast Batteries

The four seacoast batteries called for in the 1937 annexes were authorized by secret letters from the adjutant general in 1940 and 1941. Only the two currently within the boundaries of Golden Gate National Recreation Area (GGNRA) are discussed herein: Battery Constructions 129 and 243. Battery Lobos near Fort Miley was also identified in the same letters. Also listed were the several small-caliber batteries that were installed as part of the antimotor torpedo boat defense, although little remains of these today except the sites themselves.

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9. Washington, D.C., Library of Congress, U.S. Army, pp. 20-21. The seacoast fire control radar project was initiated by a War Department letter dated Nov. 3, 1941, the seacoast surveillance radar by letter dated May 13, 1942, the AMTB project by letter, dated Feb. 21, 1942, and the underwater defense project by a letter dated Oct. 20, 1942.

a. Battery Construction 129

The adjutant general's letter authorizing this project was dated September 26, 1940. The siting of this immense casemate for two 16-inch guns, navy, MK BC 15II, MI, was authorized in June 1941. Construction, however, apparently did not get underway until September 1942. The historian E. Raymond Lewis points out that while this battery was basically similar to Batteries Davis and Townsley, it was built more heavily; of all the American heavy-caliber seacoast batteries, it had the greatest elevation above sea level, being at more than 800 feet. The two cut-and-cover tunnels approaching the casemates from the rear were authorized to give a natural appearance to the hill and to provide protection from ricochets from the departmental rifle range.

By November 1943 it was clear that Japanese warships would not be attacking American ports and on November 26 the Office of the Chief of Engineers announced the curtailment of the construction of three 16-inch batteries on the Pacific Coasts, including 129 at Fort Barry. The division engineer at San Francisco was directed to complete only that work at the battery that was necessary to protect that already built. This involved backfilling and planting for protection against soil erosion, sewer and drainage facilities, lining and portal structure for service tunnel, extension of access road, and hanging all outside doors and painting them for preservation. He was to ensure that all entrances were closed so as to prevent the battery from becoming an "attractive nuisance."

When this directive was received at San Francisco, the two guns were already at the site and the carriages were due to be delivered in March 1944. The district engineer pointed this out to the chief of engineers and suggested that the guns be mounted when the carriages should arrive. The reply was that the carriages would not be shipped and that the gun tubes

were to be stored at the site for an indefinite period. The division engineer explained how he would do that: "It is proposed to store the gun tubes in the entrance corridors in rear of each casemate. The No. 1 gun tube will be stored on the South side of the entrance corridor to No. 1 casemate. The No. 2 gun will be stored on the North side of the entrance corridor to No. 2 casemate. The tubes will be stored so as to allow a clearance width of approximately nine (9) feet along one side for passage of maintenance equipment."

In February 1944 the status of Battery Construction 129 was classified as being not a canceled project but authorized for retention in the harbor defense project as a "suspended battery." At this same time a detailed statement was made as to the percentage of its completion.

	Emplacement	Plotting and Switchboard	Fire Control
Engineering work	98	100	99
Signal work	80	20	100
Ordnance	(guns on hand)	--	0

As if they could not believe that the battery would not eventually be armed, the engineers continued to write about it. At the end of 1944 an estimation of the cost to complete it was prepared.

Item	Material	Labor	Total
a. Emplacement: complete construction including permanent camouflage and side closure shields	$ 12,610	$ 30,860	$ 43,470
b. Guns and carriages: install guns, carriages, and shields	--	67,900	67,900
c. Base end stations: complete BC[1] station at Diablo Ridge	80	150	230
Total:	$ 12,690	$ 98,910	$111,600

And again in 1945 a supplement to the harbor defense project for San Francisco estimated completion costs. It was not to be. Battery Construction 129 still stands unfinished, its gun tubes long since gone to some salvage yard.[10]

b. Battery Construction 243

The adjutant general's authorization for the construction of this two-gun 6-inch battery, Construction 243, Fort Miley, was dated March 27, 1941. However, construction did not commence until January 1943. The engineers' work was completed and accepted for use and care by the troops in February 1944. The battery was complete, including its carriages and shields, except for the guns themselves. At the close of World War II, the guns had still not arrived; however, the battery was not abandoned. While the days of glory for coastal fortifications had passed, the army wished to retain some 6-inch batteries to protect minefields. Finally, the two guns were mounted in April 1948, the last seacoast guns to be installed at San Francisco. The magazine for these guns was casemated, but the guns themselves were barbette protected by cast steel shields. All that remained of them today are the concrete platforms, one of which has been converted to flagstaff foundation, and the casemated magazine that was later used by the U.S. Navy.[11]

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10. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Fortification Files 1942-1944, Lt. Col. E.R. O'Brien, Nov. 26, 1943, to Div. Engr., Pacific Div., and Lt. Col. H.E. George, CE, San Francisco, Jan. 8, 1944, to Div. Engr., Pacific Div., and endorsements, and Col. K.M. Moore, Dist. Engr., San Francisco, Dec. 19, 1944, to CO, HDFC, Ft. Scott; NA, RG 407, AGO, Special Projects, Harbor Defense, San Francisco, Supplement to Harbor Defense Project, 1945, Annex A, Armament, pp. 10 and 11; Emanuel Lewis, Harbor Defense Installations, p. 259; NPS, DSC, John Martini, letter to writer, c.a. March 1976.

11. SF, PAM, Fort Record Book, Fort Miley; NPS, DSC, Prindle, p. 22; NA, RG 407, AGO, Special Projects, Harbor Defense, San Francisco, Supplement to Harbor Defense, 1945, Annex A, pp. 10-11.

c. Battery Lobos

Records located to date disclose little data concerning this battery. It consisted of two 6-inch navy guns (MKX, model 22) emplaced on pedestal mounts and located on the cliff at Point Lobos, west of Fort Miley. The sites may still be identified. In October 1942 headquarters of the harbor defenses of San Francisco issued a memorandum stating that this battery would thereafter be referred to by the name "Lobos." The only other reference to this battery in the Fort Miley record book was that the chief of ordnance was directed on November 8, 1945, to dispose of the two guns and their ammunition, along with the four 155-mm. guns of Battery Bluff at Fort Funston.[12]

d. AMTB Batteries

Tests conducted at the Coast Artillery School in 1941 indicated that the best defense against motor torpedo boats was the 90-mm. antiaircraft gun, which was capable of rapid fire and could be traversed rapidly. But these guns were in scarce supply until late 1942, and at San Francisco the old 3-inch guns from Battery Yates were pressed into service, along with the mobile 155-mm. guns already mentioned. In 1943 the 90-mm. guns, usually in pairs, were emplaced along with mobile 37-mm. antiaircraft guns. In 1944 the latter were replaced by more powerful 40-mm. weapons.

e. Battery Gravelly Beach

In 1943 a pair of 90-mm. AMTB (M3) guns on fixed mounts and two mobile 90-mm. guns (M1A1) without emplace-

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12. NPS, DSC, Prindle, pp. 11 and 21.

ments, were established at Gravelly (or Kirby) Beach.[13] These replaced two 3-inch guns (Battery Kirby Beach) that had been installed on the beach early in the war. These guns had come from Battery Yates by way of Battery Townsley, where they had served as subcaliber weapons.

f. Battery Bonita

Two 37-mm. automatic mobile weapons were located on Bonita Cove, just below the Coast Guard buildings in 1943. Since they were mobile, no emplacements were required. Two 40-mm. weapons (M2A1) replaced them in 1944.

g. Battery Cavallo

Also two 37-mm. automatic weapons were emplaced in 1943, one on the tip of Point Cavallo and the other on the mine wharf across Horseshoe Bay. Both were replaced with 40-mm. weapons (M2A1) in 1944.

h. Battery Yates

Battery Yates retained two of its former six 3-inch guns on pedestal mounts. It played this new role as part of the AMTB defense as well as of the antisubmarine net.[14]

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13. Conn, p. 51; NA, RG 407, AGO, Special Projects, Harbor Defense, San Francisco, Supplement to Harbor Defense, 1945, Annex A, p. 6. These 90-mm. guns were protected by shields, and their maximum effective range was 7,500 yards. Emanuel Lewis, Harbor Defense Installations, pp. 264-69, and Appendix 1, pp. 11-12, states that this battery was preceded in 1942 by a pair of 3-inch guns originally from Battery Yates but lately serving as subcaliber guns at Battery Townsley.

14. NA, RG 407, AGO, Special Projects, Harbor Defense, San Francisco, Supplement to Harbor Defense, 1945, Annex A, p. 6; Emanuel Lewis, Harbor Defense Installations, Appendix 1, pp. 9-10.

i. Battery Gate

It consisted of two 3-inch guns (model 1902) also from old Battery Yates. Both guns were located on the barbette tier of the old brick fort. They were mounted there about October 1942 and were dismounted and salvaged in late 1945 or early 1946.

j. Battery Point

This battery also consisted of two 3-inch guns (model 1902) from old Battery Yates. These were the guns that had earlier been mounted at Gravelly Beach. They were then mounted on the barbette tier of the old fort along with those of Battery Gate. These guns were dismantled in 1945, one of them being sent back to Battery Townsley as a subcaliber piece.[15]

k. Battery Winfield Scott

This battery had two 40-mm. automatic weapons (M2A1) as of 1945.

l. Battery Baker

This battery was located at Bakers Beach, Fort Winfield Scott; it consisted of two 90-mm. guns on fixed mounts and two mobile 90-mm. guns. These weapons were still in place in 1945, and the supplement of that year called for their retention.

m. Battery Land

It was located at Lands End north of Fort Miley; this battery consisted of two fixed 90-mm. guns (M3) and two mobile 90-mm. guns (M1A1). These guns were emplaced in 1943 and were still in existence as of the end of 1945.

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15. San Francisco, Presidio of San Francisco, Presidio Army Museum, Fort Record Book, Fort Winfield Scott; San Francisco, Presidio of San Francisco, "Historical Record of Presidio Batteries, Jan. 12, 1975"; NA, RG 407, AGO, Special Projects, Harbor Defense, San Francisco, Supplement to Harbor Defense, 1945, p. 6.

n. Battery Buck

Two 40-mm. automatic weapons were also located at Lands End north of Fort Miley. These replaced earlier 37-mm. weapons.[16]

2. Modernization of Older Seacoast Batteries

The modernization program involved five of the older batteries at San Francisco, all of them located at Fort Barry. Four of them were 6-inch batteries from the tail end of the Endicott era--Smith-Guthrie and Rathbone-McIndoe. The fifth was the high-powered 12-inch Battery Wallace that had been constructed during World War I.

During proof-firing in 1928, Wallace's gun 2 (serial no. 68) had been damaged. A year later it was replaced by gun 75. Then in the spring of 1940, a second pair of tubes, nos. 44 and 63, which had been brought to the Pacific Coast on board the USAT Ludington, were delivered to the battery as spares. Although the magazine had been casemated in 1919, neither gun had any protection whatsoever. Pearl Harbor changed that. By late fall of 1943, the engineers had completed the casemating of the two guns in a manner generally similar to the 16-inch batteries. Battery Wallace was returned to the troops in November 1943 only to become inactive a year later.[17]

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16. NA, RG 407, AGO, Special Projects, Harbor Defense, San Francisco, Supplement to Harbor Defense, 1945, Annex A, pp. 6 and 22-23.

17. San Francisco, Presidio of San Francisco, Presidio Army Museum, Fort Record Book, Fort Barry; FARC, San Bruno, RG 77, OCE, San Francisco Dist., Fortification Files, 1924-1944, Lt. Col. H.E. George, Nov. 16, 1943 to CG, Western Defense Command. Enscribed in the concrete over one of the entrances of Wallace's casemates is the date "1942"; FARC, Suitland, RG 77, OCE, Harbor Defense Files, Brig. Gen. E.A. Stockton, HD of SF, Mar. 12, 1942, to CG, Ninth Coast Artillery Dist. Stockton in arguing for case-

Almost identical modernization work was carried out on the twin structures, Rathbone-McIndoe and Smith-Guthrie.

Rathbone - Plotting room was gas-proofed, and the loading platforms were extended.

McIndoe - Plotting room was enlarged and gas-proofed. The loading platforms were extended.

Smith - Plotting room was gas-proofed, and the loading platforms were extended.

Guthrie - Plotting room was gas-proofed and enlarged, and the loading platforms were extended.

The work was completed, inspected, found acceptable, and transferred to the troops at the same time as was Battery Wallace.[18]

3. Fate of Seacoast Batteries

Fifteen of the Endicott batteries had been disarmed before World War II began, although some of them probably had not been completely salvaged until the early 1940s. Throughout the war, their magazines were used as storehouses for various classes of supplies or as air raid shelters. These 15 were as follows:

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mates for Wallace observed that the great lesson to be learned from Singapore was that not even the Japanese would send their heavy ships up against powerful harbor defenses.

18. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Fortifications Files 1924-1944, Capt. L. E. Mullally, CE, Aug. 24, 1943, to CG, Western Defense Command.

Fort Baker
- Orlando Wagner
- Duncan

Angel Island
- Wallace
- Ledyard
- Drew

Fort Mason
- Burnham

Fort Winfield Scott
- Blaney
- Slaughter
- Sherwood
- Baldwin
- Lancaster
- Miller
- Boutelle
- Howe
- Arthur Wagner

In 1943 the War Department ordered the salvaging of 13 additional Endicott batteries, which were no longer useful.

Fort Baker
- Kirby, 12-inch gun
- Spencer, 12-inch gun

Fort Barry
- Alexander, 12-inch mortar
- Mendell, 12-inch gun

Fort Winfield Scott
- Cranston, 10-inch gun
- Saffold, 12-inch gun
- Crosby, 6-inch gun
- Stotsenburg, 12-inch mortar
- McKinnon, 12-inch mortar
- Godfrey, 12-inch mortar

Fort Miley
- Chester, 12-inch mortar
- Livingston, 12-inch mortar
- Springer, 12-inch mortar

Two more batteries were disposed of in 1945: Battery Bluff, 155-mm., and Battery Walter Howe, 12-inch mortar, both at Fort Funston. Ironically, Walter Howe had been constructed during World War I as a temporary battery; it was, in fact, the last mortar battery in the United States to be salvaged.

In the post-World War II planning for the defense of San Francisco Harbor, only 12 batteries would be retained; of these, 6 were from the Endicott period.

Priority

Construction 129, 16 inch, Fort Barry, incomplete
Townsley, 16 inch, Fort Cronkhite
Davis, 16 inch, Fort Funston
Wallace, 12 inch, high-powered, Fort Barry
Construction 243, 6 inch, Fort Miley, incomplete
Construction 244, 6 inch, Milagra Ridge, incomplete
Rathbone, 6 inch, Fort Barry (Endicott)
Chamberlin, 6 inch, Fort Winfield Scott (Endicott)
Guthrie, 6 inch, Fort Barry (Endicott)
McIndoe, 6 inch, Fort Barry (Endicott)
Smith, 6 inch, Fort Barry (Endicott)
O'Rorke, 3 inch, Fort Barry (Endicott)[19]

4. Other Wartime Developments

a. Hydrangea Station

The commanding officer, HDSF, received a letter in February 1940 directing him to commence work on a hydracoustic installation, that is, an underwater sound-ranging system to be used to detect enemy submarines, etc. A site for the building was selected at Fort Miley and this central control station was completed by September. Throughout the latter half of 1941 a Coast Artillery Corps detachment manned the station. Then in January 1942, Battery O, Underwater Ranging, Sixth Coast Artillery was activated to take charge of the station. The decision having been made to turn to this type of activity over to the U.S. Navy, a naval officer and seven enlisted men arrived at Fort Miley for instruction in April 1942. Four months later the hydrangea station was transferred to the navy.

The hydrangea station has not been located on any maps of Fort Miley. It is not believed to be standing today.

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19. NA, RG 407, AGO, Special Projects, Harbor Defense, San Francisco Supplement to Harbor Defense, 1945, Annex A, pp. 5-18; Emanuel Lewis, Harbor Defense Installations, p. 213.

The postwar naval underwater defense project called for two harbor echo-ranging and listening devices located outside the Golden Gate, with their cables coming ashore at mines II and III casemate at Bakers Beach, Fort Winfield Scott.[20]

b. Emergency Construction, December 1941

Immediately after Japanese planes bombed Pearl Harbor, Col. Warren T. Hannum, the division engineer at San Francisco, prepared an estimate for emergency construction for the harbor defense installations. It has not been possible to trace the fate of all his proposals, but it is known that a great many, if not all of them were realized.

To construct a fire control station for mines III at Fort Miley, $8,500 (The 1937 annexes had called for minefields in only North Channel [mines I] and Main Channel [mines II]. Sometime between then and December 1941, the decision had been made to add a third minefield to South Channel.)

To construct a battery commander station for Battery Rathbone, Fort Barry, $2,500

To construct a battery commander station for Battery Wallace, Fort Barry, $4,500

To construct an ammunition storage magazine for Antiaircraft Battery 2, Fort Barry, $24,000 (This cut-and-fill concrete magazine still stands west of Battery Rathbone.)

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20. NPS, DSC, Prindle, p. 35; NA, RG 407, AGO, Special Projects, Harbor Defense, San Francisco, Supplement to Harbor Defense, 1945, Annex D, Underwater Defense.

To construct an ammunition storage magazine, power plant, storage room, and director pit, for AA Battery 2, Fort Funston, $23,000 (All these facilities were constructed.)

To provide camouflage materials for all AA batteries, $2,500

To provide camouflage materials for Batteries Townsley, O'Rorke, Guthrie, Smith, Rathbone, McIndoe, Yates, Chamberlin, Davis, Mendell, Crosby, Chester, Alexander, Howe, Springer, Livingston, Spencer, and 155-mm., $90,000

To construct steel bunks for inside Batteries Davis, Townsley, and Wallace--about 105 men, plus 30 men in the plotting rooms, $8,000 (The commanding general of the Ninth Coast Artillery District commented on this proposal, saying that at present the men had to use folding cots, and when the batteries were in action, they had to move the cots, mattresses, and bedding outdoors. He wanted steel bunks attached to the wall by hinges that could be folded up so as to leave the corridors clear.)

To construct a switchboard and underwater control station (hydrangea station above), Fort Miley, $77,000

To construct a combined mine casemate, Fort Winfield Scott, $100,500 (At Bakers Beach, Fort Winfield Scott, there already was a mine casemate for the Main Channel minefield (MII). It, however, had been constructed at an early date and was small and rather flimsily built, although some attempts had been made to strengthen it. This proposal was for a bombproof mine casemate large enough to serve both Main Channel and the new South Channel minefields, MII and MIII.)

To construct a switchboard room, Fort Barry, $77,100

To construct a new "H" station and a new harbor entrance control point, Fort Winfield Scott, $350,000 (The HECP was established in old Dynamite Battery, Fort Winfield Scott, together with the harbor defense command post.)

To construct casemates for the 12-inch guns at Battery Wallace, Fort Barry, $600,000 [21]

5. Radar

Both Britain and the United States were developing radio detecting and ranging (radar) systems by the late 1930s. As far as the defenses of San Francisco were concerned, there were two families of radar: those used for air defense and those used for seacoast artillery fire control. Research priority was given to air defense radar.

One of the first operational radars was the SCR-268, which was used in connection with antiaircraft searchlights for detecting aircraft. In military terms it was called a searchlight director. The SCR-270 and SCR-271 were radar for the long-range detection of aircraft, up to 100 to 150 miles.

In August 1940 the War Department approved a plan for the placing of 21 mobile detectors on the coasts, 11 along the northeast Atlantic and 10 along the Pacific. By January 1942, 27 sets of SCR-270 had been installed on the West Coast. The

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21. FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortifications Files 1884-1944, Col. W.T. Hannum, Div. Engr., Dec. 30, 1941, to Chief of Engrs., and Brig. Gen. E.A. Stockton, CG, Ninth CA Dist., Jan. 11, 1942, to CG, Western Defense Command.

SCR-270 was heavily criticized, at least in its early days. And its antenna--described as a king-sized set of bedsprings--took up a lot of room.

The distribution of these radar sets for antiaircraft purposes in the harbor defenses of San Francisco is not known. In the postwar plans, however, San Francisco was to have nine searchlights equipped with radar, six north of the Golden Gate and three on the south.

The other family of radar was designed to assist the seacoast artillery in fire control. Development was delayed until the antiaircraft types were perfected, but by 1942 the SCR-296, a surface craft detector, was in production. The earliest correspondence concerning the SCR-296 that has been found regarding the Bay Area was dated October 16, 1943. This letter authorized the construction of five SCR-296 sets: set 1, Wildcat Military Reservation on the Point Reyes Peninsula; set 3 on Hill 640 northwest of Frank Valley; set 5 on Bonita Ridge, Fort Barry; set 10 at Devil's Slide south of Milagra Ridge; and set 11 at Pillar Point, Half Moon Bay. The directive went on to say that four other sets had already been authorized for San Francisco: Wolf Ridge at Fort Cronkhite, Fort Winfield Scott, Fort Miley, and Fort Funston.

A breakdown of the funding for set 1 (Wildcat) showed the following elements:

Tower, 25 feet high	$3,250
Transmitter house, concrete	8,800
Two power plants (erection)	2,000
Trenching	330
Tower base	420
Handhold	75
Gasline	180
Painting	200
Camouflage	300

The postwar plan for San Francisco harbor defenses showed the following total of 11 SCR-296 sets:

Wildcat Ridge
Bolinas Point
Hill 640
Wolf Ridge
Point Bonita Ridge
Bakers Beach
Fort Miley
South Fort Funston
Milagra Ridge
Devil's Slide
Pillar Point

Another type of radar used in seacoast artillery defense was the SCR-682, which was a general surveillance detector. Inasmuch as its technical specifications reached San Francisco in August 1943, this type of radar probably soon followed. Its principal components were: Antenna spinner assembly was a rotatable 4-foot paraboloid mounted on a pedestal base, approximately 2 feet square. The antenna and pedestal were protected by a light plastic blister approximately 6 feet in diameter and 6 feet high. The total weight of the antenna spinner assembly was 500 pounds. The modulator unit weighted 550 pounds. It had to be located not more than 150 feet from the antenna spinner. The indicator unit weighted 460 pounds and had to be located within 15 feet of the modulator and power units.

It is not known how many SCR-682 sets there were in the San Francisco harbor defenses. In the postwar plans for San Francisco only two such sets were called for: one at Point Reyes Headlands and one on Wolf Ridge, Fort Cronkhite.[22]

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22. Conn, pp. 61-62; Bert Webber, Retaliation: Japanese Attacks and Allied Countermeasures on the Pacific Coast in World War II (Cowallis: Oregon State University Press, 1975), p. 51; FARC, San Bruno, RG 77, OCE, San Francisco Dist., Main Office, Fortification Files 1884-1944, Lt. Col. A.C. Knight, Aug. 5, 1943, to Div. Engr., Pacific Div., and Lt. Col. E.R. O'Brien, Oct. 16, 1943, to Div. Engr., Pacific Div.; NA, RG 407, AGO, Special Projects, Harbor Defense, San Francisco, Supplement to Harbor Defense, 1945, Annex B, Fire Control, Exhibits 22B-36B, and Annex E, Antiaircraft Artillery (HD), Exhibit 3E.

6. Camouflage

Even before the engineers turned Battery Davis over to the artillerymen in 1940, they carried out extensive camouflage at the battery. Huge camouflage nets were devised for the casemate openings and a large-scale planting scheme was undertaken with considerable success. The Office of the Chief of Engineers noted the satisfactory concealment of the entrance to the plotting and switchboard rooms by planting shrubs and vines. It concluded that the primary dependence for camouflage should be placed in planting. (At the same time, the office disapproved of camouflage painting of the guns and the shields in peacetime. Under conditions of peace, these elements should be painted in olive drab color only. Further steps toward concealment could be taken when war commenced.)

Battery Townsley offered more difficult problems concerning concealment. Only sparse grasses grew on the rocky ridge and the engineers readily concluded that growing trees, bushes, or even grass on the ridge would be extremely difficult, perhaps impossible. On the other hand, Townsley's gun locations were plainly visible to the naked eye at a distance of 14 miles out to sea, from where they appeared as two large black spots against the hillside. The chief of engineers concluded to install camouflage nets for the gun openings similar to the experimental nets at Davis, but the garlands were designed for a different background. These nets were installed. However, a World War II report on camouflage pointed out that Townsley's nets formed a large rectangle that was difficult to blend in with its surroundings. The Davis nets were much more successful in hiding the openings.

The engineers were more successful in camouflaging the rear entrances to Townsley's casemates. Early in the war, they constructed huge hollow "rocks" of chicken wire, concrete, burlap,

sawdust, and so forth over the entrances. Moveable sections were provided for those times when the battery was in action. This same concept of simulated rocks was extended to the antiaircraft battery on Wolf Ridge. The personnel shelters, the mess hall, the "offices," and the magazines were all built underground. The simulated rocks covered all the passageways above ground between the guns and these structures. A photograph of the completed work showed these passageways looking like irregular but natural outcroppings of rock running in seams.

The antiaircraft battery on Rodeo Hill, Fort Barry, received a different treatment. Here, sliding panels on wheels were erected over the guns. These panels were covered with camouflage netting. One man could release the panel, allowing the gun to be elevated without interference. The magazine entrance for this battery was simply covered with netting.

The roads built for the construction of both Batteries Townsley and Construction 129 ended at the batteries. To an experienced enemy this abrupt ending would indicate something of importance at the roads' end, no matter how effective the camouflage. To overcome this, the engineers extended the road at Townsley farther to the north and constructed a quite obvious "dummy" warehouse at its new ending. It was a serviceable building and soon found itself storing camouflage materials. The road at Construction 129 was continued westward to connect with a similar deadend road at Batteries Rathbone and McIndoe--thus establishing today's one-way road to Point Bonita. Another dummy road was constructed at Battery Howe, Fort Funston. Dummy, or artificial, trees were placed at the battery. The fortification itself was covered with flat top netting that was garnished to simulate ice plant.

Other examples of effective camouflage were to be found at Batteries Chamberlin and Crosby at Fort Winfield Scott. Both were covered with flat top netting that was garlanded with burlap and salvage raincoats painted with infrared oil paints--because of the development of color photography. The blast aprons were covered either with simulated bushes that could be quickly removed, or with panels mounted on wheels. The camouflage of the adjacent fire control stations was similar and was incorporated with that of the batteries. These camouflage efforts were never put to the test, but there was no lack of ingenuity in their design.[23]

D. Troop Unit Assignments, 1941-1945

The harbor defenses of San Francisco, as has been noted in this report, underwent a great reduction of activity in October 1944 as the war entered its last year. As drastic as anything was the disbandment of the Sixth Coast Artillery Regiment that had manned the seacoast guns at San Francisco since 1924. Before leaving the World War II period, the troop unit assignments, including the Sixth, will be noted as follows:

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23. FARC, Suitland, RG 77, OCE, Harbor Defense Files, Lt. Col. G. Mayo, Feb. 17, 1940, to Dist. Engr., San Francisco, and Maj. Gen. H.T. Burgin, Ninth Corps Artillery Dist., San Francisco, May 5, 1941, to AG, and unsigned report on camouflage at San Francisco, n.d., circa World War II.

Organization	Location	Assignment	From	To
Sixth Coast Artillery (HD)				
Hdqrs. Btry.	W. Scott	HECP (Army)	Before 12/7741	10/18/44
Hd. Btry., 1st Bn.	W. Scott	HECP (Army)	Before 12/7/41	10/18/44
Hd. Btry., 2d Bn.	Cronkhite	G-1 Station	Before 12/7/41	10/18/44
Hd. Btry., 3d Bn.	Miley	G-3 Station	Before 12/7/41	10/18/44
Hd. Btry., 4th Bn.	Barry	G-2 Station	Before 12/7/41	10/18/44
Btry. A	W. Scott	Mines II and III	Before 12/7/41	10/18/44
Btry. B	W. Scott	Crosby	Before 12/7/41	10/18/44
Btry. C	Funston	Davis	Before 12/7/41	10/18/44
Btry. D	W. Scott	Chamberlin	Before 12/7/41	10/18/44
Btry. E.	Cronkhite	Townsley	Before 12/7/41	10/18/44
Btry. F	Baker	Mines I	Before 12/7/41	10/18/44
Btry. G	Barry	3-inch AA	Before 12/7/41	10/18/44
Btry. H	Barry	Rathbone-McIndoe	Before 12/7/41	10/18/44
Btry. I	Barry	Smith-Guthrie	Before 12/7/41	10/18/44
Btry. K	Barry	Wallace	Before 12/7/41	10/18/44
Btry. L	Barry	Mendell	Before 12/7/41	10/18/44
Btry. M	Barry	AA Searchlights	Before 12/7/41	10/18/44
Btry. N	W. Scott	SC Searchlights	Before 12/7/41	10/18/44
Btry. O	Miley	Underwater Detection		1/10/42
2d Bn., 18th CA (HD)				
Hd. Btry.	Funston	Grmpt. Station	Before 12/7/41	4/25/44
Btry. D	Funston	Bluff	Before 12/7/41	4/25/44
Btry. E	Funston	Howe	Before 12/7/41	4/25/44
Btry. F	Miley	Chester	Before 12/7/41	4/25/44
130th CA Bn. (AA)				
Hd. Btry	W. Scott	AACP	6/1/42	6/25/44
Btry. A	Baker	AA Searchlights	6/1/42	6/25/44
Btry. B	Cronkhite	3-inch AA	6/1/42	6/25/44
Btry. C	Barry	3-inch AA	6/1/42	6/25/44
Btry. D	Funston	3-inch AA	6/1/42	6/25/44
266th CA Bn. (HD)				
Hd. Btry.	Barry	--	6/12/42	5/14/42
Btry. A	Barry	6-inch guns	6/12/42	5/14/42
Btry. B	Barry	6-inch guns	6/12/42	5/14/42
Btry. C	Barry	6-inch guns	6/12/42	5/14/42

Organization	Location	Assignment	From	To
283d CA Bn. (HD)				
Hd. Btry.	Funston	--	3/11/43	5/8/43
Btry. A	Miley	Lobos	3/11/43	5/8/43
Btry. B	Funston	155-mm. guns	3/11/43	5/8/43
Btry. C	Funston	155-mm. guns	3/11/43	5/8/43
67th CA Bn. (HD)				
Hd. Detachment	W. Scott	Fort CP	10/18/44	9/15/45
Btry. A	Baker	AMTB Weapons	10/18/44	9/15/45
Btry. B	W. Scott	AMTB Weapons	10/18/44	9/15/45
172d CA Bn. (HD)				
Hd. Detachment	Barry	GATE CP	10/18/44	9/15/45
Btry. A	Barry	Rathbone-McIndoe	10/18/44	9/15/45
Btry. B	Barry	Smith-Guthrie	10/18/44	9/15/45
Btry. C	Miley	Lobos	10/18/44	9/15/45
173d CA Bn. (HD)				
Hd. Detachment	Baker	LIME CP	10/18/44	9/15/45
Btry. A	Funston	Davis	10/18/44	9/15/45
Btry. B	Cronkhite	Townsley	10/18/44	9/15/45
174th CA Bn. (HD)				
Hd. Detachment	Miley	MING CP	10/18/44	9/15/45
Btry. A	W. Scott	Mines II & III	10/18/44	9/15/45
Btry. B	Baker	Mines I	10/18/22	9/15/45
HD of San Francisco				
Hd. Btry.	W. Scott	HECP (Army)	10/18/44	--
Btry. A	W. Scott	SC Searchlights	10/18/44	--
Btry. B	Barry	Rathbone-McIndoe	9/15/45	--
Btry. C	Barry	Smith-Guthrie	9/15/45	--
Btry. D	Miley	Lobos	9/15/45	--
Btry. E	W. Scott	AMTB Weapons	9/15/45	--
Btry. F	Baker	AMTB Weapons	9/15/45	--
Btry. G	Baker	Mines I, II, & III	9/15/45	--
Btry. A, 174th CA Bn.	Baker	Mines I, II, & III	9/15/45	--

Organization	Location	Assignment	From	To
4th Mine Planter Btry.	Baker	USAMP Ellery W. Niles	Before 12/7/41	--
11th Mine Planter Btry.	Baker	USAMP Samuel M. Mills	Before 12/7/41	--
21st Mine Planter Btry.	Baker	USAMP Horace F. Spurgin	Before 12/4/41	--[24]

24. Washington, D.C., Library of Congress, U.S. Army, Appendix 4, Units assigned to Northern California Sector.

VII. Postwar Plans

> The technology of amphibious invasion, as demonstrated during World War II, had advanced to the point where large bodies of men and materiel could be landed under supporting air cover without the benefit of port facilities. Heavy ships' guns, if used at all, would be used in connection with such open-beach landings and not in bombarding coastal cities or naval bases, which could more safely and easily be attacked from the air.
>
> Lewis, Seacoast Fortifications of the United States

A. Supplement to the Harbor Defense Project, 1945

Thus does the historian E. Raymond Lewis describe the fast-approaching end of the concept of harbor defense that had been in vogue at San Francisco Habor since the 18th century. But the army's engineers were not yet ready to throw in the sponge when Japan surrendered in 1945. Three months later, Headquarters, Army Service Forces, approved a massive document titled "Supplement to the Harbor Defenses of San Francisco, 15 November 1945." Containing eight thick annexes and six additional appendixes, the study set forth the latest and last plan of coastal defense for San Francisco Harbor.[1]

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1. NA, RG 407, AGO, Special Projects, Harbor Defense, Supplement to the Harbor Defense Project, Harbor Defenses of San Francisco, Nov. 15, 1945, Annex A, Armament, and Annex B, Fire Control, and Annex C, Searchlights, and Annex D, Underwater Defense, and Annex E, Antiaircraft Artillery, and Annex F, Gas Defense, and Annex G, Equipment, and Annex H, Real Estate Requirements. The appendixes were estimates of cost: I Engineer, II Signal Corps, III Ordnance, IV Chemical Warfare Service, V Real Estate Procurement, and VI Consolidation.

1. Annex A, Armament

The postwar armament continued to be grouped in four main divisions: (1) long-range guns for use against distant naval targets, consisting of 16-, 12-, and 6-inch weapons (no mortars included), (2) underwater mines with their protective rapid-fire gun defense, (3) antimotor torpedo boat armament, including the antisubmarine net and seacoast searchlights, and (4) antiaircraft defense.

The following twelve batteries were to be retained in the seacoast armament:

Construction 129 - 16-inch guns, casemated, Fort Barry, work suspended

Townsley - 16-inch guns, casemated, Fort Cronkhite, existing

Davis - 16-inch guns, casemated, Fort Funston, existing

Wallace - 12-inch guns, casemated, Fort Barry, existing

Construction 243 - 6-inch guns, shields, Fort Miley, under construction

Construction 244 - 6-inch guns, shields, Milagra, under construction

Rathbone - 6-inch guns, shields, Fort Barry, existing

Guthrie - 6-inch guns, shields, Fort Barry, existing

McIndoe - 6-inch guns, shields, Fort Barry, existing

Smith - 6-inch guns, shields, Fort Barry, existing

Chamberlin - 6-inch guns, shields, Fort Winfield Scott, existing

O'Rorke - 3-inch guns, shields, Fort Barry, existing

For antimotor torpedo boat defense, the plans called for the following four batteries of 90-mm. guns, three batteries having 3-inch guns, and eight batteries of 40-mm. automatic weapons:

Baker - two 90-mm. guns, M3, shields, and two 90-mm. guns, M1A1, without shields, Fort Winfield Scott, existing, emplaced

Land - two 90-mm. guns, M3, shields, and two 90-mm. guns, M1A1, without shields, Lands End, existing, emplaced

Gravelly - two 90-mm. guns, M3, shields, and two 90-mm. guns, M1A1, without shields, Fort Baker, existing, emplaced

Blunt - two 90-mm. guns, M3, shields, and two 90-mm. guns, M1A1, without shields, Angel Island, deferred

Yates - two 3-inch guns, pedestals, shields, Fort Baker, existing, emplaced

Point - two 3-inch guns, pedestals, shields, Fort Winfield Scott, existing, emplaced

Gate - two 3-inch guns, pedestals, shields, Fort Winfield Scott, existing but not emplaced

Scott - two 40-mm. guns, M2A1, Fort Winfield Scott, existing, not emplaced

Bonita - two 40-mm. guns, M2A1, Fort Winfield Scott, existing, not emplaced

Buck - two 40-mm. guns, M2A1, Lands End, existing, not emplaced

Cavallo - two 40-mm. guns, M2A1, Fort Baker, existing, not emplaced

Park - two 40-mm. guns, M2A1, St. Francis Yacht Club, deferred

Knox - two 40-mm. guns, M2A1, Angel Island, deferred

Cove - two 40-mm. guns, M2A1, Angel Island, deferred

Sausalito - two 40-mm. guns, M2A1, Sausalito Point, deferred

The antiaircraft batteries as of 1945 were to consist of the three, 3-inch, three-gun fixed batteries already at Forts Cronkhite, Barry, and Funston.

The magazines and other rooms of many of the abandoned batteries were now serving new functions. At Battery Cranston one magazine had been converted into a dormitory for personnel assigned to the Fort Winfield Scott signal station. The old mortar battery, Stotsenburg, now stored both ammunition and other materials. Batteries Orlando Wagner, Drew, Mendell, and Alexander stored the operating reserve of TNT for the submarine mines. Burnham at Fort Mason served as an air raid shelter for

the San Francisco Port of Embarkation; and Battery Howe at Fort Winfield Scott was used as an air raid shelter for civilians. The four old batteries, Blaney, Slaughter, Sherwood, and Baldwin, because of their location were transferred from Fort Winfield Scott to the Presidio of San Francisco and were now used for miscellaneous storage (except Slaughter, which had been buried by highway construction).

During the war a considerable number of small military reservations and the rights-of-way thereto had been acquired in the San Francisco area. Of these, the ones now within the various elements of GGNRA included the following:

Datum point, Chimney Rock, Point Reyes

Wildcat Military Reservation on the Francis S. Blair Wildcat Ranch, 155 acres consisting of both government-owned and leased land that contained two fire control stations, a radar unit, and two coastal searchlights

Hill 640 Military Reservation, 5.87 acres, a short distance north of Rocky Point and containing five fire control stations and a radar set

Datum point, Rocky Point, and its 50-foot easement right-of-way

Frank Valley Military Reservation, slightly more than 9 acres having four fire control stations and a datum point

Lands End, 55.35 acres leased from the city and county of San Francisco armed with Batteries Land and Buck and two seacoast searchlights

Point Lobos, formerly Battery Lobos, but now reduced to two searchlights

Sutro Heights, containing two fire control stations and one coastal searchlight

Great Highway Military Reservation, less than 1 acre in size containing a fire control station for mines III.

2. Annex B, Fire Control

The complexity of fire control for the harbor defenses had grown greatly during World War II. Not only had radar been added to the system, but the number of stations per battery had increased greatly. In 1937, for example, a 16-inch battery required only five stations; this same battery in 1945 needed nine fire control stations. Altogether, the fire control annex was the largest annex of all, having 60 pages of text and 71 exhibits.

The annex again discussed the prevalence of fog at San Francisco and the continuing need of low-sited stations. It noted that the installation of radar fire control equipment had greatly increased efficiency as it allowed the surveillance and tracking of vessels day or night and in clear or foggy weather. However, the use of radar close to shore had to be restricted at San Francisco because of echoes from the high cliffs and rocky points.

Another improvement in fire control had been the provision of radio sets to the long-range batteries that allowed for communication with aerial observers. This method was restricted to emergencies. Coordination with the United States Navy and Coast Guard in the tactical operation of the harbor defenses was carried out through the harbor entrance control post.

The number of fire control installations between Point Reyes and Pillar Point was indeed huge. Many pages of this report would be required to list them all. Instead, there follows a listing of the principal installations that were within today's GGNRA, arranged geographically: (Many of these stations still exist; some have disappeared. Where known, these facts are stated.)

Fort Funston

B^2S^2 Construction 243 (modern pillbox, steel-covering type of fire control station) - This station was originally dug into the sand, but as of this writing, the sand has completely eroded away and the station is slowly sliding down the face of the cliff overlooking the beach. (This was a known slide area in 1945.)

Funston Group - This modern pillbox station is located near the face of the cliff to the southwest of Battery Davis. It still exists.

B^5S^5, Construction 244 - This similar station is adjacent to the Funston group station; it still exists.

Believed to be no longer existing at Fort Funston are Fort Funston FCS; B^4S^4, Battery Townsley; B^3S^3, Wallace; BC B^1S^1, Davis; and B^4S^4, Construction 129.

Fort Miley Area

B^2S^2, Townsley - It is located in front of gun 2, Battery Chester, and is still standing.

B^2S^2, Wallace - It is located in front of gun 1, Battery Chester. It too remains.

M^1, Mines III - This station was located southeast of gun 3, Fort Miley. It is not extant.

BC B^1S^1, Construction 243 - This battery commander station stood behind (east of) Battery Construction 243 on a knoll, Fort Miley. It no longer exists.

B^2S^2, Davis - This station also stood in front of gun 2, Battery Chester, adjacent to B^2S^2, Townsley above. It still remains.

B^2S^2, Construction 129 - This cleverly camouflaged fire control station still stands on the forward crest of Sutro Heights at the north end of the parapet.

M^3 Mines II - Equally well camouflaged, this station is adjacent to B^2S^2, Construction 129, above and it still exists.

BCB, Lobos - It is located adjacent to gun 1, Battery Lobos. It is not thought to be still in existence.

M^2 Mines III - It is located on the ocean side of the Great Highway near the end of Moraga Street; this station is believed to have disappeared.

Fort Winfield Scott

BC B^1, Chamberlin - It is located to the rear of the left flank of Battery Chamberlin. It still stands and is building 1622 in army records, wherein it is mistakenly identified as B^3S^3, Chamberlin.

Structure, Army 1344 - This is unquestionably a fire control station. A 1945 map of Fort Winfield Scott shows

a station, M^1 mines II, in this area. This structure is probably that station. On a list of its structures, the Presidio of San Francisco identifies the building as "BC B^1S^1" but without association with any battery.

M^2, Mines II (located near B^3, Chamberlin, above) - It also exists and is army 1663.

BS Station, Godfrey - A third fire control station in the near vicinity is identified by the army as having served Battery Godfrey, which was abandoned by 1945 and thus not carried in the 1945 supplement. Its army no. is 1662.

Structure 1644 - This is a fire control structure of considerable size. It was not identified in the 1945 supplement. The Presidio building records carry it as a harbor defense radio hut.

Signal Station, Fort Point - This was a concrete elevated station, one of only two elevated structures in the harbor defenses--the other being at Point Bonita. It is an "elevated" structure today on the west flank of Battery Lancaster. (Army records identify this as a searchlight shelter, army 1665.) It is inaccessible to the public, being fenced off by the Golden Gate Bridge Authority. Elevated stations at San Francisco were rare because of the high cliffs.

B^3, Chamberlin (located at Fort Point on the ridge to the west of the Golden Gate Bridge approach) - This station still exists and is sealed against entry. It is army 1664.

The harbor defense command post (HDCP) and harbor entrance control point (HECP) were the key installations in the harbor defenses of San Francisco. They were located in the abandoned Dynamite Battery. In 1911 a fire control station for Fort Winfield Scott and for group 7 (F Scott and G7) had been constructed in emplacement 1 (the most northerly) of Dynamite Battery. By January 1941 this structure was being used as the HDCP-HECP for San Francisco. It stood on concrete bents that rose 18 feet above the emplacement floor. The material in its walls are not known, but the roof was wood and gravelled tarpaper. The artillery officers considered it a temporary arrangement and recommended a new station in emplacement 2 that would be covered with earth and a burster course.

When in the fall of 1942 nothing had happened regarding a new HDCP, General DeWitt, commanding the Western Defense Command and Fourth Army, wrote a firm letter to the chief of staff, U.S.A., saying that after a year's experience with wartime conditions, "further delay cannot be tolerated" in constructing a new station. Besides the HDCP activities, the structure should have room for the antiaircraft groupment command post and the fire control switchboard and power room, which would meet naval requirements. The War Department disapproved, saying that offensive activities should receive higher priority than defensive ones. It suggested that DeWitt consider constructing a blast barrier around the existing structure or transferrng a part of the combined post to abandoned casemates.

By the spring of 1943 two wings, also temporary, had been added to the original structure. These additions rested on the old parapets that surrounded the emplacement. But the arrangements were still unsatisfactory. The fire control switchboard was housed in one of the cross corridors of Dynamite

Battery, and the power plant was in another corridor. A bomb hit would collapse both corridors, which were too small anyway. At this time, the main floor of the station, 87 by 37 feet, housed the following functions: army radio room, army operations room, army and navy tactical command, evaluating room, navy commander, navy radio transmitter, navy code room, radio and traffic room, navy telephone center, army telephone center, message center, army code room, and a storeroom. A small second story, 36 by 38 feet, housed the operations telephone room and the harbor entrance operations post. There was now $120,000 available for a new station, and the artillery commander proposed constructing it to the left of the old one and in front of emplacement 2. Washington agreed.

The new HDCP-HECP was transferred to harbor defenses on January 8, 1944. It was made of reinforced concrete and was dug-in in nature. The first floor consisted of about 16 rooms of various sizes. The second floor was two adjacent steel and concrete pillboxes, one for the army and one for the navy, which may still be observed on the parapet of Dynamite Battery by passersby on Lincoln Boulevard. The cost of the new structure exceeded $132,000.

Fort Baker

Structure 433 (located at Lime Point in front of and below Battery Spencer) - Access to this station is extremely dangerous because of the precipitous cliff. At one time this station served as the fire control point for the fort commander, Fort Baker. It was abandoned by 1945.

B^1S^1, Spencer (also located on Lime Point in front of and farther down the cliff than no. 433, above) - It too is difficult to reach, although quite visible to north-bound travelers on the Golden Gate Bridge. Its Fort Baker structure no. is 434.

Structure 427 (located at the base of Lime Point directly under the Golden Gate Bridge) - It is partly buried by a landslide and is located on property controlled by the Golden Gate Bridge Authority.

BC B^1S^1, O. Wagner (located on the slope directly above and behind Battery Wagner) - It still exists.

BC, Kirby (located above and to the north of BC B^1S^1, O. Wagner) - An early station, it has a metal roof that has greatly deteriorated.

BC, Construction 129 - The battery commander station for these 16-inch guns is located on top of the casemates on Diablo Ridge--on the Fort Baker side of the boundary line, while the guns themselves were on the Fort Barry side.

Fort Barry, Rodeo Ridge

BC, Wallace (located on top of Rodeo Ridge behind Battery Wallace and west of Antiaircraft Battery 2)

B^1S^1, Wallace - This separate station was adjacent to BC, Wallace (above). Both still exist and provide interesting examples of the use of rock and concrete for camouflage.

B^1, Rathbone (located on Rodeo Ridge almost half-way between Battery Rathbone and Antiaircraft Battery 2) - It is not known if this station still exists.

B^1, McIndoe (located east of Battery McIndoe on Rodeo Ridge) - It still exists.

Fort Barry, Point Bonita Ridge (currently U.S. Coast Guard property) - According to the 1937 annexes, the following fire control stations (from north to south) were located on Point Bonita Ridge, south of Battery Mendell: Coast Guard station; Barry groupment; BC B^1S^1, Alexander; M^1 mines I; B^2S^2, Livingston; B^5S^5, Wallace; B^2S^2, Chester, and B^2S^2, Springer. Farther out on the point, about midway on the finger of the point were three more fire control stations: B^2S^2, Chamberlin; B^4S^4, Mendell; and B^2S^2, Crosby. On the tip of the point below the lighthouse was a double station that served as B^1S^1, Mendell, and BC^2 B^4S^4, Alexander.

The 1945 supplement showed a much different arrangement for Point Bonita Ridge. Only three fire control stations were in use by this time. All three were located south of Battery Mendell and from north to south they were Battalion GB-2; Barry group; and M^1, mines I. Also in this area the elevated (two-story) signal station still stands. Nearly all of these fire control stations still exist and all are on Coast Guard property.

Northwest of Battery Mendell are four fire control stations. The two farthest away from the battery are an old type dug-in concrete that originally served as B^1S^1, Smith, and M^4, mines I. By 1945 the mines station had been abandoned. The two stations closer to Battery Mendell are World War II steel pillboxes. Their assignments were B^2S^2, Chamberlin, and M^4, mines II. All four stations still exist.

Fort Cronkhite

Tennessee Point - Six fire control stations stood on Tennessee Point in 1937: B^2S^2, Guthrie; B^2S^2, Godfrey; B^2S^2, Rathbone-McIndoe; B^2S^2, Spencer; B^2S^2, Saffold;

and M^2, mines I. By 1945 the Godfrey, Spencer, and Saffold stations had been abandoned. A new station, B^3S^3, Construction 243, had been added (probably in one of the abandoned structures).

Wolf Ridge - Above Battery Townsley on Wolf Ridge stands a collection of five modern concrete stations, all camouflaged with rock and vegetation. Due to their being inaccessible to the public until quite recently, they are in an excellent state of preservation. One of the stations, B^1S^1, Construction 129, is located on the south side of the road that climbs the ridge. Nearest to it, on the north side of the road is B^4S^4, Davis. Above Davis are two stations at the 600-foot elevation. The eastern one is the BC station for Battery Townsley, and the western one was Battalion GB-1 fire control. The highest of the five stations is B^1S^1, Townsley.

Tennesse (Elk) Valley - M^4, mines I, was the only fire control station located at the Tennessee Cove area of Fort Cronkhite.

Frank Valley - The Frank Valley Military Reservation was located on a spur of the high ridge that separates Frank Valley from the ocean. It contained four fire control stations that represented mines and 6- and 12-inch guns: M^3, mines I; B^2S^2, Smith; B^4S^4, Wallace; and B^5S^5, Construction 243. All four stations stand today, but their steel covers have been cut off, leaving only the concrete portions.

Hill 640 - Hill 640 Military Reservation, a short distance above Rocky Point, was the location of five fire control stations: B^6S^6, Davis; B^3S^3, Townsley; B^6S^6, Construction 243; B^3S^3,

Construction 129; and Hill 640. All remain in a state of good repair.

Wildcat - Wildcat Military Reservation was a combination of government-owned land, and land leased by the government from private owners. The two fire control stations were located on the 3.69 acres that belonged to the government. They were B^7S^7, Townsley and B^7S^7, Construction 129, both for 16-inch guns.

Radar - A World War II development in fire control was the introduction of radar. By 1945 the harbor defenses of San Francisco possessed two sets of "general surveillance" radar, SCR-682. Set 1 was located about 2,000 feet east of the lighthouse on a knoll at Point Reyes. Set 2 stood near the crest of Wolf Ridge at an elevation of 880 feet, Fort Cronkhite. Of the ten sets of surface craft detector radar, SCR-296, which were installed by 1945, seven were within the boundaries of today's GGNRA: no. 1, Wildcat Ridge; no. 3, Hill 640; no. 4, Wolf Ridge, Fort Cronkhite; no. 5, Point Bonita Ridge, Fort Barry; no. 6, Bakers Beach; no. 7, Fort Miley; and no. 8 at south Fort Funston. The other three were at Milagra Ridge, Devil's Slide, and Pillar Point. Set 2, which was to have been at Bolinas Point, was never set up--perhaps because it required a 100-foot tower.

Each radar set required a tower, usually 25- or 50-feet high and set on concrete pylons; a transmitter building, usually a dug-in type of reinforced concrete; and a structure to house a power plant.

3. Annex C, Seacoast Searchlights

In August 1943, 9 fixed 60-inch searchlights and 26 portable 60-inch searchlights were approved for the harbor defenses

of San Francisco. Then in February 1944, the Western Defense Command received the authority to replace the 9 fixed lights with portable ones. In 1945 all 35 portable searchlights were on hand, most of them in storage.

Twenty-five of these lights were located within the potential boundaries of GGNRA.

1 and 2, along the shore at Wildcat Military Reservation
5 and 6, at Rocky Point near Hill 640
7 and 8, Tennessee Point, Fort Cronkhite
9, on the south side of Rodeo Lagoon, Fort Barry
10, on Point Bonita Ridge, Fort Barry
11 and 12, Rodeo Ridge, Fort Barry
13, Gravelly Beach, Fort Baker
14, at fog signal station, Lime Point, Fort Baker
15, Horseshoe Bay, Fort Baker
16, Angel Island
17, Fort Mason
18 and 19, Fort Point
20, Bakers Beach
21, James D. Phelan Beach (then China Beach)
22, Lands End
23 and 24, Fort Miley
25, Point Lobos
27 and 28, Fort Funstons

4. Annex D, Underwater Defense

The underwater defense project as it existed in 1945 had been approved in January 1943. It called for a total of 37 controlled submarine mine groups, each group having 13 M-4 mines. These groups were so located as to protect the Golden Gate itself, from Point Bonita to Point Lobos and farther out the three channels, North, Main, and South. The outer groups were provided with five sets of "audio reception equipment M-1."

In addition to this mining project, the U.S. Navy operated underwater defense elements in time of war. These included five underwater galvanometer indicator loops located so as to form a semielliptical vessel detector system on the ocean floor,

reaching from Muir Beach on the north to Fort Funston on the south. When a vessel passed over a loop, a galvanometer reading was automatically recorded at a loop station (Muir Beach and Ocean Beach). That information was then passed on to HECP (navy) by telephone or radio.

The navy also operated two underwater harbor echo-ranging and listening devices ("Herald") at the entrance to the Golden Gate. These sonar instruments could accurately determine by echo ranging the location, the direction of travel, and the approximate type of any vessel on the surface or underwater. They had a minimum range of 1,500 yards and a maximum range of 5,000 yards and were connected directly with HDCP-HECP, Fort Winfield Scott.

The antisubmarine net across the harbor entrance was another navy responsibility. While still east of the Golden Gate Bridge, its location had changed somewhat since the 1937 project. The north end of the net was now located near Sausalito Point, and its south end was near the St. Francis Yacht Club. Its one main gate was toward the south end, and there were two small boat gates. A "ready duty" destroyer, equipped with sonar (asdic) equipment, was maintained just outside the main gate.

The submarine mine flotilla had grown considerably during the war. There were now seven mine yawls, three distribution box boats, and three mine planters (Lt. Col. Ellery W. Niles, General Samuel M. Mills, and Colonel Horace P. Spurgin).

The shore facilities for the mining project included the following:

Mine Casemate, MC-mines I - dug-in, concrete, dimensions: 57 by 22 feet, capacity: ten groups, Fort Barry

Mine Casemate, MC-mines II and III - dug-in, concrete, dimensions: 134 by 24 feet, capacity: 40 groups, Fort Winfield Scott (This new casemate had been authorized in March 1943.)

Fort Baker Depot

Wharf in Horseshoe Bay - concrete piling and deck, L-shaped, dimensions of wharf proper: 118 by 114 feet; dimensions of approach: 240 by 29 feet; capacity: one mine planter

Small Boat Wharf, Horseshoe Bay - creosoted piling and timber, L-shaped, dimensions of wharf proper 54 by 39 feet; dimensions of approach: 137 by 12 feet; capacity: five small boats

Dispersio Pier, at Yellow Bluff - creosoted piling and timber, dimensions of pier proper: 260 by 5 feet; dimensions of approach: 250 by 5 feet; capacity: two mine planters (This pier was provided with a pipeline through which water could be pumped from water barges to supply Forts Baker, Barry, and Cronkhite during an emergency.)

Small Boat Basin, west side of Horseshoe Bay - rock breakwater and creosoted piles and timber, five mooring piers; capacity: ten mine yawls

Small Boat Basin, east side of Horseshoe Bay - rock breakwater and creosoted piles and timber, 11 mooring piers; capacity: 16 small boats

Launchway - 195 feet long; capacity: 6-ton way

Launchway - 240 feet long; capacity: 100-ton way

Marine Repair Shops - dimensions: 100 by 42 by 10½ feet

Mine-loading Rooms, Horseshoe Bay - two rooms, dug-in concrete; dimensions of each room: 59 by 25 by 18 feet high; capacity: three mines each

Mine Storehouse - reinforced concrete; dimensions: 145 by 51 feet; capacity: material for 17 groups

Cable Tank House - reinforced concrete and steel; dimensions: 163 by 38 feet, containing five cable tanks, each 24 by 27 by 8 feet deep; capacity: 80 reels

Fuze Detonator Storehouse - dug-in concrete; dimensions: 6 by 6 by 7 feet high; capacity: 350 fuzes

Explosive Storage Magazine - dug-in concrete; dimensions: 14 by 8 by 8 feet high; capacity: 39,000 pounds of TNT (one group)

Power Plant - dug-in concrete; dimensions 33 by 20 feet; capacity: 75 kilowatts

Fort Winfield Scott Depot

Wharf, Fort Point - concrete piling and L-shaped deck; dimensions: wharf proper, 210 by 60 feet; approach, 328 by 20 feet; capacity: one mine planter

Mine-loading rooms - two rooms, wood frame and corrugated transite; dimensions: 45 by 22 feet each; capacity: two mines each

Mine Storehouse - steel frame and corrugated iron; dimensions: 151 by 31 feet; capacity: material for 11 groups

Cable Tank House - wood frame, corrugated iron sides, and corrugated transite roof; dimensions: 140 by 20 feet, with six cable tanks each being 17 by 19 by 7 feet deep; capacity: 54 reels

Fuze Detonator Storehouse - wood frame, transite sides and roof; dimensions: 9½ by 7 feet 10 inches; capacity: 50 fuzes

Yerba Buena Island

Wharf - creosoted piling and timber, L-shaped; dimensions: wharf proper, 72 by 83 feet; approach, 20 by 22 feet; capacity: one mine planter

Mine Storehouse - concrete block; dimensions: 162 by 76 feet; capacity: material for 20 groups

Cable Tank House - wood frame; dimensions: 196 by 43 feet, having 12 cable tanks each being 14 by 23 by 6 feet deep and one cable tank, 23 by 38 by 6 feet deep; capacity: 116 reels

Reserve Storage (wartime)

Battery Alexander, Fort Barry - capacity: 100,000 pounds of TNT

Battery Mendell, Fort Barry - capacity: 100,000 pounds of TNT

Battery Orlando Wagner, Fort Baker - capacity: 132,900 pounds of TNT

Battery Drew, Angel Island - capacity: 100,000 pounds of TNT

Battery Miller, Fort Point - capacity: 850 fuzes

5. Annex E, Antiaircraft Artillery

The 1945 supplement continued to list three antiaircraft batteries, each having three 3-inch guns, model 1917 A1M2. With each battery there was now authorized a radar set, SCR-584. The locations of the batteries remained unchanged: Wolf Ridge, Rodeo Ridge, and North Funston.

Battery 1 at Wolf Ridge, Fort Cronkhite, had the following permanent facilities: a combined storeroom and power plant structure, dug-in, splinter-proof construction; dimensions: storeroom, 16 by 12 by 7 feet; power plant 12 by 12 by 7 feet; and a magazine of similar construction--dimensions: 26 by 16½ by 8 feet. A director pit, concrete well type with sliding steel frame roof; dimensions, 10 by 10 by 4 feet 8 inches high; and a height finder base made of concrete and having a diameter of 10 feet. Batteries 2 at Rodeo Ridge, Fort Barry, and 3 at Fort Funston had similar permanent facilities, with some small variations in the dimensions of the structures.

The San Francisco Harbor Defenses still had an authorization for fifteen 60-inch mobile antiaircraft searchlights, although the older lights had been replaced by model 1942. Nine sets of searchlight radar, SCR-268, were also authorized. Very few of the lights were located on military reservations.

No.	Location
101	West peak, Mount Tamalpais
102	San Clemente
103	Tiburon Peninsula
104	Stinson Beach
105	Mill Valley
106	Muir Beach
107	Sausalito
108	Horseshoe Bay, Fort Baker
109	North Rodeo Lagoon, Fort Cronkhite
110	Bakers Beach, Fort Winfield Scott
111	Calvary Cemetery, San Francisco
112	Beach Chalet, Ocean Beach
113	Golden Gate Heights
114	Southern Fort Funston
115	Daly City

The San Francisco Harbor Defenses were also authorized thirty 40-mm. antiaircraft guns complete with carriages M2A1 and sixty-six .50 caliber antiaircraft Browning machine guns. Although the authority for some of these weapons had been suspended or deferred, their proposed locations were

	40-mm.	.50 cal MG
Point Reyes Headlands	--	2
Wildcat	--	2
Hill 640	--	2
Frank Valley	--	1
Fort Cronkhite	4	9
Fort Barry	7	13
Fort Baker	3	6
Angel Island	--	2
Fort Winfield Scott	6	5
Fort Miley area	3	2
Fort Funston	5	8
Other	2	14

6. Annex F, Gas Defense

The following installations in the harbor defenses of San Francisco were provided with collective protection equipment as a defense against poison gas:

Installation	No. of Personnel
HDCP-HECP in Dynamite Battery, Fort Winfield Scott	43
Fire control switchboard, Fort Barry	4
Fire control switchboard, Fort Winfield Scott	5
Battery Townsley: latrine, plotting, and switchboard rooms	31
Battery Guthrie: plotting room	16
Battery Smith: plotting room	16
Battery Wallace: plotting room and latrine	29
Mines I, Fort Barry	24
Battery Rathbone: plotting room	16
Battery McIndoe: plotting room	16
Battery Construction 129: latrine, plotting, and switchboard rooms	31
Battery Chamberlin	16
Mines II, Fort Winfield Scott Mines III, Fort Winfield Scott — 1 structure	24
Battery Construction 243, Fort Miley: plotting and switchboard rooms	19
Battery Davis: latrine, plotting, and switchboard rooms	33

Much of this collective protection equipment remains in the mining casemate, mines II and III, at Fort Winfield Scott.

B. The Beginning of the End

Despite the thoroughness with which the 1945 supplement addressed itself to the defenses of San Francisco Harbor, a long chapter in military history was coming to a close. Within two months after Japan's surrender, troops no longer manned any of San Francisco's seacoast batteries. In 1947 all seacoast guns except 16 inch and 6 inch were declared surplus. The great 16-inch guns were considered obsolete by the spring of 1948. Only the 6-inch batteries continued to have a function--the guarding of the minefields. At this time only four 6-inch batteries were still considered as being assigned to San Francisco Harbor.

The senior officers of the Coast Artillery Corps were not ready to give up, however. In July 1948, a Coast Artillery colonel

stationed at the Presidio wrote that San Francisco's harbor defenses were among the largest and most important in the United States. He urged the activation of a 155-mm. gun battery and two batteries of 90-mm. guns. Yet the colonel knew that the future would be different, "For future planning, it is believed that a seacoast guided missile battery might be added to the harbor defense organization."[2]

The final blow to the Coast Artillery Corps came in late 1949 when the Department of Defense announced that the responsibility for controlled submarine mines had been transferred from the army to the navy. In 1950 Coast Artillery was merged with Field Artillery into a single artillery arm, including antiaircraft artillery, which had been one of Coast Artillery's missions between World War I and World War II. In 1957 the Antiaircraft Command was redesignated the U.S. Army Air Defense Command. New guns and missiles took over the defense of the cities and industrial complexes.[3]

C. Nikes

Development started in 1946 on a surface-to-air missile that came to be called the Nike-Ajax. These rocket missiles were controlled by a computer that was "fed" by three radars. One radar tracked the target; one followed the missile itself; and the

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2. Emanuel Lewis, Harbor Defense Installations, p. 272; San Francisco Golden Gate National Recreation Area, Fort Mason, History files, Col. B.W. Boyes, CO, 319th Harbor Defense (ORC), Presidio of San Francisco, July 14, 1948, to Senior Instructor, Northern California-Nevada ORC Instructor Group, Presidio. The four 6-inch batteries probably were Smith, Guthrie, Rathbone, and McIndoe.

3. Emanual Lewis, Seacoast Fortifications, p. 124; The Army Almanac, A Book of Facts Concerning the United States Army (Harrisburg, Pa.: The Stockpole Company, 1959), pp. 14-15 and 83-84.

third "acquisition" radar detected distant aircraft and transferred the information to the target-tracking radar. In the late 1950s, the Nike-Hercules began replacing Nike-Ajax. The new missile was larger, faster and had a much greater range. Still later a third model, the Nike-Zeus, was adopted.

About 1957 construction began on Nike sites in the Bay Area. Five of these batteries were located in today's GGNRA: Presidio of San Francisco, Fort Funston, Fort Barry, Fort Cronkhite, and Angel Island. In addition, four radar complexes were to be found: one on Wolf Ridge at Fort Cronkhite, one on Diablo Ridge on top of the casemates of Battery Construction 129, one on top of Angel Island, and one on Mount Sutro in San Francisco.

Generally speaking, a Nike battery included the launcher area, where the missiles were stored in underground rooms, brought up on elevators, and launched; the control area usually at a high elevation and with its radar, which had to have an unobstructed view of the launch area; and the cantonment area, including quarters, mess hall, and recreation rooms.

1. Fort Funston, Air Defense Missile Site

The number assigned to this site has not yet been determined. Two underground rooms were provided, each with its own elevator. Nearby were the several buildings to be found at a missile site--the ready room, generator room, and so forth. Farther away, near the south boundary of the post, stood the newly built barracks, storerooms, and other structures.

2. Fort Winfield Scott, Air Defense Administration Building

As a missile structure this building was identified as San Francisco 78. In the post building records it is structure

1648. Located immediately behind old Battery Godfrey, this large, concrete block building served as an administrative center for the missile defenses. Constructed in 1957, it still serves as an army administrative building.

3. Angel Island, Air Defense Missile Site

The identification number of this site also remains unknown. Of the four missile installations in GGNRA, this was the largest, having no fewer than four underground storage rooms and twelve launchers.

4. Fort Barry, Air Defense Missile Site

The identification number of this site was San Francisco 88 for the cantonment area and 88L for the nearby launch area. Like Fort Funston, the battery consisted of two underground rooms with elevators. When the army abandoned this site, it left behind two nonoperative Nikes.

The control area for this battery was located on top of Wolf Ridge, its number being SF 88C. Two of the radar towers, some corrugated and concrete block sheds, and helicopter pads still remain.

5. Fort Cronkhite, Air Defense Missile Site

The identification for this site was San Francisco 87 for the cantonment area, SF 87L for the close-by launch area, and SF 87C for the control area that was located on top of the casemates of Battery Construction 129 on Diablo Ridge. Very little remains of this last station, there being some concrete flooring and pipe railing.

Nikes were designed to intercept high-flying strategic bombers. They were incapable of intercepting either intermediate-range or intercontinental ballistic missiles. Eventually,

all Nike sites in the Bay Area were abandoned in favor of new missile defenses located elsewhere. No longer were the military posts of San Francisco concerned with defensive batteries, minefields, or antiaircraft batteries. Yet, the concrete monuments remain to remind us of their guns and to stimulate our memory of the defenses of one of the world's magnificent harbors.[4]

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4. NPS, DSC, Kinnaird, pp. 286-87 and 366-67; The Army Almanac, pp. 2, 3n, 15, and 84-85; Morris, Weapons and Warfare, p. 398; Emanuel Lewis, Harbor Defense Installations, p. 278-281.

VIII. Conclusions and Recommendations

A. General

While the overall history of the defenses of San Francisco Harbor may be considered to be of national significance, no individual work, be it a World War II fire control station or an Endicott battery, is considered to possess more than local significance by itself.

The fortifications will be considered below on the basis of several factors: chronological age, location, accessibility, uniqueness if any, duplication, condition, and the feasibility of preserving or interpreting each.

No nomination forms for the National Register of Historic Places accompany this study in that the nominations have been or will be prepared in connection with the historic districts within which they are located, or in the individual post histories, which will be a part of the resource study.

Most of these structures have already been recommended for addition to the List of Classified Structures for Golden Gate National Recreation Area. Those that were accidentally or otherwise omitted from that list will also be added in the individual post histories.

Definitions

"Preservation involves the application of measures to sustain the existing terrain and vegetative cover of a site and the existing form, integrity, and material of an object or structure. It includes initial stabilization work, where necessary, as well as ongoing maintenance."

"Restoration is the process of recovering the general historic appearance of a site or the form and details of an

object or structure by the removal of incompatible natural or human-caused accretions and the replacement of missing elements as appropriate. For structures, restoration may be for exteriors and interiors and may be partial or complete."

"Reconstruction involves the accurate reproduction of an object or structure, in whole or in part."

Historic structures may be subject to adaptive use when they are visually important in the historic scene but do not otherwise qualify for exhibition purposes.

Ruins are classified as historic structures. The preservation techniques designed to arrest their further deterioration may be called "ruins stabilization."[1]

B. Spanish-Mexican Periods, 1776-1847

Only two fortification sites within the present GGNRA were involved with the fortifications of the Spanish and Mexican periods.

1. Castillo de San Joaquin

This battery was located on what is today called Fort Point and was completed about 1794. Any remains of the battery and the site itself were totally destroyed when U.S. Army engineers had the point excavated to near water level for the construction of a masonry fort in the 1850s. This report recommends that the history of this battery be interpreted in a visitor center or by some

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1. USDI, NPS, Management Policies (1975), pp. v-12, v-15, and v-19.

other means. Nothing remains to be preserved; reconstruction on the original site is impossible.

2. Battery Point San José (Fort Mason)

Also called the Yerba Buena Battery, this work was probably located on the tip of Point San José. If so, it too was totally destroyed when the U.S. Army constructed East and West batteries on this point in 1864. Nothing remains to be preserved; this report recommends against any reconstruction.

C. Early American Period, 1850s-1960s

Following the conquest of Alta California, U.S. Army engineers, while planning fortifications at several points in San Francisco Bay, actually carried out construction at two sites: Fort Point and Alcatraz Island.

1. Fort Point

Fort Point has been the subject of previous studies by the National Park Service. Considerable restoration and preservation of the masonry fort have already been carried out and more is planned. Although very definitely a part of the fortifications, the masonry fort has not been considered to be within the scope of this study; however, it is of national historical significance.

2. Alcatraz Island

Alcatraz also has been the subject of a separate study that has just been completed. A summary of the recommendations that were made concerning the fortifications in that report is as follows:

South Battery - This battery was recommended for addition to the List of Classified Structures; for rubble from former residences to be removed from site; and for a historical archeological investigation to be made.

Three-Gun Battery - The recommendation for this battery is the same as for South Battery.

North Battery - A historic structure report of the battery complex and of the industries building (no. 28) was recommended, as were the removal of building 28, an archeological investigation of the site, a feasibility study for the restoration of a 15-inch gun emplacement, and the mounting of a 15-inch Rodman.

North Caponier and Vicinity - A historic structure report was recommended, and if the power plant and quartermaster storehouse were ever removed, the stabilization of surviving elements of North Battery was recommended.

Tunnel, AI-207 - The reopening of this tunnel was recommended if and when feasible.

Magazines and Brick Archways: AI-202, 203, and 204 - Their clean up, stabilization, and preservation were recommended.

Defensive walls, AI-205 and 206 - Stabilization and preservation were recommended.

Guardhouse, Lower Prison, and Old Cell House: AL-77, 22, and 89 - A historic structure report, restoration of damaged sally port, stabilization and preservation, removal of the frame waterside storehouse and small-arms range were recommended.

Casemates, AI-64 - The exterior preservation and the restoration of at least two casemates' interiors were recommended.

Citadel, AI-68 - A historic structure report and/or a structural engineering study were recommended, along with the preservation of the former Citadel basement and moat.

D. Civil War Era, 1861-1868

1. Point San José (Fort Mason)

In 1864 East and West batteries were constructed at Fort Mason. East Battery contained six 42-pounder banded rifles, while West Battery was armed with six 10-inch Rodmans. Both batteries continued to be armed for many years following the war, eventually being superceded by more modern works and finally being abandoned. Today, only the general site of the two batteries remain, together with a faint outline of West Battery. After 1900, the army landscaped this area, planting grass, flowers, and trees, and laying out walks. This report recommends that this quiet, secluded "park" be maintained as such and that the Civil War batteries continue to be interpreted through signs and markers. It also recommends the continuing marking of the Frémont house site, which was destroyed by the excavation for the batteries. Finally, this report recommends that no further developments be carried out on the site of the batteries that would further impair the historic setting.

2. Angel Island

Although Angel Island is not yet a part of the national recreation area, recommendations are made concerning the Civil War batteries in the event that the island should come under federal administration. As at Point San José, temporary batteries were erected on Angel Island in 1864. At Point Stewart a small battery consisting of three 32-pounders and one 10-inch columbiad guarded Raccoon Strait. The largest battery, having seven 32-pounders, one 8-inch Rodman, and two 10-inch Rodmans, was constructed at Point Knox. During the wartime emergency of 1898, three platforms were constructed in the Point Knox Battery for

8-inch converted rifles. These guns were not mounted. At the south end of the island, a battery was constructed on Point Blunt that was to have had seven guns. Due to a landslide in the area, these guns were never mounted. A fourth, "unofficial" battery was constructed on the waterfront at Camp Reynolds. It possessed five 32-pounder smoothbores. These several batteries continued to exist for a number of years following the Civil War, gradually falling into a state of disrepair and finally being abandoned. Little remains of any of them today. At Point Stewart the recommendation is to continue preservation of the approach road and what appears to be the terreplein of the battery and a portion of the parapet. While an identification marker might be placed at the site, the interpretation of this Civil War work could best take place in a visitor center. At Point Blunt the terreplein of the battery and the parapet have long since slid into the water. However, a portion of the approach road to the battery (partially in a cut) may still be seen. Once again, this report recommends that the interpretation of the work take place in a visitor center, that an identification marker be placed on the site, and that care be taken to preserve the small tangible evidence that remains. At Point Knox the site of the Civil War battery was occupied by Battery Ledyard, an Endicott-period battery. There are no recommendations. At Camp Reynolds nothing remains of the temporary Civil War battery except a part of the site itself. Its interpretation in a visitor center and, possibly, an identification marker on the site is the recommendation.

3. Alcatraz Island

Civil War construction on the Alcatraz batteries was a continuation of the prewar project. As the war progressed certain modifications were made in the plans, particularly for the emplacement of 15-inch Rodmans and Parrott rifles. Toward the end of the war a start was made on the bombproof casemated barracks that was to be armed with artillery. The recommendations for Alcatraz Island, above, cover the Civil War period as well as the 1850s.

E. Postwar Modernization, 1868-1876

The modernization of the coastal defenses of San Francisco Bay resulted in a number of new works around the harbor. These new batteries were West and East at Fort Point; additional 15-inch Rodmans on Alcatraz Island; and Gravelly Beach, Cliff, Ridge, and Cavallo batteries at Lime Point.

1. Alcatraz Island

Again, the recommendations presented in section C apply to the postwar modernization of the batteries on Alcatraz Island.

2. Fort Point

a. West Battery

Most of West Battery was destroyed during construction of the Endicott batteries at Fort Point in the 1890s. Six magazines and their earthen traverses remain: Presidio building 1640, an isolated magazine and earthen traverse standing south of Battery Godfrey; Presidio building 1643, another isolated magazine and earthen traverse standing south of Battery Godfrey; Presidio building 1646, a magazine and its traverse located on the left flank of Battery Godfrey; Presidio building 1647, a magazine located on the right flank of Battery Godfrey (it may be entered only through the magazines of Godfrey itself); Presidio building 1651 (the number is for Boutelle itself),a magazine and its earthen traverse located on the right flank of Battery Boutelle, the entrance passageway to this magazine has been lengthened considerably; and Presidio building 1658, located on the left flank of Battery Miller (this magazine has been completely buried and is inaccessible).

The two isolated magazines south of Battery Godfrey (nos, 1640 and 1643) are considered the best survivors of West Battery for the interpretation of this post-Civil War work.

The recommendations for West Battery are as follows: recommend that they receive preservation treatment and that they be used as the vehicle for interpreting West Battery; recommend that for the foreseeable future magazine 1658 remain sealed off; recommend that magazines 1646, 1647, and 1651 be considered as parts of the respective Endicott batteries to which they are attached, recommend that they receive preservation treatment comparable to the respective Endicott batteries (below), and recommend that the interpretation of them cover both the post-Civil War modernization and the Endicott period.

b. East Battery

When appropriations ceased in 1876, East Battery, though nearing completion, was still unarmed. Later in the 1890s, some armament was emplaced in the battery, most notably for today's purpose was a 15-inch Rodman smoothbore that was placed in position 16 in 1891 for practice purposes and was still there during the Spanish-American War. Should the mounting of a 15-inch Rodman on Alcatraz Island prove infeasible, this report recommends that consideration be given to mounting the gun here, as second choice. Since the first 15-inch gun to be mounted on the Pacific Coast was on Alcatraz, this location remains unquestionably the first choice for this weapon. Alcatraz also had 15-inch guns from the Civil War to the close of the century, whereas East Battery was armed for only a brief period. In any case, the recommendation is the preservation and interpretation of the surviving elements of East Battery.

3. Lime Point

a. Gravelly Beach Battery

This typical post-war battery with its thick earthen parapets was completed in 1873. Although its 12 wooden platforms for 15-inch Rodmans were constructed, only one gun was ever mounted. This Rodman had the honor of being the first and

for a long time the only artillery piece mounted on the north side of the Golden Gate. As completed, the work had six earthen traverses, each with a brick and concrete magazine underneath. The greater portion of the battery was destroyed during construction of an Endicott battery on the same site. A large masonry culvert that ran under the battery so as to drain the runoff from the valley into the ocean and an earthen traverse and magazine at either end of the Endicott battery remain today. In recent times the California Department of Parks and Recreation closed the entrances to the magazines with planks and an earth fill, making them inaccessible to visitors. It is recommended that when an interpretive program is developed for the Gravelly Beach area, consideration should be given to reopening these magazines. However, as long as Gravelly Beach remains a walk-in area, its role in the overall fortifications story will be minimal and fortifications should have a low priority. The ordinary preservation and maintenance procedures should be carried out.

b. Cliff Battery

Situated at an elevation of 473 feet, this battery was at that time the highest in the San Francisco area. It was designed for five 15-inch Rodmans and had two traverses with magazines. Completed in 1873, it was never armed. It was totally demolished during the construction of Battery Spencer in the 1890s. There are no recommendations.

c. Ridge Battery

Located behind Cliff Battery on Lime Point ridge at an elevation of 438 feet, Ridge Battery originally contained emplacements for four 15-inch Rodmans and four seacoast mortars. There were two traverses with magazines. Although completed in 1872, the battery was not armed until 1893 and then only for a short period of time. The battery is in relatively good condition today. Visitors to Battery Spencer have to walk through Ridge

Battery, where they may still see the positions for the two Rodmans pointing out to sea and the two looking inward to the bay. Recently, the California Department of Parks and Recreation filled in the magazine entrances with earth to make them inaccessible to visitors. Regrettably, this earth was borrowed from the historic fabric of the traverses themselves. It is recommended that the earthen traverses be restored, that the magazines again be made accessible to visitors, and that the necessary preservation measures be taken with regard to the battery. Ridge Battery and nearby Battery Spencer provide an example in the changes that occurred in coastal fortifications between the 1870s and the 1890s; thus, it is further recommended that the interpretation of the two emphasize this evolution in seacoast defenses.

d. Cavallo Battery

Completed in 1874, this battery in its final design was to contain 15 heavy Rodmans, plus an additional 2 in an outwork located on the tip of the point. (Nothing remains of the outwork.) Of all the works constructed in the 1870s, the Cavallo Battery was the most handsome architecturally and is the best surviving example of the post-Civil War earthworks. It was not armed upon its completion--not until many years later were a few rifles emplaced in the works for a brief period. Roughly in the shape of a triangle, bisected by a large earthen traverse (through which are two brick passageways), the battery had the appearance of being a fort more than anything. The engineer was so taken with his project that he proposed constructing a sally port at its rear entrance. In excellent condition until recently, the battery has suffered quite heavily from motorcycles riding through its terreplein and over the parapets. It is recommended that the necessary restoration of the parapets be carried out and that the battery be preserved and interpreted as a prime exhibit of the post-Civil War modernization project.

F. Endicott Era, 1890-1905

The Endicott era brought an avalanche of fortification construction to the Bay Area. No fewer than 36 gun and mortar batteries sprang up on both sides of the Golden Gate and on Angel Island.

Fort Winfield Scott	17 batteries
Fort Barry	7
Fort Baker	5
Fort McDowell	3
Fort Miley	3
Fort Mason	1

Of these, five batteries at Fort Winfield Scott either have been destroyed or their integrity has been seriously impaired: two 12-inch mortar batteries--Howe and Arthur Wagner, buried under a large earthen hill; 12-inch gun Battery Lancaster, impaired by construction of the Golden Gate Bridge; 8-inch gun Battery Slaughter, buried by construction of a Golden Gate Bridge approach road; and 15-pounder, 3-inch gun Battery Baldwin, which was destroyed.

Ten of the remaining 31 Endicott batteries are not now administered by the National Park Service.

12-inch gun Battery Saffold, Fort Winfield Scott
Dynamite Battery, Fort Winfield Scott
12-inch mortar Batteries Stotsenburg and McKinnon, Fort Winfield Scott
10-inch gun Battery Cranston, Fort Winfield Scott
5-inch gun Battery Sherwood, Fort Winfield Scott
3-inch gun Battery Blaney, Fort Winfield Scott
8-inch gun Battery Drew, Angel Island
8-inch gun Battery Wallace, Angel Island
5-inch gun Battery Ledyard, Angel Island

All these batteries except Dynamite are duplicated by similar batteries currently within GGNRA.

1. Fort Winfield Scott, Non-GGNRA Batteries

a. Battery Saffold

Two 12-inch guns are mounted on nondisappearing carriages. This battery is duplicated by similar works: nearby Battery Godfrey, Spencer at Fort Baker, and part of Chester at Fort Miley. A characteristic unique to Saffold was that it was constructed so that its guns could fire not only seaward but into San Francisco Bay itself. Because of its close location to Battery Godfrey, Saffold cannot be regarded as being critical to the interpretation of the Endicott period. It is currently administered by the U.S. Army. It is recommended that acquisition and interpretation be given a low priority. It is hoped, however, that this structure can be preserved and its integrity held intact inasmuch as it does play a role in the overall history of the seacoast fortifications of San Francisco Bay.

b. Dynamite Battery

This battery with three dynamite guns is unique to the Pacific Coast. There is only one other similar battery constructed in the United States at Sandy Hook (Fort Hancock), New York Harbor. Although this type of weapon was not accepted by the army, it added a fascinating chapter to the history of San Francisco's coastal defenses. Also during World War II, the important headquarters of the harbor defenses of San Francisco were located within this structure. It is currently administered by the U.S. Army. The battery is located adjacent to Lincoln Boulevard; however, entrance and exit onto this street are extremely dangerous. Access to the battery will have to be from inside Fort Winfield Scott. It is recommended that acquisition of this battery be made as soon as the army decides to abandon it. It should have a high priority in preservation, maintenance, and interpretation.

c. Stotsenburg and McKinnon

It was originally constructed as one battery containing sixteen 12-inch mortars. Later, the number of weapons was reduced to eight, and the battery was divided in two batteries. A similar work, Batteries La Rhett Livingston and Anton Springer, is located at Fort Miley. This latter is in an isolated location and cannot be interpreted with ease at this time (this study will recommend that it not be included in the interpretive tour of the fortifications). Livingston and Springer are administered by the U.S. Army. It is recommended that when the army releases these batteries they be acquired by the park. They should have a high priority in preservation, maintenance, and interpretation as representatives of mortar batteries south of the Golden Gate.

d. Battery Cranston

Two 10-inch guns were mounted on disappearing carriages. This battery is practically identical to adjacent Battery Marcus Miller. The two were originally considered to be one battery, although the emplacements of Miller were the first to be built. Its guns had been dismounted prior to Pearl Harbor. The Golden Gate Bridge Authority currently uses Battery Cranston as a shop and storage area. It is recommended that Cranston continue in its present function and that interpretation of 10-inch guns on disappearing carriages be concentrated at Battery Marcus Miller.

e. Battery Sherwood

Two 5-inch guns were mounted on pedestal mounts. Located in the national cemetery area, this battery and its neighbor, Blaney, are somewhat isolated from the main complex of batteries at Fort Winfield Scott. After the early abandonment of this battery, when the submarine mines were moved to outside the Golden Gate, its magazines were used for storage and the boundary was redrawn to place the battery within the Presidio of San Francisco. While its tactical value was shortlived, Sherwood was

the only battery of its type in the Endicott period at San Francisco. Because of their isolated location and the limited parking available (off Crissy Field Avenue), Sherwood and Blaney will not receive much visitation. They will remain of interest to visitors especially involved with fortifications. Despite heavy traffic on the adjacent Golden Gate Bridge approach road, the area containing Sherwood and Blaney is a remarkable pleasant site--or would be with the heavy growth of vegetation trimmed back. It is an idylic spot from which to view the bay and its shipping as well as activities at lower Presidio below it. If acquired, it is recommended that the preservation and cyclic maintenance of Battery Sherwood and, if feasible, the cleanup and development of the area as a pleasant site for harbor watching should be pursued.

f. Battery Blaney

Four 3-inch guns were mounted on pillar mounts. The guns were dismounted in 1920 when inner defenses were no longer considered necessary. Blaney was another unique battery because it was the only battery of its type in the coastal defenses of San Francisco. Comments and recommendations for it are identical to those for Sherwood.

2. Angel Island, Non-GGNRA

a. Battery Drew

One 8-inch gun was mounted on a barbette carriage and was duplicated by Battery Duncan, Fort Baker. It is currently administered by the state of California. If Angel Island is added to GGNRA, it is recommended to continue the preservation and interpretation of the battery as a part of the fortifications history of the island.

b. Battery Wallace

One 8-inch gun was mounted on a disappearing carriage and was similar to Battery Burnham, Fort Mason. It is

currently administered by the state of California. If Angel Island is added to GGNRA, it is recommended to continue the preservation and interpretation of this battery as a part of the fortifications history of the island and its early role as a part of the secondary line of defense for San Francisco Bay.

c. Battery Ledyard

Two 5-inch guns were mounted on pedestal mounts and were duplicated by Battery Sherwood, Fort Winfield Scott. It is currently administered by the state of California. If Angel Island becomes a part of GGNRA, it is recommended to continue the preservation and interpretation of the battery as part of the fortifications history of the island.

At present, 21 Endicott-period batteries are located on properties managed by the National Park Service.

Forts

Fort W. Scott	5	
Fort Mason	1	
Fort Miley	3	
Total:	9	(south of the Golden Gate)
Fort Baker	5	
Fort Barry	7	
Total:	12	(north of the Golden Gate)

Weapons

Type	No. of Batteries	North Golden Gate	South Golden Gate
12-inch guns on disappearing carriages	2-2/3	2	2/3*
12-inch guns on barbette carriages	2-2/3	1	1/3
12-inch mortars	3	1	2
10-inch guns on disappearing carriages	1		1
8-inch guns on disappearing carriages	1		1
8-inch guns on barbette carriages	1	1	
6-inch guns on disappearing carriages	2		2
6-inch guns on barbette carriages	4	4	
5-inch guns on balanced pillar mounts	2	1	1
3-inch guns on pedestal mounts	2	2	

*Battery Chester, Fort Miley, had two disappearing carriages and one barbette

Names

Fort Winfield Scott

Godfrey, three 12-inch guns on barbette carriages

Marcus Miller, three 10-inch guns on disappearing carriages

Crosby, two 6-inch guns on disappearing carriages

Chamberlin, four 6-inch guns on disappearing carriages

Boutelle, three 5-inch guns on balanced pillar mounts

Fort Mason

Burnham, one 8-inch gun on disappearing carriage

Fort Miley

James Chester, two 12-inch guns on disappearing carriages and one 12-inch gun on a barbette carriage

La Rhett Livingston
Anton Springer } originally one battery with sixteen 12-inch mortars

Fort Baker

Spencer, three 12-inch guns on barbette carriages

Kirby, two 12-inch guns on disappearing carriages

Duncan, two 8-inch guns on barbette carriages

Orlando Wagner, two 5-inch guns on pillar mounts

George Yates, six 3-inch guns on pedestal mounts

Fort Barry

Mendell, two 12-inch guns on disappearing carriages

Alexander, eight 12-inch mortars

Edwin Guthrie and Hamilton A. Smith, originally one battery with four 6-inch guns on barbette carriages

Samuel Rathbone and James F. McIndoe, originally one battery with four 6-inch guns on barbette carriages

Patrick O'Rorke, four 3-inch guns on pedestal mounts[2]

With a few exceptions it will be seen from the above breakdowns that there is a fair distribution of Endicott batteries, both by numbers and by weapons, on either side of the Golden Gate. Considering the distances involved, say from the 12-inch guns at Battery Chester, Fort Miley, to the 12-inch guns at Battery Mendell, Fort Barry, this factor is of importance in planning the interpretion of the coastal defenses of San Francisco Bay.

Before evaluating the individual batteries and making recommendations concerning them, it should be stated that this study judges each of these structures to possess, individually, a local level of historical significance. Taken together, the Endicott fortifications, whether administered by the National Park Service, the U.S. Army, or the state of California, combine to tell a nationally significant story of the coastal defenses of the United States. Second only perhaps to New York Harbor, this network of coastal batteries, from before, during, and after the Endicott era, is the richest, most varied, and historically significant collection in the nation, possibly, the world.

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2. Note: Batteries erected early in the Endicott period usually had only the surname of the person being honored applied to them; the General Orders naming the later batteries most often applied the full name of the person honored. Disappearing carriages were employed in batteries having a low elevation; barbette ones were used at higher elevations where the artillerymen were not so exposed to enemy fire.

3. Fort Winfield Scott, GGNRA Batteries

a. Battery Godfrey

Three 12-inch guns were mounted on barbette carriages. This was the second Endicott battery to be undertaken in the Bay Area, and it is the largest of all the gun batteries at Fort Winfield Scott. Construction on the work began in 1892. Its first platform, laid in 1894, was the first 12-inch barbette platform to be constructed in the United States. Its guns served in the defenses of San Francisco until 1943 when the battery was salvaged. It plays an important interpretive role in the history of the complex of batteries at Fort Winfield Scott. It is recommended that Battery Godfrey be given protection, preservation treatment, cyclic maintenance, and interpretation. At present a parking lot is located between a portion of the battery and the sea. This parking lot encroaches immediately up to the firing apron of emplacement 3. It is recommended that the parking area either be reduced in size so as to protect the firing apron or that it be located to the rear of the battery--in the vicinity of structure 1648 (ADA site SF-76) and that the present lot be regraded and planted to its historic condition.

b. Battery Marcus Miller

Three 10-inch guns were mounted on disappearing carriages. Construction began on this battery in 1891, making it the first Endicott-era work to be undertaken in San Francisco Harbor. Its completion, however, was delayed until the Ordnance Department developed a satisfactory disappearing carriage. At first it was named Battery Cranston as were two additional emplacements later built to the north, but eventually, the five guns were divided into two batteries, the two newer ones retaining the name Cranston and these three being named Marcus Miller. Today's Battery Cranston is under the jurisdiction of the Golden Gate Bridge Authority. Thus, Marcus Miller is the only 10-inch gun battery within GGNRA. Its guns were dismounted in

1920. It too plays an important interpretive role in the history of the complex of batteries at Fort Winfield Scott. It is recommended that Battery Marcus Miller be given protection, preservation treatment, cyclic maintenance, and interpretation.

c. Battery Crosby

Two 6-inch guns were mounted on disappearing carriages. Construction on this battery began circa 1900, making it slightly older than the adjacent 6-inch Battery Chamberlin. Its guns remained in service until 1943. Since Crosby and Chamberlin were similarly designed and armed and because Chamberlin's importance is greater than Crosby's (see below), it is recommended that Crosby play the lesser role of the two in the interpretation of the coastal defenses. It is also recommended that Crosby not be on the regular interpretive tour and that it be placed in reserve, so to say. It is further recommended that it be protected by a fence with a locked gate (vandals have torn holes in an existing fence) and that the necessary preservation and cyclic maintenance be carried out. (Crosby is unique in that a sign still remains painted on a wall explaining for whom the battery was named. Another noticeable thing is that the existing graffiti in this battery are the most vulgar of all the fortification graffiti in San Francisco.)

d. Battery Chamberlin

Originally, four 6-inch guns were mounted on disappearing carriages. These guns were dismounted in 1917. In 1920 two emplacements were modified to receive 6-inch guns on barbette carriages. Thus, in this one battery there are emplacements representing both kinds of carriages. In 1976 a 6-inch gun on a disappearing carriage was mounted in the battery. This is the only weapon from the Endicott period currently at GGNRA. Also, the emplacements are well protected today by a stout fence. Moreover, the battery is readily accessible, there being ample parking nearby on Bakers Beach. At present the

concrete of emplacements 1 and 2 is painted with nonhistoric colors--red and white. In that the guns of Chamberlin remained mounted until after World War II, it is recommended that the two emplacements on the left of the battery (nos. 3 and 4) be restored to their early condition of the early 1900s and that the two emplacements on the right be restored to their World War II appearance. It is also recommended that an early historic structure report be programmed.

e. Battery Boutelle

Three 5-inch guns were mounted on balanced pillar mounts. Boutelle was the only battery of this nature south of the Golden Gate (Orlando Wagner at Fort Baker was similarly armed). The guns of this battery were dismantled in 1918. Unfortunately, the platforms of Boutelle have settled considerably but not the concrete parapet walls. The result has been a large horizontal crack in the parapet concrete that is too great for ordinary repairs. However, there appears to be no immediate danger of the battery collapsing, or other dire results. Boutelle is strategically located between the 10-inch guns of Marcus Miller and the 12-inch guns of Godfrey. Thus, within a few hundred feet, dramatic representations are to be found of three types of Endicott fortifications. It is recommended that Boutelle be protected, preserved (but not restored), and interpreted.

4. Fort Mason, Battery Burnham

One 8-inch gun was mounted on a disappearing carriage. It is duplicated today only by Battery Wallace, Angel Island, which at this time is not a part of GGNRA. Burnham was the first Endicott battery to be abandoned by the Artillery in 1909, and it was the only Endicott work constructed at Fort Mason. The U.S. Army has retained administrative control over Burnham and considers it to be a high security area. However, the gun emplacement, the battery commander station, and the general

exterior of the battery are available for viewing and climbing over. A nonhistoric automobile garage is attached to the east side of the battery. It is recommended that the exterior of the battery be interpreted as part of the Endicott fortifications for the harbor. It is further recommended that the garage (FM5) be removed when feasible, and it is recommended that the preservation and interpretation of the complete battery be made when it is no longer needed by the army.

5. Fort Miley

a. Battery James Chester

Two 12-inch guns were mounted on disappearing carriages and one 12-inch gun was mounted on a barbette carriage. Like Battery Chamberlin, James Chester offers the opportunity to see the two kinds of emplacements for its guns. The battery was disarmed in 1943. Since visitation has been restricted until recently, Chester is in excellent condition and has established a standard for the other batteries. It is recommended that its protection, preservation, cyclic maintenance, and interpretation be continued.

b. Batteries La Rhett Livingston and Anton Springer

It was originally one battery containing sixteen 12-inch mortars. Later, the number of mortars was reduced to eight, and it was divided into two batteries. The mortars were dismounted in 1943. These batteries are in excellent condition but are located in an isolated portion of Fort Miley, the Veterans Administration Hospital cutting them off from the rest of the fortifications. Part of the works is currently being used as a park maintenance area, and it is proposed to use one of the mortar pits for a modular horse stable for the U.S. Park Police. These are most satisfactory adaptive uses for the batteries, care being taken to preserve the original fabric. Because these batteries cannot at

this time be feasibly interpreted, it is recommended that the adaptive uses be continued and that, when it is possible, mortar Batteries Stotsenburg and William McKinnon should be acquired at Fort Winfield Scott for their interpretive value (see above).

6. Fort Baker

a. Battery Spencer

Three 12-inch guns were mounted on barbette carriages. Gun 3, the most easterly of the three, was dismounted in 1918; the other two were salvaged in 1943. Spencer was the first Endicott-period battery to be built on the north side of the Golden Gate, and it possessed the highest elevation of the Endicott batteries in San Francisco Bay. As a young lieutenant, General of the Army Douglas MacArthur was dispatched to Battery Spencer to investigate an anchor bolt that had sheared off at emplacement 1. This is the only known association of MacArthur with any of the batteries while he was assigned to San Francisco as an engineer officer. Spencer, because of its distance from Fort Baker proper, had a number of auxiliary structures built between the road and the battery itself. These buildings still stand in various stages of preservation. Their presence is unique among the Endicott works, and they help to illustrate the organization and living conditions of the crews for the big guns. It is recommended that the protection, preservation, cyclic maintenance, and interpretation of Battery Spencer, the associated structures, and the 1870s Ridge Battery be continued.

b. Battery Kirby

Two 12-inch guns were mounted on disappearing carriages. Kirby is duplicated by two emplacements in Battery Chester, Fort Miley, and Battery Mendell, Fort Barry. One gun was shipped to the Philippines in 1933; the other was removed in 1941. The battery is located in a "walk-in" area and will not be heavily visited, even by fortification buffs. Nonetheless, it is

recommended that its preservation, maintenance, and identification be made.

c. Battery Duncan

Two 8-inch guns were mounted on barbette carriages, which is similar to Battery Drew on Angel Island. Located on top of an isolated knoll at Fort Baker and still protected by a stout fence, Duncan is believed to be in excellent condition. Its guns were dismounted as early as 1917, and there might not be a great amount of original machinery or equipment still in place. Outside the battery, there still remains a portion of barbed wire "entanglements" believed to date from World War II. This is, by far, the best representation of this type of protection surviving from that war. Since the interior condition of Battery Duncan is still unknown, recommendations must herein be conditional. It is recommended that when this battery becomes accessible to visitors that it be protected, preserved, maintained, and interpreted as the only work of its type currently within GGNRA. The same recommendations are made for the barbed wire on the exterior of the battery--the sole relic of this type of defense during the emergency following Pearl Harbor. Although not on the "beaten path," Battery Duncan offers a vivid contrast to the nearby 1870s Cavallo Battery and even to the nearby Endicott Battery Yates. To the novice and the expert alike the contrasts in architecture and materials among these three batteries can be an exciting experience. Many lessons concerning the evolution of coastal defenses may be learned here.

d. Battery Orlando Wagner

Two 5-inch guns were mounted on pillar mounts; the guns were dismounted in 1918. Battery Boutelle on the south side of the Golden Gate was similarly armed, and the guns were removed in 1917. This battery is located along the "walk-in" road to Kirby Beach but can be observed clearly from Battery

Spencer. Like Boutelle, it is architecturally interesting; moreover, it is situated so that it presents an inviting scene for photographers standing on the "walk-in" road. It is recommended that it be protected, preserved, maintained, and interpreted.

e. Battery George Yates

Six 3-inch guns were mounted on pedestal mounts. Its armament was similar to that of Battery Patrick O'Rorke, Fort Barry. During World War II, two guns remained on Battery Yates to protect the antisubmarine net that was located near the entrance to the harbor. Because of its location on Cavallo Point and adjacent to Horseshoe Bay, Yates receives a heavy visitation, resulting in "wear-and-tear." Although its guns were small, its history is long. Considering the two nearby batteries, Duncan and Cavallo, it complements the historic setting. It is recommended that it be protected, preserved, cyclically maintained, and interpreted.

7. Fort Barry

a. Battery Mendell

Two 12-inch guns were mounted on disappearing carriages. Along with nearby mortar Battery Alexander, Mendell was the first Endicott battery to be constructed on Point Bonita (Fort Barry). Construction began in 1901, the engineers taking advantage of their experiences gained during the erection of earlier Endicott batteries. It was named for Col. George Mendell, one of the more outstanding engineers assigned to San Francisco who had died not long before. Mendell had supervised the beginnings of the Endicott batteries at San Francisco. Located on the edge of a high cliff, Battery Mendell may be faced with erosion problems in the future. But it is an important element in the complex of batteries from several periods that are to be found concentrated in this area. Mendell's big guns were finally salvaged in 1943. The battery today is in need of attention due to considerable spalling of

concrete and rusting of reinforcing bars. Traces of its World War II camouflage paint are still to be seen. It is recommended that the battery be protected, preserved, cyclically maintained, and interpreted.

b. Battery Alexander

It originally contained eight 12-inch mortars. Later, the number of weapons was reduced to four. Alexander, named for another senior engineer assigned to San Francisco, Lt. Col. Barton S. Alexander, was the only mortar battery erected on the north side of the Golden Gate. With the exception of some colorful chalk drawings on the parapet walls, the battery is in excellent condition today. It is recommended that the battery receive protection, preservation, cyclic maintenance, and interpretation.

c. Batteries Edwin Guthrie and Hamilton A. Smith

Originally, it was one battery containing four 6-inch guns on barbette carriages. One of the last Endicott fortifications to be constructed, these batteries were also one of the last to be abandoned. This long life was due to the continuing need to cover submarine mines with this type of weapon. In 1949, however, mine defense became a naval responsibility. These batteries are admirably suited to interpretation, being strategically located between Batteries Wallace and O'Rorke. It is recommended that they receive protection, preservation, cyclic maintenance, and interpretation.

d. Batteries Samuel Rathbone and James F. McIndoe

Originally, it was one battery containing four 6-inch guns on barbette carriages. Their history is identical to Batteries Guthrie and Smith. However, they are not so well located for interpretation as the other two, being sited a considerable

distance from the complex of fortifications. Any intensive interpretation of Rathbone and McIndoe would be duplicating that of the identical Guthrie and Smith. However, these batteries will be observed by visitors driving from Battery Construction 129 to Point Bonita. Thus, it is recommended that their identification along with their preservation and maintenance be made. It is not recommended that the reconstruction of the missing iron stairways from the parade to the terrepleins (from the ground to the top) of these batteries be done.

e. Battery Patrick O'Rorke

Four 3-inch guns were mounted on pedestal mounts and were similar to Battery George Yates at Fort Baker; however, like it, O'Rorke continued to play a role in the past-World War II planning for the defense of San Francisco. Under existing conditions, this small battery is often overlooked by visitors. It could, however, play an important role in the history of the fortifications at Fort Barry, both for its different armament and because of its location within an area inhabited by several batteries of different kinds and different eras. Its preservation, maintenance, and interpretation are recommended.

G. World War I

The Endicott period of construction at San Francisco came to a conclusion in 1905. The next decade witnessed the abandonment of some of the new batteries, particularly those inside the Golden Gate, and the improvement of others. The coming of World War I resulted in the disarmament of several batteries, their guns being needed elsewhere, and the construction of four new works.

1. Fort Miley, Battery Loren H. Call

Two 5-inch guns were mounted on pedestal mounts. This battery was constructed in 1915, not because of World War I

but because of troubled relations with Japan. The two guns were transferred from Battery Ledyard, Angel Island. Battery Call was short lived, its guns being dismounted in 1921. The emplacements themselves continued to exist to at least 1937, but the annexes of that year called for no role for this work. The battery was later demolished during the enlargement of the Veterans Administration Hospital at Fort Miley. No visible remains are to be seen today. It is recommended that the history of this battery be told in a visitor center.

2. Fort Barry, Battery Wallace

Two 12-inch guns were mounted on barbette carriages. Construction began on the platforms in 1917. Battery Wallace differed from the earlier 12-inch batteries in that modifications were made to its carriages that allowed for a greater angle of elevation. This factor plus a lighter projectile increased the range of the guns by almost 12,000 feet. At first only the magazines were casemated, but in 1943 the guns themselves were buried under covers of earth and concrete. Wallace continued to play a role in the post-World War II planning defenses. By 1948, however, it was considered obsolete. Strategically located within the complex of batteries at Fort Barry, Battery Wallace contributes significantly to the history of fortifications at San Francisco, being the only one of its type constructed there. Its protection, preservation, maintenance, and interpretation is recommended.

3. Fort Funston

a. Battery Walter Howe

It contained four 12-inch mortars. In order to extend the range of mortars farther out to sea and to provide a defense against enemy ships approaching from the southwest, four 12-inch mortars were transferred from Batteries Stotsenburg and McKinnon, Fort Winfield Scott, in 1917 to the newly established Fort Funston. Although emplaced in an extremely simple temporary

work, these mortars were the last in San Francisco to be salvaged in 1945. No visible traces of the battery remain today. It is recommended that its story be told in a visitor center.

b. Battery Bruff

Two 5-inch guns were mounted on pedestal mounts. Construction of this temporary battery began in 1917. Its guns came from Battery Sherwood, Fort Winfield Scott. Bruff had a short history, being considered obsolete by 1919, and no visible remains can be seen today. It is recommended that its story be told in a visitor center.

H. 16-inch Guns, 1930s

As early as 1915 plans called for the construction of 16-inch batteries at San Francisco. But not until the 1930s were two such batteries completed.

1. Fort Funston, Battery Richmond P. Davis

It contained two 16-inch navy guns. Construction of this huge battery began in 1936--the first such work for San Francisco Bay. The battery was completed in 1939. Although early plans called for casemating the guns (the historian E. Raymond Lewis states that these casemates were the prototypes for such), the guns were first emplaced in open barbette positions. Not until after the guns were in position were their casemates completed. (Work on casemate 1 began in April 1938 and was essentially completed by November 1938.) Auxiliary structures included the battery commander's fire control station, combination plotting and switchboard splinterproof, pump house and pumping station, reservoir, latrine, and radio room; of these, only the plotting and switchboard rooms remain. Their entrance has recently been filled in with sand for the protection of the structure. Other than some rather grim graffiti, this structure is in good condition and could be reopened if future circumstances warranted it. Also of

importance at Battery Davis was the army's planting program that was carried out to reduce erosion of the sand dunes and to provide camouflage. These plans still exist and are of interest concerning other sand control problems within GGNRA today. Battery Davis possesses considerable historical significance for being the first 16-inch gun battery undertaken at San Francisco, for being a representative of this mighty climax to coastal guns, and for being the prototype for gun casemates of modern batteries. It is recommended that the battery itself be protected, preserved, maintained, and interpreted. Of some urgency is the need to rebuild and stabilize the sand cover over the burster course, which is currently exposed through erosion. Since all the cover of the battery is sand and since visitors will insist on climbing to the top of the casemates, it is recommended that consideration be given to the wooden stairs leading to the top.

2. Fort Cronkhite, Battery Townsley

It contained two 16-inch navy guns. Although construction of Townsley began (1938) after that of Battery Davis, both batteries were completed about the same time (1939). The gun casemates at Townsley were constructed at the same time as the rest of the work. Also of interest to fortification experts is the different layout of the battery at Townsley than at Davis. Townsley was the first of the two to be turned over to the Artillery, July 1940. For at least a year after Pearl Harbor, 150 men lived within the battery. Probably because of its more isolated position, Townsley experienced more firing than did Davis. Also, it continued to be active after World War II when radar was used in firing Townsley's guns. But the 1948 Townsley was considered to be obsolete. Townsley had its own central reserve magazine, also located at Fort Cronkhite. This is the only such structure currently within GGNRA. This latter (currently used for storage) is of interest in that its trolley rails are still in place. Certain modifications were made to the interior of Battery Townsley in

recent years when a private firm used its facilities for experimental work. Still the major portion of the magazines, etc., can be restored. The protection, preservation, maintenance, and interpretation of this important 16-inch battery is recommended. It is also recommended that the later machinery and equipment from the interior of the work be removed.

I. World War II

The last major construction of gun batteries at San Francisco took place on the eve of America's entry into World War II and in the early years thereafter. These projects ranged from 16-inch batteries to 37-mm. automatic weapons.

1. Fort Barry

a. Battery Construction 129

It contained two 16-inch navy guns. This battery was first called for in the 1937 annexes to the harbor defense project. Construction began in 1942; but, due to America's improved position in the Pacific, construction was suspended in 1943. By that time the battery itself was nearly 100 percent constructed, and the gun tubes had arrived on the site. (The carriages were never delivered to San Francisco.) After the war, the army continued for a time to include this battery in planning San Francisco's defenses; however, work was never renewed on the project. The battery, located on top of Diablo Ridge at an elevation of over 800 feet, was one of the highest seacoast batteries in the world. Although never armed and thus less historically significant than either Davis or Townsley, the battery today represents an outstanding example of the construction of these immense works. It is recommended that the battery, its battery commander's station on top of the work and the nearby plotting/switchboard/radio rooms be protected, preserved, maintained, and interpreted. Later in this report is a recommendation that the interior of this battery be considered as a possible fortifications visitor center.

b. Battery Bonita

It contained two 37-mm. automatic weapons (mobile mounts) which were set in position in 1943 but were replaced by two 40-mm. weapons in 1944. Nothing remains today. It is recommended that this battery be interpreted in a visitor center only.

2. Fort Baker

a. Battery Kirby Beach

Two 3-inch guns were formerly mounted in Battery Yates. The battery was completed in August 1942. The gun blocks were octagonal. Later the guns were moved to Fort Point; only the site remains.

b. Battery Gravelly

Two 90-mm. guns were on fixed mounts and two 90-mm. guns were on mobile mounts and placed at Gravelly (Kirby) Beach in 1943. They were still in place when the 1945 supplement concerning the planning of the future harbor defenses was prepared. The gun blocks were circular. It is recommended that this battery be interpreted in a visitor center. Only the site remains; it is recommended that it be identified.

c. Cavallo Battery

It contained two 37-mm. automatic weapons, which were on mobile mounts, and set in position in 1943 but were replaced by two 40-mm. weapons in 1944. One was located on the tip of Point Cavallo, the other on the Fort Baker mine wharf. There are no remains today, and it is recommended that this battery be interpreted in a visitor center only.

3. Fort Point

a. Battery Gate

Two 3-inch guns were mounted on pedestal mounts. The guns had formerly been mounted at Battery Yates. They were mounted on the barbette tier of the old masonry fort. They are currently interpreted at Fort Point. There are no recommendations.

b. Battery Point

Two 3-inch guns were mounted on pedestal mounts. These guns were originally mounted at Battery Yates. At the outbreak of war they were emplaced at Gravelly Beach to the east and in front of Battery Kirby. Later, when 90-mm. guns were mounted at Gravelly Beach, these two 3-inch guns were moved to Fort Point and mounted on the barbette tier of the old fort. Their platforms are interpreted today. There are no recommendations.

4. Fort Winfield Scott

a. Battery Baker

Two 90-mm. guns were on fixed mounts and two 90-mm. guns on mobile mounts. The 1945 supplement called for the retention of these weapons. There are no traces of this battery today. It is recommended that they be interpreted in a visitor center only.

b. Battery Scott

It contained two 40-mm. guns. These may have replaced the earlier 37-mm. automatic weapons. One of these was located at Fort Point; the other was emplaced on Bakers Beach, but both were to be retained in the 1945 supplement. Nothing remains today. It is recommended that this battery be interpreted in a visitor center only.

5. Fort Miley

a. Battery Construction 243

It contained two 6-inch guns, barbette carriages, and steel shields. Also called for in the 1937 annexes, this battery did not begin construction until January 1943. The emplacements, the carriages, and the shields were accepted for use and care by the troops in February 1944. However, the guns still had not arrived when World War II ended. Not until 1948 were the guns mounted, making this the last gun battery to be armed at San Francisco. When mine defense was turned over to the U.S. Navy in 1949, this complex was turned over to that service, which continued to use the casemated magazines. Today, one of the concrete gun emplacements has been converted to be used as a flagstaff site. The continued protection, preservation, maintenance, and interpretation of the battery is recommended.

b. Battery Lobos

Two 6-inch navy guns were mounted on pedestal mounts and were emplaced on Point Lobos, circa 1942 (disarmed, circa 1945). Only the sites of the guns remain, and these are not readily accessible. It is recommended that this battery be interpreted in a visitor center.

c. Battery Land

It contained two 90-mm. guns on fixed mounts and two 90-mm. guns on mobile mounts. It was located at Lands End, north of Fort Miley. These guns were emplaced in 1943 and were still in existence as of the end of 1945. The access to the site of this battery is extremely difficult. It is recommended that it be interpreted in a visitor center only.

d. Battery Buck

At first, the battery contained two 37-mm. automatic weapons; these were replaced in circa 1943 by 49-mm.

guns. This battery was located at Lands End, north of Fort Miley. There are no remains today. It is recommended that it be only interpreted in a visitor center only.

6. Fort Funston, Battery Bluff

It contained four mobile 155-mm. guns. Either before or after Pearl Harbor these four guns were mounted on Panama mounts on the edge of the ocean cliff in the northern portion of Fort Funston. Because of erosion, the guns were later moved to southern Fort Funston, the Panama mounts being left behind in their original location. Today, one of these concrete mounts has been lost to continuing erosion, and a second mount is in danger of sliding to the bottom of the cliff (the mount is also badly deteriorated). Two of the Panama mounts are still in a good state of preservation but will likely be subjected to suffering the same fate as the first two. There are no traces of Battery Bluff to be seen in its second location; it is possible that the concrete mounts were not constructed in this new location. It is recommended that at least one of the two surviving Panama mounts be removed from its precarious location and placed near Battery Davis and that it be interpreted there. These were the only Panama mounts in San Francisco.

J. Nike Batteries

Although not a part of the history of seacoast defenses, the Nike batteries within the potential boundary are discussed here. Four batteries are involved: Forts Funston, Barry, Cronkhite, and McDowell (Angel Island).

1. Angel Island

This Nike battery, the largest of the four, is under the jurisdiction of the state of California. If Angel Island becomes a part of GGNRA, it is recommended that this battery be preserved, maintained, and interpreted as part of the history of

the defenses of the island. As far as it is known, no significant remains exist of the control area for this battery on top of Mount Caroline Livermore.

2. Fort Funston

Structure FF-495 is the number assigned to this air defense missile site. One of the underground storage areas has been adapted to a youth camp. Nearby are a few structures that were associated with launching activities. Farther away is the cantonment area. This last is judged to have no historical significance. It is recommended that this missile site continue in its adaptive use or any future adaptive uses that may be found for it. It is further recommended to continue the maintenance and a minimum of interpretation, since it is the only one of the four on the south side of the Golden Gate. Since the cantonment area has no historical significance, no recommendations are made for it.

3. Fort Cronkhite

This air defense missile site was numbered SF 87 for the cantonment area, 87L for the nearby launch area, and 87C for the control area that was located on top of the casemates of Battery Construction 129, Fort Barry. Nearly all the structures at the control area have been demolished, so much so that interpretation of the site is regrettably an impossibility. The launch area has been admirably adapted to function as a maintenance area. The cantonment area is judged to have no historical significance. It is recommended that the launch area continue to serve as a maintenance area, care being taken to preserve the exteriors of the structures.

4. Fort Barry

The identification number of this air defense missile site was SF 88 for the cantonment and 88L for the nearby launch area. The army left behind two inoperative Nikes when it

abandoned the site. The cantonment area is judged to have no historical significance. The launch site and the missiles, on the other hand, serve admirably to illustrate this phase of the defense of San Francisco. It is strategically located near a cluster of coastal batteries, and this fortunate location allows for the interpretation of the defenses from 1900 to the 1960s. It is recommended that the launch area and the missiles be protected, preserved, maintained, and interpreted.

The control area for this battery was located on top of Wolf Ridge, Fort Cronkhite, its number being SF 88C. Of all the control areas, this has the most physical remains. These control areas, which are located on peaks, dominated the skylines when they were active. The large white radar domes were visible from almost anywhere in the Bay Area. In the minds of many they were intrusions upon the natural scene that outweighed any historical significance they might possess. However, on Wolf Ridge two radar towers (without their domes), a few buildings, and some helicopter landing pads still remain. It is recommended that the two radar towers be preserved and maintained as vestigates of this closing chapter in the defenses of the Bay Area.

K. Mine Defenses

1. Alcatraz Island

The magazine in the unfinished casemated barracks served as the first storage area in San Francisco Bay for submarine mines (torpedoes) when these arrived in 1884. The magazine has been heavily modified over the years. Exterior doors and windows have been added, and interior walls have been partly or wholly removed. Today the magazine is part of a visitor center. It is recommended only that the room be identified as the first storage area in the bay for submarine mines. In 1890 this same magazine became one of the first two mining casemates (control rooms) in San Francisco Bay. At that time a small tunnel for electrical cables was

dug from underneath the magazine to the water's edge. Today, the entrance to this tunnel through the floor of the magazine has been sealed. Again, it is recommended that only the identification of this room be made as one of the first two mining casemates in the bay.

2. Fort Mason, Mining Casemate

This mining casemate (at the foot of Point San José adjacent to Black Point Cove erected in 1890) had to be planned from scratch. It was the other of the first two mine casemates in San Francisco Harbor and is believed to be intact today. It is not known if the small (2½ by 3½-foot) cable gallery still exists since many changes have occurred in the area. When the first mines were laid in San Francisco Bay during the Spanish-American War, this mining casemate provided the controls from the south side of the bay. It is considered to possess a local level of historical significance. It is recommended that it be protected, preserved, maintained, identified, and, if feasible, interpreted (probably through guided tours only).

3. Angel Island, Mining Casemate

Completed in 1891 this mining casemate at the water's edge at the foot of Mortar Hill was of similar design to the one at Fort Mason. It still stands in pristine condition and is administered by the state of California. As far as it is known, this casemate did not play an active role in the mining of the harbor. If Angel Island becomes a part of GGNRA, it is recommended that its preservation, maintenance, and interpretation be made as a part of the history of the island's defenses. Access down the steep incline to the casemate's entrance would have to be improved. In 1897 another mining casemate was constructed at Quarry Point on Angel Island. However, it never played an active role in the mining of the bay. Its present condition is unknown.

4. Fort Baker, Mining Casemate

It was constructed in 1893 in a cove north of Point Cavallo. Along with the mining casemate at Fort Mason, this one was scheduled to play a role in the first mining of the harbor in 1898. Further investigation proved, however, that it was inadequate to its role. A temporary installation was quickly erected farther north. It is not believed that remains of either casemate exist. It is recommended that no interpretation be made of these structures because the primary emphasis of this early effort is recommended for the mining casemate at Fort Mason.

5. Fort Barry, Mining Casemate

It was constructed in 1908. This was the first casemate designed and located for mining in the waters outside the Golden Gate. It was made bombproof in 1940 by the addition of concrete and earth. It is in reasonably good condition today; however, access is currently something of a hazard. It is recommended that the preservation and interpretation be made of this work. It is further recommended to remove a frame radio room adjacent to this work. This latter structure is in an advanced state of deterioration and is a safety hazard of the first order.

6. Fort Winfield Scott

a. Mine Depot

It was constructed between 1907 and 1910, and this mine depot supplemented the then existing depot on Yerba Buena Island. When completed, it consisted of a wharf, a 1,330-foot tramway, a mine storehouse, two torpedo loading rooms, two explosive rooms, and a cable tank building. The mine wharf (structure 984) was rebuilt of reinforced concrete in 1941 on the eve of World War II. The historic cable tank building (no. 977) was recently demolished (it had been doubled in size in 1943--from three to six cable tanks). The mine storehouse (no 979) still

stands but has been greatly modified to serve its present function as an army shop building. The two loading rooms with their traveling cranes (nos 985 and 986) still stand in relatively good condition, except that the cable tanks have been filled in with concrete, and are currently used as maintenance buildings by Fort Point National Historic Site. The two explosive storage rooms (no. 987) still stand. Nearby are two other nonrelated historic structures: No. 983 was an engineer storehouse built in 1908 and is still used as a storehouse, and no. 989 was originally an engineer plumbing shop but now serves as administrative headquarters for Fort Point National Historic Site. This mine depot served through World War II as one of three depots in San Francisco Bay. It is the oldest mine depot that is within the boundaries of GGNRA. It is recommended that the entire surviving complex, including the engineer buildings, be considered as a historic district. The mine storehouse (no. 979) and the engineer storehouse (no. 983) are still administered by the U.S. Army. The army should be encouraged to make no further exterior alterations to these two structures--although a great deal of the integrity of no. 979 has already been lost. The exterior of the park headquarters (no. 989) has already been modified through the use of nonhistoric paint colors and other alterations. Hopefully, these changes can be reversed eventually, although the adaptive use of no. 989 should be continued. The exteriors of the remaining structures should be maintained in their historic condition. It is recommended that a proposal to covert this area into a visitor parking lot be discarded. It is further recommended that the area be retained as a historic district, with emphasis on the mining activity but not to the exclusion of the engineer buildings. Compatible adaptive uses of the various structures should be continued.

b. Mining Casemate I, Bakers Beach

Replacing an earlier frame mining casemate at Bakers Beach, the army in 1912 constructed the existing concrete structure, no. 1600, which is located near Battery Chamberlin. Originally it was not a bombproof structure, its roof consisting simply of wood, tar, and gravel. During World War I in 1918, this casemate was made bombproof by the addition of thick layers of concrete and by the addition of an earthen (sand) traverse. It is recommended that this casemate be retained but that it not be opened for visitation.

c. Mining Casemate II, Bakers Beach

Located near the above mining casemate, this bombproof structure was not constructed until 1943. By then the first casemate was considered inadequate to its task. The new work was actually a double casemate, having the task of controlling two minefields, mines II in Main Channel and mines III in South Channel. It is in an excellent state of preservation. In contrast to most coastal fortifications, it retains some of its original equipment, including control panels and equipment for removing poison gases from the air and from contaminated personnel. It is recommended that the machinery be left in place and that the casemate be preserved, maintained, and interpreted through tours only.

7. Fort Baker

a. Mining Casemate, Cavallo Battery

Constructed circa 1909, this concrete building was located inside the earthworks of the old Cavallo Battery of the 1870s at the north end. Nothing remains of it today. There are no recommendations.

b. Mine Depot

Although long proposed, the mine depot at Fort Baker did not come into existence until the eve of World War II. In 1937 construction began on a new L-shaped mine wharf. The remaining structures of the depot were constructed in 1941. They consisted of a mine storehouse (no. 407), a cable tank building (no. 670), an auxillary power plant (no. 409), a detonator storage magazine (no. 410), a TNT storage magazine (no. 411), and mine loading rooms (no. 412). All these structures still exist and are in excellent condition. The concrete face of the mine loading rooms still retain its paint colors from navy days (the navy took over the mine defenses in 1949).

While this mine depot is of less historical significance than the one at Fort Winfield Scott, it is in far better physical condition and retains nearly all its integrity. Of the several structures, the cable tank building (no. 670) is the most important historically, simply because the similar building at Fort Winfield Scott has been demolished. It is the only survivor of this type of structure left in the Bay Area. This large building contains five huge concrete tanks in which the electrical cable was stored by being immersed in seawater. The cable was periodically tested for reliability, its constant immersion providing circumstances similar to an actual minefield. A traveling crane remains overhead for moving cable. It is recommended that this structure be preserved. Should the building be subjected to adaptive use, it is further recommended that any temporary flooring over the tanks should not materially damage the historic fabric.

The mine storehouse (no. 407) is another large building also in excellent condition. Essentially it consists of one large two-story room with two traveling cranes overhead for moving mines. It is currently used by the army for vehicle storage. This is an excellent adaptive use structure. It is recommended that the

exterior of this structure be preserved. At such time as this structure comes under National Park Service administration, it could serve admirably as a museum, perhaps for the history of Lime Point Military Reservation, or as an army transportation museum--for which good records happen to exist for Fort Baker. The army transportation museum could include the many types of horse drawn vehicles employed by the army in the late 19th and early 20th centuries: the introduction of motor vehicles by the army and their development down to the jeep and beyond, the quartermaster ferry steamers and other boats, and the construction of Golden Gate Bridge and its effects on the military bases at San Francisco.

The auxiliary power plant (no. 409) is housed in a bombproof cut-and-fill concrete structure. While all the machinery is still in place, this structure is not particularly suited to interpretation, nor does it possess much historical significance. The two structures (nos. 410 and 411) are also cut-and-fill bombproofs at the base of Lime Point ridge. Both are quite small storage rooms, completely functional. It is recommended that these three structures remain closed and locked and that only their exteriors (fronts) be preserved as part of the historic scene of the mining depot.

The mine loading rooms (no. 412) had a later use as living quarters according to a chart found on one of the walls. The historical significance of this structure is not great inasmuch as the two older loading rooms of the mine depot at Fort Winfield Scott are still intact (and functioning as maintenance and storage areas for Fort Point National Historic Site). It is recommended that the exterior (front) of this prominent bombproof cut-and-fill structure be preserved and identified. Being located immediately behind the mine depot wharf, it is observed by a large number of visitors. If the original army paint colors of the exterior can be determined, it is further recommended that they be applied to the structure in place of the present navy colors.

The existing mine depot wharf (no. 415) and the adjacent but deteriorated quartermaster wharf (no. 416) represent the latest of a succession of wharves that have been at this same site for over 100 years. The quartermaster wharf appears to be in an advanced state of decay; it was originally built in 1903 by the engineers. It was extensively repaired many times, particularly in 1928. While possessing a degree of historical significance, it is recommended that it be removed as a dangerous safety hazard if engineers/architects determine that it is not feasible to restore it. It is recommended that the 1937 mine wharf be maintained and that its present function be continued as a popular recreational angling site.

L. Seacoast Searchlights

The first seacoast searchlight project for San Francisco Bay was prepared in 1901. Other than a single searchlight at Fort Winfield Scott, no further action was taken at that time. No known remains are left of that first light; it probably was erected on the barbette tier of the old masonry fort.

1. Fort Mason

Between 1910 and 1912 a number of searchlights, their metal shelters, and their power plants were installed around the bay. One of the best samples of a searchlight shelter remaining from that period is to be found today on Point San José at Fort Mason. This shelter has been included in the nomination of the Fort Mason Historic District to the National Register of Historic Places. Of the few survivors it is in the best state of preservation and is the most accessible for interpretation. It is recommended that it be protected, preserved, maintained, and interpreted as a part of the defenses of San Francisco Bay.

2. Fort Baker

a. Lime Point

Also erected in 1910 and 1912, this searchlight stood adjacent to the fog house at the foot of Lime Point. Only a portion of the concrete foundation remains today. The property is under the administration of the Golden Gate Bridge Authority. There are no recommendations.

b. Point Cavallo

Located on the tip of Point Cavallo, this light was quite different in construction than the above two. When not in operation, it was lowered into a pit and raised when needed by a counterweight. It was erected in 1912, and there are no visible remains today. There are no recommendations.

3. Fort at Fort Point

By 1912 a 60-inch searchlight had been mounted in one of the emplacements of the barbette tier on the west face of the old masonry fort at Fort Point. No physical remains of this light exist today. There are no recommendations.

4. Fort Cronkhite, Tennessee Point

These two searchlights, each erected on an elevator that raised it from a pit, were constructed sometime between 1913 and 1937. A 1913 project numbered them 16 and 17, but the 1937 annexes referred to them as lights 1 and 2 then proceeded to renumber them 3 and 4. There are no physical remains today. There are no recommendations.

5. Fort Barry

These two lights were also erected sometime between 1913 and 1937. One of these searchlights was located in front of and slightly below the lighthouse on Point Bonita. The shelter exists in relatively good condition but is on property administered

by the U.S. Coast Guard. This report recommends that the U.S. Coast Guard be encouraged to preserve and maintain this searchlight shelter. Should it come under the administration of the National Park Service, it is recommended that this shelter be interpreted as the best surviving structure of its type north of the Golden Gate.

The other Fort Barry searchlight was located near Bird Island north of Battery Mendell. Although the shelter exists, it is in a state of deterioration. It is recommended at most that it be stabilized and left as a potential ruin in place. It is not heavily visited, but it can be observed from Battery Mendell.

Of the several other fixed searchlights in the harbor defenses, no known remains exist. During World War II all the fixed searchlights, such as those discussed above, were replaced by portable lights. There are no recommendations for this phase.

M. Fire Control Stations

Fire control stations became a necessity when the long-range guns of the Endicott period were assigned to San Francisco Harbor. In 1906 a comprehensive fire control project for San Francisco was formalized. The earliest stations were simple wooden structures. None of these survive today. By World War I, the stations were being constructed of reinforced concrete (rarely brick) and were dug-in. Roof material varied--from metal to tar and gravel. Later the roofs too became reinforced concrete covered with earth. By World War II camouflage was a part of most fire control stations. This included mortaring rock around the observation slits to match the surrounding terrain, paint, camouflage netting, and so forth. Also during the war a steel and concrete pillbox type of station was introduced. Some of these unfortunately present a visitor hazard today. Each of them had a steel hatch in the roof for entrance and exit. Some of these covers

are missing or badly rusted, and the unwary visitor could easily tumble in, the holes being at or near ground level. Over the years there was a tendency to increase the number of stations for each battery, according to the caliber of the battery's guns. Sixteen-inch guns ended up with as many as nine stations, while 3-inch guns usually had but one. Also, an individual station sometimes was reassigned to a different battery; this was particularly true after the abandonment of a number of Endicott-period batteries. The following identifications reflect primarily the assignments of the stations toward the end of their active duty. Due to the great number of stations and the impossibility of inspecting all of them, there are undoubtedly omissions and errors in the following list. Hopefully, however, the recommendations are accurate enough to provide a basis for planning the preservation and interpretation of this important element in the fortifications history.

Over the years the army used a variety of abbreviations to identify the fire control stations; most of these have already appeared in this report. Only four will be used herein--the ones in use in 1945:

BC — battery commander's station

B^1 — primary fire control station for a battery

B^1S^1, B^2S^2, etc. — a combination observation and spotting station (i.e., a fire control station), the numbers served only to distinguish among the several such stations assigned to a battery

BC B^1S^1 — a combination battery commander and fire control station (This was always at the battery or quite near it.)

1. Fort Funston

The 1937 annexes listed ten fire control stations existing at or proposed for Fort Funston. The 1945 supplement reduced this number to five. Today only three survive, all being the World War II steel and concrete pillbox design. Two of these are located together near the cliff's edge south of Battery Davis. They are believed to be the Funston group fire control station (the more northerly) and the B^5S^5 station for Battery Construction 244, Milagra Ridge. Both stations have presented problems in recent times (safety hazards and vandalism); yet, they are important representatives of the fire control system in this most southerly unit of GGNRA. It is recommended that the necessary safety measures be taken, such as the placing of wooden railings around the hatch openings as has been done elsewhere and a general cleanup. As both visitation and protection increase in the area, there probably will be a reduction of the particular types of vandalism now occurring. It is recommended that these two stations be preserved, maintained, and identified.

The third station, located in a slide area on the cliff's edge north of Battery Davis, was assigned as B^2S^2 for Battery Construction 243, Fort Miley. Due to steady erosion of the sand in the area, the entire body of this station--both the steel and the concrete portions--has been exposed. If left untouched, the structure will gradually slide down the cliff to the beach below. Because it is entirely exposed, the structure offers a unique example of this type of station visible in its entirety. It is recommended that it be moved from its present location, along with a Panama mount to Battery Davis and be interpreted as an example of how a fire control station was constructed.

2. Fort Miley

No fewer than 17 fire control stations were already located at or proposed for the Fort Miley-Point Lobos area in the 1937 annexes. This large number was reduced to five in the 1945

supplement, all located at the west portion of Fort Miley. Three of them remain today. One of these, B^2S^2, Battery Wallace, Fort Barry, is located at the north end and in front of Battery Chester, which is near an excellent example of a later helicopter landing pad (navy?). It is readily accessible to visitors. It is recommended that it be preserved, maintained, and identified on the basis that it is the one accessible fire control station at Fort Miley.

The other two stations, B^2S^2, Battery Townsley, Fort Cronkhite, and B^2S^2, Battery Davis, Fort Funston, are located in front of and below gun emplacement 2, Battery Chester. Today, they are buried in thick foliage and can be approached only by clambering up a steep sand bank from below. It is recommended that for the foreseeable future these two stations remain in their present condition, well camouflaged from passing visitors.

3. Sutro Heights

During World War II, two fire control stations were erected adjacent to the north end of the parapet at Sutro Heights. One station is directly above the other. Both are of the steel pillbox design. The upper station served as B^2S^2, Battery Construction 129, Fort Barry, and the other was M^3 for mines II at Fort Winfield Scott. Besides their unusual location on the Sutro estate, these stations represent the most effective use of rock for camouflage to be found in the Bay Area. It is recommended that the rock camouflage be restored where necessary and the two stations be preserved, maintained, made safely accessible, and identified.

4. Fort Winfield Scott

At Fort Point, above the masonry fort and west of the Golden Gate Bridge toll plaza, there are four or five fire control stations cleverly set into the rocky slopes and more or less camouflaged by earth and rock covers. These probably date from

before World War II; some, at least, were in service through World War II. All are sealed against entry at present, but one can look into them through their observation slits. At least one of them contains a typical curved wooden bench that was part of the furniture of the stations. The 1945 supplement called for the retention of two of these stations: B^3, Chamberlin, Fort Winfield Scott, and M^2, mines II at Fort Winfield Scott. Although not readily accessible to visitors because of the rugged terrain, a number of persons make their way to these stations when wandering around the cliff at Fort Point. It is recommended only that these stations be preserved in their present state.

The functions of harbor defense command post and harbor entrance control post at Battery Dynamite, Fort Winfield Scott, during World War II have already been discussed in this report. It is noted here that in connection with these functions, two pillbox-type observation posts (one for the army and one for the navy) were erected on top of the west parapet of Battery Dynamite. These still exist. The recommendation was made earlier in this report that Battery Dynamite be added to GGNRA whenever the army has no further use for it. In that event, it is recommended that these two important observation posts be incorporated with the preservation and interpretive plans for the area.

A large two-room fire control structure, Presidio 1644, is located south of Battery Godfrey. The original function of this structure is as yet unknown. The Presidio building information schedule (1975) identifies this structure as having been a radio hut and gives its date of construction as 1911--before radios became a part of the fire control system. From its size and general appearance this structure must have had some earlier function than a radio hut. On one of the exterior walls today is an extraordinary piece of graffiti. Next to a mythological beast-god

(Egyptian influence?) is inscribed the "Psalm of the Heads." This graffiti possibly dates from the 1960s. Although such an element has absolutely no place in the coastal defenses of San Francisco, it is recommended that it be allowed to remain at least until more is known about the history of the structure.

At the rear of gun emplacement 4 (Battery Chamberlin, Bakers Beach) is the BC B^1 station for that battery. This large station is still clothed with part of its green camouflage paint. It is strategically located with regard to the recently mounted 6-inch gun on a disappearing carriage. Its location provides an excellent opportunity to interpret the relationship between the battery commander's station and the guns themselves. It is recommended that it be preserved, maintained, and interpreted. Currently, it may be reached only by scrambling up a soft bank of sand covered with fragile vegetation. It is recommended that a suitable flight of wooden steps be constructed for access to the station.

Still under army administration is structure 1344, located just off Washington Blvd. and adjacent to the West Coast Memorial. This also is a large two-room fire control station similar to no. 1644 above. Prior to World War II at the time of the 1937 annexes, this structure had the important function as serving as the harbor defense station. Although its walls were partly protected by earthen embankments, it possessed no overhead cover. It is recommended that when the army releases this structure it be acquired by GGNRA and interpreted. (Excellent parking is now available near the site.)

5. Fort Barry

a. Point Bonita

Before World War II, no fewer than 12 fire control stations had been constructed on Point Bonita between

today's radar tower and the tip of the point itself. The 1945 supplement called for the continuance of only three stations, all in the vicinity of today's radar tower: GB-2, Battalion; Barry group; M^1, mines I. At least four of these large stations still exist in the vicinity of the radar tower (one of them is inside the tower's fence). All of them are on land thought to be under the jurisdiction of the U.S. Coast Guard. Regardless, these stations are in generally poor condition; there are several deep manholes without covers in the area, and visitors to the Battery Mendell area are tempted to visit these structures (another one in the vicinity is the quite noticeable two-story radio signal tower) via a narrow path that drops off about 200 feet into the sea. If and when these stations should come under the National Park Service, it is recommended that they be measured, drawn, photographed, and buried and that the area be made safe for visitors.

At the lighthouse on Point Bonita, in front of and below the light and the searchlight shelter, is a double (two-room) fire control station dramatically perched on a shelf of rock on the very point itself. This location also is under the jurisdiction of the U.S. Coast Guard. Until 1943 these concrete stations served as B^1S^1, Battery Mendell, and BC^2 B^4S^4, Battery Alexander, both at Fort Barry. One must exercise great caution in descending a flight of steps to reach these stations. If they should be acquired by GGNRA, it is recommended that they be preserved and maintained. Even if it should not be feasible for visitors to enter them, these stations are dramatically visible from several points within GGNRA.

b. Vicinity of Battery Mendell

Immediately to the northwest of Battery Mendell are two steel and concrete pillbox fire control stations dating from World War II, Fort Barry 1362 and 1363. The one nearest the battery (no. 1362) was M^4, mines II, Fort Winfield Scott; the other

served as B^2S^2, Chamberlin, Fort Winfield Scott. These stations too require, or soon will, wooden railings to protect the unwary visitor from open hatches. Still farther to the northwest under the edge of the cliff is a concrete dug-in fire control station dating from before World War II. It served as B^1S^1 Smith, Fort Barry, and continued to play a role in the 1945 supplement. This fire control station is located in an extremely dangerous location; interpretation is impossible; and there are many other better examples of this type of station. It is recommended that steps be taken through the proper procedures to have the station demolished; its existence tempts visitors to investigate it, despite danger to their life and limb.

On Rodeo Hill east of Battery Wallace are two fire control stations pertaining to that battery: no. 985, BC, Wallace, and no. 989, B^1S^1, Wallace. Both stations represent examples of camouflaging with rock and mortar. It is recommended that both be preserved, maintained, and identified.

6. Fort Cronkhite, Wolf Ridge

Located on Wolf Ridge above Battery Townsley is a collection of steel and concrete fire control stations that is in an excellent state of preservation. Until recently, the area containing these stations was under the jurisdiction of the U.S. Coast Guard, and the area was fenced off from the visitors. On the lower side of the road outside the Coast Guard area is B^1S^1, Battery Construction 129, Fort Barry. Across the road, a short distance to the north is B^4S^4, Davis, Fort Funston. Farther up the ridge is the BC station for Battery Townsley; GB-1, Battalion; and B^1S^1, Townsley. All these stations exhibit rock and earth camouflage. On the interior walls of some of them are stenciled information concerning the fire control system. Beyond question, this group of stations is the best within GGNRA, all of them dating from the late 1930s and early 1940s. It is recommended to continue their preservation, maintenance, and interpretation.

7. Frank Valley Military Reservation

Overlooking Muir Beach, Frank Valley served as the location of four fire control stations. From north to south, or from highest to lowest elevation, these were B^5S^5, Battery Construction 243, Fort Miley; B^4S^4, Wallace, Fort Barry; B^2S^2, Smith, Fort Barry; and M^3, mines I, Fort Barry. All the stations were the steel and concrete pillbox ones of World War II. However, sometime after the war someone, possibly the army, removed all four front steel sections leaving only the concrete portions. The National Park Service has already developed this area, which is just off Coast Highway 1. A parking lot has been constructed, wooden railings placed where necessary for safety purposes, and a series of walks laid out to the high rocky point. These paths pass by or lead to all four stations. Although the historical integrity of these stations has been greatly impaired, it is recommended to continue the maintenance of the remains and to identify them for the many visitors to the site.

8. Hill 640 Military Reservation

Located on a high point of land between the Coast Highway and the White Gate Ranch on Panoramic Highway, these five World War II fire control stations are currently in a good state of preservation--their entrances being sealed and the area little visited at present. The 1945 supplement accounted for only four of the stations, from highest to lowest elevations: B^3S^3, Battery Construction 129, Fort Barry; B^5S^5, Battery Construction 243, Fort Miley; B^3S^3, Townsley, Fort Cronkhite; and B^6S^6, Davis, Fort Funston. Today's unaccounted for fifth station is located adjacent to the last of the above. These stations cannot be seen from either highway; they may be reached by a pleasant walk from Panoramic Highway via a gate and lane opposite White Gate Ranch. Currently cattle and horses graze in the fields. This is a most pleasant site overlooking the Pacific Ocean and Stinson Beach. While there would seem to be little reason to "develop" the area, it is recommended

that any developments be located away from the fire control stations. It is also recommended that at most identification signs be made for these structures and for a nearby radar site.

9. Wildcat Military Reservation

Two fire control stations were located on Wildcat in the Bear Valley area of Point Reyes National Seashore. These were the most northerly of all the stations in the harbor defenses of San Francisco. Their assignments were B^7S^7, Townsley, Fort Cronkhite, and B^7S^7, Battery Construction 129, Fort Barry. There are no remains of these stations today according to local information. (The writer has not visited this site.) There are no recommendations.

N. Antiaircraft Defenses

World War I introduced the need for antiaircraft defense. Not until the 1920s, however, were antiaircraft batteries introduced at San Francisco. The 1920 plans called for four batteries, each having two 3-inch antiaircraft guns, model 1917 (Seacoast). They were to be located at Rodeo Hill, Fort Barry; to the left (south) of Battery Godfrey, Fort Winfield Scott; at the northeast corner of the Fort Miley Military Reservation in front of Battery Livingston; and on a knoll northeast of Battery Davis, Fort Funston. All eight concrete plugs were constructed in 1920. The guns were mounted at Forts Barry and Winfield Scott and possibly at Fort Miley in the early 1920s. In 1925 Fort Winfield Scott's two guns were moved to Fort Funston. And in 1934 two new guns replaced the original two at Fort Barry, the original ones having been shipped East. The 1937 annexes called for only three batteries of three fixed 3-inch guns, model 1917 M1A2, each at Forts Funston, Winfield Scott, and Barry. In addition two mobile batteries of three guns each were to be assigned to Forts Cronkhite (Wolf Ridge) and Miley (Lincoln Park Golf Course). Other antiaircraft defenses called for in the annexes were 104 (.50-cal.) machine guns mounted on tripods and fifteen 60-inch antiaircraft searchlights.

In 1939 a board of officers recommended the transfer of the fixed battery at Fort Winfield Scott to Fort Cronkhite to replace the proposed mobile battery. This recommendation was carried out, but on what date it was done is unknown. It will be noted that now a fixed antiaircraft battery was located near each of three long-range coastal gun batteries--Battery Davis, Fort Funston; Battery Wallace, Fort Barry; and Battery Townsley, Fort Cronkhite. These three fixed batteries remained in operation through World War II.

The 1945 supplement called for the retention of these three batteries, each one now being augmented by a radar set, SCR-584. The battery on Wolf Ridge, Fort Cronkhite, now contained the following components:

Three 3-inch guns, model 1917 A1M2, mounted on carriages on concrete plugs
One radar set, SCR-584
A combination concrete splinterproof containing a storeroom, 16 by 12 feet, and a power plant room, 12 by 12 feet
A concrete splinterproof magazine, 26 by 16½ feet
A director pit, being a concrete well with a sliding steel frame roof, 10 by 10 feet by 4 feet deep
A concrete height finder base, 10 feet in diameter

The batteries at Barry and Funston were similarly designed.

The 1945 supplement also called for fifteen 60-inch searchlights, model 1942 (only five of which were to be located within today's GGNRA); nine searchlight radar sets, SCR-268; thirty 40-mm. antiaircraft guns; and sixty-six .50 cal. antiaircraft Browning machine guns.

Remains of all three fixed antiaircraft batteries are to be found today.

1. Fort Funston

Two of the three concrete gun plugs are still to be found. They are on a sandy knoll that is subject to steady erosion. One plug is currently in danger of being lost to erosion. So little is left of this battery and so much is left of the one on Wolf Ridge, it is recommended only that the two gun plugs be regarded as ruins and that modest ruin stabilization be carried out so as to retain them as long as possible. Two dug-in reinforced concrete splinterproofs (one a magazine, the other a combination storeroom and power plant) are to be found at the south base of the knoll on either side of an abandoned road. These being out of the way and out of sight of the main activities at Fort Funston have presented a serious management problem for the area. The entranceways to both have been filled in with sand to prevent further vandalism to their interiors, which have served as toilets and other functions. It is recommended that these entrances remain filled in for the foreseeable future. Should it be desirable to reopen these splinterproofs at some future date, it would be an easy matter to do so. There are no known remains of the director pit or of the concrete base of the height finder.

2. Fort Barry

Here, too, little remains of the antiaircraft battery. The three gun plugs, the director pit, and the height finder were all placed close to one another on the top of Rodeo Hill, just east of the two fire control stations associated with Battery Wallace. It is recommended only that the visible remains be cleaned up and be regarded as ruins. At present this hilltop receives very little visitation.

3. Fort Cronkhite

Of the three fixed antiaircraft batteries, Battery 1 (1945 designation) on Wolf Ridge is by far the best preserved. The two splinterproofs are in excellent conditions. The three gun

emplacements are still intact. Sandbags that had been filled with concrete are still emplaced. The director pit is still intact; however, its steel sliding roof has deteriorated considerably. There remains considerable evidence of underground living quarters, mess hall, battery officers, etc.--this battery was located a considerable distance from the barracks area of Fort Cronkhite. Some of these have collapsed in part or in whole; others are fairly well preserved. They should be preserved or stabilized and made safe for visitors. It is recommended that this battery be considered to be the prime exhibit for interpreting the history of antiaircraft defenses of San Francisco. In that regard this report recommends the stabilization, preservation, maintenance, and interpretation of the various features.

O. Miscellaneous Fortification Structures

1. Fort Barry, Balloon Hangar

It was constructed in 1921. This is the only survivor of three such hangars in the harbor defenses of San Francisco--the other two having been at Forts Winfield Scott and Funston. These helium-filled balloons were used for observation purposes in the firing of the larger coastal guns. One other similar hangar is known to exist on the Pacific Coast at Fort Worden State Park, Washington. Being unique to the San Francisco fortifications, the Fort Barry hangar is considered to possess historical significance. It is recommended that the hangar be preserved, maintained, and interpreted. It is a large structure and of awkward design for any adaptive uses, although its front appears to have been already partly modified. If some compatible adaptive use could be found for the structure, it would be of benefit to its preservation.

2. Fort Cronkhite, Central Reserve Magazine

Originally designed as a reserve magazine for Battery Townsley only, this large dug-in concrete five-room

magazine was later considered to be a central reserve magazine for the north side of the Golden Gate. It is in excellent condition today, with even its trolley rails still in place, and is used as a maintenance facility. It is recommended to continue the use of this structure as a maintenance facility, care being taken to preserve the historic fabric.

3. Hill 640, Site of Radar Set SCR-296

In addition to the five fire control stations on Hill 640, there are the concrete pylons of the World War II radar set that was established on this hill. Also, there is a dug-in concrete splinterproof that was associated with the radar. It is recommended to preserve and maintain these modest structures as a representative of the several radar sets in the defenses of San Francisco, along with the fire control structures.

4. Automatic Weapon Emplacements

On top of the casement at Battery Davis at either end are the ruins of sandbagged automatic weapon emplacements for .50 caliber machine guns. Also, to the north of Battery Mendell are four circular, earthen emplacements that appear to be for automatic weapons. It is recommended that all these be stabilized and preserved.

P. Additional Research

Despite the lengthy amount of time spent on research for this study and its large size, certain records yet remain to be consulted with regard to the harbor defenses of San Francisco. That they were not looked into at this time was simply a problem of time and funding. As necessity arises, particularly with the preparation of any historic structure report or furnishing study, it is recommended that further research be made in the following resources:

1. National Archives, Record Group 156, Office of the Chief of Ordnance

Although a considerable amount of data concerning the ordnance mounted at San Francisco was available in the engineer records, it is recognized that much more is available in the ordnance records.

2. National Archives, World War II Army and Navy Correspondence

A fair amount of information concerning World War II activities at San Francisco was gathered in the National Archives for this study, but the writer realizes that the history of this period has not been exhausted herein. Despite repeated attempts to find them, records concerning 1942-1946 have proven to be elusive.

3. Secondary Sources

Secondary sources, including biographies, autobiographies, memoirs, etc., concerning soldiers stationed at San Francisco are also available. Time allowed for an examination of a few items of this nature but, again, much remained unread.

4. Spanish and Mexican Records, Pre-1847

This study relied almost entirely on secondary sources for the Spanish and Mexican periods of fortifications. It would undoubtedly be a profitable enterprise for the National Park Service to have an expert in the Spanish language and in the mysteries of Spanish and Mexican archives prepare a monograph on the Presidio of San Francisco and its outworks.

Q. Some Recommendations Concerning Interpretation

The Activities Standards, National Park Service, allows for broad recommendations on interpretation within a historic resource study. Those recommendations that follow are based not

only on the historic research that has been carried out but on observations made on numerous visits to the fortifications.

Two major factors affect an interpretive program for the fortifications. The first of these is the vast amounts of distance and time involved regarding the fortification resources. Those within the potential boundaries of GGNRA lay scattered from Stinson Beach in the north to Fort Funston in the south. They include the islands of Alcatraz and Angel. It would be impossible to spread an interpretive program evenly among this multitude of structures and functions. Second, most of the fortifications are located within or near a high-density urban area. The result is horrendous vandalism of the historic resources of a character not found, say, in the backcountry of a natural park. Experience at the area has shown that a simple battery name painted on a board has a lie expectancy of three weeks.

The day is far distant, if ever, when a ranger will be on hand at all the sites to offer interpretive services. However, there are certain areas where a concentration of fortification elements makes tours both feasible and worthwhile. These are the concentration of a wide variety of batteries, a mining casemate, fire control stations, and so forth, at Fort Barry, north of the Golden Gate; a similarly varied collection of works at Fort Winfield Scott south of the Golden Gate; and to a lesser degree, the batteries and fire control stations at west Fort Miley.

The first and last of the above three offer an additional advantage of being locations from where excellent vistas of the headlands can be had. For example, from one spot at Fort Barry one can see from Point Reyes to Point Lobos, which includes Endicott batteries, a nearby Nike battery, the masonry fort at Fort Point, the 16-inch gun emplacements at Battery Construction 129, and on, and on.

It is recommended that the concept be explored for self-guiding tours via a printed pamphlet at at least Fort Barry and Fort Winfield Scott. It is also recommended that thought be given to advertised, scheduled, and guided tours at these two areas. It is further recommended that a self-guiding booklet for all the fortification elements in San Francisco Bay be printed. This last might be more suitable as a sales item than as a free folder.

Finally, it is recommended to develop a fortifications-oriented visitor center similar to but more far reaching (to cover 200 years of fortifications history) than the ones now located at Fort Point and Alcatraz Island--which cover other themes as well as fortifications. There are several sites that would be suitable to such an undertaking, the most eminent (in more ways than one) being the 16-inch gun Battery Construction 129, Fort Barry, which has a large amount of interior space as well as commanding vistas from the exterior. (Parking is currently limited.) Also, the adaptive use of this structure is justified on the grounds that it was never armed; thus, it is less significant in its defensive role than the 16-inch gun Batteries Davis and Townsley.

A secondary, smaller "museum" of fortifications might be developed for the south side of the Golden Gate, within a work at either Fort Winfield Scott or Fort Miley--perhaps a major expansion of the present exhibits at Fort Point.

IX. List of Classified Structures

A. Fortification Structures Now on List of Classified Structures

Structure No.	Name	LCS No.
Alcatraz Island		
AL-209	North Battery	10056
AL-208	North Caponier and fortifications	10058
AL-22	Guardhouse	10061
AL-202	Fortification arch and bombproof	10063
AL-203	Fortification arch and magazines	10064
AL-204	Fortification arch and magazines	10065
AL-205	Fortification wall	10066
AL-206	Fortification wall	10067
Fort Mason		
FM-23	Mine casemate	05889
FM-242	Battery Burnham	05919
FM-15	Searchlight shelter	10196
FM-250	1898 battery	10198
Fort Winfield Scott (Presidio)		
PE-1600	Old mine casemate	05945
PE-1601	New mine casemate	05946
PE-1621	Battery Chamberlin	05947
PE-1630	Fire control station, Chamberlin	05948
PE-1640	Brick magazine	05949
PE-1643	Brick magazine	05950
PE-1644	Radio hut	05951
PE-1646	Brick magazine, Godfrey	05952
PE-1647	Battery Godfrey	05953
PE-1651	Battery Boutelle	05954
PE-1658	Brick magazine, Marcus Miller	05955
PE-1660	Battery Marcus Miller	05956
FP-99	Fort Point	00362
FP-979	Mine storehouse	09028
FP-984	Mine wharf	09030
FP-985	Mine loading room	09031
FP-986	Mine loading room	09032
FP-987	Mine explosive storeroom	09033
Sutro Heights		
SH-8	Fire control station	05987

Structure No.	Name	LCS No.
Fort Miley		
FI-1	Battery James Chester	05963
FI-2	Battery James Chester	05964
FI-3	Powerhouse, Chester	05965
FI-4	Battery Construction 243	05966
FI-5	Flagpole	05967
FI-6.1	Fire control station, Townsley	05968
FI-6.2	Fire control station, Davis	05969
FI-7	Fire control station, Wallace	05970
FI-329	Battery La Rhett Livingston	05971
FI-329A	Fire control station	05972
FI-330	Battery Anton Springer	05973
Fort Funston		
FF-499	Battery Davis	05982
FF-200	Nike missile battery	05974
FF-201	Nike missile battery	05975
FF-202	Nike missile battery	05976
FF-206	Nike missile battery	05977
FF-2501	Fire control station, Funston	05979
FF-2502	Fire control station 244	05980
FF-497	Plotting room, Davis	05981
FF-211	Antiaircraft Battery 3	10192
FF-212	Magazine, AA 3	10193
FF-213	Storerooms, AA 3	10194
Fort Baker		
FB-770	Plotting room, Battery Construction 129	10121
Fort Barry		
FA-991	Magazine, antiaircraft battery	10068
FA-993	Magazine, antiaircraft battery	10069
FA-999	Battery Wallace	10070
FA-1351	Battery O'Rorke	10071
FA-1353	Firing booth, Alexander	10072
FA-1354	Batteries Smith-Guthrie	10073
FA-1355	Firing booth, Alexander	10074
FA-1356	Battery Alexander	10075
FA-1358	Searchlight shelter	10076
FA-1359	Fire control station	10077
FA-1362	Fire control station, mines II	10078
FA-1363	Fire control station, Chamberlin	10079
FA-1364	Battery Mendell	10080
FA-1365	Mine casemate	10081
FA-773	Battery Construction 129	10122
FA-830	Rifle range	10123
FA-831	Pistol range	10124
FA-905	Balloon hangar	10125

Structure No.	Name	LCS No.
Fort Barry (cont.)		
FA-911	Batteries Rathbone-McIndoe	10126
FA-966	Nike missile generator building	10143
FA-967	Nike missile assembly building	10144
FA-969	Nike missile battery	10145
FA-971	Nike missile battery	10146
FA-976	Nike missile sentry station	10147
FA-985	Fire control station, Wallace	10148
FA-989	Fire control station, Wallace	10149
Fort Cronkhite		
FC-1008	Plotting room, Townsley	10082
FC-1014	Battery Townsley	10083
FC-1100	Nike missile battery	10111
FC-1101	Nike missile battery	10112
FC-1106	Nike missile assembly shop	10113
FC-1107	Nike missile test shop	10114
FC-1109	Nike missile warhead building	10115
FC-1130	Reserve magazine	10116
FC-1194	Nike missile tracking tower	10117
FC-1197	Nike missile tracking tower	10118

B. Fortification Structures Recommended for Addition to the List of Classified Structures

Structure No.	Name
Alcatraz Island	
AL-64	Casemated barracks
AL-207	Fortifications and tunnel
none	South Battery
Fort Mason	
None	East and West batteries, Civil War
Fort Winfield Scott	
None	Gun plug, antiaircraft battery
None	Gun plug, antiaircraft battery
1662	Fire control station
1663	Fire control station
1664	Fire control station
1630	Battery Crosby
Sutro Heights	
None	Fire control station

Structure No.	Name
Fort Funston	
None	Fire control station, Battery Construction 243
None	Panama mount, Battery Bluff
None	Panama mount, Battery Bluff
Fort Baker	
None	Battery Kirby
None	Battery Wagner
None	Battery Spencer
None	Brick magazine, Ridge Battery
None	Brick magazine, Ridge Battery
FB-433	Fire control station, Baker
FB-434	Fire control station, Spencer
None	Fire control station, Wagner
None	Fire control station, Wagner

The following fortification structures at Fort Baker are still under the administration of the U.S. Army. It is recommended that they be added to the List of Classified Structures when they are transferred to Golden Gate National Recreation Area.

FB-573	Battery Duncan
FB-575	Cavallo Battery
FB-571	Battery Yates
FB-407	Mine depot storehouse
FB-670	Mine depot cable tanks
FB-409	Mine depot powerhouse
FB-410	Mine depot explosive storehouse
FB-411	Mine depot explosive storehouse
FB-412	Mine depot loading rooms
FB-415	Mine depot wharf
Fort Barry	
None	Fire control station, Rathbone
None	Fire control station, Battery Construction 129
Fort Cronkhite	
None	Height-finder emplacement, Antiaircraft Battery 1
None	Bombproof storeroom, Antiaircraft Battery 1
None	Three emplacements, Antiaircraft Battery 1
None	Fire control station, Townsley
None	Fire control station, GB-1
None	Fire control station, Townsley
None	Fire control station, Davis
None	Fire control station, Battery Construction 129

Structure No.	Name
Frank Valley Military Reservation	
None	Fire control station, Battery Construction 243
None	Fire control station, Wallace
None	Fire control station, Smith
None	Fire control station, mines I
Hill 640 Military Reservation	
None	Radar bombproof
None	Fire control station, Battery Construction 129
None	Fire control station, Battery Construction 243
None	Fire control station, Townsley
None	Fire control station, Davis
None	Fire control station, unknown use

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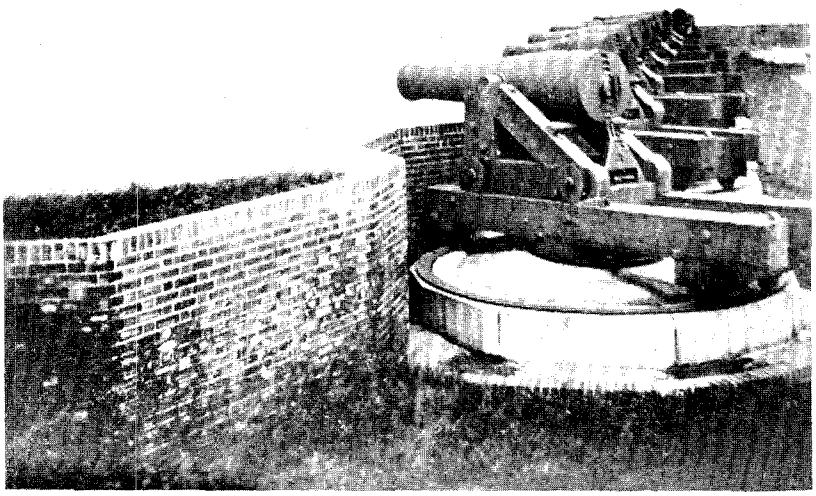
4. Newspapers

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ILLUSTRATIONS

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5. Brick Magazine, Ridge Battery, 1870s
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9. Battery Ledyard, Angel Island
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11. Battery Mendell, Fort Barry
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29. Sixteen-inch Gun, Battery Davis, Fort Funston
30. Test Firing 16-inch Gun, Battery Townsley, Fort Cronkhite

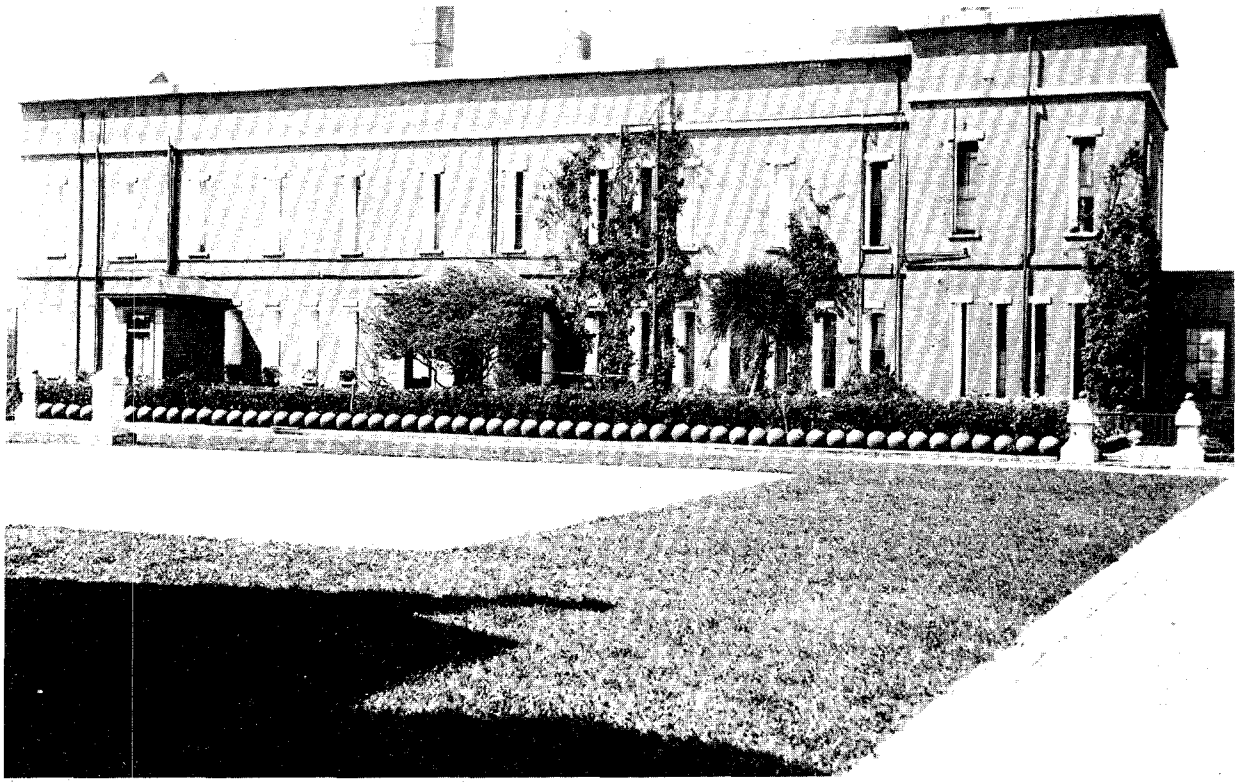
31. Mine Depot Wharf, Fort Baker
32. Mine Loading Rooms, Fort Baker
33. Nike Missile Battery, Angel Island
34. Aerial Photograph, Fort Funston, 1937
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1. Eight-inch Columbiads on the Barbette Tier of the Fort at Fort Point.

Fort Point and Alcatraz Island were the first two places permanently fortified by American engineers.

Courtesy, Bancroft Library, University of California, Berkeley.



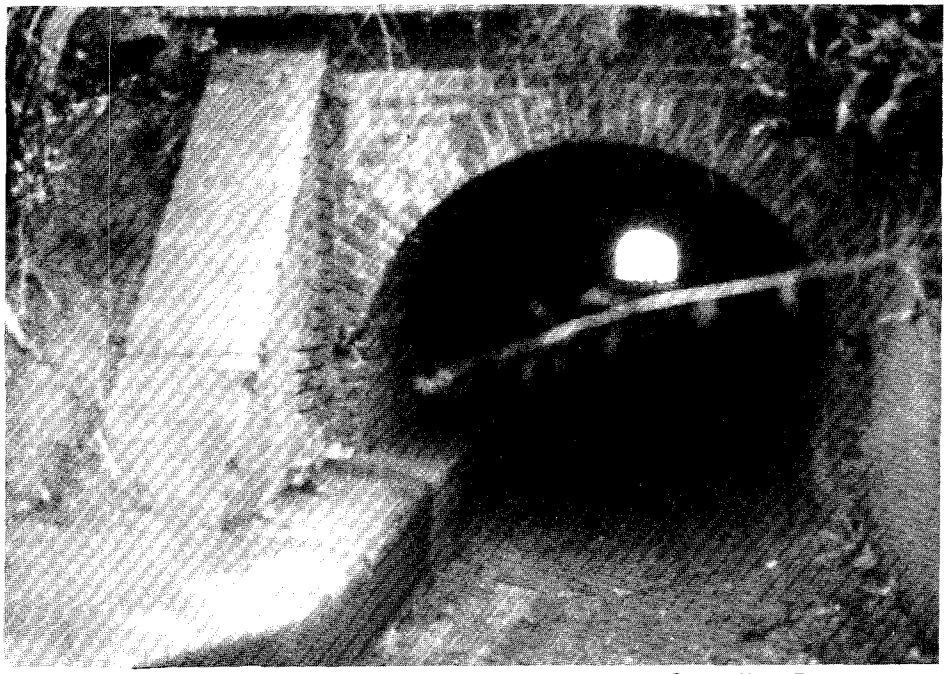
2. The Defensive Barracks, or Citadel, on Alcatraz Island.

This structure, completed in 1859, was designed to withstand shot and shell as well as an infantry attack. It was the only structure of its nature erected on the Pacific Coast. In this photograph (1893) it has been remodeled into officers' quarters.

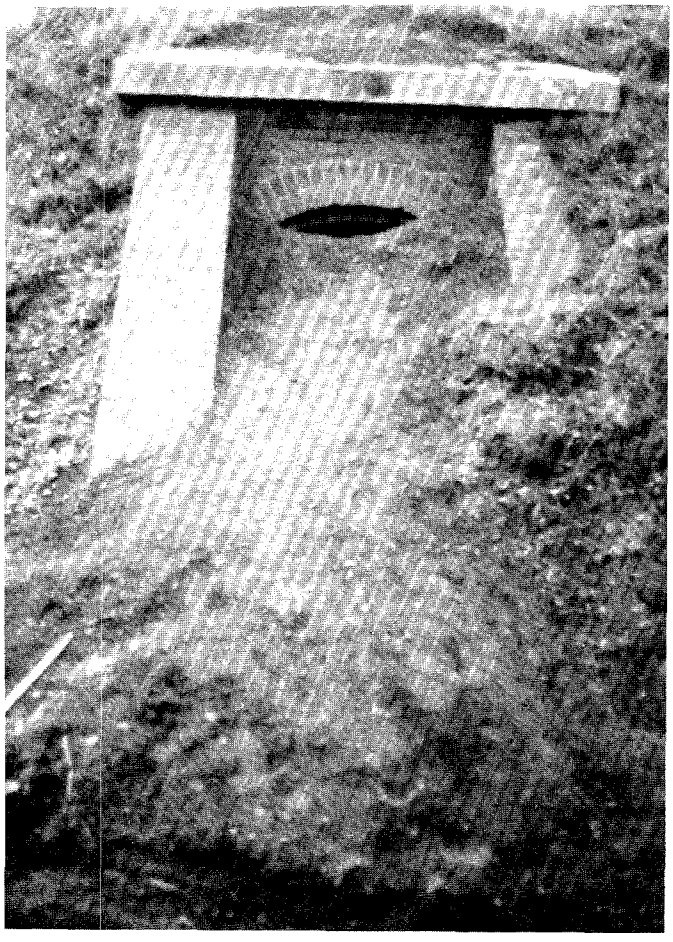
National Archives,
Audiovisual Archives Division, 92-F-2-6.



3. Mendell's Large-Scale Blasting Effort at Lime Point, 1868.
The project was eventually cancelled, not because of lack of success at blasting but because of the realization that casemated masonry works had been made obsolete by developments in weapons.
National Archives, Audiovisual Archives Division, 77-F-100-14c.



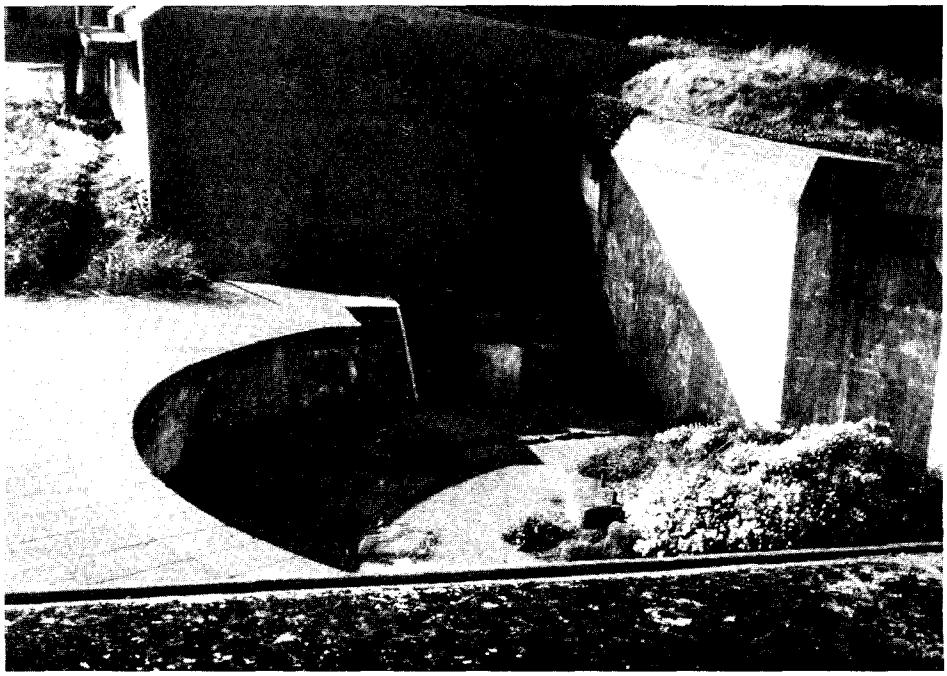
4. Brick and Concrete Drainage Culvert under Gravelly Beach Battery, Lime Point, Constructed in the Post-Civil War Modernization of San Francisco's Defenses.
It continued to serve as a culvert for Battery Kirby in the Endicott period. Erwin N. Thompson, NPS, 1975.



5. Brick and Concrete Magazine Covered by an Earthen Traverse, Ridge Battery, Lime Point, 1870s.

The earth fill was placed in the entranceway by the state of California in an effort to stop vandalism.

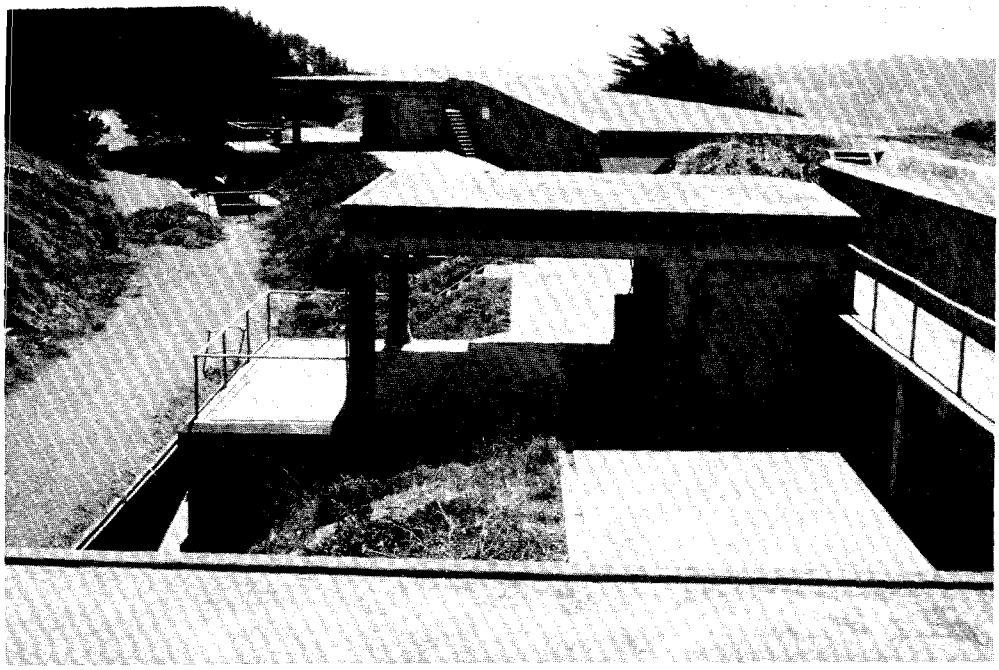
Erwin N. Thompson,
NPS, 1975.



6. Emplacement for a 10-inch Gun on a Disappearing Carriage at Battery Marcus Miller, Fort Winfield Scott.
   This was the first Endicott-period battery to be undertaken at San Francisco.
   Erwin N. Thompson, NPS, 1975.



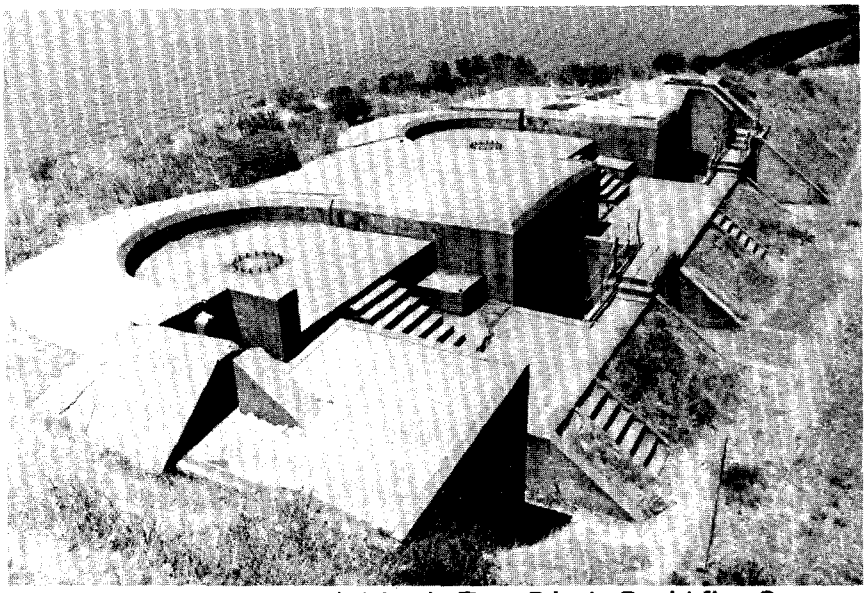
7. Battery Boutelle, Fort Winfield Scott, Three 5-inch Rapid-fire Guns on Balanced Pillar Mounts.
   The concrete parapet is badly cracked due to settlement of the heavy platforms.
   Erwin N. Thompson, NPS, 1975.



8. **Battery Godfrey, Fort Winfield Scott, Three 12-inch Guns on** Nondisappearing Carriages.

   This Endicott-period battery was the first 12-inch work in the United States to have its platforms laid. Also, it was the first battery of that era at San Francisco to be armed.

   Erwin N. Thompson, NPS, 1976.



9. **Battery Ledyard, Angel Island, Two 5-inch Rapid-fire Guns on** Pedestal Mounts.

   This battery was part of the inner harbor defenses developed in the Endicott period. By World War I these batteries were abandoned in favor of new works that fired seaward.

   Harold La Fleur, NPS, 1976.



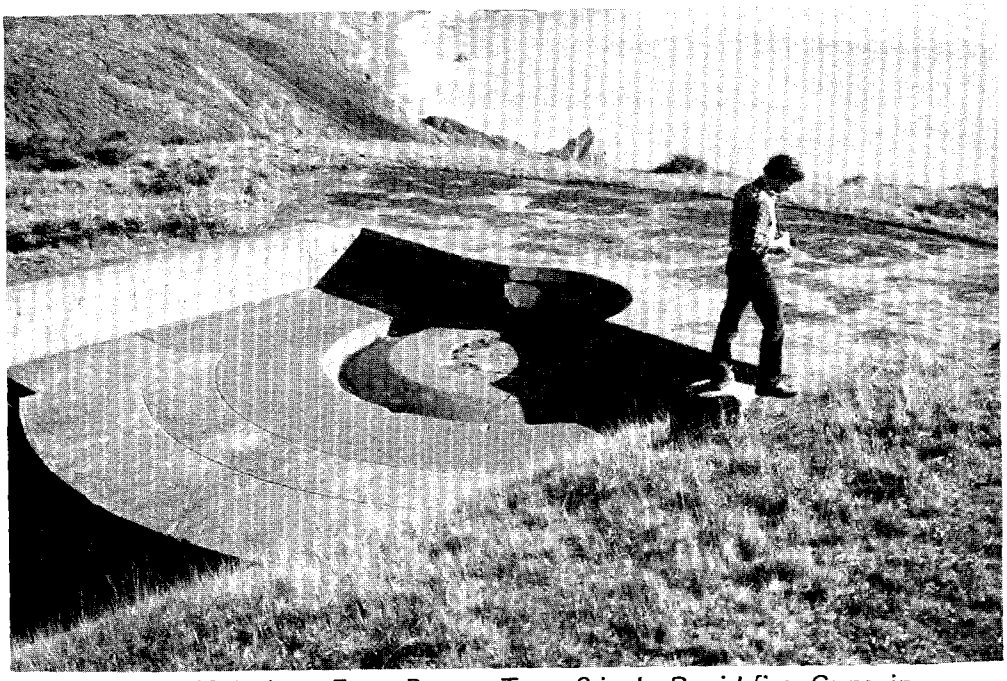
10. Battery Yates, Fort Baker, Six 3-inch Guns on Pedestal Mounts.
Constructed in the Endicott period, Yates continued to be armed (two guns only) through World War II.
Erwin N. Thompson, NPS, 1975.



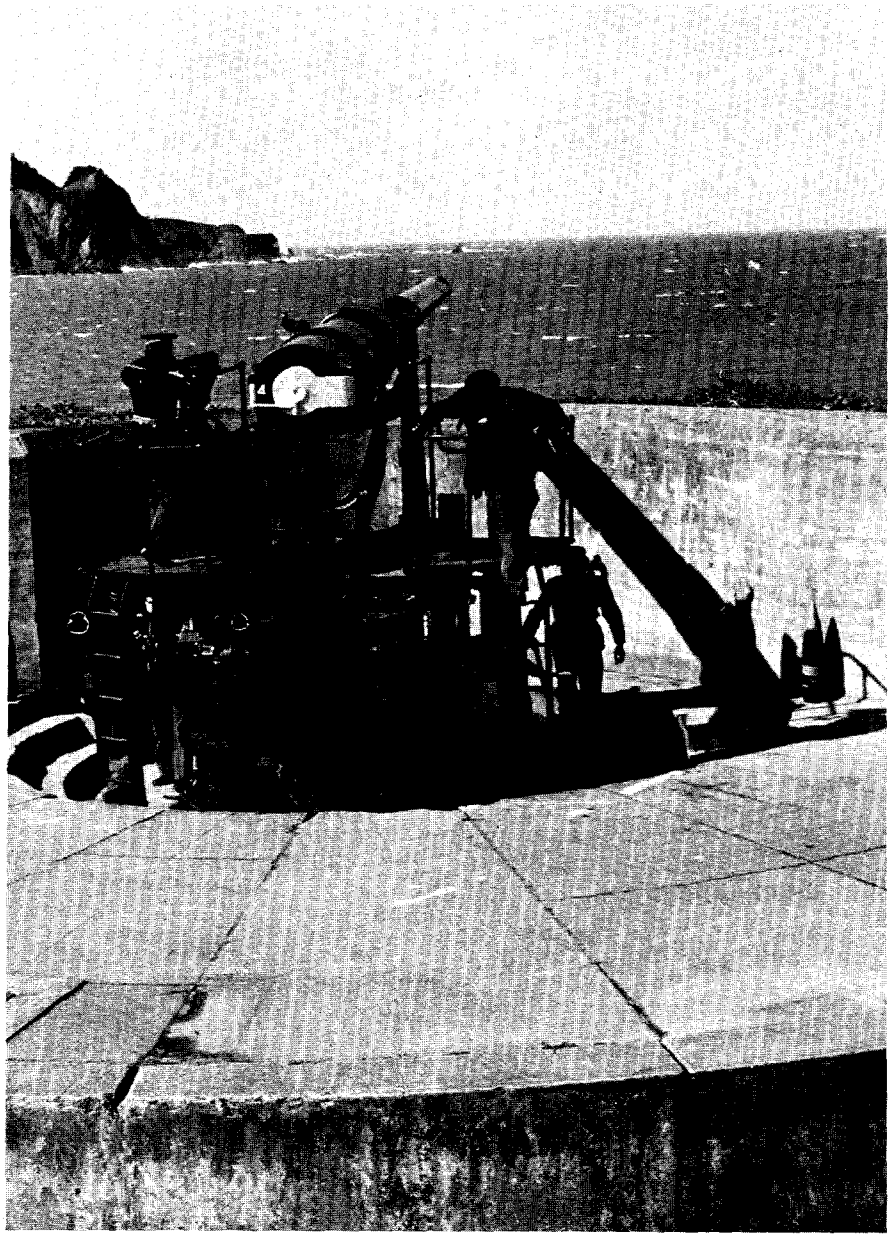
11. Battery Mendell, Fort Barry, Two 12-inch Guns on Disappearing Carriages.
It was the first gun battery to be constructed at Point Bonita. In the foreground are quarters dating from the Nike missile era.
Erwin N. Thompson, NPS, 1975.



12. Battery Kirby, Fort Baker, Two 12-inch Guns on Disappearing Carriages.
Located at near water level, its guns fired directly into the entrance of San Francisco Bay. The heavy concrete "apron" in front of the gun emplacement prevented dirt from flying, thus wrecking the parapet from the blast of the gun.
Erwin N. Thompson, NPS, 1975.



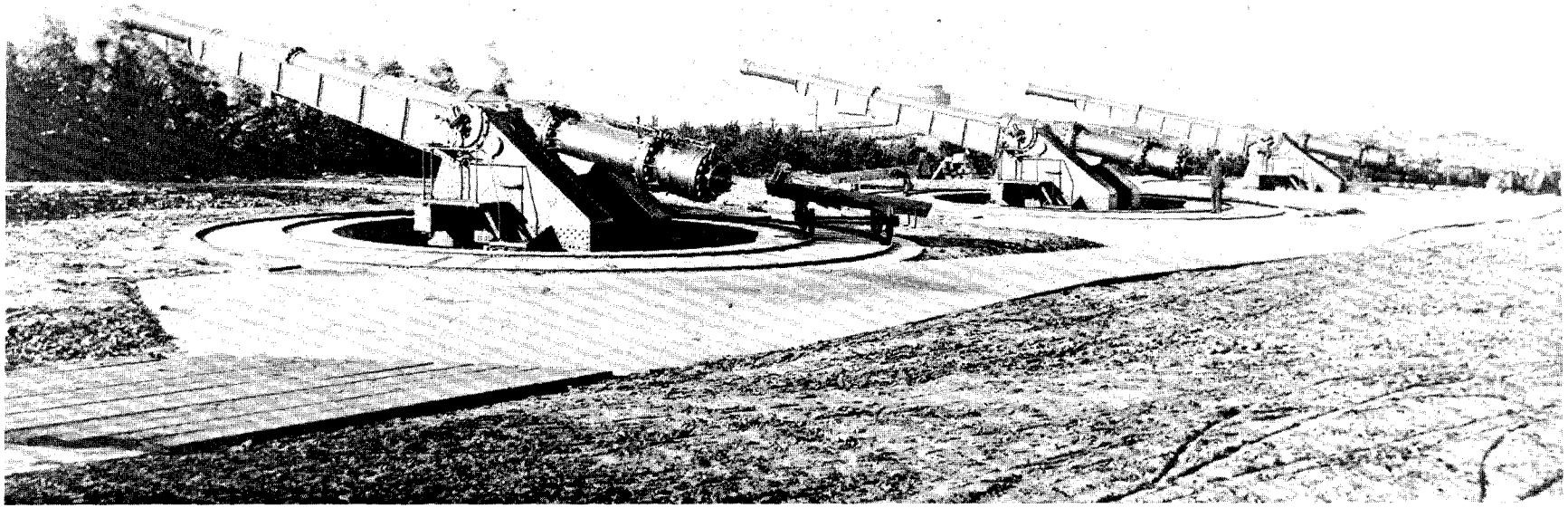
13. Battery McIndoe, Fort Barry, Two 6-inch Rapid-fire Guns in Barbette.
This battery is an excellent example of the plain but impressive architectural lines of the Endicott batteries.
Erwin N. Thompson, NPS, 1975.



14. Recently Mounted 6-inch Gun on a Disappearing Carriage at Battery Chamberlin, Fort Winfield Scott.

This is the only Endicott-period weapon currently at Golden Gate National Recreation Area. Volunteer "artillerists" carry out gun drills today.

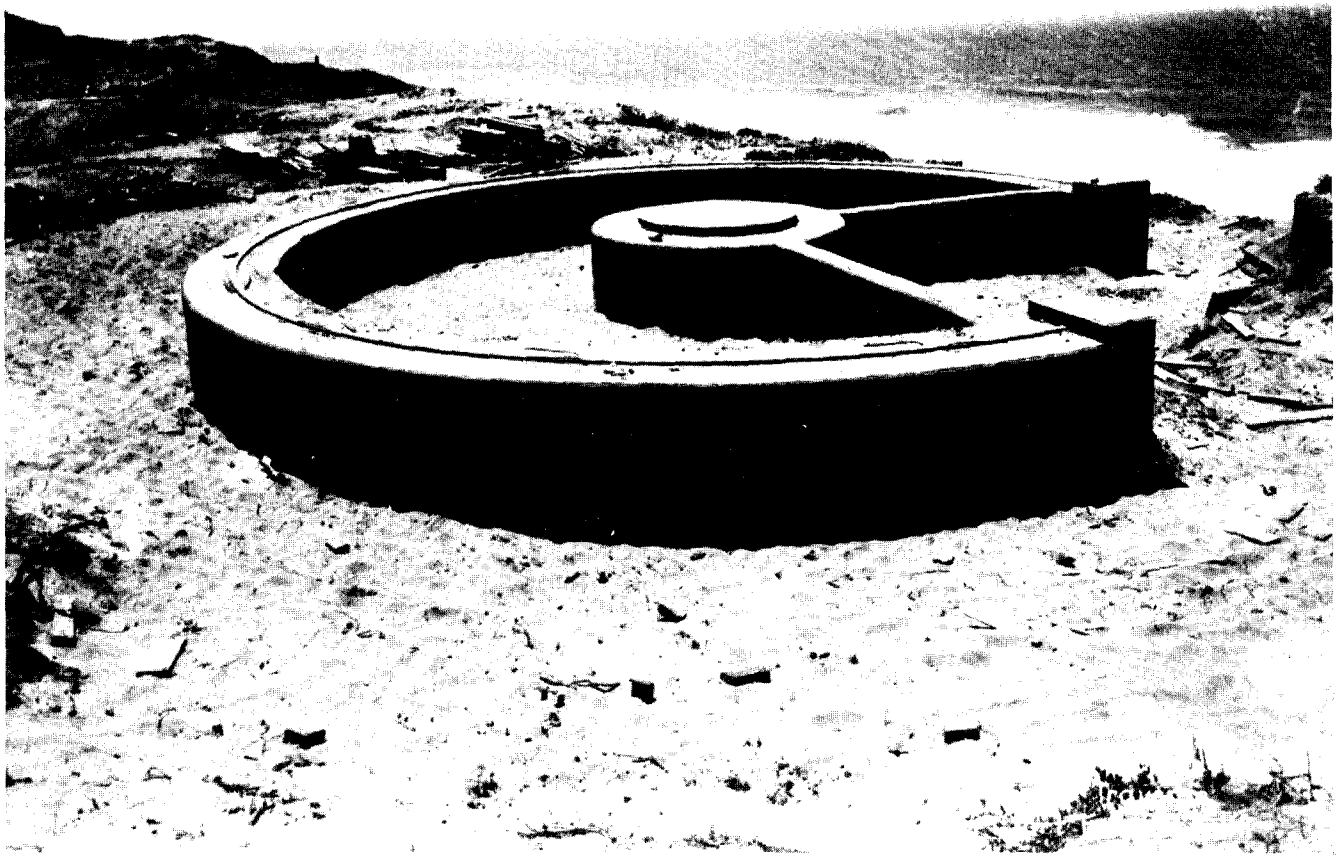
Courtesy, Golden Gate National Recreation Area, 1977.



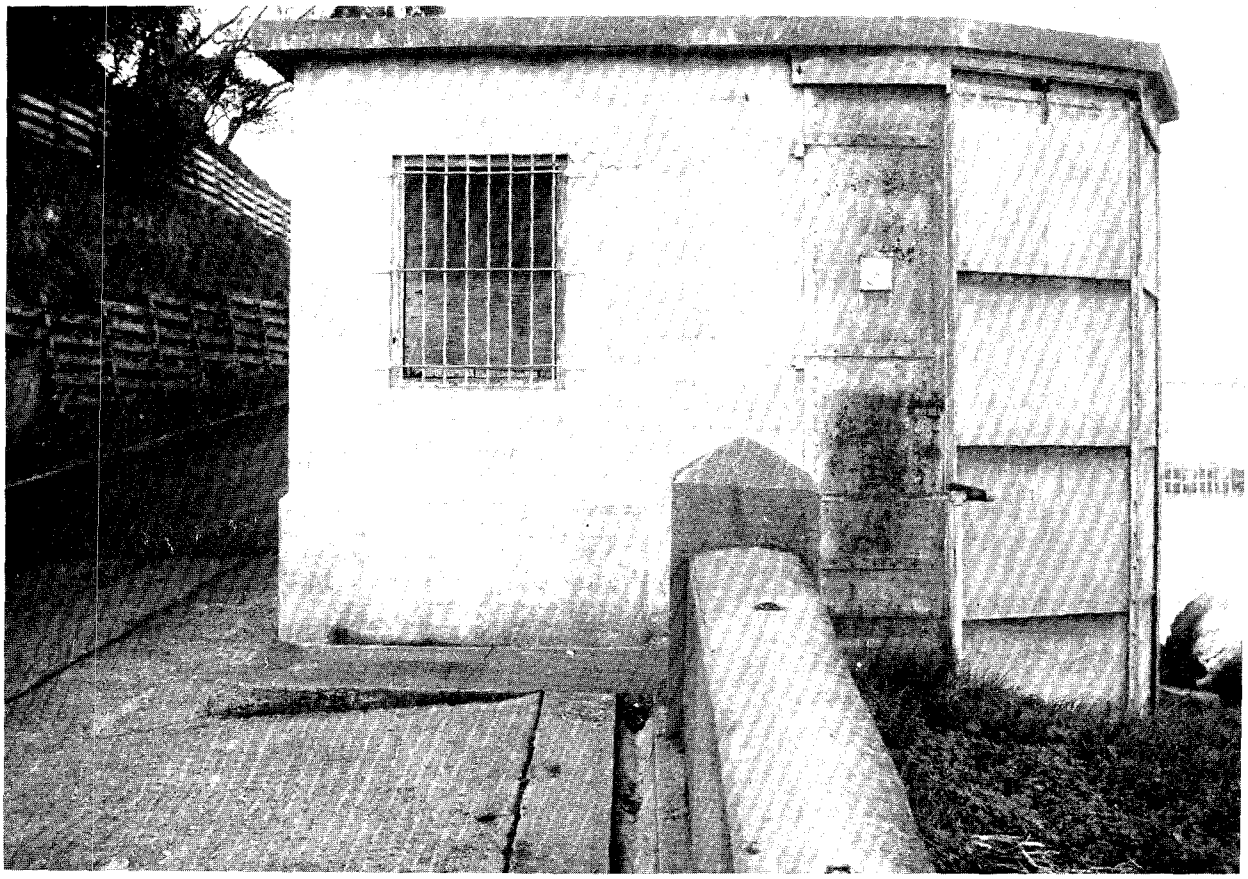
15. Three 15-inch Dynamite Guns at Fort Winfield Scott.

Only two batteries of this type were constructed in the United States, the other one being in the defenses of New York Harbor. This type of weapon, which fired a charge of dynamite by means of compressed air, was not adopted by the army. However, the engineers later constructed earthen parapets around the guns. During World War II, Dynamite Battery served as the harbor defense command post.

National Archives,
Record Group 77, Office of the Chief of Engineers.



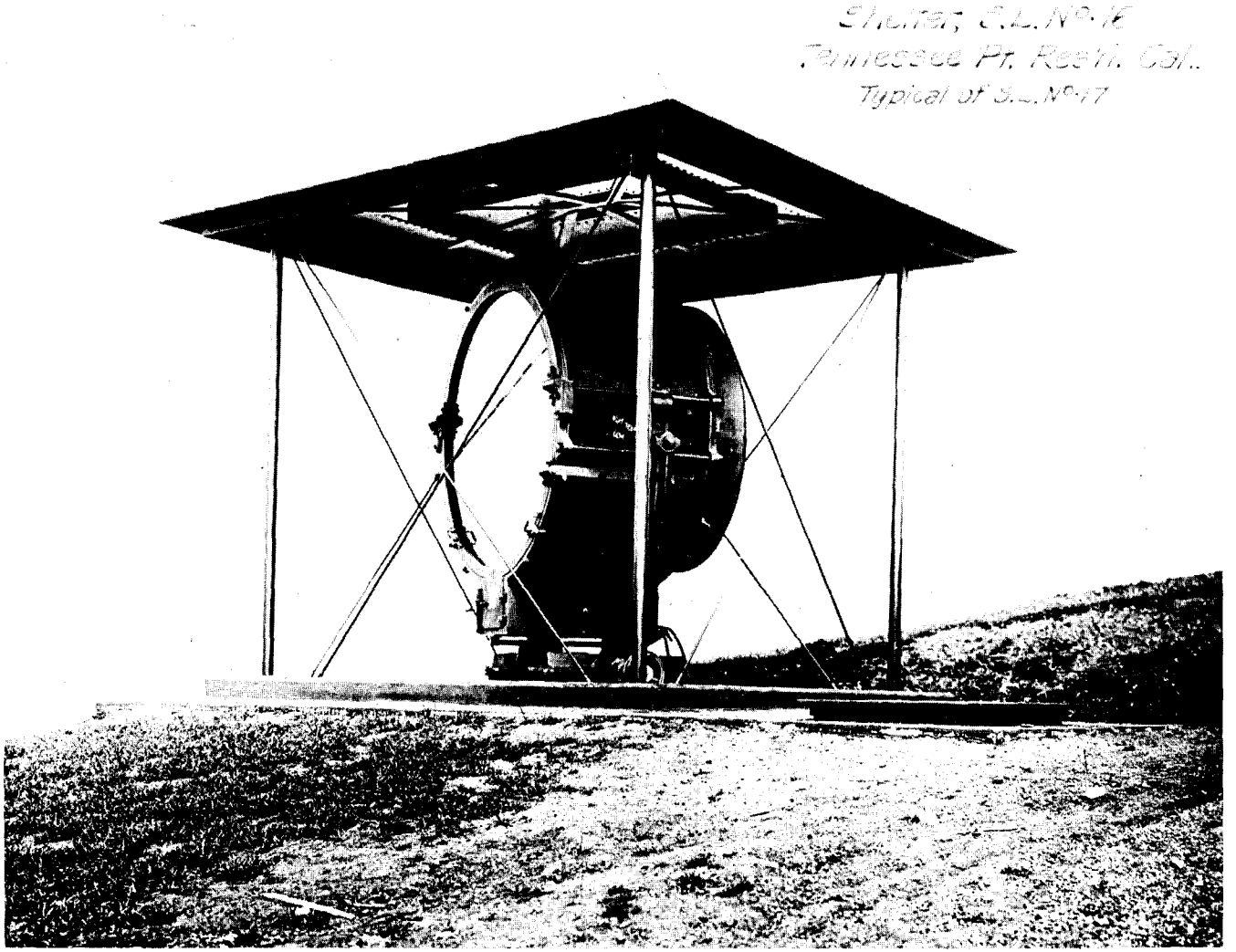
16. Panama Mount for 155-mm. Guns, Semimobile.
Four of these mounts, first designed in the Panama Canal Zone, were emplaced at Battery Bluff, Fort Funston. Only two of them remain in good condition today.
Federal Archives and Records Center, San Bruno, California,
Record Group 77, Office of the Chief of Engineers.



17. Steel Shelter for a 60-inch Seacoast Searchlight, Fort Mason.

It is the best preserved of the few such shelters that still exist.

Harold La Fleur, NPS, 1976.



18. Seacoast Searchlight, 60-inch, on Tennessee Point, Fort Cronkhite.
Mounted on an elevator, this light disappeared into a pit when not in use.
Federal Archives and Records Center, San Bruno, California,
Record Group 77, Office of the Chief of Engineers.



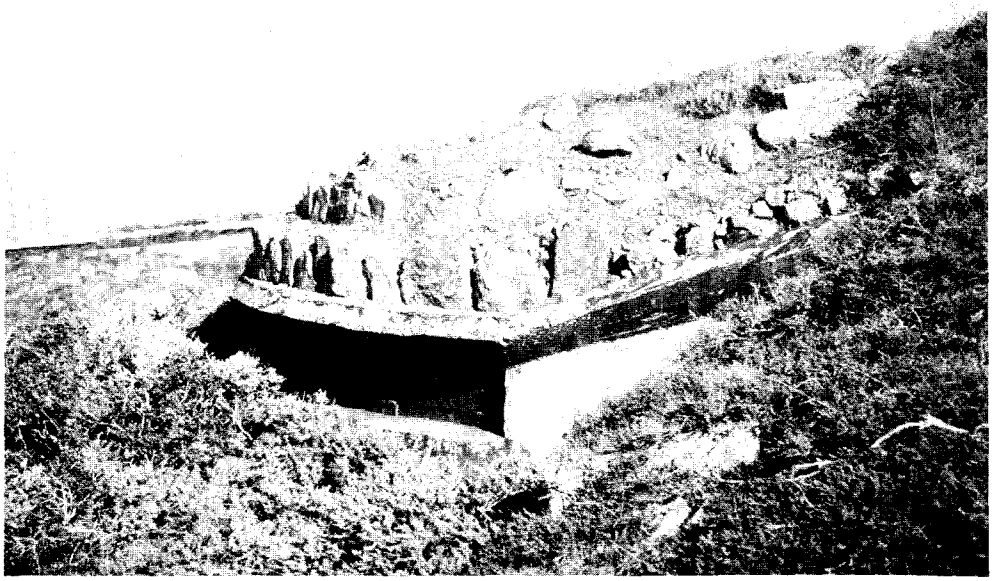
19. Gun 1, 3-inch Antiaircraft Battery, Wolf Ridge, Fort Cronkhite, 1940. San Francisco had antiaircraft defenses beginning in the 1920s. Federal Archives and Records Center, San Bruno, California, Record Group 77, Office of the Chief of Engineers.



20. The Same Antiaircraft Battery Today.

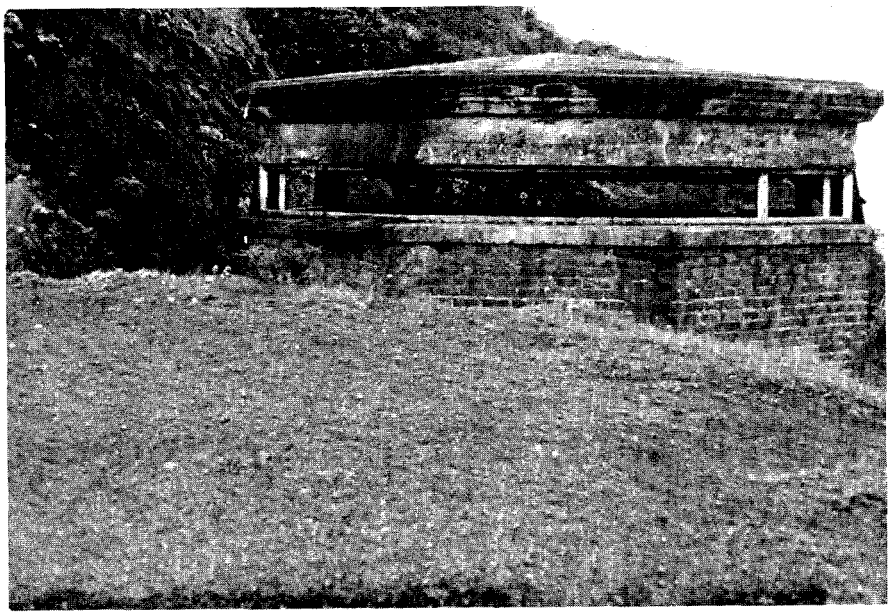
This was probably the emplacement for a height-finder instrument. The concrete-filled sandbags were added during World War II.

Harold La Fleur, NPS, 1976.

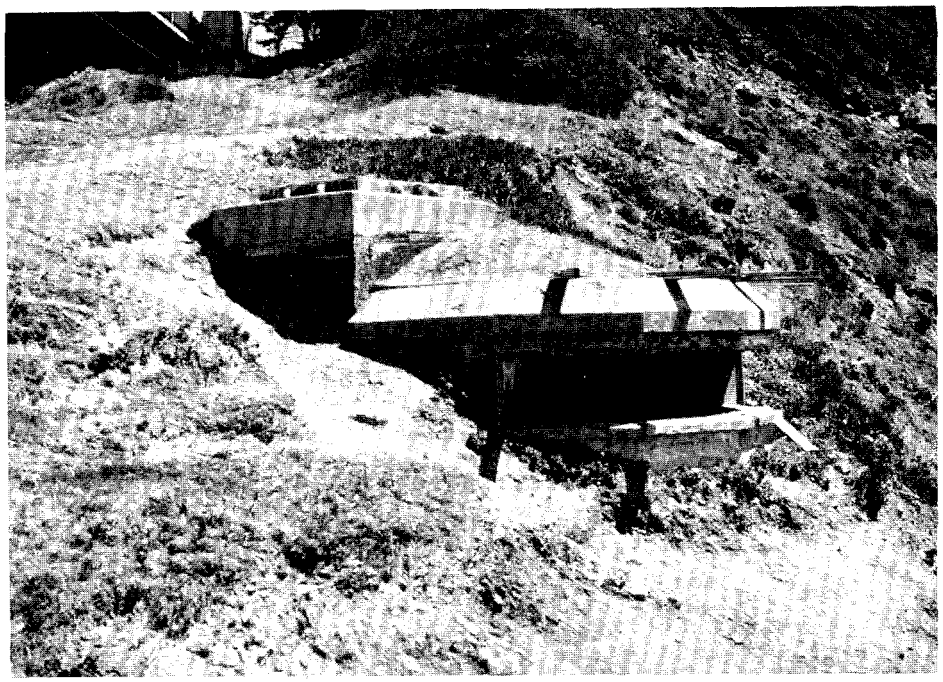


21. A Well-Camouflaged Fire Control Station, Also Located on Wolf Ridge, Fort Cronkhite.

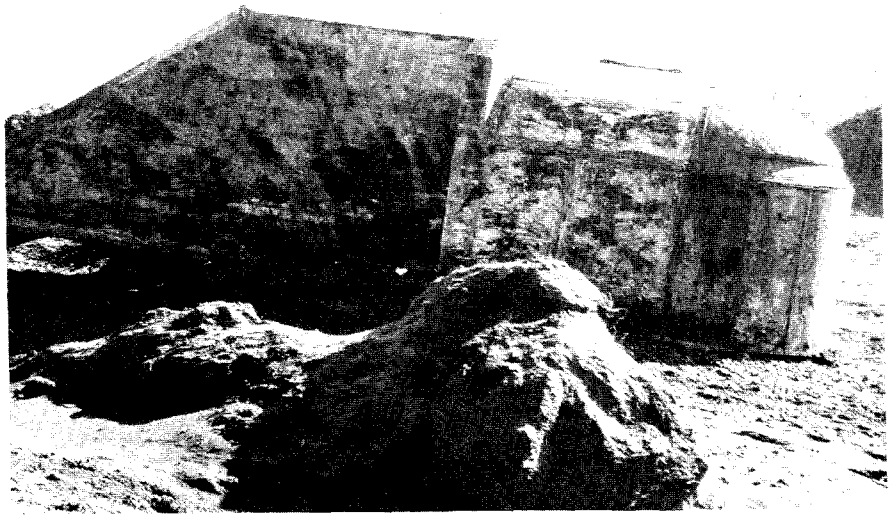
Erwin N. Thompson, NPS, 1975.



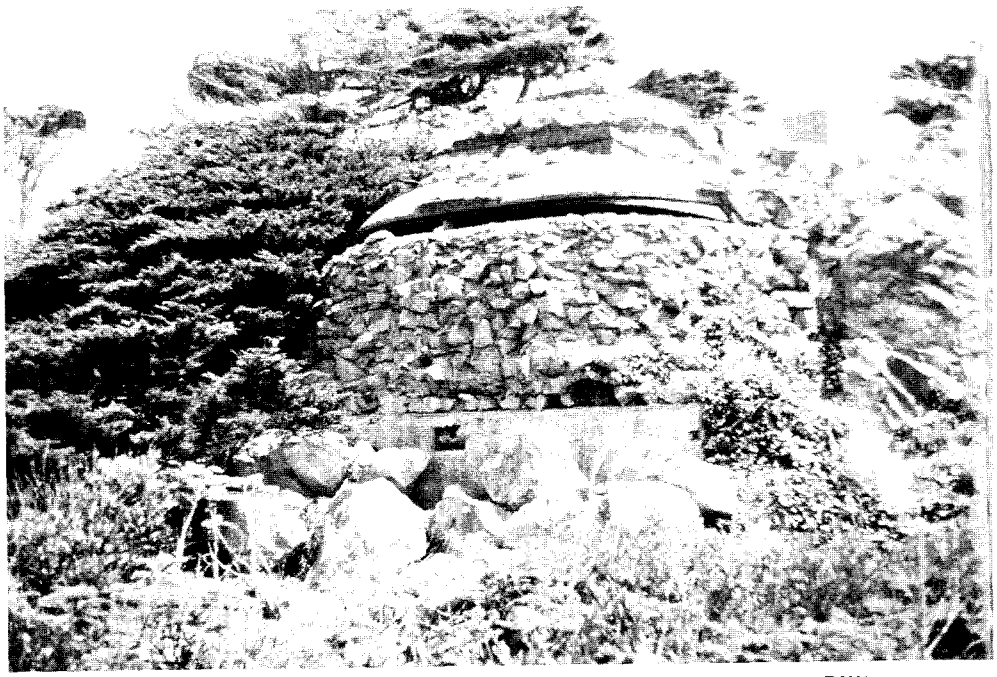
22. An Early Fire Control Station Located Below Battery Spencer on Lime Point, Fort Baker.
This is the only example of the use of brick in these stations extant at GGNRA. Difficult of access, it is highly conspicuous to persons crossing the Golden Gate Bridge.
Erwin N. Thompson, NPS, 1975.



23. A Pre-World War II Concrete Fire Control Station on Fort Point, Fort Winfield Scott.
The projecting steel rods probably held camouflage netting.
Erwin N. Thompson, NPS, 1976.



24. A World War II Pillbox Fire Control Station, Fort Funston.
This concrete and steel station has been completely uncovered due to erosion of sand dunes.
Erwin N. Thompson, NPS, 1975.



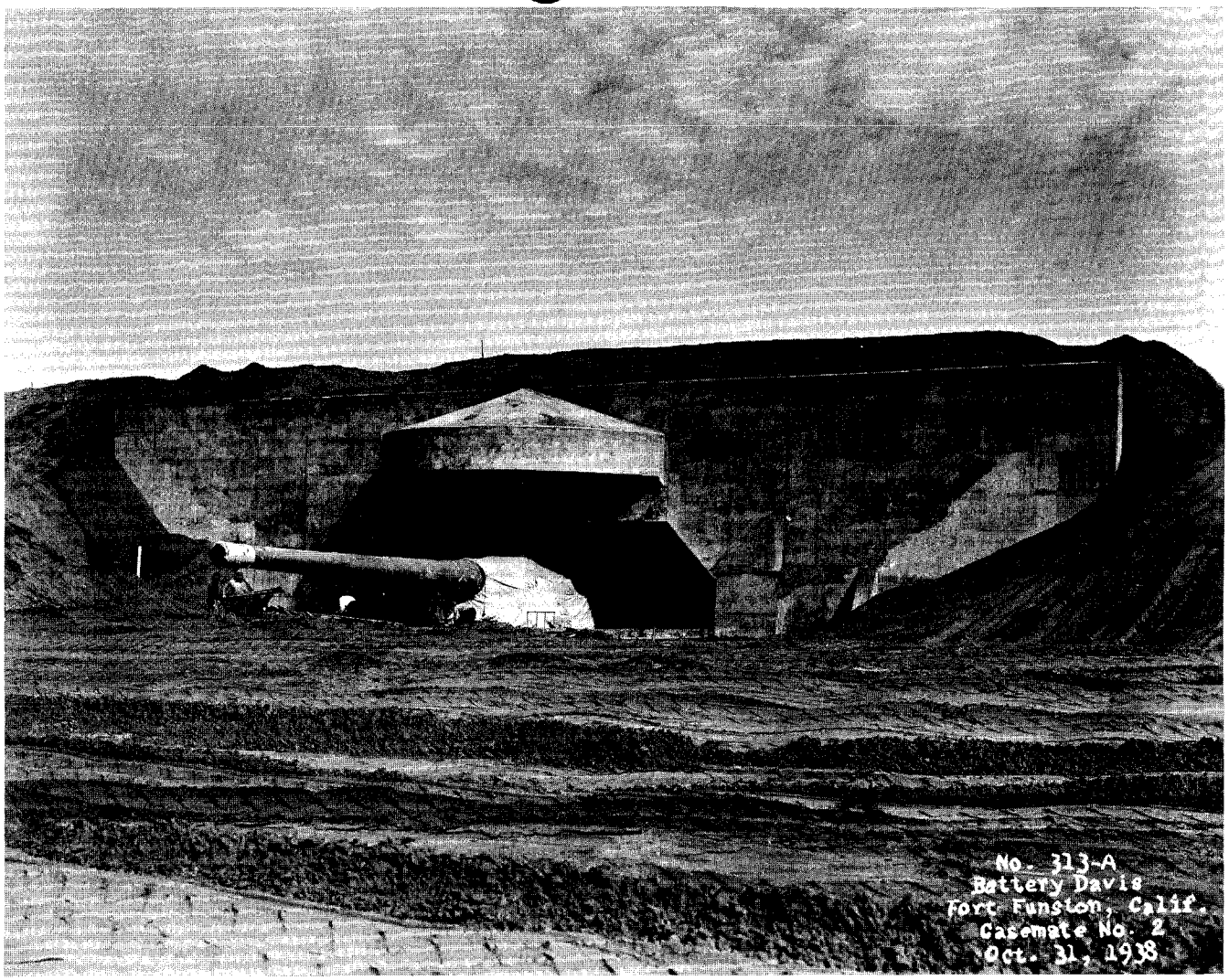
25. Two Superbly Camouflaged Fire Control Stations, Pillbox, Located on the Parapet at Sutro Heights.
Erwin N. Thompson, NPS, 1975.



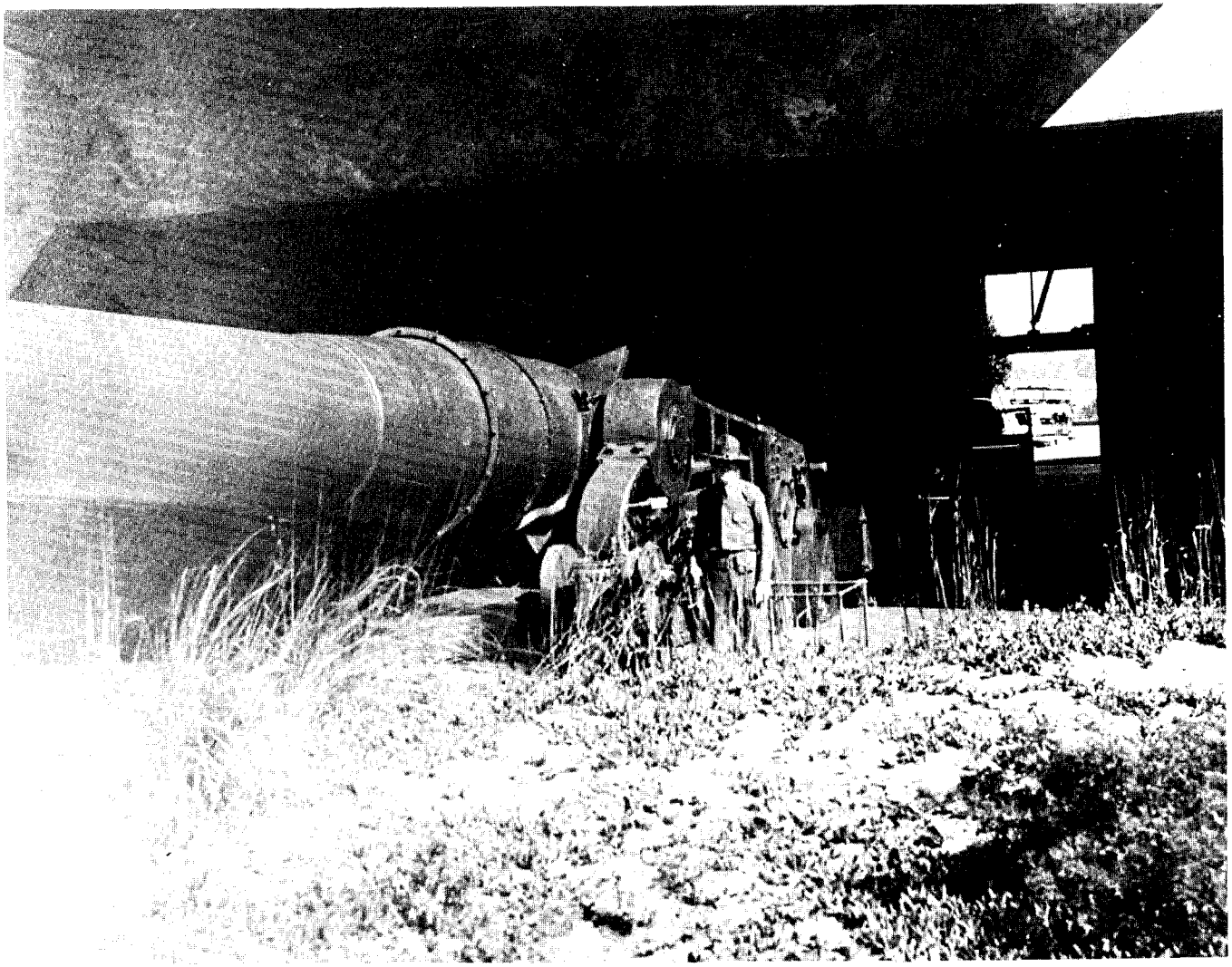
26. Point Bonita, North Side of the Golden Gate.
On the lower, foreward shelf are two pre-World War II fire control stations. Behind and above them is a steel shelter for a 60-inch seacoast searchlight. Behind it is Point Bonita lighthouse. This complex may be reached by a tunnel and a suspension bridge. It is not currently open to public visitation.
National Archives, Audiovisual Archives Division, 80-G-71868-2, (photograph taken from a warship).



27. Constructing the Massive Casemate for 16-inch Gun 1 at Battery Davis, Fort Funston.
At Davis the two guns were mounted before the casemates were built. The plans for these casemates were the prototype for such works in the United States.
Federal Archives and Records Center, San Bruno, California,
Record Group 77, Office of the Chief of Engineers.



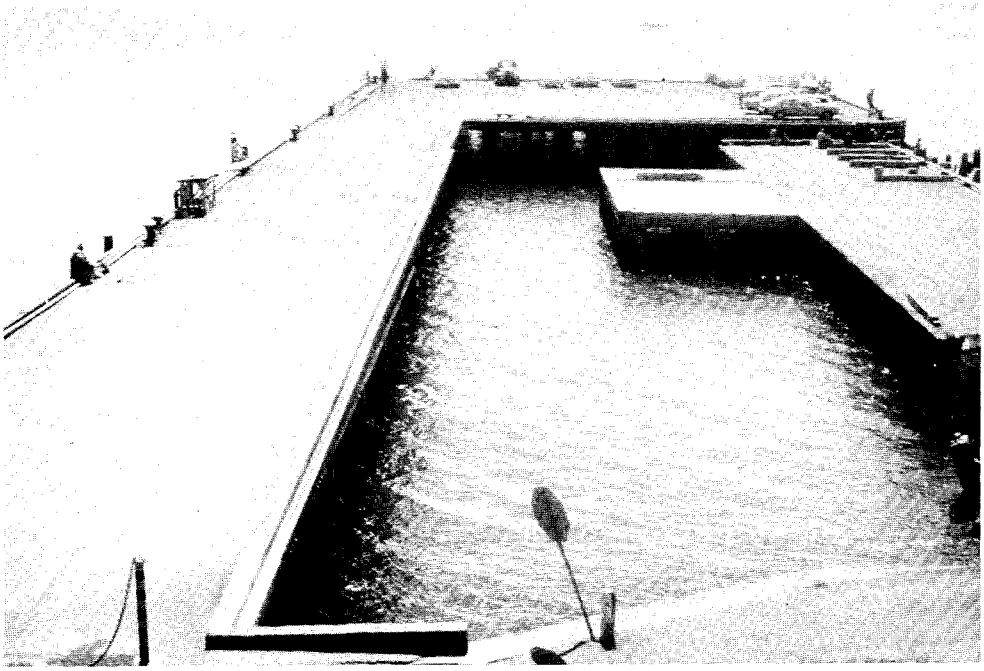
28. Backfilling at Gun 2, Battery Davis, Fort Funston.
Later elaborate landscaping was carried out both for erosion control of the sand dunes and for protective concealment.
Federal Archives and Records Center, San Bruno, California,
Record Group 77, Office of the Chief of Engineers.



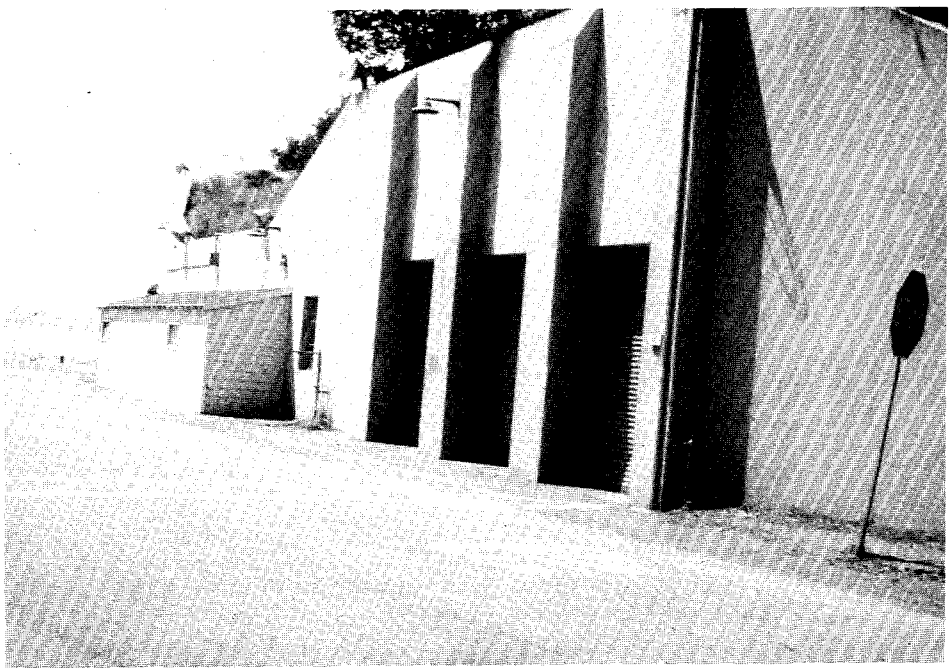
29. One of the Two 16-inch Guns at Battery Davis, Fort Funston.
Later a steel shield was placed around the gun tube completely covering the opening of the casemate.
Federal Archives and Records Center, San Bruno, California,
Record Group 77, Office of the Chief of Engineers.



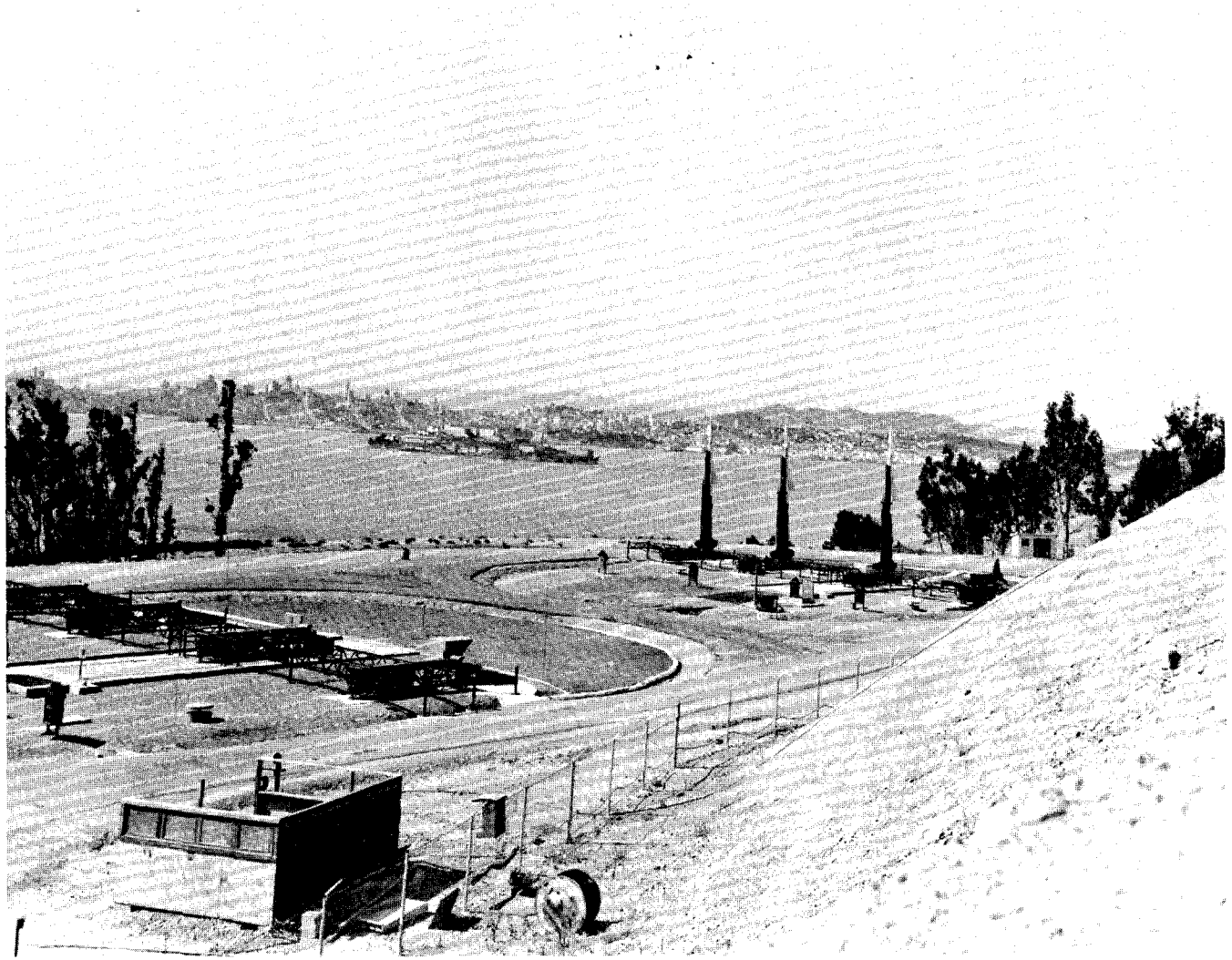
30. Test Firing a 16-inch Gun at Battery Townsley, Fort Cronkhite.
Due to its more isolated location, this battery was used in gun drill much more often than Battery Davis.
Federal Archives and Records Center, San Bruno, California,
Record Group 77, Office of the Chief of Engineers.



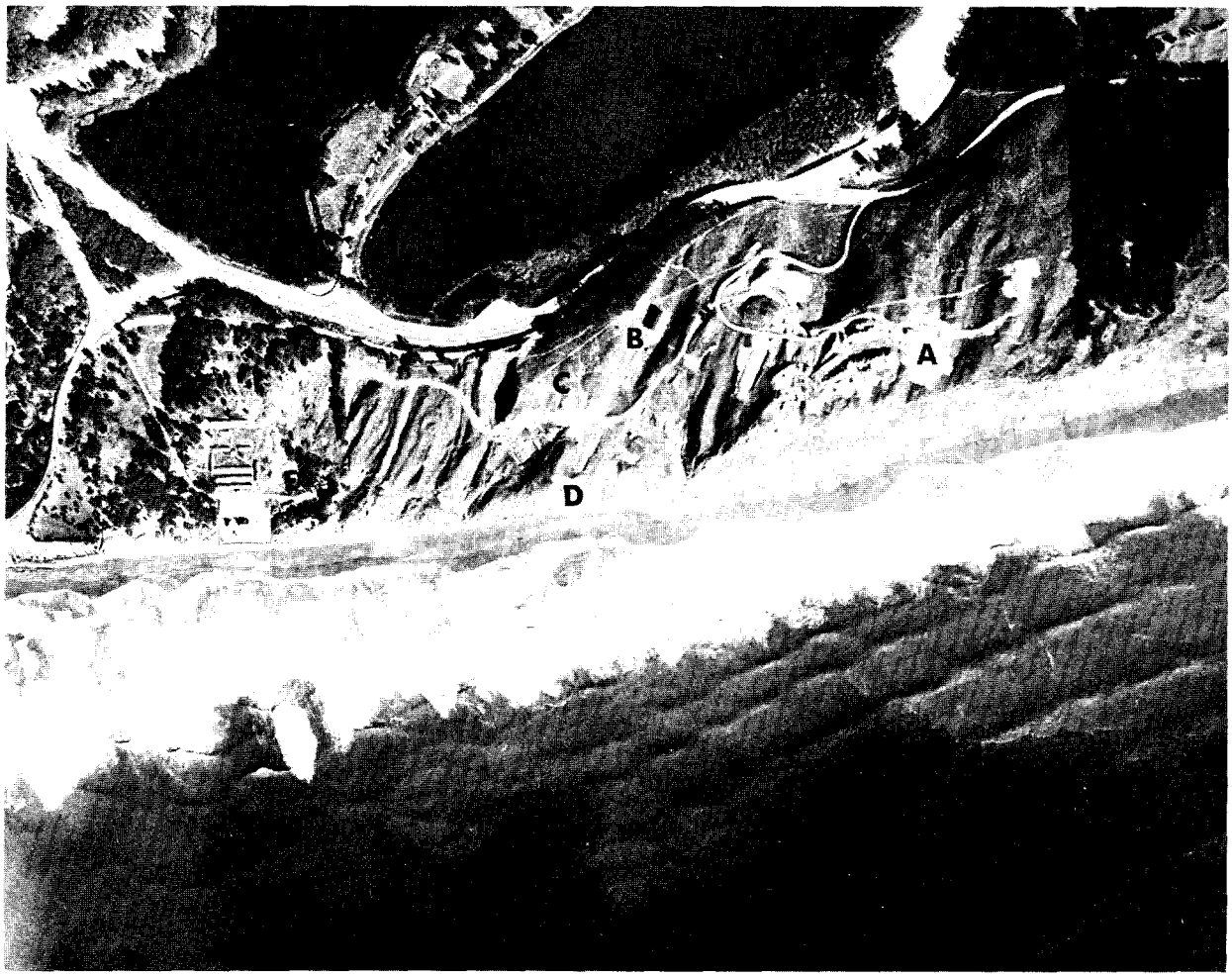
31. Mine Depot, Wharf, Fort Baker.
It was constructed on the eve of World War II to supplement the mine depots at Fort Winfield Scott and Yerba Buena Island.
Erwin N. Thompson, NPS, 1975.



32. Mine Loading Rooms, Mine Depot, Fort Baker.
Here the explosives were placed in the submarine mines just prior to their being taken out to the minefields.
Erwin N. Thompson, NPS, 1975.



33. Nike Missile Battery, Angel Island.
Although not strictly seacoast defenses, the missile batteries marked the end of locally situated defenses of San Francisco Bay.
Courtesy, Dr. Elliott Evans, Orinda, California.



34. Aerial Photograph of Fort Funston, 1937.

A. Battery Davis, under construction, two 16-inch guns
B. Balloon hangar
C. Antiaircraft gun battery, three 3-inch guns
D. Battery Bluff, four 155-mm. guns (first location)
E. Battery Howe, four 12-inch mortars

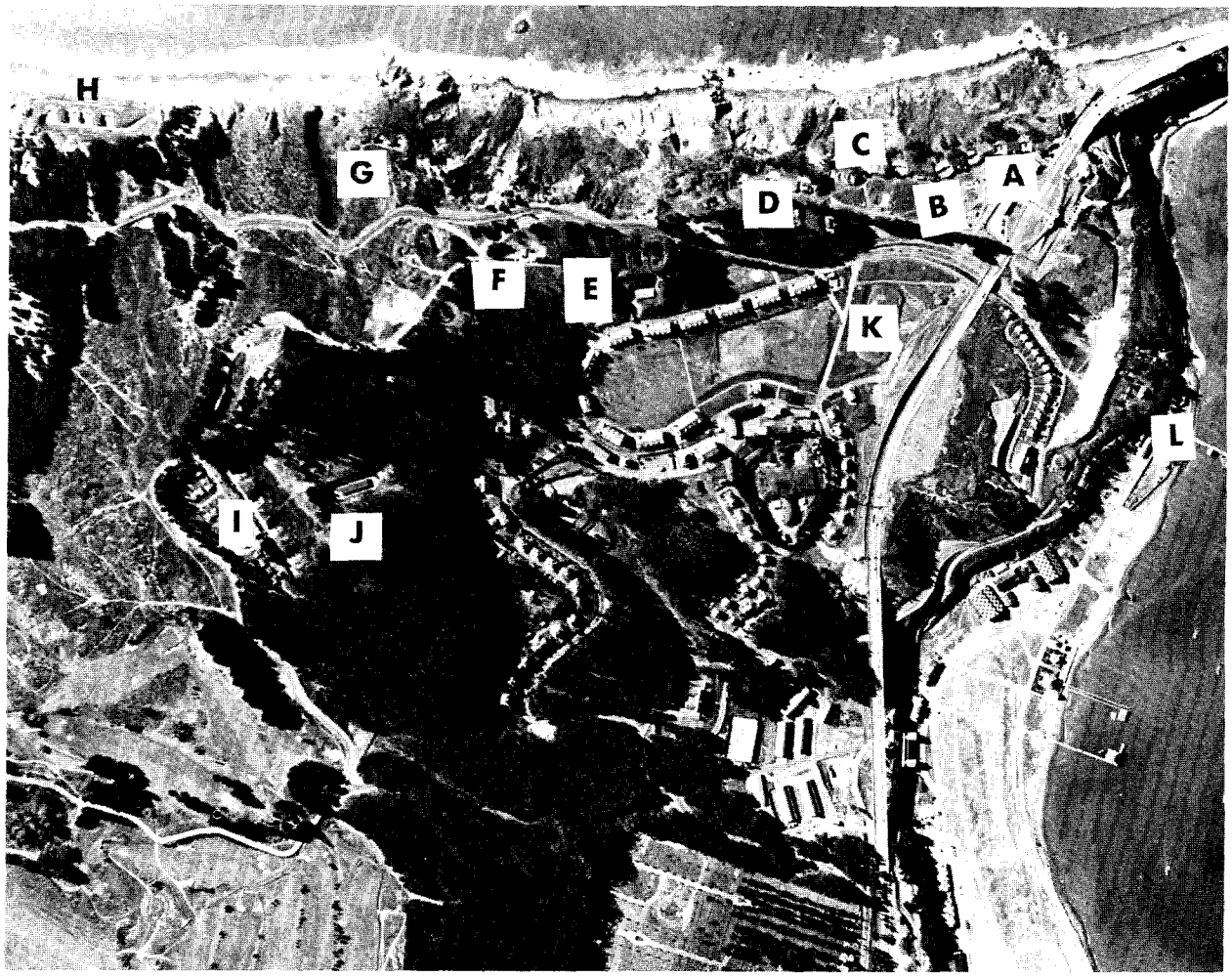
Federal Archives and Records Center, San Bruno, California,
Record Group 77, Office of the Chief of Engineers.



35. Aerial Photograph of Fort Miley, 1937.

A. Battery Chester, three 12-inch guns
B. Battery Call, two 5-inch guns
C. Future site, Battery Construction 243, two 6-inch guns
D. Batteries Livingston and Springer, 12-inch mortars
E. Point Lobos
F. Lands End

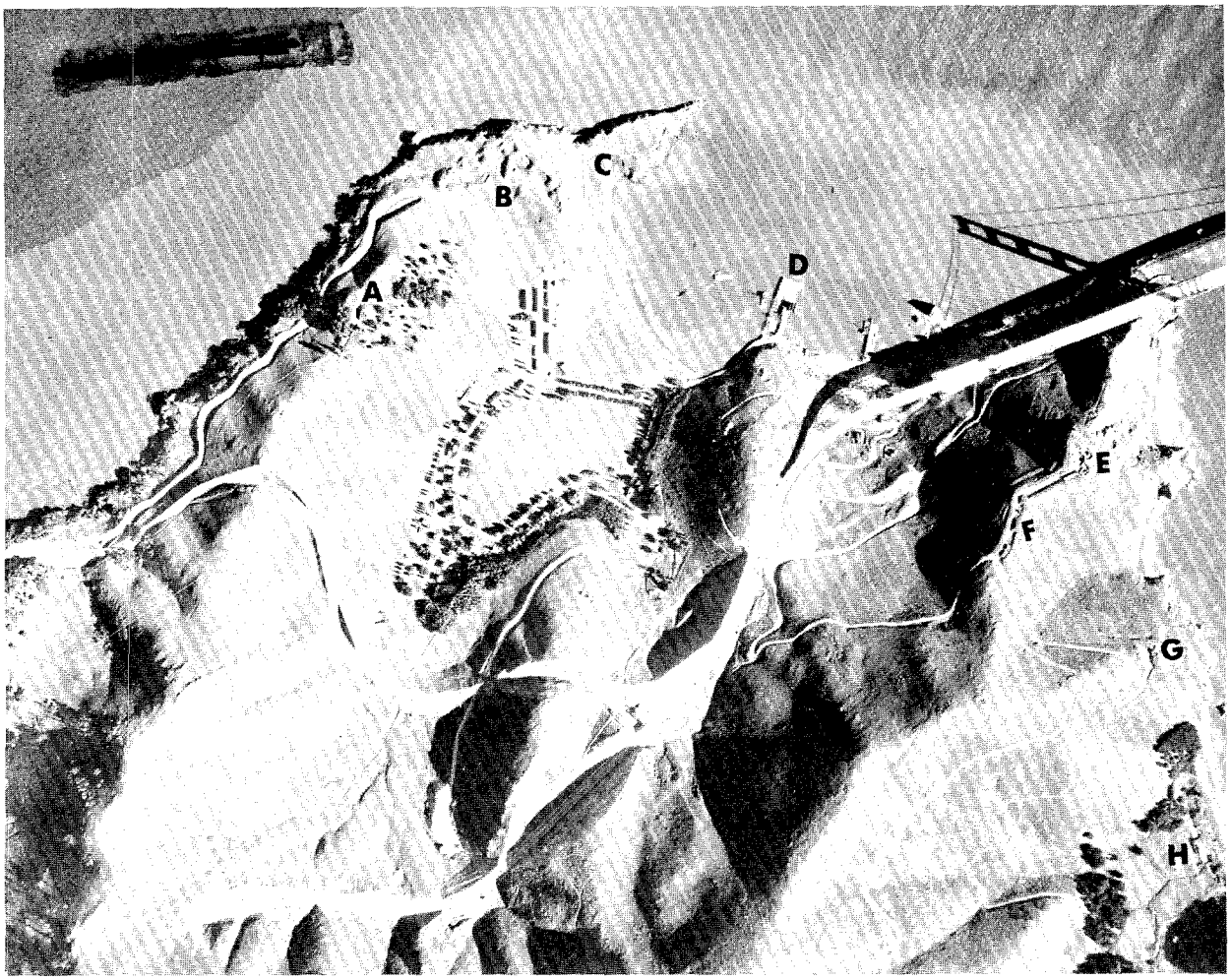
Federal Archives and Records Center, San Bruno, California,
Record Group 77, Office of the Chief of Engineers.



36. Aerial Photograph of Fort Winfield Scott, 1937.

A. Battery Cranston, two 10-inch guns
B. Battery Marcus Miller, three 10-inch guns
C. Battery Boutelle, three 5-inch guns
D. Battery Godfrey, three 12-inch guns
E. Battery Dynamite, three 15-inch guns
F. Battery Saffold, two 12-inch guns
G. Battery Crosby, two 6-inch guns
H. Battery Chamberlin, four 6-inch guns
I. Batteries Stotsenburg and McKinnon, 12-inch mortars
J. Central Reserve Magazine
K. Formerly Batteries Howe and Wagner, 12-inch mortars
L. Mine Depot

Federal Archives and Records Center, San Bruno, California, Record Group 77, Office of the Chief of Engineers.



37. Aerial Photograph of Fort Baker, 1937.

A. Battery Duncan, two 8-inch guns
B. Cavallo Battery, four 15-inch Rodmans
C. Battery Yates, six 3-inch guns
D. Mine Depot Wharf
E. Battery Spencer, three 12-inch guns
F. Ridge Battery, four 15-inch Rodmans
G. Battery Orlando Wagner, two 5-inch guns
H. Battery Kirby, two 12-inch guns

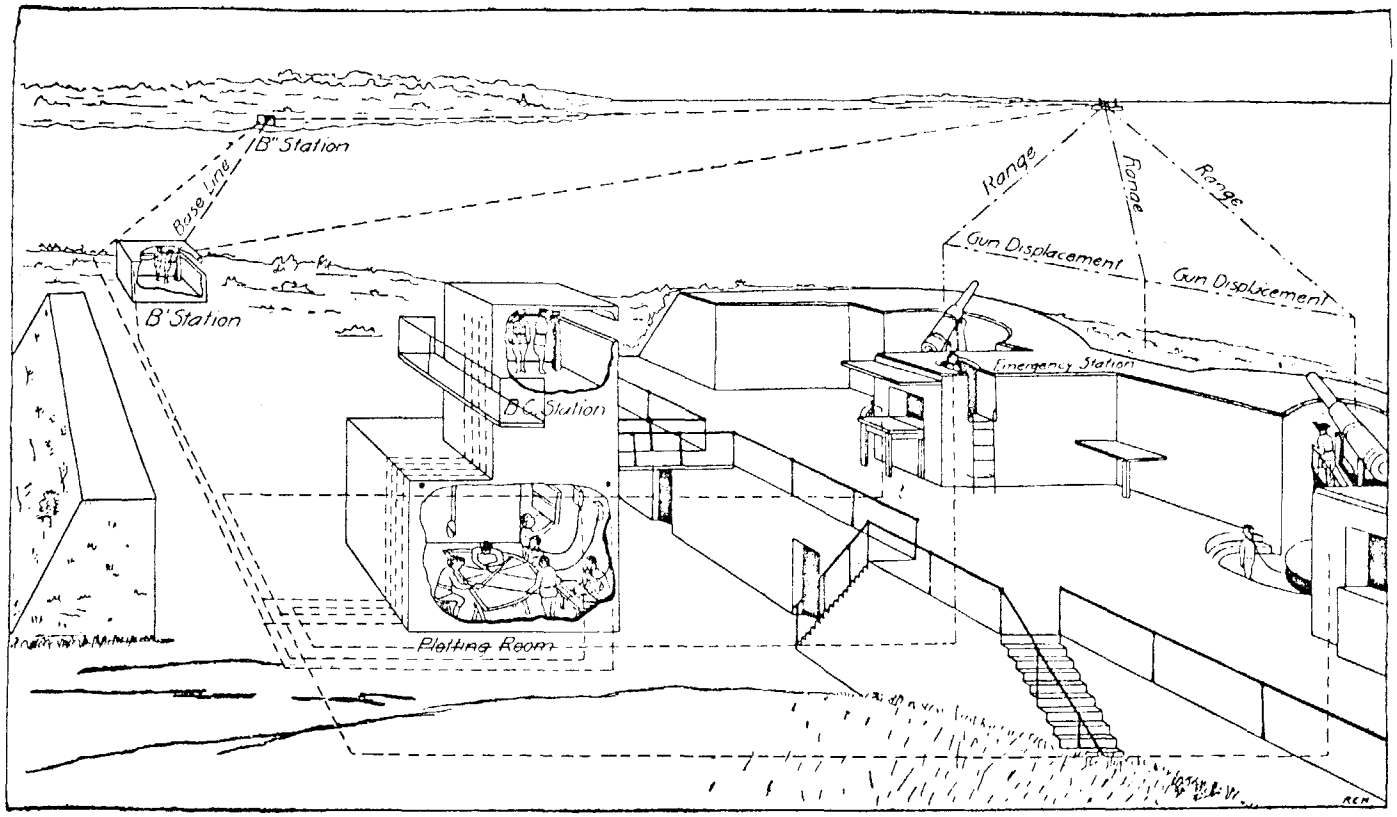
Federal Archives and Records Center, San Bruno, California,
Record Group 77, *Office of the Chief of Engineers.*



38. Aerial Photograph of Fort Barry, ca. 1937.

A. Battery Wallace, two 12-inch guns
B. Battery Alexander, 12-inch mortars
C. Batteries Guthrie and Smith, four 6-inch guns
D. Battery Patrick O'Rorke, four 3 inch guns
E. Battery Mendell, two 12-inch guns

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39. A Sketch Showing How Fire Control is Coordinated.

From *The R.O.T.C. Manual, Coast Artillery, Basic,* p. 15.



40. Six-inch Gun, Battery Chamberlin, ca. 1905.

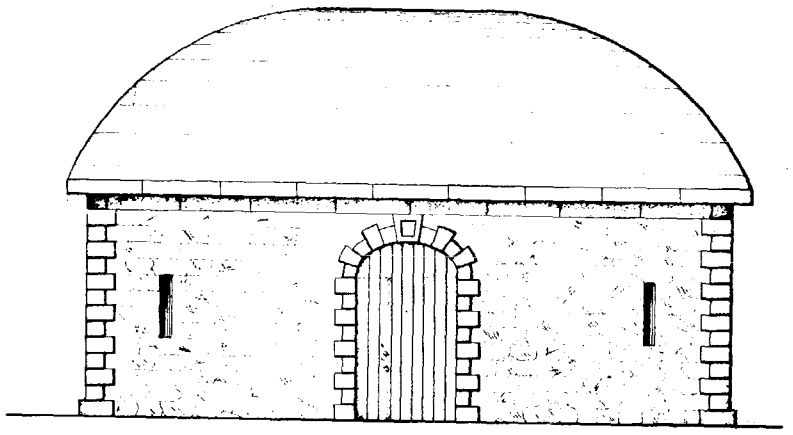
HISTORIC DRAWINGS

No. 1 Powder Magazine, Presidio of San Francisco, 1863
No. 2. Cavallo Battery, Lime Point, 1872
No. 3. Cliff and Ridge Batteries, Lime Point, 1892
No. 4A. Blasting at Lime Point, 1868-69
No. 4B. Fortifications for Lime Point, 1867
No. 5. Mortar Batteries Livingston and Springer, Fort Miley, 1899
No. 6. Battery O'Rorke, Fort Barry, 1904
No. 7. Battery Boutelle, Fort Winfield Scott, 1915
No. 8. Battery Chamberlin, Fort Winfield Scott, 1924
No. 9. Battery Duncan, Fort Baker, 1915
No. 10. Battery Marcus Miller, Fort Winfield Scott, 1913
No. 11. Battery Kirby, Fort Baker, 1910
No. 12. Battery Davis, Fort Funston, 1937
No. 13. Dynamite Battery, Fort Winfield Scott, 1900
No. 14. Ammunition Storage, Battery Marcus Miller, Fort Winfield Scott, 1896
No. 15. Ammunition Storage, Batteries Howe and Wagner, 1896
No. 16. Old Mining Casemate, Bakers Beach, Fort Winfield Scott, 1912
No. 17. Fort Funston, Ca. 1938
No. 18. Fort Miley, 1914
No. 19. Fort Baker, Ca. 1930s
No. 20. Fort Barry, 1972
No. 21. Fort Cronkhite, 1972

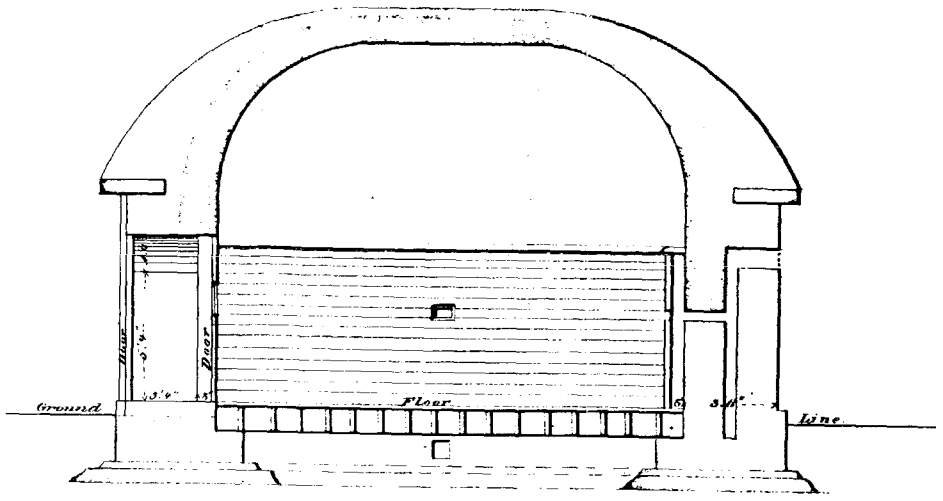
No. 1. Powder Magazine Built at the Presidio of San Francisco During the Civil War.

It still survives but with a different roof arrangement.

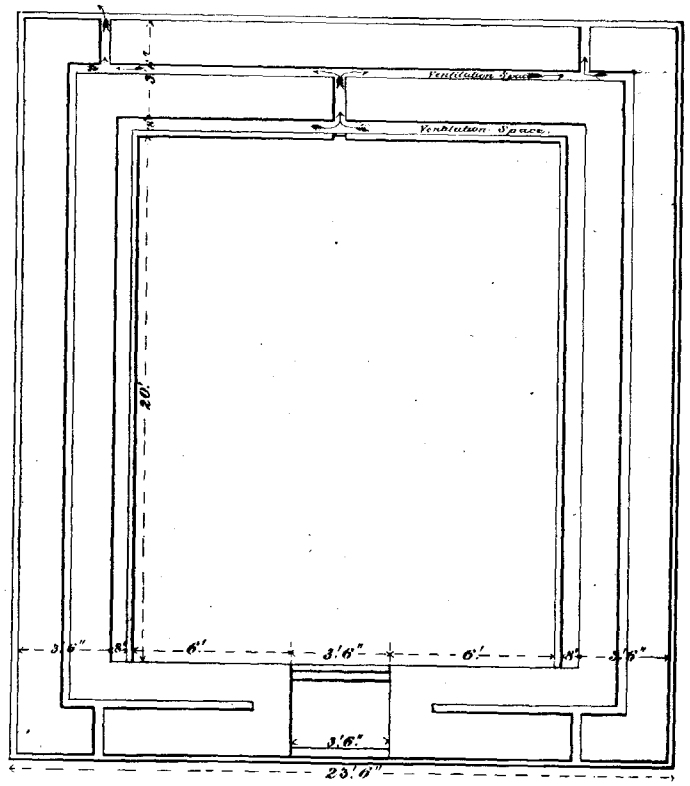
National Archives,
Cartographic Archives Division,
Record Group 92,
No. 42-5, Presidio No. 11.



Elevation.



Section.



Plan.

Location. 3 Miles Northwest of San Francisco.
Capacity. See Dimensions of Plan.
Materials. Rough-hewn stone Masonry
Roof. Stone mixed with Cement.
Built. Summer 1863.
Occupied. October 1st 1863.
Condition. Good.

CALIFORNIA

PRESIDIO

Latitude 37°.48' N, Longitude 122°.21' W.

MAGAZINE

Approved by the Sec'y of War.

DRAWING NO. 1

Copied from drawing on file in O.M.G.O. by C. Jacobsen. Aug. 31st 1872.

No. 2. Cavallo Battery, Lime Point, Constructed in the Early 1870s for 15-inch Rodmans.

This handsome earthen fort and its outwork was built by George Mendell, one of the better known army engineers at San Francisco. Kings depressing carriage, mentioned on the drawing, was not adopted by the army.

National Archives,
Cartographic Archives Division,
Record Group 77,
Dr. 101, Sht. 8.

April 8th 1872
Sent to Chief of Engineers with
Report of Board of this date.

DRAWING NO 2

Ver 1942

Revised Plan
of the Battery at
Point Cavallo.
San Francisco Harbor
California
giving Spaces between Traverses to admit
Kings Depressing Carriage
Should its introduction be expedient
Proposed by the
Board of Engineers for Fortifications
March 1872.

283 2 1872

Gen'l M. Meigs
Col. Corps Engrs. U.S.A.

D. B. Sowter
Lt Col Engrs & Asst Insp. Gen'l

H. G. Wright
Bvt Brig. Gen'l & Col Corps Engrs

Rep'y dated Foreign Engr Dept &c
Maj Gen'l Halleck with Letter
of April 23 1872 — H. Ellis.

Scale 50 0 50 100 200 300 400 500 600 feet

Section of Parapet showing proposed arrangement
of parade platforms and barrel platform, to give greater cover
Red line shows section adopted in Kings Carriage

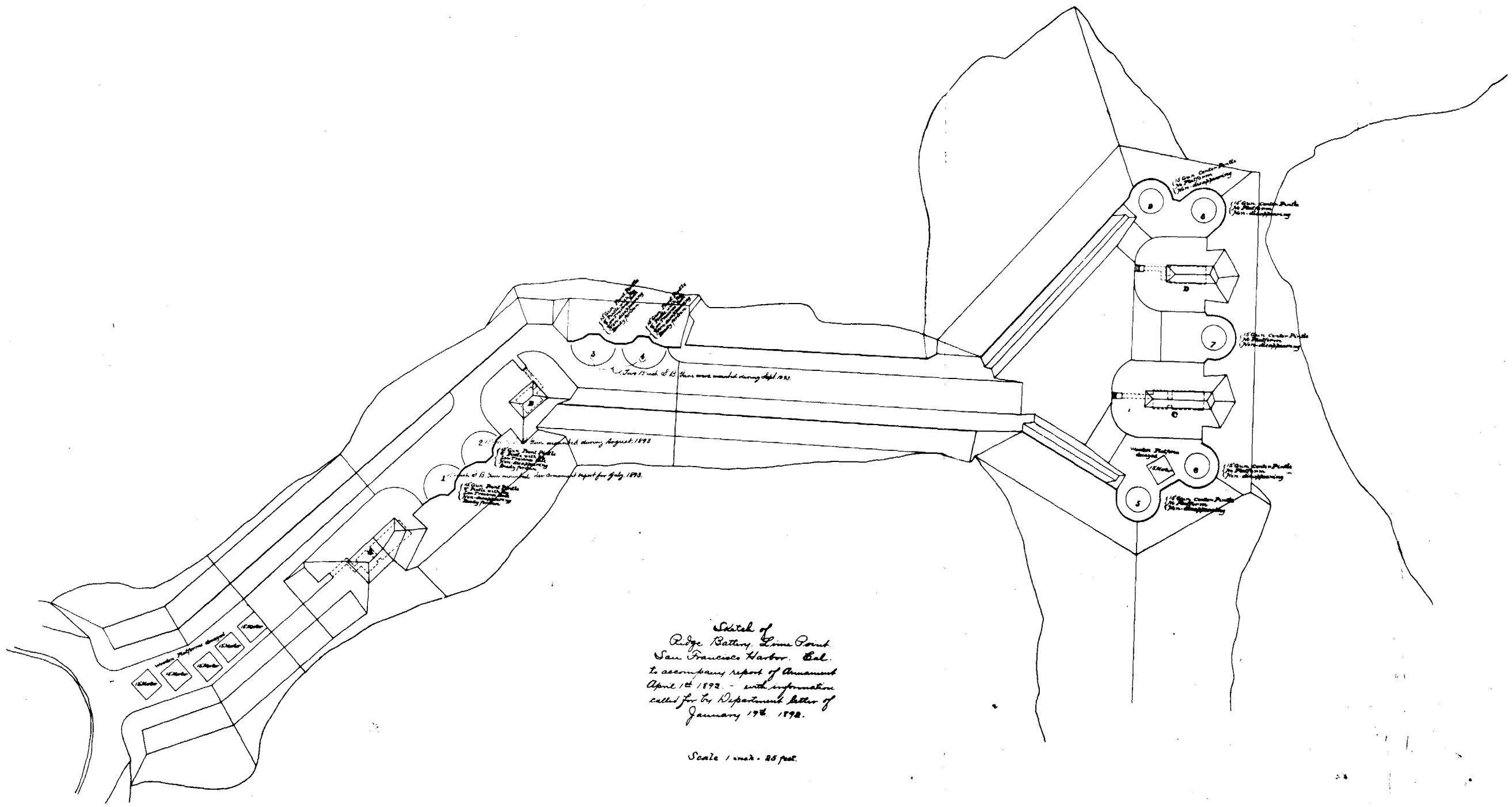
Sheet 8.

161-5

No. 3. Other Post-Civil War Works Built by Colonel Mendell: Cliff Battery on the Right and Ridge Battery on the Left, Designed for 15-inch Rodmans and 13-inch Seacoast Mortars.

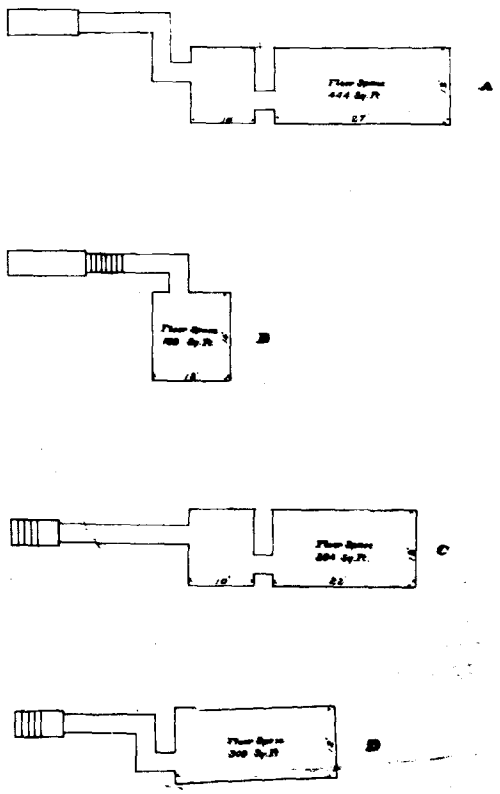
Rodmans were mounted only in Ridge Battery but not until the 1890s. The gun emplacements and magazines of Ridge Battery still survive.

National Archives,
Cartographic Archives Division,
Record Group 77,
Dr. 256, Sht. 8.



Sketch of
Ridge Battery, Lime Point
San Francisco Harbor Cal.
to accompany report of Armament
April 1st 1892. - with information
called for by Department letter of
January 19th 1892.

Scale 1 inch - 25 feet.



DRAWING NO. 3

No. 4A. Plans of Colonel Mendell's Blasting with Gunpowder at Lime Point, 1868-69.

This was the largest blasting effort made by army engineers up to that date for fortification purposes. The uncompleted project called for blasting away the cliff so as to make a water-level platform for casemated works.

National Archives,
Cartographic Archives Division,
Record Group 77,
Dr. 100, Sht. 18.

Drawer 100.
Sheet 18.

SKETCH

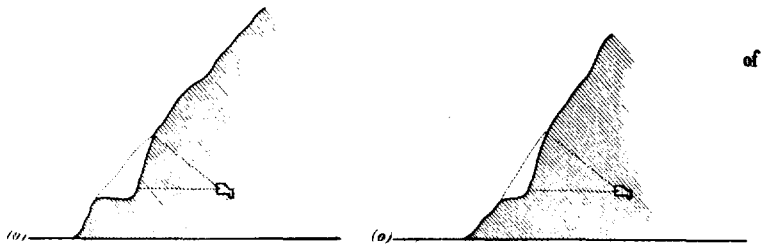
of positions of powder chambers

at

LIME POINT, CAL.

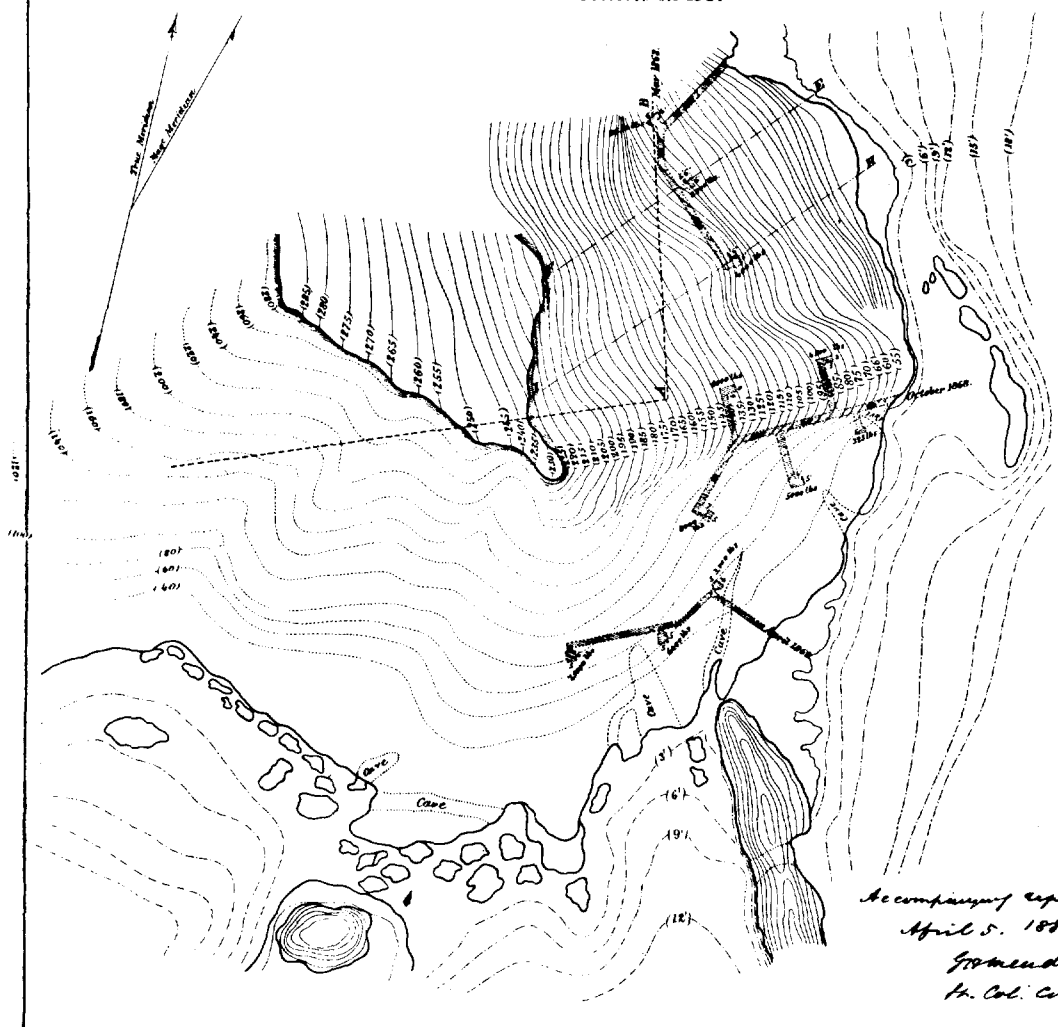
1868-69.

Scale: 1 in. = 50 Feet.



Section on EF.

Section on HI.

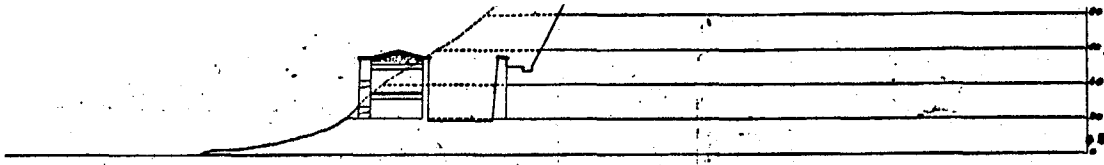


Accompanying report of April 5. 1870.
J. G. Mendell
Lt. Col. Corps of Engrs

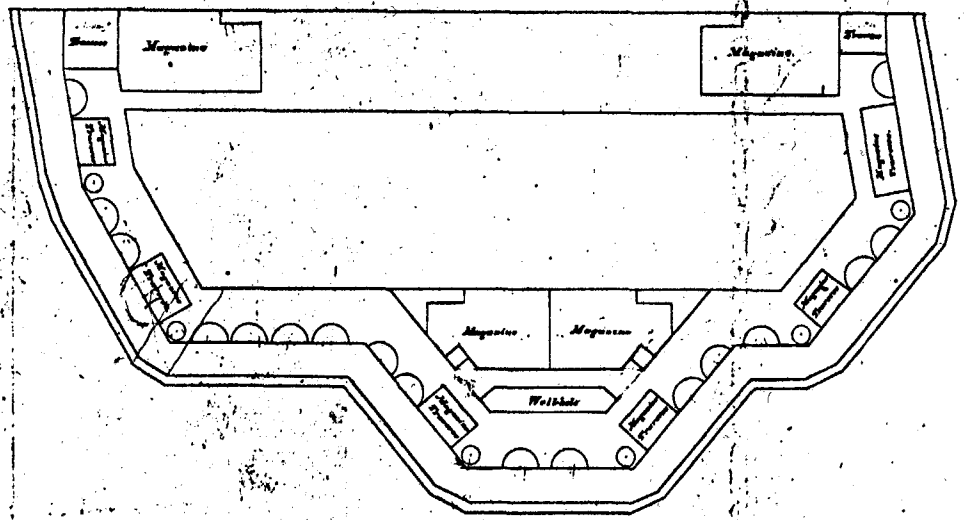
No. 4B. A Section From the Last of a Series of Plans for Fortifying Lime Point.

It shows the existing contours and the excavation proposed by Colonel Mendell. Behind the casemated guns there were to be casemated magazines. Still farther to the rear casemated barracks and storerooms were to stand on the shelf of rock.

National Archives,
Cartographic Archives Division,
Record Group 77.



Section on G-H Battery



Plan of Barbette Tier

Scale of 1 inch to 50 feet, or $\frac{1}{600}$

Office Board of Engineers,
San Francisco, May 28. 1867.
Sent to Engineer Department with Report of this date.
Chas. W. Raymond
Capt. U.S.A.
Recorder of Board

Engineer Department
Washington, July 9. 1867.
Sent to Bd. of Engrs for Investigation with letter of this date. (See Doc. 1 of 1867)

Returned with Report of Bd of Engrs for Investigation dated July 27. 1867 (B 216 — 1867)

Sent again to Bd Mar 30. '69 (Res 500)
Returned with B 216. 1867.

DRAWING 4B

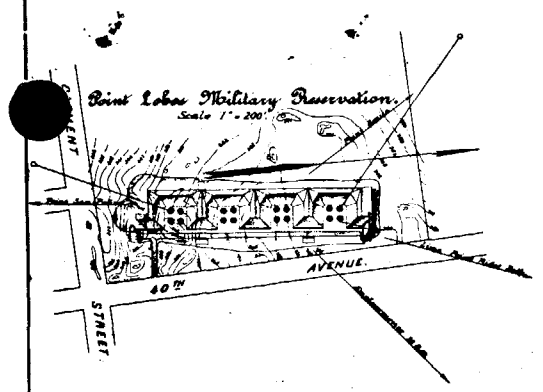
No. 5. Proposed Plan for Mortar Batteries Livingston and Springer, Fort Miley.

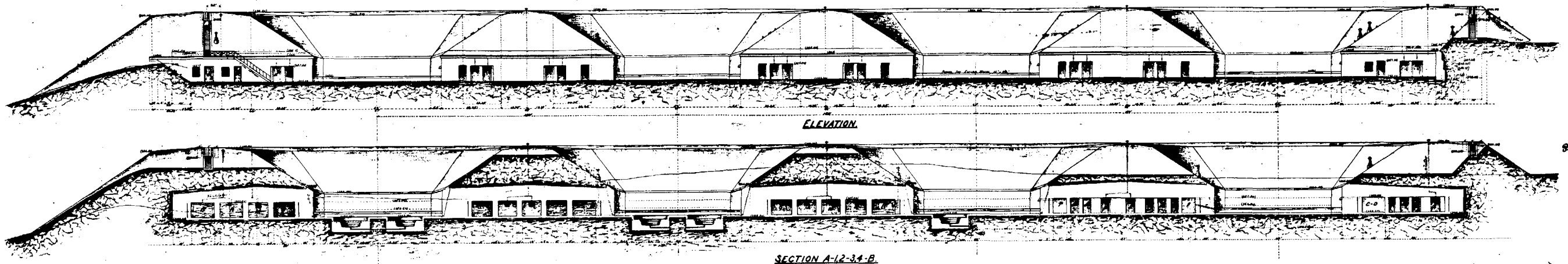
Originally designed as one battery for sixteen 12-inch rifled mortars, it was later divided into two batteries, and the number of mortars reduced to eight. This work is in an excellent state of preservation, but its isolated location does not lend it to interpretation. Mortar Batteries Stotsenburg and McKinnon at Fort Winfield Scott and Alexander at Fort Barry are similar in design and function. The interior layouts do not correspond with the actual conditions found at Livingston-Springer today.

National Archives,
Cartographic Archives Division,
Record Group 77,
Dr. 93, Sht. 76.

Defenses of San Francisco.

Point Lobos, California.





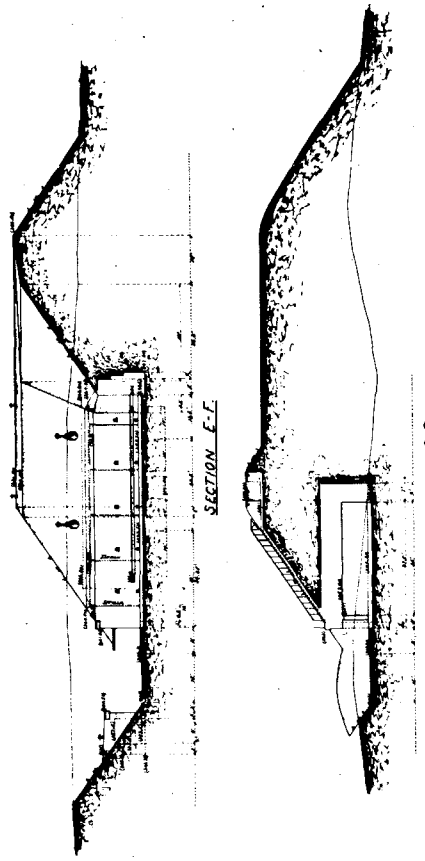
ELEVATION.

SECTION A-1-2-3-4-B.

Proposed Emplacements for Sixteen 12" B. L. Steel Mortars Mounted on U. S. Carriages Model of 1896.

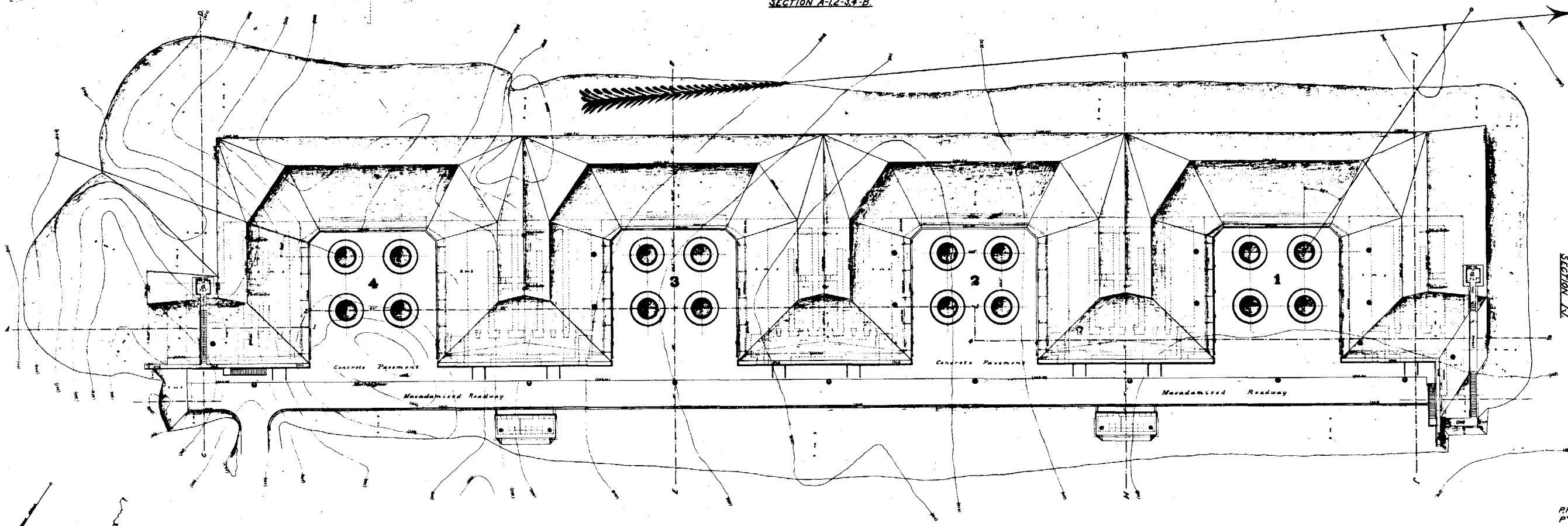
Prepared under the direction of Major Chas. E. L. B. Davis, Corps of Engineers, U.S.A.

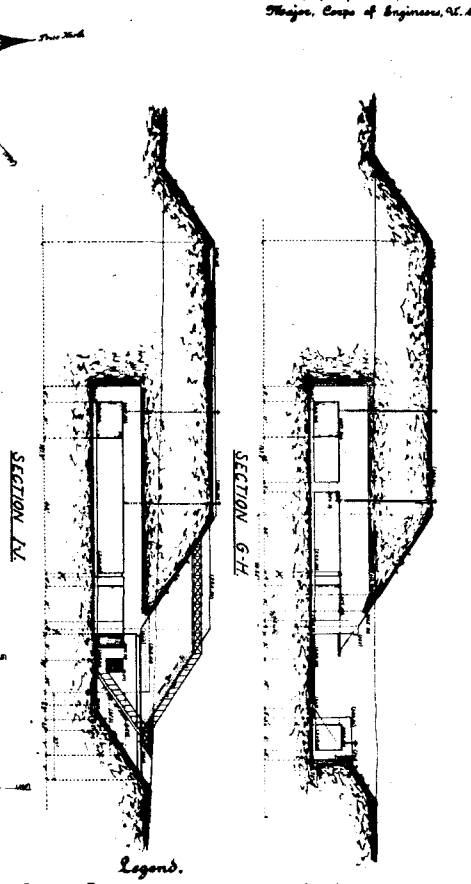
San Francisco, California, July 31st 1899.
Sent to Chief of Engineers, U. S. A. with report of this date.
Major, Corps of Engineers, U.S.A.



SECTION E-F.

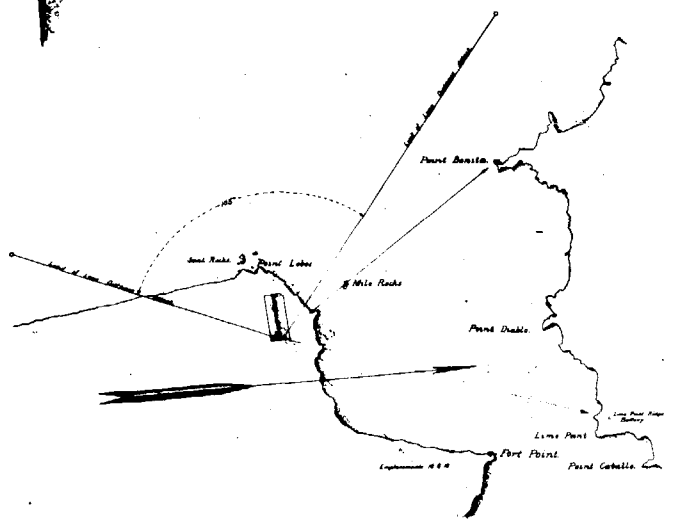
SECTION C-D.

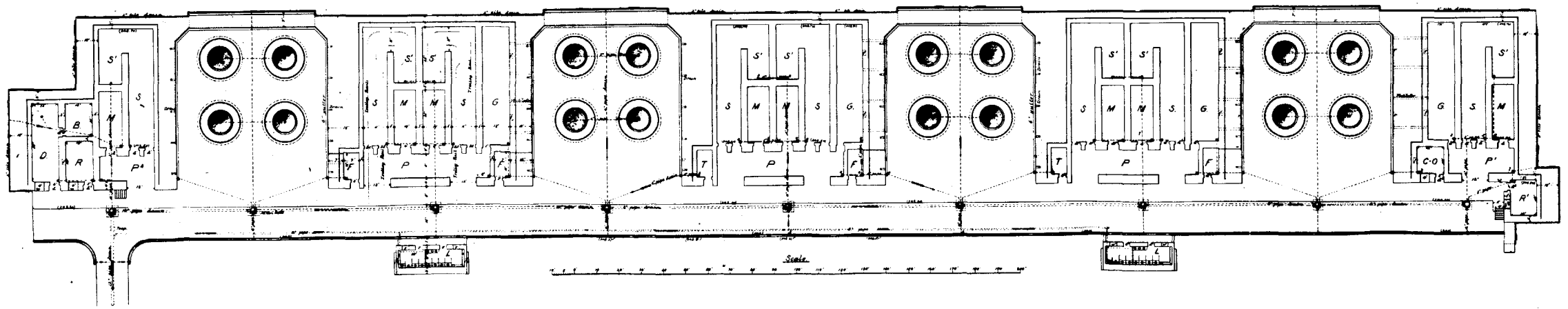




SECTION G-H.

SECTION K-L.





Legend.

PP	Passages	11' x 57'
P'	"	11' x 38'
P*	"	11' x 24
MMM	Magazines	10' x 25'
SSS	Shot Rooms	11' x 53'
SSS	"	10' x 25'
FFF	Firing Rooms	7' x 12'
R	Relocating Room	12' x 18'
R'	"	12' x 16'
D	Engine and Dynamo Room	12' x 35'
B	Storage Battery Room	12' x 23'
C-O	Commanding Officers Room	12' x 12'
GGG	Guard Rooms	12' x 53'
TT	Tool Rooms	7' x 12'
LL	Latrines	8' x 20'
OO	Observation Stations	7' x 7'
d d d	Double Doors	4' x 7.5
d' d' d'	"	3.5' x 7.5'
d" d" d"	"	3' x 7.5'
d" d" d"	Single	3' x 7.5'
w w w	Windows with bars	6' x 5'
w' w' w'	"	3' x 5'
r r r r	Recesses for firing wires	3" x 12'
ffff	Fire places	7.5 x 2.3 x 2.2 high
m m	Mantels	6.7 x 2.3 x 2.2 high
LLLL	Communication for electric fan	2.5' x 2.5'
SSSS	Sumps	

DRAWING NO. 5

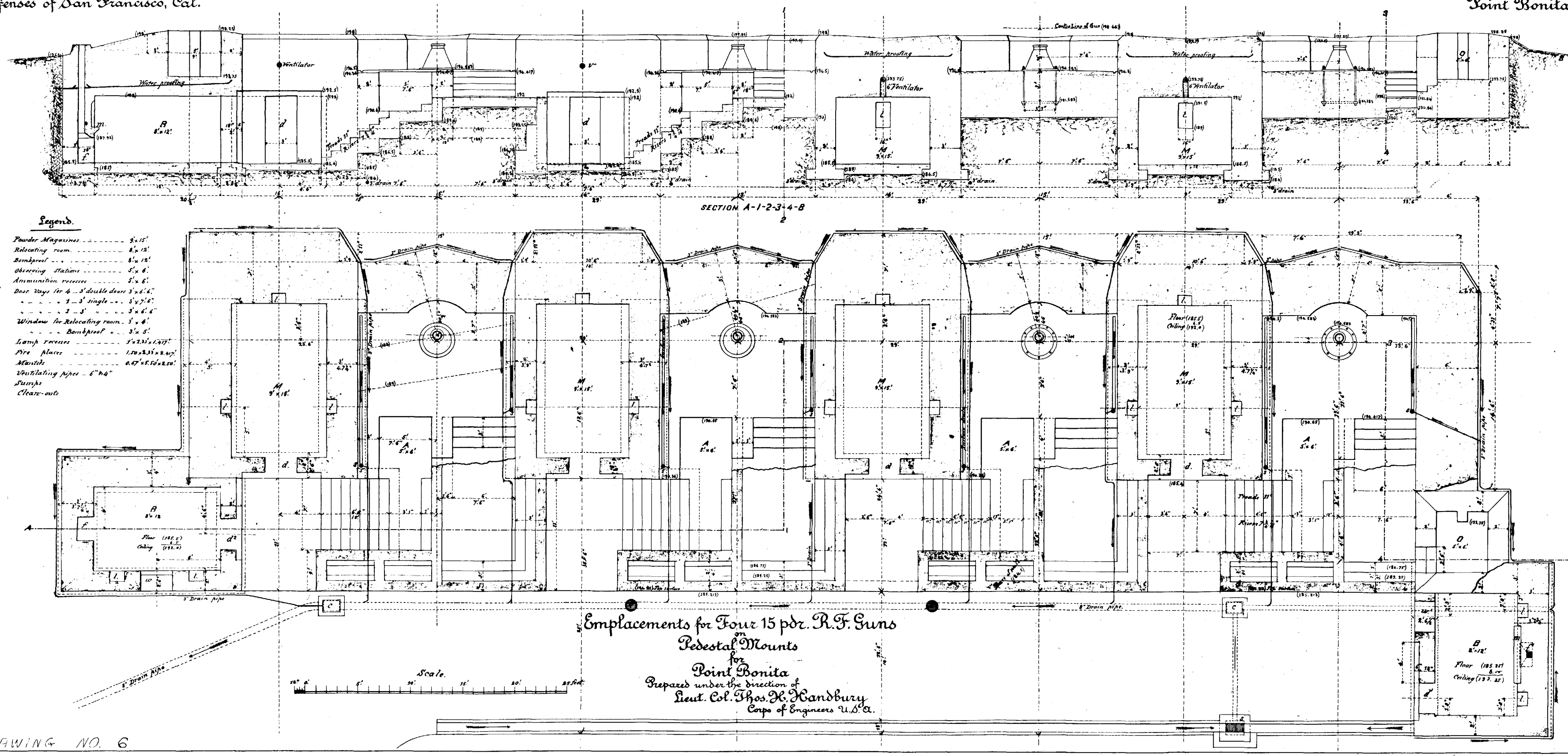
No. 6. Battery O'Rorke, Fort Barry.

It contained four 3-inch (or 15-pounder) coastal guns that had the missions of covering a submarine minefield and of defending against an enemy landing at Rodeo Beach. Battery Yates at Fort Baker was similar in design but larger.

National Archives,
Cartographic Archives Division,
Record Group 77,
Dr. 99, Sht. 21-3.

Defenses of San Francisco, Cal.

Point Bonita.



Emplacements for Four 15 pdr. R.F. Guns on Pedestal Mounts for Point Bonita

Prepared under the direction of
Lieut. Col. Thos. H. Handbury
Corps of Engineers U.S.A.

DRAWING NO. 6

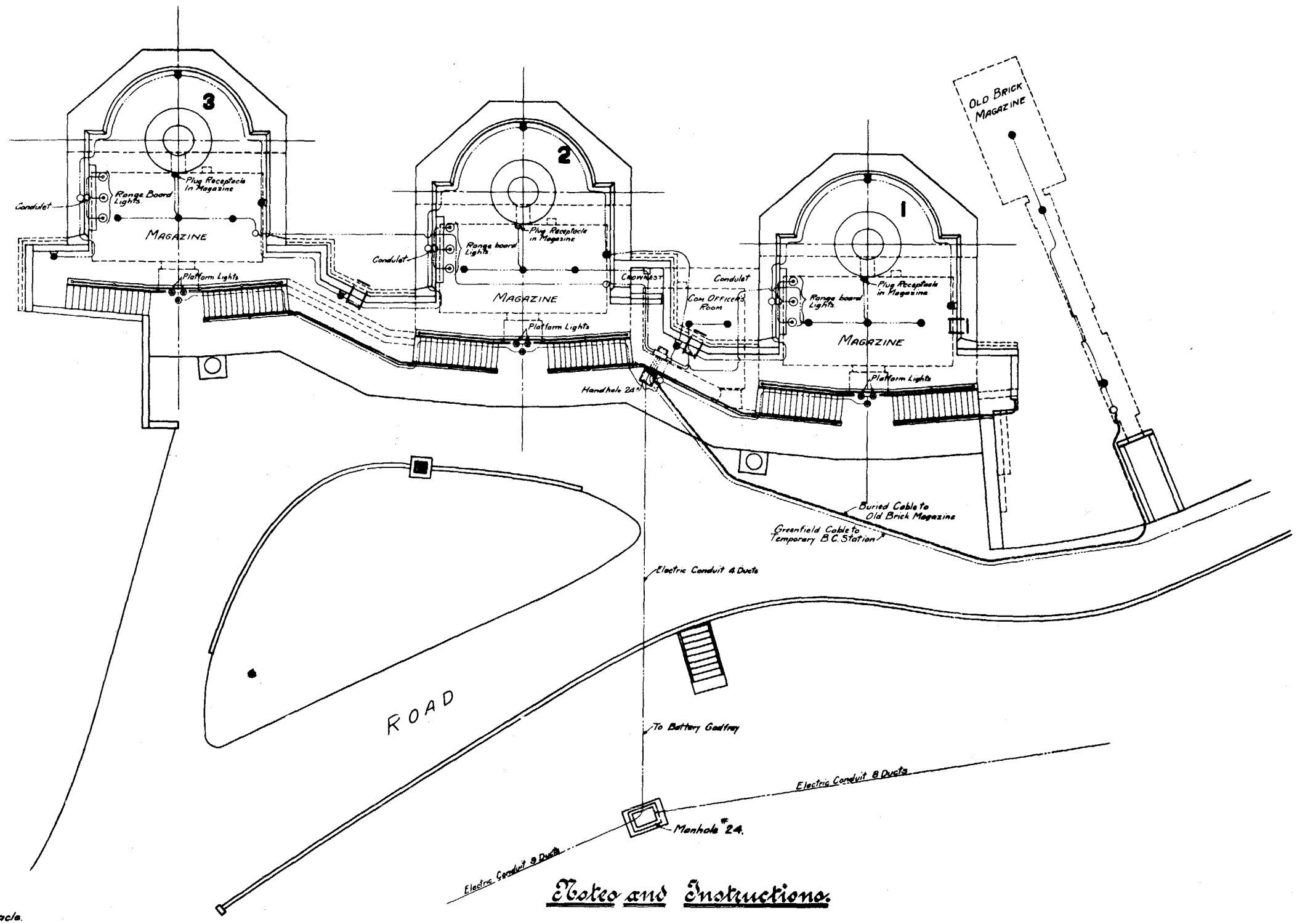
No. 7. Battery Boutelle, Fort Winfield Scott, Three 5-inch Guns.

To the right is a brick and concrete magazine from old West Battery of the 1870s.

National Archives,
Cartographic Archives Division,
Record Group 77,
Dr. 94, Sht. 132-5.

Circuit Index for Cabinet Panel.

1 - Com. Officers' Room.
2 - Magazine Emplacement #2.
3 - Magazine Emplacement #1.
4 - Magazine Emplacement #3.
5 - Rear and Platform Lights
6 - Old Magazine.
7 - Gun Platform Lights Emp #1, 2 & 3
8 -



Legend.

- Side wall junction box and lamp receptacle.
- Junction box and lamp receptacle.
- Junction box.
- Plug receptacle.
- Armored Cable
- Wiring in conduit.
- Range board reflector lights.

Notes and Instructions.

When leaving battery all switches shall be left open. Extra fuses of sizes needed shall at all times be kept on hand. In case a fuse should blow out, it must under no circumstances be replaced by anything but by another fuse of the proper size. Cables must not be disturbed after once in place if possible to avoid it and extreme care must be taken not to step on them in manholes.

Electric Wiring at Battery Boutelle Fort W. Scott, Cal.

Scale: ½" = One Foot.

Forwarded to the Chief of Engineers, U.S.A. with letter dated, June 24, 1915

Thos. H. Rees

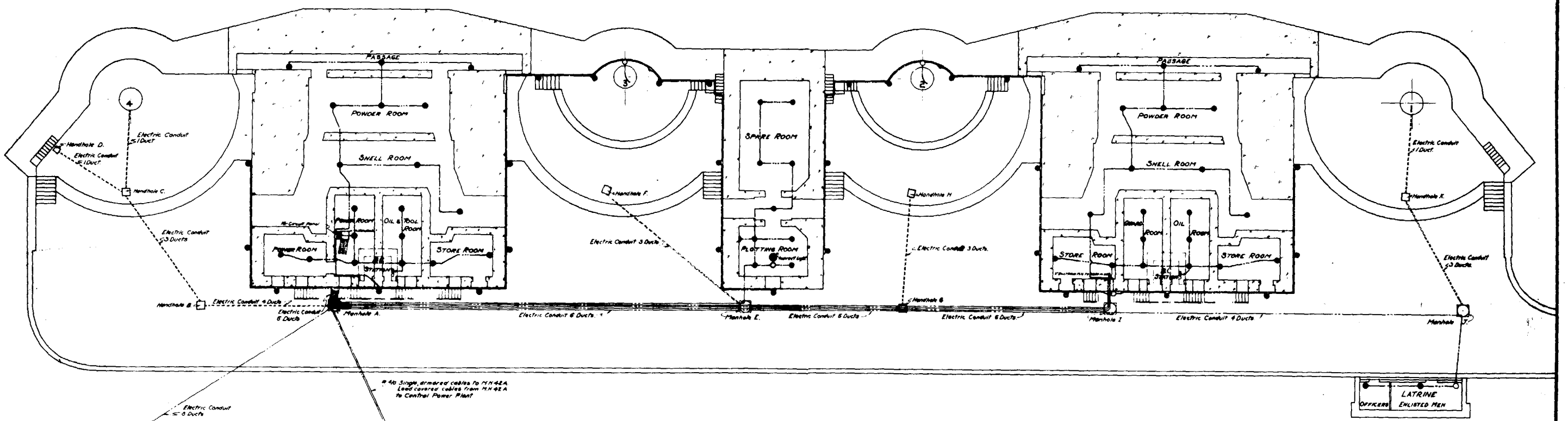
Lieut. Colonel, Corps of Engineers, U.S.A.

U.S. ENGINEER OFFICE - SAN FRANCISCO, CAL.				
DOC. FILE	DATE	BLK.	SH.	SHEET
F 115 131	June 1915	13	4	2

No. 8. Battery Chamberlin, Fort Winfield Scott, Originally Designed for Four 6-inch Guns Mounted on Disappearing Carriages.

Later the two right emplacements (nos. 1 and 2) were rebuilt for 6-inch guns on nondisappearing carriages. Today, a 6-inch gun on a disappearing carriage is mounted at emplacement 4, the only Endicott-period weapon currently at GGNRA.

National Archives,
Cartographic Archives Division,
Record Group 77,
Dr. 94, Sht. 145-10A, 172.



Circuit Index for Panel Box

1. Latrine
2. Power Rooms and Service Rooms Empls Nos 3 & 4
3. Plotting Room and Spare Room
4. Magazine, Empls Nos 3 & 4
5. Service Rooms Empls Nos 3 & 4
6. Fire Control Stations.
7. Magazine, Empls Nos 1 & 2
8.
9. Pilot Light on Panel Box.
10.
11. Platforms, Empls. Nos 3 & 4
12. Platforms Empls. Nos 1 & 2
13.
14.
15.
16.

Legend

- Combined junction box and lamp receptacle
- Side wall bracket
- Junction box
- Plug receptacle
- ——Armored cable
- ——Wiring in conduit

Electric Wiring at Battery Lowell Chamberlin Fort W. Scott, California.

Scale - 1" = 10'

U.S. Engineer Office 1st Dist. San Francisco Cal, March 8, 1924.

Submitted.
Lee J. Fitzgerald
Assistant Engineer

Approved.
Herbert Deakyne
Col. Corps of Engineers, U.S.A.

Transmitted with letter dated May 15, 1924.

Drawn by - A.W.D. Checked by - A.E.B. H.H.P.

Dec. File	Page	Div.	Drawing
	15	4	4

DRAWING No 8

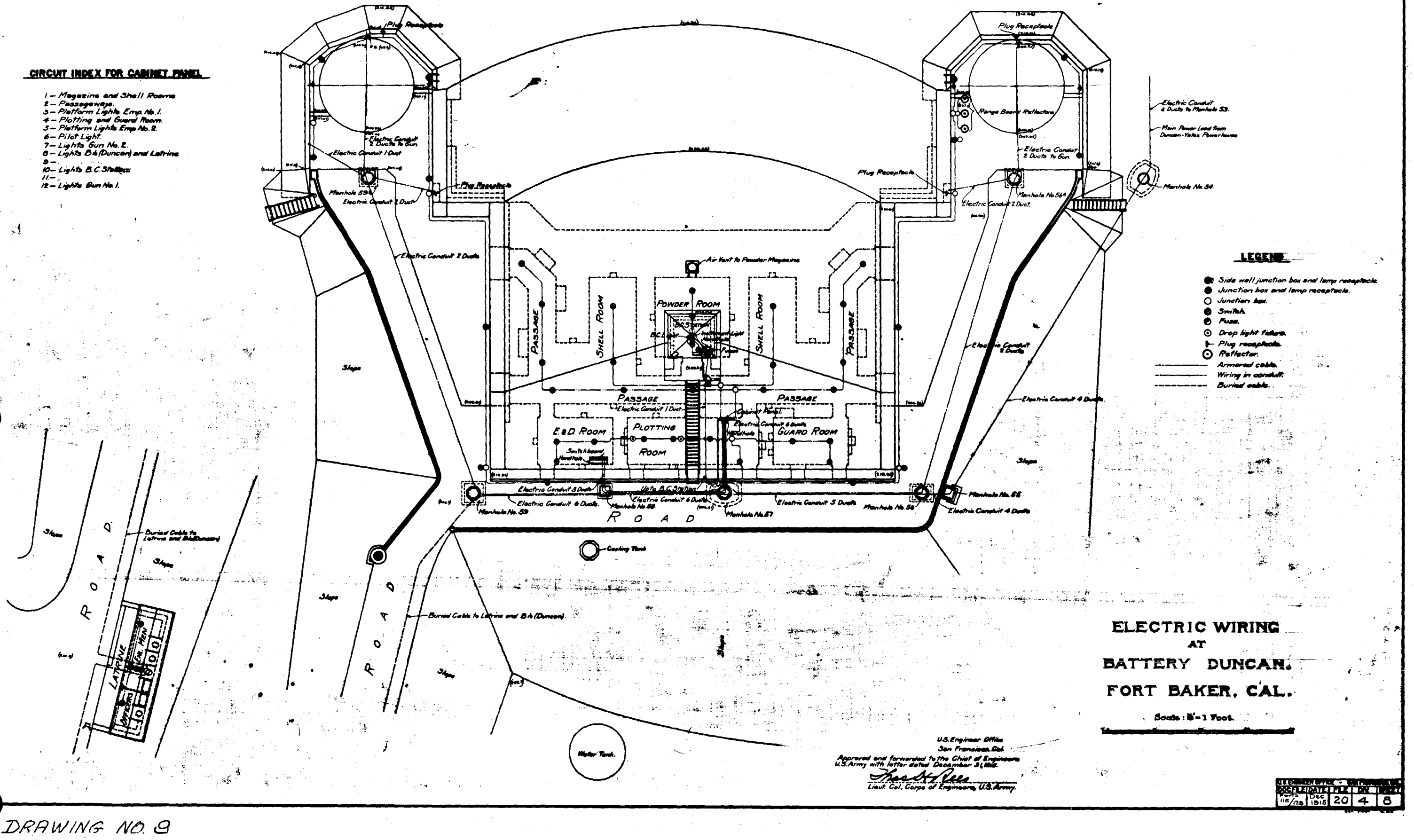
No. 9. Battery Duncan, Fort Baker.

It was one of several 8-inch gun batteries designed early in the Endicott period for the defense of the interior of San Francisco Bay. They were all abandoned early when new batteries were erected on the exterior headlands. Their magazines continued to be used for the storage of explosives and for other purposes.

National Archives,
Cartographic Archives Division,
Record Group 77,
Dr. 100, Sht. 32-6.

CIRCUIT INDEX FOR CABINET PANEL.

1 – Magazine and Shell Rooms
2 – Passageways.
3 – Platform Lights Emp. No. 1.
4 – Plotting and Guard Room.
5 – Platform Lights Emp. No. 2.
6 – Pilot Light.
7 – Lights Gun No. 2.
8 – Lights B.& (Duncan) and Latrine.
9 –
10 – Lights B.C. Stations.
11 –
12 – Lights Gun No. 1.



LEGEND.

- Side wall junction box and lamp receptacle.
- Junction box and lamp receptacle.
- Junction box.
- Switch.
- Fuse.
- Drop light fixture.
- Plug receptacle.
- Reflector.
- Armored cable.
- Wiring in conduit.
- Buried cable.

ELECTRIC WIRING AT BATTERY DUNCAN. FORT BAKER, CAL.

Scale: 8'-1 Foot.

U.S. Engineer Office
San Francisco, Cal.
Approved and forwarded to the Chief of Engineers U.S. Army with letter dated December 31, 1915.
Thos. M. Reese
Lieut. Col. Corps of Engineers, U.S. Army.

DOCKET No.	DATE	FILED	DRAWN	TRACED
115/128	Dec 1915	20	4	8

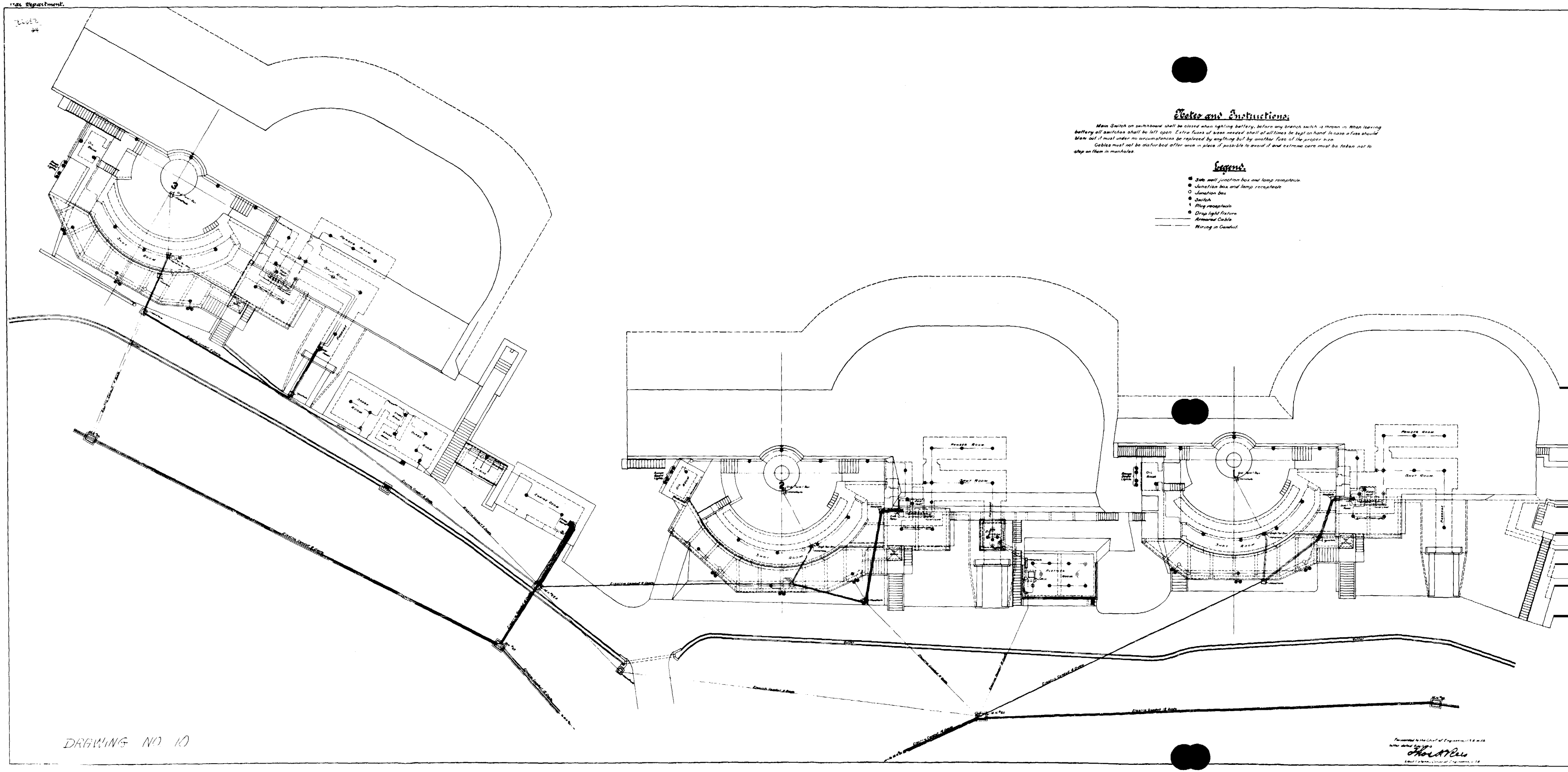
DRAWING NO. 9

No. 10. Battery Marcus Miller, Fort Winfield Scott, Three 10-inch Guns on Disappearing Carriages.

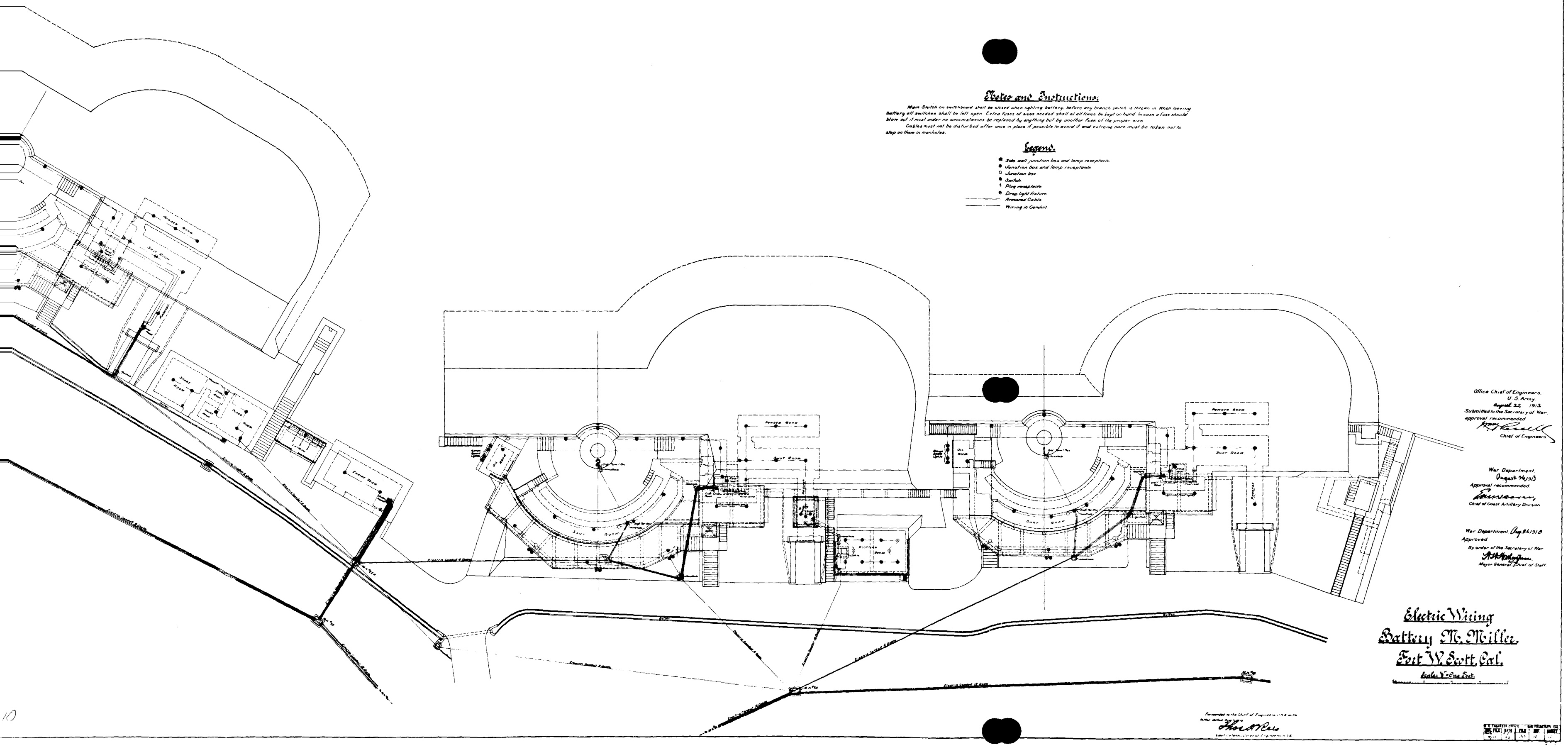
This was the first Endicott-period battery at San Francisco to undergo construction. But it was not the first to be completed, due to a delay by the Ordnance Department in adopting a suitable disappearing carriage.

National Archives,
Cartographic Archives Division,
Record Group 77,
Dr. 97, Sht. 154-4.

War Department.


Notes and Instructions:
Main Switch on switchboard shall be closed when lighting battery, before any branch switch is thrown in. When leaving battery all switches shall be left open. Extra fuses of each needed shall at all times be kept on hand in case a fuse should blow out it must under no circumstances be replaced by anything but by another fuse of the proper size.
Cables must not be disturbed after once in place if possible to avoid it and extreme care must be taken not to step on them in manholes.
Legend:
Safe and junction box and lamp receptacle
Junction box and lamp receptacle
Junction box
Switch
Plug receptacle
Drop light fixture
Armored Cable
Wiring in Conduit
Oil Room
Shell Room
Passage
Fuse Room
Switch Room
Engine Room
Dynamo Room
Battery Room
Shell Room
Passage
Oil Room
Fuse Room
Switch

Corps of Engineers, U.S. Army.


Powder Room
Shell Room
Passage
Shell Room
Passage
Cartridge Room
Powder Room
Shell Room
Shell Room
Shell Room
Shell Room
Pilasters
Powder Room
Shell Room
Shell Room
Passage
Entrance Control & Shelter
Entrance Control & Shelter
Entrance Control & Shelter

No. 11. Twelve-inch Gun Emplacements at Battery Kirby, Fort Baker.

These guns were mounted on disappearing carriages, as were those 12-inch guns at Battery Mendell, Fort Barry. Other 12-inch batteries located at higher elevations had nondisappearing carriages. Kirby was located on the site of Gravelly Beach Battery of the 1870s. Magazines, not shown, of this older battery still survive.

National Archives,
Cartographic Archives Division,
Record Group 77,
Number unknown.

Defenses of San Francisco Harbor, Cal.

Fort Baker

Instructions for Care of Plant.

Operation and Care of Engine.

Complete instructions for the operation and care of the engine are contained in the Instruction Books 8367 and 8368 issued by the General Electric Co. and in the Memorandum of Aug 31, 1905 and the communications accompanying it, issued by the U.S. Engineer Officer, New London, Conn. The above books and papers have been delivered to, and are in the possession of, the Post Artillery Engineer, as government property.

In cold weather the radiator should be drained after each run by opening the pet cock "a" in the lower front water connection of the radiator. The same applies to the cylinders of the engine which should be thoroughly drained by opening the pet cock at the water pump on the engine.

The engine should not be started unless the radiator is full of water. As water evaporates fresh water should be added.

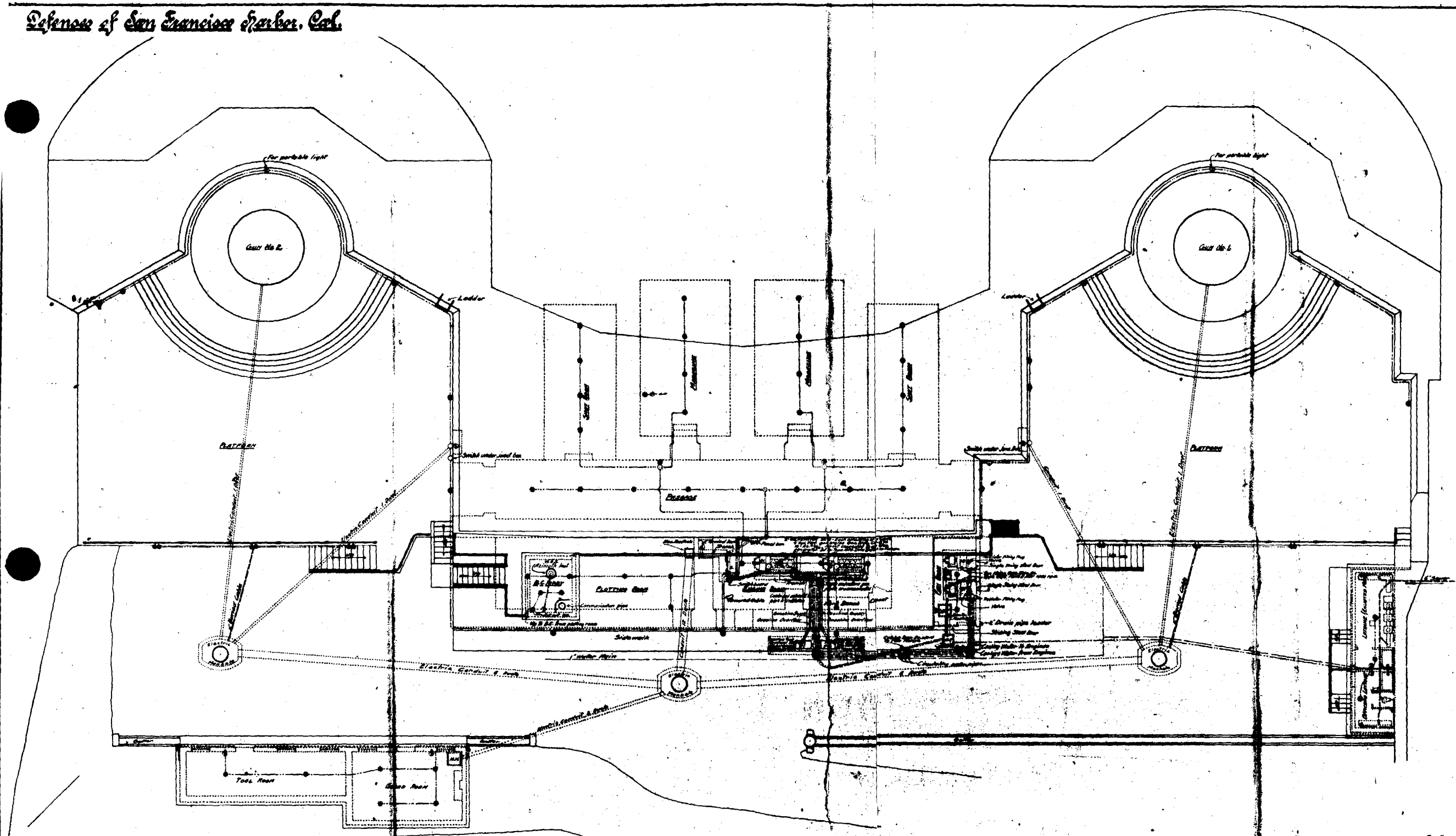
Before starting, the gasoline should be pumped up by hand until the carburetor overflows and the gasoline return pipe is completely filled. This condition is indicated when the sound of air bubbling up from the return pipe into the carburetor ceases.

The starting and running position of the needle valve is between two and two. The valve should be left open, the engine being stopped by opening the ignition switch.

Gasoline should test not less than 64° Baume.

The normal speed is 360 r.p.m. at full load.

The normal voltage is 115 volts at no load and full load. The generator will carry 217 amperes continuously, and 270 amperes for two hours, at this voltage.



Notes and Instructions

All valves shall be kept lightly closed when not in actual use and especial care to be taken that valves are closed tight before leaving stations. Any valve, etc. found in leaky condition shall be repacked immediately.

Main Switch on switch board shall be closed when lighting battery, before any branch switch is thrown in. When leaving battery all switches shall be left open. Extra fuses of sizes needed shall at all times be kept on hand and under no circumstances should a fuse be blown out, shall it be replaced by anything but by another fuse of the proper size.

Cables must not be disturbed after once in place if possible to avoid it and extreme care must be taken not to step on them.

Machinery, Engine, Dynamo etc. shall be carefully inspected, cleaned and oiled, if needed, at least once a week and be kept in good condition. The Engine and Dynamo shall be run for a short time, particular care being taken that the gasoline and oil feed pumps work satisfactorily.

Legend.

- Sewer pipe
- Water pipe
- Wiring in conduit
- Armored cable
- Gasoline pipe
- Switch
- Junction box
- Combined junction box and lamp receptacle
- Double comb. junc. box & lamp receptacle (Platform lights)
- Hand Hole

Serial Numbers of Parts.		
Parts	Set 91	Set 92
Gas Motor Set	5461	5462
Generator	183198	183197
Armature	183299	183295
Heater	5316	5315
Magneto	84-33973	84-34421
[illegible]	26659	26752
[illegible]	180446	180328
Armature	182186	187158
Order Brushes to Cat.	—	318593

Forwarded to the Chief of Engineers U.S.A. with letter dated April 26th 1910.

John Biddle
Lieut. Col. Corps of Engineers, U.S.A.

Electric Lighting and Power at Battery Kirby, Fort Baker, Cal.

Scale: ½ Inch = One Foot.

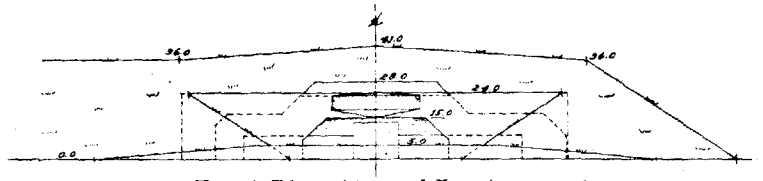
U. S. Engineer Office - San Francisco, Cal.				
Doc. File	Date	File	Ins.	Sheet
Pc 75 04/9	4/26/10	04	4	8

DRAWING NO. 11

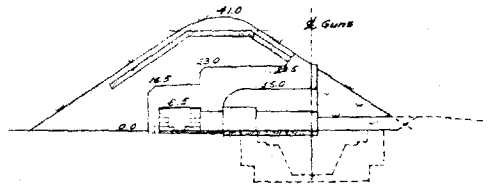
No. 12. Two Early Layouts for Battery Davis, the First 16-inch Gun Battery to be Undertaken at San Francisco.

The plans for casemates over the gun emplacements were the prototype for this kind of protection. At Battery Davis the guns were mounted before the casemates were constructed; however, at Battery Townsley, Fort Cronkhite, the casemates were constructed before the guns were mounted.

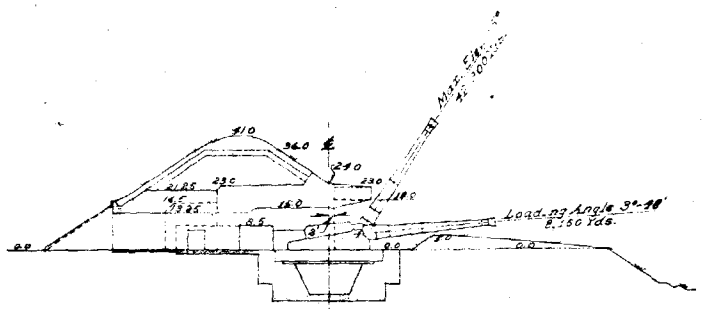
National Archives,
Cartographic Archives Division,
Record Group 77,
Dr. 188, Sht. 70-41.



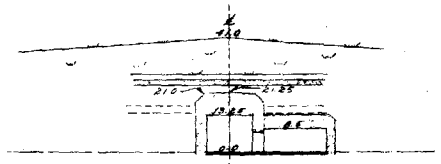
Front Elevation of Emplacement



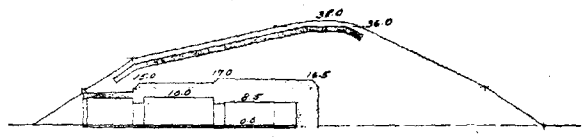
Section A-A



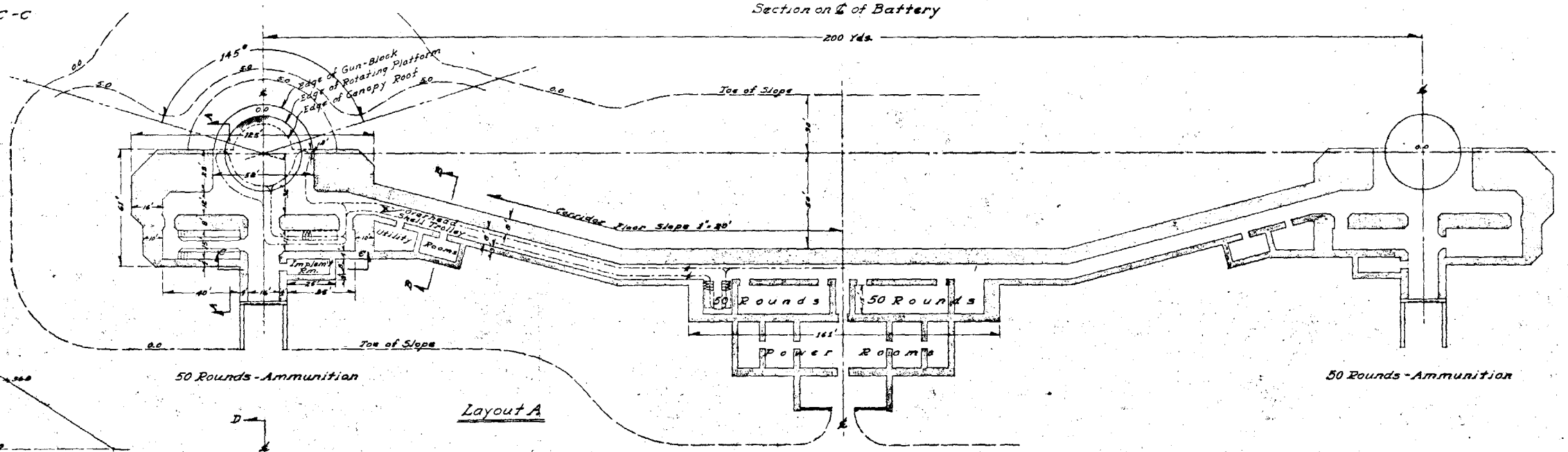
Section on ℄ of Emplacement



Section C-C



Section on ℄ of Battery

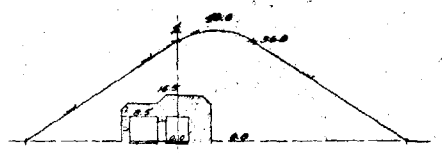


Layout A

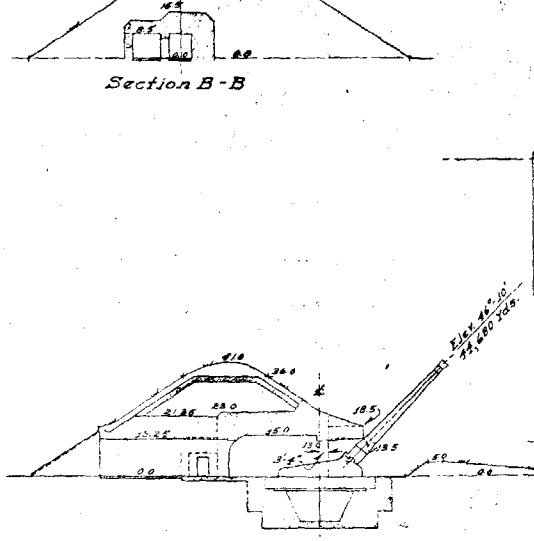
PLAN

Scale in Feet

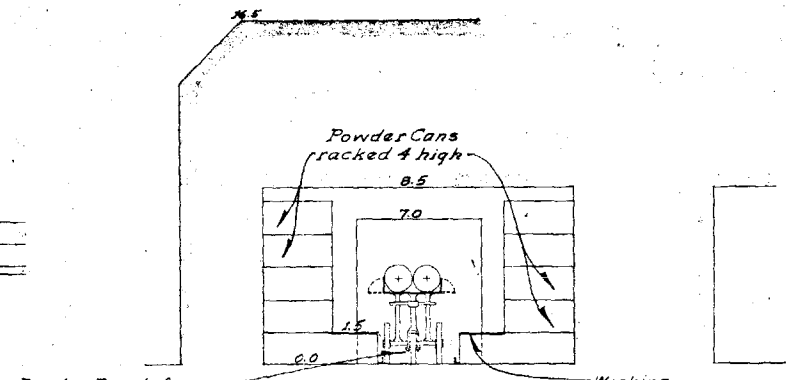
Alternate Layout B



Section B-B



Alternate Section D-D



Section thru Magazine

STUDY FOR EMPLACEMENT
TWO 16 IN GUNS ON BARB. CARR. 1919M1
WITH OVERHEAD COVER

Construction Section, O.C.E. Mar. 15, 1937.

J.K.L.
G.W.S.

To accompany 6th Ind. Mar. 18, 1937. on C of E 662.B (San Francisco) 79

DRAWING NO. 12

Alternate Layout B approved by A.G.O., see 662.B (San Francisco) 79, 9th Ind.

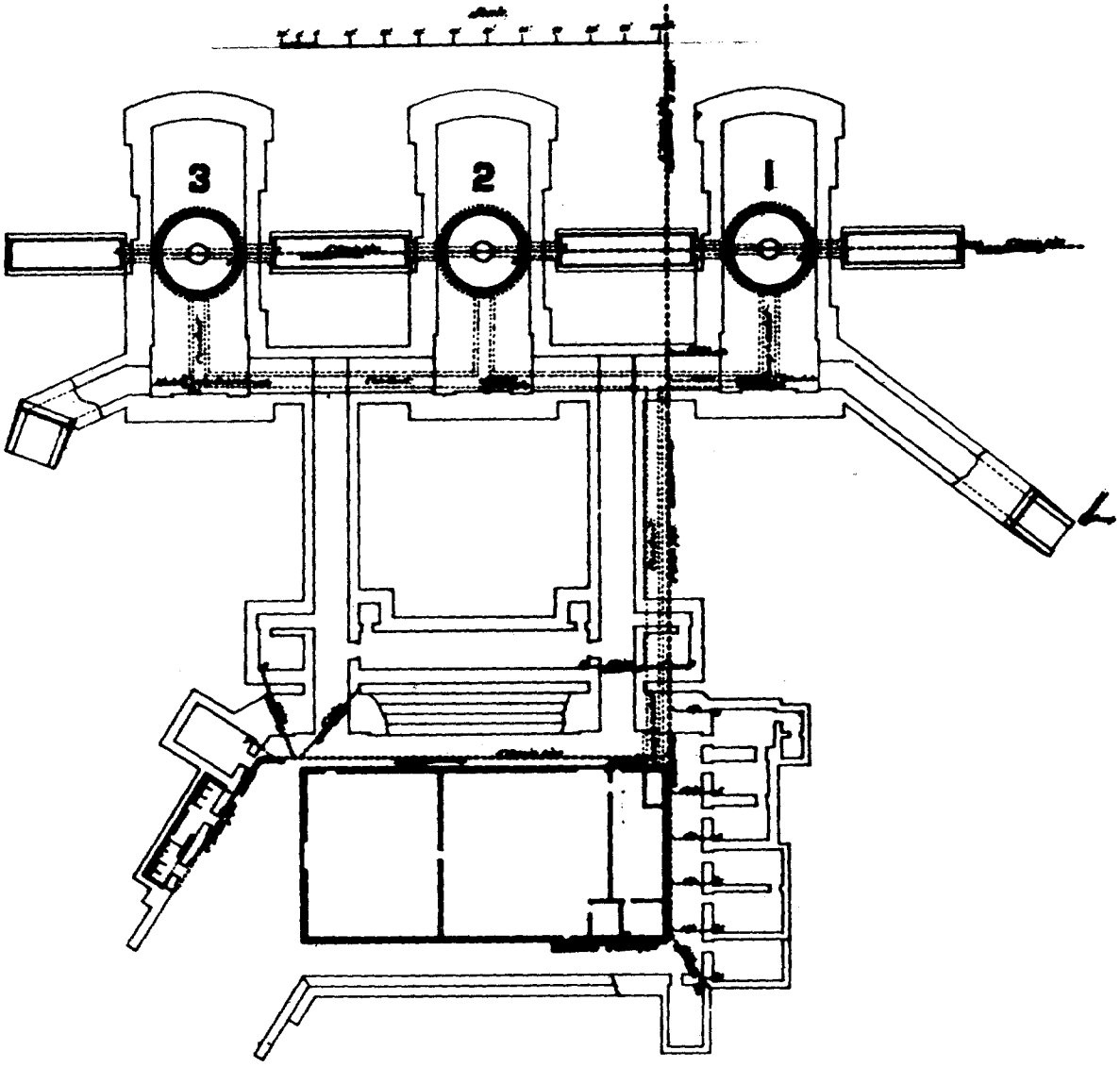
Rec 3/24/37

No. 13. Dynamite Battery, Fort Winfield Scott.

The three 15-inch dynamite guns were mounted by the private company that had designed them. However, army engineers constructed the huge earth and concrete parapets that surrounded them. The army did not adopt this kind of weapon. During World War II the harbor defense command post and the harbor entrance control point were located in this complex.

National Archives,
Cartographic Archives Division,
Record Group 77,
Dr. 94, Sht. 133-2.

Emplacements
for
3-15" Pneumatic Dynamite Guns
Fort Point,
California.



Notes and Instructions for the care of the drainage System &c. at these Emplacements.

All open drains or gutters shall be carefully swept and the rubbish removed at least once a week, more frequently should the coverings are removed to such a place that it will not be carried back with drains by wind or weather.

All manholes, traps in floors, gutters and drains shall be carefully inspected at least once a week, removing debris so as that the stones and rubbish at bottom of holes be removed; if stones found it must be loosened and taken out.

All covered drain pipes and batteries shall be cleaned and flushed at least once a week.

Immediately after each rain the Earth Slopes shall be carefully inspected and any slight washing is gently re-shaped, shall be at once remedied. Any serious gullying &c. shall be reported in writing to the Engineer Officer in charge of the locality, at once, and all water found standing on horizontal or other surfaces except 24 hours after precipitation through the manhole.

Valleys, Manholes &c. shall be carefully inspected, cleaned and relaid, if broken and be kept in good condition.

By strict conformance with the above instructions all water obtaining entrance to the Building will be quickly carried off, but any carelessness may cause stoppages at some point or points, rendering the Drainage System ineffective, thus causing damage to costly machinery, to plant and ammunition.

Arrows show the direction of the flow in drains.

War Department,
April 7, 1898.

Approved:

Secretary of War.

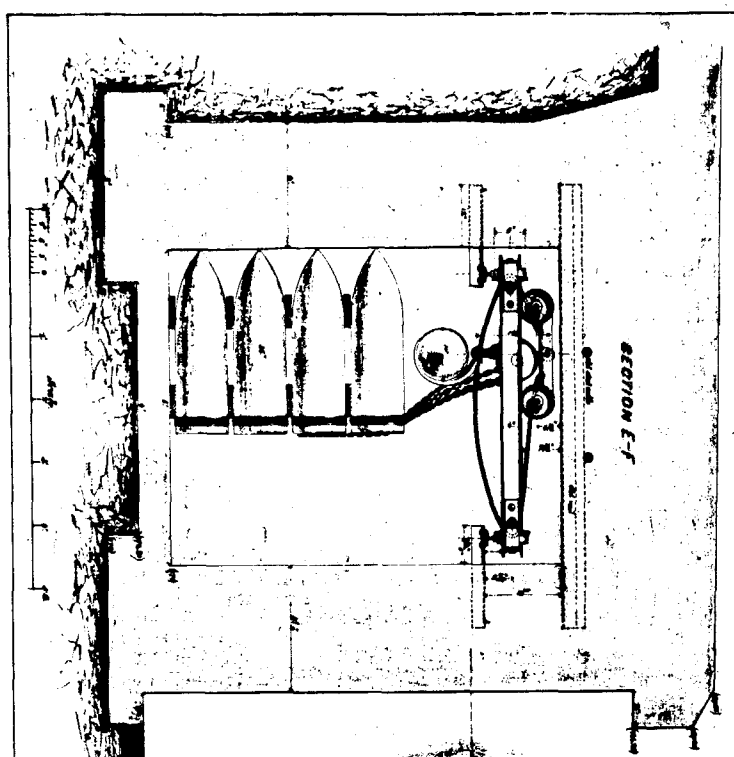
——— Gutters or open drains.
- - - - - - Covered cobbled drain pipes.
□ □ Manholes.
/ / / Steps.

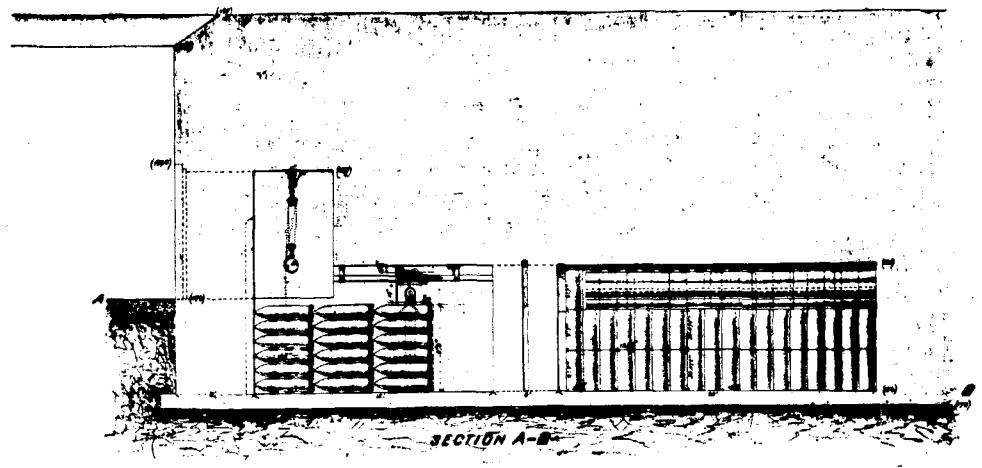
DRAWING NO. 13

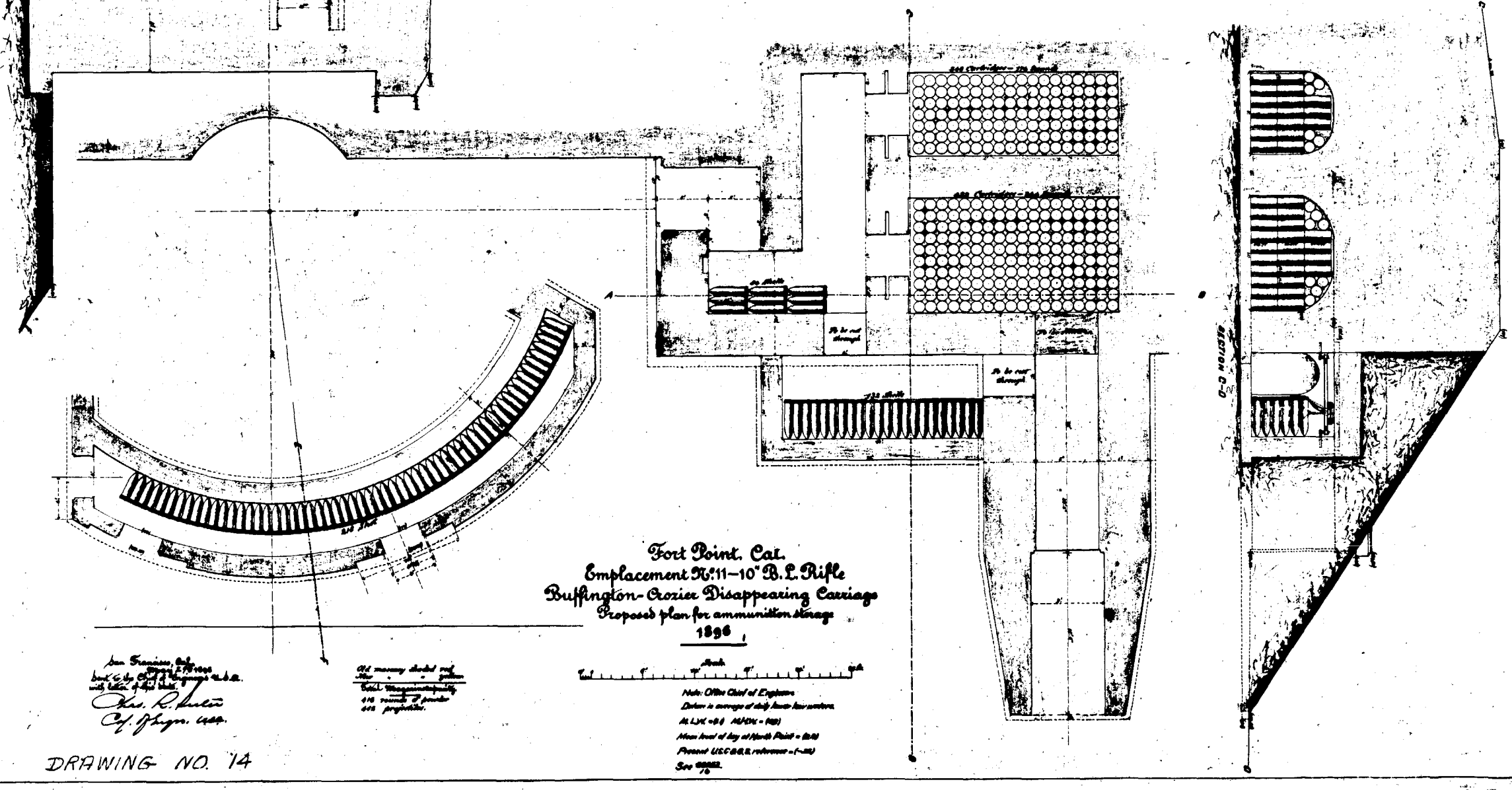
No. 14. Ammunition Storage at Battery Marcus Miller.

The older Endicott batteries such as this one had insufficient space in their magazines. This plan shows alterations to be made to enlarge the storage space.

National Archives,
Cartographic Archives Division,
Record Group 77,
Dr. 94, Sht. 128-1.







Fort Point, Cal.
Emplacement No. 11—10" B.L. Rifle
Buffington-Crozier Disappearing Carriage
Proposed plan for ammunition storage
1896.

DRAWING NO. 14

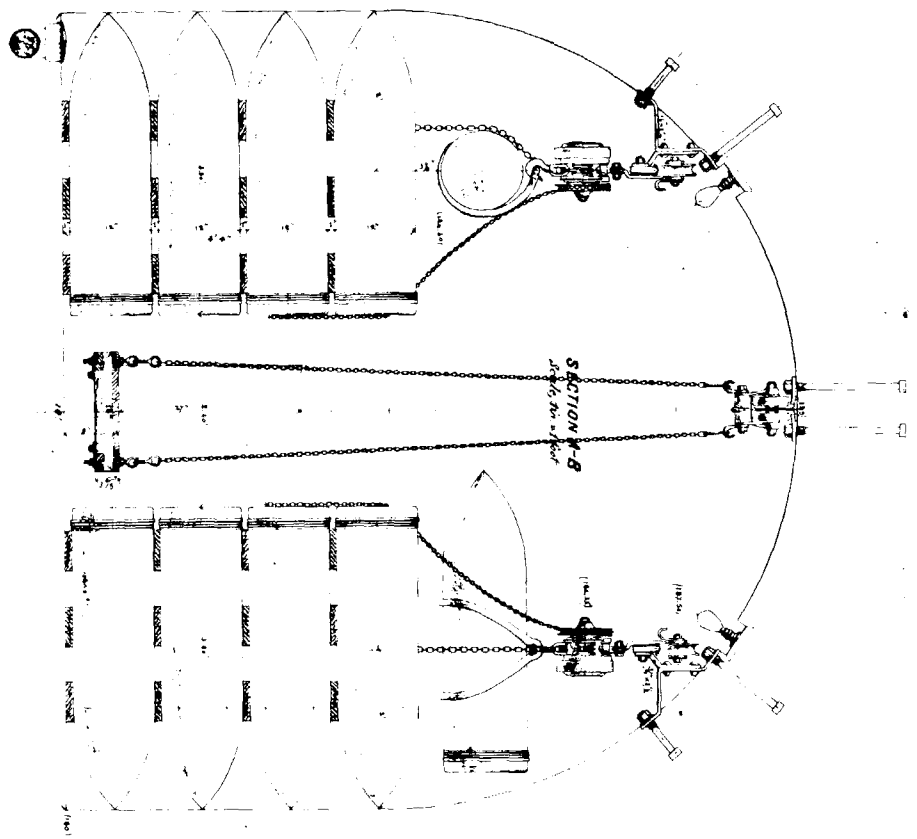
No. 15. Ammunition Storage at Mortar Batteries Howe and Wagner.

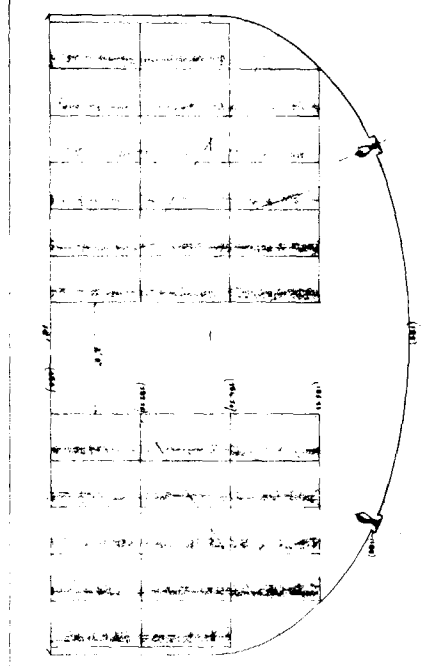
This was the only such work at San Francisco to be cross shaped. All other mortar batteries in the Bay Area were linear in nature. These rooms are believed to be intact under an artificial hill that was eventually placed over the battery.

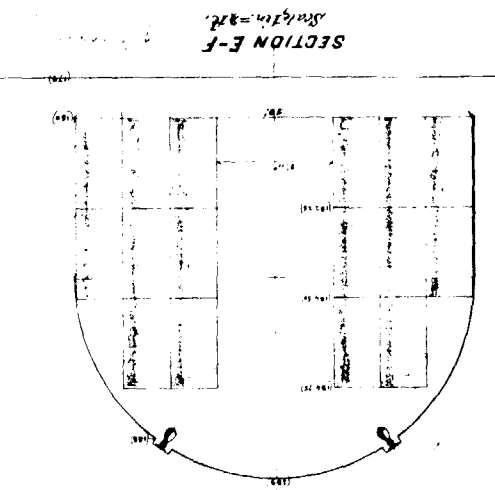
National Archives,
Cartographic Archives Division,
Record Group 77,
Dr. 94, Sht. 118-9.

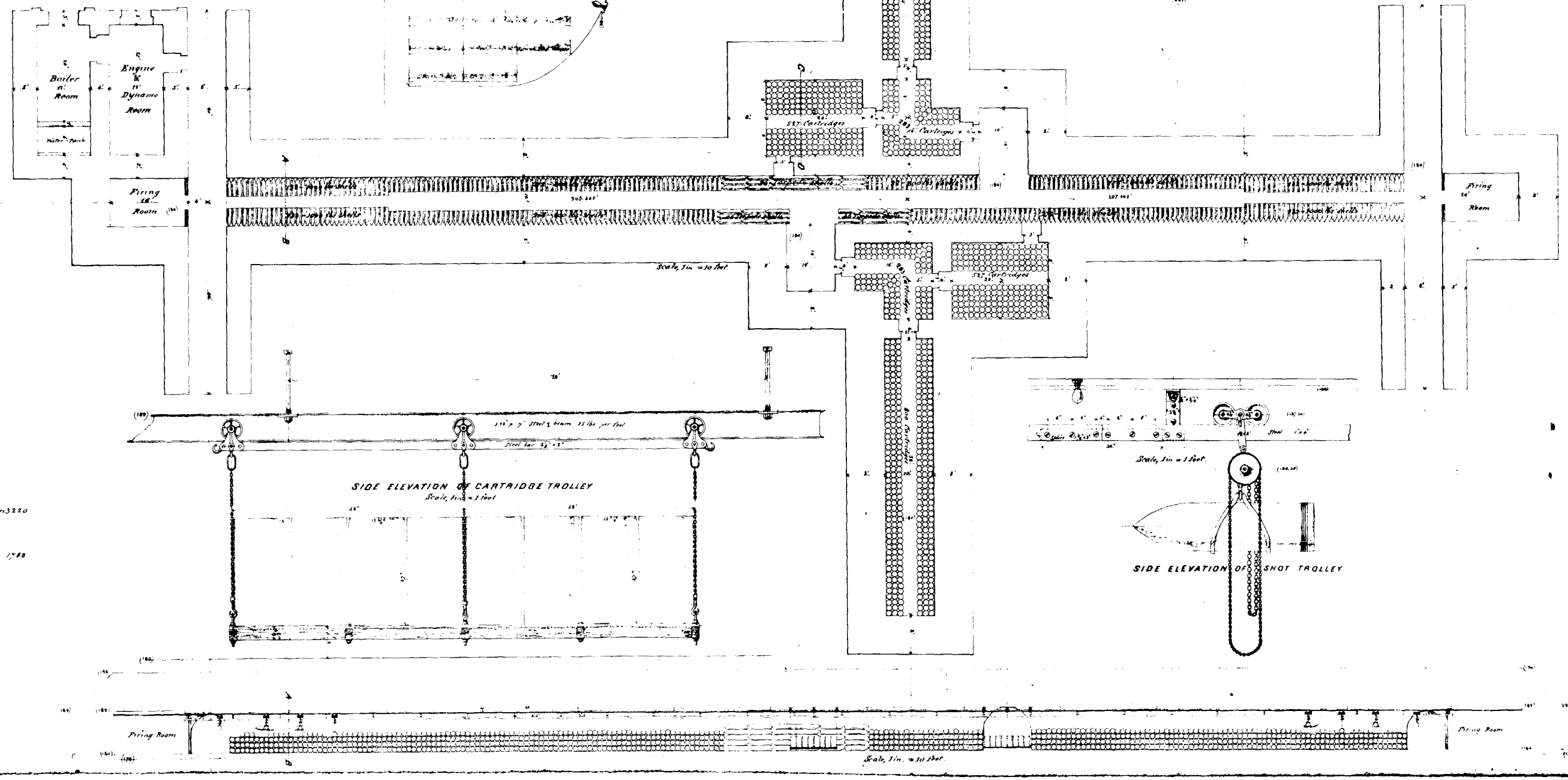
Drawer 9a
Sheet No. 118
9

Plan and Sections of Magazines and Galleries
Mortar Battery No. 1
Fort Point, California
Showing proposed Scheme for ammunition storage and service.
1896.









Total number of cartridges in magazines 3220
" " " 100 lbs shell 1080
" " " 1000 lbs " 528
" " " Torpedo " 180
" " " Projectiles in gallery 1432

U.S. Engineer Office
Pacific Division
San Francisco, Cal.
April 11 1896

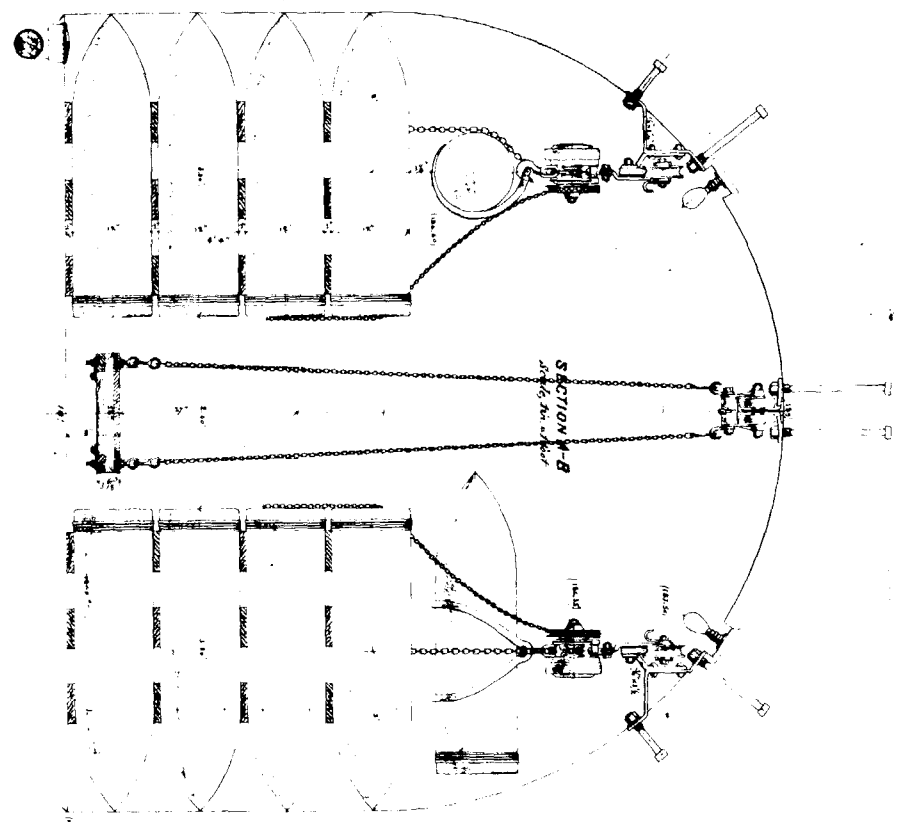
Examined, approved and forwarded
Chas. R. Suter
Colonel of Engineers U.S.A.

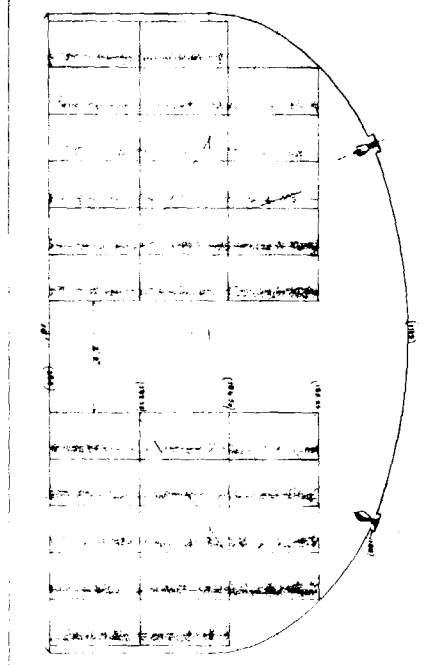
DRAWING NO. 15

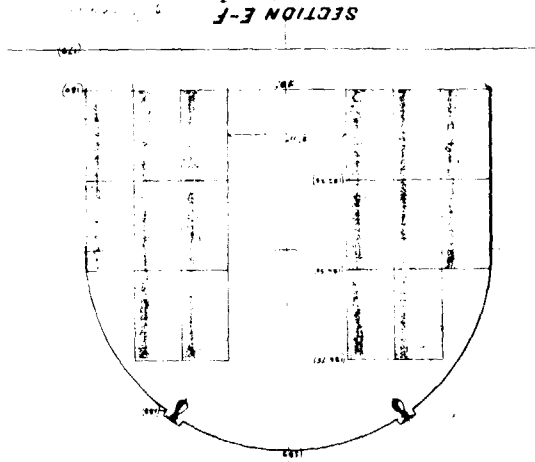
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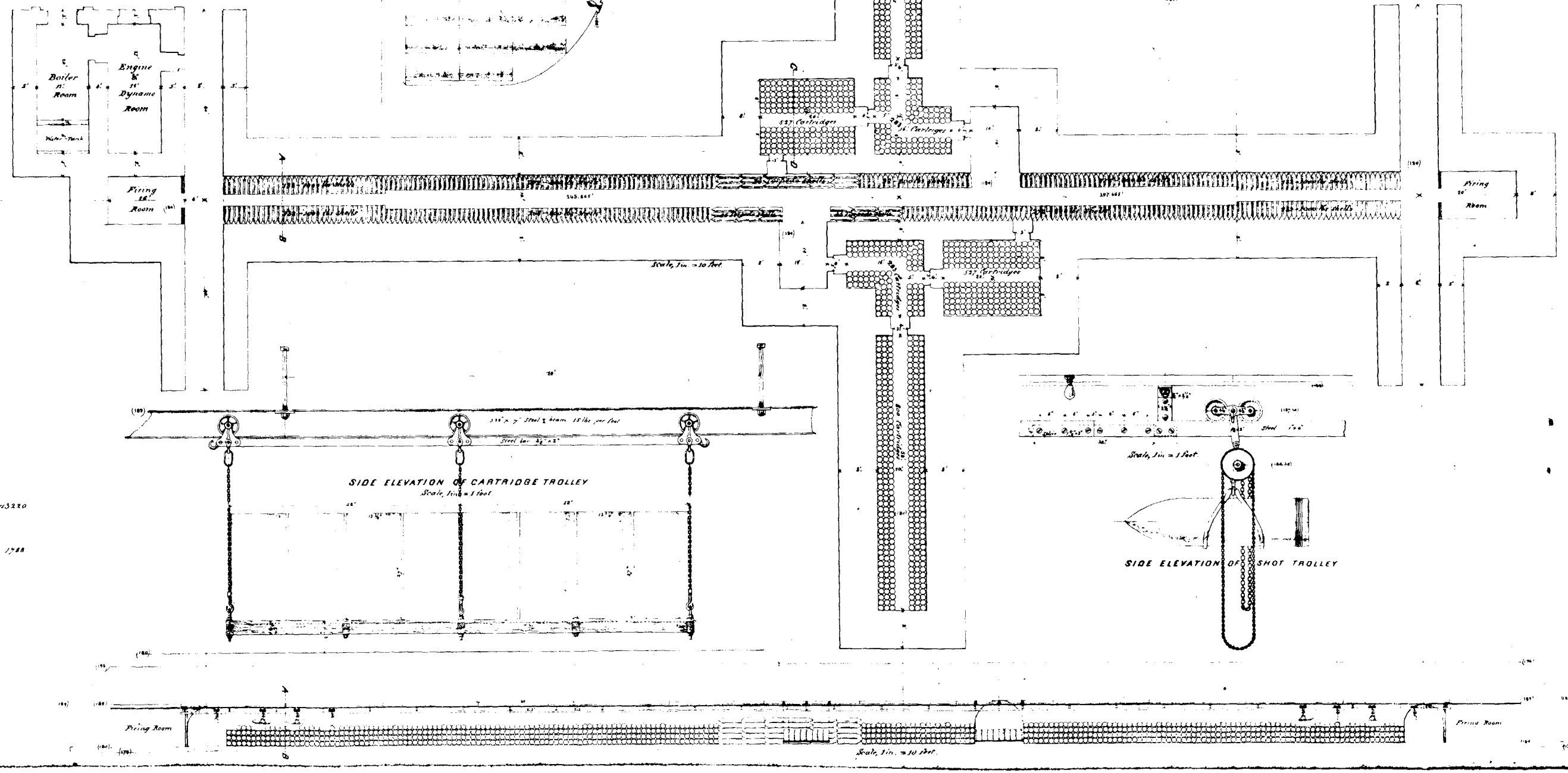
Power 94
Sheet No. 118
9

Plan and Sections of Magazines and Galleries
Mortar Battery No. 1
Fort Point, California
Showing proposed Scheme for ammunition storage and service.
1896.









Total number of cartridges in magazines 3220
" " " 100 lbs shell 1080
" " " 1000 lbs " 528
" " " Torpedo " 180
" " " Projectiles in gallery 1788

U.S. Engineer Office
Pacific Division
San Francisco, Cal.
May 11 1896.

I recommend approval of this case
Chas. R. Suter
Colonel of Engineers

DRAWING NO. 15

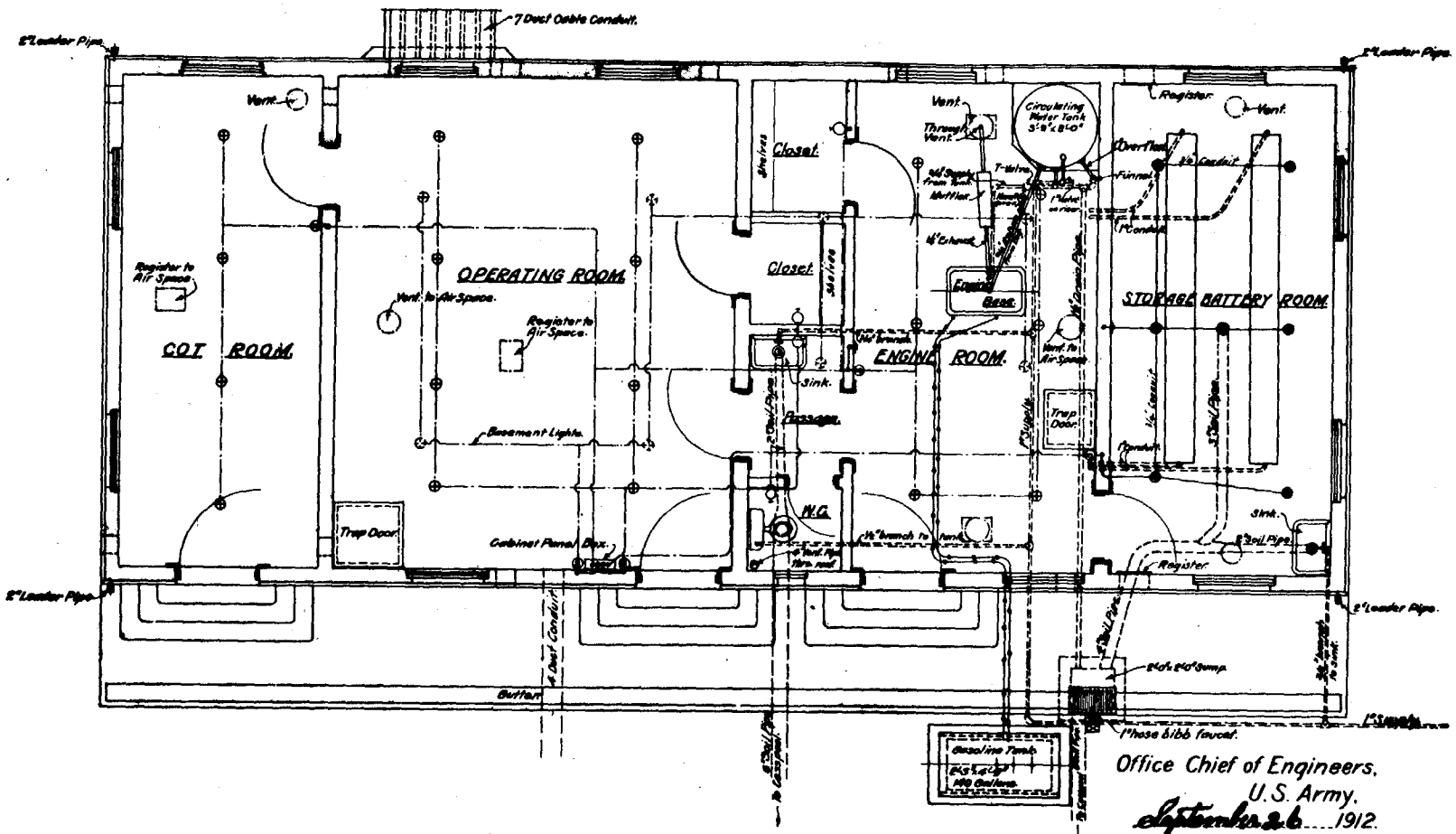
94-118
9

No. 16. Old Mining Casemate, Bakers Beach, Fort Winfield Scott.

This was the control room for operating a submarine minefield outside the Golden Gate. On the eve of World War II this casemate was abandoned in favor of a larger casemate erected nearby that controlled two minefields.

National Archives,
Cartographic Archives Division,
Record Group 77,
Dr. 94, Sht. 151-19.

War Department. Corps of Engineers, U.S. Army.



Office Chief of Engineers,
U.S. Army,
September 26 1912.
Respectfully submitted to the Secretary of War, with recommendation for approval.

M. Taylor
Acting Chief of Engineers.

War Department
September 30 1912.

Approved
Robert Shaw Oliver
Acting Secretary of War.

Notes and Instructions.

All sumps, gutters and drains shall be carefully inspected at least once a week, care being taken that the sand and rubbish at bottom of holes is removed.

Arrows show the direction of flow in drains. Roof gutters shall be thoroughly cleaned before the commencement of the rainy season.

Immediately after each rain, the earth slopes shall be carefully inspected and any slight tendency to gully or slough shall be at once remedied. Any serious gullying, etc., shall be reported in writing to the Engineer Officer in charge of the locality.

Engines, dynamos, etc., must be given the best of care and attention. The framed instructions issued by the manufacturers as well as the instructions contained in the hand-book for use of electricians in the operation and care of electrical machinery and apparatus of the U.S. Seacoast Defence must be strictly followed. Machinery, engine, dynamo, etc., shall be carefully inspected, cleaned and oiled if needed, at least once a week.

Extra fuses of sizes needed shall at all times be kept on hand. In case a fuse should blow out, it must under no circumstances, be replaced by anything but by another fuse of the proper size.

Cables must not be disturbed after once in place, if possible to avoid it.

Legend.

- Gasoline Pipes.
- Knob and bushing wiring.
- ● Switch.
- ○ Keyless Receptacle.
- ⊕ Key Receptacle.
- ● Combined Junction Box and Lamp Receptacle.

Mining Casemate
Baker's Beach, Ft. W. Scott,
California.

Scale: ½" = One Foot.

U.S. Engineer Office, 2nd District, San Francisco, Cal.
September 18, 1912.
Respectfully submitted to the Chief of Engineers; approval recommended.

Thos. H. Rees
Lieut. Col., Corps of Engineers.

U.S. ENGINEER OFFICE				SAN FRANCISCO, CAL.
DOC. FILE	DATE	FILE	DIV.	SHEET
166/142	June 6 1912	7	3	29

DRAWING NO. 16

No. 17. Fort Funston, Ca. 1938.

The planting plan was concerned with concealment of the fortifications, especially the new Battery Davis, and with erosion control of the sand dunes. Batteries Walter Howe (mortars), Bluff (155-mm. guns), and Antiaircraft Battery 3 are also shown. Note U.S. Coast Guard Lifesaving station in the vicinity of the post barracks. A few foundation ruins of the barracks may still be seen.

National Archives,
Cartographic Archives Division,
Record Group 77,
Dr. 215, Sht. 15-35.

WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY

215-15-35

LEGEND

Leptospermum	100	5' centers
Acacia		8' "
Pine		15' "
Eucalyptus		12' "
Kudzu		5'

GROUP	LEPTO.	ACACIA	PINE	EUCALYP.	KUDZU	GROUP	LEPTO.	ACACIA	PINE	EUCALYP.	KUDZU
1		30				17				110	
2		80	25			18				40	
3			40			19			15		160
4	100	80	35			20				45	
5			40	60		21			15	240	
6			20			22			20		
7			20			23		170	205		
8	80	40	40			24	100	45			
9	80		30			25	275	130	95		
10			95			26			30	180	
11			10			27			85		160
12			30			28		65			
13			40			29	125	50	35		
14			35			30			115		
15				40		31	300	135	255	15	
16				180		32			80	160	170
						TOTALS	1040	825	1420	1070	490

CLASSIFIED PLANTING PLAN

Scale 1" = 200'

COMPREHENSIVE PLAN

PACIFIC OCEAN

Top of Bluff

U. S. M. R. BOUNDARY

U. S. M. R. BOUNDARY — FT. FUNSTON

STATE HIGHWAY

SEC. A 4,100 Ft.

SEC. B 1,800 Ft.

SEC. C 3,700 Ft.

SEC. D 2,200 Ft.

SEC. E 300 Ft.

4120'

3780'

Shrubs & Trees interspersed

U.S. COAST GUARD STATION

ARTILLERY BARRACKS

Pistol Range

Director Box

Power House

CONSTRUCTION ROAD

SKYLINE BOULEVARD

Lake Merced

CONFIDENTIAL

FENCING PLAN SUPERIMPOSED IN BLACK

PLANTING PLAN

(INCOMPLETE IN VICINITY OF BTRY. DAVIS)

FORT FUNSTON, CALIFORNIA.

IN 1 SHEET SCALE: 1" = 200' SHEET NO 1

U.S. ENGINEER OFFICE, SAN FRANCISCO, CALIF.

SUBMITTED APPROVAL RECOMMENDED APPROVED

215-15-35

Senior Engineer Capt, Corps of Engineers Lt Col, Corps of Engineers

DESIGNED	DOC FILE	FILE	DIV.	SHEET	TRANSMITTED WITH LETTER DATED
CHECKED					
DRAWN TRACED	5-1	59	11	2	

DRAWING NO 17

No. 18. Fort Miley, 1914.

The central part of the post, the parade ground and quarters, is today occupied by a U.S. Veterans Administration Hospital. Battery Call, shown here as disarmed, had just been constructed as a result of tension with Japan over immigration policy.

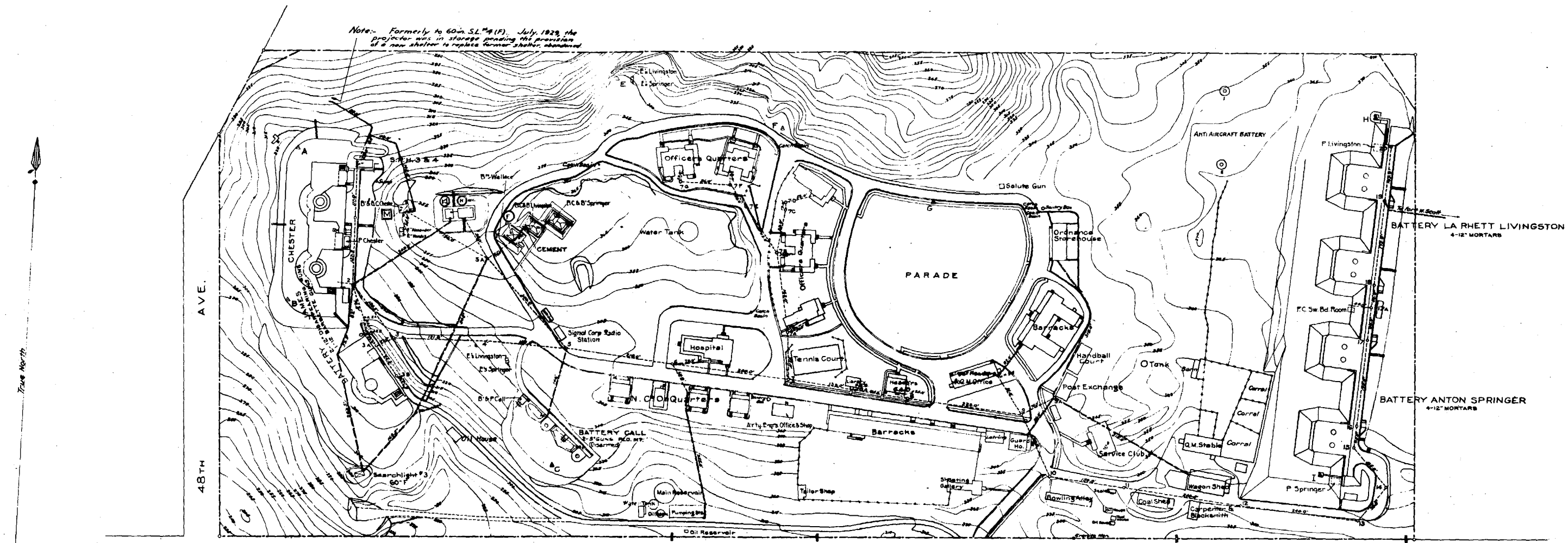
National Archives,
Cartographic Archives Division,
Record Group 77,
Dr. 93, Sht. 120-4.

WAR DEPARTMENT

CORPS OF ENGINEERS, U.S. ARMY

FORT MILEY
SAN FRANCISCO, CAL.

SCALE: 1 INCH = 100 FEET



NOTES

This map was prepared from a survey made in May-June 1914 by the U.S. Engineer Department.

The elevations are referred to the plane of M.L.L.W.

B.M. is "CEMENT" elevation of which is 370.24

The area of FORT MILEY is 54.05 acres

o-Electric conduit manhole

o H.H. " " handhole

--T--T-- " "

△-Triangulation points of survey

---T.T.--- " " Buried cable

P.S.B.- Post Telephone Switchboard

SERIAL PRINT No. 4
1st SAN FRANCISCO DISTRICT

U.S. ENGINEER OFFICE SAN FRANCISCO, CAL.				
DOC. NO.	DATE Nov. 1914	FIL. 6	DIV. 1	SHEET 11

DRAWING NO. 18

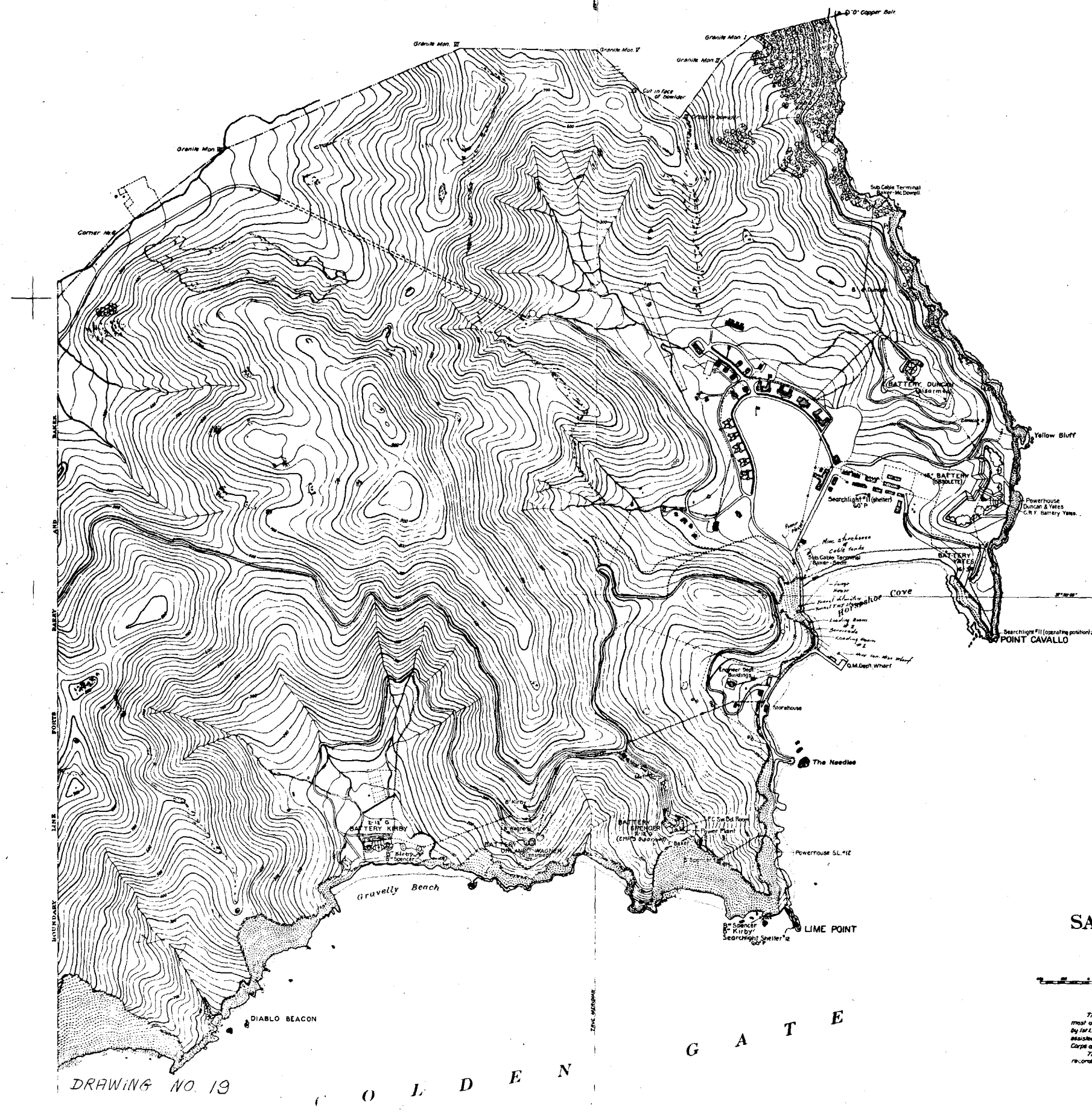
No. 19. Fort Baker, Ca. 1930s.

While the map was drawn before the construction of the Golden Gate Bridge, it has been updated by showing the mine depot structures, which were not built until 1937-41. Note the Fort Baker post garden behind Battery Kirby.

National Archives,
Cartographic Archives Division,
Record Group 77,
Dr. 93, Sht. 69-58.

WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY.



FORT BAKER
SAN FRANCISCO HARBOR
CALIFORNIA

SCALE: 1 INCH = 400 FEET

NOTES

The topography of this map was traced from the map entitled "Map of the Lime Point Tract" most of which was surveyed under the direction of the Board of Engineers for the Pacific Coast by 1st Lieut. T.H. Handbury, Corps of Engineers, assisted by J.G. Le Conte in 1868-9 and by W.H. Wright, C.E., assisted by J.P. Mouron and R.H. Salter Jr. in 1871-2. The remainder by 1st Lieut. J.B. McPherson, Corps of Engineers in 1880.

The batteries, wharves, barracks and structures in general were compiled from surveys, records etc. on file in the U.S. Engineer Office, San Francisco, California.

DRAWING NO. 19

SERIAL PRINT N° 8
1ST SAN FRANCISCO DISTRICT.

No. 20. Fort Barry, 1972, on the Eve of the Establishment of GGNRA.

Army fortifications on Point Bonita are not shown, that area being under U.S. Coast Guard administration.

Presidio of San Francisco,
U.S. Army and Golden Gate National Recreation Area.

LEGEND

EXISTING

- BUILDING, PERMANENT
- BUILDING, SEMIPERMANENT
- BUILDING, TEMPORARY
- PAVED ROAD OR AREA
- UNPAVED ROAD OR AREA
- RAILROAD
- FENCE
- *RESERVATION BOUNDARY*
- RIGHT OF-WAY OR EASEMENT LINES
- INDEX CONTOUR 50' INTERVAL
- INTERMEDIATE CONTOUR 10' INTERVAL

RODEO LAKE

RODEO LAGOON

RODEO COVE

BONITA COVE

BIRD ISLAND

POINT DIABLO

POINT BONITA

MARIN HEADLANDS, STATE PARK
KIRBY BEACH UNIT

FORT CRONKHITE
FORT BARRY

MARIN COUNTY
CITY & COUNTY OF SAN FRANCISCO

FORT BARRY
CITY & COUNTY OF SAN FRANCISCO

FORT BARRY
U.S. COAST GUARD

APPROXIMATE 300 YARDS BEYOND LOW WATER MARK

APPROXIMATE 300 YARDS BEYOND LOW WATER MARK

PACIFIC OCEAN

DEBRIS DISPOSAL SITE

RIFLE RANGE

PISTOL RANGE

SANITARY FILL AREA

BATTERY MILLER

BATTERY MITCHELL

BATTERY ALEXANDER

BATTERY RATHBONE - MCINDOE

BATTERY KIRBY

BATTERY WALKER

BATTERY WOODWARD

BATTERY KINNEY

BATTERY WOOD

BATTERY MILL

BATTERY KILL

BATTERY MERRILL

BATTERY MEHOLL

AD MSL SITE SF 88L

ADMIN SF 88

EMERGENCY GATE

SCALE IN FEET

11 MAR 72

DRAWING NO. 20

FORT BARRY
CALIFORNIA

MASTER PLANNING OFFICE
DIRECTORATE OF FACILITIES ENGINEERING
HEADQUARTERS PRESIDIO OF SAN FRANCISCO

No. 21. Fort Cronkhite, 1972.

Fortification structures on Wolf Ridge are not shown, that area then being under U.S. Coast Guard administration.

Courtesy, Presidio of San Francisco,
U.S. Army and Golden Gate National Recreation Area.

MARIN HEADLANDS STATE PARK
TENNESSEE VALLEY UNIT

TENNESSEE (ELK) VALLEY

TENNESSEE COVE

TENNESSEE POINT

TENNESSEE POINT AMMUNITION DESTRUCTION AREA

US COAST GUARD PRIMARY RADIO RECEIVER STATION

US COAST GUARD FORT CRONKHITE

BATTERY TOWNSLEY

TOWNSLEY RESERVE

AD MSL SITE SF 88 C

INACTIVE AD MSL SITE SF 87 L

ADMIN SF 87 INACTIVE

FORT CRONKHITE

FORT BARRY

RODEO LAGOON

RODEO LAKE

RODEO COVE

PACIFIC OCEAN

MARIN COUNTY

MITCHELL ROAD

BUNKER ROAD

KIRKPATRICK ST.

ASSBURY ST.

LEGEND

EXISTING

- BUILDING, PERMANENT
- BUILDING, SEMIPERMANENT
- BUILDING, TEMPORARY
- PAVED ROAD OR AREA
- UNPAVED ROAD OR AREA
- RAILROAD
- FENCE
- RESERVATION BOUNDARY
- RIGHT OF-WAY OR EASEMENT LINES
- INDEX CONTOUR 50' INTERVAL
- INTERMEDIATE CONTOUR 10' INTERVAL

N

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FORT CRONKHITE
CALIFORNIA

MASTER PLANNING OFFICE
DIRECTORATE OF FACILITIES ENGINEERING
HEADQUARTERS PRESIDIO OF SAN FRANCISCO

DRAWING NO. 21

HISTORIC BASE MAP

Sheet 1. Locations of Seacoast Fortifications, GGNRA
Sheet 2. Fortifications, Hill 640 Military Reservation
Sheet 3. Fortifications, Frank Valley Military Reservation
Sheet 4. Fortifications, Fort Cronkhite
Sheet 5. Fortifications, Fort Barry
Sheet 6. Fortifications, Fort Baker
Sheet 7. Fortifications, Angel Island
Sheet 8. Fortifications, Fort Winfield Scott
Sheet 9. Fortifications, Fort Miley
Sheet 10. Fortifications, Fort Funston

Sheet 1. Locations of Seacoast Fortifications, Golden Gate National Recreation Area.

PT. REYES

DRAKES BAY

WILDCAT MIL. RESERVATION

HILL 640 MIL. RESERVATION

PACIFIC

OCEAN

FRANK VALLEY MIL. RESERVATION

ANGEL I.

FORT CRONKHITE

FORT BARRY

FORT BAKER

ALCATRAZ I.

PRESIDIO OF SAN FRANCISCO

FORT WINFIELD SCOTT

FORT MASON

YERBA BUENA I.

FORT MILEY

SUTRO HEIGHTS

LAKE MERCED

FORT FUNSTON

S.E. FARALLON I.

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HALF MOON BAY

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LOCATIONS OF SEACOAST FORTIFICATIONS

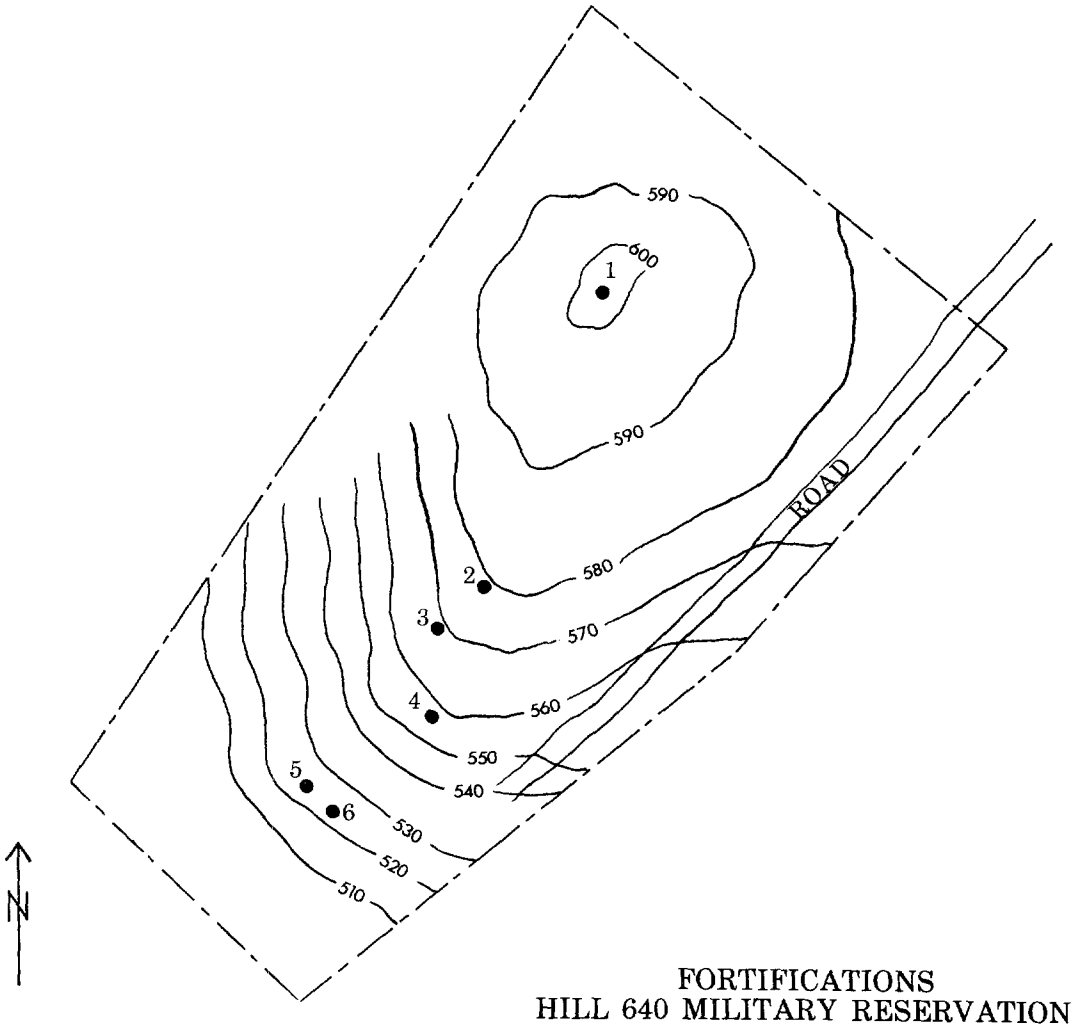
GOLDEN GATE NATIONAL RECREATION AREA

HISTORIC BASE MAP SHEET 1

United States Department of the Interior/National Park Service

Sheet 2. Fortifications, Hill 640 Military Reservation.

1. Radar set, SCR-296, foundation pylons and dug-in, reinforced concrete bombproof
2. Fire control station, B^3S^3, Battery Construction 129
3. Fire control station, B^5S^5, Battery Construction 243
4. Fire control station, B^3S^3, Townsley
5. Fire control station, B^6S^6, Davis
6. Fire control station, unknown



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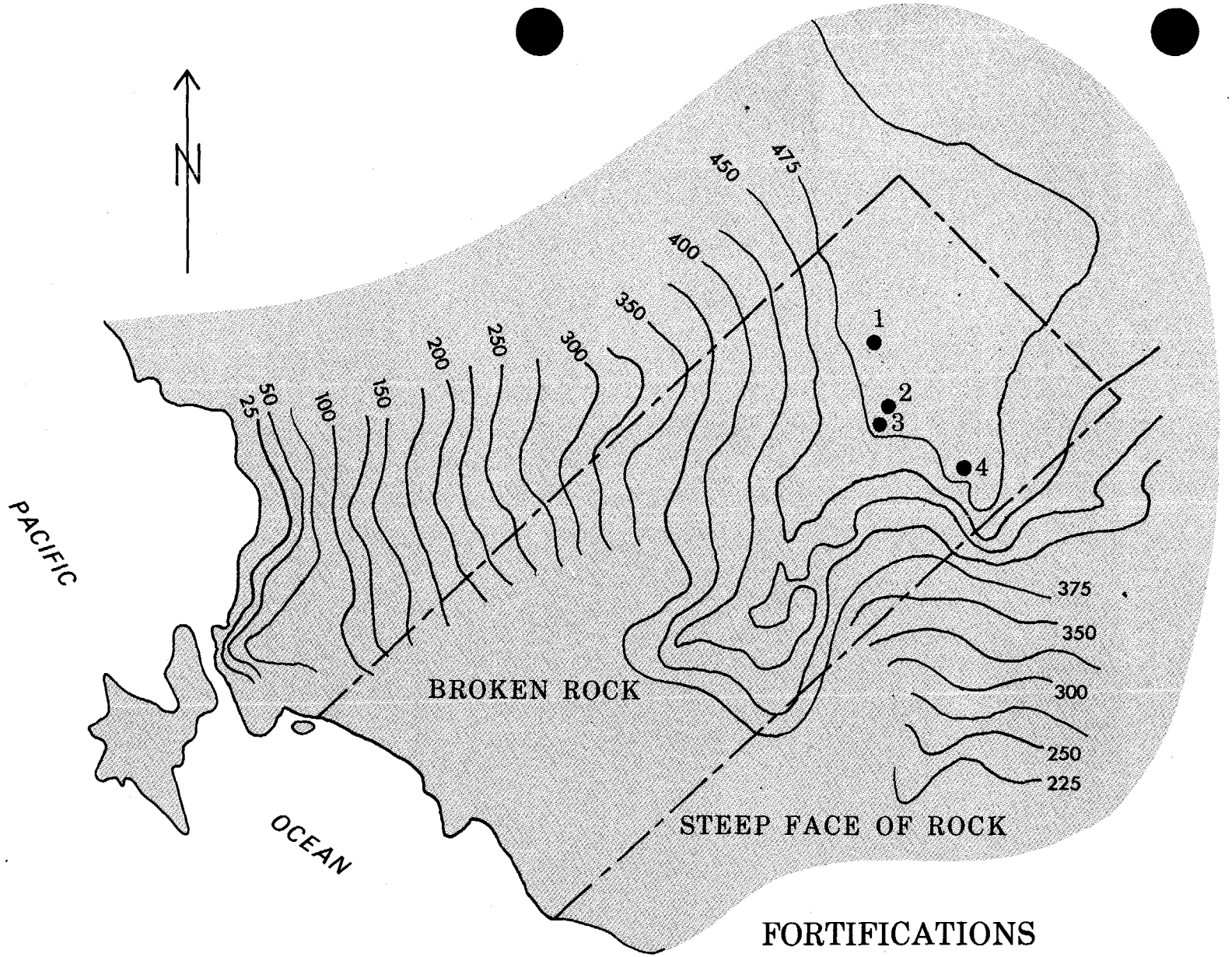
FORTIFICATIONS
HILL 640 MILITARY RESERVATION

GOLDEN GATE NATIONAL RECREATION AREA
HISTORIC BASE MAP SHEET 2

United States Department of the Interior/National Park Service

Sheet 3. Fortifications, Frank Valley Military Reservation.

1. Fire control station, B^5S^5, Battery Construction 243
2. Fire control station, B^4S^4, Wallace
3. Fire control station, B^2S^2, Smith
4. Fire control station, M^3, Mines I



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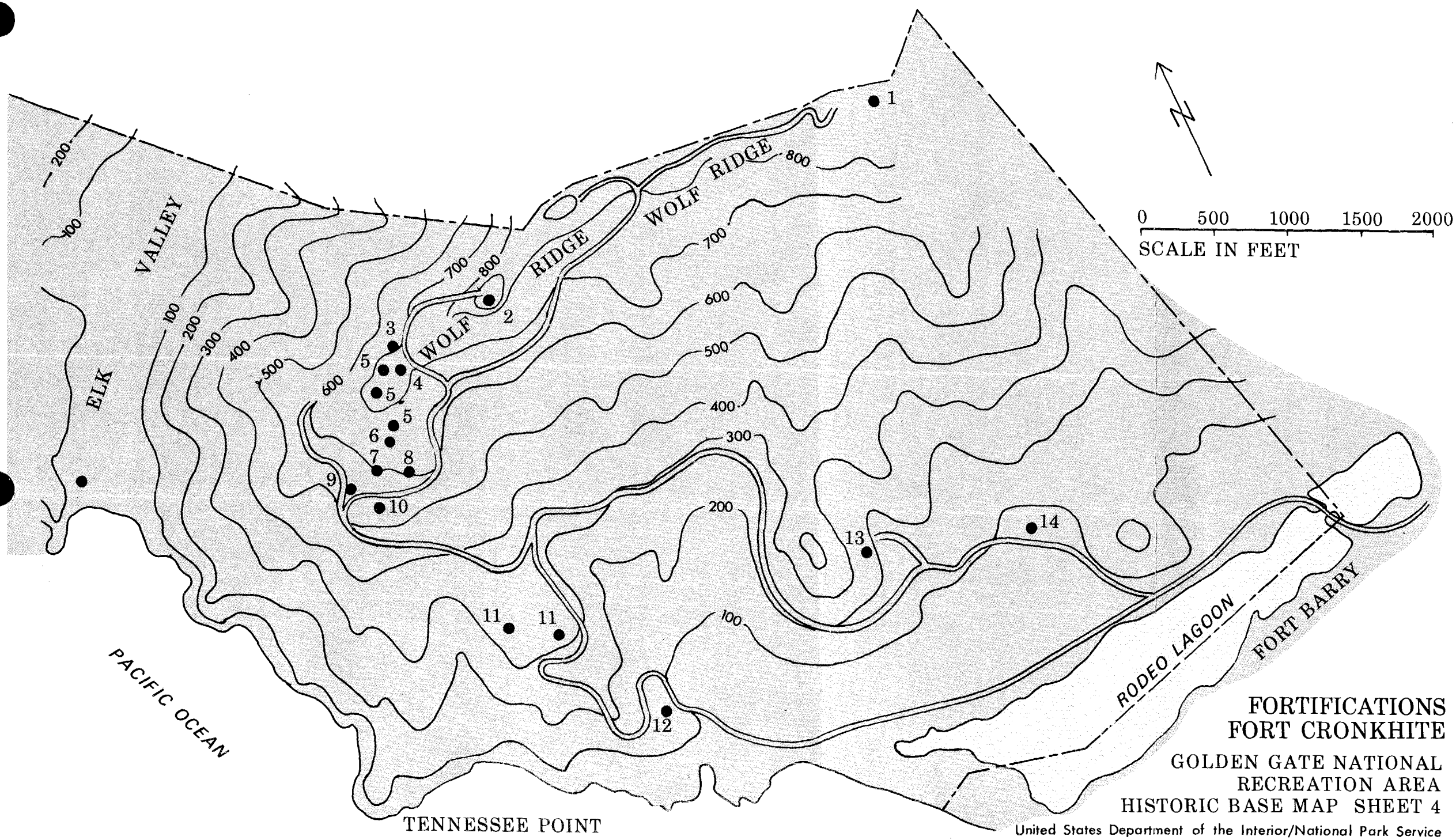
FORTIFICATIONS
FRANK VALLEY MILITARY RESERVATION

GOLDEN GATE NATIONAL RECREATION AREA
HISTORIC BASE MAP SHEET 3

United States Department of the Interior/National Park Service

Sheet 4. Fortifications, Fort Cronkhite.

1. Air Defense Missile Site (Nike). San Francisco 88C. This was the radar control center for the Nike battery at Fort Cronkhite. The two radar towers are considered historically significant.
2. Height finder and director pit, Antiaircraft Battery 1
3. Bombproof storeroom and power room, Antiaircraft Battery 1
4. Bombproof magazines, Antiaircraft Battery 1
5. Three emplacements for 3-inch guns, Antiaircraft Battery 1
6. Fire control station, B^1S^1, Townsley
7. Fire control station, GB-1
8. Battery command post, Townsley
9. Fire control station, B^4S^4, Davis
10. Fire control station, B^1S^1, Battery Construction 129
11. Two emplacements, 16-inch guns, Battery Townsley
12. Switchboard, plotting, and radio rooms, Battery Townsley
13. Central Reserve Magazine
14. Air Defense Missile Site (Nike) Launch Area. San Francisco 87L



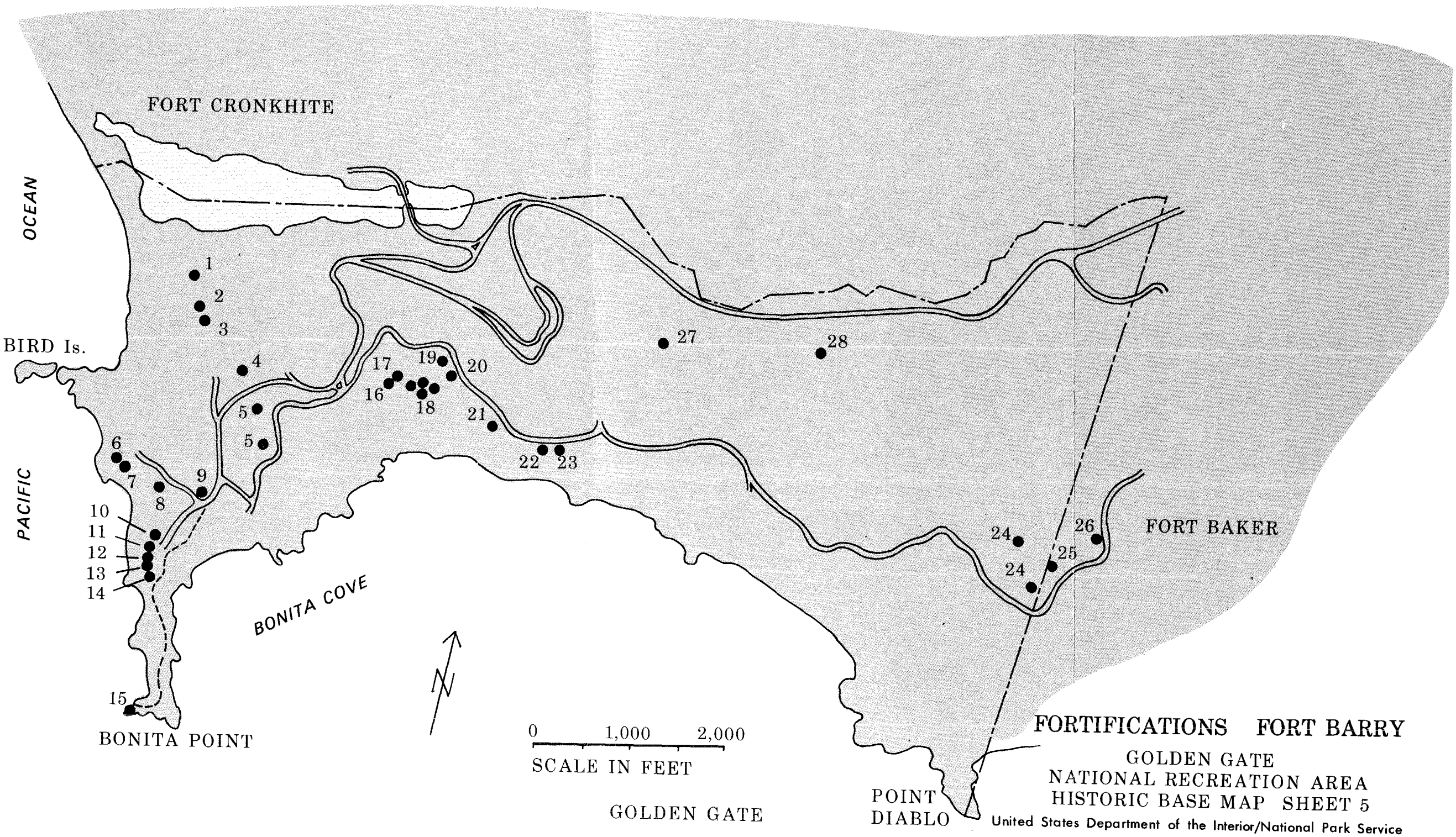
FORTIFICATIONS FORT CRONKHITE

GOLDEN GATE NATIONAL RECREATION AREA HISTORIC BASE MAP SHEET 4

United States Department of the Interior/National Park Service

Sheet 5. Fortifications, Fort Barry.

1. Battery O'Rorke, four 3-inch guns
2. Battery Guthrie, two 6-inch guns
3. Battery Smith, two 6-inch guns
4. Battery Alexander, eight 12-inch mortars
5. Battery Wallace, two emplacements for 12-inch guns
6. Fire control station, B^2S^2, Chamberlin
7. Fire control station, M^4, mines II
8. Battery Mendell, two 12-inch guns
9. Mine casemate, 1
10. Signal tower
11. Fire control station, GB-2
12. Fire control station, Barry Group
13. Fire control station, M^1, mines I
14. Fire control station, B^2S^2, Livingston
15. Fire control station, B^1S^1, Mendell, and BC^2 B^4S^4, Alexander, and searchlight shelter
16. Battery command post, Battery Wallace
17. Fire control station, B^1S^1, Wallace
18. Antiaircraft Battery 2: three 3-inch gun emplacements and director
19. Magazine, Antiaircraft Battery 2
20. Storeroom and power room, Antiaircraft Battery 2
21. Fire control station, B^1, Rathbone
22. Battery Rathbone, two 6-inch guns
23. Battery McIndoe, two 6-inch guns
24. Battery Construction 129, two emplacements for 16-inch guns
25. Battery command post, Battery Construction 129
26. Radio and switchboard rooms, Battery Construction 129
27. Balloon hangar
28. Departmental rifle range



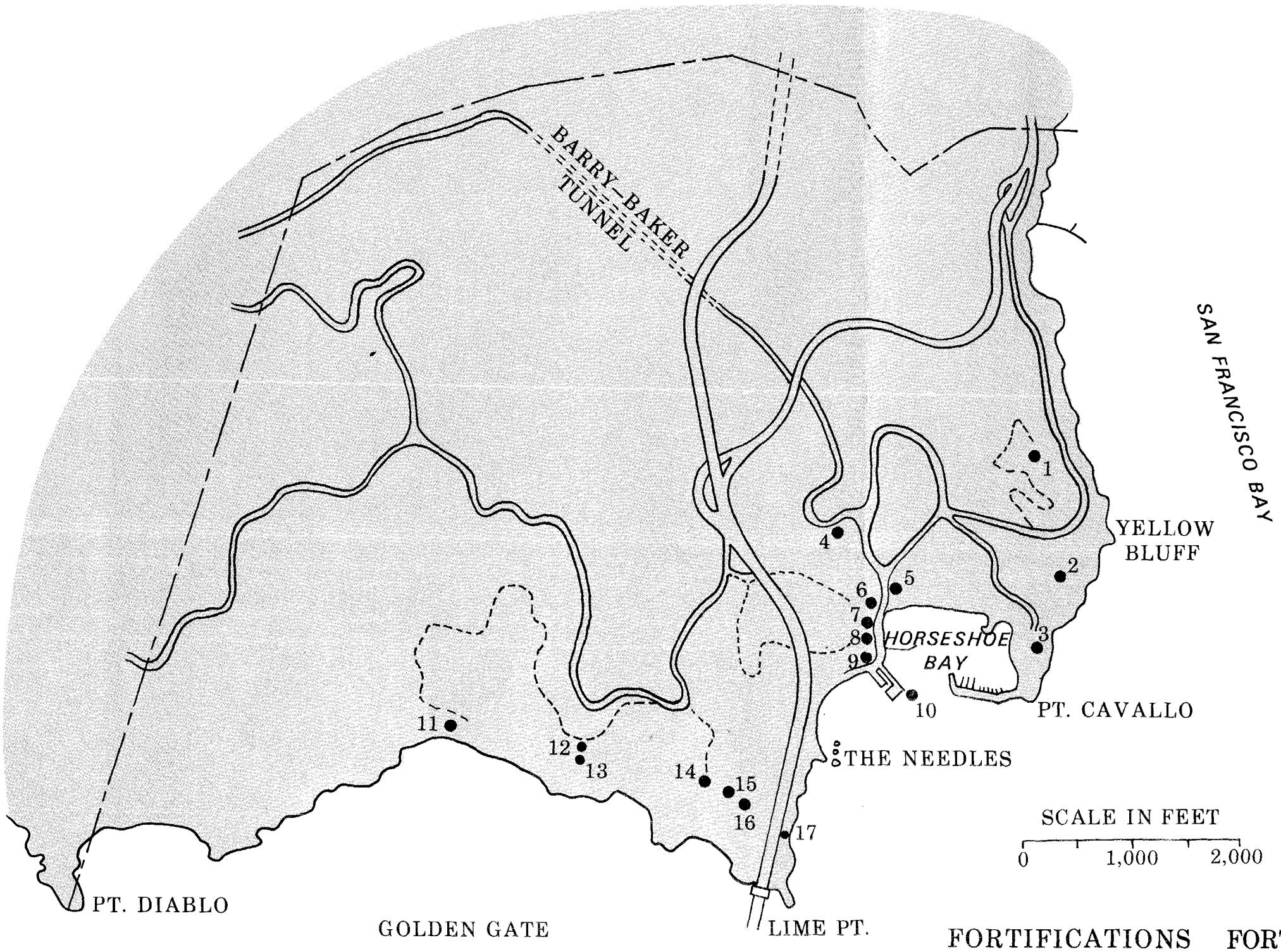
FORTIFICATIONS FORT BARRY

GOLDEN GATE
NATIONAL RECREATION AREA
HISTORIC BASE MAP SHEET 5

United States Department of the Interior/National Park Service

Sheet 6. Fortifications, Fort Baker.

1. Battery Duncan, two 8-inch guns
2. Cavallo Battery, 15-inch Rodmans
3. Battery Yates, six 3-inch guns
4. Storehouse, mine depot
5. Cable tanks, mine depot
6. Powerhouse, mine depot
7. Explosives storage, mine depot
8. Explosives storage, mine depot
9. Loading rooms, mine depot
10. Wharf, mine depot
11. Battery Kirby, two 12-inch guns, and portions of Gravelly Beach Battery, 15-inch Rodmans
12. Fire control station, possibly associated with Battery O. Wagner
13. Battery Wagner, two 5-inch guns
14. Battery Spencer, three 12-inch guns, associated structures, and Ridge Battery, four 15-inch Rodmans
15. Fire control station, Fort Baker
16. Fire control station, B^1S^1, Spencer
17. Site of large-scale blasting, Mendell, late 1860s



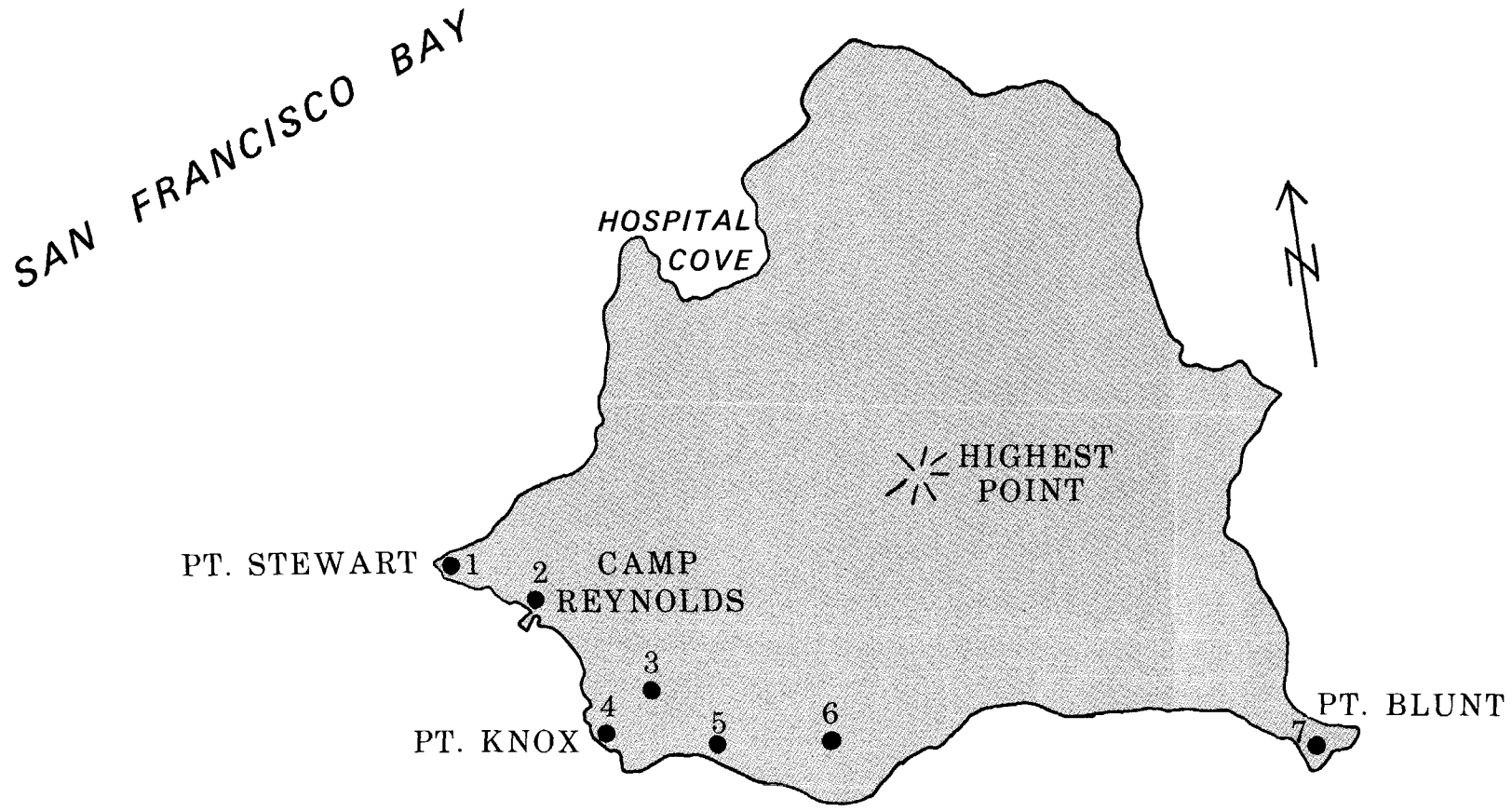
FORTIFICATIONS FORT BAKER

GOLDEN GATE NATIONAL RECREATION AREA
HISTORIC BASE MAP SHEET 6

United States Department of the Interior/National Park Service

Sheet 7. Fortifications, Angel Island.

1. Point Stewart Battery, site only
2. Camp Reynolds Battery, site partially destroyed
3. Battery Drew, one 8-inch gun
4. Battery Ledyard, two 5-inch guns, on site of Point Knox Battery
5. Mining Casemate
6. Battery Wallace, one 8-inch gun
7. Point Blunt Battery, site only



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FORTIFICATIONS ANGEL ISLAND

GOLDEN GATE NATIONAL RECREATION AREA

HISTORIC BASE MAP SHEET 7

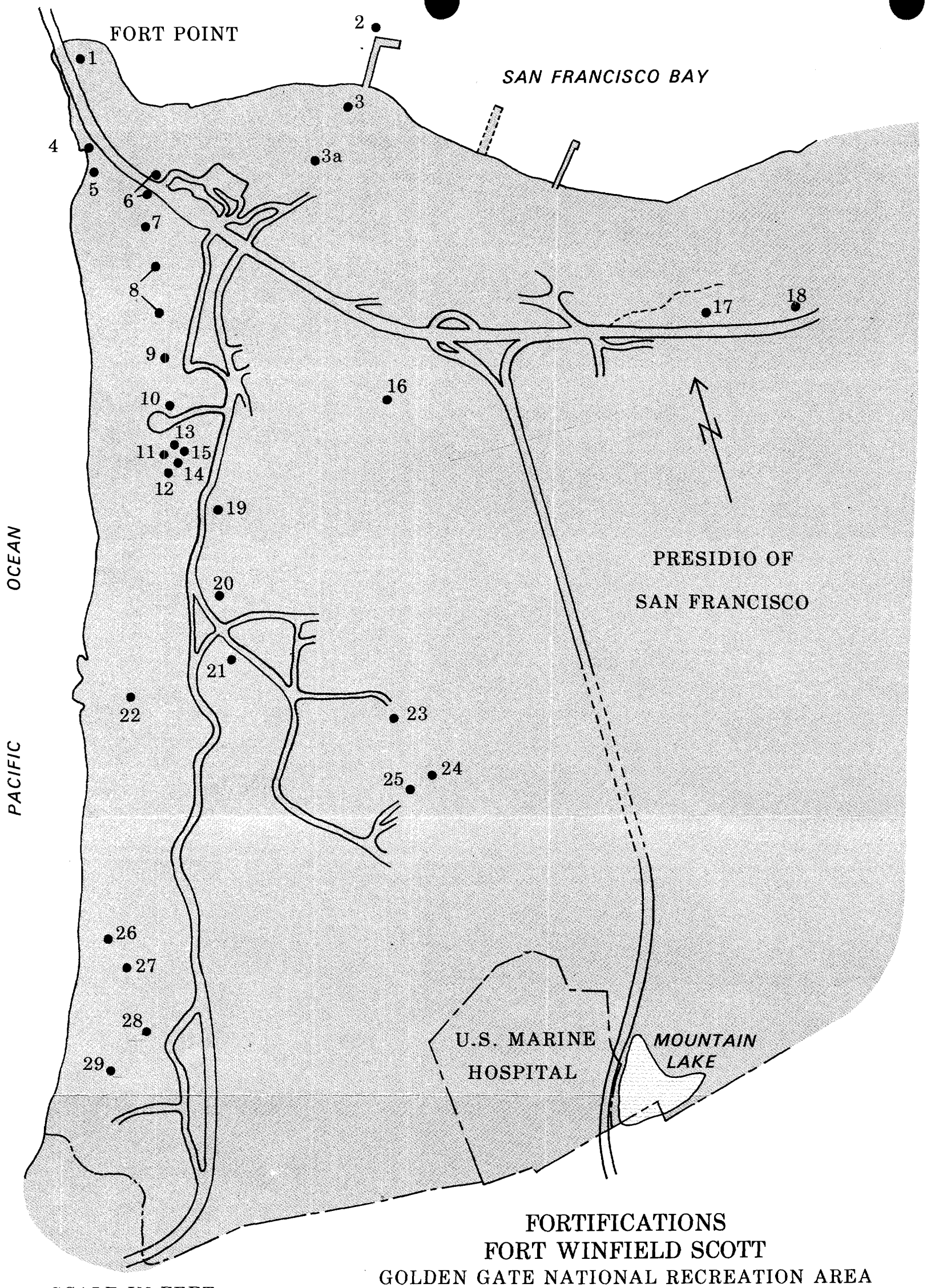
United States Department of the Interior/National Park Service

Sheet 8. Fortifications, Fort Winfield Scott.

1. Fort at Fort Point
2. Wharf, mine depot
3. Mine depot

3a. Battery East

4. Fire control station, B^3, Chamberlin
5. Fire control station, M^2, mines II
6. Partial ruins of Battery Lancaster
7. Battery Cranston, two 10-inch guns
8. Battery Marcus Miller, three 10-inch guns
9. Battery Boutelle, three 5-inch guns
10. Battery Godfrey, three 12-inch guns
11. Magazine, Battery West
12. Magazine, Battery West
13. Gun plug, former antiaircraft battery
14. Gun plug, former antiaircraft battery
15. Fire control station or radio hut
16. Batteries Howe and A. Wagner, sixteen 12-inch mortars, buried
17. Battery Sherwood, two 5-inch guns
18. Battery Blaney, four 3-inch guns
19. Battery Dynamite, three 15-inch guns, harbor defense command post, and harbor entrance control point
20. Battery Saffold, two 12-inch guns
21. Fire control station, function unknown
22. Battery Crosby, two 6-inch guns
23. Central Reserve Magazine
24. Battery Stotsenburg, eight 12-inch mortars
25. Battery McKinnon, eight 12-inch mortars
26. Battery Chamberlin, four 6-inch guns
27. Fire control station, BC B^1, Chamberlin
28. Mining Casemate, mines II and III
29. Old mining casemate



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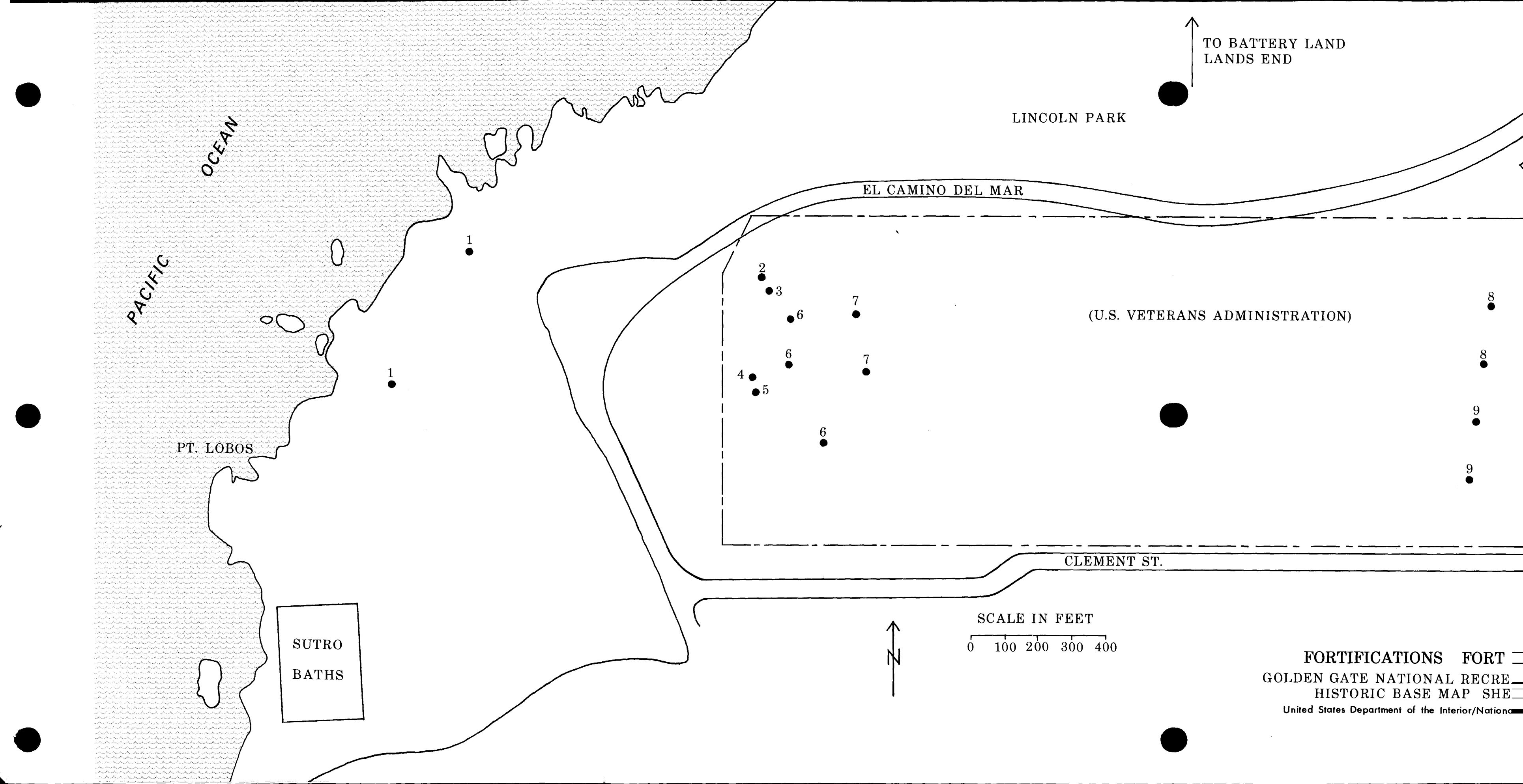
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FORTIFICATIONS
FORT WINFIELD SCOTT
GOLDEN GATE NATIONAL RECREATION AREA
HISTORICAL BASE MAP SHEET 8

United States Department of the Interior/National Park Service

Sheet 9. Fortifications, Fort Miley.

1. Battery Lobos, two emplacements for 6-inch guns, sites only
2. Fire control station, B^2S^2, Wallace
3. Helicopter landing pad
4. Fire control station, B^2S^2, Townsley
5. Fire control station, B^2S^2, Davis
6. Battery Chester, three 12-inch guns
7. Battery Construction 243, two 6-inch guns
8. Battery Livingston, eight 12-inch mortars
9. Battery Springer, eight 12-inch mortars

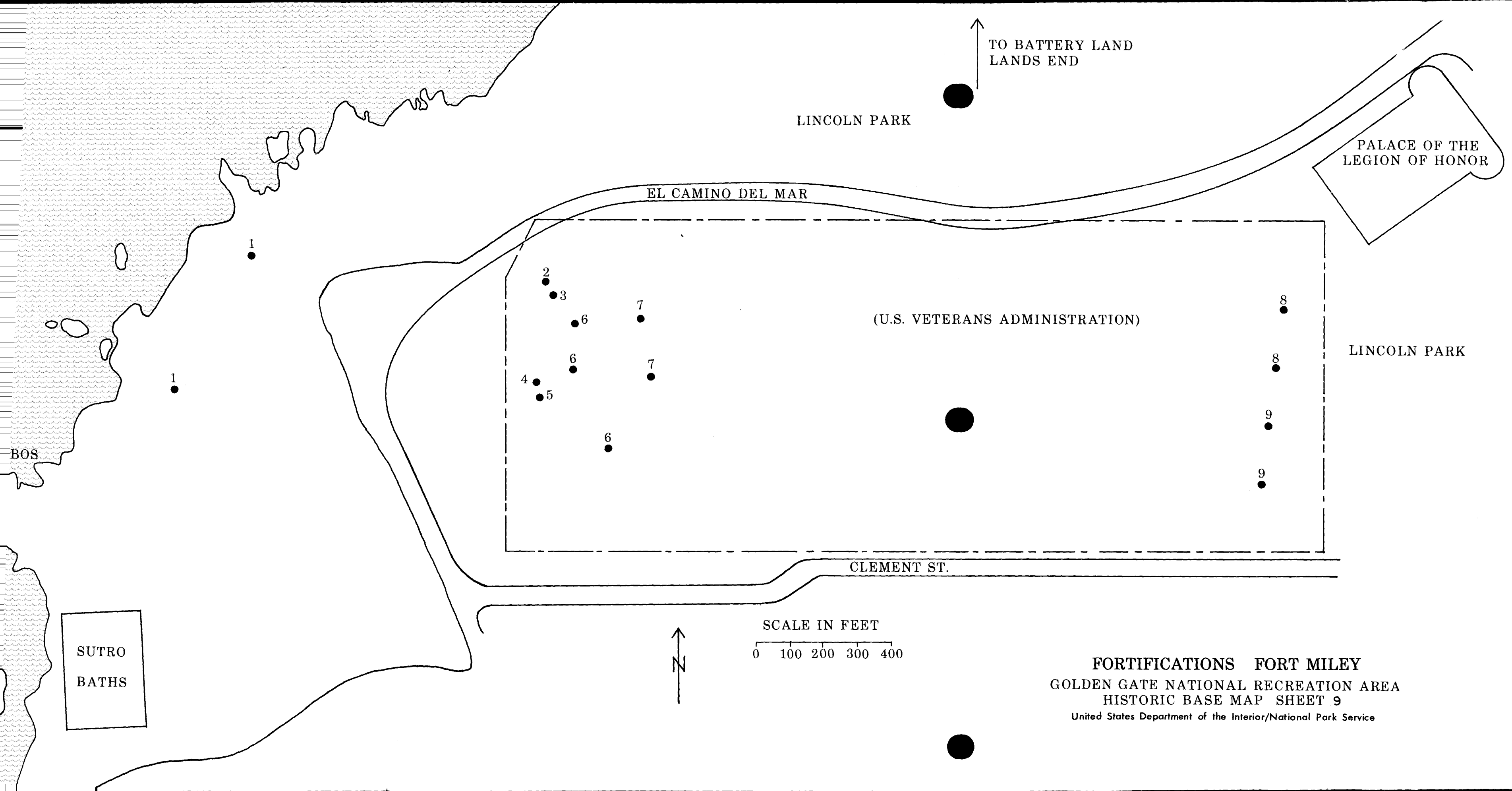


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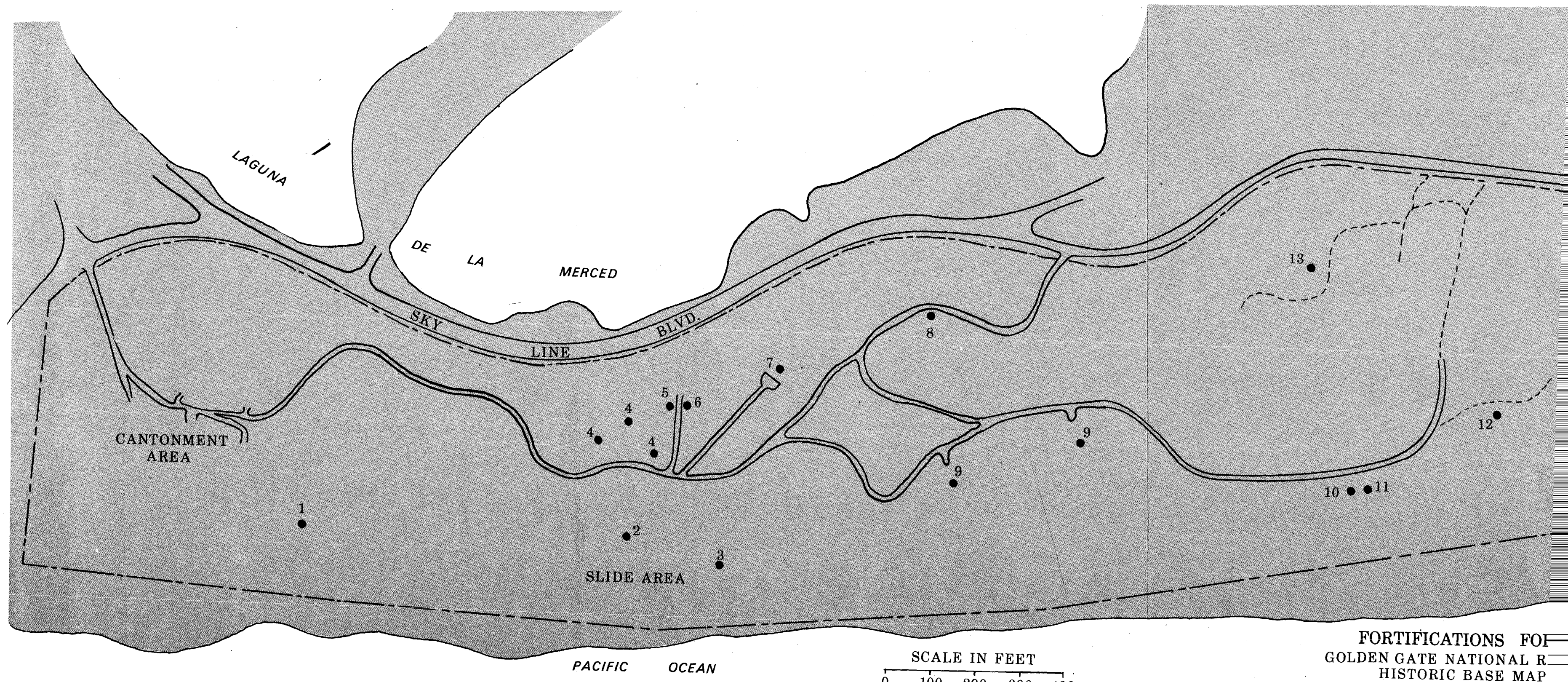
FORTIFICATIONS FORT MILEY

GOLDEN GATE NATIONAL RECREATION AREA
HISTORIC BASE MAP SHEET 9

United States Department of the Interior/National Park Service

Sheet 10. Fortifications, Fort Funston.

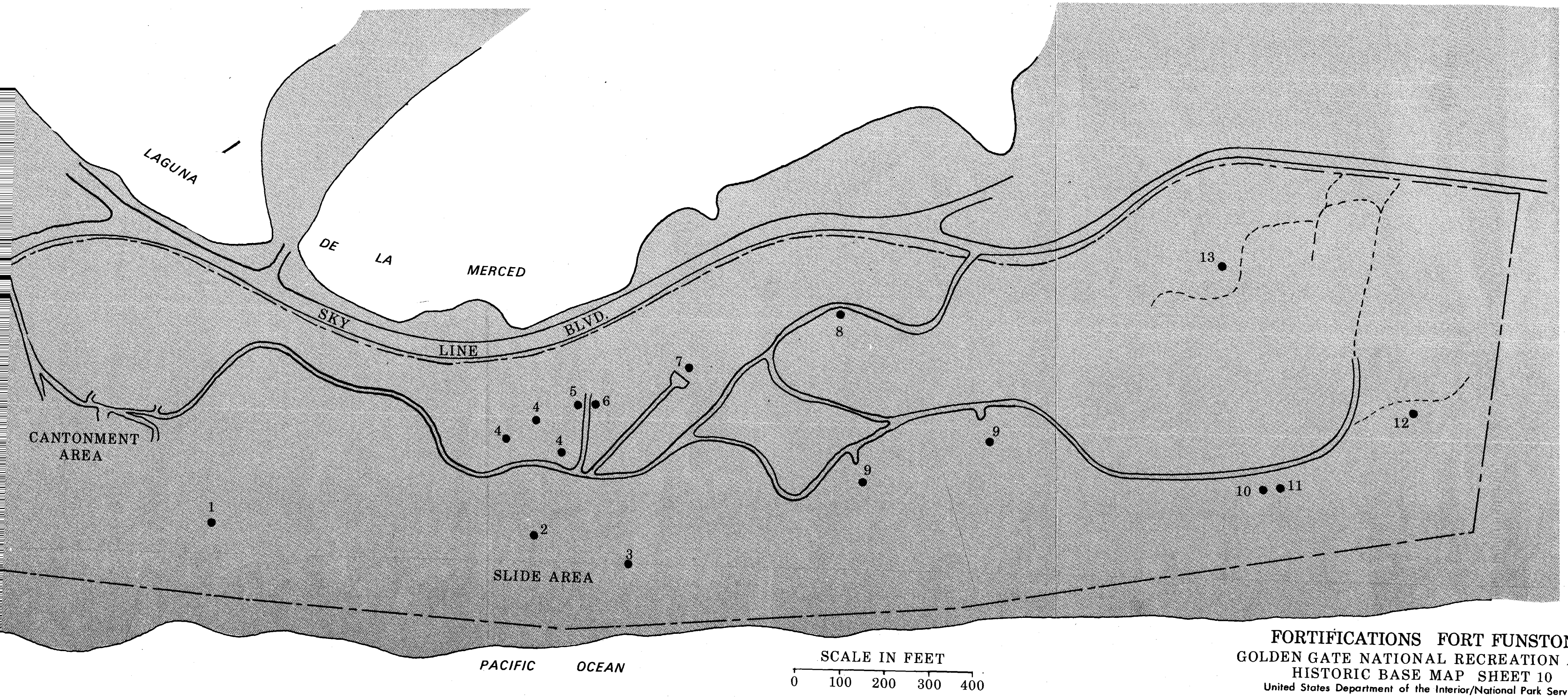
1. Battery Howe, four 12-inch mortars, site only
2. Fire control station, B^2S^2, Battery Construction 243
3. Panama mounts for 155-mm. guns, Battery Bluff
4. Antiaircraft Battery 3, three 3-inch gun plugs
5. Storeroom and power room, Antiaircraft Battery 3
6. Magazine, Antiaircraft Battery 3
7. Balloon hangar, site only
8. Switchboard and plotting rooms, Battery Davis
9. Battery Davis, two emplacements for 16-inch guns
10. Fire control station, Funston Group
11. Fire control station, B^5S^5, Battery Construction 244
12 Second site of Battery Bluff (no. 3, above), site only
13. Nike missile battery



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FORTIFICATIONS FORT FUNSTON

GOLDEN GATE NATIONAL RECREATION AREA

HISTORIC BASE MAP SHEET 10

United States Department of the Interior/National Park Service

As the nation's principal conservation agency, the Department of the Interior has basic responsibilities to protect and conserve our land and water, energy and minerals, fish and wildlife, parks and recreation areas, and to ensure the wise use of all these resources. The department also has major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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