

# FINAL TRAIN RAIL SYSTEM HISTORIC CONTEXT, MAPPING AND INVENTORY SURVEY REPORT

U.S. NAVY HISTORIC RAILROAD AND TRAIN RAIL SYSTEM THROUGHOUT PHNSY & IMF  
PEARL HARBOR NAVAL SHIPYARD (PHNSY) & INTERMEDIATE MAINTENANCE FACILITY (IMF)  
PEARL HARBOR, O'AHU, HAWAII



Prepared for:  
COMMANDER NAVY REGION HAWAII

June 2016

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PEARL HARBOR, O'AHU, HAWAII**

*Prepared for:*

Commander, Navy Region Hawaii

*Prepared by:*

SEARCH

45-035 Kāne'ōhe Bay Drive, #3

Kāne'ōhe, Hawai'i 96744

*Under contract to:*

Naval Facilities Engineering Command Pacific

258 Makalapa Drive, Suite 100

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## LIST OF ACRONYMS

CIA	Controlled Industrial Area
CPNAB	Contractors Pacific Naval Air Bases
DSLR	Digital Single-Lens Reflex
GIS	Geographic Information System
GPR	Ground Penetrating Radar
GPS	Global Positioning System
GUPPY	Greater Underwater Propulsion Power Program
HRS	Hawaiian Railway Society
MCON	Military Construction Project
NAD	Naval Ammunition Depot
NARA	National Archives
NAVFAC	Naval Facilities Engineering Command
NHPA	National Historic Preservation Act
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
PHNSY & IMF	Pearl Harbor Naval Shipyard & Intermediate Maintenance Facility
SOW	Statement of Work
USDA	US Department of Agriculture
USGS	US Geological Survey



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# CHAPTER 1: HISTORIC CONTEXT REPORT

## 1.1: INTRODUCTION

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This Historic Context Report is structured in three chapters followed by a Bibliography. The first chapter provides a history of the railway system of the Oahu Railway and Land Company (Company). Founded by B. F. Dillingham in the late nineteenth century, the Company built the first railway to traverse approximately half of O'ahu and ran tracks to the Naval Reservation that became Pearl Harbor. Through the first half of the twentieth century, the Oahu Railway and the Navy Yard at Pearl Harbor forged a nearly inseparable relationship. A brief overview of the history of the development of the Navy Yard is presented in the second chapter. The third chapter is a specific discussion of the physical evolution of the railway system within what is now the Navy Railway at Pearl Harbor Naval Shipyard and Intermediate Facility. This chronological chapter traces the development of the system from its initial installation in the early twentieth century to its ultimate abandonment in the post-World War II period.

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## 1.2: HISTORICAL RESEARCH METHODOLOGY

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The historical research for this project focused on gathering information pertinent to understanding the history of the railway system that existed at what is now the Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility and its relationship to the Oahu Railway and Land Company. The historical research on the Navy's railway focused on a review of archival material, such as historic photographs, historic maps, historic plans, correspondence, newspapers, cultural resources studies, and government reports as well as secondary literature such as journal articles and published histories. The historical research on the Oahu Railway and Land Company was generally derived from secondary sources. Historians Nicholas J. Linville and Travis Fulk conducted the archival research during the months of January, February, and March 2012. Nicholas J. Linville conducted the research in secondary sources during the 2012–2015 period. The relevant historical information was synthesized into the Historic Context Report that follows. A full list of sources utilized in the creation of this report is available in the Bibliography.

SEARCH Historians visited several national repositories during the course of archival research. The Seabee Museum Archives, located in Port Hueneme, California, contains a large collection of material generated by the Navy in relation to activities of the many Construction Battalions. The Seabee Museum Archives also has a large general collection of Navy maps, Annual Reports, and Data Books. Archivist Gina Nichols assisted in identifying material of interest. This archive provided maps and plans, aerial oblique photographs, Navy

annual reports and data books, and miscellaneous other material of relevance, although little of the material in this archive dated from years outside of the decades of the 1940s and 1950s.

The National Archives and Records Administration in San Bruno, California, also was visited. This archive contains numerous Navy-generated record collections that pertain to Pacific Ocean installations and activities. Archivist Robert Glass assisted in understanding the breadth and relevance of certain record groups relating to Pearl Harbor. Several hundred cartographic records (installation maps, plans, building plans, roadway plans, etc.) were reviewed; however, only a small selection of these provided useful information on the railway and many of these records were created in the 1940s. This archive had no photographs of relevance to the railway at Pearl Harbor. The most useful records were Navy correspondence from the 1899 to 1950s that provided valuable details on the construction and operation of the railroad in addition to information on the Navy's historic relationship with the Oahu Railway and Land Company.

The National Archives and Records Administration in College Park, Maryland, also was visited. This archive houses several sections, including Still Pictures, Cartographic, and Textual. Records in each of these sections were consulted. A large number of historical photographs of the Naval Shipyard were available in the Still Pictures section. Many of the photographs focused specifically on the railway while others coincidentally showed segments of the rail system and its components. In general, the selection of Naval Shipyard maps

in the Cartographic section of this archive covered a broader span of time. In the Textual section, a number of records dealing with Navy contracts for equipment were located.

Historical newspapers assisted in understanding the history of both the Navy railway and the Oahu Railway and Land Company. Historical newspaper articles were available through the California Digital Newspaper Collection due to the fact that railway developments in Hawai'i were a focus of the press in San Francisco and other major California cities. The Library of Congress's Chronicling America Collection contains several historic Hawaiian newspapers, including the Honolulu *Star-Bulletin*. The newspaper collection of GenealogyBank.com also contained relevant articles.

Secondary historical information on the Oahu Railway and Land Company, as well as the Navy railway at the Naval Shipyard, was available in the SEARCH library, local libraries, and digital repositories. The digital repositories contain scanned books and journal articles, including many that dated to the late nineteenth and early twentieth century. The digital repositories included HathiTrust and Google Books.

O'ahu railway historian Jeff Livingston shared historical photographs and archival information on the subjects of interest. He provided SEARCH with a National Archives microfilm publication that focused on railway equipment and maps of the Navy Yard, several of which were not found in the physical archival collections in California, Washington, DC, and Maryland. Mr. Livingston also shared scanned copies of historic photographs in the collection of the Hawaiian Railway

Society and the 14<sup>th</sup> Naval District. We are especially grateful for the historical information that railway historian Bob Paoa and the Hawaiian Railway Society provided. NAVFAC Hawai'i also shared valuable documents. Finally, the Library of the Marine Corps (Quantico, Virginia) shared several photographs of the historic Marine Officers Quarters at Pearl Harbor.

### 1.3: HISTORY OF THE RAILWAY SYSTEM OF THE OAHU RAILWAY AND LAND COMPANY

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This chapter provides a historic context for the Oahu Railway and Land Company. The Oahu Railway and Land Company was founded in 1889 by B. F. Dillingham, an enterprising and often frustrated visionary whose goal was to advance the economy of O‘ahu and the greater Hawaiian Islands. In spite of numerous naysayers who considered O‘ahu too remote to be the site of a major railway, Dillingham corralled the financial, political, and physical means necessary to develop an approximately 72-mile mainline around half the island that remained in operation for over half a century. Starting at Honolulu, the railway reached Pearl Harbor in 1889. From there, the line continued around the western, northern, and eastern portions of the mountainous island until it reached its terminus at Kahuku in 1898 (**Figure 1**). The ensuing years brought ups and downs as political strife and Dillingham’s financial straits impacted the progress and profits of the railway company. Yet even as the company struggled, the railway itself spread energy and investment across O‘ahu that helped to change the profile of the island from a far Pacific outpost to a strategic and economically valuable corner of the world. As military interest in O‘ahu increased after the Hawaiian Islands were annexed in 1898, the Oahu Railway served as the conduit for developing and sustaining military installations on the island through times of peace and war. At the same time, the railway provided transportation needs for old and new agricultural enterprises across O‘ahu as well as the passenger transport needs of an expanding economy.

#### A. B. F. Dillingham: A Phenomenon of Nature

The Oahu Railway was the vision of Benjamin Franklin Dillingham (1844–1918) (**Figure 2**). Dillingham was born in 1844 in West Brewster in the Cape Cod region of Massachusetts. Three months later, his family moved to Southboro, a suburb of Boston. His father was a sailor who left the sea-going profession to become a farmer when “Frank,” as Dillingham was known for much of his life, was 12 years old. Having received little formal schooling, Dillingham went to sea at the age of 14 as a cabin boy on the *Southern Cross*. His life as a sailor took him across the globe to Asia and the islands of the Pacific. In the course of his journeys, he had tattoos made on the back of each wrist, one being a star and the other an anchor. Many years later, as an enterprising businessman, he hid the tattoos as best he could under the cuffs of his shirt. As a sailor, Dillingham quickly rose through the ranks, exemplifying at his young age an “incredible drive, energy, and perseverance” that his biographer accredited to “a phenomenon of nature.”<sup>1</sup>

Though drawn to the sea, Dillingham, like his father, grew weary of the life of a sailor. Time spent as a prisoner of war may have influenced his direction away from the profession. During the Civil War, the CSS *Florida* antagonized Union shipping on the eastern coast of the United States. The vessel captured and sunk the *Southern Cross*. Dillingham and the other crew were taken aboard and later offloaded onto a

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<sup>1</sup> Paul T. Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918* (Honolulu: University Press of Hawaii, for B. F. Dillingham Company, 1981), 10.

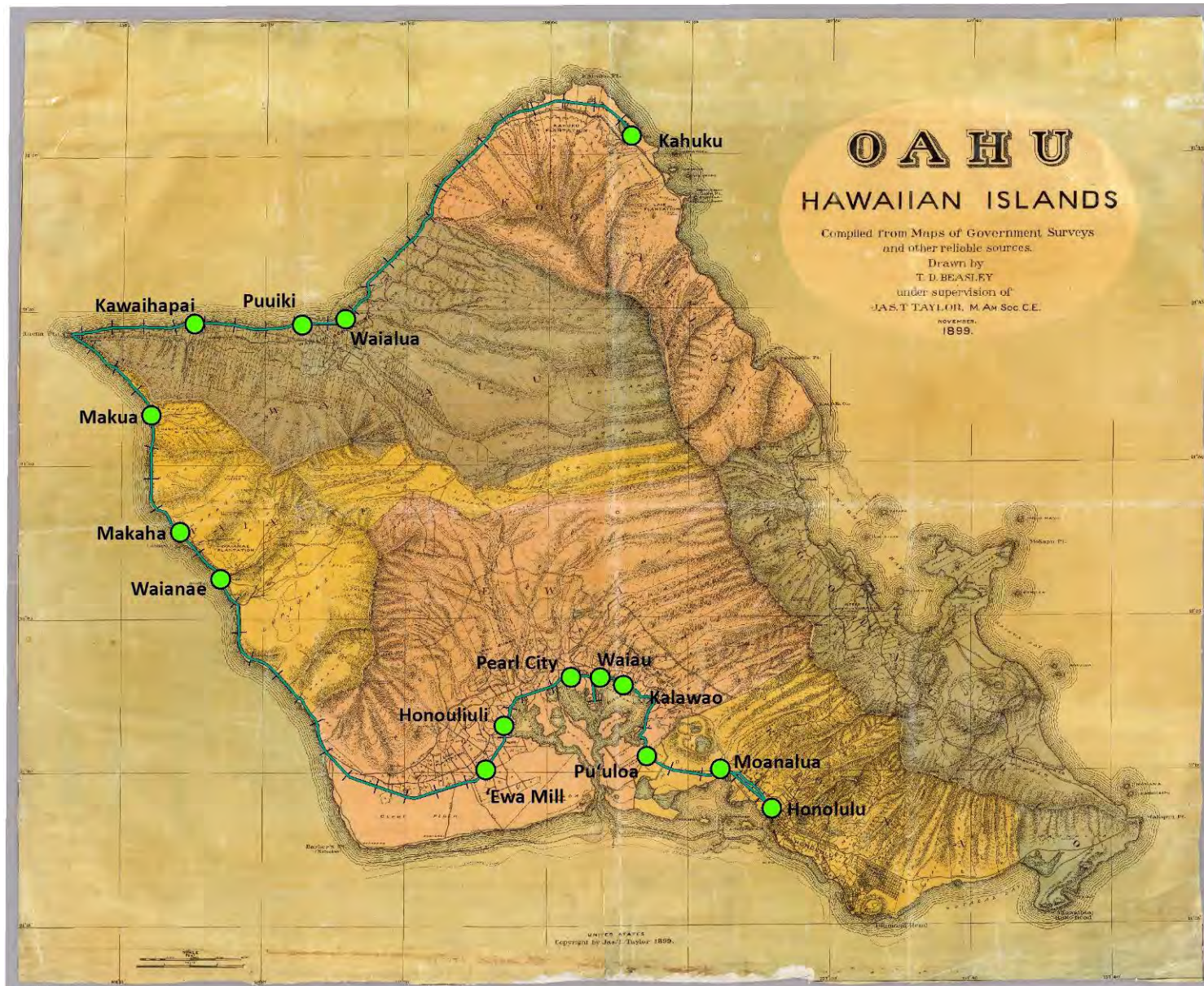


Figure 1. 1899 map of Oahu showing the names of the prominent early stations on the Oahu Railway. Source: David Rumsey Map Collection.





Figure 2. Benjamin Franklin Dillingham, ca.1900. Source: Kuykendall 1967.

vessel bound for Brazil. From Brazil, Dillingham and the other captives managed to find passage back to New York and back to freedom.<sup>2</sup>

Dillingham's passion for the island of O'ahu undoubtedly influenced his abandonment of life on the seas. In all of his sailings through the Pacific, Dillingham had never visited Hawai'i. Beginning in 1865, he sailed aboard a vessel called the *Whistler*, a ship with a fitting name for this future railway developer. Making regular runs between San Francisco and the growing port of Honolulu, this merchant ship took Dillingham on his first voyage to Hawai'i. The Honolulu that Dillingham entered in the mid-1860s was then a small port town with a population of 14,000. Whaling, the economic stronghold of the town for many decades, was in decline. Dillingham became enchanted with O'ahu during subsequent voyages, each during the year 1865. During a horseback riding excursion that he took while the *Whistler* was in port at Honolulu, he fell from his horse and broke a leg. As he lay in bed in recovery, his ship left without him. Though he healed and remained an esteemed seaman, Dillingham chose to abandon the sea and settle in Honolulu.<sup>3</sup>

At this point in his life, Dillingham was described as "short, stocky, and well-muscled ... the firmness of his jaw and the direct glance of his blue eyes told the world that he could take

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<sup>2</sup> Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918*, 20.

<sup>3</sup> Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918*, 28.



care of himself.”<sup>4</sup> After his leg healed, he took a position as a clerk at a Honolulu hardware store. Then in 1869, he took out a loan and purchased the store, the first of his many ventures in entrepreneurship. In the same year, he married Emma Smith, the daughter of prominent Honolulu missionaries, and soon started his own family. One of several sons, Walter, was born in 1875 and would later feature prominently in Dillingham’s railroad company and other business affairs in Honolulu. Another son, Harold, was born in 1881, and he also became prominent in the family business as an adult.<sup>5</sup>

Dillingham’s years as a hardware store owner in growing Honolulu served as a primer for future business endeavors. While engrossing himself within the Honolulu business community, his “generous, inquisitive, and affectionate” nature won him many friends.<sup>6</sup> Given the fact that he had no formal education, the business knowledge he developed in these early years was impressive. Between the time of his purchase of the store in 1869 and the opening of his railroad company in 1889, he gained a working knowledge of stocks, bonds, and other investment vehicles that served his many business projects.<sup>7</sup>

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<sup>4</sup> Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918*, 3.

<sup>5</sup> John William Siddall, *Men of Hawaii* (Honolulu: Honolulu Star-Bulletin, 1921); Perry Edward Hilleary, ed., *Men and Women of Hawaii*, 1954 (Honolulu Business Consultants, 1954), 193.

<sup>6</sup> Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918*, 20.

<sup>7</sup> Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918*, 59-90.

Also in this period, patterns emerged in his business style and personal life that were evident throughout his life. He became a frequent borrower of money and was heavily indebted. The hardware store was nearly bankrupt and, in 1876, Dillingham became incapacitated due to depression, the first of several episodes in his life. He recovered, but could not raise the store from its burden of debt. Despite this obstacle, Dillingham pursued other business interests with zeal in hopes that success there would alleviate his sufferings elsewhere. This reaction to failure can be seen at various other points in his many years as a businessman.<sup>8</sup>

While drearily carrying on with the hardware store and experimenting with a dairy farm in the 1870s and early 1880s, Dillingham entered discussions to buy extensive acreage on O’ahu. The owner was James Campbell, one of the wealthiest men on the island who was one of the first to amass a fortune from sugar. Campbell operated the Pioneer Mill, an extremely profitable venture in Lāhainā, Maui. With the profits from sugar, Campbell had purchased 60,000 acres on O’ahu for cattle ranches, including the ‘Ewa Plain, which stretched across southwestern O’ahu, and Kahuku, at the northern tip of the island. In 1879, Campbell successfully drilled an artesian well at his ‘Ewa Plain ranch (known as Honouliuli), the first in Hawai’i. The event served as proof that the presumably arid areas of the island could be irrigated and cultivated on a large scale. Dillingham hoped to pursue this goal with the Campbell lands, but he failed to convince investors to back his purchase. ‘Ewa and Kahuku were too remote, and in the early 1880s, too

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<sup>8</sup> Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918*, 59-60.

dry to attract investment. The experience, as biographer Yardley wrote, taught Dillingham that the combination of land, irrigation, and transportation held great potential for profit.<sup>9</sup>

## B. “Dillingham’s Folly”: Building and Operating the Oahu Railway

When he failed to secure land investors, Dillingham turned his energy to building a railroad around O’ahu. At the time, few thought the idea was sensible, and many critics labeled the plan “Dillingham’s Folly.” Much of the interior of O’ahu was not developed to a degree that would support a railroad. Sugar was attracting much attention, but the crop was not extensively cultivated beyond Honolulu. The small farms that produced the crop found it sufficient to ship their harvests over sea to Honolulu. Other than sugar, there was little that could be hauled on a railroad. The main product of the ‘Ewa Plain was cattle, and to a lesser degree firewood, neither of which suffered for rail transportation.<sup>10</sup>

Dillingham didn’t need to look far from O’ahu to see that railroads were greatly advancing the sugar industry and transportation in general in the Hawaiian Islands. Many of Hawai’i’s early railroads were developed to haul raw sugar from interior plantations to port for shipment to the United States. Sugar had first been cultivated in Hawai’i in the early

nineteenth century, but rarely on a commercial scale. By the 1860s and 1870s, businessmen had begun to invest in the development of plantations in the islands. In 1876, the United States Congress ratified the Reciprocal Trade Treaty with the Kingdom of Hawai’i, allowing the latter to export sugar to the United States free of duty, effectively giving the islands a favored position. This act made sugar a more profitable industry. Campbell’s Pioneer Mill on Maui, was an early example of the success that could be attained, although it did not utilize railroads for transport.<sup>11</sup>

Hoping to encourage the development of railroads throughout Hawai’i, the reigning monarch of the islands, King Kalākaua, passed “An Act to Promote the Construction of Railways” in August 1878. The act permitted the chartering of public railroads and entitled them to condemn private property for their own use, so long as the railroad was for the public good. The act provided financial support to railway construction, and several railways appeared shortly after the King’s act. In 1879, the Waiākea Mill at Hilo, Hawai’i, became the first plantation to use a steam locomotive to haul cane.<sup>12</sup> In the same year, Thomas H. Hobron opened the Kahului and Wailuku Railroad on Maui. There, irrigation projects had recently opened the land to new sugar cultivation. Pineapple cultivation followed next. Hobron’s railway was a narrow gauge system of

<sup>9</sup> Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918*, 91-105.

<sup>10</sup> Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918*, 130.

<sup>11</sup> John B. Hungerford, *Hawaiian Railroads: A Memoir of the Common Carriers of the Fiftieth State* (Reseda: Hungerford Press, 1963), 3.

<sup>12</sup> Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918*, 81.

approximately 15 miles in length.<sup>13</sup> Several years later, in 1883, Samuel Wilder chartered the Hawaiian Railroad, a 20-mile, narrow-gauge line on the island of Hawai'i that was mainly employed in hauling sugar cane.<sup>14</sup> Compared to the continental United States, where railroads were fairly common by the time of the Civil War, Hawai'i received them late. However, these small railroads were important predecessors to the Oahu Railway.

In light of these obstacles, it took an individual of Dillingham's fortitude and perseverance to promote the development of the railroad. By late 1887, he had turned to his local political connections, many of whom were members of the Reform Party. US businessmen and sugar farmers filled the ranks of this party which had recently won a new constitution from King Kalākaua. Moreover, the King himself had shown his support for railroad development with his 1878 Act supporting railroad development in Hawai'i. Back in 1886, a franchise to build a railway had been granted to William K. Austin to construct a street railway in Honolulu. This also was an important precedent for Dillingham's railroad.<sup>15</sup>

The Hawaiian monarchy, with approval of the legislature, extended Dillingham a franchise to build a railroad in September 1888. Dillingham's franchise required that his

company, dubbed the Oahu Railway and Land Company, build a steam railway between Honolulu and Pearl Harbor, a distance of 12 miles, within three years of the award (**Figure 3**). His goal to complete this line well before the expiration date of the franchise was ambitious.<sup>16</sup> To fulfill the construction contract for his railway, Dillingham partnered with Mark P. Robinson and William R. Castle to form the Hawaiian Construction Company. The company was to build the line and also provide the necessary rolling stock to support the project.<sup>17</sup>



**Figure 3.** The Oahu Railway and Land Company's line somewhere near Pearl Harbor, c.1901. *Railroad Trainman's Journal* 1901.

<sup>13</sup> Hungerford, *Hawaiian Railroads: A Memoir of the Common Carriers of the Fiftieth State*, 67-76.

<sup>14</sup> Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918*, 118-120.

<sup>15</sup> Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918*, 124-137.

<sup>16</sup> Jim Chiddix and MacKinnon Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971* (Honolulu: Sugar Cane Press, 2004), 14-16.

<sup>17</sup> Jeff Livingston, "Who Built the OR&L?," 2010, [www.hawaiianrailway.org](http://www.hawaiianrailway.org).

A ceremonial groundbreaking for the Oahu Railway was held at the Damon Estate at Moanalua in March 1889. By April, 3 miles of the line were graded. While work continued, Dillingham traveled to the United States to order rolling stock from Carter Brothers in Newark, California, and two locomotives from Baldwin Locomotive Works in Pennsylvania. He had made the momentous decision to make the Oahu Railway a narrow gauge track of 3 feet in width. Later railroad developments on O'ahu followed his lead, including the lines that were developed at the sugar and pineapple plantations and the lines that the military developed within their establishments such as Fort Kamehameha and the Navy Yard at Pearl Harbor.<sup>18</sup>

Dillingham's reasons for choosing a narrow gauge rail over a standard gauge rail appear to have been financially motivated. Standard gauge railroads were expensive to build. Their rolling stock was larger and heavier, thereby requiring more fuel to power their locomotives. Also, their broader width could only be accommodated with a similarly sized roadbed, which required more land over the course of the line.<sup>19</sup> Additionally, a larger railroad would inevitably necessitate more material for all components of the system, from trestles and depots to ballast and cross ties. In simpler terms, O'ahu was an island. As space was at a premium, narrow gauge made the most sense.

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<sup>18</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 14-22.

<sup>19</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 14-22.

Grading for the railroad system began in 1889. In May 1889, 148 men were working on building the railroad.<sup>20</sup> Through late spring and summer of 1889, the sound of shovels, picks, saws, axes, and the bray of mules and men filled the air between Honolulu and Pearl Harbor as the Oahu Railway was built.<sup>21</sup> The laborers were predominantly Chinese.<sup>22</sup> George Denison served as their overseer, the first of many positions he would hold with the Oahu Railway and Land Company as he rose through their ranks over a lifelong career with the company. Denison himself worked under Charles H. Kleugel, a civil engineer who Dillingham hired to survey the course of the railroad.<sup>23</sup>

Locomotives and rolling stock were not the only railroad components that the Oahu Railway and Land Company had to import from elsewhere. Many of the cross ties were made of redwood from California. The rails that were laid down on the first stretch of the railway came from a manufacturer in Germany.<sup>24</sup> Other metal components of the trackage, such as the spikes that held the rails to the ties, also likely came from beyond Hawai'i since there was yet no foundry in the islands that produced such items.

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<sup>20</sup> Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918*, 140.

<sup>21</sup> Livingston, "Who Built the OR&L?"

<sup>22</sup> Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918*, 140.

<sup>23</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 17.

<sup>24</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 17.

These imports aside, the islands provided a great quantity of the materials that made the railway. Those cross ties that were not redwood came from 'ōhi'a trees which, at the time, remained fairly abundant in the islands. The ballast that formed the roadbed of the railroad consisted of local coral.<sup>25</sup> The Oahu Railway favored coral over all other types of ballast as late as the 1910s. "The material obtained from submerged coral reefs has proven to be the best for ballast of any of the various materials available," Dillingham remarked in 1917 after many years of using coral for ballast.<sup>26</sup> Aesthetics, as well as practicality, were important to him, even when it came to coral ballast. "The color is not trying on the eyes, and it is almost entirely free of dust, as well as very durable."<sup>27</sup> According to his biographer, "unpleasant sights, odors, or subjects of conversation gave him sufferings of physical nausea."<sup>28</sup> Dillingham was serious about making his railroad shine.

September 1889 saw the completion of the first mile of the railroad. Dillingham was anxious to test what track had been laid. Having purchased a Baldwin locomotive that the monarchy had been using at the Mō'ili'ili Quarry, he renamed it Kauila and numbered it "6" after his youngest daughter's age. On September 4, his birthday, Dillingham and a small

group of passengers rode the first mile of rails of the line that would eventually extend more than 100 miles.<sup>29</sup>

Following this initial ride, the Company's locomotives and rolling stock that Dillingham had ordered in the United States arrived in O'ahu. Among the rolling stock was a luxurious parlor car that featured both a male and female restroom and upholstered seats. This car became Dillingham's personal car. Simultaneously, the company took bids for the construction of a depot in Honolulu and pushed the laborers to finish the railway to Pearl Harbor (**Figure 4**). November 16, 1889, the opening day of the existing length of the railroad, was picked in order to coincide with King Kalākaua's birthday. Thousands were invited for free rides on what was then O'ahu's most advanced form of transportation. The initial leg of the Oahu Railway was completed with two years to spare on the franchise.<sup>30</sup> The opening of the rails from Honolulu to Pearl Harbor was the first phase of the railway. Since the first pick axes hit the raw earth, the company had conducted surveys for the trackage to continue beyond Pearl Harbor to 'Ewa Plains and then northward along the coast to Kahuku.

Just three days after the railroad reached Pearl Harbor, Campbell agreed to lease his 'Ewa land west of Pearl Harbor to Dillingham. The deal, which was first broached several years prior, was a success for Dillingham and his railroad; after this

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<sup>25</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 26.

<sup>26</sup> B.F. Dillingham quoted in Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 162.

<sup>27</sup> B.F. Dillingham quoted in Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 162.

<sup>28</sup> Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918*, 59.

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<sup>29</sup> Kauila is presently at the Hawaiian Railway Society facility. Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 20.

<sup>30</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 19-23.



Figure 4. The Honolulu depot of the Oahu Railway and Land Company, c.1901. *Railroad Trainman's Journal* 1901.

land was developed for sugar cultivation, it further justified the continued construction of the railroad. Sugar harvested from these lands became the major freight item of the railway.<sup>31</sup>

The Hawaiian Construction Company, which had built the Oahu Railway and Land Company line as far as Pearl Harbor by the end of 1889, continued work into the following year. By July 1890, they had extended the line to 'Ewa. However, in the following months, the Hawaiian Construction Company ran out of funding to continue their work and construction

<sup>31</sup> Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918*, 153-154.

halted in 1891. The Oahu Railway and Land Company thus turned to A. Feek of Seattle, Washington, to complete the line from 'Ewa to its terminus at Kahuku. Feek continued the railway work by surveying and building the new line. Feek reached Waianae, but at this point failed to fulfill the contract to Kahuku.<sup>32</sup>

The mid-1890s was a tumultuous period in Hawaiian society and influenced the progress of the Oahu Railway. In 1893, American-born sugar planters in Hawai'i joined forces to overthrow Queen Liliuokalani, sister of the late King Kalākaua. John Stevens, US Minister to the Kingdom of Hawaii, supported the revolutionaries and called for US Marines to land the USS *Boston* to support the overthrow. After a brief provincial period of rule, the revolutionaries established the Republic of Hawai'i in 1894. Under the leadership of Sanford Dole, the Republic pressed the United States for annexation, but initially failed to achieve their goal. Royalists to the Kingdom of Hawai'i initiated a counter-revolution against Dole. The short war (known as the Hawaiian Counter-Revolution of 1895) erupted in January 1895, lasting January 6-9. With support from the United States, the Republic quelled the Royalists.<sup>33</sup>

Amidst the unrest, construction on the Oahu Railway made no progress in terms of trackage. In June 1894 when the provincial government expired and the new Republican government commenced, the Board of Directors of the Oahu

<sup>32</sup> Livingston, "Who Built the OR&L?"

<sup>33</sup> Gavan Daws, *Shoal of Time: A History of the Hawaiian Islands* (Honolulu, Hawaii: University Press of Hawaii, 1989).

Railway and Land Company acquired the Hawaiian Construction Company. The temporary stability allowed Dillingham to resume attempts to acquire loans for the Railway's completion. The 1895 insurrection interrupted this progress; however, when the uprising ended, Dillingham continued his efforts. By early 1896, Dillingham had acquired the necessary funding to continue construction of the Railway. Finally, in 1898, the line was operative all the way to its terminus at Kahuku.<sup>34</sup>

In the same year as the opening of the line to Kahuku, the United States annexed the Republic of Hawai'i. The pressure for annexation had been building for many years. For the numerous American politicians who subscribed to the ideal of Manifest Destiny, the addition of Hawai'i to the Union was a natural step. In doing so, the United States would strengthen its presence in the Pacific realm and prove their hegemony in the region to Japan. The onset of the Spanish-American War in February 1898 also influenced the push for annexation, for the Hawaiian Islands offered a strategic position as a refueling station and naval bulwark, particularly as the war theater spread to the Philippine Islands.<sup>35</sup> Leading the support for annexation in the Hawaiian Islands were businessmen, including B. F. Dillingham, and primarily those involved in the sugar industry. Annexation would ensure a stable price for

sugar on the American market and, by extension, bring prosperity to the railroad.<sup>36</sup>

During one of his many trips to San Francisco, B. F. Dillingham gave an interview on his activities to a local reporter. Dillingham listed his various enterprises at the time: the Oahu Railway and Land Company, the Ewa Plantation Company, the Kahuku Sugar Company, the Oahu Sugar Company, the Honolulu Sugar Company, and the Waiialua Agricultural Company. He remarked that the entire investment in these companies was \$30 million and stated that the market value of the related stocks and bonds in both Honolulu and San Francisco of these corporations was over the investment amount.<sup>37</sup>

The Oahu Railway and Land Company tracks were approximately 70 miles at the start of the twentieth century. The main line of the railroad was laid with steel rails of 45 pounds per yard. The company had 10 Baldwin locomotives, which ranged from eight to 34 tons each, 30 passenger coaches (**Figure 5**), 193 freight cars, and 25 miscellaneous cars.<sup>38</sup>

The company leased 75,000 acres of land along the line. By 1901, nearly 50 percent of these lands were under cultivation.

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<sup>34</sup> Livingston, "Who Built the OR&L?"

<sup>35</sup> Julia Flynn Siler, *Lost Kingdom: Hawaii's Last Queen, the Sugar Kings, and America's First Imperial Adventure* (New York: Atlantic Monthly Press, 2012), 282-283.

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<sup>36</sup> Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918*, 204-206.

<sup>37</sup> "New Sugar Industries in Hawaiian Islands," *San Francisco Call*, July 15, 1900.

<sup>38</sup> "Railway Systems of the Hawaiian Islands," *Evening Bulletin*, November 30, 1901.



Figure 5. Interior of a passenger car of the Oahu Railway and Land Company, no date. Provided by NAVFAC Pacific.

The company subleased most of this land to four plantations, collecting a percentage of their sugar crop as rent payment. Some of the subleases were as long as 60 years. The Honolulu *Evening Bulletin* predicted that the business in freight and passenger traffic of the company for the fiscal year 1901 would surpass any previous year.<sup>39</sup>

The company was centered in Honolulu where it owned extensive acreage upon which the main offices and general passenger depot stood. Also here were several large

<sup>39</sup> "Railway Systems of the Hawaiian Islands," *Evening Bulletin*, November 30, 1901.

workshops that featured modern machinery. Here, the company manufactured all of its rolling stock, except locomotives, and all bridge work (Figure 6). In Figure 6 the second car is a third-class passenger car. Note the open air build of the car.<sup>40</sup>

In this period, the company also was developing a large wharf complex area on Honolulu Harbor. Six hundred thousand cubic yards of material had to be excavated to obtain sufficient depth to accommodate large vessels and steamships. When completed, the complex in 1901 consisted of slips that allowed dockage of up to 15 vessels. Two large warehouses, each with a 10,000 ton capacity, also were here. The warehouses had electric conveyors that were capable of loading 120 tons of sugar an hour into the hold of a vessel. The wharf also processed imports such as lumber, fertilizer, and machinery.<sup>41</sup>

At the turn of the century, the Oahu Railway and Land Company employed section gangs, a type of labor organization that was prevalent on the mainland. Section gangs cared for the maintenance and repair of trackage in a certain section of the line. The section gang laborers often lived in camps alongside the rails. The location of each of these camps is not known except for a camp that was located at Makua near Ka'ena Point which provides excellent information about these camps. The Oahu Railway and Land

<sup>40</sup> "Railway Systems of the Hawaiian Islands," *Evening Bulletin*, November 30, 1901.

<sup>41</sup> "Railway Systems of the Hawaiian Islands," *Evening Bulletin*, November 30, 1901.





**Figure 6. A train of the Oahu Railway and Land Company crossing the Wailua River, c.1901. Railroad Trainman's Journal 1901.**

Company built this camp (and likely others) which consisted of several cottages. Single men lived together while married men lived in their own cottages.<sup>42</sup>

The labor force of the Company reflected the ethnic diversity of the Hawaiian Islands. An 1898 newspaper article from the *Hawaiian Star* mentioned a Danish contractor who was involved in blasting for the railroad corridor at Ka'ena Point. His name was Martin Olson, and he was unfortunately killed in

<sup>42</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 74.

the process.<sup>43</sup> Japanese were prevalent in the Company work force into the 1940s. On at least one occasion, the Company issued instructions in Japanese for installing and maintaining insulated joints. The manual was issued in 1917.<sup>44</sup> Still later, Filipino workers filled the ranks. In what was a reflection of the racial stratification of Hawai'i at the time, mostly American-born white men held the higher-level positions of the Company, such as bookkeepers, clerks, engineers, and directors.<sup>45</sup>

For Dillingham and his investors, which consisted primarily of San Francisco banks, the Oahu Railway was a success in its initial years. Rather than rest on his laurels, Dillingham ventured to expand his business enterprises on the profits of the Railway. One of his main projects was the Olaa Sugar Plantation on the island of Hawai'i. Dillingham chartered the company in 1899. As the project developed, a downturn in sugar prices translated into mounting financial liabilities for the company. As a result of the suffering Olaa Plantation venture, Dillingham's total financial picture became bleak as his liabilities came to outnumber his assets. In April 1904, his bleak financial situation was detailed in the San Francisco *Call* newspaper. He owed more than two million dollars to various banks and investors. Overburdened by his financial situation, Dillingham entered a sanitarium in San Francisco that same month.<sup>46</sup> For the several weeks when Dillingham was in the

<sup>43</sup> "Work Now Being Rushed," *The Hawaiian Star*, January 31, 1898.

<sup>44</sup> "The News of the Month," *Railway Signal Engineer* 10, no. 4 (1917), 129.

<sup>45</sup> Siddall, *Men of Hawaii*.

<sup>46</sup> "Many Banks Large Creditors of Promoter B.F. Dillingham," *San Francisco Call*, April 29, 1904.

sanitarium, his son Walter ran the family businesses and, in the coming years, his other son, Harold, also took on a leadership role in the Company.<sup>47</sup>

Walter Francis Dillingham was educated in O‘ahu before attending Newton High School in Massachusetts. He then returned to Hawai‘i to serve as clerk with the Oahu Railway between the years 1893-1898. He then enrolled at Harvard where he stayed until 1902. Returning to O‘ahu, he became involved in some of the largest development projects on the island and, as time went on, he was involved in projects across the Pacific. He organized the Hawaiian Dredging Company in 1902 which was involved with opening the harbors at Hilo, Kahului, and Honolulu. The company also opened Pearl Harbor. Walter’s involvement at Pearl Harbor continued as his company was a joint contractor in the construction of the first dry dock at Pearl Harbor beginning in 1902. Walter served as treasurer and financial director of the Railway Company in 1904 as well as the B. F. Dillingham Company, following his father’s illness.<sup>48</sup>

By 1908, the financial distresses of Dillingham’s businesses were decreasing. Branch lines to pineapple country in Wahiawa and the new Schofield Barracks site, completed in 1906 and 1909, respectively, had increased revenues for the Oahu Railway. Sugar prices, which had been depressed for several years, resurged. Also, his son Walter had been funneling profits from his successful Hawaiian Dredging

<sup>47</sup> Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918*, 273.

<sup>48</sup> Siddall, *Men of Hawaii*, 131.

Company to relieve debts of the other Dillingham family companies. Walter’s company had become quite profitable as the premiere dredging company in the Hawaiian Islands.<sup>49</sup>

Railroad technology evolved in the early twentieth century. One of the most important evolutions was the conversion from coal-fueled locomotives to heavy oil. The Oahu Railway and Land Company sought to stay connected with the changes in railroad technology, and beginning in 1904, the Company embarked on a mission to convert their coal-fueled locomotives to heavy oil. The process of this change took many years. The last locomotive was converted to this new system in 1922.<sup>50</sup>

The Oahu Railway embraced traditional railroad operational methods as well as the latest technology to help prevent accidents at its many roadway crossings. In a July 1919 article for *Railway Signal Engineer*, the Company’s Electrical Supervisor, W. D. Cleveland, explained some of the tactics that the company used along its line to protect against highway crossing accidents, a growing problem at the time. Cleveland had recently conducted studies of highway-rail crossing on O‘ahu and he noted, rather frustratingly, that he “had yet to see the first auto stop before crossing the tracks.”<sup>51</sup> At its own expense, the company erected signs of sheet iron on each side

<sup>49</sup> Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918*, 282-299.

<sup>50</sup> Gale E. Treiber, *Hawaiian Railway Album WWII Photographs*, 4 vols. (Hanover: The Railroad Press, 2008), 47.

<sup>51</sup> W.D. Cleveland, “How Should Highways at Railways Be Protected,” *Railway Signal Engineer* 12, no. 7 (1919): 250–51.

of its tracks at public highway crossings that read “Railroad Crossing 300 Feet.” They also erected the more traditional, X-shaped wooden signs on 9-foot posts that read “Railroad Crossing.” The post itself read “Stop, Look, and Listen.” A novel means of protecting motorists that the Oahu Railway used was an emergency lane for runaway vehicles. Consisting of a 100-foot lane with a 3-foot high dirt mound at the end, this site was situated where the Oahu Railway crossed the Waikakalaua Road. Any driver who lost control of their auto while heading towards the crossing could steer down this lane and into the mound, thus avoiding a collision with the passing train. At the time of Cleveland’s article, the Oahu Railway was expanding its usage of electric bells at railroad crossings. These devices produced an audio warning and were switched on by an electric sensor on the track.<sup>52</sup>

While the Oahu Railway stayed apace with technology, it could not keep up with its extensive debt. Through the closing years of B. F. Dillingham’s life, his various business ventures struggled as a consequence of the ups and downs of agricultural prices and seemingly insurmountable debt. Dillingham steadily declined in health and, in 1918, he died of cancer. At the time of his death, Dillingham’s interests aside from the Railway included the Olaa Sugar Plantation, the Woodlawn Dairy, the Waialua Agricultural Company, the Pacific Hardware Company, the Haleiwa Hotel, the McBryde Sugar Company, the Puna Sugar Company, the Kihei Sugar Company, the Volcano House Company, and the McCully Land

Company.<sup>53</sup> The operations of these various companies passed to his sons.

B. F. Dillingham’s son, Walter, was quite experienced in railway operations by the time of his father’s death. During World War I, Walter was stationed in Washington, DC, where he organized training for the Motor Transport Corps. When his father died, Walter became the president of the Oahu Railway and Land Company and other Dillingham interests. Like his father, Walter was involved in numerous agriculture and development ventures in Hawai‘i.<sup>54</sup>

Harold, another of B. F. Dillingham’s sons, also had valuable experience that benefited the railway company. He had attended local schools in Hawai‘i and Oakland High School in California before attending Harvard University where he graduated in 1904. Upon his return to Hawai‘i, Harold served as cashier for the railway company, a position he held until 1909 when he was promoted to assistant treasurer. Nine years later, he attained the position of treasurer. During World War I, he served in the Army as a captain. He also was involved with other companies including the B.F. Dillingham Company, the McBryde Sugar Company, the Hawaiian Contracting Company, the Kauai Railway Company, the Kauai Electric Company, and the Kauai Fruit & Land Company.<sup>55</sup>

The Oahu Railway was in the midst of a period of increased usage by the early 1920s. This increased usage largely was the

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<sup>52</sup> Cleveland, “How Should Highways at Railways Be Protected,” 1919.

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<sup>53</sup> “Many Banks Large Creditors of Promoter B.F. Dillingham.”

<sup>54</sup> Hilleary, *Men and Women of Hawaii*, 1954, 191-194.

<sup>55</sup> Siddall, *Men of Hawaii*, 129-131.

result of expansions at Pearl Harbor and other military installations on O‘ahu along with the general national prosperity of the 1920s. In their 1920 Annual Report, the Oahu Railway commented that, “For several years the business of the road has, at certain periods, brought about an almost impossible traffic situation with the increasing of the garrison at Schofield Barracks and the development of Pearl Harbor Naval Station and Fort Kamehameha, not only a larger tonnage business is anticipation but a very material increase in passenger service will be required.”<sup>56</sup> To meet these new demands, the Directors of the Oahu Railway decided that the company had to double the trackage of the first 14 miles of rails from Honolulu to Waipahu. The expansion, which cost approximately \$300,000, was undertaken and completed in July 1921.<sup>57</sup>

Despite their great investment in doubling trackage, the Oahu Railway began to see a drop in passengers as the 1920s progressed. “We have to record a further decrease in passenger traffic,” noted their 1924 Annual Report. “This decrease is partly accounted for by the decrease in construction work at Pearl Harbor, but very largely is the result of the increasing use of automobiles.”<sup>58</sup> Labor disputes also interrupted usual operations. In the 1919–1920 period, labor strikes occurred in Hawai‘i and involved the Oahu

Railway and Land Company. Other large companies involved were Mutual Telephone Company, Honolulu Construction and Draying Company, and Inter-Island Steamship Company. The labor strikes generally were not successful and many of the employers simply hired replacements or refused to come to the bargaining table.<sup>59</sup>

As noted above in the 1924 Annual Report, a major issue facing the Oahu Railway and Land Company in the 1920s and 1930s was the advent of automobiles in hauling passengers and freight. In the face of this evolving transportation environment, the Company altered their services and equipment to remain the leader in transportation on O‘ahu. The Company continued to run trains, but they abandoned certain rail corridors and most of their passenger service. In 1929, the Company reported a continued decline in their passenger service and began to consider converting passenger cars into freight cars. “With the exception of labor trains,” read their 1929 annual report, “all regular passenger service is now furnished by gasoline motor cars.” The Company had replaced the rail service to Schofield Barracks by a motor bus service. In general, the Company forecasted the end of passenger service and finally started converting passenger cars into freight cars. “The increasing use of automobiles ... does not leave much opportunity for any profitable operation of passenger service under present conditions of unregulated

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<sup>56</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 344.

<sup>57</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 344.

<sup>58</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 344, 345.

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<sup>59</sup> Edward L.H. Johannessen, *The Hawaiian Labor Movement: A Brief History* (Boston: Bruce Humphries, 1956), 81.

road traffic by taxicabs, private automobiles, and motor trucks hauling passengers on weekends and other excursions.”<sup>60</sup>

Through the 1930s, the Oahu Railway and Land Company continued its transition into non-railway transportation. They brought more passenger buses into their fleet and created a trucking division. As the 1937 annual report noted, “We find that there is a demand for this service, as is shown by the business which has come to us.” The business referred to was a recent contract the Company had signed with the Waimanalo Sugar Company which desired trucking services for its freight hauling. Indeed many of the plantations were seeking trucks over railroads.<sup>61</sup>

Over the course of 1937, trucking business in general increased for the Oahu Railway and Land Company. The Company had at least 20 trucks in its fleet. The Army and the Navy, as well as the plantations, were the main customers. The Oahu Railway’s devotion to accommodating the transportation needs of the Navy and the Army remained evident into the late 1930s. The Company was planning “an enlarged and more efficient bus service” for its Army and Navy customers in this period. The company characterized their relationship with both military branches as “cordial and

cooperative.”<sup>62</sup> This relationship of mutual respect proved vital in the years ahead.

### C. Railroad Resurgence: The Oahu Railway in World War II

Walter F. Dillingham, President of the Oahu Railway and Land Company, recalled the December 7, 1941, attack on Pearl Harbor in a post-World War II statement. The son of B. F. Dillingham and leader of the family businesses was having breakfast on the veranda of his ranch house near the Waianae Mountains when he noticed two planes engaged in what he thought was target practice. Realizing the planes truly were Japanese invaders, he went immediately to Pearl Harbor to check on his son who was in charge of an ongoing dredging operation at the base. There, he witnessed the destruction wrought by the surprise attack and readied himself for the surge of activity that was certain to come to O’ahu.<sup>63</sup>

The Oahu Railway survived the attack on Pearl Harbor with no damage to its locomotives, rolling stock, or infrastructure. Had the Japanese chosen to target the railway, note historians Chiddix and Simpson, the impact on transportation around O’ahu would have been powerful. The tremendous

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<sup>60</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 346.

<sup>61</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 346.

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<sup>62</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 346.

<sup>63</sup> United States Congress, *Pearl Harbor Attack: Hearings Before the Joint Committee on the Investigation of the Pearl Harbor Attack* (Washington DC: Government Printing Office, 1946), 1443.

contribution of the Oahu Railway to the war effort to come might have been nil.<sup>64</sup>

Though the Oahu Railway survived the Pearl Harbor attack with no damage to its railway system, the Company nevertheless was quite concerned that any new attacks might target them, especially their locomotives. The Company therefore called all engineers in to work, ordering them to disperse the locomotives at various points along the tracks to hide them from any potential enemy attack.<sup>65</sup> Soon after, train headlights were painted black, as initially demanded by blackout regulations.<sup>66</sup> In the coming weeks and months, the Oahu Railway was converted into a wartime railroad.

World War II put incredibly high demands on the Oahu Railway and Land Company. The Oahu Railway ran trains around the clock, not only to meet the needs of the military, but to continue hauling their pre-war freights of sugar and pineapple. Indeed, the proficient operation of the line by its owners and personnel likely dissuaded the US government from seizing the line. Walter Dillingham's political connections at the local and federal level, forged in the early days of the construction of the Naval Station Pearl Harbor, also surely helped.<sup>67</sup>

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<sup>64</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 199.

<sup>65</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 199.

<sup>66</sup> Treiber, *Hawaiian Railway Album WWII Photographs*, 53.

<sup>67</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 199.

After the attack on Pearl Harbor, the War Department called on the Oahu Railway to initiate round-the-clock operations. In the weeks after the attack, the Company experienced a resurgence in passenger service due to the increased work force and military personnel at the Naval Station and other military installations on O'ahu (**Figure 7**). To deal with the increase in personnel transport needs at the Naval Station, the Company returned passenger cars that had been converted can cars, by the addition of freight doors and other modifications, back to passenger service. In 1942, the Company logged 365 days of continuous service with many locomotives operating 24-hours a day.<sup>68</sup>

During the war, the Oahu Railway carried Army, Navy, and civilian-related freight across the island. The railway was so crucial to transportation on O'ahu that, at the start of the war, Gen. Delos Emmons, the Commanding General of the Hawaiian Islands, appointed Walter Dillingham to organize the port of Honolulu to handle Army, Navy, and civilian transports. Later in the war, Dillingham headed the Office of Food Production for the Territory. Meanwhile, Walter's Hawaiian Dredging Company was deeply involved in the military buildup across the Pacific. His firm was one of three contracting firms that developed the far-flung military installations that ultimately helped the Allies win the war in the Pacific.<sup>69</sup>

The story of George Denison, a long-time Oahu Railway and Land Company employee, illustrates the incredible effort that

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<sup>68</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 347.

<sup>69</sup> Hilleary, *Men and Women of Hawaii*, 1954, 193.



**Figure 7. Steam locomotive for operating passenger cars, 30 April 1945. Record Group 80, National Archives and Records Administration.**

the Company put forth to support the wartime traffic on its lines. Denison had worked for the Company since its founding in 1889. As General Manager of the Oahu Railway during World War II, the demands of his job of directing trains and the overall operations of the line convinced him to take up residence in his office in Honolulu. Until peace came in 1945, Denison was so extensively consumed with the operations of the railway that he slept on a cot in his office.<sup>70</sup>

<sup>70</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 199.

The specific operational statistics for the railroad for each year of World War II are unknown. A glimpse of the wartime conditions, however, is evident in data from 1943 which tells that the Company transported two and a half million passengers.<sup>71</sup> A pre-war figure from 20 years prior was approximately 300,000.<sup>72</sup> Assisting in the incredible work load were two new General Electric diesel-electric switching locomotives. The War Production Board approved this purchase (**Figure 8**). Diesel power in this period was a technological development in the world of railroads and the fact that the Oahu Railway used them indicates the progressive nature of the Company at the time. These locomotives had caterpillar engines. They could be used for more than switching cars as their power enabled them to also haul freight on the mainline.<sup>73</sup>

The Oahu Railway and Land Company found itself in need of personnel to meet the needs of the increased usage of the railway. The company posted ads in local newspapers throughout the war, asking for railroad brakemen, firemen, track workers, truck helpers, and laborers. The ads deemed these positions of great value to the war effort, noting that “Railroad Work is real War Work.”<sup>74</sup> According to O’ahu railway historian Gale Treiber, these workers and others who

<sup>71</sup> Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918*, 318.

<sup>72</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 347.

<sup>73</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 347.

<sup>74</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 211.





**Figure 8. Mainline Diesel-Electric locomotive of the OR&L, 30 April 1945. Record Group 80, National Archives and Records Administration.**

the Oahu Railway employed benefitted from the increase in traffic that came with the war as their wages climbed during the duration of the conflict.<sup>75</sup>

For years, the Oahu Railway employed a large number of Japanese and Japanese-Americans. Both prior to and after the attack on Pearl Harbor, some American military planners held suspicions about the loyalty of these individuals and believed they were conspirators in the attack. Indeed, this sentiment was prevalent across the United States, and many Japanese were pressed into internment camps. Walter Dillingham,

<sup>75</sup> Treiber, *Hawaiian Railway Album WWII Photographs*, 13.

President of the Oahu Railway, was asked during the post-war Pearl Harbor attack hearings if he thought the Japanese in Hawai'i, and particularly on O'ahu, were involved in sabotaging the United States. In what was a remarkable position at the time, Dillingham called the accusations and rumors "hoey" and based on "not one particle of evidence."<sup>76</sup> In fact, the Japanese had a "marvelous record" during the conflict and delivered "a square job to the United States." As he stated:

I do not know of a single case where a Japanese agent or a Japanese-American showed anything out of line with support to this country. In our own experience, we had 45 Japanese-American brakemen, and on the morning of [December 7, 1941] we had on our docks, which are served by rail and truck, a great many thousand tons of dynamite and high explosives. We used, because we had no other labor, our regular train crews, worked them around the clock, and they picked up and moved away from the docks in Honolulu enough dynamite and high explosives to flatten the whole city of Honolulu. These boys worked on these trains, carrying train loads of ammunition, dynamite and high explosives, from the water front in Honolulu and the Pearl Harbor naval station and other restricted areas, now restricted areas, towed by locomotives without headlights, without any

<sup>76</sup> United States Congress, Pearl Harbor Attack: Hearings Before the Joint Committee on the Investigation of the Pearl Harbor Attack, 1441-1443.



lights of any sort, and they had to give up using fog torches, electric torches, because when they were used it frequently happened that somebody on guard on the way took a shot at the fellow that was between the engine and the highball.<sup>77</sup>

Dillingham added that in one incident, US troops machine gunned his workers as their train pulled out of the Waianae Mountains in the belief that they were the enemy. This happened even when the Oahu Railway trains traveled with Marine Guards and carried heavy loads of ammunition. Despite these harassments, the Japanese employed by the Railway, in Dillingham's estimation, "never showed any inclination to do other than his job and do it well and faithfully and stay on it 17, and 18, and 19 hours out of the 24, as many of them did."<sup>78</sup>

## **D. The End of the Line: The Oahu Railway in the post-World War II Era**

The Oahu Railway, which had existed under the Hawaiian monarchy, Provisional Government, Republic, and Territory, would abandon its mainline and most of its branches in the late 1940s, ceasing all operations on December 31<sup>st</sup> 1971. There were several causes, including weather catastrophe, an improved roadway system, expanding automobile ownership and usage, and the proliferation of trucking. In April 1946, the

Alaskan Aleutian tsunami struck the Hawaiian Islands, including O'ahu. A portion of the Oahu Railway trackage between Waianae and Kahuku was destroyed by a monster set of waves that hit the area. The repair process strapped the company work force; in response, the Oahu Railway augmented their labor with plantation gangs loaned from the Oahu Sugar Company, the Ewa Plantation Company, the Waialua Agricultural Company, and the Kahuku Plantation Company.<sup>79</sup> Another factor not often attributed to the demise of the railroad was the surge of road construction during the war period. Automobile traffic certainly had been increasing before the war, however, the expansion of O'ahu's road system facilitated even further increase.

Walter F. Dillingham, the President of the Oahu Railway and Land Company who had managed the business since 1904, knew the new challenges that the railway faced. In April 1946, he met with his largest freight customers to tell them that the funds he would have to expend to repair the tattered railway would inevitably drive up their rates. The meeting, in effect, was a formal admission of something that likely was already known: trucking was now the favored mode of transportation.<sup>80</sup> Soon after Dillingham's meeting with his customers, he announced that the Oahu Railway would be abandoning their tracks by the end of 1947. Control of the

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<sup>77</sup> United States Congress, Pearl Harbor Attack, 1441-1443.

<sup>78</sup> United States Congress, Pearl Harbor Attack, 1441-1443.

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<sup>79</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 258.

<sup>80</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 258.

right of way would revert to the state.<sup>81</sup> The company also reported that it had made certain that all railway employees would be assigned to jobs in their trucking company when the railway was discontinued.<sup>82</sup>

On December 31, 1947, Walter Dillingham, whose father had founded the Oahu Railway and Land Company some 60 years prior, hosted a special chartered passenger train from Kahuku on the north side of O'ahu to Honolulu. The ride took Dillingham and passengers around Ka'ena Point where, in the late 1880s, work teams blasted the rock to level a passageway for the railroad. Continuing southward, they passed sugarcane and pineapple fields that had been brought into existence by the promise of rail transportation. They crossed trestles and passed watering stations, semaphores, small countryside depots, and the former sites of section gang camps, all reminders of the extensive infrastructure of the old railroad. Through 'Ewa and on to Pearl Harbor they viewed the great expanse of the Navy Yard which was but a plan on paper when the rails were first laid. Finally, they chugged toward Honolulu along the route of the first section of the Oahu Railway that B. F. Dillingham and his army of workers had opened with little more than muscle and mule power.

Soon after the final run, the Oahu Railway sent out work teams to remove trackage along the entirety of its line. Some exceptions were made. The Navy wished to maintain access

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<sup>81</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 260.

<sup>82</sup> Kent W. Cochrane, "The Oahu Railway and Land Company," *Trains*, no. March (1947): 26–37.

to their ammunition depot at Lualualei which, since the installation was opened in 1934, was reached via the main line of the Oahu Railway and then via a branch that led to the site. The Navy took control of this length of track and continued to run narrow gauge locomotives and rolling stock across it for many years to come.<sup>83</sup> Additional trackage that the company kept was located at their terminal on Honolulu harbor; however, this trackage had been phased out by the 1960s.<sup>84</sup> In 1961, the Oahu Railway and Land Company merged with the Hawaiian Dredging Company to form the Dillingham Corporation.<sup>85</sup>

Historians Chiddix and Simpson tell that most of the removed rails along the Oahu Railway were scrapped. Those that were not often showed up as roof supports, I-beams, and trellises around O'ahu. Apparently, locals on O'ahu valued the abandoned rails for structural needs. Taking up the rails also meant that many thousands of cross-ties were available. These, too, sometimes ended up in strange places. Stories are told of cross-ties being converted into surfboards.<sup>86</sup>

The Oahu Railway and Land Company also had to divest itself of its locomotives and rolling stock. At the end of the war, the company owned 27 locomotives. Many were manufactured well before World War II and may have been considered

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<sup>83</sup> Treiber, *Hawaiian Railway Album WWII Photographs*, 14.

<sup>84</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 260.

<sup>85</sup> Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918*, 10.

<sup>86</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 259.

antiques. The two diesel switching locomotives built in 1943 were the most modern and the remaining 25 were built in the 1887–1926 period.<sup>87</sup> Some were sent to El Salvador to serve a narrow gauge railway there. A small number were preserved and now exist at the Hawaiian Railway Society Museum, but unfortunately, most of the locomotives were sold or scrapped in the late 1940s. Generally, the many passenger cars and other rolling stock of the Oahu Railway went the same way as the locomotives. Like the locomotives, most were sold or scrapped, although some were preserved.<sup>88</sup>

The end of the Oahu Railway signaled a similar demise of the small plantation railway lines on O‘ahu. The lines at Waimanalo were the first to go in 1941, several years prior to the general abandonment of the Oahu Railway. After the 1947 decision to end the Oahu Railway, the plantations around ‘Ewa, Waialua, Waianae, and Kahuku also abandoned their lines.<sup>89</sup>

From the time of the Oahu Railway’s completion in the late nineteenth century to its demise in the post-World War II era, the Hawaiian Islands grew from a relatively quiet island monarchy to a modernizing US territory. As the largest and most important transportation system on O‘ahu, the Oahu Railway was a key player in that change. The service it provided brought wealth to the sugar planters who promoted the end of the monarchy and the annexation of Hawai‘i to the

United States, even as the railroad’s founder, B. F. Dillingham, sunk into debt. In a very basic sense, the faster connection the railroad provided to the distant places on O‘ahu opened up new areas to settlement and development. The Oahu Railway contributed to the expansion of the US military on O‘ahu via the transportation services the line provided. During World War II the railroad, which had been in a state of decreased usage for many years prior, resurged to become a bloodline to the US military in Hawai‘i.

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<sup>87</sup> Treiber, *Hawaiian Railway Album WWII Photographs*, 53.

<sup>88</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 260-279.

<sup>89</sup> Cochrane, “The Oahu Railway and Land Company,” 29.

## 1.4: PEARL HARBOR NAVAL SHIPYARD AND INTERMEDIATE MAINTENANCE FACILITY

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### A. General Historic Overview

The following was adapted from the *Oahu Integrated Cultural Resources Management Plan*.<sup>90</sup> Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility is the largest industrial complex in the State of Hawai'i. In 1998, the Shipyard and Intermediate Maintenance Facility were consolidated. The consolidation has capitalized on the strengths of both elements and demonstrated the expected efficiencies of combined capabilities. The core capabilities include nuclear propulsion plant work, submarine maintenance and modernization, as well as the capability to maintain all Navy ships in general. The facilities vital to these capabilities include dry docks, piers, cranes, marine railway, and industrial equipment.

#### *i. Establishment of the Navy Yard, 1908-1917*

After supporting a Naval Station at Honolulu for many years, the US Navy ventured to construct a much larger Station on Pearl Harbor in the early twentieth century. The initial appropriation for shops at Pearl Harbor, "including a smithery [sic] and foundry," was only \$107,000. In 1908, a much larger appropriation of \$700,000 was provided for machine shops, storehouses, and development of a Navy Yard at Pearl Harbor.

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<sup>90</sup> Commander Navy Region Hawaii, "Oahu Integrated Cultural Resource Management Plan," 2008.

Several years prior in 1905, dredging work had opened a channel into the Harbor. Construction on the initial facilities at the Navy Yard started with Drydock No. 1 in 1909 and industrial buildings in 1910. These structures were nearing completion in 1913. The Navy Yard at Pearl Harbor had been intended from the beginning only for repair of ships, not for construction of new ships. The central function of the installation was the Navy Yard, the portion of the broader Pearl Harbor Naval Station that was known in the post-World War II period as the Shipyard.

In August 1913, the Commandant and administrative personnel of the Naval Station in Honolulu moved to Fac. 1 in the Navy Yard at Pearl Harbor. Work in the Navy Yard commenced, despite the failure of the first dry dock earlier that year (see following section). The Yard workers and Navy men participated in the salvage of the sunken F4 submarine, and undertook ship repairs in the 1910s without the benefit of a dry dock. From the beginning and through most of the century, the Navy Yard has always had the greatest concentration of industrial buildings in Hawai'i.

Almost all the buildings from the initial era of the Navy Yard still existed at the end of the twentieth century. These include the Administration Building (Fac. 1), the Forge Shop (Fac. 5), the Foundry (Fac. 6), the Woodworking Shop (Fac. 7), the original Power Plant (Fac. 8), the Storehouse (Fac. 9), the Paint Shop (Fac. 11), the Boat Shop (Fac. 12), the Steel Storage Building (Fac. 13), the Pattern Shop (Fac. 14), the Lumber Storage Building (Fac. 15), and the Ice Plant (Fac. 18). Most of these facilities faced onto the streets originally named First

and Second Street, later re-numbered as Sixth and Seventh streets and recently renamed Lake Erie Street and Port Royal Street, respectively.

Some of the original facilities have not survived into the twenty-first century. The Boiler and Shipfitters' shop (Fac. 4) was demolished in 2000. The original Copper and Machine Shops (Facs. 2 and 3) were demolished several decades ago. The early wooden buildings at the Yard, such as the Stable, Storage Sheds, and a Telephone Exchange Building were demolished before World War II. Other facilities were also constructed at the Navy Yard in the initial base or World War I period, of which little or nothing remains. These facilities include railroad tracks, remnants of which are still visible. Originally, the railroad lines ran into, or adjacent to, most buildings in the Navy Yard. Other facilities were removed long ago, including three Torpedo Boat Piers (in the location of the Repair Basins) and two fabric-covered airplane hangars near those piers.

### ***ii. World War I at the Navy Yard, 1917-1919***

Two interesting ship overhauls were done at Pearl Harbor during World War I. Two German ships, the gunboat *Geier* and its collier *Locksun*, had taken refuge in Honolulu Harbor when the war started in Europe in 1914 to escape British vessels. With the United States on the brink of joining the war in 1917, these ships were seized when their crews attempted to scuttle them. The two ships were renovated at Pearl Harbor and commissioned as American vessels Carl Schurz and

Gulfport. A torpedo from the *Geier* remains displayed in front of the Administration building (Fac. 1) to this day.

Waterfront improvements continued at the Navy Yard during World War I, including the construction of the 1010 Wharf, called "ten-ten" because it was 1,010 feet long. Two buildings erected in the World War I period remain, a Latrine (Fac. 19) and the Main Cafeteria (Fac. 29), although the latter has been much altered and enlarged in following decades. The number of workers at the Yard increased during this period, with the Navy requesting Hawaiian Dredging Company to release its employees who were US citizens for government employment. Hawaiian Dredging was involved in building the dry dock and 1010 Wharf during that period. In 1964–1965, the 1010 Wharf was completely reconstructed as Pearl Harbor's first pre-stressed concrete wharf.

### ***iii. Building the First Dry Dock and Pump House, 1909-1919***

The 1908 appropriation also included two million dollars for a dry dock, an essential facility for a repair base. The pump house was an integral part of the dry dock, and these were always considered one facility until decades later when separate numbers were assigned. In February 1913, the partially completed facility was destroyed by hydrostatic pressure, which burst the concrete bottom and collapsed side sections. Luckily, workers were able to get out before the dry dock exploded, but four years of construction lay in ruins. The Navy's annual report noted this event as "the Naval disaster of the year," and Hawaiians felt the shark goddess Ka'ahupahau and her son Kūpipi had been angered by the construction.

Construction of the dry dock resumed about two years later, after much finger pointing, soil investigations, redesign, additional funding, and ceremonies directed by a Hawaiian kahuna (priest). The new design was ingenious, utilizing precast sections that were lowered into place under water, and then joined together with poured concrete. Construction delays resulted from the difficulties of obtaining materials during World War I. The formal opening of the dry dock, on August 21, 1919, was attended by the Secretary of the Navy and about 7,000 others. This was the critical facility for the Navy Yard, and its main function of ship repair could not be optimized until this dry dock was completed. This important facility, Dry Dock No. 1 (Fac. S 779) and its pump house (Fac. 17), remain in active use.

#### ***iv. Between the World Wars at the Navy Yard, 1919–1939***

Although World War I had centered in Europe, it had an effect on the Pacific, especially the awarding of the former German island colonies there to Japan by the League of Nations after the war. Even before World War I, the US Navy officers had started viewing the Pacific as the next likely center of conflict, and the Japanese as potential enemies. The completion of the Panama Canal in 1914 allowed the Atlantic Fleet to more quickly move to the Pacific. In May 1919, the US Fleet had been divided into Atlantic and Pacific components. At this time, Pearl Harbor did not have the facilities to support the whole US fleet, but the goal was to develop the installation so that it could take care of the whole fleet.

Quite a few buildings were added to the Navy Yard during the two decades between World Wars I and II and most are extant. Five of the six storehouses (Fac. 64, 66, 68, 69, 71, 72) built in the early 1920s remain (all but Fac. 69). An additional Latrine (Fac. 74) was constructed in 1923. In 1924, a two-story building (Fac. 90) was built adjacent to an initial base building (Fac. 27, now demolished); since both buildings were used for paint and oil storage, the new one was called an extension. The Administration Building (Fac. 1) was extended in 1926, with additional matching bays of concrete and with a one-story wooden addition that was later replaced. Two water tanks were erected in the mid-1920s as part of a joint Army-Navy water development project. One of the tanks (Fac. S 1058) remains; it had a signal station built on top in 1926, and is significant for its role in the events of December 7, 1941. Two other facilities were completed in the 1920s, a Marine Railway early in the decade, and in 1926, an Accessories Building (Fac. 92) associated with it. Fac. 92 has most recently been used as a school for welders. The most significant facility built at the Navy Yard in the 1920s was the Inside Machine Shop (Fac. 67). This enormous building dwarfed all the others at Pearl Harbor at the time.

In the 1930s, the major project in the Navy Yard was the construction of two additional repair basins. In this decade, a very simplified Art Moderne style was used for most buildings, including a Boiler House (Fac. 139), two electric substations (Fac. S 132 and S 133) and four latrines (Fac. 133, 134, 136, and 141; Figure 9). A Heavy Materials Storehouse (Fac. 129) was built early in the decade, in a very plain, utilitarian design. About this time, the Foundry (Fac. 6) was extended with the

design matching the profile of the initial portion. The most architecturally and historically significant building erected in the 1930s was the Navy Yard Dispensary (Fac. 140).

Fleet maneuvers were frequently held in Hawaiian waters in the 1920s and 1930s, and these exercises often led to increased appropriations for improvements at Pearl Harbor. During the 1935 war games, 163 ships were anchored in the Pearl Harbor lochs. The Chief of Naval Operations recognized the importance of Pearl Harbor as the westernmost repair base in the Pacific. In the late 1930s, ships were purposely sent to Pearl Harbor, rather than to mainland shipyards, for repair and overhaul to prepare this Navy Yard for the types of workloads that were expected with a Pacific war looming.

#### ***v. Buildup to War and World War II Expansion, 1939-1945***

Before 1939, besides the periods of fleet maneuvers, there were normally few ships stationed at Pearl Harbor. With the outbreak of World War II in Europe in 1939, the Navy recognized the possibility of the war spreading to the Pacific. A Hawaiian Detachment, consisting of eight cruisers, one carrier, and 16 destroyers, was stationed at Pearl Harbor in August 1939 and “quickly showed up the deficiencies of the base” (Coletta 1985:451). About the same time, a large contract was signed with a group of construction firms known as Contractors Pacific Naval Air Bases (CPNAB). Their work was not limited to new Navy air bases, but also included facilities throughout O’ahu, including Navy Yard projects. Another major contract, for facilities to be built mostly in the Navy Yard, was signed with Pacific Bridge Company in 1941.

Their scope of work included building three additional dry docks, a bombproof power plant and electrical substations, an additional marine railway, and other facilities. Even before the United States entered the war, there was a tremendous build-up of personnel and facilities at the Pearl Harbor Navy Yard.

Relatively few of the facilities at the Navy Yard were damaged in the December 7, 1941, attack, since the focus of the Japanese aviators was on ships and planes rather than buildings. The fires and explosions from the three ships (Battleship USS *Pennsylvania* and two Destroyers USS *Cassin* and the USS *Downes*) in Dry Dock No. 1 caused damage to that facility, to the substation (Fac. S169) between Dry Docks No. 1 and No. 2, and to adjacent equipment such as cranes and power cables.

Part of the significance of all the pre-1945 facilities at the Navy Yard is the work accomplished by the Navy Yard employees and their collective contribution to the victory in the Pacific. The Pearl Harbor ship repair personnel and facilities supported the vessels going to the forward lines.

The scope of the salvage work on the ships damaged during the December 7, 1941, attack, as well as the repair work later in the war, was phenomenal. The workload continued to increase until the Navy Yard was handling an average of 252 repairs a month in the last year of the war.

The amount of World War II construction at the Navy Yard was also tremendous; almost twice as many facilities were

built there during the first half of the 1940s as had been erected during the previous four decades. The majority of these facilities remain, although the number of personnel at the Navy Yard has declined dramatically.

Storehouses, either wooden or metal-framed, were common building types erected in the Navy Yard in the early 1940s. The Supply Department of the Navy Yard spun off the separate activity of Naval Supply Depot. In addition to the typical gable roofed warehouses, two unusual two-story warehouses (Fac. 393 and 394) with concrete ramps to the second floor were built in 1945 on Seventh Street (now Port Royal Street) near Marine Barracks.

Other building types with numerous examples in the Navy Yard Zone are splinter-proof and bombproof electrical buildings, air raid shelters, casualty stations, latrines, office annexes of wooden construction, and shop additions with steel framing. Many of these facilities are examples of World War II construction types that were not used before or since. For instance, bombproof buildings, such as the power plant near Dry Dock No. 4 (Fac. 177) or the smaller electrical switching station near Dry Docks No. 1 and No. 2 (Fac. 47), have 6-foot thick roofs and 4-foot thick walls of reinforced concrete.

Several large new shop buildings were erected during World War II. One was a Transportation Shop (Fac. 58), where railcars could be repaired. The other new shops included an additional Woodworking Shop (Fac. 154), a new Shipfitters Shop (Fac. 155), and two large concrete buildings for the

Auxiliary Machine & Electric Shop (Fac. 214) and for the Auxiliary Shipfitters Shop (Fac. 215, Figure 14). One interesting building erected in World War II was the Industrial X-ray lab (Fac. 315), where welding and other metal work could be inspected. Another building of interest, and a reminder of the scrap metal drives during World War II, is the Scrap Metal Packaging structure (Fac. 1170).

Architect Albert Kahn is noted for his influence on industrial architecture from the late-1800s through the mid-twentieth century. A designer of innovative plants and factories, Kahn also played a major role in World War I and World War II architecture, designing buildings for Army airfields and naval bases. In the late-1930s and early-1940s, he designed many administration and shop buildings, hangars, and other structures for the United States' military in the Territory of Hawai'i. Albert Kahn Associates, Inc. was responsible for the design of several extant buildings at Pearl Harbor, including several in the Navy Yard. These include the Instrument Shop (Fac. 3A), the Shipfitters Shop (Fac. 155), and the General Storehouse (Fac. 167).

The Navy Yard needed expansion room during World War II and part of the Naval Hospital reservation was taken over in order to build Dry Dock No. 4 and nearby facilities, including the galley (Fac. 388) and latrine (Fac. 387) for the dry dock, the bombproof power plant (Fac. 177), and electrical substation (Fac. S 246). Additional acreage was gained on Waipi'o Peninsula for a salvage depot, where parts were scavenged from ships damaged beyond repair, sorted and made ready for use on other ships.



In addition to new construction, many existing facilities were expanded during the war. For example, Fac. 1 was expanded through the addition of four major annex buildings from 1940-1944 (Facs. IB, IC, ID, and IE). The design of the annex buildings was responsive to the climatic conditions at Pearl Harbor. The relationship between Fac. 1 and its annexes also provides a historical continuum that illustrates the architectural response to the crisis of wartime. Fac. 1 was located across the street from the Navy Yard Depot (**Figure 71**).

#### ***vi. Post-World War II Period, 1945-Recent History***

After the war ended in 1945, the pace of work at the Navy Yard slowed, and by 1950 the work force had been cut from 16,000 to 3,500. About the same time, the official name of the area became Naval Shipyard instead of Navy Yard. During the Korean War, the number of employees rose to 7,000 and generally decreased thereafter.

After World War II, all hospital functions at Hospital Point were transferred to 'Aiea Heights (now Camp Smith). The remaining hospital buildings were turned over to the Shipyard. With these additional buildings, plus all the World War II and earlier facilities, there was little new construction at the Shipyard in the decades after the war. One facility built in the early post-World War II period that has historic merit because of its interesting vernacular design, is the covered bus stop built by Shipyard workers in 1947 (Fac. S 839, Figure 15). A structure with historic merit from the Cold War period is Fac. 9A, completed in 1953 as a Radar Antenna Shop, and

converted to a large equipment radiological service facility for nuclear reactors in 1970.

Up until the late-1950s, the Shipyard's chief roles were taking ships out of mothballs (inactive status) for service in the Korean War, and repairing ships that had been damaged in the voyage from the US mainland. The Shipyard's function increased in complexity when, in 1959, it was designated as the planning shipyard for Regulus and Permit class submarines. As work continued on destroyers, the Shipyard also began to take on additional submarine-oriented work, such as modifications to Greater Underwater Propulsion Power Program (GUPPY) IIs and installing antisubmarine rocket systems. In 1962, the Shipyard began its first nuclear refueling operation (of the USS *Sargo*).

By the 1970s, the Shipyard had acquired sufficient machinery capable of replacing any system on board a modern nuclear submarine. However, only a handful of additional structures were built in the Shipyard in the 1970s and 1980s. These included shops, cafeterias, a test facility, a classroom, and a training facility.

Throughout the Cold War period and into the present day, numerous extant World War II and earlier ship repair facilities have been used to keep the fleet "fit to fight." For example, Fac. 9 (constructed in 1913) was converted into a nuclear engineering repair facility during the Cold War. Also, in 1968, Facs. 11 and 67 (constructed in 1917 and 1926 respectively) were overhauled to serve as a repair shop for all advanced electronic-based systems of modern combat ships. Other

examples include Fac. 1, which became a center for nuclear engineering, and Fac. 214 which was used for advanced electronics repair.

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## **1.5: HISTORY OF THE NAVY RAILWAY AT PEARL HARBOR NAVAL SHIPYARD AND INTERMEDIATE MAINTENANCE FACILITY**

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### **A. Introduction**

Through its several decades of existence, the railway of the present Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility was vital to the Navy. Without the railway, the early establishment and operation of the Navy Yard would have been impossible. The railway system performed the bulk of the heavy lifting and hauling that made Pearl Harbor a Pacific bastion of the US military in the first half of the twentieth century; this chapter traces the history of the railway's development and operation. The chapter is organized chronologically and divided into notable increments of time in the history of the railway system. During the 1909–1915 period, the Navy planted the seed of the Yard railway system. Temporary tracks of narrow gauge were vital to the great and tedious effort that cleared the land, hauled building material, dredged watersides, and transported workmen. Also in this period, the Oahu Railway and Land Company maneuvered into place as the fledgling Yard railway system's connection to the outside world.

Between the years 1915 and 1919, the Navy developed a permanent system of narrow gauge that connected nearly every major structure in the Navy Yard, and railway facilities influenced the architecture of many new structures. Though narrow gauge served the majority of the Yard, in this period,

the Navy diversified the rail facilities of the Yard with the completion of a massive Coaling Plant structure that featured standard gauge, likely due in part to the weight distribution demands of the coaling cranes. The Yard's first Dry Dock, completed with much delay in 1919, raised the Navy Yard's profile as a world-class Navy Yard, and for many decades after, the railway system was a main feature of this prestigious installation. As new installations opened across the Yard and Pearl Harbor and O'ahu in general in the 1920s and 1930s, the Navy extended rails to each of them, thereby affording the Navy Yard a greater lifeline of support.

The Navy Yard continued to grow in importance in the late 1930s and early 1940s as Japan aggressively spread its empire through the Pacific. After the Japanese attacked Pearl Harbor in 1941, the railway system of the Navy Yard played a role in rehabilitating the injured base; with almost no warning, the railway system of the Yard and O'ahu as a whole surged in usage. During the war, the railway system of the Yard and beyond proved its value to the military numerous times over as a mover of people, war materiel, and supplies. The Navy's ability to meet the needs of fleet operations in the Pacific through the war was much greater than it would have been had the rails been abandoned before Japan attacked. At the start of the war, the railway system at the Navy Yard had not dramatically changed in configuration since the early twentieth century, but wartime developments on the base necessitated new rail connections and functional support.

The Korean War brought a resurgence of railway usage, but when the war ended, the Navy moved forward with a plan to

retire the system in the Yard. The abandonment of the system within the Yard in 1954 reflected the advent of new technologies and fleet functions that made the railway obsolete. Nevertheless, the last ammunition train ran in 1968, and rail operations continued at Lualualei until 1973.

## B. Naval Station Railway Development, 1909–1915

In the 1909-1915 period, when the major development of the Naval Station Pearl Harbor proceeded, the railway system consisted of several components and included both temporary and permanent trackage. As the primary motive force at the giant worksite, the railway system was the “backbone” of the construction of the Naval Station.<sup>91</sup> The US Navy, as well as the various contractors involved with the development of the Station, used railroad lines and equipment to transport building supplies, haul excavated fill, grade roadways, and perform other heavy-duty work. Railroads were vital to the completion of the Dry Dock, Coaling Plant, industrial buildings, fuel storage areas, Hospital, Submarine Base, Naval Magazine, and other features of the early Naval Station. The components that helped build the Naval Station were as follows: the first locomotive which arrived in 1909; the permanent railway system; two 15-ton locomotive cranes that arrived in 1913; a second locomotive that arrived in 1914; a third locomotive that arrived in 1915; a number of boxcars and flatcars that arrived in 1915; and additional locomotive cranes that arrived in 1915.<sup>92</sup> The components performed the

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<sup>91</sup> Livingston, *Oahu's Narrow-Gauge Navy Rail*, 7-9.

<sup>92</sup> The standard gauge locomotives, dump cars, and trackage at the Coaling Plant that the Naval Station received in 1915 were not extensively involved

bulk of construction at the Naval Station and, afterwards, some were incorporated into the permanent railway system of the Station. As the Station became fully functioning, railroads remained crucial to day-to-day operations for many decades.

Well before ground was broken on the Naval Station at Pearl Harbor, firms interested in developing the railroad there were contacting the Navy. Wonham and Magor, an engineering firm from New York, contacted U.S.G. White, a civil engineer with the Navy Bureau of Yards and Docks, about the subject in late summer of 1903. White responded on September 18 that “a small railroad is estimated for the Naval Station at Pearl Harbor,” adding that specific plans for its construction were not in place. “At present there is no prospect for it being built,” he reported, “but when it is, the equipment, etc., will be advertised in the papers in the States.”<sup>93</sup>

That the Navy was going to develop an internal Naval Station railway was well known by 1908 when newspaper reports told of several companies vying to control the inevitable passenger and freight traffic to come. While the Oahu Railway was the likely winner due to their already existing infrastructure, there were other entities interested. B. F. Dillingham at this early date was reportedly planning to construct a new track to the

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in the overall construction of the Station. Livingston, *Oahu's Narrow-Gauge Navy Rail*, 7-9.

<sup>93</sup> U.S.G. White, Letter from U.S.G. White to Wonham & Magor. Record Group 181: Records of Naval Districts and Shore Establishments: Pearl Harbor. Box 1. (National Archives and Records Administration, San Bruno, September 18, 1903).

Naval Station that would provide transportation to passengers from Honolulu. This plan never came to fruition, a topic to be discussed at length.<sup>94</sup> A competitor called the Rapid Transit Company simultaneously surveyed a route for an electric railway to the Naval Station as of October 1908.<sup>95</sup> The speculation continued into 1909 when a company called Pearl Harbor Traction also planned an electric railway between Honolulu and the emerging Naval Station, but by this time, the Oahu Railway was the clear frontrunner in the competition for the connection to the Naval Station.<sup>96</sup>

In November 1908, the *Hawaiian Gazette* reported that the Oahu Railway and Land Company expected to connect its main line with the internal Naval Station railway to come. The connection was to be made via a 700-foot spur that would lead from the main line of the Oahu Railway to the entrance of the Naval Station. The juncture was at an area known as Pu'uloa.<sup>97</sup>

The *Hawaiian Gazette* newspaper reported in December 1908 that the Navy recently had ordered 6,000 crossties from the Hawaiian Mahogany Lumber Company (**Figure 9**). The ties were to be delivered to the Navy no later than January 15, 1909. The ties were made of the wood of the 'ōhi'a, a native evergreen of Hawai'i. The lumber was collected from the

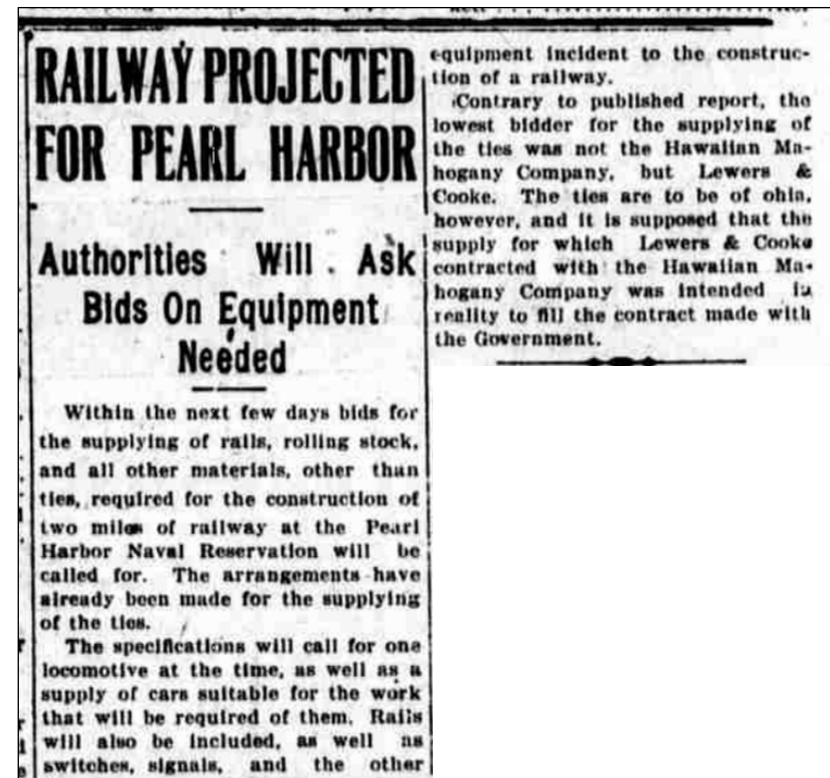


Figure 9. Newspaper article announcing the upcoming release of bids for construction of the railway at Pearl Harbor. *Evening Bulletin* 2 December 1908.

island of Hawai'i.<sup>98</sup> The same newspaper also announced in December that the Navy would soon release bids for rails, rolling stock, switches, signals, and all other materials (aside from ties) needed for the construction of the Naval Station railway. Specifically, one locomotive was to be requested and "a supply of cars." The newspaper noted that the proposed

<sup>94</sup> "New Track for Passenger Trains," *Hawaiian Star*, May 13, 1908.

<sup>95</sup> "Rapid Transit Company," *Hawaiian Star*, October 16, 1908.

<sup>96</sup> "Pearl Harbor Traction Company," *Hawaiian Star*, January 28, 1909.

<sup>97</sup> "O.R. Ready to Build Military Tracks," *Hawaiian Gazette*, November 20, 1908.

<sup>98</sup> "Small Talks," *Hawaiian Gazette*, December 1, 1908, 6.

railway trackage was to be 2 miles.<sup>99</sup> However, the length grew to more than five times that size during the next two decades.<sup>100</sup>

The *Hawaiian Gazette* happily announced on January 5, 1909, that Honolulu was “now in direct rail communication with Pearl Harbor naval station.” In the preceding three days, the Oahu Railway and Land Company had completed its 700-foot spur to the border of the Naval Station. The spur extended westward from the Oahu Railway station known as Pu‘uloa or Pu‘uloa Station.<sup>101</sup> The spur connected to the main line of the Naval Station railway. The completion of the spur meant that the Naval Station now could directly receive supplies from Honolulu.<sup>102</sup>

By 1909, the Oahu Railway and Land Company was attempting to win a contract with the Navy to construct the Naval Station railroad. Earlier in the year, the Treasurer of the Company, W. F. Dillingham (**Figure 10**), and the Superintendent of the

<sup>99</sup> “Railway Projected for Pearl Harbor,” *Evening Bulletin*, December 2, 1908, 6.

<sup>100</sup> A 1927 estimate would state the narrow gauge trackage as 10.5 miles and the standard gauge trackage as 2.5 miles. *Bureau of Yards and Docks, Public Works of the Navy Data Book* (Washington DC: Government Printing Office, 1927).

<sup>101</sup> “Pu‘uloa” was the Hawaiian word for Pearl Harbor. However, the word also applied to the landing on the west side of the harbor entrance. The Oahu Railway and Land Company’s station near the main gate of the Naval Station (i.e. on the east side of Pearl Harbor) took the name Pu‘uloa. Paul T. Yardley, *Millstones and Milestones: The Career of B. F. Dillingham, 1844-1918* (Honolulu: University Press of Hawaii, for B. F. Dillingham Company, 1981), 100-101.

<sup>102</sup> “Spur Track to Pearl Harbor,” *Hawaiian Gazette*, January 5, 1909, 6.

Company, George F. Denison (**Figure 11**), traveled to Washington, DC, to meet with Navy officials at the Navy Department. They reviewed plans for the Naval Station railroad on this occasion. The contract, as the *Hawaiian Gazette* reported, called for a railroad with 60-pound rails of 3-foot gauge that could support a 25-ton locomotive. The railroad was to connect to the Oahu Railway and Land Company via the spur from Pu‘uloa Station, thus providing a direct connection to Honolulu.<sup>103</sup> Plans for the railway at Pearl Harbor, however, did not come to fruition for nearly two years.

In January 1909, the Hawaiian Mahogany Company delivered the ties to the Naval Station. In the meantime, the Navy was evaluating responses from the bids it had opened at the end of 1908 for rolling stock, rails, and other railway equipment.<sup>104</sup> The Navy apparently had made determinations on bids by August 1909, as the H. K. Porter Company of Pittsburg, Pennsylvania, delivered a saddle-tank style locomotive that month. The locomotive was the first of many at the Naval



**Figure 10.** Walter F. Dillingham, Treasurer of the Oahu Railway and Land Company during the development of the railway at Pearl Harbor. *Men of Hawaii 1917*.

<sup>103</sup> “Some Fine New Dredgers,” 2.

<sup>104</sup> “Army, Navy and Marine Corps,” *Evening Bulletin*, January 21, 1909, 3.



**Figure 11. George F. Denison, Superintendent of the Oahu Railway and Land Company during the development of the railway at Pearl Harbor. *The Rotarian* 1928.**

Station.<sup>105</sup> A saddle-tank style of locomotive was one that carried water or oil in an on-board water tank rather than a separate tender car. Saddle tanks, which were oil fired, offered the ability to run in either direction along the rails because the need to pull a tender was absent. This locomotive was the only one at Pearl Harbor until 1914. **Figure 12** is a 1917 photograph of locomotive #1 pushing dump cars of excavated rock along the temporary track of the Station.<sup>106</sup>

In 1909, when the ground was broken for construction at Pearl Harbor, the Navy purchased the first railway equipment, aside from the earlier purchase of 'ōhi'a crossties, for the forthcoming Naval Station. They acquired one locomotive, several dump cars, and railroad tracks.<sup>107</sup> All of this equipment was for a 3-foot gauge or narrow system which was an interesting choice in a period when standard gauge railways were commonplace elsewhere in the United States. The reasons why the Navy chose a narrow gauge system over

<sup>105</sup> Jeff Livingston, "Navy Narrow Gauge at Pearl Harbor," Hawaiian Railway Society, July 30, 2012, <http://www.hawaiianrailway.org/historian/Articles/NavyNarrowGaugeatPearlHarbor.html>.

<sup>106</sup> Livingston, *Oahu's Narrow-Gauge Navy Rail*.

<sup>107</sup> Livingston, *Oahu's Narrow-Gauge Navy Rail*, 7–8.



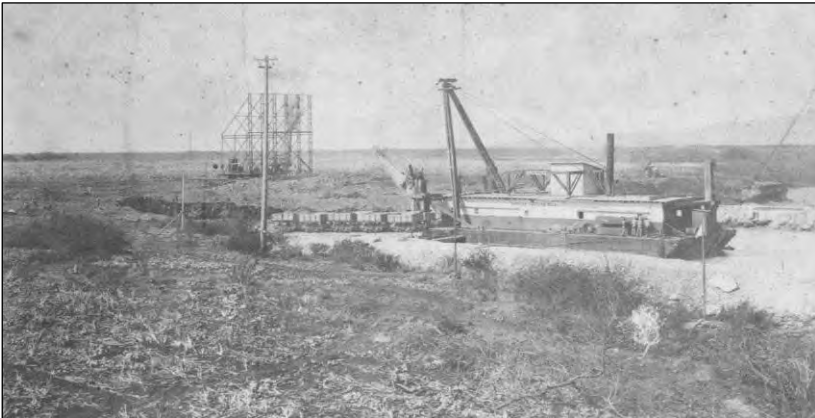
**Figure 12. Locomotive #1, built by H. K. Porter Company of Pittsburg, Pennsylvania, at work at the Navy Yard in 1917. Hawaiian Railway Society Collection.**

standard gauge are not documented; however, several assumptions can be made. The broader Oahu Railway and Land Company system on the island of O'ahu was narrow gauge, and thus the Navy most likely deemed it impractical to develop a standard gauge system that had no possibility of operating on the regional, private rail system on O'ahu. If the gauge of the Naval Station were different, receiving cargo at Honolulu and shipping it to the station by rail would have



been impossible. Other reasons behind the Navy's choice of narrow gauge were most likely economical. Narrow gauge systems were physically smaller meaning that all components, from rails to locomotives to boxcars, were less expensive to build. Their small physical size was ideal for operations in the confines of the Naval Station where space was limited.

A 1909 photograph (**Figure 13**) of the early stages of the Dry Dock excavation provides information on railway activity. The work at this point was being conducted by the Hawaiian Dredging Company, owned by Walter Dillingham. In the photograph, the company dredge *Governor* is at work on the site. The dredge is loading excavated material onto several dump cars for transport away from the site. The railway that these cars and their locomotive (not pictured) operated upon was a temporary railway that had been laid to complete the construction. It is likely that the locomotive and dump cars belonged to the Hawaiian Dredging Company.



**Figure 13. Dredging for the first Dry Dock at Pearl Harbor, 1909. The dump cars belonged to the Hawaiian Dredging Company. Hawaiian Railway Society Collection.**

Temporary trackage was used to transport material to and from work sites. This temporary trackage was laid atop the ground rather than inside an excavated railbed. No plans for the location of the temporary trackage have been found but use of this style of trackage is evident in numerous photographs from the base development period.

Through the year 1909, little construction occurred at Pearl Harbor aside from the Dry Dock which was to be the focal point of the Navy Yard. In October 1910 the *Hawaiian Gazette* newspaper reported that the Navy was furthering construction plans for the Naval Station at Pearl Harbor. The newspaper cautioned that, once started, construction would be gradual, including the work on the railway system:

The machine shops, storehouses and the dozens of buildings, the railway tracks, concrete work, electrical work, seawall, roadways, wharves, cranes, tool shops, officers' quarters, administration building, hospital, shore quarters for enlisted men, etc. will require a long time to build, and in less than two years, the drydock will be ready to accommodate warships.<sup>108</sup>

Historical evidence indicates that the permanent railway for the Naval Station had not yet been developed as of May 1910. At this date, Pierce Taylor wrote in the periodical *Navy News* that \$150,000 was to be used to build railroads and roads

<sup>108</sup> "May Commence Building Soon," *Hawaiian Gazette*, October 28, 1910, 1.

through the Station. The implication was that work on the permanent railway system had not commenced. Photographs in Taylor's article provided a view of temporary railroad trackage around the Dry Dock and nearby at the time. This temporary trackage can be seen adjacent to the Dry Dock excavation site (**Figure 14**) and also near the Framing Yard (**Figure 15**) where Dry Dock cribs were being held until needed.<sup>109</sup> The Dry Dock work as of January 1911 was expected to require 1,000 tons of rock for concrete each day. The Oahu Railway and Land Company held a contract to deliver this material to the site.<sup>110</sup>

By 30 June 1910, the Bureau of Yards and Docks reported that the Navy had completed the topographic surveying of the Naval Station area as well as plans for a general layout. Railroad equipment had been purchased but the Navy still had not decided upon a specific layout of the Station. Thus, railway work and other projects aside from the Dry Dock were stalled as of mid-1910.<sup>111</sup>

As the *Hawaiian Gazette* forecasted, construction efforts at Pearl Harbor progressed in 1910. The new wave of construction went beyond the Dry Dock. Construction on the first shops, storehouses, and other industrial buildings adjacent to the Dry Dock began in this year and continued into

<sup>109</sup> Pierce Taylor, "Pearl Harbor, Our New Navy Yard," *Our Navy* 4, no. 1 (May 1910): 21.

<sup>110</sup> "Part of Pearl Harbor Drydock Finished," *San Francisco Call*, January 16, 1911.

<sup>111</sup> Bureau of Yards and Docks, "Annual Report of the Chief of the Bureau of Yards and Docks to the Secretary of the Navy for the Fiscal Year 1910" (Government Printing Office, 1910), 12–13.



**Figure 14.** The dredge *Governor* at work on the Dry Dock during the first half of 1910. At right, the dump cars of the contractors are seen. Taylor 1910.

the next. In each of these efforts, temporary railroads that the Navy and their contractors had laid out hauled excavated rock, dumped fill, transported material, and shouldered the burden of this massive material moving project.<sup>112</sup>

In December 1910, the *Hawaiian Gazette* reported that railroad tracks were being laid in the vicinity of the Dry Dock site. These rails were likely the beginning of the permanent trackage. The report added that the Dry Dock-area rails were "connected up with lines which tap the main line of the Oahu Railway." There were "scores of men" at work at the Naval

<sup>112</sup> Livingston, *Oahu's Narrow-Gauge Navy Rail*, 7–8.



**Figure 15.** The temporary Framing Yard for the Dry Dock crib is featured in this May 1910 photograph. At right, the temporary railroad track of the developing Navy Yard is seen. Taylor 1910.

Station and seven dredges of the Hawaiian Dredging Company were hard at work on the Dry Dock site and the waters around the Naval Station.<sup>113</sup>

An April 1911 map of the US Naval Station Pearl Harbor (**Figure 16: Appendix A, Map 1**) indicates that the permanent railway system of the Station still had not been developed. The map similarly does not indicate any temporary railway lines, most likely because they often changed in configuration.

<sup>113</sup> "Progress on Dry Dock," *Hawaiian Gazette*, December 16, 1910.

The map shows other features of interest. The Pu'uloa Station (outside of the Naval Station) of the Oahu Railway and Land Company is visible to the southeast of the Dry Dock site. From Pu'uloa Station, the Oahu Railway and Land Company had earlier run its 700-foot spur line to the border of the Naval reservation. The 700-foot spur line is illustrated on the map. The spur line veered westward from the Company's mainline out of Pu'uloa Station and passed by a Chinese labor camp associated with area plantation operations. The spur line stopped abruptly at the boundary of the naval reservation. No connecting railroad line is depicted within the Station boundary. The illustrated lines that extend into the Naval Station are proposed water lines (i.e., not railroads).<sup>114</sup>

The *Hawaiian Gazette* announced in August 1911 that further construction at the Naval Station was to be in "full blast" in early September. Bids were being taken for a machine shop, power plant, foundry, forge shop, a pipe and plumbing shop, a woodworking shop, and combined ship fitters, metal work, and boiler shop. Each was to have a permanent railway connection. The article implied that the Navy had not yet opened bidding on the sewer, street, and the permanent railway work although an announcement would soon be made.<sup>115</sup>

<sup>114</sup> This map is available on microfilm and is of poor resolution, thus some of the details are illegible. Bureau of Yards and Docks, "US Naval Station Pearl Harbor: Paving," January 1912, Microfilm Reel 1058 (Bureau of Yards and Docks Plans), National Archives and Records Administration.

<sup>115</sup> "Pearl Harbor Buildings to Be Commenced Next Month--Bids Called For," *Hawaiian Gazette*, August 11, 1911, 3.

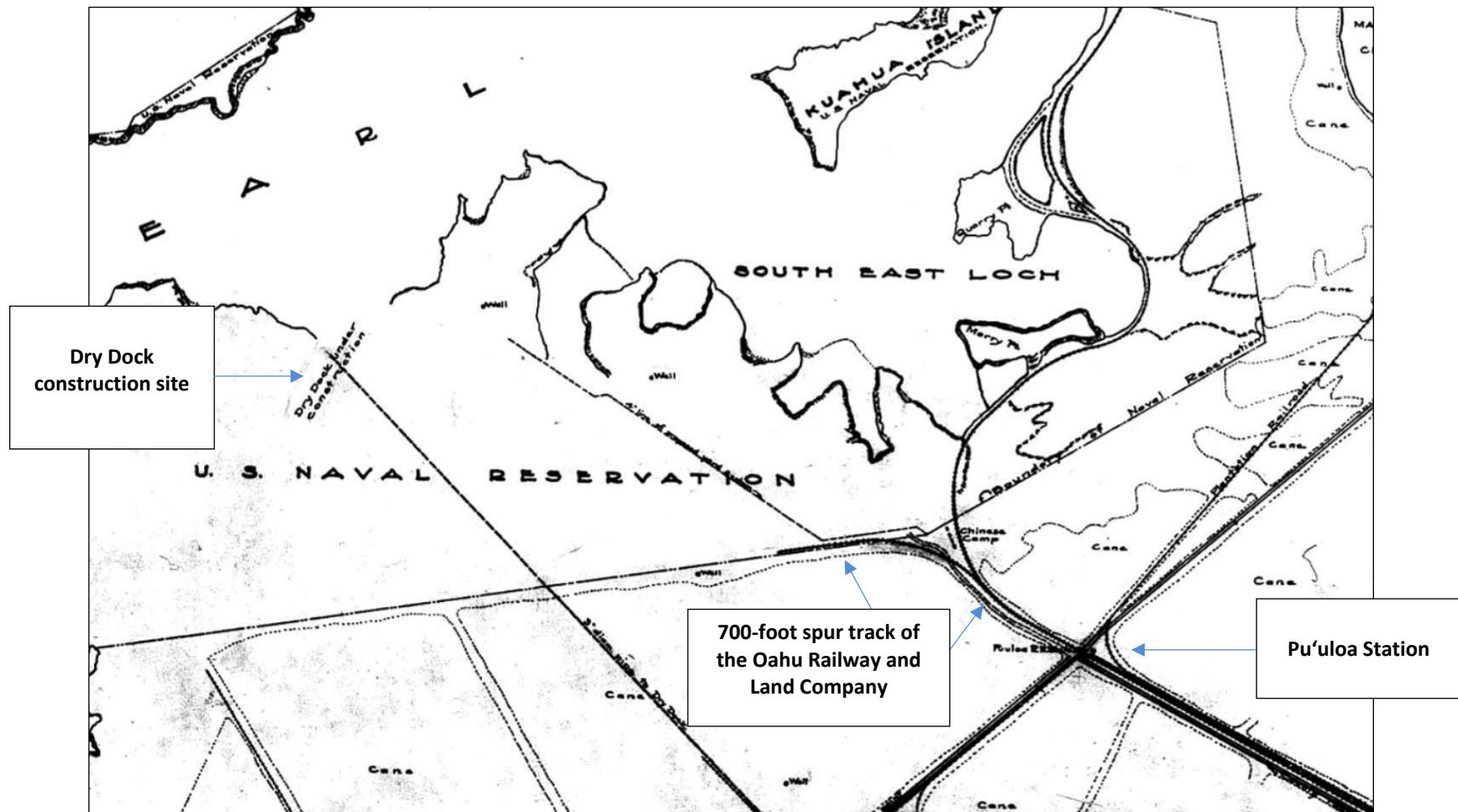


Figure 16. Inset of 1911 map of the Naval Station Pearl Harbor showing the Oahu Railway and Land Company's spur track (identified) from Pu'uloa Station to the boundary of the Naval Station. The Dry Dock construction site is identified as a point of reference. Bureau of Yards and Docks 1911.

Further work on the permanent railroad system of the Naval Station seems to have begun in the fall of 1911. On November 10, 1911, the *Evening Bulletin* announced that railroad construction “on an extensive scale” was to begin at the Naval Station that day. An “army of workmen” was to commence grading the roadbed and laying ties. A main line of rails through the Yard was to connect with shops, storehouses, and other buildings. The “engineers” intended to complete the Yard railway as soon as possible so that the system could aid the building construction work.<sup>116</sup>

During this period of accelerated construction work at the Naval Station, one of the only known accidents involving the railway system occurred. The *Hawaiian Star* reported the accident which happened in December 1911. A Marine by the name of Baldwin was killed in “a railroad accident.” The details of the accident were not stated. Baldwin was buried with honors at Nuuanu Cemetery.<sup>117</sup>

A map of the Naval Yard area dated August 1912 (**Figure 17**) illustrates the permanent railway system of the Navy Yard up to that time as well as the progress of building construction.<sup>118</sup>

The permanent system extended into the Station from the eastern boundary line of the Naval Reservation at the Oahu Railway and Land Company spur from Pu‘uloa Station. The

spur entered the Yard at the intersection of what was later known as South Avenue and North Road. The Navy Yard tracks continued roughly northwestward into the Yard along Avenue D towards First Street<sup>119</sup> into the industrial waterfront/Dry Dock area of the Yard. At a point halfway to the Dry Dock area, a separate Yard track curved southwestward along Fourth Street<sup>120</sup> and then turned northwestward along Avenue E into the Dry Dock area. Thus, incoming railway traffic to the Station had the option of driving toward the buildings on the north or the south side of the Dry Dock area.

The 1912 map, which was created in August, does not depict the permanent trackage that existed (or was being completed) along Central Avenue. This trackage paralleled Central Avenue on the southern side of the road’s right-of-way. This trackage can be seen in an August 1912 photograph of the construction of the Marine Officer’s Quarters (the Quarters, though part of the original Naval Station, are outside of the present-Navy Yard). Apparently, this photograph was taken after the map was completed.

The 1912 map illustrates the emerging industrial buildings at the Dry Dock area, each of which had convenient, permanent rail access. The buildings at this time were located between First and Second Street<sup>121</sup> and Avenues D and E. Along First Street and affronting the Dry Dock (from roughly north to south) were several substantial structures: a Paint and Rigging

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<sup>116</sup> “Railroads for Pearl Harbor,” *Evening Bulletin*, November 10, 1911, 1.

<sup>117</sup> “Marine Funeral,” *Hawaiian Star*, December 23, 1911.

<sup>118</sup> Bureau of Yards and Docks, US Naval Station Pearl Harbor T.H. Plan of Improvements, map 1400-17-13. Record Group 71: Bureau of Yards and Docks (National Archives and Records Administration, College Park, Maryland, August 1912).

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<sup>119</sup> During World War II, First Street was redesignated as Sixth Street.

<sup>120</sup> Fourth Street was redesignated Eighth Street during World War II.

<sup>121</sup> Second Street was redesignated Seventh Street during World War II.



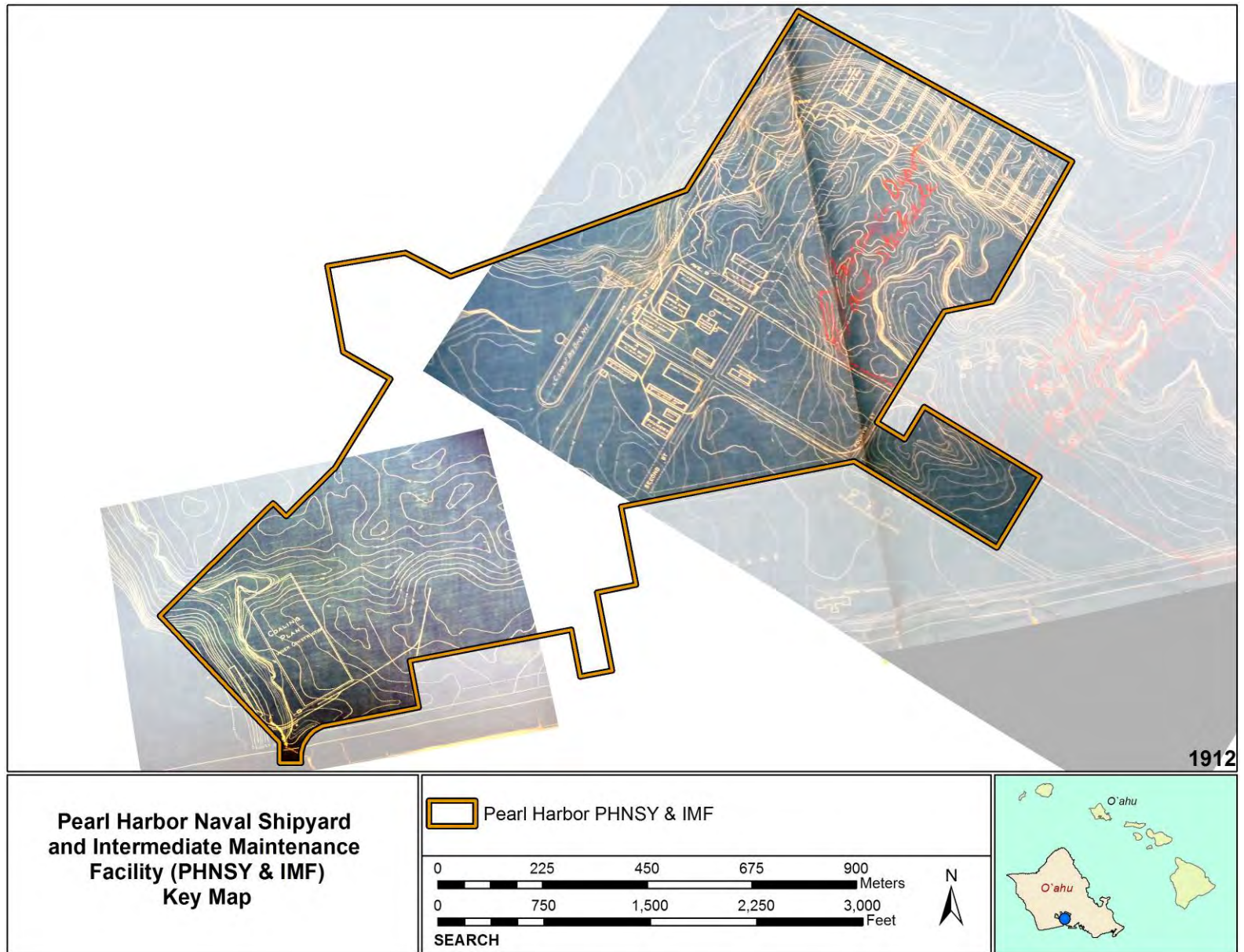


Figure 17. 1912 map illustrating the permanent railway system of the Navy Yard.

Shop; a Forge Shop; a combined Ship Fitters and Boilermaker's Shop; a Machine Shop, and a Pipes and Plumbing Shop. Each of these structures had railroad trackage adjacent to them. A second row of substantial structures stood behind the First Street row. These structures included (from roughly north to south) three Storehouses, a Power House, a Metal Storehouse, a Lumber Storehouse, a Woodworking Shop, a Pattern Shop, and a Foundry. Similar to the row of buildings on First Street, this second row of buildings also had trackage adjacent to them, with the exception of the metal storehouse and lumber storehouse. The Administration Building stood to the southeast of the two rows of buildings.<sup>122</sup> Also depicted in the 1912 map were the Coaling Plant and the Torpedo Boat Piers area. The Coaling Plant was under construction at the time of the map (August 1912) and the Torpedo Boat Piers area was depicted as a future development.<sup>123</sup>

The *Star-Bulletin* newspaper of Honolulu reported that Pearl Harbor was growing "with mushroom rapidity" in November 1912, and the railroad was a key component of the project. Across the work site, "the ring of hammers and the rattle of the riveting machines mingled with the rumble of heavy yard trains shunting their loads of pipe and structural steel from point to point, or hauling stone and dirt from excavation to fills" could be heard.<sup>124</sup> Concrete and steel structures were

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<sup>122</sup> Bureau of Yards and Docks, US Naval Station Pearl Harbor T.H. Plan of Improvements, 1912.

<sup>123</sup> The ultimate configuration of the completed Torpedo Boat Piers area was different from the proposed layout depicted in the map.

<sup>124</sup> "Pearl Harbor Job Is Now Close to \$15,000,000," *Star-Bulletin*, November 12, 1912, 1.

underway. Administrative officials from Naval Station Hawaii had recently transferred to the Yard. The development work employed 500 men, most of whom lived in Honolulu. The workers rode into the Yard each morning on "a special train" that left the city at 7:15 a.m. and returned at 4:15 p.m. Private firms were fulfilling the work on the Dry Dock construction, industrial buildings, and the quarters for Marines and Naval personnel, among other unidentified facilities. The Coaling Plant, water front improvements, sewers, roads, and other unidentified projects were being performed by the federal government. An extension of the Dry Dock had been approved and, to make up for lost time in recent months, the contractors were rushing the work.<sup>125</sup>

**Figure 18** is a photograph of the Marine Officers Quarters under construction with some of the Yard railroad's early permanent trackage in the foreground.

By 1912, the Concannon Company had won the contract to complete the industrial buildings. As of November 1912, many of the industrial buildings were ready to receive machinery, but the actual manufacture and delivery was expected to take a year. The industrial buildings were arranged in a double row back from the Dry Dock. Behind the two rows of industrial buildings was an undeveloped site for an Administration Building. About a half mile from the Dry Dock was the Marine Barracks and the Marine Officers

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<sup>125</sup> Pearl Harbor Job Is Now Close to \$15,000,000," *Star-Bulletin*, 1912.



**Figure 18.** View of construction of three Officers Quarters for the US Marine Corps at the Naval Station, 4 August 1912 (left to right: Fac. 201, 202, and 203). The permanent trackage in the foreground was the line that paralleled Central Avenue. Library of the Marine Corps.

Quarters. There were also plans to build a Naval Officers Quarters.<sup>126</sup>

The year 1912 also marked the start of construction of a Coaling Plant at the Naval Station. Whereas the Station railroad systems (both permanent and temporary) were of narrow gauge, the Coaling Plant was to consist of standard gauge. The reason for this decision is unknown. Work on this

<sup>126</sup> The Marine reservation area, though part of the original Naval Station, is outside of the present Pearl Harbor Naval Shipyard & Intermediate Maintenance Facility boundaries.

massive structure took several years in pace with appropriations and the sheer magnitude of the construction. The railway system received the necessary standard gauge locomotives, locomotive cranes, and 20-yard capacity dump cars in 1915.<sup>127</sup>

Aside from the Dry Dock, the Coaling Wharf construction project was the most extensive construction project at the Naval Station in this period, if not one of the largest construction projects in the Hawaiian Islands. **Figure 19** is a 1914 photograph of the construction of the wharf section and construction crane. The Coaling Wharf which provided coal until the remaining structure of the Wharf was completed



**Figure 19.** The construction of the Coaling Wharf and construction crane at Pearl Harbor, May 1914. Hawaiian Railway Society Collection.

<sup>127</sup> Livingston, *Oahu's Narrow-Gauge Navy Rail*, 9.



several years later. **Figure 20** is a 1918 photograph of work underway on the elevated trackage portions of the wharf. **Figure 21** is an August 1919 photograph of the completed Coaling Wharf.

The naval appropriations bill for fiscal year 1913 devoted more than two million dollars to Hawai'i. A large portion of the money was devoted to Pearl Harbor and, specifically, \$45,000 was devoted to the Yard railway system.<sup>128</sup> On December 31, 1912, the *Honolulu Star-Bulletin* ran a story titled "Pearl Harbor Naval Base is Growing Up Like Magic." The article reported:

A score of buildings, many of them almost entirely completed, dot the shoreline, construction trains shunt their heavy loads over several miles of trackage, a monster coaling plant and wharf is being rushed to completion.<sup>129</sup>

The article also noted that, since the start of 1912, numerous contracting firms had been working at Pearl Harbor. The newspaper listed what it considered to be the principle projects. With projects in parenthesis, the contractors were the Hawaiian Dredging Company (channel and harbor dredging), the San Francisco Bridge Company (Dry Dock), Lord-Young Engineering (naval magazine), Spalding Construction

<sup>128</sup> J.A. Breckons, "What Naval Bill Holds for Hawaii," *Hawaiian Star*, May 31, 1912.

<sup>129</sup> "Pearl Harbor Naval Base Is Growing Up Like Magic," *Honolulu Star Bulletin*, December 31, 1912, 1.



**Figure 20. Work underway on Coaling Wharf, 6 May 1918. Record Group 71, National Archives and Records Administration.**



**Figure 21. The coaling wharf as seen from Radio Tower No. 1, 18 August 1919. Hawaiian Railway Society Collection.**

Company (Marine barracks and quarters and naval officers' quarters), and Concannon Company (seven industrial buildings, administration buildings, and general storehouse).<sup>130</sup>

A photograph dating to February 1, 1913, is presented in **Figure 22**. The photographer was facing southwest and apparently shot the image from atop the smokestack of the Power Plant. From right to left, the large structures underway in the foreground include the Shipfitters, Metal Works, and Boiler Shop; the Machine Shop; and the Pipe and Plumbing Shop. The small structure to the left of the Machine Shop is unknown but may have been a temporary structure for contractors. Adjacent to each of the large structures, the



**Figure 22. General view of Pearl Harbor looking west with former Facilities 4, 3, and 2, February 1913. Record Group 71, National Archives and Records Administration.**

<sup>130</sup> Pearl Harbor Naval Base Is Growing Up Like Magic," 1912.

permanent railway system of the Station is visible. Beyond the three large structures, the Dry Dock work site is visible. Many of the smaller structures in this area were part of the Dry Dock construction operation.

An April 1913 photograph (**Figure 23**) depicts air dump cars in use in the vicinity of the General Storehouse (at center) at what eventually became the intersection of Avenue D and Second Street. The photographer was facing roughly west. The dumps cars appear to be resting on bare ground rather than temporary rails (the permanent railway in the area was just to the right of the photographer and outside of the photograph). Manually operated dump cars were a very common site during the construction of the Naval Station.



**Figure 23. Manually operated Dump Cars employed in work near Fac. 9, General Storehouse. View looking west. 1 April 1913. Record Group 71, NARA.**

Documentation on these cars is scarce. The various contractors who built the Dry Dock and the structures of the Naval Station used these cars frequently. The dump cars in the photograph are believed to have been owned by the Concannon Company which developed many of the industrial buildings. Kilbourne and Jacobs Manufacturing (Columbus, Ohio) insignia can be seen on one of these four yard capacity dump cars.

The Navy approved \$45,000 for “Railroad Equipment” for Naval Station Pearl Harbor for fiscal year 1913. The specific equipment desired was not stated; however, it is clear the Navy purchased the first locomotive cranes for the yard with some of the funds. In November 1912, the Navy Department opened bids for 15-ton locomotive cranes for the Station.<sup>131</sup> The Brown Hoisting Machinery Company successfully obtained the contract to build the cranes and deliver them to Pearl Harbor. Three were built. The specific arrival date of the cranes is unknown although they most likely were delivered in the first half of 1913. A May 1913 photograph (**Figure 24**) depicts the first locomotive crane as it rested along the stretch of permanent rail system on First Street between the Paint Shop/Rigging Loft building (far right) and the Pipe/Plumber Shop building (far left). **Figure 25** is a September 1914 photograph of a locomotive crane involved in excavating a site for a Lumber Shed. The cranes operated on 3-foot gauge track. The cranes worked on the Radio Station and other construction projects.<sup>132</sup> Also included in the fiscal year 1913



**Figure 24.** The first locomotive train at Pearl Harbor (pictured) was manufactured in Cleveland, Ohio, by the Brown Hoisting Company. Photo dated 1 May 1913. Record Group 71, National Archives and Records Administration.



**Figure 25.** A locomotive crane and dump cars employed in excavation for construction of a Lumber Shed, September 1914. Record Group 71, National Archives and Records Administration.

<sup>131</sup> “Government Purchases,” *Iron Age*, 1912, 1074.

<sup>132</sup> Livingston, *Oahu’s Narrow-Gauge Navy Rail*, 11, 20.

appropriation was locomotive #2, a production of Vulcan Iron Works, which was built in 1913.<sup>133</sup>

Vulcan Iron Works of Wilkes-Barre Pennsylvania manufactured locomotives #3, #4, and #5 (**Figure 26**). These locomotives were standard gauge and intended for use at the Coaling Plant, the only area of the Naval Station where standard gauge rails were developed. The \$23,680 needed to acquire these engines came from the Naval Appropriation Act of 22 August 1912. Vulcan had extensive experience in fulfilling contracts with the US Government and, in particular, the Navy. Vulcan had built locomotives for the Isthmian Canal Commission, the Brooklyn Navy Yard, Guantanamo Naval Station, Fort DuPont, Charleston Navy Yard (Boston), Charleston Navy Yard (South Carolina), Fort Monroe, Mare Island Navy Yard, Puget Sound Navy Yard, and other installations. The Navy entered into the Pearl Harbor contract with Vulcan on 22 March 1912. The delivery date of the engine is unknown.<sup>134</sup>

The Navy contractors completed the majority of the Naval Station's repair shops and railroad system in early 1914. In this period, the railway system became fully operational.<sup>135</sup> The Yard's second locomotive arrived in October 1914 from Vulcan Iron Works. The locomotive was immediately put to

<sup>133</sup> Livingston, "Navy Narrow Gauge at Pearl Harbor."

<sup>134</sup> Navy Department, "Contract No. 1931 Dated Mar. 22 1913 for Switching Locomotives, Pearl Harbor, T.H., between Vulcan Iron Works and the United States by the Navy Department," March 22, 1913, Record Group 71: Bureau of Yards and Docks: Bound Contracts, 1896-1926: No. 1930 to No. 1935. Box No. 230, National Archives and Records Administration, Washington, DC.

<sup>135</sup> Livingston, "Navy Narrow Gauge at Pearl Harbor."



**Figure 26. Completion photograph of locomotives of the Navy Yard. Photo taken at Vulcan Iron Works, Wilkes-Barre, Pennsylvania (date unknown). Hawaiian Railway Society Collection.**

work on construction projects including the Marine Barracks and Coaling Plant.<sup>136</sup> Photographs from the 1910s indicate numerous flatcars, box cars, and dump cars at the Yard. Some of the flatcars were 30-ton flatcars, five of which were supplied to Pearl Harbor by the Seattle Car and Foundry Company in 1913. These flatcars are believed to be the first at Pearl Harbor.<sup>137</sup> Additional boxcars and flatcars arrived at

<sup>136</sup> Livingston, *Oahu's Narrow-Gauge Navy Rail*, 17.

<sup>137</sup> Specific numbers of flatcars, boxcars, and other rolling stock belonging to the Navy Yard are not available prior to the World War II period. Livingston, *Oahu's Narrow-Gauge Navy Rail*, 17.

Pearl Harbor in 1915. The Gregg Company Limited of Hackensack, New Jersey, provided the three boxcars and 11 flatcars. Each of the boxcars and flatcars featured steel frames. As was the case with much of the railway equipment sent to Pearl Harbor in this period, the boxcars and flatcars arrived disassembled and Yard labor put them together on site.<sup>138</sup>

### C. The Early Years of the Navy Yard Railway, 1915-1919

The Dry Dock was the centerpiece of the new Naval Station and an engineering feat at the time. However, a great catastrophe accompanied its development. The construction of the first Dry Dock was severely interrupted in 1913 in an event that set back the Navy Yard's progress toward full operations. David Kanakeawe Richards was a foreman with the Hawaiian Dredging Company. He had worked at the Naval Station site from 1909 up to the time the Dry Dock was completed 10 years later. In an undated recollection, Richards described the tragedy that befell the construction of the Dry Dock. He also mentioned that the nearly 1,000 workers involved in the construction of the dock traveled to their work site via the railway. They traveled along the Oahu Railway to Pu'uloa Station and, from there, traveled on "workmens trains" into the Naval Station to their work site.<sup>139</sup>

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<sup>138</sup> Livingston, *Oahu's Narrow-Gauge Navy Rail*, 25.

<sup>139</sup> The Richards account dates to sometime after the 7 December 1941 Japanese attack on Pearl Harbor. David K. Richards, "True Story of the Beginning of Pearl Harbor, Oahu, July, 1909 to December 7, 1941," no date, Record Group 5, Seabee Museum Archive, 70.

A Hawaiian fisherman approached Richards during the early stages of the work and warned him that the Dry Dock work was disturbing an area under the purview of the shark god. The fisherman repeatedly warned Richards and his men that they would be punished severely if they did not appease the shark god. Though a Hawaiian himself, Richards, as well as his men, dismissed the fisherman's warning as superstition and continued on with the work. The dredging took place in 1909-1910. Detailed pile-driving, cement pouring, and carpentry work to form a support structure followed for several years. Then, on February 17, 1913, the bottom of the support structure buckled and the entire fabrication collapsed. All workers evacuated in time and no one was killed. In the aftermath, most of the approximately 1,000 workers were laid off.<sup>140</sup>

Over the next two years, engineers devised a new construction plan.<sup>141</sup> When the Dry Dock work restarted in 1915, the contractors, including Walter Dillingham (owner of the Hawaiian Dredging Company), apparently were overcome with superstition for they requested that Richards arrange a traditional Hawaiian offering and christening of the site. A kahuna, or traditional priest, oversaw the offer and christening just prior to the pouring of concrete in 1918.<sup>142</sup>

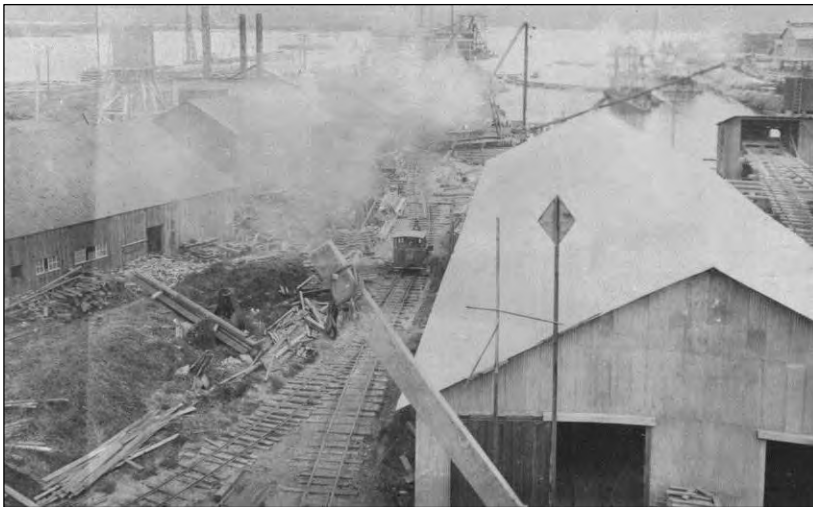
A 1916 photograph (**Figure 27**) shows the second period of construction of the Dry Dock. The plant area is visible at the

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<sup>140</sup> Richards, "True Story," 10.

<sup>141</sup> Stanford, "Pearl Harbor Dry Dock."

<sup>142</sup> Richards, "True Story of the Beginning of Pearl Harbor, Oahu, July, 1909 to December 7, 1941."



**Figure 27. Pearl Harbor, view looking north, 30 August 1916. View looking northeast toward the Dry Dock 1 site. Hawaiian Railway Society Collection.**

base of the Dry Dock. The rails of temporary trackage in this area can be seen at center and on the right. The large building at the right is a Cement Shed and the small wood-frame structures are temporary work shacks belonging to the contractors. Another photograph from the same period (1916) provides an overhead view of the Dry Dock and the Yard's developing industrial area (**Figure 28**). Four years later, the contractors (Hawaiian Dredging Company and San Francisco Bridge Company) completed the Dry Dock.<sup>143</sup> The Oahu Railway and Land Company sent a special train decorated in red, white, and blue regalia to the grand opening ceremony.<sup>144</sup>

<sup>143</sup> Stanford, "Pearl Harbor Dry Dock."

<sup>144</sup> Livingston, *Oahu's Narrow-Gauge Navy Rail*, 46.



**Figure 28. View of the Dry Dock and industrial area, 22 August 1916. Record Group 71, National Archives and Records Administration.**

Through the various developments of the 1910s, the railroad was a key component in construction. In most of the photographs from this period, locomotives happen to be chugging through the landscape, such as a 1916 photo of the Pattern Shop (**Figure 29**) and a 1917 photograph of the Foundry and Boat Storehouse area (**Figure 30**). The Naval Hospital was an important development of this period. The site was located to the west of the industrial area of the growing Naval Station.<sup>145</sup> Construction commenced in 1915. The Hospital was one of few developments at the Naval Station that would not have a direct railway connection.

<sup>145</sup> Navy Region Hawaii, "O'ahu Integrated Cultural Resources Management Plan," October 2008.



**Figure 29.** Railroad tracks near Fac. 14, Pattern Shop (left) on Port Royal Street, former Second Street, 6 October 1916. View looking southeast. Record Group 71, NARA.



**Figure 30.** Railroad track between the Fac. 6, Foundry (right) and Fac. 12, Boat Storehouse (left), 11 September 1917. One of the Station's locomotive cranes is visible at left. View looking southeast.

Nevertheless, the temporary narrow gauge railway of the Station carried in all of the necessary construction material for the Hospital. The Naval Hospital was commissioned in 1917.<sup>146</sup>

Pearl Harbor's need for locomotive cranes increased along with construction in the 1910s. In 1915, the American Locomotive Crane Company manufactured and shipped two 10-ton locomotive cranes (#9 and #10) to the Naval Station. The cranes arrived in disassembled condition and were put together at the Station. In the same year H. K. Porter Company built locomotive #6 for the Naval Station. No evidence has been found that there was a locomotive #7 at the Naval Station. Locomotive #8 was built by Vulcan Iron Works and was instated at Pearl Harbor in 1918.<sup>147</sup>

Another development of the 1910s was the Metal and Lumber Storehouse. The structure was perpendicular to Second Street. Like many of the industrial buildings in the Yard area, the Metal and Lumber Storehouse was connected to the permanent railway of the Station. **Figure 31** is a March 1916 photograph of this structure. The photograph is worthy of note because at the center a finished bed for the railway that would soon be installed can be seen. Indeed, ongoing "yard railroad improvement" at the Naval Station is referenced in the 1916 report of the Bureau of Yards and Docks.<sup>148</sup> This photograph provides an indication of how deep the

<sup>146</sup> Livingston, *Oahu's Narrow-Gauge Navy Rail*, 23.

<sup>147</sup> Livingston, *Oahu's Narrow-Gauge Navy Rail*, 26.

<sup>148</sup> Bureau of Yards and Docks, "Public Works of the Navy" (Government Printing Office, 1916).





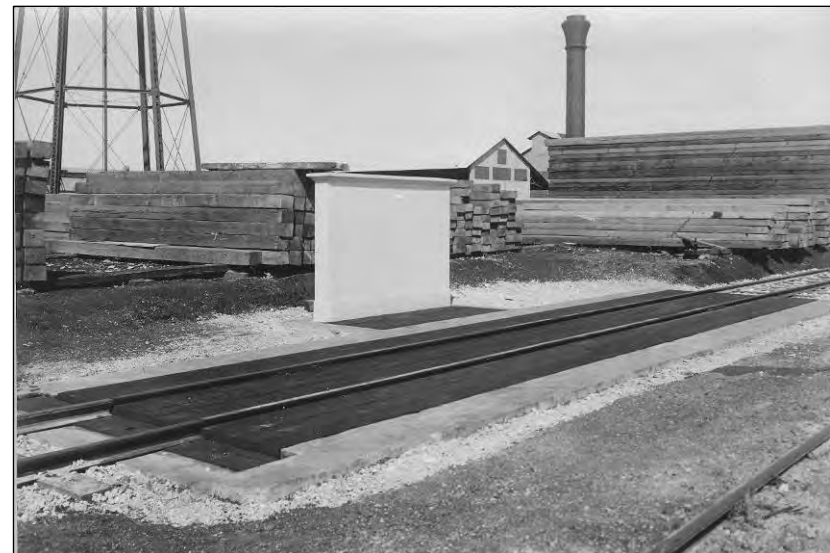
**Figure 31.** Preparation of railroad bed into Fac. 15, Metal and Lumber Storehouse, March 1916, view looking northwest. Record Group 71, NARA.

permanent railway bed was at the Yard in this era; it appears to be several feet deep, based on other surrounding features. The caption indicates that this railroad track was developed by the labor force of the Yard as opposed to a private contractor.

A railroad track scale was installed near Avenue D in 1915. Photographs from 1915 show its construction and completion. This vital equipment weighed material in transport to and from the Yard. **Figure 32** is a 1915 photograph of the pit under excavation for the scale. Alongside the scale to the right is a set of temporary tracks with dump cars on them. **Figure 33** is the completed scale with pavement over the top of it.



**Figure 32.** Construction of the railroad track scale located along Avenue D (what is today Paul Hamilton Avenue), April 1915. Record Group 71, NARA.



**Figure 33.** Completed railroad track scale, August 1915. Record Group 71, National Archives and Records Administration.



Beginning in 1912, the Navy developed a Coaling Plant at Pearl Harbor. The initial purpose of the Coaling Plant was to provide fuel to naval warships and vessels. A special naval appropriation for “Depots for Coal” sponsored the project. A November 1912 Honolulu newspaper article noted that the work on the plant was being performed by federal government labor.<sup>149</sup> When completed, the Coaling Plant was an impressive engineering feat that could store 200,000 tons of coal and deliver coal to ships via rail.<sup>150</sup> Navy photographers extensively documented the construction work and initial operations of the Plant. Unlike the rest of the Naval Station and the island of O’ahu in general, the Coaling Plant featured standard gauge tracks. Six 15-ton locomotive cranes of the Brown Hoisting Machinery Company operated on the structure. The cranes, which arrived circa 1913, had grab buckets and track clamps for moving coal.<sup>151</sup> In addition to the cranes there were three new locomotives (#3, #4, and #5, all model 0-4-OT) that operated on the wharf. Vulcan Iron Works constructed these three locomotives. Coal was hauled in 15 dump cars of 20-yard capacity that featured air-powered pneumatics that lifted the cars on one side to dispense coal. The dump cars were built by the William J. Oliver Manufacturing Company. The Coaling Plant was entirely contained within the Naval Station and was completed in 1918.<sup>152</sup>

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<sup>149</sup> “Pearl Harbor Job Is Now Close to \$15,000,000,” 4.

<sup>150</sup> Bureau of Yards and Docks, “Public Works of the Navy,” 32.

<sup>151</sup> Livingston, *Oahu’s Narrow-Gauge Navy Rail*, 20.

<sup>152</sup> Livingston, *Oahu’s Narrow-Gauge Navy Rail*, 20.

The Coaling Plant essentially was a large basin with elevated rails atop it. The basin bordered the harbor. Inside the basin, a large stockpile of coal was kept. The basin permitted seawater to partially flood it as a means of reducing coal dust, preserving the coal itself, and preventing fire. The basic operation consisted of the locomotive cranes on one track and the dump cars (pulled by the standard locomotives) on a parallel track. The cranes would lift the coal from the stockpile in the basin below and place the coal into the dump cars. The standard locomotive then pulled the dump cars to the edge of the harbor where ships awaited coal. The dump cars, using their pneumatic lifts, then dumped the coal down into the ships.<sup>153</sup>

Another major project of this period, commenced in 1917, was the development of an underground Fuel Reservoir. The Fuel Reservoir area was located between the Navy Yard and the Coaling Plant. As usual, a temporary narrow-gauge railway was established to the site area. The temporary railway was involved in carrying excavated rock away from the site and bringing in material for concrete. **Figure 34** is a photograph of the work underway in April 1919 and illustrates the use of a rail-mounted concrete mixer, dump cars, and double trackage. The excavated material was sent from the temporary rails to the main line of the Station, ultimately reaching other areas of the Station where fill was needed to stabilize the waterfront and create land area. Thus, the railway was centrally involved in the creation of the physical

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<sup>153</sup> Livingston, *Oahu’s Narrow-Gauge Navy Rail*, 36-37.



Figure 34. A flatcar of concrete supplies a concrete mixer (also atop a flatcar) for Fuel Oil tank construction, 30 April 1919. Hawaiian Railway Society Collection.

layout at Merry Point, the Submarine Base, and other areas of the Station.<sup>154</sup>

The excavation of a water reservoir also was a development of the late 1910s. **Figure 35** is a July 1918 photograph of the excavation underway with the assistance of a locomotive crane on temporary trackage. Barely visible in front of the crane and on a separate track is one of the Station locomotives. An example of temporary trackage employed in a unique task is presented in **Figure 36**. Two temporary tracks were laid outward from the Boat Storehouse and two Station flatcars were employed to transport the 65-foot Tug 90 down to a barge in the Dry Dock.



Figure 35. Locomotive crane involved in excavation of a water reservoir, north of Fac. 1, 3 July 1918. Hawaiian Railway Society Collection.



Figure 36. Transporting Tug 90 from Fac. 12, Boat Storehouse to Dry Dock No. 1 with the assistance of two flatcars, 13 December 1912. Hawaiian Railway Society Collection.

<sup>154</sup> Livingston, *Oahu's Narrow-Gauge Navy Rail*, 35.

The Navy Yard's capacity to maintain and supply ships expanded in the late 1910s with the development of the Torpedo Boat Pier area. This area was to the north of the original Dry Dock. Extensive dredging was required to shore-up the area and create the berths in which the torpedo boats would dock. As in so many construction projects at the Naval Station at the time, the railway hauled fill into the area over temporary tracks and, finally, connected the Torpedo Boat Piers to the main part of the Yard via permanent trackage. **Figure 37** is a July 5, 1918, photograph of the new permanent railroad line into the Torpedo Boat Piers area. The Yard labor crew at center is taking rails off a small flatcar and connecting them to the crossties. **Figure 38** is a photograph of the permanent railroad nearing completion at the Torpedo Boat Pier 3, the easternmost of the Torpedo Boat Piers.

The Navy designated Kūāhā Island, roughly north of the Navy Yard, as an ammunition storage area in the 1910s. Construction of this installation commenced in 1911. For many years, the island had an internal, narrow-gauge railway system that was confined to the island. Later, in the 1930s, the Navy constructed a railroad causeway from the island to the mainland.<sup>155</sup> The Kūāhā railway system received its first locomotive in 1914 and was completed by the following year.<sup>156</sup> The close proximity of ammunition stores precluded the use of a steam locomotive at Kūāhā for safety reasons.

<sup>155</sup> Livingston, "Navy Narrow Gauge at Pearl Harbor."

<sup>156</sup> Bureau of Yards and Docks, Annual Report of the Chief of the Bureau of Yards and Docks to the Secretary of the Navy for the Fiscal Year 1915 (Washington DC: Government Printing Office, 1915).



**Figure 37.** Yard laborers completing railroad work toward the Torpedo Boat Piers. View looking northeast, 5 July 1918. Record Group 71, National Archives and Records Administration.



**Figure 38.** Railroad track turnout at Torpedo Boat Pier No. 3, 6 August 1918. Record Group 71, National Archives and Records Administration.

Therefore, the Navy purchased a compressed air locomotive.<sup>157</sup>

The Navy also developed the Submarine Base north of the Navy Yard in the late 1910s. Construction of the Submarine Base commenced in 1918 and was completed in 1919.<sup>158</sup> Among the submarine repair facilities and support structures was a railway system.<sup>159</sup> The Submarine Base, as well as the trackage on Kūāhūa, connected to the Navy Yard at this time via the main line of the Oahu Railway, which skirted the border of both the Submarine Base and Kūāhūa.

By the time of World War I (1917–1919), the Naval Station was well developed. Occasionally the Navy expanded, relocated, or removed the permanent railway system in certain areas. Evidence of these transitions is available in photographs and maps. A June 6, 1918, photograph (**Figure 39**), for example, shows a gang of laborers relocating the trackage near Building 9 (also known in this period as Building 9A), a Storehouse. The original tracks had been laid very close to the structure and, perhaps as a safety measure, the crew was moving them further away (northward).

A June 1919 map of the Navy Yard depicts the inseparable relationship of the Yard railway and the industrial operations

<sup>157</sup> Kūāhūa is outside of the present Pearl Harbor Naval Shipyard & Intermediate Maintenance Facility boundaries. Livingston, *Oahu's Narrow-Gauge Navy Rail*, 9.

<sup>158</sup> The Submarine Base is outside of the present Pearl Harbor Naval Shipyard & Intermediate Maintenance Facility boundaries. Livingston, *Oahu's Narrow-Gauge Navy Rail*, 7–8.

<sup>159</sup> Livingston, "Navy Narrow Gauge at Pearl Harbor."



**Figure 39.** Relocation of trackage along Building 9A (a Storehouse), 6 June 1918. View facing southwest. Record Group 71, National Archives and Records Administration.

of the Yard (**Figure 40**).<sup>160</sup> The map also displays the growth of the Yard rail system since 1912. Whereas in 1912, the Yard railway system served mainly the industrial area adjacent to the Dry Dock, in 1919 it reached as far as the Coaling Plant area and the Torpedo Boat Piers area. Nearly every major structure in 1919 had an adjacent railway connection and some structures had trackage through their interiors. The spur from the Oahu Railway entered the Navy Yard at South Avenue and North Road (as in 1912). After paralleling South Avenue westward for a short distance, the tracks paralleled

<sup>160</sup> Bureau of Yards and Docks, US Naval Station Pearl Harbor T.H. Map of Yard, map 1400-3-54. Record Group 71: Bureau of Yards and Docks (National Archives and Records Administration, College Park, Maryland, 30 June 1919).



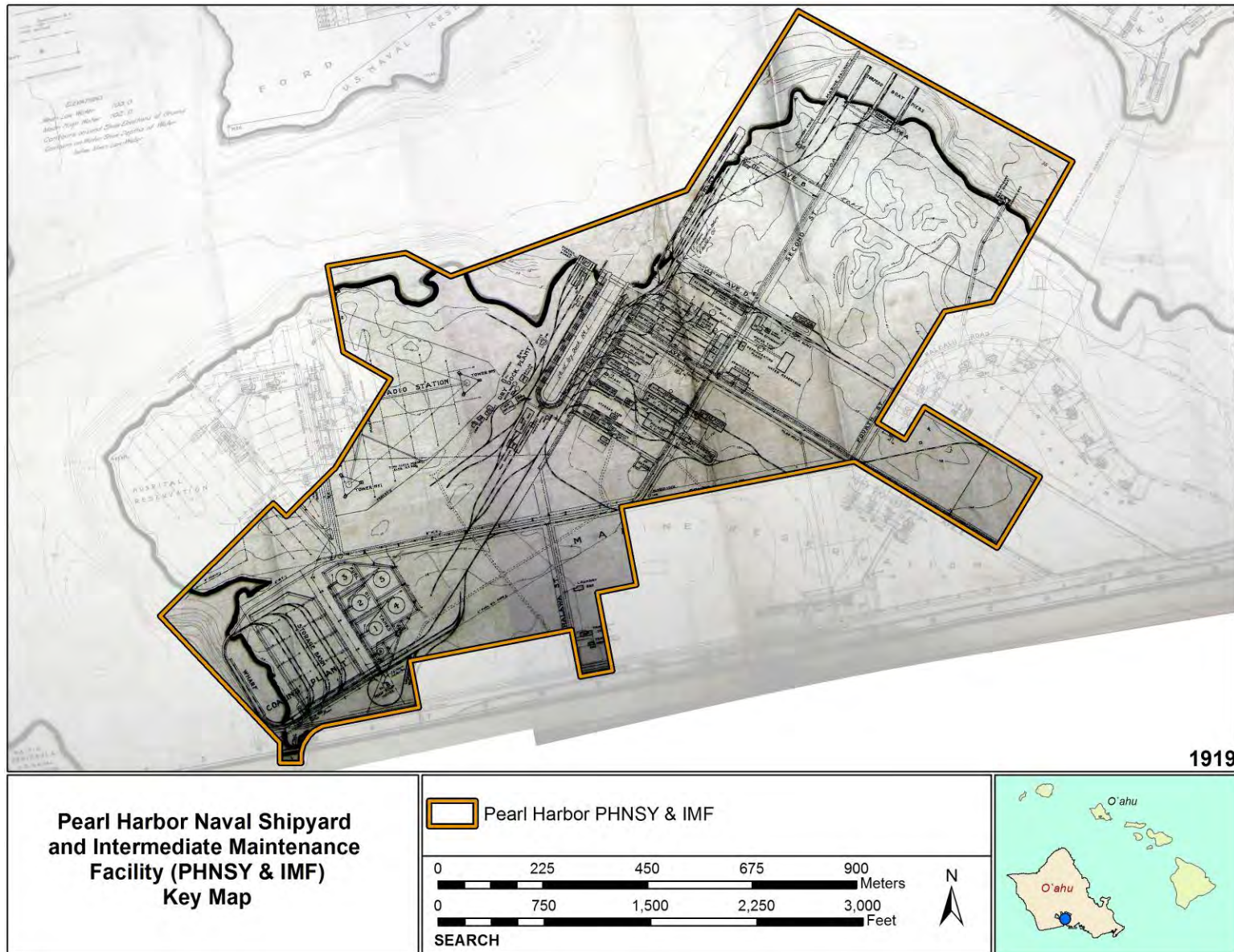


Figure 40. 1919 map illustrating the permanent railway system of the Navy Yard.

Avenue D in a northwestward direction towards the industrial waterfront/Dry Dock area of the Yard. A spur turned westward to parallel Central Avenue towards the western area of the Yard. Also along the Central Avenue spur, there were additional spurs that turned northwestward towards the industrial waterfront/Dry Dock area, thereby creating multiple points of access to the busiest area of the Yard and the area with the highest concentration of structures. **Figure 41** provides an illustration of the railroad trackage along First Street.

The permanent railway system in the industrial/Dry Dock area as depicted in 1919 was much more extensive than in 1912. While there had been no remarkable increase in structures, the rail system in 1919 provided existing structures with better access to the Dry Dock. Also, rails had been laid through the center of most of the structures. In general, the



**Figure 41. General view of First Street (now called Lake Erie Street) showing railroad tracks, with Fac. 5 in the foreground. 28 June 1919. Record Group 71, NARA.**

1919 track locations in and around the buildings of the industrial area are so different from 1912 that they essentially represent a new layout. Also by 1919, rails had been laid parallel to First Street, and the Dry Dock has triple trackage around its land edges for the Yard locomotives as well as a portal crane. To the southwest of the Dry Dock and to the north of it was a Dry Dock Plant area (including a large Cement Plant building) that was associated with the completion of the Dock. This area has its own small network of rails.

The 1919 map depicts railway connections in the recently-developed 10-10 Destroyer Wharf and Torpedo Boat Piers area. Moving northeast from the Dry Dock, the Yard railway traveled past the 10-10 Destroyer Wharf and into the Torpedo Boat Piers area. The 10-10 Destroyer Wharf was under construction at the time and intended to permit two rows of destroyer warships.<sup>161</sup> The shore along the Wharf had several spurs that connected it to the rail trackage out from First Street. Continuing northeastward from the Destroyer Wharf and crossing Avenue B, a single rail line entered the Torpedo Boat Pier area which consisted of three piers and a Marine Railway. Each of the three piers and the Marine Railway had its own spur line.<sup>162</sup>

Railroad trackage in the Coaling Plant and Fuel Oil Tank areas also is depicted in the 1919 map. These developments, located in the southwestern area of the Yard, had trackage that fed from the line extending from First Street and Central

<sup>161</sup> Livingston, *Oahu's Narrow-Gauge Navy Rail*, 34.

<sup>162</sup> Bureau of Yards and Docks, US Naval Station Pearl Harbor T.H. Map of Yard, map 1400-3-54, 1919.

Avenue. The lines in this area ran on the southern side of the five Fuel Oil Tanks and the Coaling Plant. The trackage in this area was triple-tracked. The narrow gauge rails of the Yard essentially ended in the Coaling Plant area because the Coaling Plant trackage itself was of standard gauge. It should be noted that a second railway entry to the Navy Yard was opened by 1919. This second entry was located to the south of the Fuel Oil Tanks and was guarded by a Sentry.<sup>163</sup> The railway line that passed through this second entry went southward to Watertown, where many of the Dry Dock laborers lived, and crossed South Avenue, the road the bordered the boundary of the Navy Station. A 1916 photograph (**Figure 42**) taken near South Avenue indicates that this railway line originally was



**Figure 42.** The railroad spur to Watertown that lead out of the Navy Yard's southwestern gate, August 1916. Photo taken near where the railroad crossed South Avenue. Record Group 71, National Archives and Records Administration.

<sup>163</sup> Bureau of Yards and Docks, US Naval Station Pearl Harbor, 1919.

temporary trackage. It appears the men in the photograph are preparing for a new set of tracks, believed to be the permanent trackage seen in the 1919 map.

#### **D. The Navy Yard Railway in the Interwar Period, 1919-1941**

In the 1919 through 1941 period, the Navy finally completed the first Dry Dock at Pearl Harbor and undertook new expansions at the Navy Yard that made the installation one of the most important in the United States. The Yard railway continued to provide notable service and expanded in this period. The railway system's codependency on the Oahu Railway also continued although the Navy restricted the Oahu Railway's access to the Yard. In the mid-to-late 1930s, the Navy began construction on new Dry Docks and other facilities in response to Japan's aggressive actions in the Pacific. Through this time of uncertainty and preparation, the Navy Yard railway proved its worth.

For many years, the Navy Yard was in a state of constant construction. By 1919, the Yard appeared well in order. **Figure 43** is a photograph of the Navy Yard that was taken in early August 1919 from atop one of the three radio towers at the Naval Station. The unidentified photographer was roughly facing east. The photograph shows the majority of the Navy Yard. Not visible is the Coaling Plant area and the Fuel Oil Tank area, both of which would have been to the rear of the photographer. At center is the main industrial area of the Navy Yard where shops, lumber storehouses, boathouses, a water tower, administrative structures, and other corollary



**Figure 43. Overview of Pearl Harbor, 18 August 1919. Photographer facing east. Record Group 71, National Archives and Records Administration.**

structures were located. This industrial area fronted the Dry Dock which was nearing completion at the time of the photo. To the northeast of the industrial buildings and across a wooded area are the Torpedo Boat Piers, identified by a large overhead crane. Though faintly visible in this photograph, the Navy Yard railway passed through or adjacent to every major structure in the photograph. Its tracks bordered the Dry Dock and also extended to the Coaling Plant and Fuel Oil Tank area. To the south (and just out of site of the photographer), the Yard railway connected with the main line of the Oahu Railway which provided the Yard a rail connection to other points on O'ahu.

At the time of the initial development of the Navy Yard, the Oahu Railway and Land Company trains were permitted access to the Yard. The purpose of their access was to deliver goods and contractors associated with the development of the Yard. However, by about 1920, the Navy determined the Company's open access to the waterfront area of the Yard should be revoked, and the Company was barred from the waterfront area. As the transportation services of the Company remained necessary, the Navy constructed an 18-car spur line adjacent to the Yard about 5.6 miles from Honolulu. To this location, the Company could haul cars destined for the Yard. Yard locomotives came to pick up the cars to distribute them to the Naval Station.<sup>164</sup>

One of the most important developments of the late 1910s was the completion of the Dry Dock. In August 1919, Dry Dock 1, as it was known, finally became fully operational. Secretary of the Navy Josephus Daniels attended the dedication ceremony. Contemporary plans and photographs indicate that the rim of the Dry Dock (except for the entry gate side) had three parallel sets of tracks. These three sets of tracks are visible in **Figures 44** and **45**, both 1921 photographs that were taken as Yard laborers were pouring concrete around some of the tracks. In this photograph, the Dry Dock was to the left and the industrial buildings of the Navy Yard were at right. From the rails bordering the Dry Dock radiated trackage that connected with the industrial buildings, thereby allowing material to be provided directly to and from the Dry Dock.

<sup>164</sup> Bureau of Yards and Docks, US Naval Station Pearl Harbor, 1919.





**Figure 44.** A concrete mixer atop a flatcar assists in the paving of concrete and trackage around the Dry Dock, 20 January 1921. Hawaiian Railway Society.



**Figure 45.** The completed Dry Dock No. 1 with rail access, 9 February 1921, view looking north. Record group 71, NARA.

**Figure 46** is an example of how railroad trackage was laid inside structures. The structure in this 1921 photograph is the General Storehouse that was located along Avenue D. As can be seen in the photograph, the rails were laid down the center of the structure and entered through large bay openings.

Concrete was poured around the rails. The 1922-1923 construction of Building 68, yet another Storehouse, also involved railroad assistance as is visible in **Figures 47** and **48**. In the same period, locomotive cranes excavated foundation for a new Machine Shop (Building 67) (**Figure 49**).

Aviation was a growing interest of the Navy in the 1910s and 1920s. In December 1919, the Navy established a small Naval Air Station at the Navy Yard. The site was located on the east end of the Yard and adjacent to the Torpedo Boat Piers. The Naval Air Station began with a small detachment of nine



**Figure 46.** Railroad trackage inside Fac. 64, General Storehouse, which was located parallel to Avenue D, 4 April 1921. Record Group 71, NARA.



Figure 47. Railroad involvement in site preparation for the construction of a storehouse (Building 68), 24 May 1922. Record Group 71, National Archives and Records Administration.



Figure 48. Railroad trackage involved in the construction of a new storehouse (Building 68), 10 January 1923. Record Group 71, National Archives and Records Administration.

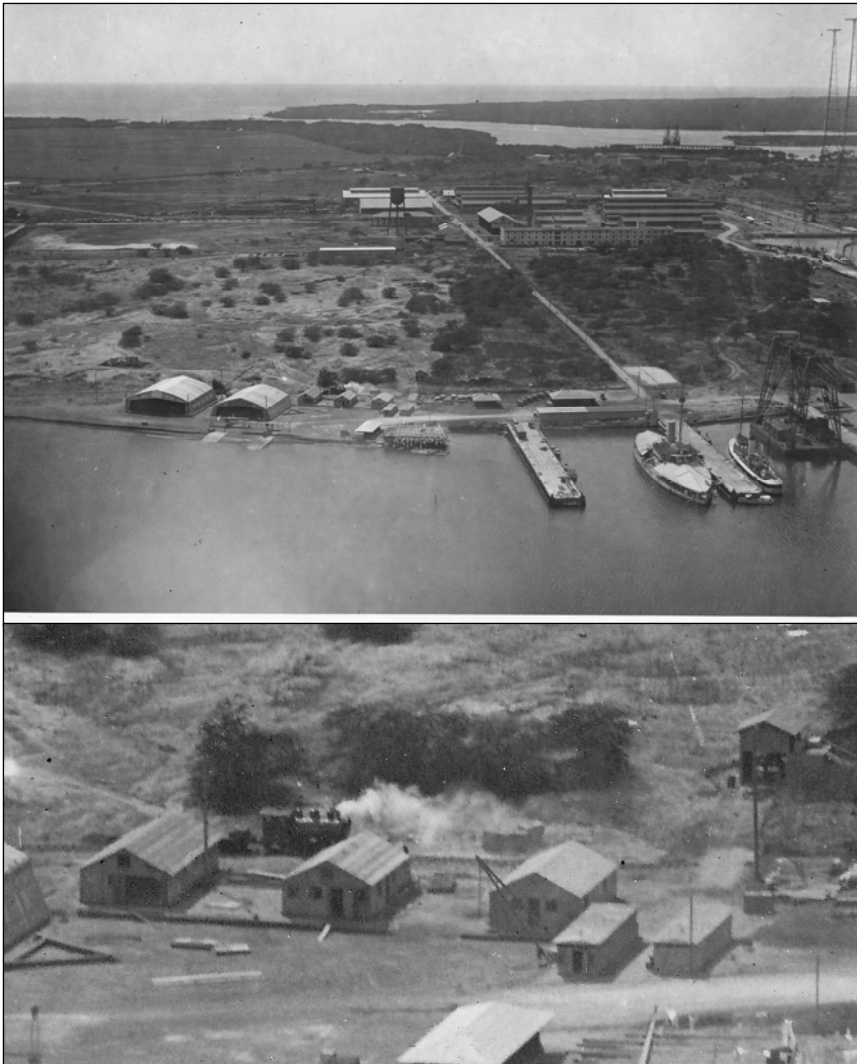


Figure 49. Locomotive cranes employed in the excavation of the foundation for Machine Shop (Building 67), 4 October 1921. Records Group 71, National Archives and Records Administration.

officers and 55 men. Their aircraft consisted of two HS2L flying boats and two N-9 float-type planes. By 1920, the resident unit, which was known as the Pacific Air Detachment, had two large hangars and several supporting structures. Within several years, however, the Bureau of Aeronautics relocated the Naval Air Station to Ford Island. The date of the move was January 17, 1923.<sup>165</sup> The main reason for the move was to accommodate the construction of a large ship Repair Basin at the Naval Air Station site.

The Naval Air Station, like other facilities throughout the Navy Yard, also had direct railway service via the internal Yard railway system. **Figure 50** is a photograph of the Naval Air Station from 1920. In the photograph, two large hangars can

<sup>165</sup> W.L. Peterson, "History of Naval Air Station Pearl Harbor," 1945.



**Figure 50. Overview (top) and inset (bottom) showing the railroad line near the Naval Air Station Pearl Harbor, 29 October 1920. Record Group 71, National Archives and Records Administration.**

be seen as well as smaller supporting (unidentified) buildings to the right. Just behind these smaller buildings, a smoke-belching locomotive and railway trackage are visible. Although no documentation has been found, this trackage likely hauled in the material to construct the buildings and supported any freight needs of the Naval Air Station during its short existence at the site (1919–1923).

An updated map of the Navy Yard dated 30 June 1926 helps illustrate the internal railway at this date (**Figure 51**).<sup>166</sup> The railway system layout is consistent with the 1919 map, in general. The industrial waterfront/Dry Dock area features generally the same layout in 1926 as in 1919. One notable difference by 1926 was the removal of trackage in the Dry Dock Plant area and the Cement Plant site as seen in 1919. Also, there appear to be fewer rails along the shore of the 10-10-Destroyer Wharf which is to the northeast of the industrial area. Perpendicular to the wharf, a large Machine Shop had been developed since 1919 and it, too, had internal rails. The Torpedo Boat Piers area was identical to 1919. A new area of development since 1926 that featured rails was two large Storehouses at the east end of Fourth Street. Their rails connected with the Avenue D trackage. Also, to the north of where Avenue D intersected with Fourth Street were three new Storehouses that had spurs. The Fuel Tank area also had

<sup>166</sup> The map is damaged and therefore the Coaling Plant portion of the map is not available. Bureau of Yards and Docks, Map of the Yard and Adjacent Units Showing, map 1400-17-19. Record Group 71: Records of the Bureau of Yards and Docks (National Archives and Records Administration, College Park, Maryland, 30 June 1926).





more than doubled in extent; however, this apparently did not entail any new railway infrastructure.<sup>167</sup>

A 1927 data book about Navy infrastructure described that the narrow-gauge trackage at Pearl Harbor was 10.5 miles in length while the standard gauge trackage (i.e. the trackage at the Coaling Plant) was 2.5 miles. The Station also had two railroad scales (completed back in 1915) with a capacity of 100,000 pounds. The rolling stock of the Station consisted of eight locomotives, 17 flatcars, 21 industrial cars, nine boxcars, and 27 dump cars.<sup>168</sup> **Figure 52** provides an overhead view of Dry Dock 1. At left, railroad trackage is visible along First Street.

The railway system was involved in multitude of projects at the Navy Yard in the 1920s as is evidenced in historical photographs. Locomotive cranes were crucial to roadwork in the period, as seen in **Figure 53**, which is a 1927 photo of repaving work along Avenue E, and **Figure 54**, which is a 1928 photograph of coral being removed at an unknown location. The coral was going to be used for repairs to North Road. The crane is filling a dump truck and also hydraulic cars on trackage. **Figures 55** and **56** demonstrate how permanent railroad tracks were excavated and filled with coral rock ballast with the use of a locomotive crane on parallel temporary trackage. **Figures 57** and **58** depict Yard laborers replacing railway trackage near South Avenue and West Gate, respectively. Ten years later, the crossties in this same



**Figure 52.** Dry Dock at Pearl Harbor, 7 October 1924. Record Group 71, National Archives and Records Administration.

<sup>167</sup> Bureau of Yards and Docks, Map of the Yard, 1926.

<sup>168</sup> Bureau of Yards and Docks, *Public Works of the Navy Data Book*, 1927.



Figure 53. A locomotive crane assisting in the repaving of Avenue E and the driveway to the Administration Building, 4 April 1927. Hawaiian Railway Society Collection.



Figure 54. A locomotive crane removes and loads fill from a coral pit for repairs to North Road. 27 April 1928. Hawaiian Railway Society.



Figure 55. A locomotive crane assists in the excavation of foundation for new trackage. View taken from Second Street looking west, 3 May 1928. Hawaiian Railway Society Collection.



Figure 56. Ballast work on nearly completed trackage. View taken from Second Street looking west, 2 June 1928. Record Group 71, National Archives and Records Administration.



Figure 57. Replacement of railway track, 20 September 1928. View looking northeast from South Avenue. Hawaiian Railway Society.



Figure 58. Navy Yard laborers work to replace 1,216 feet of track leading to the West Gate. View looking southwest. Record Group 71, National Archives and Records Administration.

location were replaced (Figure 59). There seemed to be scarcely a heavy-lifting job that the railway could not handle; one such example was in 1928, when the construction of a new Diesel Oil Purification Plant required several 8,000 gallon tanks to be moved. In this particular case, the Navy used Oahu Railway flatcars (Figure 60).

In the early years of the Navy Yard, there was no central shop for the railroad equipment and repairs were completed in the open air. By the 1930s, a Transportation Shop devoted to the railway had been completed. The Transportation Shop “was in charge of all the transportation needs, including maintenance of all the locomotives, cranes, the travelling cranes, all the trucks—things of that sort—that were used at Pearl Harbor,” remembered Herbert Y. S. Foo, who worked at the Navy Yard in the 1930s and 1940s. Attached to the shop



Figure 59. New railroad tie installation along the spur track that lead to the Mixing Plant, 1 August 1938. Record Group 71, National Archives and Records Administration.



**Figure 60. The Oahu Land and Railway Company flatcars transporting 8,000-gallon tanks for a new Diesel Oil Purification Plant at Pearl Harbor. 4 May 1928. Hawaiian Railway Society Collection.**

were personnel who held deep knowledge about locomotives and railway equipment. At the time, the master of the shop was E. Miller. Foo recalled the following about Miller: “He was a *hapa haole* [half Hawaiian and half Caucasian], a gentleman who was really respected in the whole yard for his knowledge of heavy equipment.”<sup>169</sup>

By the early 1930s, the Navy had come to view the magazine at Kūāhua Island as dangerously close to vessel traffic. Therefore, the Navy developed a new facility 30 miles away in the Lualualei Valley. The facility was dubbed Naval Ammunition Depot (NAD) (**Appendix A, Map 2**) Oahu but

<sup>169</sup> Lawrence Reginald Rodriggs, *We Remember Pearl Harbor: Honolulu Civilians Recall the War Years, 1941-1945* (Communications Concepts, 1991), 143.

known informally as Lualualei.<sup>170</sup> Kūāhua was not abandoned, however. In the mid-1930s, the Navy created a causeway from the mainland to Kūāhua, thereby creating a land connection where one had not existed prior.<sup>171</sup> Atop this causeway was a Navy-owned and Navy-developed narrow gauge track that connected with the main line of the Oahu Railway.<sup>172</sup>

The Navy established the NAD Lualualei in 1934 and used this site to store ammunition, bombs, and related war materiel. The Oahu Railway and Land Company’s main line (narrow gauge) connected Lualualei to Pearl Harbor, a distance of 30 miles. An OR&L Company spur served West Loch.<sup>173</sup>

The Navy Yard’s relationship with the Oahu Railway since the early days had been codependent. The Navy relied on the main line of the Oahu Railway to connect it with Honolulu and Navy installations on O’ahu while the Railway profited from allowing the use of its rails. It appears that in the 1930s, the Navy and the Oahu Railway did business together in even more ways. In April 1930, to cite an example, the Navy released a bid to overhaul and recondition several of its boxcars and flatcars. Within several days, the Navy had reviewed the responses and accepted the lowest bid which came from the Oahu Railway and Land Company.<sup>174</sup> Thus, the

<sup>170</sup> Livingston, “Navy Narrow Gauge at Pearl Harbor.”

<sup>171</sup> Lyndall Landauer and Don Landauer, *Pearl: The History of the United States Navy in Pearl Harbor* (Lake Tahoe: Flying Cloud Press, 1999), 261.

<sup>172</sup> Livingston, *Oahu’s Narrow-Gauge Navy Rail*.

<sup>173</sup> Jim Chiddix and MacKinnon Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971* (Honolulu: Sugar Cane Press, 2004), 270.

<sup>174</sup> Memo from Supply Officer to District Public Works Officer regarding overhaul and recondition of railroad flat and box cars by the Oahu Railway



Railway appears to have been a valuable resource for the Navy, not only for transportation corridors, but also for expertise in maintaining rolling stock.

In the late 1920s, automobile usage was commonplace on O'ahu and at the Navy Yard. A 1927 inventory of motor vehicles attached to the Navy Yard estimated around 60 automobiles. This same number was counted in 1938. In this same period, many Navy Yard workers began to carpool to the Yard rather than ride the train to the Yard station.<sup>175</sup> Nevertheless, the rising use of automobiles (and in particular trucks that could haul heavy loads) did not diminish the importance of the railway. In fact, between 1927 and 1938, the length of narrow gauge railway trackage increased. Whereas in 1927 the length of narrow gauge tracks was 10.5 miles,<sup>176</sup> the length increased by 1938 to 14.5 miles.<sup>177</sup> Other railroad infrastructure the Navy Yard held in 1938 were two railroad scales (inventoried in 1927), seven locomotives, 15 flatcars, 15 box cars, two tank cars, one hose car, and one oil tank car. The Navy Yard also held a battery-charging plant car that was used at the Submarine base.<sup>178</sup> At times, rolling stock belonging to other entities appeared in the Yard, as is evident

in a 1923 photograph that shows a Union Oil Company tank car at the Yard (**Figure 61**).

The unsettling geopolitical atmosphere of the 1930s led to increased defense preparations across the United States. As the doorway to the Pacific, Pearl Harbor was a special focus of improvements. These improvements included an expansion of the railway system at the base. Standard gauge locomotive cranes were ordered from the Ohio Locomotive Crane Company. Narrow gauge locomotive cranes were ordered from the Orton Crane and Shovel Company. At the Navy Yard and the Submarine Base railroad trackage was built to the point that nearly all piers and repair basins had railways. New railway development in this period abandoned the prior



**Figure 61.** Union Oil Company tank car in use at Pearl Harbor, 3 March 1923. Record Group 71, National Archives and Records Administration.

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and Land Company. Record Group 181: : Records of Naval Districts and Shore Establishments: 14th Naval District Commandant: General Correspondence, 1925-1942. Box 735. (National Archives and Records Administration, San Bruno, April 27, 1933).

<sup>175</sup> Rodriggs, *We Remember Pearl Harbor*, 43-45.

<sup>176</sup> Bureau of Yards and Docks, *Public Works of the Navy Data Book, 1927*.

<sup>177</sup> Bureau of Yards and Docks, *Public Works of the Navy Data Book, 1938* (Washington DC: Government Printing Office, 1938).

<sup>178</sup> Bureau of Yards and Docks, *Public Works of the Navy Data Book, 1938*.

restriction to narrow gauge, and thus the new development at many of the piers included standard dual-gauge trackage.<sup>179</sup>

Beginning in the fall of 1939, the Navy Yard entered a period of extensive and sustained construction as the US military embarked on a nationwide defense construction program. This period of expansion and growth, which continued through World War II, impacted the internal Navy Yard railway considerably, because the railway was integral to moving heavy loads within the Navy Yard, as well as shipping loads out and bringing loads into the Yard. The Navy commenced work on new Dry Docks, power plants, shops, storehouses, piers, wharves, barracks, office buildings, various utilities, and other projects that strengthened the Yard in a time of great concern. Much of this work was completed by the time of the Japanese attack on Pearl Harbor in December 1941. Navy contractors, rather than the Construction Battalions (also known as the Seabees), completed the majority of this work.<sup>180</sup>

On December 22, 1939, naval appropriations allotted seven million dollars to build two new Dry Docks at the Navy Yard. Located directly northwest of the first Dry Dock, the new docks came to be known as Dry Dock 2 and 3. Dry Dock 2 was to serve battleships and would measure 1,000 feet in length. Dry Dock 3 was to serve destroyers and submarines and would measure 497 feet in length. The Navy appropriated funding for

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<sup>179</sup> Rodriggs, *We Remember Pearl Harbor*, 43-45.

<sup>180</sup> United States, Department of the Navy, *Building the Navy's Bases in World War II: History of the Bureau of Yards and Docks and the Civil Engineer Corps, 1940-1946*, 2 vols. (Washington, DC: US Government Printing Office, 1947).

a fourth Dry Dock at the Navy Yard on October 4, 1941, and work began in November. This dock was to serve as a battleship Dry Dock and it was located in the southwestern area of the Yard near the Coaling Plant.<sup>181</sup> Historic maps indicate that the internal, narrow gauge railway of the Yard was extended to each of the new Dry Docks as construction proceeded.

Another project of this period that impacted the railway system of the Navy Yard was redevelopment at the Coaling Plant. This standard gauge structure which had supplied coal to Navy ships for many years was partially taken down between October 1941 and June 1942, as in indicated in historic Yard plans and photographs. **Figures 62** and **63** are October 1941 photographs of the Coaling Plant prior to its dismantling. The reason for this redevelopment appears to have been twofold. One reason was the adjacent construction of Dry Dock 4, which necessitated some of the land area encompassed by the Coaling Plant. By 1942, most of the trackage on the Coaling Plant had been removed, as well as the more than half of the structure itself; in the following year, a plan of the Navy Yard shows a cement storage structure related to Dry Dock 4 at the site of the Coaling Plant. A second reason was the general decline of coal-powered vessels in the fleet, a decline that had started in the 1920s.<sup>182</sup>

Historic plans (1934, 1938, and 1941) of the Navy Yard illustrate the evolution of trackage in this period. A 1934 map

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<sup>181</sup> United States, Department of the Navy, *Building the Navy's Bases*, 121-122.

<sup>182</sup> Livingston, "Navy Narrow Gauge at Pearl Harbor."



Figure 62. The Coaling Plant at Pearl Harbor, 13 October 1941. Record Group 10, Seabee Museum Archive.

(Appendix A, Map 3) of the Navy Yard illustrates that there were no substantial changes in the layout of trackage since 1926.<sup>183</sup> The most notable development at the Navy Yard since 1926 was the beginning of the development of the Repair Basin. The Repair Basin area is visible to the northeast of the industrial waterfront/Dry Dock area of the Yard and to the east of the Torpedo Boat Piers area. The 1938 map of the

<sup>183</sup> A portion of the map depicting the central area of the Navy Yard was damaged, therefore, complete information is not available for this area. Bureau of Yards and Docks, Pearl Harbor T.H., map 1400-3-86. Record Group 71: Records of the Bureau of Yards and Docks (National Archives and Records Administration, College Park, Maryland, June 30, 1934).



Figure 63. The Coaling Wharf at Pearl Harbor, 13 October 1941. View looking northwest. Record Group 10, Seabee Museum Archive.

yard depicts no substantial changes in the layout of trackage at the Navy Yard since 1934. One notable difference in the 1938 map (Figure 64) was the completion of the Repair Basin area and the development of a railway connection. The Repair Basin, similar to the Dry Dock, had a multi-track system around its rim, thereby allowing it a connection with all other rail areas of the Yard (except the standard gauge tracks at the Coaling Wharf).<sup>184</sup> A June 1941 map (Figure 65) indicates that the railway system was not substantially different in its layout

<sup>184</sup> Bureau of Yards and Docks, Pearl Harbor T.H., map 1400-3-97. Record Group 71: Records of the Bureau of Yards and Docks (National Archives and Records Administration, College Park, Maryland, June 30, 1938).



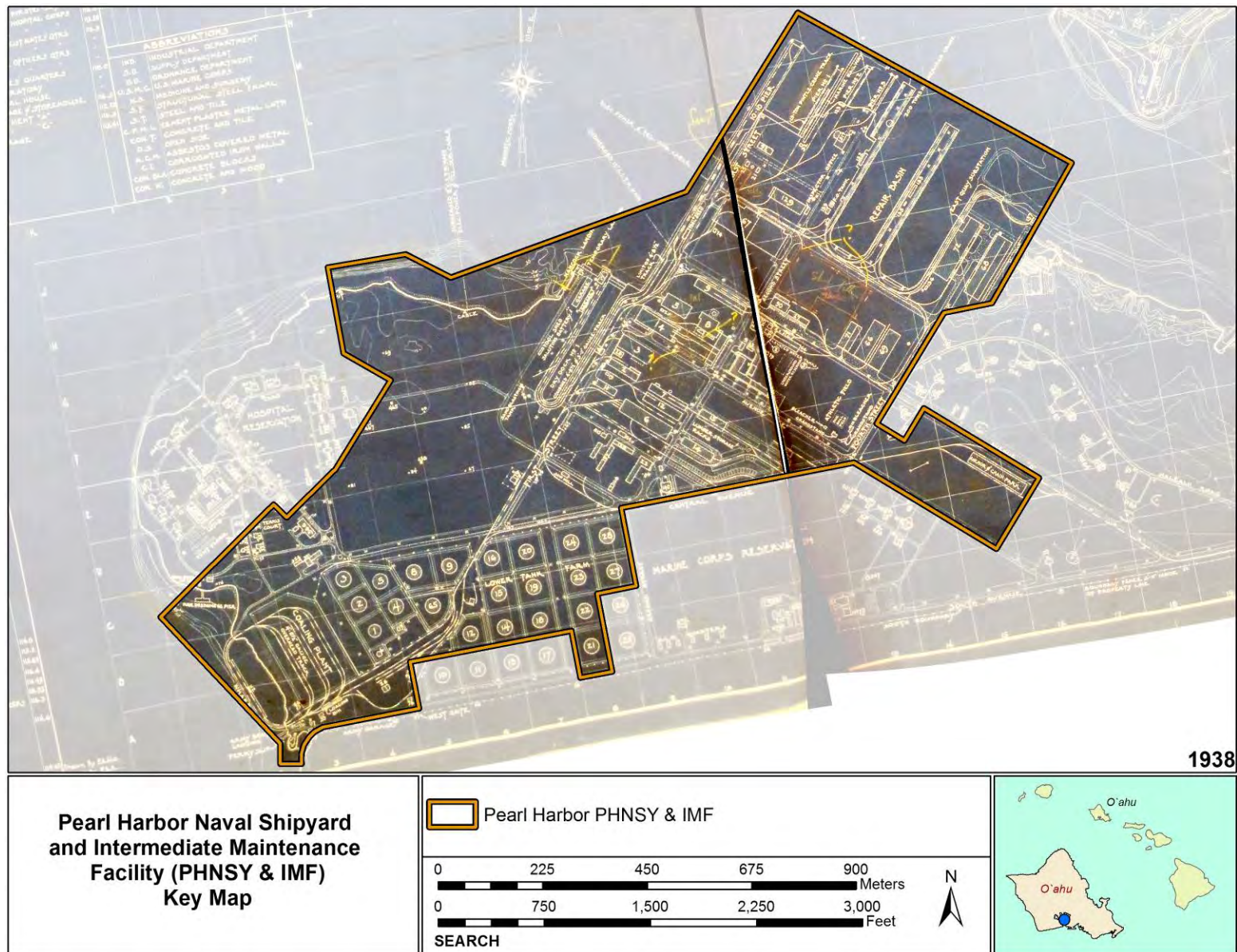


Figure 64. 1938 map illustrating the permanent railway system of the Navy Yard.



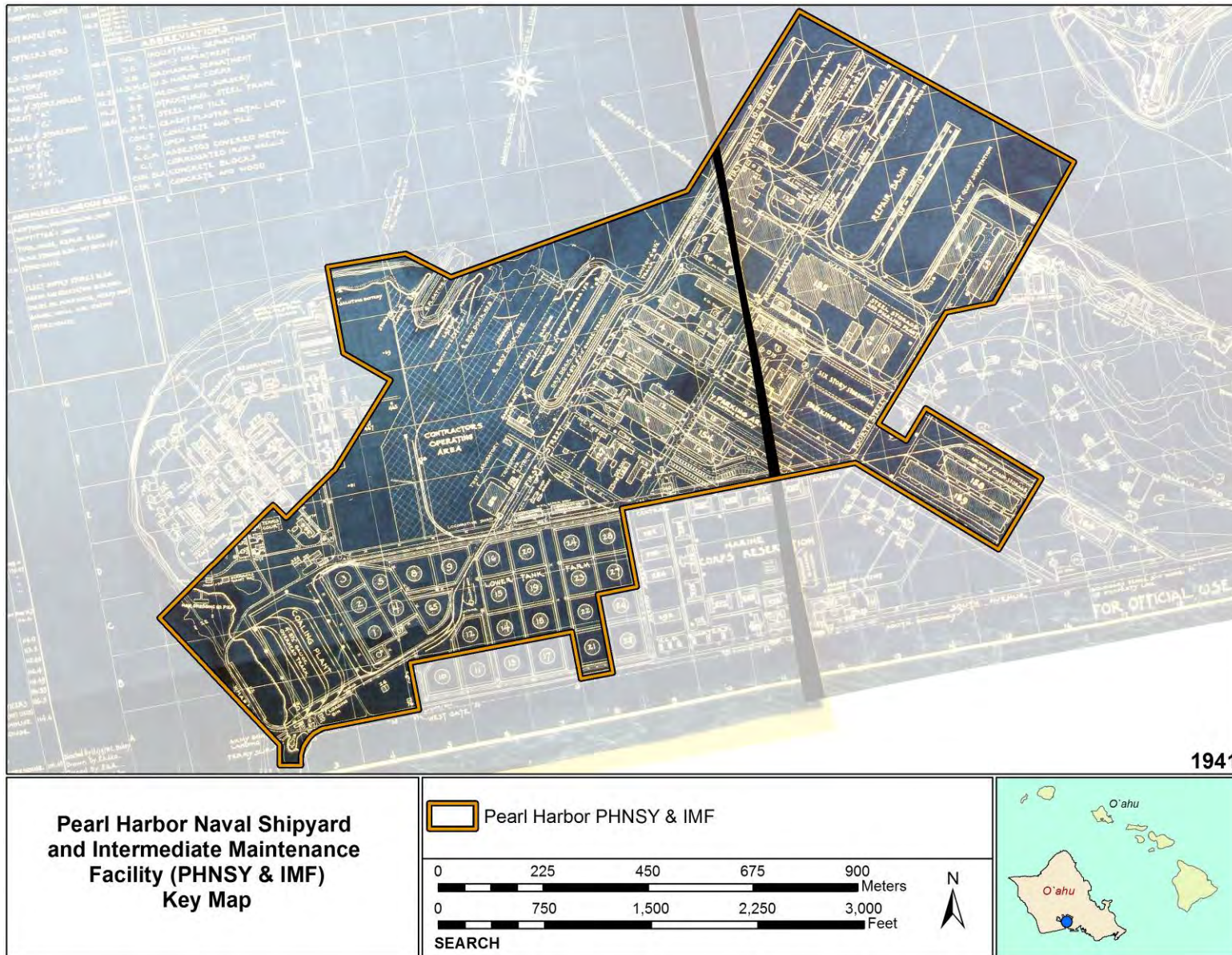


Figure 65. 1941 map illustrating the permanent railway system of the Navy Yard.

as compared to earlier years, even as the number of structures at the Yard increased and construction of new Dry Docks to the northwest of the original Dry Dock had begun.<sup>185</sup>

The increasing importance of Hawai'i to the Navy can be seen in the frequency of fleet exercises held in the islands in the 1920s, 1930s, and 1940s. The Navy held fleet exercises in 1920, 1925, 1928, 1932, 1933, 1936, 1937, and 1940. Finally, the Navy ordered the fleet to remain at Pearl Harbor after the 1940 maneuvers. Thus, in the course of about 40 years, the Navy Yard had become one of the most important Navy fleet installations in the western United States (**Figure 66**).



**Figure 66.** Navy Yard Pearl Harbor, 13 October 1941. View looking south. Record Group 10, Seabee Museum Archive.

## E. The Navy Yard Railway in World War II, 1941-1945

The Japanese attack on Pearl Harbor on December 7, 1941, thrust the United States into global war. O'ahu, where military preparations already were escalating, became the center of military operations in the Hawaiian Islands. Through the war years (1941–1945), transportation on O'ahu was overwhelmed as war materiel, soldiers, and civilians clogged the ports, roads, and railways of the island. The Shipyard reached an unforeseen level of activity. In this period, the importance of the Oahu Railway as a corridor for war supplies and manpower to the Shipyard was greater than ever. The Railway also was a crucial supplier of rolling stock to the Navy at a time when equipment was much needed. By the time peace came in 1945, the internal and external yard railways had proven their worth numerous times.

Although the Oahu Railway was not a specific target of the Japanese attackers on that December day, the railway at Pearl Harbor, by nature of its circuitous location throughout the Shipyard, certainly underwent damage. Ernest Pacheco worked at the Dry Dock at Pearl Harbor in the 1930s and 1940s. When the Japanese attacked, he ran for safety from the Dry Dock area, but the strafing bullets of the attackers followed him. "I ran to the round house building where they [kept] the locomotives. And that wasn't safe ... because there were other planes coming behind, machine gunning the round house." Whether the Japanese purposely targeted railroad

infrastructure has not been determined; however, it is clear that the Shipyard railway suffered.<sup>186</sup>

In the immediate aftermath of the attack, the internal Shipyard railway appears to have played an important role, though certain components may have been damaged. Herbery Y. S. Foo worked in the Transportation Department at the Shipyard at the time of the attack and had evacuated the yard on the day of the bombardment. He was one of many Yard workers who were called back to the Yard in the days after to assist in cleaning and repairing the Shipyard. “So we finally got into the yard and to the Transportation Department,” he recalled.

We did our jobs as usual, not really knowing the extent of the devastation so close by. When the drivers would come back for relief or to get off their shifts, we would hear their stories about how many people were killed and that they had to haul the injured and the dead from the drydock area. They used any kind of transportation available to do the job.<sup>187</sup>

Foo’s recollection, though brief, seems to indicate that the internal railway at Pearl Harbor assisted in bringing casualties out of the areas of devastation. The Transportation Department, then, appears to have played a notable role in the recovery from the Japanese onslaught. Indeed, the Navy

awarded Transportation Department workers and many other Yard workers an “E” for excellence pin.<sup>188</sup>

In the weeks following the attack, the Navy was faced with a massive cleanup effort at Pearl Harbor. In addition to raising salvageable ships, this work entailed removing an incredible amount of debris from the Shipyard. Although not well documented, the railway certainly played a central role in the physical movement of this material from the Yard. In this effort, locomotive cranes proved invaluable. The Yard had approximately 14 cranes at the time of the 1941 attack. When the smoke cleared, these cranes loaded scrap onto ships for removal, and through the war, they performed much of the heavy lifting needs of the Shipyard. As the war progressed, the Navy retired some of the older cranes and also ordered 12 new ones.<sup>189</sup> **Figure 67** is a 1943 photograph of a locomotive crane loading scrap onto an Army barge at the Navy Yard’s Repair Basin.

Although the damage to the internal Yard railway is not well documented, the Navy undoubtedly brought the railway infrastructure back into service in short time. Though devastated in the attack, Pearl Harbor was no less important to maintaining and resupplying the Pacific fleet, and the Navy pushed to revive the Shipyard. The Oahu Railway, which had survived the Japanese attack unscathed, was jolted awake after the attack. The necessity of the railway to military efforts on O’ahu was already being recognized prior to the attack, but records indicate that the aftermath brought

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<sup>186</sup> Rodriggs, *We Remember Pearl Harbor*, 43–45.

<sup>187</sup> Rodriggs, *We Remember Pearl Harbor*, 141–143.

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<sup>188</sup> Rodriggs, *We Remember Pearl Harbor*, 146.

<sup>189</sup> Livingston, *Oahu’s Narrow-Gauge Navy Rail*, 92-93.





**Figure 67.** A railroad crane loading scrap metal onto an Army barge, 18 January 1943. Hawaiian Railway Society Collection.

record-breaking usage. In their 1941 Annual Report, the company recorded their busiest year ever. As the Company stated in its report, “The increased personnel at Pearl Harbor as well as on other government work make it necessary to keep all of our rolling stock in continuous service.”<sup>190</sup>

While the Navy had devoted increasing funds toward the expansion of the internal railway system at the Shipyard in the 1930s, the severe lack in narrow gauge equipment was such that it could not meet the needs of the base. To make up for the shortfall, the Navy ordered large amounts of new equipment from manufacturers on the mainland and Hawai‘i.

<sup>190</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 347.

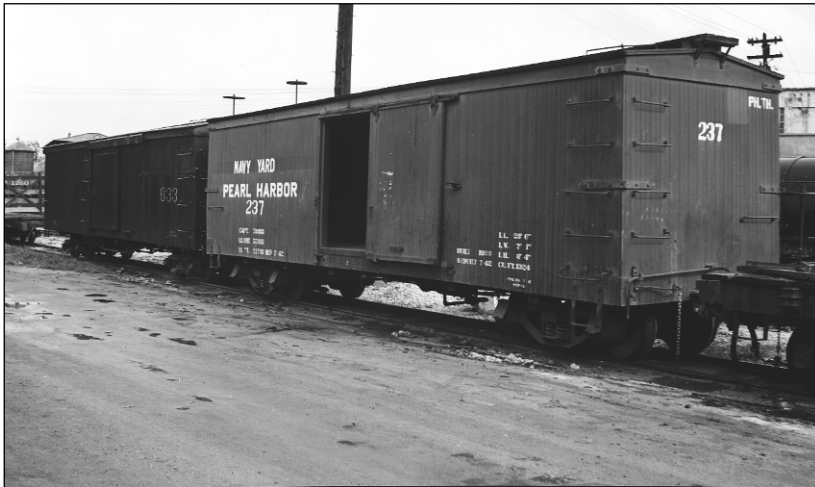
Across the nation, the needs of the military had created a wartime scarcity of railway equipment, and thus the Navy had to search far and wide to find the necessary components. The search was particularly exhaustive given the fact that narrow gauge railways were scarce on the mainland. The Navy ordered numerous 60,000-pound capacity steel flatcars and gondolas from the Pressed Steel Car Company and Koppel Industrial Car and Equipment Company. The Pressed Steel Car Company also provided outside-braced wood boxcars of 60,000-pound capacity. American Car and Foundry Company provided tank cars. When the necessary equipment could not be obtained from standard manufacturers, the Navy acquired used or antique equipment from the mainland. The sources of these locomotives, freight cars, and passenger cars were the Nevada Narrow Gauge Railroad, the Rio Grande Southern Railroad, the East Broad Top Railroad, the Denver and Rio Grande Western Railroad, the Florence and Cripple Creek Railroad, and the Boston, Revere Beach, and Lynn Railroad.<sup>191</sup>

**Figure 68** is an undated photograph of a former boxcar of the Colorado & Southern Railroad that the Navy had converted for use at the Navy Yard. **Figure 69** is an October 1945 photograph of the so-called “Argentine” boxcars that were in use at the Navy Yard throughout the war. These cars were built by the Pullman-Standard Company for the Argentine State Railway; however, the Navy commandeered the order and redirected it for wartime usage.

To compensate for a lack of locomotives, the Navy on O‘ahu obtained several from island sugar plantations. For example, the Navy Yard acquired *Waipio*, a steam locomotive built in

<sup>191</sup> Livingston, “Navy Narrow Gauge at Pearl Harbor.”





**Figure 68.** A Navy boxcar (center) that formerly belonged to the Colorado and Southern Railroad, undated. Typically Navy Yard rail stock was painted dark blue and Army rail stock olive green. Hawaiian Railway Society Collection.



**Figure 69.** An Argentine boxcar in use at the Navy Yard near the Repair Basin, October 1945. Record Group 5, Seabee Museum Archive.

1897. The locomotive had been owned and operated by the Oahu Sugar Company for decades. The Navy redubbed it No. 13 and used it at the Yard throughout the war.<sup>192</sup>

The importance of the Oahu Railway to Pearl Harbor and, indeed, all military operations on O‘ahu can be seen in the status of its workers following the United States’ entry into the war. The government excluded many of those who worked for the railroad operations of the Oahu Railway and Land Company from the draft because their occupations were considered vital to the military. Richard Gossett was one of many of these individuals whose position as a railway worker was indispensable to the war effort. He had begun working for the Oahu Railway and Land Company railroad just prior to the attack on Pearl Harbor. He worked for the company throughout the war but was never drafted.<sup>193</sup>

Millions of soldiers, sailors, and Marines passed through O‘ahu during World War II. To deal with the stunning increase in passenger traffic, the Oahu Railway needed to increase the number of locomotives and railroad passenger cars in its pool. In 1942, to cite one example, the Oahu Railway purchased locomotive No. 111 from the Pacific Coast Railway Company.<sup>194</sup> The need for passenger cars was somewhat ironic, for in recent decades, the Company had converted many of its passenger cars into cars that could haul canned pineapple. The company now found itself reinstalling the

<sup>192</sup> Livingston, *Oahu’s Narrow-Gauge Navy Rail*, 81.

<sup>193</sup> Rodriggs, *We Remember Pearl Harbor*, 293.

<sup>194</sup> Gale E. Treiber, *Hawaiian Railway Album WWII Photographs*, 4 vols. (Hanover: The Railroad Press, 2008), 45.

benches that it had ripped out back when automobiles were depleting ridership. Windows, which had been removed and covered with wooden slats to allow cans to be stacked, were reinstalled, too, but sometimes the urgency to create passenger cars meant that this step was skipped.<sup>195</sup>

In the several weeks that followed the Pearl Harbor attack, new personnel arrivals that came in through Honolulu were shuttled to Pearl Harbor on the Oahu Railway. Richard “Bud” Lamb, a Navy sailor in training, arrived in Honolulu at Pier 11 with his comrades on December 21, 1941. “We arrived at 2AM—the middle of the night,” he recalled. “Marine sentries lined us up and warned us not to get out of line.” From here, Lamb and the other men marched to the main Oahu Railway depot at Iwilei, shrouded in darkness as a blackout was in effect across the city. From Iwilei, the sailors piled into boxcars and were hauled to their new station at Pearl Harbor.<sup>196</sup>

As the war effort built, liberty parties increased the passenger traffic on the Oahu Railway. The liberty parties generally consisted of groups of sailors and Marines from ships docked in Pearl Harbor who took temporary leave in Honolulu and other places outside of the Shipyard. The Oahu Railway served as their passageway to recreation.<sup>197</sup>

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<sup>195</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 347.

<sup>196</sup> Lamb quoted in Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 200.

<sup>197</sup> Treiber, *Hawaiian Railway Album WWII Photographs*, 33-37.

Throughout the war, the Navy struggled to deal with the influx of passenger traffic to and from the Shipyard which was the overarching focus of the military effort on O‘ahu. Midway through the war in June 1943, the *Honolulu Advertiser* was reporting a “massive transportation problem” that was due to the incredible number of workers coming and going from the Shipyard in large shifts.<sup>198</sup> Captain R. W. Pain, manager of the Industrial Department at the Shipyard, worked to resolve the situation. He reported that the Navy was seeking to expand the drop off area near the Main Gate to the Shipyard, growing it from two tracks to four. Four tracks would allow trains to come and go without having to wait for trains ahead of them.<sup>199</sup> In addition to accommodating more trains, the Navy designed and constructed numerous large carrier buses and nicknamed them “Coral Sea” buses. In what must have been a desperate move to answer the transportation problem, the Navy also pulled trailers of passengers with tractors.<sup>200</sup>

Security was another pressing issue in the World War II Navy Yard and the railway was a subject of scrutiny. While ammunitions handling was extremely rare at the Naval Yard, loading and unloading of munitions was done at West Loch. The boxcar loads of ammunition that were transported along Naval rail lines on Oahu and elsewhere were susceptible to enemy interference. To guard them, Marines were posted

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<sup>198</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 208.

<sup>199</sup> No evidence has been found that the drop off area ever was four-tracked.

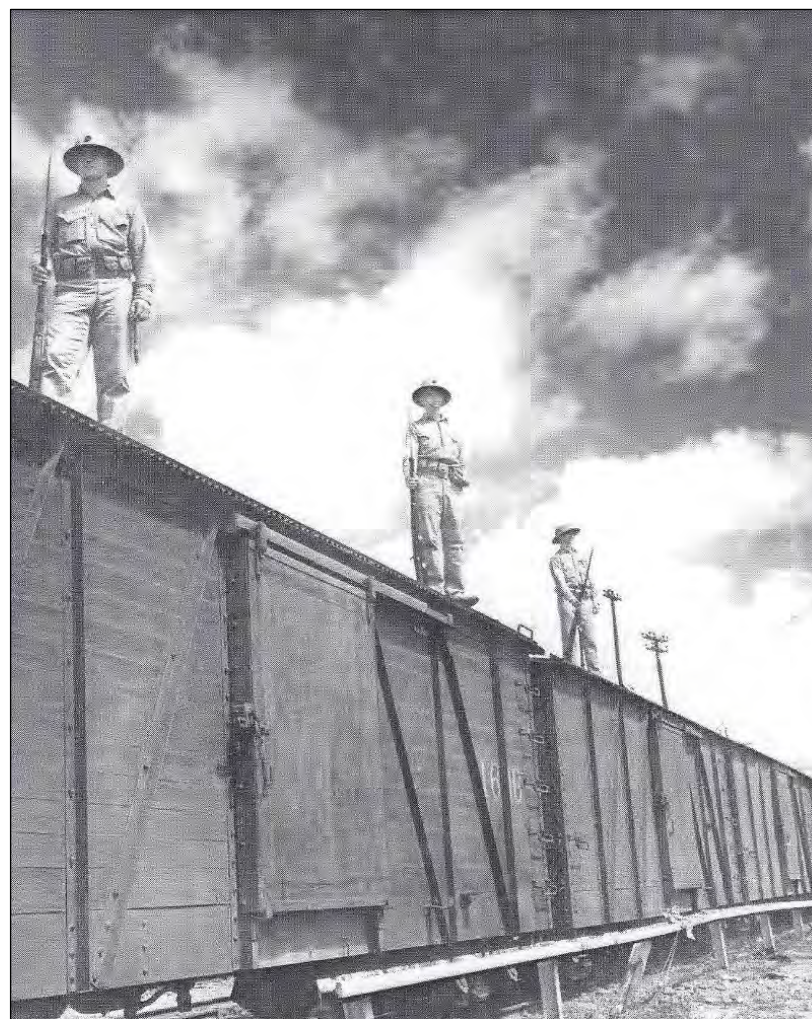
<sup>200</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 208–209.

atop stationary cars. An undated photograph from the period shows Marines posted atop ammunition boxcars at an unidentified location (**Figure 70**). Since the early 1920s, the Navy had not permitted Oahu Railway trains to enter the Yard. The contingencies of World War II changed this rule. During the war years, the Navy permitted the Oahu Railway trains to enter the Yard, but only to drop off and pick up passengers. **Figures 71** and **72** are views of the small siding within the Shipyard where the Oahu Railway passenger trains, as well as buses, collected and distributed passengers. This drop-off siding was near the Main Gate and, presently, near the intersection of Central and Russell Avenues.<sup>201</sup> The Shipyard's Main Gate was "the only connection between the OR&L's track system and that of the Navy Yard, and the various piers and berths located in the Yard proper and immediately adjacent areas" said the Commandant in 1944.<sup>202</sup>

The Oahu Railway, even when it was overwhelmed with traffic, nevertheless was vital to the war effort of the Shipyard. As a mover of people, the significant contribution of the railway is plain to see. The railway funneled manpower from Honolulu into the Shipyard, as well as other military installations on O'ahu. For example, Remy Latour worked at Instrument Shop #51 at Pearl Harbor during World War II. He collected some insightful memories of the Oahu Railway train service to and

<sup>201</sup> Livingston, *Oahu's Narrow-Gauge Navy Rail*, 79.

<sup>202</sup> Letter from Commandant of Navy Yard to Commandant of the 14th Naval District regarding Pooling of Railroad Equipment. Record Group 181: Records of Naval Districts and Shore Establishments: Naval Shipyard, Pearl Harbor, Hawaii, Office of the Commandant, General Correspondence. Box 132 (National Archives and Records Administration, San Bruno, 25 May 1944).



**Figure 70. Marines guard boxcars at Pearl Harbor, undated photograph. Record Group 80, National Archives and Records Administration.**



Figure 71. Undated World War II-period photograph of the Oahu Railway and Land Company trains depositing the Navy Yard work force. This location was near present-day Central Avenue and Russell Avenue. Source: Hawaiian Railroad Society.



Figure 72. Navy Yard workers head for buses and Oahu Railway and Land Company trains to Honolulu at the end of a day's work, 1943. *Pearl Harbor Banner* 1943.

from the Shipyard. Latour and his coworkers rode the train to Pearl Harbor six days a week. The fare was 10 cents. From his home in Honolulu, Latour took the Honolulu Rapid Transit trolley to the Oahu Railway depot at Iwilei. Boarding the train here, he rode to the Shipyard in time to begin work at 7 a.m.<sup>203</sup>

At the end of their workday, Latour and others would make their way to the trains near the Main Gate of the Navy Yard.

<sup>203</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 242.

On their ride home, he remembered, “someone would start strumming the ukulele, and we would sing ... We all forgot about the war for a short time.” At times, the ride home was not so easy. Latour recalled that there was a grade in the area that often gave the train trouble as it drew out of the Shipyard area. On those occasions, passengers had to lend a hand in moving the train. Latour and other able-bodied men (females were exempt from the task) went to the sides of the coaches to push the train.<sup>204</sup>

The engine wheezed as the engineer eased the throttle forward ... Wheels squealed, as sand was dropped on the rails for traction. And slowly, with man’s help and the hiss and chug of the engine, we began to move. The whistle tooted twice, and the constant ringing of the bell told us to get aboard quickly. Those already on the platform helped the others aboard so no one missed the train.<sup>205</sup>

Herbert Y. S. Foo, a Yard worker at the time of the Pearl Harbor attack, lived in Kailua and carpooled to the Yard on work days until after the attack. Congestion made it necessary for him and others to take a bus to the Oahu Railway and Land Company depot in Honolulu. From here, they would ride the train to the Yard. According to Foo, the

railroad served the Shipyard well. He noted that during the war “it was always packed with navy yard people.”<sup>206</sup>

By many accounts, the Oahu Railway met the challenge that the build-up for war presented. Exact figures are not available for freight and passenger traffic for each year of the war, but the company’s Annual Reports tell of broken records. The 1940-1941 period, as mentioned above, was a record-breaking year for the company in terms of service, but the 1941-1942 period surpassed it.<sup>207</sup> Passenger traffic prominently figured in the overall traffic. In the year 1943, for example, the Oahu Railway transported 2.5 million passengers.<sup>208</sup> Given that the trains ran 365 days per year during the war, this figure averages to approximately 7,000 passengers per day. However, the ridership likely surpassed this daily number during periods when ships were docked at Pearl Harbor and when large construction projects were taking place on O’ahu military installations. The Oahu Railway provided access to the majority of the military installations on O’ahu. This included Fort Shafter, the Kapalama Depot, Hickam Army Air Field (later Hickam Air Base), Camp Kahuku, Schofield Barracks, Wheeler Army Air Field (later Wheeler Air Base), NAS Barbers Point, and NAD Lualualei.<sup>209</sup>

To aid in the efficiency of rail operations in the Navy Yard, the Navy ordered new equipment including two diesel-electric

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<sup>204</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 242.

<sup>205</sup> Remy Latour, quoted in Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 242.

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<sup>206</sup> Rodriggs, *We Remember Pearl Harbor*, 145.

<sup>207</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 347.

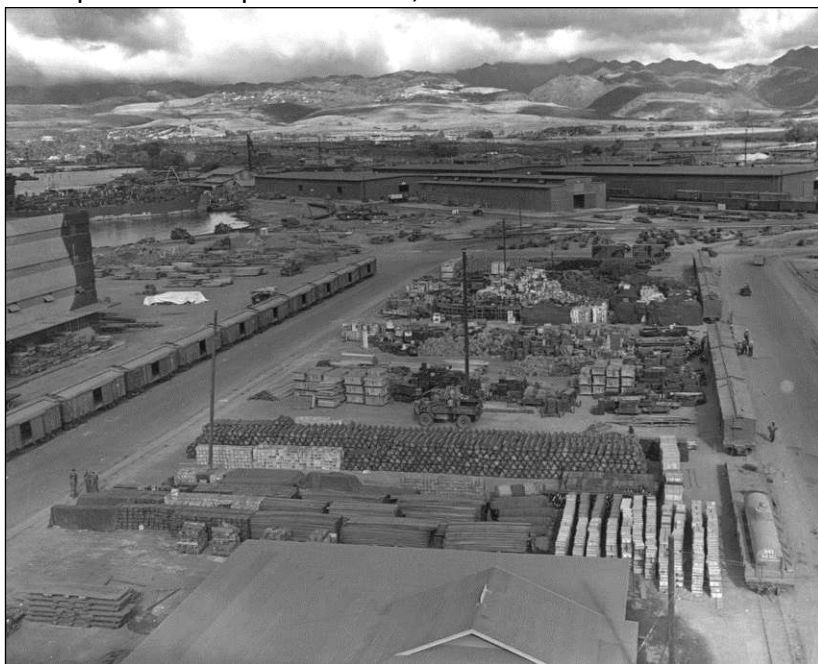
<sup>208</sup> Treiber, *Hawaiian Railway Album WWII Photographs*, 11.

<sup>209</sup> Treiber, *Hawaiian Railway Album WWII Photographs*, 74-77.



switchers. These 45-ton, 300-horsepower locomotives could run forward and backward across short or long distances. The Navy ordered this equipment from the George D. Whitcomb Company of Chicago. The two switchers arrived partially assembled in 1943.<sup>210</sup> **Figure 73** is a 1944 photograph of a supply area at the Navy Yard that gives an indication of the massive cargoes the railway carried into and out of the Yard.

As of May 1944, all responsibilities pertaining to Shipyard transportation were vested in the Public Works Officer and his Transportation Superintendent, both of whom were based in



**Figure 73. Overview of Naval Supply Center operations at Kauhua Peninsula, Pearl Harbor, 1944. Note Fac. 479 to left is camouflaged. Hawaiian Railroad Society Collection.**

<sup>210</sup> Livingston, “Navy Narrow Gauge at Pearl Harbor”, 19.

Shop 02. This office maintained and operated the internal railway system of the Yard. Their personnel and railroad equipment handled all spotting and switching of cars inside the Yard.<sup>211</sup> As historic documents from the period indicate, this office included a Yard Car Dispatcher, an Officer-in-Charge of handling naval ammunition, and an Officer-in-Charge of supplies.

Commandant William R. Furlong argued against a proposal by the Supply Officer at Kūāhūa to take over rail operations. In a May 25, 1944, letter to the Fourteenth Naval District, he wrote: “Inasmuch as the Yard must maintain and operate locomotives for its own purposes and as these locomotives must pass over the same track system as serves Kūāhūa, Submarine Base and Merry Loch, it is an inescapable conclusion that both for efficiency and security the Yard must continue to perform all locomotive service in the general Yard area.” He added that, “This means that all cars entering the Yard regardless of their ownership or destination would be handled by Yard locomotives.”<sup>212</sup>

<sup>211</sup> Letter from Commandant of Navy Yard to Commandant of the 14th Naval District regarding Pooling of Railroad Equipment. Record Group 181: Records of Naval Districts and Shore Establishments: Naval Shipyard, Pearl Harbor, Hawaii, Office of the Commandant, General Correspondence. Box 132 (National Archives and Records Administration, San Bruno, 25 May 1944).

<sup>212</sup> Letter from the Commandant of the Navy Yard to the Commandant of the Fourteenth Naval District concerning the Shortage of Rail Transportation on Oahu. Record Group 181: Records of Naval Districts and Shore Establishments: Naval Shipyard, Pearl Harbor, Hawaii, Office of the Commandant, General Correspondence. Box 132 (National Archives and Records Administration, San Bruno, 22 July 1944).

In July 1944, the Navy established a District Rail Transportation Coordination office. This office took control of all Navy railcar movements across Navy installations on O'ahu.<sup>213</sup> The establishment of this office helped to relieve logistical bickering between the various Navy installations on O'ahu that had a need for railway cars and locomotives. This office was based at Naval Supply Depot Kuahua.<sup>214</sup>

Navy correspondence regarding railway logistics provides insight into railway operation of World War II at the Shipyard. Furlong, the Commandant of the Shipyard, wrote the Fourteenth Naval District regarding Navy-owned railroad equipment at the Shipyard as of May 1944. His letter included a tabulation of railroad locomotives and cars under Navy control (later documentation indicates that this tabulation included equipment that was owned by the Navy, Army, and the Oahu Railway). Furlong's purpose in the letter was to illustrate the need for updated equipment. Furlong described that some of the Yard's locomotives were so old "as to be beyond effective repair." Most likely he was referring to the old steam locomotives (Numbers 2, 6, 8, 9, 10, 12, 13, and 17). In addition to these were three diesel locomotives (Nos. 11, 14, and 15), two diesel-electric locomotives (Nos. 16 and 18) (**Figure 74**), and one gasoline locomotive (No. 20). Forty percent of the 483 rail cars under the Yard's control were suitable for service only within the Yard due to structural issues that precluded their usage beyond the Yard. Some of

<sup>213</sup> Livingston, *Oahu's Narrow-Gauge Navy Rail*, 79.

<sup>214</sup> Letter from the Commandant of the Navy Yard to the Commandant of the Fourteenth Naval District concerning the Shortage of Rail Transportation on Oahu, 1944.



**Figure 74.** 50-ton electric locomotive crane for use at the Dry Dock. 20 August 1943. Record Group 71, National Archives and Records Administration.

the cars had been damaged to the extent that it was not economical to repair them and they simply were not in service.<sup>215</sup> A summary of the number and type of rail cars from Furlong's letter is presented in **Table 1**.

**Table 1. Equipment Under Control of the Shipyard as of May 1944.**

Equipment Type	Count
Flat cars	227
Box Cars	210
Misc Rolling Stock	46
Total	483

The Commandant also enclosed in his July 1944 letter a list of the contents and the destination of 190 rail cars in the Shipyard as of July 14. This list may be interpreted as a glimpse into the usual cargo aboard the Shipyard railcars during the height of World War II. The contents included mostly ammunition. Other cargoes included towels, clothing, life rafts, oil drums, hose, bomb racks, barrel chains, boat fenders, drill mines, and dynamite. Some of the cars were empty. The cars were destined to military sites as Pearl City, West Loch, Honolulu, Lualualei, Barber's Point, and Waikele.<sup>216</sup>

Like Commander Furlong, M. C. Robertson, who was the Chief of Staff of the Fourteenth Naval District that included O'ahu, also promoted the betterment of the Shipyard's railway system during the war. Robertson wrote Chester W. Nimitz,

<sup>215</sup> Livingston, *Oahu's Narrow-Gauge Navy Rail*, 79.

<sup>216</sup> Letter from the Commandant of the Navy Yard to the Commandant of the Fourteenth Naval District concerning the Shortage of Rail Transportation on Oahu, 1944.

the Commander in Chief of the Pacific Fleet, in July 1944 about the need for additional railroad equipment on O'ahu and also Maui. The intention of the request was to promote more efficient shipment of war materiel. Robinson's equipment request asked for 300 box cars, 180 flat cars, 50 gondolas, 12 tank cars, and 10 locomotives for the two islands.<sup>217</sup>

Robertson's letter also enclosed a table indicating the cars in use on O'ahu at the time of his letter (July 1944) and also the rail freight performance on the islands of O'ahu and Maui for the December 1943 to May 1944 period. He broke down the number of cars by ownership and type of car. This data, presented in **Table 2**, indicates that the Oahu Railway owned the vast majority of cars on O'ahu. The second largest owner was the Navy followed by the Army. The table helps to illustrate the deep value of the O'ahu Railway and its components to the war effort on O'ahu. Both the Navy and the Army were reliant upon the Railway's equipment throughout the war.<sup>218</sup>

<sup>217</sup> The letter does not distinguish the specific number that each island would receive. Additional Railway Equipment for Oahu and Maui. Record Group 181: Records of Naval Districts and Shore Establishments: Naval Shipyard, Pearl Harbor, Hawaii, Office of the Commandant, General Correspondence. Box 132 (National Archives and Records Administration, San Bruno, 8 July 1944).

<sup>218</sup> "Additional Railway Equipment for Oahu and Maui," 1944.



**Table 2. Railway Cars in Use on O‘ahu as of July 1944.**

Owner	Boxcars	Flatcars	Gondolas	Tank Cars	Stock Cars
Army	100	--	--	--	--
Navy	146	55	--	--	--
Oahu Railway and Land Company	368	593	185	100	13
Total	614	648	185	100	13

Robertson’s tabulation of rail freight for the period from December 1943 to May 1944 was arranged in terms of tonnage and carloads. His figures likely included Maui in addition to O‘ahu, and thus it is difficult to draw specific conclusions about figures for O‘ahu alone. Nevertheless, it is very clear that tonnage in general was increasing in this period.<sup>219</sup> Robertson’s information is transcribed in **Table 3**.

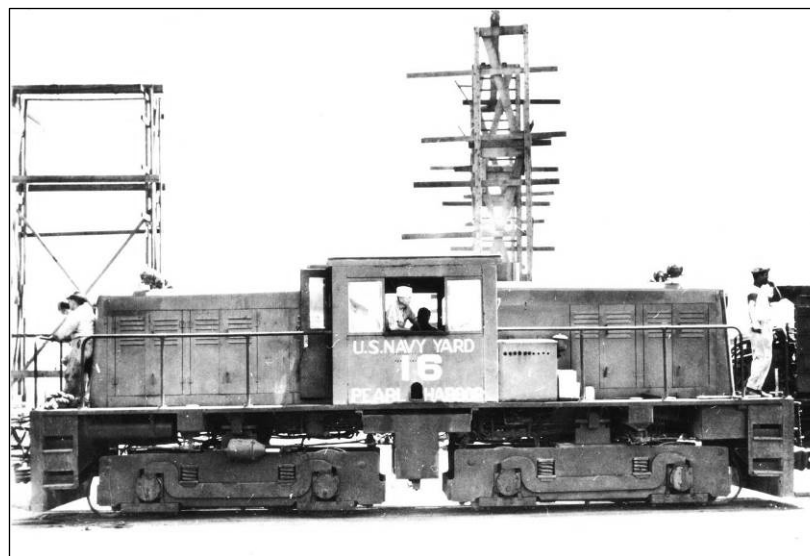
**Table 3. Rail Freight Performance on O‘ahu and Maui, December 1944 through May 1944.**

Month	Net Tons	Carloads
December 1943	128,235	7,097
January 1944	105,279	5,546
February 1944	110,692	5,152
March 1944	129,724	6,690
April 1944	186,200	9,540
May 1944	172,271	8,854
Average	138,733	7,146

Sources suggest that the Navy heeded the Shipyard’s call for better railway equipment. Before the end of the year 1944, the Navy shipped 500 new boxcars and gondolas to O‘ahu. The cars, the majority of which must have gone to the

<sup>219</sup> “Additional Railway Equipment for Oahu and Maui,” 1944.

Shipyard, had been manufactured at the Pressed Steel Car Company in New Jersey. The Navy also sent 10 new diesel electric locomotives to the Shipyard. **Figure 75** is one of the new diesel-electric locomotives built by Porter Locomotives. Outside of Pearl Harbor, the internal railway system of Lualualei and West Loch received new locomotives. Shortages still existed and it was a constant battle to meet demand.<sup>220</sup> The surrender of Japan on August 15, 1945, forecasted a break in the harried pace of railway operations at the Shipyard and across O‘ahu. **Figure 76 (Appendix A, Map 4)**, a 1945 plan of the Yard, illustrates the layout of railroad trackage in the year the war ended.



**Figure 75. One of the diesel electric locomotives that the Porter Locomotive Company built for the Navy Yard in the World War II period, undated photograph. Hawaiian Railway Society.**

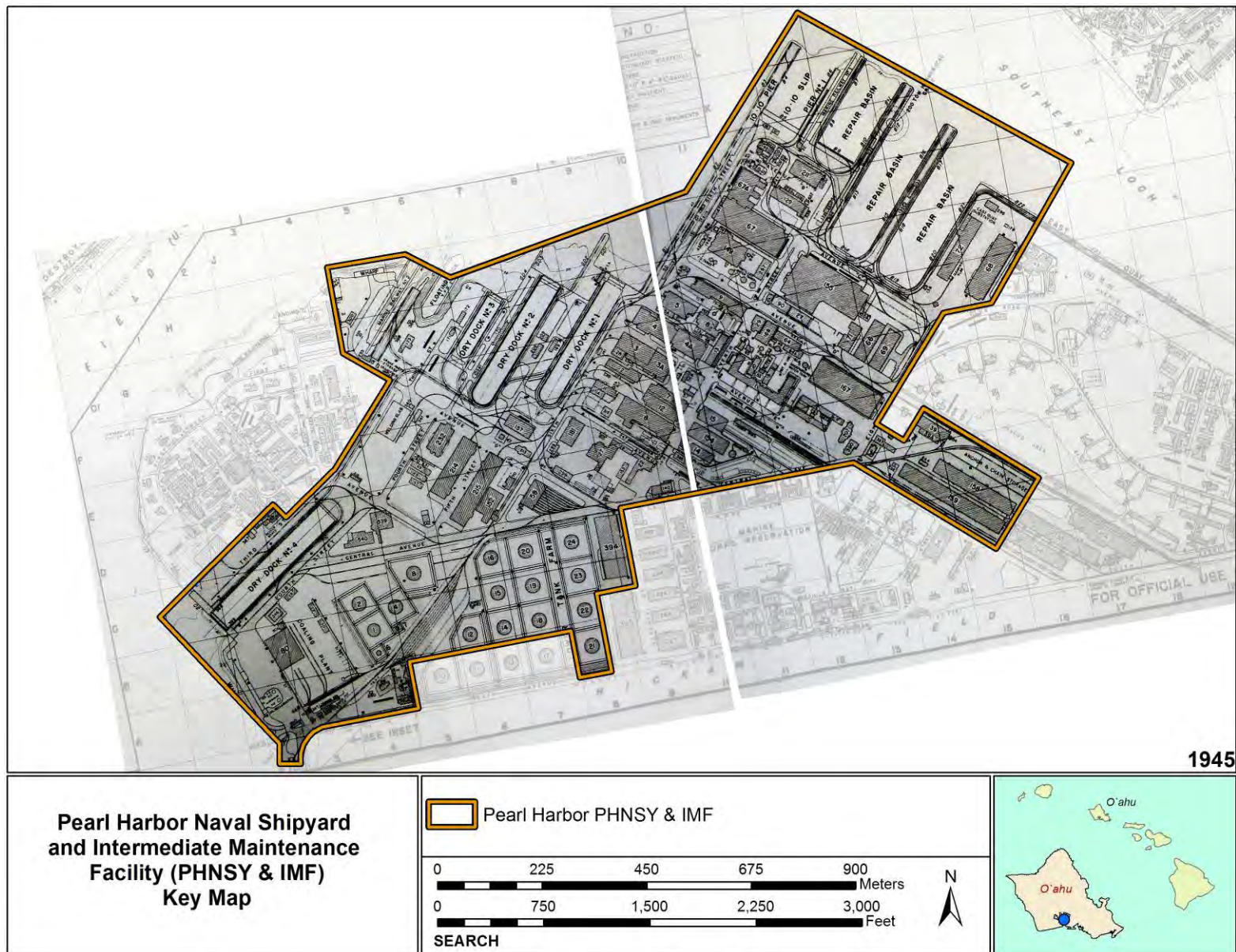


Figure 76. 1945 map illustrating the permanent railway system of the Navy Yard.

## F. The Post-World War II Railway and Decline, 1945-1972

Following World War II, the railway system at the Shipyard passed through a period of decreased usage in the late 1940s, a period of resurging use during the Korean War, and, finally, a period of gradual reduction and end of use from the late 1950s until the early 1970s. In May 1946, the Navy compiled data on existing infrastructure at the Shipyard. Among the subjects tabulated was the internal railway system. The data noted that the Shipyard railway connected with a “freight spur and passenger station” that was at the Shipyard. The main feature of the internal railway was 13.8 miles of narrow gauge track. The internal railway also featured 2.1 miles of standard gauge track. The 1946 data compilation also was the first document to enumerate the number of non-locomotive cranes (two gantry, one hammerhead, and 22 traveling) and the gauge and length of their trackage (27’ 11.75” and 14,970 inches, respectively). In addition to standard and narrow gauge track, the Shipyard in the postwar era (and likely during the war) had a 28 foot-gauge track for cranes. These tracks encircled the Dry Docks.<sup>221</sup> **Figure 77** illustrates the continued presence of the railway system throughout the Yard in the post-World War II period. The photograph was taken in October 1945 and focuses on the Main Office of the Power Plant. In front of the plant, trackage is visible.



**Figure 77. Railroad tracks in the vicinity of Fac. 41, Main Office of the Power Plant at Navy Yard, Pearl Harbor, October 1945. Record Group 5, Seabee Museum Archives.**

The same 1947 compilation also listed the inventory of rolling stock at the Shipyard as of May 1946. This equipment is interpreted to be the equipment that was present during the World War II era. The 1946 data listed seven diesel electric locomotives<sup>222</sup> and 28 locomotive cranes. There also were 134 boxcars, 88 flatcars, 20 tank cars, and five sludge oil tank cars.<sup>223</sup> In the coming years, the Navy divested itself of most of this equipment.

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<sup>221</sup> The data compilation was published in 1947. Bureau of Yards and Docks, “Public Works of the Navy Data Book: General Information,” 1947, Hawaiian Railway Society, 1018.

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<sup>222</sup> Livingston believes the number was sixteen, but his figure likely includes all Naval facilities on Oahu. Livingston, “Navy Narrow Gauge at Pearl Harbor.”

<sup>223</sup> Bureau of Yards and Docks, “Public Works of the Navy Data Book: General Information,” 1018.

Through the closing years of the 1940s, the Shipyard scarcely used its internal railway system. Before the decade ended, the estimated 16 locomotives (steam and diesel electric) were transferred to NAD Lualualei. A process of selling, scrapping, or otherwise deactivating rolling stock, locomotive cranes, and other railway components began in this period. The primary Navy usage of rails in the Pearl Harbor area was to receive ammunition transports from NAD Lualualei. These shipments passed over Oahu Railway and Land Company trackage. The once bustling passenger traffic of the World War II period was practically non-existent. On December 31, 1947, the Company ended service on all of its trackage west and north of Kalihi on O'ahu and, in response, the Navy acquired the mileage connecting Pearl Harbor, Waikele, West Loch, and Lualualei between 1947 and 1950.<sup>224</sup> Specifically, the Oahu Railway trackage between Pearl Harbor and Lualualei commenced at the Main Gate to the Shipyard.<sup>225</sup> West Loch was the only location where ammo could be transferred from rail to ship.<sup>226</sup>

The onset of the Korean War in 1950 influenced resurgence in railway use at Pearl Harbor. **Figure 78** is a 1951 plan that depicts the extent of railway trackage in this period. The main factor in the return of railway usage was the inability of trucks to meet the demand for transporting naval ammunition between Lualualei and Pearl Harbor (**Appendix A, Map 5**).

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<sup>224</sup> Livingston, *Oahu's Narrow-Gauge Navy Rail*.

<sup>225</sup> Memo summarizing Oahu Railway trackage acquisition by Navy. Record Group 181: Records of Naval Districts and Shore Establishments: Pearl Harbor. Box 8. (National Archives and Records Administration, San Bruno, October 1951).

<sup>226</sup> Livingston, *Oahu's Narrow-Gauge Navy Rail*, 117.

The rail system was upgraded and the retired diesel locomotives and rolling stock were reactivated. The sale of locomotives and rolling stock that had begun in the 1940s halted. The rush to meet the war demand is evident in a massive effort to renovate flatcars at the Shipyard. The renovation presumably was done to accommodate the transport of ammunition. Over the course of six weeks in 1951, the Shipyard renovated 164 flat cars at an expense of approximately \$600 apiece.<sup>227</sup>

The flurry of railway activity of the Korean War subsided with the end of the conflict in 1953. With the war over, the ammunition transportation demand dramatically decreased and the Navy continued on the pre-Korean War path toward reducing their reliance on railways at the Shipyard. A Navy property inventory from August 1954 indicated that the Shipyard's permanent trackage was active (i.e. in use) and held a value of \$247,600. The track was described as 3-foot (or narrow) gauge. The estimated life remaining in the rail trackage was 25 years. There is no mention of the standard trackage at the Coaling Plant, and thus it is clear that all standard gauge trackage had been removed from the Shipyard by August 1954.<sup>228</sup> Although active in August, the inter-Shipyard railway was retired by the end of the year.<sup>229</sup> **Figure 79** is a photograph of Berths 1 and 2 at the Navy Yard. Several

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<sup>227</sup> Livingston, "Navy Narrow Gauge at Pearl Harbor."

<sup>228</sup> Navy property card for railroad trackage at Pearl Harbor Naval Shipyard. Record Group 11.2.3: NAVFAC Historian's Office, Navy General Reference Files, Naval Districts, 14th Naval District, Property Cards. Box 74. (National Archives and Records Administration, San Bruno, January 1955).

<sup>229</sup> No details of the removal process have been found. Livingston, *Oahu's Narrow-Gauge Navy Rail*.







**Figure 79.** Crane trackage near Berth B-1 and B-2, 1010 Dock, View looking north with Fac. 67 and 67B to right, 1964. Record Group 5, Seabee Museum Archives.

lengths of abandoned narrow-gauge railway trackage are visible in the photograph.

The post-Korean War trickle of railway traffic from Lualualei to West Loch all but ceased in November 1954 when a storm washed out tracks at Waikele. As a result, the Navy increased truck transport of high explosives, but still, there was a certain benefit of rails over trucks, at least in terms of hauling explosives. The Navy came to consider truck transport too dangerous and, thus, they reconsidered using railways. In July 1956, the Navy reinstated the line between Lualualei and West Loch. Between this date and until the last shipment of

ammunition in 1968, the frequency of locomotive operations between the two locations steadily decreased.<sup>230</sup>

The Navy continued to operate the line from West Loch to Lualualei through the Vietnam War period. Yet, this traffic also drew to a close. In 1972, the shipping of ammunition from Lualualei to ships at West Loch was discontinued. The remaining Navy railroad equipment on O’ahu, some of which lay rotting at various sidings along the line between the Pearl Harbor area and Lualualei, was conveyed to the General Services Administration.<sup>231</sup>

The Navy continued to rid itself of remaining rolling stock through the 1960s and into the early 1970s. In 1961, the Navy sold three of their 45-ton locomotives and one of their 65-ton locomotives to Dulien Steel of Seattle, Washington. Crane operator Flynn Lerner of Honolulu purchased a 25-ton Whitcomb in this period to use for spare parts. Two locomotives are believed to have been sent to Saudi Arabia.<sup>232</sup>

Additional Naval rail lines that supported the Submarine Base waterfront, Floating Dry Dock at Kaukua Island, were also removed. This included the waterfront at Sierra 1 and Piers S8 and S9 as well as wharves Sierra 10 to 21. Remnants of lines still remain at the Naval Supply Center, Piers Kilo 7 and 8, and Ford Island wharves Fox 12 and 13. For Navy land rail systems the Naval Magazine at West Loch retains much abandoned rail track in its original position; however, rail tracks have been

<sup>230</sup> Livingston, “Navy Narrow Gauge at Pearl Harbor.”

<sup>231</sup> Livingston, “Navy Narrow Gauge at Pearl Harbor.”

<sup>232</sup> Livingston, *Oahu’s Narrow-Gauge Navy Rail*.

cleared from roadway crossings. Also, the Naval Magazine at Lualualei also had an extensive rail distribution system but almost all rail there, including the connector line formerly along Lualualei Naval Road to the OR&L main line, were scrapped by a contractor in the late 1970s. All that remains at Lualualei is one short section of rail running through a paved road near the site of the former engine house site. Only a small portion of the two-foot gauge “mining” railroad at Red Hill is still in use today. This stretch of track is the only remnant of the 1940s rail system addition that remains operational.

In 1972, the Navy donated two 45-ton Whitcomb locomotives and a 65-ton Whitcomb locomotive to the Hawaiian Railway Society.<sup>233</sup> The rolling stock includes seven boxcars, all built by Pressed Steel Car Company, and delivered to the Navy in 1945, a flat car (builder unknown), two tank cars built by American Car & Foundry Company in 1945, one gondola built by Pressed Steel Car Company in 1945, and one railcar built by Kalamazoo Manufacturing Company in 1945.<sup>234</sup>

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<sup>233</sup> House Committee on Government Operations, “Transfer of Railway Equipment in Hawaii” (Government Printing Office, 1974).

<sup>234</sup> Chiddix and Simpson, *Next Stop Honolulu! Oahu Railway and Land Company, 1889-1971*, 279.

## CHAPTER 2: MAPPING/INVENTORY SURVEY REPORT

### 2.1: INTRODUCTION

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This report presents the results mapping and inventory survey of the historic railroad tracks and train rail system throughout the Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility (PHNSY & IMF). This report is structured in six sections and has been prepared in accordance with the Statement of Work (SOW) prepared by Naval Facilities Engineering Command (NAVFAC), Hawaii, under base Contract No. N62742-09-D-1960 issued by NAVFAC Pacific. Section 2.1 is a brief introduction to the project and existing conditions of the rail system. Section 2.2 characterizes the methodology used during the mapping and inventory survey. Section 2.3 states the criteria for National Register of Historic Places (NRHP) evaluation of the rail system. Section 2.4 presents the analysis and evaluation of condition, integrity, and significance of the rail system as a whole. Section 2.5 lists the recommendations for a tiered treatment approach for the preservation of the extant portions of the rail system. Section 2.6 provides a summary of this report and its findings.

The mapping/inventory survey was conducted for NAVFAC Hawaii to assist the US Navy in meeting a stipulated condition for a “no adverse effect” determination in a Section 106 consultation for Military Construction Project (MCON) P-307, Production Services Support Facility for Pearl Harbor Naval Shipyard and Intermediate Facility, Pearl Harbor, O’ahu,

Hawai’i. In 2008, the US Navy prepared the *Pearl Harbor Naval Shipyard & Intermediate Maintenance Facility Facilities Modernization Plan* as a long-range planning document to guide the Navy in deciding on future facilities and infrastructure investments in support of PHNSY & IMF mission operations. To fulfill the requirements of the mapping and inventory survey SOW, SEARCH conducted archival research at several federal and state archives and carried out oral history interviews to prepare a historical context (**Chapter 1**). Research for the historic context was used to develop field methodologies in order to document the extant historic railroad tracks, train rails system, and associated features within PHNSY & IMF proposed construction project areas (as described in the Facilities Modernization Plan).

In consultation with NAVFAC Hawaii personnel, 20 survey areas were selected based on archival research. Fieldwork within the areas included a pedestrian survey, inventory of above-grade features, and a geophysical survey utilizing ground penetrating radar (GPR). Extant and subsurface features were recorded using a Global Positioning System (GPS). Recorded features were photographed and mapped onto present-day aerials.

The information gathered during the development of the historic context and the mapping and inventory survey is used to evaluate the NRHP eligibility of the extant railroad features, within PHNSY & IMF. The results and analysis of the mapping and inventory survey and NRHP evaluation form the basis of treatment recommendations for the extant historic railroad tracks and train railway system, and will serve to support the



Shipyard's long range planning to meet current and future mission requirements.<sup>235</sup>

## A. Existing Conditions

The Shipyard's core assets include four dry docks and two repair berths that are contained within a single Controlled Industrial Area (CIA), and areas outside the CIA including waterfront support, infrastructure for material and ordinance transportation from storage areas and the transportation of personnel from O'ahu, and harbor defense functions that were historically supported by the former Navy Yard industrial complex.

The former rail system was decommissioned at PHNSY & IMF in 1954. The majority of the historic railway system was removed or paved over with asphalt to accommodate automotive traffic. Small sections of the remnant features are exposed in parking lots, along the docks, and in the road bed, or were repurposed. Exposed rails along the dry docks are located underneath storage containers, buildings, or within vehicle corridors.

Crane (28-foot gauge) rail is still in use at PHNSY, although it is restricted only to crane rails along Dry Docks 1-4. Gantry cranes are still used in these areas; however, many of their functions have been replaced and/or supplemented by fixed overhead and tower cranes and a variety of specialized, task-based mobile cranes (harbor, floating, deck mounted, sidelifter, rough terrain, pick and carry, carry deck, telescopic handler, jib, and loader cranes).

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<sup>235</sup> Naval Facilities Engineering Command (NAVFAC) Hawaii. Contract: N62742-09-D-1960 Amendment No. CR-11 F. Statement of Work for Pearl Harbor Naval Shipyard & Intermediate Maintenance Facility (PHNSY & IMF) Mapping/Inventory Survey and Historic Context Report of the Historic Railroad Tracks and Train Rails System Throughout Pearl Harbor Naval Shipyard & IMF, PHNSY & IMF, Pearl Harbor, Hawai'i. Department of the Navy, Naval Facilities Engineering Command, Hawaii, Pearl Harbor, Hawai'i, 2011.

## 2.2: METHODOLOGY

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Prior to beginning fieldwork, SEARCH conducted research at several archives to develop a contextual history of the historic railroad system throughout the PHNSY & IMF facility and its relationship to the overall O'ahu railway system. Research was conducted at the following repositories:

- Hawaiian Railway Society, 'Ewa, Hawai'i
- National Archives (NARA), College Park, Maryland
- National Archives (NARA), San Bruno, California
- Library of Congress, Washington, DC
- Port Hueneme Seabee Museum, Port Hueneme, California
- University of Florida Library System, Gainesville, Florida
- US Department of the Navy, Navy Public Works Center, Pearl Harbor, Hawai'i
- Joint Base Pearl Harbor-Hickam Public Affairs Office, Pearl Harbor, Hawai'i
- SEARCH Library, Kailua, Hawai'i

The archival research was used to develop the Historic Context Report (**Chapter 1**), which explores the origins of the rail system and how the military, political, and technological changes influenced its use. Historic maps, photographs, site plans, master plans, cultural resource studies, and government reports gathered during the research phase of this project were used to determine study areas during the mapping and inventory survey. Historic maps were georeferenced and incorporated into field maps to provide in-

field context for extant surface and subsurface rails. Further context was provided through two oral history interviews, from an informant selected during the research phase of this project.

The mapping and inventory survey involved the location, documentation, and mapping of extant above and below grade rail lines, representative railway features, and former Navy railroad equipment. SEARCH implemented a three-phased approach to conduct the mapping and inventory: (1) photo documentation (using digital single-lens reflex [SLR]); (2) Global Positioning System (GPS) recording of the survey areas and extant above ground tracks and other features associated with the railway system; and (3) documenting below-grade geophysical survey features utilizing Ground Penetrating Radar (GPR) to identify rails below grade. The specific methodology of each approach to record the remnant railroad systems is presented below. A three member team from SEARCH, consisting of Project Manager David Crowell, MS, Architectural Historian and GPS Technician Kelly Higelmire, MA, and Remote Sensing Specialist Christopher Altes, MA, performed the fieldwork over the course of three weeks in June 2015.

### A. Historic Map and Aerial Photo Georeferencing

For the rail survey, SEARCH utilized documents and maps compiled during archival research that identified former rights-of-way and components associated with Navy's railway system at PHNSY & IMF. One of the goals of this research was to address the overall functionality of the former railroad as a

complete system that supported the industrial naval complex and to understand how the remnant individual components fit into the overall larger system that once existed.

To help accomplish this goal, SEARCH georeferenced a series of historical maps of the shipyard using ESRI ArcGIS Geographic Information System (GIS) software. The goal of the georeferencing was to track the development of the shipyard and rail system through time and provide a geographic and temporal context from which to develop the historic context, identify the survey areas, and analyze and evaluate the results of the rail survey. The geofeferenced historical map series shows the development of the rail system between 1909 and 1954. The progressive maps documented major and minor expansion and contraction the rail system as well as differences in technology meant to meet the needs of PHNSY & IMF over time.

Aerial photography, US Geological Survey (USGS) topographic maps, and various GIS data layers were acquired from the US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Data Gateway and the Pearl Harbor Naval Yard Public Works Department. Installation boundaries, extant railways, utilities, fence lines, and building footprints were provided by the Public Works Department in the form of Autodesk AutoCAD files.

## B. Photography

Photographs were taken of views showing the relationships between buildings, objects, and structures. Mr. Jeff Dodge,

NAVFAC Hawaii Historian, was the project photographer. The SEARCH Project Manager selected the photo subjects and assisted in directing the photo compositions. Mr. Dodge used a Canon EOS 5D 12.8 megapixel, full-frame digital single-lens reflex (DSLR) camera to take the photographs, and the SEARCH Project Manager recorded the subject matter and direction of the photos on standard forms. The 4368 x 2912 pixel photographs were taken with a 72 dpi resolution. PHNSY Security reviewed the photos and selected photos approved for public release. The main photo subjects were overall views of historic resources and relationship between various components and significant historic features identified during the rail survey. Photographs were taken of extant architectural, structural, engineering, or technical aspects of the rail system. Linear features such as operational or abandoned rails included a view down the roadbed. When possible, context photos around the subject were taken. The photographs also included the documentation of work areas and the fieldwork. Photographs approved by PHNSY security are shown in this report.

## C. Global Positioning System

SEARCH recorded GPS point, line, and polygon data of extant surface and subsurface rail features. SEARCH also recorded GPR survey areas and transects. The data was recorded with a Trimble GeoXH, GeoExplorer 2800 Series using TerraSync software at +/- 1 meter accuracy. The GPS data was corrected via Trimble GPS Pathfinder Office version 5.60 software and uploaded to ESRI ArcMap 10 GIS software. GPS data recorded included wharves, rails, storage yards, spur lines, switch

locations, and other associated rail features. All features were mapped on present-day aerials. Features were named based on the survey area and series number (i.e., Feature 1.1)

#### D. Ground Penetrating Radar

GPR survey target areas were identified for survey based on the results of the background research and historic map and aerial photograph analysis. Twenty target areas were developed to investigate the presence or absence of the historic railroad. The survey areas were refined during fieldwork based in part by additional historic research, field conditions, real-time GPR readings, and available access to the target areas. Discretionary GPR transects were also used to investigate locations outside of the target survey areas. The results of the GPR analysis are presented in this report as both two-dimensional (reflection profiles) and three-dimensional (amplitude maps) data highlighting anomalies associated with the historic rail system (**Figure 80**).

The GPR survey was conducted aboard the PHNSY using a GSSI SIR-3000 Integrated Radar Control Unit, mounted on an UtilityScan wheel-cart with a 400-MHz shielded antenna. The UtilityScan cart includes a survey wheel encoder, which adds fine-detail spatial information to the data. SIR-3000 control unit screen allows for real-time display of the GPR data as either a waveform or a radargram. The SIR-3000 has internal data storage and allows for the replacement of the internal batteries, allowing for data collection without interruption during the workday. This hardware setup is appropriate for data collection to ultimately create three-dimensional models of subsurface features.

A 400-MHz shielded antenna is generally well-suited for finding shallow, buried features. The higher the frequency of the antenna, the better the possible spatial resolution, but the signal does not penetrate as deeply. The maximum depth of the buried rails was unknown prior to fieldwork, as the ongoing construction activities potentially buried rails to a

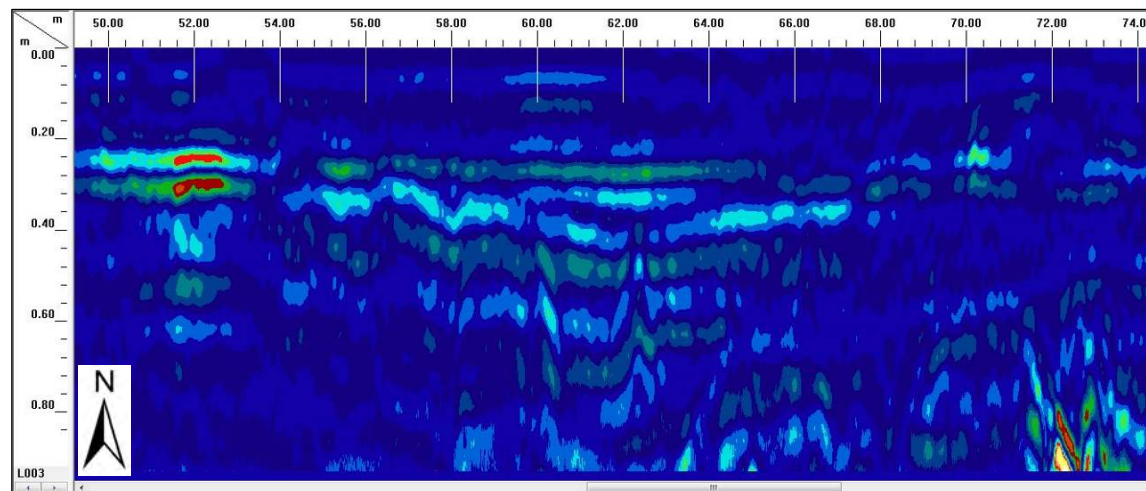


Figure 80. Typical example of GPR amplitude map.

significant depth. The 400 MHz provides a balance between other commercially available antennae, which are either limited to ranges that are too shallow (900 MHz, about one meter) or too deep (270 MHz, about 6 meters). The 400-Mhz antenna is designed for depths up to several meters while maintaining good vertical resolution. The shielding on the antenna prevents signals from directions other than the ground from interfering for the radar.

GPR data was processed in Radan 7.0 (GSSI) and GPR-Slice 7.0 (GAL, Inc.). Both allow for imaging of the radargrams and the creation of derived data forms. The specialized software can take the collected radargrams or reflection profiles, which are three-dimensional data with distance, depth (time), and signal strength, and interpolate the data into three-dimensional models and time-slice plan views called amplitude maps.

The GPS and GPR data were collected, analyzed, and prepared in a Navy-compatible Geographic Information System (GIS) geospatial data standard. The GIS data will serve as effective management tools to determine the location of rails before design plans are finalized and prior to the signing of construction contracts.

Prior to the collection of any data, all of the survey areas were subject to pedestrian survey in order to assess the appropriate methods and indications of railroad hardware within the surrounding area. Indications of land use history and subsurface utilities were noted. During this time, the GPR was calibrated for each survey area to ensure appropriate settings for each location.

The methods employed to collect GPR data varied on the basis of the conditions on the ground and project goals. Where possible and productive, data was collected in a grid survey pattern with one-meter intervals between transects. These grids were placed over projected locations of rails, with allowances made for cartographic error or inconsistency. Using survey tapes, the grid layouts were measured out and marked using chalk on pavement or survey paint on grass. Each grid had a local coordinate system for data collection. The corners of the grids were recorded using a handheld GPS unit.

The transects were arrayed across these grids, perpendicular to the direction of the historical alignment of rails within the area. The data within the grids was collected along linear transects. During this process, notes on the location and observations for each transect were recorded on standardized field forms. These forms include the local coordinates for the start and stop position of each transect.

In many instances, impediments to survey prevented the creation of formal GPR collection grids. Data collection of survey areas within storage areas, busy roads, active work areas, and parking lots were collected opportunistically. Beginning at an available open location, GPR data would be collected using transects or prospecting. In these instances the data was interpreted in the field.

Data readings consistent with potential rails were identified and marked in the field using chalk. Additional data was then collected on either side of the chalk-marked possible rail. This

processes continued iteratively until reaching either a location making data collection completely impractical or no additional rails were present in the data. In areas with limited surveyable space, this provided a means of characterizing the presence of rails in the field within accessible areas.

After marking in the chalk the extents of the rails on the basis of field GPR readings, the locations were recorded using GPS. This method proved an expedient means of detecting, visualizing, and mapping subsurface rails when formal GPR grids were impossible or impractical. This method required careful examination of the radargrams in the field in order to discriminate between rails and other subsurface anomalies, requiring repeat collection of the same area to confirm initial interpretation. Following review of the data and use of chalk to mark out any anomalies, further judgmentally transects were employed to better characterize the size and nature of the anomalies.

## E. Interview

SEARCH staff conducted two oral history interviews with an individual identified during the research phase of the project, and the interview subject was approved by the US Navy. Along with Navy, SEARCH worked with the staff of the Hawaiian Railway Society to identify potential oral history candidates and selected Mr. Jeff Livingston. The oral interview was conducted using the standards for collecting and preserving oral histories as described in the National Park Service *Handbook for Oral History* and treated with the requisite ethics and sensitivity. The oral interview was guided

by, but not restricted to, a specific set of questions developed to gather new information, fill-in gaps in the archival research and provide context for extant portions of the rail system.

The oral history interview was conducted on two separate occasions with Mr. Livingston, first at the Hawaiian Railway Society (HRS) and later on site at PHNSY during the fieldwork. The oral interview, at the HRS, was digitally recorded using a Sony PCMD-50 digital audio recorder. The second interview was conducted in a group setting with Mr. Livingston, Mr. Jeff Dodge, and SEARCH personnel on site at PHNSY. Because of the outdoor on-site location, digital recording was not used for the second interview. SEARCH recorded two sets of notes during the interview and scanned the notes.

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## 2.3: CRITERIA FOR NRHP EVALUATION

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The evaluation of the designed historic landscapes throughout the PHNSY & IMF was undertaken using the guidance provided in the following documents:

- *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation*<sup>236</sup>
- *National Register Bulletin 18: How to Evaluate and Nominate Designed Historic Landscapes*<sup>237</sup>

All of the guidance focuses on the identification and evaluation of properties to determine if they are eligible for listing in the NRHP. If a property is eligible for listing in the NRHP, any undertaking that may have an effect on that property is subject to compliance with Section 106 of the NHPA, and corresponding DoD regulations and instructions.

### A. National Register of Historic Places

The National Park Service (NPS) NRHP is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect America's historic and

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<sup>236</sup> United States Department of the Interior. *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation*. US Department of the Interior, National Park Service, Cultural Resources. US Government Printing Office, Washington, DC, 1998.

<sup>237</sup> United States Department of the Interior. *National Register Bulletin 30: Guidelines for Evaluating and Documenting Rural Historic Landscapes*. US Department of the Interior, National Park Service, Cultural Resources. US Government Printing Office, Washington, DC, n.d.

archeological resources. The identification of cultural resources originated with passage of the Historic Sites Act of 1906. Expansion of the list of historic properties was authorized by the National Historic Preservation Act of 1966, which authorized the Secretary of the Interior to “expand and maintain a National Register of districts, sites, buildings, structures, and objects significant in American history, architecture, engineering, and culture” (36 CFR 60.1).

For a property to qualify for listing in the NRHP, it must meet one of four criteria. It must be:

- A. Associated with events that have made a significant contribution to the broad patterns of our history; or
- B. Associated with the lives of persons significant in our past; or
- C. An embodiment of distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction; or
- D. A property that has yielded, or may be likely to yield, information important in prehistory or history.

In addition, the Criteria for Evaluation (36 CFR 60.4) list possession of integrity of location, design, setting, materials, workmanship, feeling, and association as necessary qualities of an NRHP property.

### ***i. National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation***

National Register Bulletin 15<sup>238</sup> sets out the process for determining if a property meets the NRHP criteria, and the criteria for determining if a property meets the standard of integrity of location, design, setting, materials, workmanship, feeling, and association. The evaluation of integrity focuses on whether or not the property conveys the purpose for which it was designed and developed.

### ***ii. National Register Bulletin 18: How to Evaluate and Nominate Designed Historic Landscapes***

National Register Bulletin 18<sup>239</sup> identifies the process of identifying components and contributing elements of a designed landscape within the PHNSY & IMF. It establishes the type of data expected in reviewing a historic landscape. The information gathered consists of a full range of data from property ownership through vegetation, including:

- Dates of design and construction
- Names of owners, landscape architects, designers, and administrators

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<sup>238</sup> United States Department of the Interior. *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation*. US Department of the Interior, National Park Service, Cultural Resources. US Government Printing Office, Washington, DC, 1998.

<sup>239</sup> United States Department of the Interior. *National Register Bulletin 30: Guidelines for Evaluating and Documenting Rural Historic Landscapes*. US Department of the Interior, National Park Service, Cultural Resources. US Government Printing Office, Washington, DC, n.d.

- Identification of construction techniques, methods, and plant materials
- Landscape style
- Existing and previous uses with the dates of these uses identified
- The acreage and existing boundaries of the original tract and any subsequent additions or reductions
- Existing topography and grading
- Natural features
- Land uses
- Circulation system of roads, paths, trails, etc.
- Spatial relationships and orientations such as symmetry, asymmetry, and axial alignment
- Views and vistas into and out of the landscape
- Vegetation by botanical name and common name with caliper for trees and heights for shrubs
- Landscape dividers such as walls, fences, and hedges
- Drainage and engineering structures
- Site furnishings and small-scale elements such as benches, planters, and urns
- Bodies of water such as pools, fountains, lakes, streams, and cascades
- Lighting, including actual fixtures such as street lights and lanterns, as well as the use of both natural and artificial lighting as design elements (e.g., intensity, color)
- Signs delineating entrances, street names, and other features
- Buildings such as houses, barns, dormitories, or hospitals that may be contained within the landscape
- Structures such as bridges, roads, and dams
- Sculpture and other works of art

## 2.4: RESULTS

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This section presents the results of the PHNSY historic map and photography analysis and fieldwork conducted at the naval shipyard. The historic map analysis found that the railway system was an integral part of the Shipyard's operation. The railway system alignment was changed, expanded, and reduced between 1909 and its eventual abandonment in 1954. The railway system consisted of narrow gauge, standard gauge, and dual gauge trackage as well as 28-foot gauge crane lines. Historic maps also show that the internal railway connected to the historic O. R. & L railway in two locations. By the time of its abandonment, the system contained two primary lines, along Avenue D and Central Avenue, with secondary lines and spurs located along Dry Docks 1-4, Repair Basins, East Quay, Avenues B-G, First Street, Fourth Street, Sixth Street and Seventh Street. Expansions also included lines within and between several facilities throughout the Shipyard.

Based on the historic map and photography analysis, SEARCH conducted a pedestrian and GPR survey of 20 predetermined areas located within the PHNSY & IMF, totaling 17.12 acres. Additional areas were tested outside of these areas based on field observations of extant rails, georeferenced historic maps, and available access.

### A. Historic Map and Photography Analysis

The historic context of this report and review of the historic railroad maps and photographs found that the historic railway

system was integral in the development of the Pearl Harbor Navy Shipyard between 1901 and 1954. Early construction of the shipyard required temporary rails to support excavation and hauling activities. Prior to 1901, Oahu's rail system consisted of a narrow gauge system, constructed by the O. R. & L. Company. In order to utilize the established island network, the US Navy had to adopt the narrow gauge standard within the Naval Reservation. By 1908, O. R. & L. established a link to the narrow gauge network by supplying a rail line outside of the Naval Reservation boundary. The line was an extension of the established Puuloa track.

The spur was built to tie in with the railway construction plans developed by the Navy. Temporary lines were laid along Avenue D, from the boundary line to the developing administrative and industrial complex on First Street, to the east. The Navy purchased local *ohi'a* wood for the railroad ties and a single locomotive, several dump cars, and boxcars. The 25-ton engine and a supply of cars arrived in 1909, riding on 2 miles of track<sup>240</sup>.

Expansion of the naval yard continued with the construction of shops, storehouses, and other industrial buildings near Dry Dock 1. O. R. & L trains provided material near the waterfront. By 1911, workers began grading the roadbeds around the dry dock and adjacent industrial structures in preparation for the installation of permanent rail lines<sup>241</sup>. The first permanent line was installed by 1912 along Avenue D and looped around the industrial complex before heading down

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<sup>240</sup> Livingston, *Oahu's Narrow-Gauge Navy Rail*, 7-9

<sup>241</sup> "Railroads for Pearl Harbor," *Evening Bulletin*, November 10, 1911

Avenue E, leading to the First Street track merge. Several spurs near the dry dock lead to Building 3 (Machine Shop), Building 5 (Forge Shop), Building 6 (Foundry), Building 7 (Woodworking Shop), and Building 8 (Power House)<sup>242</sup>.

A second set of tracks was laid in the southeast of the Naval Reservation during the construction of the Coaling Plant and Coaling Wharf. While the Coaling Plant was planned to feature overhead standard gauge lines, narrow gauge track was constructed along the southeastern side of the facility and serviced the wharf<sup>243</sup>. Not depicted on the 1912 historic map, the line connected with a temporary track paralleling Central Avenue<sup>244</sup> towards the Marine Officers Quarters on Avenue E. The railway system was fully functional in 1914.

The Navy increased its locomotive inventory through the acquisition of standard gauge locomotives #3, #4, #5, and dump cars. Narrow gauge acquisitions included locomotive cranes that worked along the permanent tracks on First Street. The cranes were used to aid with the construction of

several support facilities<sup>245</sup>. In 1915, a railroad scale was installed along Avenue D.

Expansion of the permanent railway ceased for the next three years. Temporary track was laid near Dry Dock 1, alongside the Naval Hospital construction site, and to the Torpedo Boat Piers. Locomotive cranes also utilized temporary tracking for the construction of the reservoir, Pattern Shop, and Boat Storehouse. After the completion of Dry Dock 1, expansion of the railway system resumed.

The Naval Station was well developed by 1919<sup>246</sup>. The rail system had expanded outside of the industrial and Dry Dock area to include access to the Torpedo Boat Piers, to the northeast, and the Coaling Plant, to the southwest. Permanent rails within the industrial Area were realigned so that tracks either went through or were adjacent to the major industrial buildings. Three tracks were added around the length of Dry Dock 1, connecting to tracks leading to the Dry Dock Plant. The Avenue D line loop was replaced with a merge to the permanent Central Avenue line. The Central Avenue line replaced the Fourth Street track merge, linking with the Avenue D line south of the newly constructed Officers Quarters. The 1919 map shows triple tracks leading to the 10-10 Wharf, with a single line extending northeast to

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<sup>242</sup> United States Navy. US Naval Station Pearl Harbor, Territory of Hawaii: Plan of Improvements. Map. August 1912. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

<sup>243</sup> United States Navy. US Naval Station Pearl Harbor, Territory of Hawaii: Plan of Improvements. Map. August 1912. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

<sup>244</sup> United States Navy. US Naval Station Pearl Harbor, Territory of Hawaii: Plan of Improvements. Map. August 1912. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

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<sup>245</sup> Livingston, *Oahu's Narrow-Gauge Navy Rail*, 7-9

<sup>246</sup> Bureau of Yards and Docks, US Naval Station Pearl Harbor T.H. Map of Yard, map 1400-3-54. Record Group 71: Bureau of Yards and Docks (National Archives and Records Administration, College Park, Maryland, 30 June 1919).

each of the Torpedo Boat Piers. A Marine Railway was installed west of the Torpedo Boat Piers.

To the southwest, tracks adjacent to the Coaling Plant were linked to the Central Avenue line. By this time, the Coaling Plant was fully operational and serviced the wharf. Several additional lines ended in open fields, north of Central Avenue, in preparation for future development. A second railway entrance opened south of the Fuel Tank Farm, crossing South Avenue on its way to the Industrial Area. The rail system alignment remained the same throughout the 1920s; a 1926 map shows the removal of the Dry Dock Plant line and two rails along the 10-10 Wharf. By 1927, the Naval Yard railway system contained 10.5 miles of narrow gauge and 2.5 miles of standard gauge, confined to the interior of the Coaling Plant, rail lines.

Between 1927 and 1938, narrow gauge rail line increased to 14.5 miles within Pearl Harbor Naval<sup>247</sup>. The extra track was laid parallel to the Fuel Tank Farm, adjacent to the Coaling Plant. Increase in railroad equipment began in 1938 with the addition of standard gauge locomotive cranes and increasing stock of narrow gauge cranes. Narrow gauge lines were extended around the rim of the two Repair Basins and the East Quay Substation. Dual gauge rail lines were added around Dry Dock 1<sup>248</sup>, but did not extend past Building 5 on First Street. A 13-ton Pintle Crane Track was added on Pier No. 1. Geopolitical tensions prior to World War II led the Navy to develop a nationwide construction program.

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<sup>247</sup> *Bureau of Yards and Docks*, Public Works of the Navy Data Book, 1938.

<sup>248</sup> *Rodriggs*, "We Remember Pearl Harbor, 43-45.

Naval appropriations in 1939 allowed for the construction of Dry Docks 2 and 3 as well as associate power plants, shops, storehouses, piers, wharves, and administrative buildings. In 1941<sup>249</sup>, to assist the expansion of port facilities, two spurs off the Central Avenue line were built, heading north into the Contractors Operating Area. Expansion of the Central Avenue line continued with spurs heading east, from the intersection of Central Avenue and Fourth Street, to the southern elevations of Buildings 158 and 159. Additionally, lines surrounding the Anchor & Chain Storage area were expanded to include parallel tracks. Reduction of the Coaling Plant occurred over the next year to accommodate the construction of Dry Dock 4. The realignment now included a line from the Loading Bin, south of the Coaling Wall, to connect to the Central Avenue line, via the west side of the Fuel Tank Farm.

The Japanese attack on Pearl Harbor was the catalyst for rapid expansion on the naval railway. While the attack damaged the infrastructure of Pearl Harbor, the railroad was operational shortly after the attack. Locomotive cranes were used around the shipping docks and repair basins to load debris onto nearby naval vessels. The war effort shortly outpaced the capacity of the internal Naval Yard railway and the O. R. & L. railroad stock. Rapid expansion naval facilities and rails occurred between 1942 and 1943.

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<sup>249</sup> Bureau of Yards and Docks, Navy Yard Pearl Harbor, T.H, map 1400-3-106. Record Group 71: Records of the Bureau of Yards and Docks (National Archives and Records Administration, College Park, Maryland, June 30, 1941).

Completion of Dry Docks 2 and 3 included constructing parallel narrow and dual gauge lines around the dock rims. The tracks included several switches to move locomotive cranes between docks. Dual gauge rail was never expanded past its 1938<sup>250</sup> alignment along First Street. Expansion of Southeast Loch Wharf connected the three Repair Basin Lines with the existing and proposed Ferry Slips to the east. The lines also serviced Docks 22-24. Minor alterations of the line occurred around Dry Dock 1 and included the extension of narrow gauge track to pass through Building 157, connecting Sixth Street with the dry dock lines.

Further changes to the railway system included the removal of standard gauge track and overhead railway lines at the Coaling plant. The narrow gauge line was realigned to merge with the Central Avenue line from the west side of the Fuel Tank Farm. The Central Avenue spurs, linking Buildings 158 and 159, were also expanded to service the newly constructed Buildings 165 and 166. These tracks extended northeast along South Street and connected with the Avenue D line, leading to the Main Gate.

By the end of 1943, construction of the Transportation Shop (Building 58) was complete. Building 58 is located along Central Avenue and served as the railroad maintenance facility. A junction line was installed on the north side of Central Avenue, allowing serviced cars and engines to return

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<sup>250</sup> United States Navy. Navy Yard Pearl Harbor, Territory of Hawaii: 14<sup>th</sup> Naval District Showing Conditions on June 30, 1938. Map. 30 June 1938. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

to service. The junction line contained 11 spurs that corresponded to the 11 open bays on the east side of Building 58. The 1943 rail layout map<sup>251</sup> shows two additional planned spurs within Avenue G; however, these rails were either temporary or never built, as they do not show up on any subsequent maps.

Completion of Dry Dock 4 in the same year brought with it an extension of the narrow and dual gauge rail lines. The tracks extended from the west side of Dry Dock 3, south along Third Street. A narrow gauge spur was also added along Avenue H, connecting the Dry Dock 4 tracks with the Central Avenue Track to the east. While the majority of the remaining railway system remained the same, 28-foot gauge non-locomotive crane lines were installed around the rim of Dry Dock 1. The crane rails expanded to include the remaining dry docks in 1944 and 1945.

Several changes to the railway system alignment occurred in 1945<sup>252</sup>. Expansion of the shipyard west of the floating dock included the construction of Marine Railway No. 2. The dual gauge rail connecting the dry docks was extended to intersect with the marine railway. Rail lines servicing Piers No. 1 and No. 2 were removed during the construction of a third repair

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<sup>251</sup> Bureau of Yards and Docks, Navy Yard Pearl Harbor, T.H, map 1400-3-106. Record Group 71: Records of the Bureau of Yards and Docks (National Archives and Records Administration, College Park, Maryland, June 30, 1943).

<sup>252</sup> United States Navy. Naval Shipyard, Marine Reservation, Submarine Base, and Naval Supply Depot Showing Conditions as of June 30, 1945. Map. 30 June 1945. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

basin. Interconnected crane rails were installed around all three basins. Narrow gauge lines along Avenue G were expanded along the southern edge of the new basin and 10-10 Slip. The line created a loop around Buildings 129 and 211. The East Quay tracks were extended eastward into Merry Loch.

East of the Anchor & Chain Storage area, Buildings 39 and 39A were completed. Two spurs were added to the Central Avenue line, southeast of the Avenue D track merge. The western spur entered into the eastern garage of Building 39 while, the eastern spur was adjacent to the western wall. Nearby, a second parallel track was added along the southern sides on Building 159 and 166.

Tracks along Central Avenue were realigned at Avenue E, Fourth Street, and Sixth Street. Three parallel lines were added in the former lumber yard, adjacent to Avenue E. Realignment of Sixth Street and removal of fuel tanks from the nearby Tank Farm included seven parallel branches that would service a future supply area. Three partial lines were added on the Central Avenue line, west of Fourth Street and east of Fuel Tank 8, to facilitate a future bridge gantry.

Modifications to the railway system also included removal of track within the naval yard. Along Avenue D, the rail lines servicing Buildings 27, 66, 69, and 90 were severed in the middle of the avenue and removed. Two Central Avenue spurs crossing Seventh Street were also removed. Remnants of the lines were left intact on the western elevation of Buildings 7 and 12.

Following Japanese surrender in 1945, the shipyard operations slowed and railway system usage decreased in favor of truck transport<sup>253</sup>. Public works reported that the internal railway consisted 13.8 miles of narrow gauge and 2.1 miles of standard gauge track within the shipyard<sup>254</sup>. The report also stated that non-locomotive crane lines encircled the Dry Docks. In the late 1940s, the Navy divested itself of most of its rolling stock<sup>255</sup>. The Navy disposed of the steam locomotives but redistributed the diesel locomotives between the Shipyard, West Loch, and Lualualei. The remaining standard gauge lines were removed from the Shipyard<sup>256</sup>. Narrow gauge and crane rails in the shipyard were maintained but no additions were made, except for the Bridge Gantry No. 1 parallel lines, constructed between 1945<sup>257</sup> and 1951<sup>258</sup>.

The railway system saw a resurgence during the Korean War (1950–1953). Truck transportation could not keep up with

<sup>253</sup> Livingston, "Navy Narrow Gauge at Pearl Harbor."

<sup>254</sup> Bureau of Yards and Docks, "Public Works of the Navy Data Book: General Information," 1947, Hawaiian Railway Society, 1018.

<sup>255</sup> Bureau of Yards and Docks, "Public Works of the Navy Data Book: General Information," 1018.

<sup>256</sup> Navy property card for railroad trackage at Pearl Harbor Naval Shipyard. Record Group 11.2.3: NAVFAC Historians Office, Navy General Reference Files, 14<sup>th</sup> Naval District. Box 74.

<sup>257</sup> United States Navy. Naval Shipyard, Marine Reservation, Submarine Base, and Naval Supply Depot Showing Conditions as of June 30, 1945. Map. 30 June 1945. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland

<sup>258</sup> United States Navy. Map of Pearl Harbor Naval Shipyard, Shipyard Annex Bishop Point, Shipyard Annex Waipio Peninsula Showing Conditions as of 30 June 1951. 30 June 1951. Seabee Museum Archives, Port Hueneme, California.



war-time demand, so the Navy reactivated the railway. Narrow gauge diesel locomotives and flat cars were renovated and the existing rail line was upgraded. According to the 1951 railway map<sup>259</sup>, the rail alignment did not change from the 1945 alignment. With the conclusion of the Korean War, the Navy continued to sell off its rail stock. By 1954, the railway system was inactive and the narrow gauge tracks were abandoned in place. The remaining boxcars, flat cars, and gondolas were sold at auction in 1959 to a scrapper.

The development of the shipyard has continued since the time of railway abandonment. Only the 28-foot gauge crane lines are active along the Dry Docks and Repair Basins. Due to continued construction activity and utility upgrades, portions of the railway system tracks have been removed or repurposed. Based on the historical data, SEARCH conducted a pedestrian and GPR survey of 20 survey areas to locate extant portions of the railway system.

## B. Pedestrian and GPR Survey

SEARCH conducted a pedestrian and GPR survey of 20 predetermined areas located within the PHNSY & IMF, totaling 17.12 acres (**Figure 81**). Discretionary testing occurred outside of these areas based on field observations of extant rails, georeferenced historic maps, and available access. As a result of the identification of extant surface rails and GPR

<sup>259</sup> United States Navy. Map of Pearl Harbor Naval Shipyard, Shipyard Annex Bishop Point, Shipyard Annex Waipio Peninsula Showing Conditions as of 30 June 1951. 30 June 1951. Seabee Museum Archives, Port Hueneme, California.

survey, SEARCH located 92 extant surface and subsurface features, totaling 6,473.31 meters of surface rail lines and 1,746.93 meters of subsurface lines, within the PHNSY & IMF. Additional resources recorded in the field included the extant remains of the coaling plant walls, the transportation building (Building 58), and support pilings of the early gantry crane. All rail lines, surface or subsurface, and features were recorded using GPS.

### i. Survey Area 1

Survey Area 1 is a 1.58 acre area located west of Lake Erie Street (formerly Sixth Street) within the field that abuts the former Coaling Station wall (**Figures 82 and 83**). The eastern edge of the survey area featured a culvert and three street lights, fed by an underground electric utility line. From the street, the field sloped up towards the wall and was covered in grass. The northeastern portion of the area contained an electric utility box and sloped down towards the adjacent parking lot. One extant rail was located within the parking lot (**Table 4**). The extant rail was previously paved over with asphalt and portions were exposed due to deterioration of the asphalt.

**Table 4. Survey Area 1 Extant Features.**

Feature	Length (m)	Type
1.1	59.03	Surface

Review of historic maps indicated that up to three lines dating between 1912 and 1954 were located within the survey area. The original alignment was constructed in 1912 along the



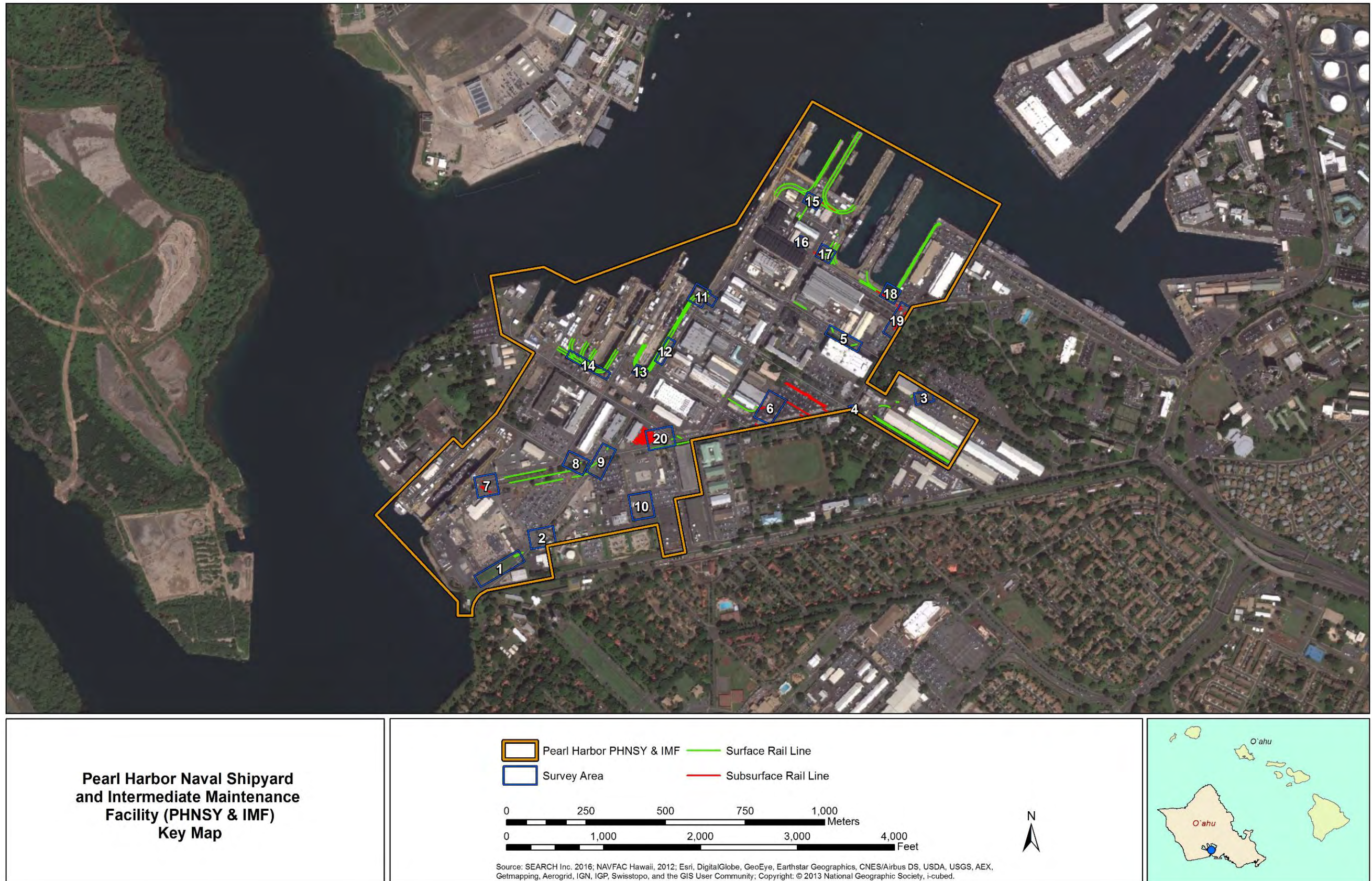


Figure 81. Key map of the Pedestrian and GPR Survey and Results.



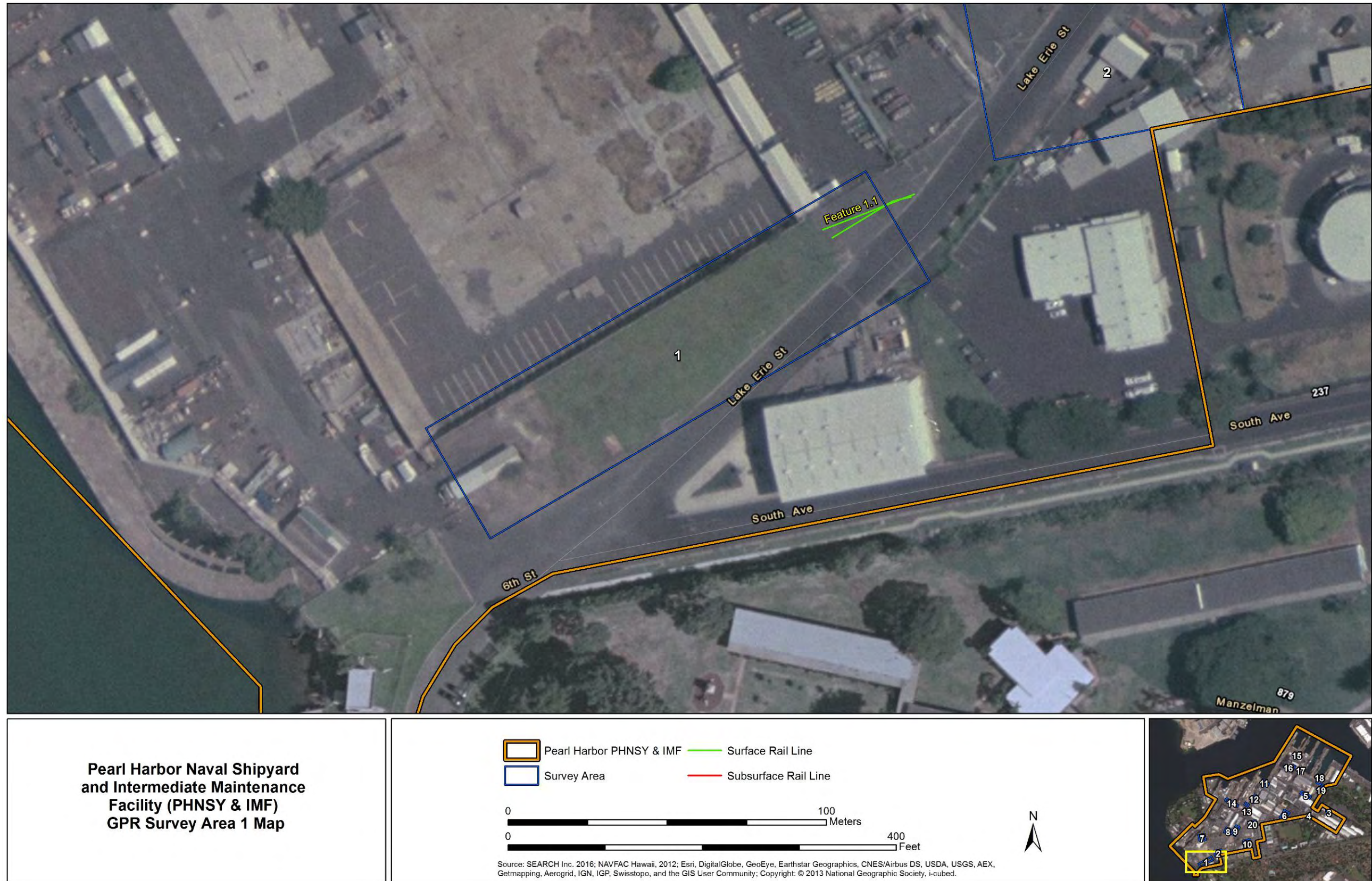


Figure 82. Map of Survey Area 1 (Former coaling Station Enclosure) and Results.





Figure 83. Survey Area 1, looking west.

south wall of the Coaling Plant (**Figure 84**). The line consisted of narrow gauge rails and serviced the nearby Coaling Wharf. A Loading Bin was added to the alignment in 1934, along with two parallel lines. Operation of the lines was scaled back by 1941, as a result of the dismantling of the Coaling Plant. The earlier rail alignments were reduced and realigned, terminating on the northern side of the Loading Bin, rather than continuing to the wharf. The tracks were still used into the 1950s to service the Salvage Yard, located on the former Coaling Plant site<sup>260</sup>.

<sup>260</sup> United States Navy. Map of Pearl Harbor Naval Shipyard, Shipyard Annex Bishop Point, Shipyard Annex Waipio Peninsula Showing Conditions as of 30 June 1951. 30 June 1951. Seabee Museum Archives, Port Hueneme, California.

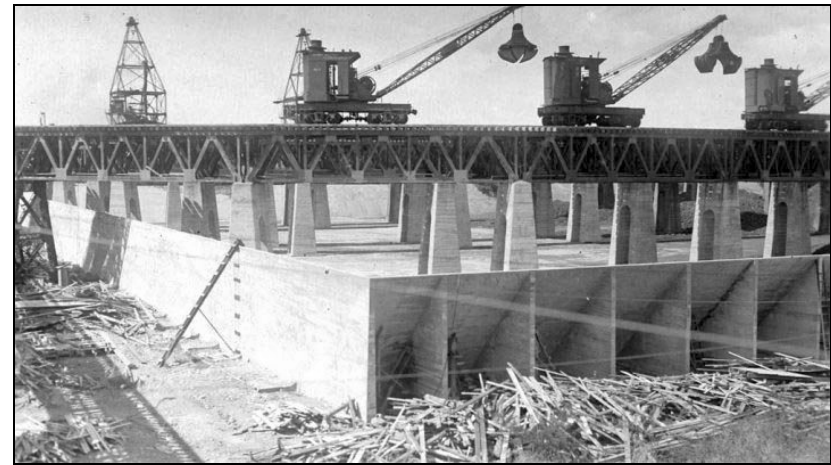


Figure 84. Undated Photograph of Coaling Construction, looking southwest.

The GPR survey was placed south of the former Coaling Station wall to determine the presence or absence of the three pre-existing tracks. The survey consisted of grid collection blocks, set at one-meter intervals. The grid encompassed the entire grass field. The borders of the grid were defined by the Lake Erie Street culvert, the wall of the former Coaling Station, and the edges of the predefined Survey Area. GPR data collection revealed several utilities in the area but the grass field lacked evidence of rails. Two rails surface extant rails were located within the northeastern portion of the grid. GPR data indicated that the rails were cut at the border of the parking lot and grass field, just under the asphalt (**Figure 85**).

From the grass field, the tracks (Feature 1.1) merged into a single line. Visible portions of the rail line terminated ending at the Lake Erie Street culvert (**Figure 86**). SEARCH performed

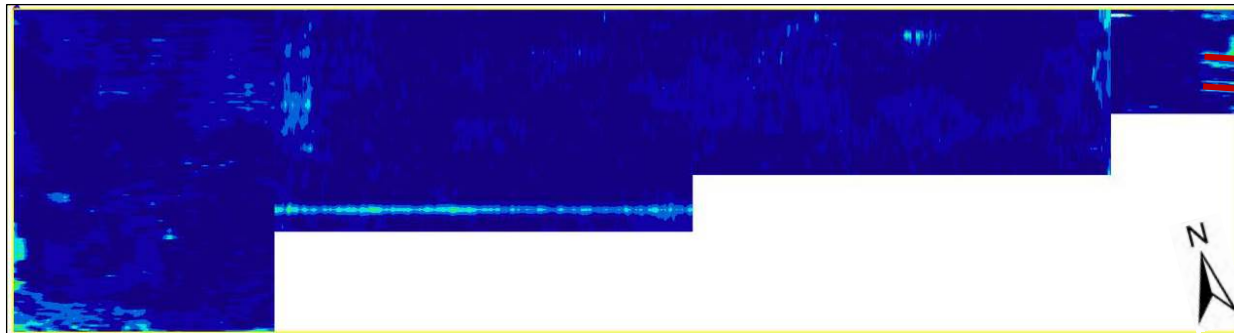


Figure 85. Amplitude map of the survey grids collected in Survey Area 1. Rails are evident on the far right edge of the data.



Figure 86. Feature 1.1, looking west.

an informal GPR survey, consisting of transects, between Areas 1 and 2 and within Lake Erie Street, where a formal grid was impractical, to determine if additional rails segments were present. The individual radargrams and interpolated amplitude maps were reviewed for any signals consistent with rails; however, the GPR data provided evidence of various utilities and soil disturbances within this area.

Feature 1.1 consisted of a single track that split into two rail lines historically paralleling the coaling plant's southern wall. The feature is consistent with a realigned spur, off the Sixth Street right-of-way, shown on the 1941 map<sup>261</sup>, terminating at the Loading Bin. Neither the third rail line nor the 1912 track were located within the survey area. It is unclear when the narrow gauge rails were cut and removed; however, a review of aerial photography indicates this area had standing structures as recent as 2000. The GPR data also provided evidence of the various utilities and disturbances installed within this area.

### ii. Survey Area 2

Survey Area 2 (**Figures 87 and 88**) is a 1.51-acre area located 40 meters northeast of Survey Area 1. The survey area encompassed a portion of Lake Erie Street (formerly Sixth

<sup>261</sup> United States Navy. Navy Yard Pearl Harbor, Territory of Hawaii: 14<sup>th</sup> Naval District Showing Conditions on June 30, 1941. Map. 30 June 1941. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.



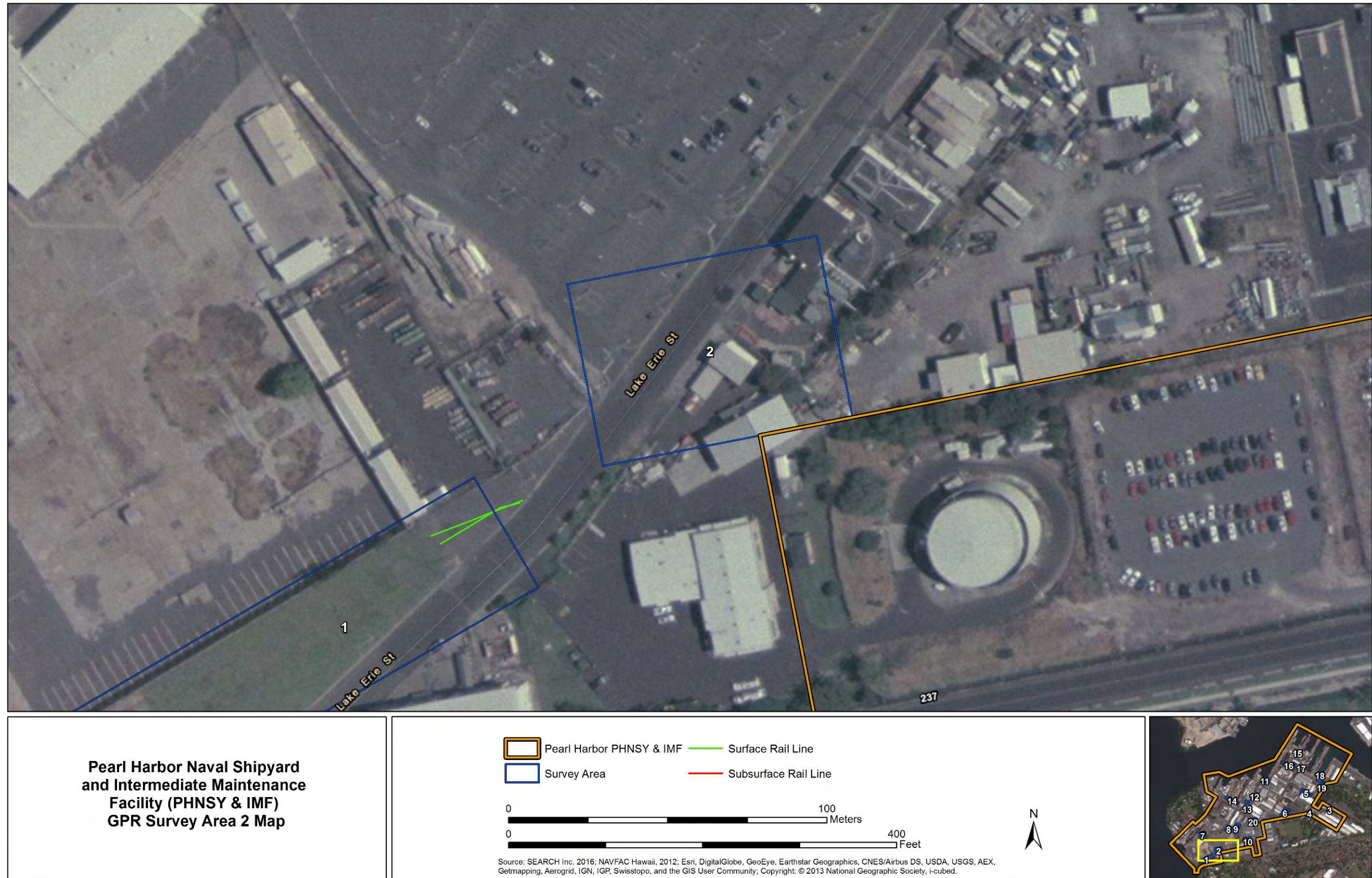


Figure 87. Map of Survey Area 2 (Former B-97 Engine-House Site) and Results.

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Figure 88. Survey Area 2, looking south down Lake Erie Street.

Street) and parking lot, to the west. The eastern and southeastern portions were located within an inaccessible fenced compound. Inspection of the roadway located evidence of utility trenches as well as a sewer manhole and open metal drain grates. The eastern edge of the roadway was landscaped with hibiscus shrubs and plumeria trees. Within the landscaped area were water and electrical utility hand holes. The survey found no extant rails within the survey area.

Historic maps indicated that up to six lines were located within the survey area. The line was originally constructed in 1912 as a single narrow gauge track. The track was unaltered until

1945<sup>262</sup> when five parallel lines were installed within Sixth Street. The westernmost track was realigned in 1945 to continue southwest along Sixth Street. A spur connected the Coaling Plant and Feature 1.1 with the Sixth Street line and it remained operational until the system was abandoned in 1954<sup>263</sup>.

A formal GPR collection grid was constructed encompassing the southern corner of Survey Area 2 and the projected location of rails beneath the road. The remainder of the survey area either fell within the inaccessible areas or was not near projected rail locations. GPR data provided evidence of multiple sub-surface utilities and homogenous fill (**Figure 89**). The recorded utilities correspond with the manholes and control boxes noted on the surface. The most pronounced anomaly seen in the data is the lack of dielectric change within a zone that crosses the grid diagonally. This homogenous zone documented in the GPR could be a uniform fill.

The homogeneity stands in contrast to the stochastic signal from across the grid. The anomalous zone seen in the amplitude map corresponds with the historic alignment of rails, indicating they were removed during a construction

<sup>262</sup> United States Navy. Naval Shipyard, Marine Reservation, Submarine Base, and Naval Supply Depot Showing Conditions as of June 30, 1945. Map. 30 June 1945. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

<sup>263</sup> United States Navy. Map of Pearl Harbor Naval Shipyard, Shipyard Annex Bishop Point, Shipyard Annex Waipio Peninsula Showing Conditions as of 30 June 1951. 30 June 1951. Seabee Museum Archives, Port Hueneme, California.

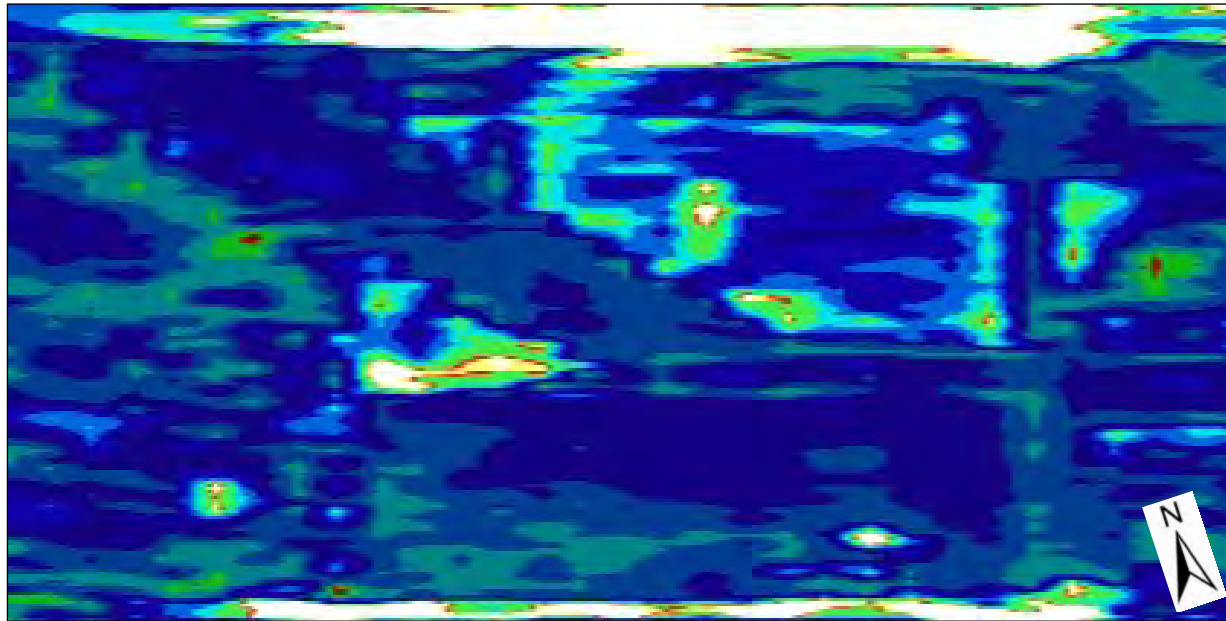


Figure 89. Amplitude map of the grid data collected Survey Area 2.

event. No evidence of rails was encountered within Survey Area 2.

### **iii. Survey Area 3**

Survey Area 3 is a 0.46-acre area located at the intersection of Central Avenue and Avenue D, between Buildings 39 and 158 (**Figures 90 and 91**). The survey area is located within an existing parking lot. The northeastern boundary terminates at the sidewalk lined with palm trees while the southwestern boundary terminates at the Building 158 fence line. The parking lot features several plantings and street lamps, fed by an underground electric utility. The parking lot slopes inward,

from the north and south sides, towards the storm water grates located in the middle parking lot row. Formal GPR survey found no extant lines within the survey area; however, seven extant visible features were found in the adjacent area (**Table 5**).

Review of historic data indicated up to four lines were located within the survey area. Historically, the survey area is located along Avenue D, which was the main line in 1912 and linked Pearl Harbor with the outside O. R. & L. line. The Central Avenue line was added in 1919, running through the middle of



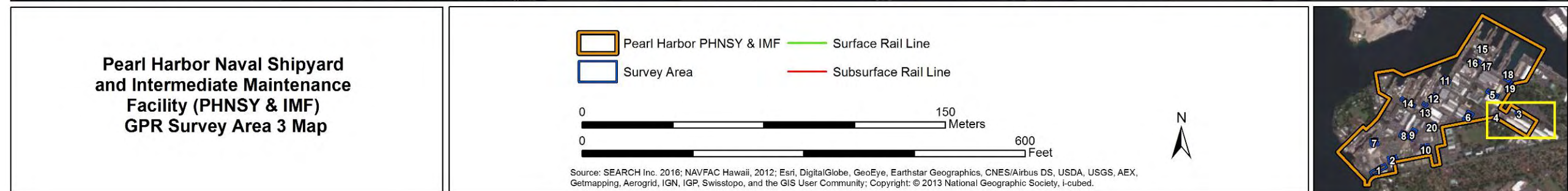


Figure 90. Map of Survey Area 3 (Former Navy Yard Store Houses) and Results.



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**Figure 91. Survey Area 3, looking west at east elevation of Fac. 39, Heavy Storage.**

**Table 5. Survey Area 3 Extant Features.**

Feature	Length (m)	Type
3.1	10.87	Surface
3.2	4.76	Surface
3.3	9.03	Surface
3.4	38.56	Surface
3.5	177.31	Surface
3.6	296.48	Surface
3.7	277.62	Surface

the current survey area<sup>264</sup>. Two secondary lines were added in 1934 to service the Anchor & Chain Park, south of Avenue D. Development remained stagnant in this area until 1941, when

<sup>264</sup> United States Navy. US Naval Station Pearl Harbor, Territory of Hawaii: Map of Yard. Map. 30 June 1919. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

a parallel track was placed along the Central Avenue line<sup>265</sup>. The surrounding area saw rapid development between 1941 and 1945. South of Survey Area 3, Buildings 158 and 159 were constructed. Each building included a rail line on the southern elevation. In 1942, these lines were extended east to service the newly constructed Buildings 165 and 166<sup>266</sup>. In 1945, Buildings 39 and 39A were built. The southeastern side of Building 39 included a rollup bay door to allow rail cars to pass through the building, connecting with the Avenue D line<sup>267</sup>.

A GPR grid, set at one-meter intervals, was constructed in the survey area. Based on historic research, SEARCH extended the grid east to encompass the entire parking lot as well as the grass area and sidewalk along Avenue D. All survey areas were linked via a single coordinate system, along all of the data from Survey Area 3 to be analyzed together (**Figure 92**).

Data collected within Survey Area 3 indicates the presence of a utility trench within the historic rail alignments. Two linear anomalies, in the northeastern portion of the survey area,

<sup>265</sup> United States Navy. Navy Yard Pearl Harbor, Territory of Hawaii: 14<sup>th</sup> Naval District Showing Conditions on June 30, 1941. Map. 30 June 1941. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

<sup>266</sup> United States Navy. Navy Yard Pearl Harbor, Territory of Hawaii: 14<sup>th</sup> Naval District Showing Conditions on June 30, 1941. Map. 30 June 1942. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

<sup>267</sup> United States Navy. Naval Shipyard, Marine Reservation, Submarine Base, and Naval Supply Depot Showing Conditions as of June 30, 1945. Map. 30 June 1945. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

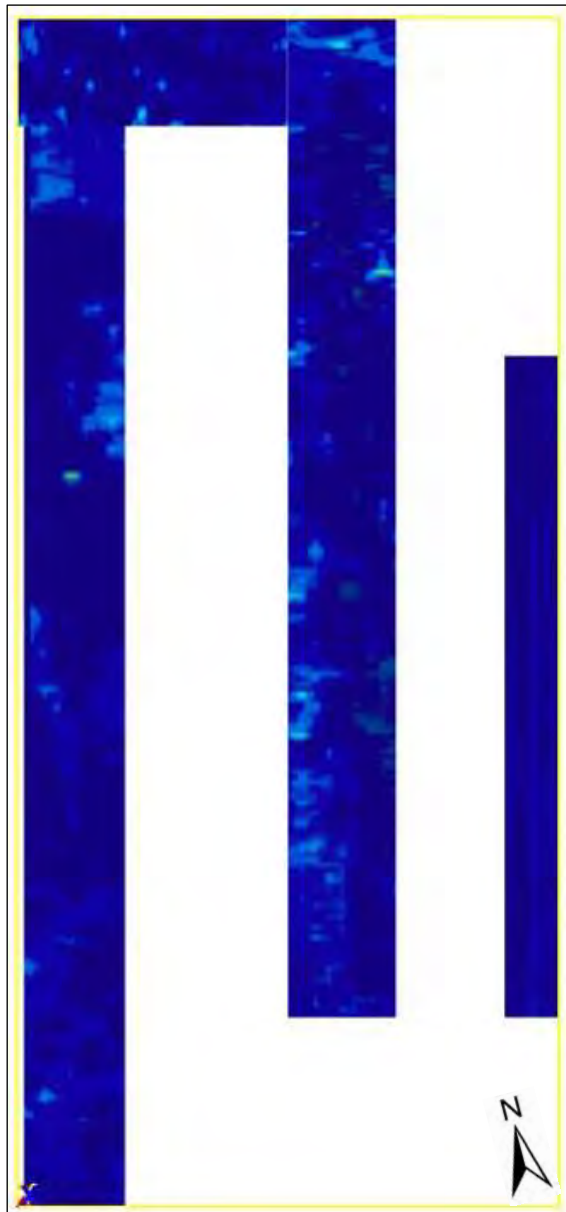


Figure 92. Amplitude map of Survey Area 3 grid.

were noted as possible rails in the field; however, during post-processing the anomalies did not correspond with the historic rail alignments. The linear anomalies are straight, and rails in this area should be turning towards the southeast. The amplitude map of the data shows no anomalies consistent with rails. The rails were most-likely removed during utility installation.

During a pedestrian survey of the adjacent area, SEARCH located several extant surface rails. Tracks were located on the northeastern (Feature 3.1) and southeastern (Feature 3.2) corners of Building 39. Feature 3.1 (Figure 93) was on top of Avenue D's southern sidewalk. Feature 3.2 (Figure 94) was located within a deteriorating portion of asphalt and aligned



Figure 93. Feature 3.1, looking northwest down Paul Hamilton Avenue.





Figure 94. Feature 3.2, looking north toward Fac. 39.



Figure 95. Feature 3.5, looking northwest between Fac. 159 and Fac. 158.

with the tracks inside Building 39. Located southwest of Feature 3.2 is another exposed track (Feature 3.3) (Figure 95) along the same alignment.

SEARCH located four additional extant surface rail line segments south of the survey area, near Buildings 158 and 159. Feature 3.4 is a curvilinear track aligning with Feature 3.5, located along the southern side of Building 158. Two parallel tracks (Features 3.6 and 3.7) (Figure 96) were located on the south side of Building 159. The latter three features did not extend past the eastern wall of these buildings, as indicated on the historic maps between 1942 and 1951. All the extant lines were visibly cut on the surface.

SEARCH performed an informal GPR survey on each end of the extant rails, where a formal grid was impractical, to determine



Figure 96. Feature 3.6 and 3.7 looking northwest along south elevation of Fac. 159.

if additional rails segments were present. The individual radargrams and interpolated amplitude maps were reviewed for any signals consistent with rails; however, the GPR data showed no evidence of additional subsurface rails.

The extant rail sections located in this area was consistent with the narrow gauge rail used throughout PHNSY & IMF. The rail segments consisted of a single tracks located along Central Avenue, Avenue D, and adjacent to Buildings 158 and 159, connecting the Central Avenue lines with South Street.

Feature 3.1 is a single track consistent with the Avenue D line right-of-way, shown on historic maps between 1912 and 1954. Feature 3.2 and 3.3 are remnants of the 1945 parallel Central Avenue line that guided locomotives into Building 39. Features 3.4, 3.5, and 3.6 are extant tracks developed in 1941 as spurs off the Central Avenue line<sup>268</sup>. Features 3.4 and 3.5 are aligned tracks located on the south side of Building 158. Feature 3.6 is located on the southern side of Building 159. Feature 3.7 was designed as a parallel track along Building 159 in 1945<sup>269</sup>. It is unclear when the narrow gauge rails were cut and removed; however, GPR data and the pedestrian survey provide evidence of the various utilities and disturbances located within this area.

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<sup>268</sup> United States Navy. Navy Yard Pearl Harbor, Territory of Hawaii: 14<sup>th</sup> Naval District Showing Conditions on June 30, 1941. Map. 30 June 1941. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

<sup>269</sup> United States Navy. Naval Shipyard, Marine Reservation, Submarine Base, and Naval Supply Depot Showing Conditions as of June 30, 1945. Map. 30 June 1945. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

#### **iv. Survey Area 4**

Survey Area 4 is 0.11-acre area located at the intersection of Central Avenue, Russell Avenue, and Safeguard Street (**Figures 97 and 98**). The survey area was located within the crosswalks along Russell Avenue and Safeguard Street and the sidewalk. The roadway contained evidence of utility trenches as well as a sewer manhole and storm drains. Extant rails were not found within this survey area.

The survey area is located within the historic intersection of Fourth Street and Avenue E. An early 1912 rail line was located along Avenue E, cutting across Fourth Street before intersecting with the Avenue D line<sup>270</sup>. The line was removed sometime between 1912 and 1919 when the Central Avenue line was installed. The railway within the survey area was realigned again in 1938 and 1945. The 1945<sup>271</sup> and 1951<sup>272</sup> historic maps indicated two parallel tracks within the survey area.

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<sup>270</sup> United States Navy. US Naval Station Pearl Harbor, Territory of Hawaii: Plan of Improvements. Map. August 1912. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

<sup>271</sup> United States Navy. Naval Shipyard, Marine Reservation, Submarine Base, and Naval Supply Depot Showing Conditions as of June 30, 1945. Map. 30 June 1945. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

<sup>272</sup> United States Navy. Map of Pearl Harbor Naval Shipyard, Shipyard Annex Bishop Point, Shipyard Annex Waipio Peninsula Showing Conditions as of 30 June 1951. 30 June 1951. Seabee Museum Archives, Port Hueneme, California.



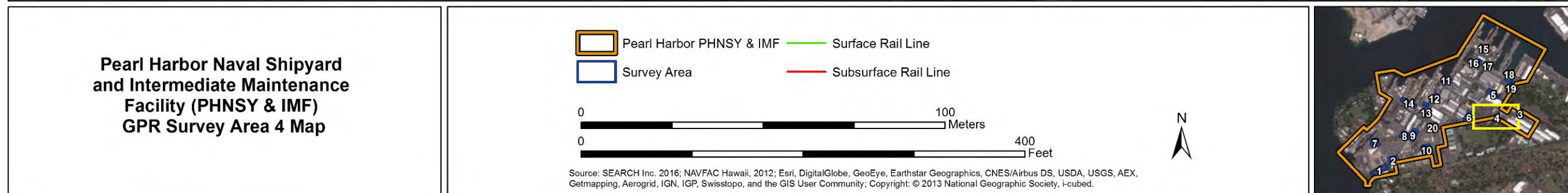


Figure 97. Map of Survey Area 4 (Former Avenue "D"[Russell Ave.]) and Results.



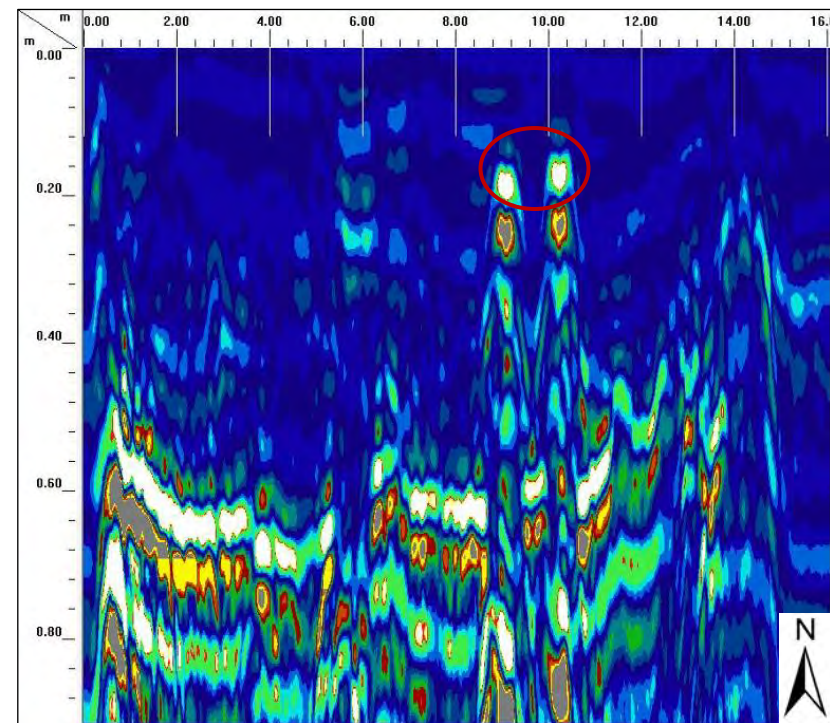
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**Figure 98.** Survey Area 4, looking southeast at intersection of Russell Avenue. Central Avenue is to the right and Safeguard Street is to the left.

Survey Area 4 proved to be a very active intersection. The constant flow of traffic made construction of a formal survey grid impossible. As an alternative, individual transects were set on either side of the intersection and collected. Anomalies visible in the data were georeferenced and compared to historic rail locations. Locate markings indicated the area was densely populated with subsurface utilities.

The individual transects do not allow for the ready creation of amplitude maps to visualize the data in plan view, but still provide radargrams allowing for analysis of reflections consistent with buried rails (**Figure 99**). The radargram indicated a possible rail remnant between the GPR transect points 4.3a and 4.3b. The points correspond to the historic maps showing the Central Avenue line between 1945 and



**Figure 99.** Radargram from Survey Area 4 showing two anomalous reflections.

1951; however, the data was inconclusive as additional sections of the rail line were not observed and the two points were directly adjacent to marked utilities. Most likely, the rails in the intersection were removed during the installation of utilities, identified in the surrounding transects.

#### **v. Survey Area 5**

Survey Area 5 is a 0.91-acre area located along Avenue D, north of Building 167 (**Figures 100 and 101**). The survey area

included the roadway between Buildings 66, 71, 167, and the northwestern parking garage, as well as the grass lawn and sidewalk adjacent to Building 167. The roadway included manholes and paved utility trenches. Hand holes and irrigation lines were located within the grass lawn. A fenced-off junction or transformer box was located adjacent to Building 167 parking lot, along the south side of the roadway. Four surface extant tracks were located within and adjacent to the survey area (**Table 6**). The extant rails were previously paved over with asphalt; however, portions are exposed as parallel cracks due to deterioration of the asphalt.

Survey Area 5 encompasses a portion of the Avenue D right-of-way that linked the O. R. & L. tracks with Pearl Harbor's administrative area in 1912. A secondary line, consisting of



**Figure 100. Survey Area 5, looking south down Paul Hamilton Avenue.**

**Table 6. Survey Area 5 Extant Features.**

Feature	Length (m)	Type
5.1	19.12	Surface
5.2	20.17	Surface
5.3	16.40	Surface
5.4	43.00	Surface

three tracks, was added in 1919. The spurs serviced Building 27, Paint and Oil Storehouse (no longer extant), and the railroad track scale. Additional split lines were constructed in between 1919 and 1926 during the construction of Third Street and Buildings 64, 66, 69, 70, and 90<sup>273</sup>. Within the survey area, a new track was laid between Building 66 and Building 69 and another that went into Building 71. Further development of the area in 1941 included parallel tracks along Avenue D to service the new six-story Storehouse (Building 167)<sup>274</sup>. In 1945, the track between Buildings 66 and 69 was removed and rerouted up Eighth Street before turning west into Building 155<sup>275</sup>.

<sup>273</sup> United States Navy. Navy Yard Pearl Harbor, Territory of Hawaii, 14<sup>th</sup> Naval District: Map of the Yard and Adjacent Units showing Developments to June 30, 1926. 30 June 1926. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

<sup>274</sup> United States Navy. Naval Shipyard, Marine Reservation, Submarine Base, and Naval Supply Depot Showing Conditions as of June 30, 1945. Map. 30 June 1941. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

<sup>275</sup> United States Navy. Naval Shipyard, Marine Reservation, Submarine Base, and Naval Supply Depot Showing Conditions as of June 30, 1945. Map. 30 June 1945. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.





**Pearl Harbor Naval Shipyard  
and Intermediate Maintenance  
Facility (PHNSY & IMF)  
GPR Survey Area 5 Map**

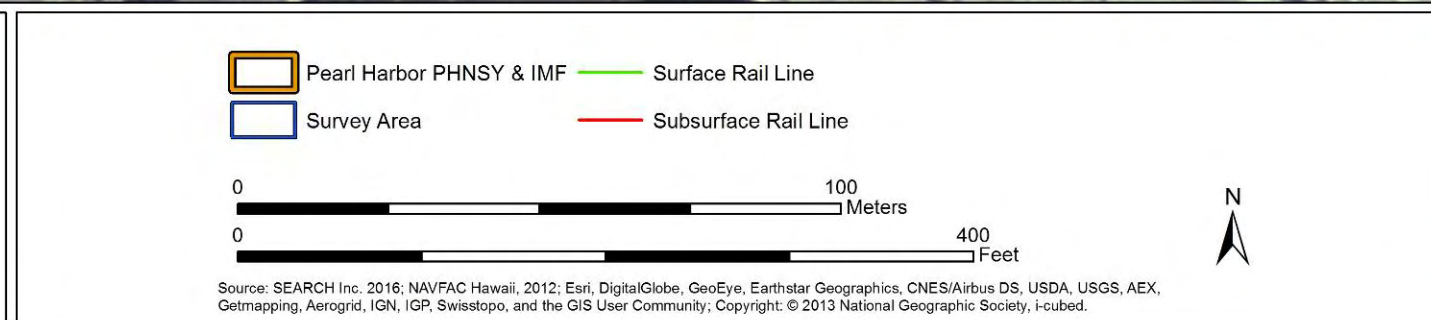


Figure 101. Map of Survey Area 5 (Navy Yard Storehouses) and Results.



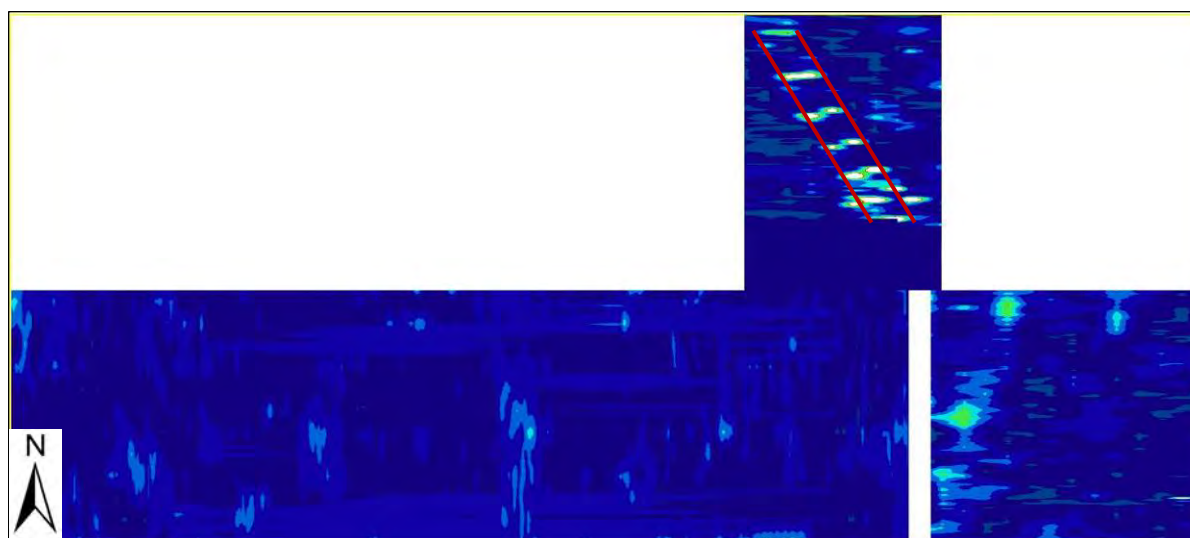
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The GPR survey within Survey Area 5 included three contiguous grids covering the grass area, the driveway, and a portion of Avenue D. The GPR survey consisted of grid collection blocks set at one-meter intervals. The survey areas were linked via a single coordinate system, along all of the data from Survey Area 5 to be analyzed together (**Figure 102**).

During data collection within the grass area, there were no readings consistent with rails. Transects in the road resulted in readings consistent with rails directly over parallel cracks in the roadway. After the possible rails were recorded within the roadway, additional transects were collected along the

sidewalk and adjacent driveway; unfortunately, it appears the position of any rails here would be beneath the rebar-reinforced sidewalk. Data collection within the narrow driveway, in the western portion of the survey area, did not indicate the presence of rails.

Three extant surface rails and parallel cracking in the asphalt were located in the survey area. Feature 5.1 is a single track that was cut in 1945 within the middle of the road and paved over<sup>276</sup>. Portions of the steel were visible in the deteriorating asphalt. Feature 5.2 is also located in the road and is aligned with a single track located inside Building 71. Feature 5.3 is a



**Figure 102.** Amplitude map of the data collected in Survey area 5. Reflections consistent with the rails are visible in the road.

<sup>276</sup> United States Navy. Naval Shipyard, Marine Reservation, Submarine Base, and Naval Supply Depot Showing Conditions as of June 30, 1945. Map. 30 June 1945. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

single track located near the existing parking structure. GPR was used to locate the end of each track. Building 71 was restricted and the rail inside was not recorded.

Pedestrian survey of the surrounding area located a section of rail (Feature 5.4) adjacent to Building 90. Feature 5.4 was located 89 meters north/northwest of the survey area, behind a fenced compound. Outside of the fence line, a perpendicular utility trench exposed a 2-meter section of rail line beneath the asphalt. The feature was recorded, with GPS, outside of the fence.

The right-of-way along Avenue D dates back to 1912; the extant secondary lines were constructed later. Features 5.1, 5.2, 5.3, and 5.4 (**Figures 103-106**) are indicated on historic



Figure 103. Feature 5.1, looking west at Fac. 167 and down Paul Hamilton Avenue.



Figure 104. Feature 5.2, looking north across Paul Hamilton Avenue toward Facility 71.



Figure 105. Feature 5.3, looking northwest across Paul Hamilton Avenue with Fac. 155 in the background.



Figure 106. Feature 5.4, looking west toward Fac. 27.

maps dating from 1926 to 1951 and were associated with the construction of Buildings 27, 66, 69, 71, and 90. In 1926, Feature 5.1 was a spur off the main Avenue D line that ran northwest between Building 66 and the no longer extant Building 69<sup>277</sup>. Feature 5.2 ran northeast into Building 71 and terminated at the rear (northwestern) wall of the building. Features 5.3 and 5.4 are portions of the same spur that ran west toward Buildings 27 and 90. The track was adjacent to the buildings, terminating at the western edge of Building 90. According to historic maps, Feature 5.1 was cut in 1945 and the track was removed from between Buildings 66 and 69. It is unclear when portions of the remaining rail features were

<sup>277</sup> United States Navy. Navy Yard Pearl Harbor, Territory of Hawaii, 14<sup>th</sup> Naval District: Map of the Yard and Adjacent Units showing Developments to June 30, 1926. 30 June 1926. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

cut and removed; however, GPR data and the pedestrian survey provide evidence of the various utilities and disturbances located within this area.

#### vi. Survey Area 6

Survey Area 6 is a 1.37-acre area located within a parking lot between Central Avenue and Buildings 14, 15, and 154 (Figures 107 and 108). The western boundary is located along the entrance of Building 14 and the fence line of Building 15, while the east boundary is located entirely within the parking lot. The southeastern corner is the only portion of the survey area that is located within the road. The parking lot features plantings, gravel filled curbed concrete islands, and street lamps powered by underground utility lines. Formal GPR survey found two extant subsurface lines within and adjacent to the survey area. Two surface and seven additional subsurface lines were located in the adjacent parking lot during a pedestrian survey and through GPR transects and prospecting (Table 7).

Table 7. Survey Area 6 Extant Features.

Feature	Length (m)	Type
6.1	6.98	Surface
6.2	91.47	Surface
6.3	39.18	Subsurface
6.4	3.95	Surface
6.5	18.44	Subsurface
6.6	143.45	Subsurface
6.7	136.8	Subsurface
6.8	35.30	Subsurface





**Figure 107. Survey Area 6, looking north down Central Avenue.**

Review of the historic maps and photographs found that Survey Area 6 contained three historic railway lines, developed between 1919 and 1941. The survey area and adjacent lot was largely undeveloped until 1919 when the Pattern Shop (Building 14) and nearby Lumber and Metal Storehouse (Building 15) were constructed. Two branches of the Central Avenue line headed west through the two buildings before ending in the Woodworking Shop (Building 6 and Foundry (Building 7). While the tracks remained untouched, the area between Building 14 and Building 15 was repurposed as a Lumber Storage Area in 1934<sup>278</sup>. In 1941, the Lumber Storage area was removed and Building 154 was

built<sup>279</sup>. Two new lines were introduced, one that bypassed Building 14 to the south, and another that ran between Building 14 and Building 154. Additionally, two new lines were added to the north, along Avenue E, to service the Saluting Battery and new Lumber Shed. By 1945, lines running across Seventh Avenue were cut, including the lines through Building 15 and adjacent to Building 154. The remaining lines were in service until the system was abandoned.

<sup>278</sup> United States Navy. 14<sup>th</sup> Naval District Pearl Harbor, Territory of Hawaii. Map. 30 June 1934. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

<sup>279</sup> United States Navy. Navy Yard Pearl Harbor, Territory of Hawaii: 14<sup>th</sup> Naval District Showing Conditions on June 30, 1941. Map. 30 June 1941. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.



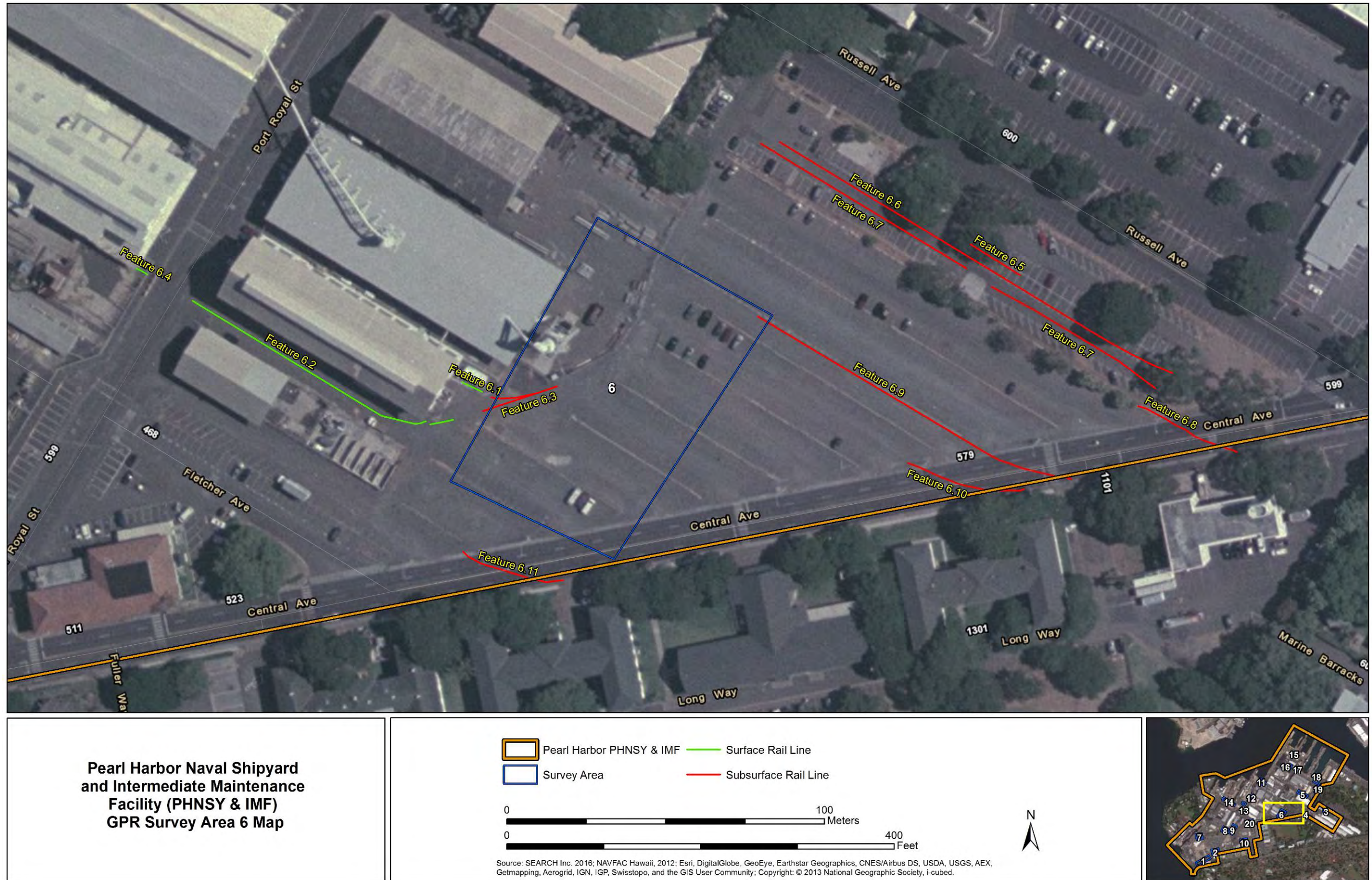
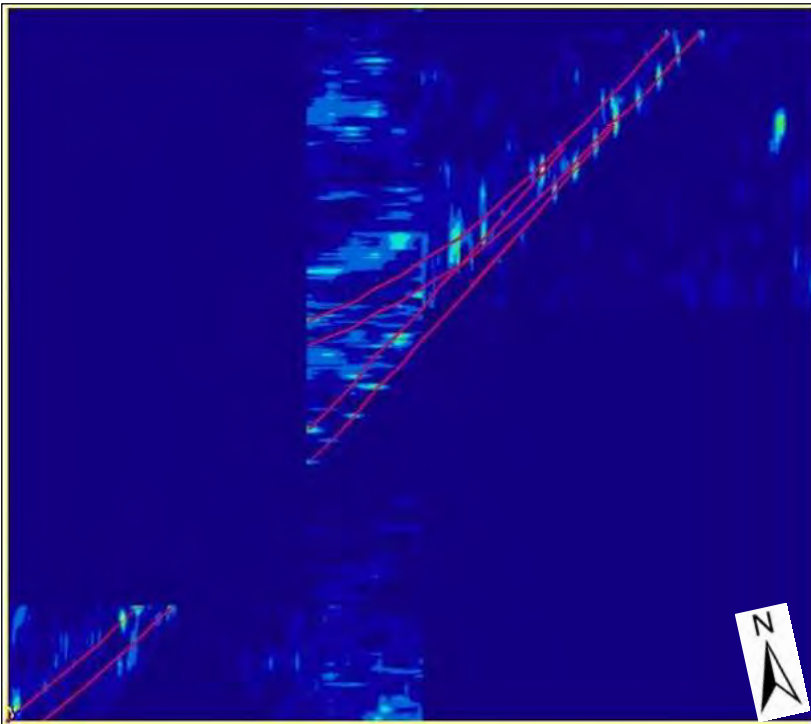


Figure 108. Map of Survey Area 6 (Former Navy Yard Rail and Bus Depot) and Results.



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The GPR survey within Survey Area 6 consisted of grid collection blocks set at one-meter intervals within the parking lot. SEARCH extended the grid east to encompass the area in front of Building 14. All survey areas were linked via a single coordinate system in order for all data from Survey Area 6 to be analyzed together (**Figure 109**). Just outside of the survey area, two extant rail lines were observed in the deteriorating asphalt. Feature 6.1 (**Figure 110**) is located in front of the entrance of Building 14 while Feature 6.2 (**Figure 111**) is located on the southern side. Feature 6.2 extends from the corner of the building to Seventh Avenue.



**Figure 109.** Amplitude map of Survey Area 6, showing converging subsurface rails.



**Figure 110.** Feature 6.1, looking west toward the east elevation of Fac. 14.



**Figure 111.** Feature 6.2, looking east at southeast corner of Fac. 14.

A GPR grid was constructed around impediments to survey, including Building 14, a fence surrounding Building 15, cars, and concrete islands. Within the gridded area, two linear anomalies are present just outside of Building 14 that were noted as possible rails. The linear anomaly was cataloged as Feature 6.3. The subsurface feature is located east of the Building 14 entrance, along the Building 154 fence line. The feature contains two tracks, oriented northeast to southwest that align with Features 6.1 and 6.2. While recording these alignments, SEARCH located an additional surface rail (Feature 6.4) across Seventh Avenue (**Figure 112**). The track was in line with Feature 6.2, on the eastern side of the road. The feature was cut at both ends and did not continue beyond the Building 6 fence.



Figure 112. Feature 6.4, looking west toward Fac. 6.

SEARCH performed an informal GPR survey within the remainder of the parking lot and across portions of Central Avenue where rail lines were indicated on historic maps. SEARCH located seven additional features outside of the survey area. Features 6.5, 6.6, and 6.7 are located 44 meters northeast of Survey Area 6, within the existing parking lot. These features represent three parallel lines that branched off of the Central Avenue Line along Avenue E. Feature 6.7 did not contain two steel rails along its alignment. Rather, the amplitude map of the data shows a single anomaly. During post processing, the feature matched the location of the third track in this area; however, the parallel rail was removed.

Rails were also located within the Central Avenue road way. Feature 6.8 is a triple track feature, crossing the road between Building 206 and the parking lot. Features 6.9 (**Figure 113**)



Figure 113. Feature 6.9, looking west down Central Avenue.



and 6.10 contain a single set of tracks crossing the road between Building 287 and the parking lot. Feature 6.9 continues west extending 4.5 meters into the northeastern corner of Survey Area 6. Feature 6.11 consists of double rails crossing Central Avenue right-of-way, between Building 285 and parking lot.

Survey Area 6 is located within a former lumber yard, indicated on historic maps dated between 1919 and 1956. Features 6.1, 6.2, 6.3, 6.4, and 6.10 were constructed in 1919 as a branch of the Central Avenue right-of-way, running adjacent to Building 144 and the Foundry. Features 6.9 and 6.11 were added in 1934 in order to expand service to the yard<sup>280</sup>. Features 6.5, 6.6, 6.7, and 6.8 were added in 1942 to serve the saluting battery and newly constructed Lumber Shed<sup>281</sup>. It is unclear when the narrow gauge rails were cut and removed; however, GPR data and the pedestrian survey provide evidence of the various utilities and disturbances located within this area. Evidence of rail removal in the area was found during the reconnaissance survey. Removed rails were piled within an open concrete storage bin, south of Building 14 (Figure 114).



Figure 114. Removed Rails from Parking Lot F former Navy Yard Depot and stored in former ore ingot bins near Survey Area 6, looking south.

### vii. Survey Area 7

Survey Area 7 is a 1.09-acre area located at the corner of Central Avenue and Leftwich Street (formerly Fourth Street), within a storage yard. The northern boundary of the survey area was located adjacent to the CIA fenceline while the southern line stopped short of the northwest corner of Building 1526. Utilities in the area included a fire hydrant and high pressure water line, located along the northern boundary. Survey Area 7 is primarily a paved storage area east of Building 1526 and includes storage of mooring blocks, concrete barriers, and metal shipping containers (Figures 115 and 116). SEARCH located three subsurface features within the survey area (Table 8).

<sup>280</sup> United States Navy. 14<sup>th</sup> Naval District Pearl Harbor, Territory of Hawaii. Map. 30 June 1934. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

<sup>281</sup> Bureau of Yards and Docks, Navy Yard Pearl Harbor, T.H, map 1400-3-106. Record Group 71: Records of the Bureau of Yards and Docks (National Archives and Records Administration, College Park, Maryland, June 30, 1942).



**Figure 115.** Survey Area 7, looking west near Dry Dock No. 4.

**Table 8.** Survey Area 7 Extant Features.

Feature	Length (m)	Type
7.1	6.70	Subsurface
7.2	18.67	Subsurface
7.3	37.95	Subsurface

Survey Area 7 is located northeast of the Coaling Station within the former Fuel Tank Farm. Rail in the area was not developed until 1941, when a loop line was established on the east side of the Coaling Station from Sixth Street. The loop line was dismantled by 1945 and replaced with a line off Central Avenue connecting new lines on Fourth Street. The Central Avenue line was expanded into three parallel lines, in 1951, to service the Bridge Gantry No. 1 facility.

The GPR survey within Survey Area 7 consisted of grid collection blocks set at one-meter intervals within open portions along Leftwich Street, Central Avenue, and storage area, within the predefined survey area. The survey grids were linked to a single grid system. Small open sections within the western portion of the storage area were informally surveyed using the GPR transects and prospecting. The individual radargrams and interpolated amplitude maps were reviewed for any signals consistent with rails; however, the GPR data provided evidence of various utilities and soil disturbances within this area. Three linear subsurface anomalies, consistent with rails, were located within the survey area (**Figure 117**).

Analysis of the amplitude map revealed subsurface portions of the rail line were located within Leftwich Street and between the concrete mooring blocks. Feature 7.1 is located at the northern extent of the grid, running east to west. Feature 7.2 also ran east to west, and crossed over several utilities. Evidence of the track was located in between the mooring blocks. Feature 7.3 ran north to south, in the middle of Leftwich Street, curving to the east through the storage area. The track crossed three utility lines, including the water line feeding the fire hydrant.

SEARCH conducted a pedestrian survey along the remainder of Leftwich Street and Central Avenue, as well as the inaccessible portions of the storage area. No tracks were visible on the surface of the asphalt. Portions of the subsurface rail indicate that it may extend underneath the concrete and metal storage material.





**Pearl Harbor Naval Shipyard  
and Intermediate Maintenance  
Facility (PHNSY & IMF)  
GPR Survey Area 7 Map**

- Pearl Harbor PHNSY & IMF
- Survey Area
- Surface Rail Line
- Subsurface Rail Line



Source: SEARCH Inc. 2016; NAVFAC Hawaii, 2012; Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, Swisstopo, and the GIS User Community; Copyright: © 2013 National Geographic Society, i-cubed.



Figure 116. Map of Survey Area 7 (Dry Dock No. 4 Gantry Crane Rail) and Results.

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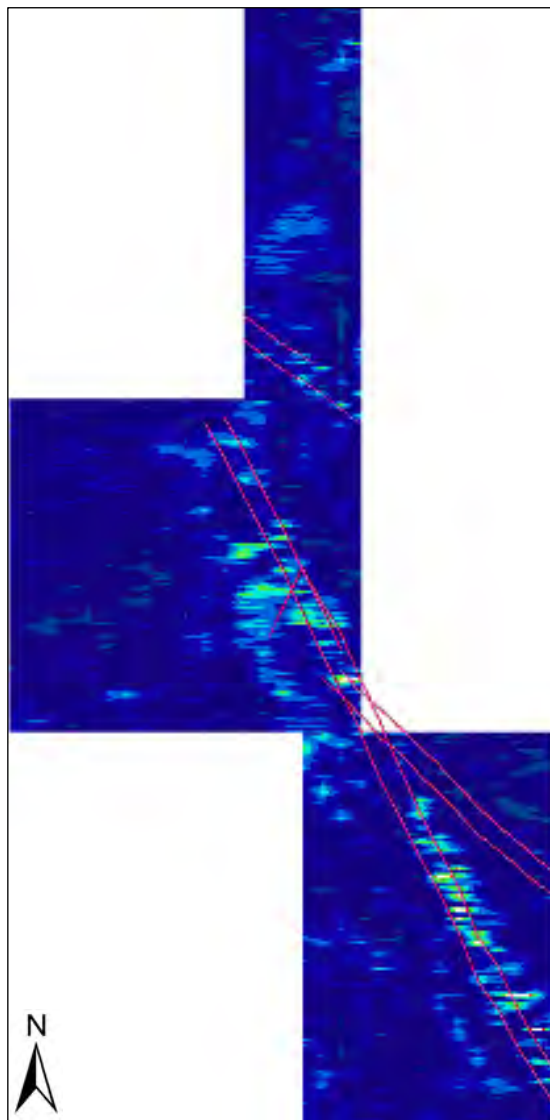


Figure 117. Amplitude map with the data collected from grids in Survey Area 7.

Features 7.1, 7.2, and 7.3 are remnants of three gantry lines installed between 1945 and 1951. Feature 7.1 is a remnant of the northern line, paralleling Central Avenue. Feature 7.2 represents the mid-track. Feature 7.3 is a spur of the Fourth Street line and ran south of the Bridge Gantry. All three lines merged with the Central Avenue line, via the Sixth Street track. It is unclear when the narrow gauge rails were cut and removed; however, GPR data and the pedestrian survey provide evidence of the various utilities and disturbances located within this area. Additional remnants may exist underneath the concrete and metal debris currently stored in this area.

**viii. Survey Area 8**

Survey Area 8 is a 0.86-acre area located at the intersection of Central Avenue, Seabee Way (formerly Avenue H), and Fifth Street (Figures 118 and 119). The survey area encompassed part of a parking area, the active intersection, and a bus stop. Field observations of the roadway and parking lot and included a derelict concrete pad with abandoned subsurface utilities as well as buried storm water, irrigation, and electrical power. SEARCH located five extant surface rail lines within the survey area (Table 9).

Table 9. Survey Area 8 Extant Features.

Feature	Length (m)	Type
8.1	12.26	Surface
8.2	132.26	Surface
8.3	210.01	Surface
8.4	58.45	Surface
8.5	87.51	Surface





**Figure 118. Survey Area 8, looking northeast down Central Avenue at the intersection with Lake Erie Avenue.**

The survey area contained four historic lines, including a portion of the Central Avenue right-of-way built in 1919. Rail in the area was limited to the Central Avenue line until 1941, when a secondary contractor line was installed, north of Central Avenue. The line was removed in 1943; corresponding with the completion of Fifth Street construction<sup>282</sup>. By 1945, three spurs, on either side of Fuel Tank 8, were laid in preparation for the construction of Bridge Gantry No. 1, completed sometime between 1945 and 1951.

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<sup>282</sup> Bureau of Yards and Docks, Navy Yard Pearl Harbor, T.H, map 1400-3-106. Record Group 71: Records of the Bureau of Yards and Docks (National Archives and Records Administration, College Park, Maryland, June 30, 1943).

Survey Area 8 was an active intersection and the constant flow of traffic within the roadway and parking lot made construction of a formal survey grid throughout the survey area impossible. As an alternative, individual transects were collected, allowing any anomalies visible in the data to be georeferenced and compared to historic rail locations. Transects indicated significant ground disturbances. During fieldwork the presence of these lines made it difficult to discern utilities from possible rails.

One formal grid was constructed in Survey Area 8 across the limited sidewalk and grass area, located on the south side of Central Avenue, in the projected location of the rails. Irrigation lines were noted, as were multiple buried lines extending into the grid. After processing the data from the GPR grid, it appears that there is a possible rail buried beneath the sidewalk; the strength and appearance of the anomaly are consistent with a buried wire or pipe (**Figure 120**). While the possibility of an extant rail cannot be ruled out, the data did not show a second parallel anomaly (indicative of rail lines). Due to this, readings in this area were inconclusive. Further investigation included transects near the adjacent bus stop and road; however, these areas failed to produce readings consistent with rails.





**Pearl Harbor Naval Shipyard  
and Intermediate Maintenance  
Facility (PHNSY & IMF)  
GPR Survey Area 8 Map**

- Pearl Harbor PHNSY & IMF
- Survey Area
- Surface Rail Line
- Subsurface Rail Line
- + Gantry Foundations



Source: SEARCH Inc. 2016; NAVFAC Hawaii, 2012; Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, Swisstopo, and the GIS User Community; Copyright: © 2013 National Geographic Society, i-cubed.



Figure 119. Map of Survey Area 8 (Former Gantry Crane Site) and Results.



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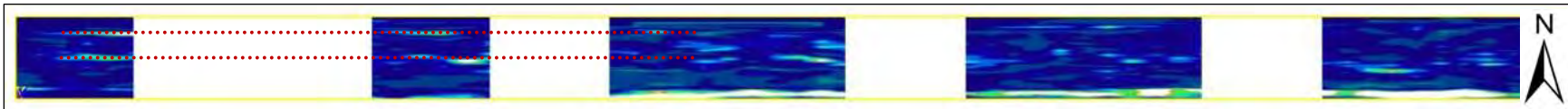


Figure 120. Amplitude maps of the data collected in Survey Area 8. Possible rail located under the sidewalk.

SEARCH conducted a pedestrian survey of the survey block and surrounding area. One extant surface rail section (Feature 8.1) was visible within the parking lot driveway. A second feature (Feature 8.2) was located 54 meters west of Survey Area 8. This feature is a single track rail lining a grass walkway (**Figure 121**) along Central Avenue. Four additional surface features were located within the dirt parking lot, between Survey Areas 7 and 8. Feature 8.3 (**Figure 122**) was located within the center of the dirt parking lot, extending from the



Figure 121. Feature 8.2, looking east down Central Avenue toward Fac. 215.

western boundary of Survey Area 8 towards Survey Area 7. The rail was adjacent to 19 paired concrete pilings associated with Bridge Gantry No. 1 structure. The pilings were uniform in size, measuring 60 square centimeters. Each concrete block included two steel lag bolts, 50 centimeters apart.

A second set of paired pilings was associated with Feature 8.4. The feature is a parallel track, located on the southern extent of Bridge Gantry No. 1. The feature extended south of the bus stop into Survey Area 9. The western extent of the line



Figure 122. Feature 8.3, looking east from Gantry Crane Parking Area.

terminates in the middle of a pair of concrete pilings (**Figure 123**). The pilings continue east, along the south side of the feature, to the edge of the parking lot.



**Figure 123.** Feature 8.4, looking east from Gantry Crane Parking Area.

Unlike the pilings adjacent to Feature 8.3, the cement blocks have been moved, as they do not align with the other pilings. Feature 8.5 (**Figure 124**) is an extension of Feature 8.4 and located 29.74 meters west of the previous lines termination point. This section is adjacent to eight additional pairs of concrete pilings. All of the features were clearly cut at both ends. Portions of Feature 8.4's southern track has been removed, leaving a single steel rail.

The extant rails within Survey Area 8 are associated with the construction of Bridge Gantry No. 1, between 1945 and 1951. Prior to this, the area was part of a Fuel Tank Farm and did not



**Figure 124.** Feature 8.5, looking east from Gantry Crane Parking Area.

contain rail lines. Portions of the features have been previously moved or removed. It is unclear when the rails were cut and removed; however, GPR data and the pedestrian survey provide evidence of the utilities and erosion located throughout this area.

#### **ix. Survey Area 9**

Survey Area 9 is a 1.24-acre area located south of Central Avenue and Building 70 and includes portions of Central Avenue, Port Royal Street (formerly Sixth Street), and a parking lot with a grass island (**Figures 125 and 126**). The survey area is located 10 meters east of Survey Area 8. A pedestrian survey within the area indicated there were many buried utilities within the road and parking lot. Extant rails within the survey area included two surface tracks (**Table 10**).





**Pearl Harbor Naval Shipyard  
and Intermediate Maintenance  
Facility (PHNSY & IMF)  
GPR Survey Area 9 Map**

	Pearl Harbor PHNSY & IMF		Surface Rail Line
	Survey Area		Subsurface Rail Line

0 100 Meters  
0 400 Feet

Source: SEARCH Inc. 2016; NAVFAC Hawaii, 2012; Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, Swisstopo, and the GIS User Community; Copyright: © 2013 National Geographic Society, i-cubed.



Figure 125. Map of Survey Area 9 (Former Gantry Crane Site) and Results.



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Figure 126. Survey Area 9, looking southwest down Lake Erie Street.

Table 10. Survey Area 9 Extant Features.

Feature	Length (m)	Type
9.1	12.47	Surface
9.2	36.60	Surface

Review of the historic maps indicated that the area was largely undeveloped until 1919<sup>283</sup> when the Sixth Street line was laid, connecting Dry Dock No. 1 to the north with the Coaling Plant to the south. Historically, the right-of-way in this area followed current road alignment and included spurs to the north. The Sixth Street track merged with Central Avenue track in the middle of this survey area. The rails in this area

<sup>283</sup> United States Navy. US Naval Station Pearl Harbor, Territory of Hawaii: Map of Yard. Map. 30 June 1919. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

were unchanged until 1945, with the preparation of the Bridge Gantry No. 1 rail installation.

Two visible extant rails were located within the survey area. Feature 9.1 is a single track located within a deteriorating portion of asphalt in the parking lot for Building 215. A second line (Feature 9.2) was located within the Lake Erie Street roadway, along the west side of the survey area. Both rails were cut at both ends. Along with these features, a 1.83 meter section of Feature 8.4 (discussed above) is located within the survey area's southwest corner.

GPR survey of this area included transects in all projected historic rail locations including: across the busy road, in the narrow grass areas, and within the parking lots. The constant flow of traffic made construction of a formal survey grid impossible. As an alternative, individual transects were collected allowing any anomalies visible in the data to be georeferenced and compared to historic rail locations. Locate markings on the asphalt indicated the area was densely populated with subsurface utilities. GPR transects confirmed the location of the utility lines. Following collection of data in the street and the southern parking lot, additional prospecting was performed in the northern portion of the grid. The amplitude map of the data shows no anomalies consistent with rails (Figure 127).

The extant rail sections, within the Building 215 parking lot and Lake Erie Street, were consistent with the narrow gauge rail used throughout PHNSY & IMF. Feature 9.1 is consistent with the 1919 Sixth Street line that was utilized until 1951

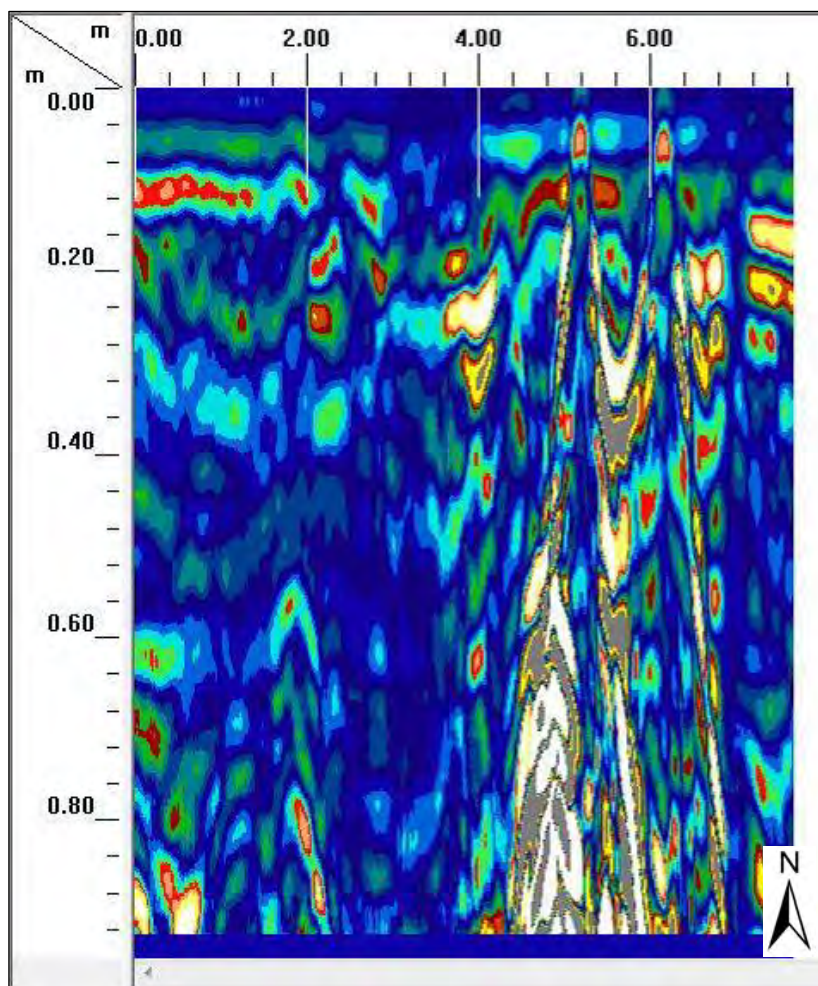


Figure 127. Radargram from Survey Area 9 showing utility reflections consistent with utilities.

when the adjacent locomotive shed and Building 152 were demolished. The line was replaced with a single spur of the Central Avenue Line. Feature 9.2 was constructed at the same

time as the Bridge Gantry No. 1 facility and represents a portion of the central gantry track. The feature aligns with Feature 8.3 track alignment (discussed above). It is unclear when the narrow gauge rails were cut and removed. According to the GPR radargram, historic rails in Survey Area 9 were most likely removed during the installation of utilities identified during data collection. Furthermore, the line associated with Feature 9.1 was most likely removed during the demolition of Building 152 and the expansion of Building 70.

#### x. Survey Area 10

Survey Area 10 is a 1.38-acre area was located in a parking lot between South Street and Central Avenue (**Figures 128 and 129**). The survey area encompassed the western portion of the parking lot. The presence of cars within the survey area limited the survey to long transects between parking rows. SEARCH extended the survey boundaries to the entire lot. The lot was raised above the grade of adjacent areas and contained storm water grates, fuel storage, street lights with underground electric utilities, and several manholes. No extant rails were located in the survey area.





Survey Area 10 is in the former Tank Farm, constructed in 1926<sup>284</sup>, and encompasses the footprint for Tank 18 and 19. During this time, the Tank Farm was divided by Halawa Street.

<sup>284</sup> United States Navy. Navy Yard Pearl Harbor, Territory of Hawaii, 14<sup>th</sup> Naval District: Map of the Yard and Adjacent Units showing Developments to June 30, 1926. 30 June 1926. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.





**Pearl Harbor Naval Shipyard  
and Intermediate Maintenance  
Facility (PHNSY & IMF)  
GPR Survey Area 10 Map**

	Pearl Harbor PHNSY & IMF		Surface Rail Line
	Survey Area		Subsurface Rail Line

0 100 Meters  
0 400 Feet

Source: SEARCH Inc. 2016; NAVFAC Hawaii, 2012; Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, Swisstopo, and the GIS User Community; Copyright: © 2013 National Geographic Society, i-cubed.



Figure 128. Map of Survey Area 10 (Former Lower Tank Farm) and Results.



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**Figure 129. Survey Area 10, looking northwest from north side of area toward Central Avenue.**

By 1938, Halawa Street was encompassed by the Tank Farm and no longer in use. During the same period, fuel tanks were surrounded by earthen berms. A rail line was installed along the outside of the tank farm, along Central Avenue, but no tracks were within. The Fuel Tank Farm was removed sometime after the 1960s and replaced with a parking lot.

Pedestrian survey of the area revealed that the parking lot was elevated above the surrounding grade and contained several utilities, including storm water drains, underground electrical lines, powering street lights, and sewer manholes. The edge of the parking lot was surveyed for any signs of possible cultural features. No evidence of rails was noted.

SEARCH conducted a survey using transects within the vehicle lanes. SEARCH expanded the survey area to encompass the entirety of the parking lot and former Halawa Street. During GPR field work it was clear there was a considerable amount of fill and obvious buried utilities. Review of the processed data confirmed the field observations. None of the radargrams of the approximately 100-meter long transects included reflections consistent with buried rails (**Figure 130**).

The survey area was located within the historic Fuel Tank Farm that did not historically contain rails. Data collected within Survey Area 10 confirmed that rails were not present in the area. GPR did confirm that the parking lot was located above fill and contained numerous utilities.

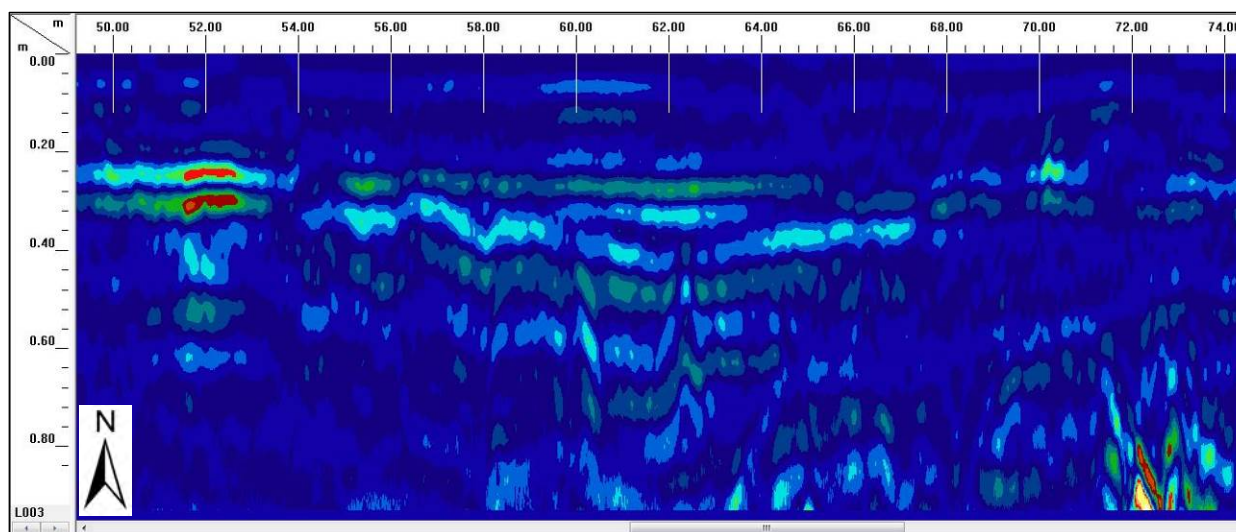


Figure 130. Radargram from Survey Area 10 showing utility reflections consistent with utilities.

### xi. Survey Area 11

Survey Area 11 is a 0.94-acre area located along Port Royal Street (formerly First Street) and includes northeast corner of Dry Dock 1 and operational crane rails, the parking lot between Building 4 and Building 5, and the alleyway near Building 5A (Figures 131 and 132). Visual inspection of the area found extensive subsurface utilities and access points throughout the area. A portion of dock decking, in the northwestern corner of the survey area, has been replaced. GPR testing of the deck indicated that the newer portion was reinforced with rebar, while the older portions were not. Eight features were recorded within and adjacent to the survey area (Table 11).

Table 11. Survey Area 11 Extant Features.

Feature	Length (m)	Type
11.1	12.83	Subsurface
11.2	3.99	Subsurface
11.3	25.01	Subsurface
11.4	23.80	Subsurface
11.5	437.39	Surface
11.6	461.39	Surface
11.7	7.96	Surface
11.8	96.49	Surface

Construction of Dry Dock 1 began in 1912<sup>285</sup>. Early maps indicate that a narrow gauge track was laid along First Street,

<sup>285</sup> United States Navy. US Naval Station Pearl Harbor, Territory of Hawaii: Plan of Improvements. Map. August 1912. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.





**Pearl Harbor Naval Shipyard  
and Intermediate Maintenance  
Facility (PHNSY & IMF)  
GPR Survey Area 11 Map**

- Pearl Harbor PHNSY & IMF
- Survey Area
- Surface Rail Line
- Subsurface Rail Line



Source: SEARCH Inc. 2016; NAVFAC Hawaii, 2012; Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, Swisstopo, and the GIS User Community; Copyright © 2013 National Geographic Society, i-cubed.



Figure 131. Map of Survey Area 11 (Dry Dock No. 1) and Results.



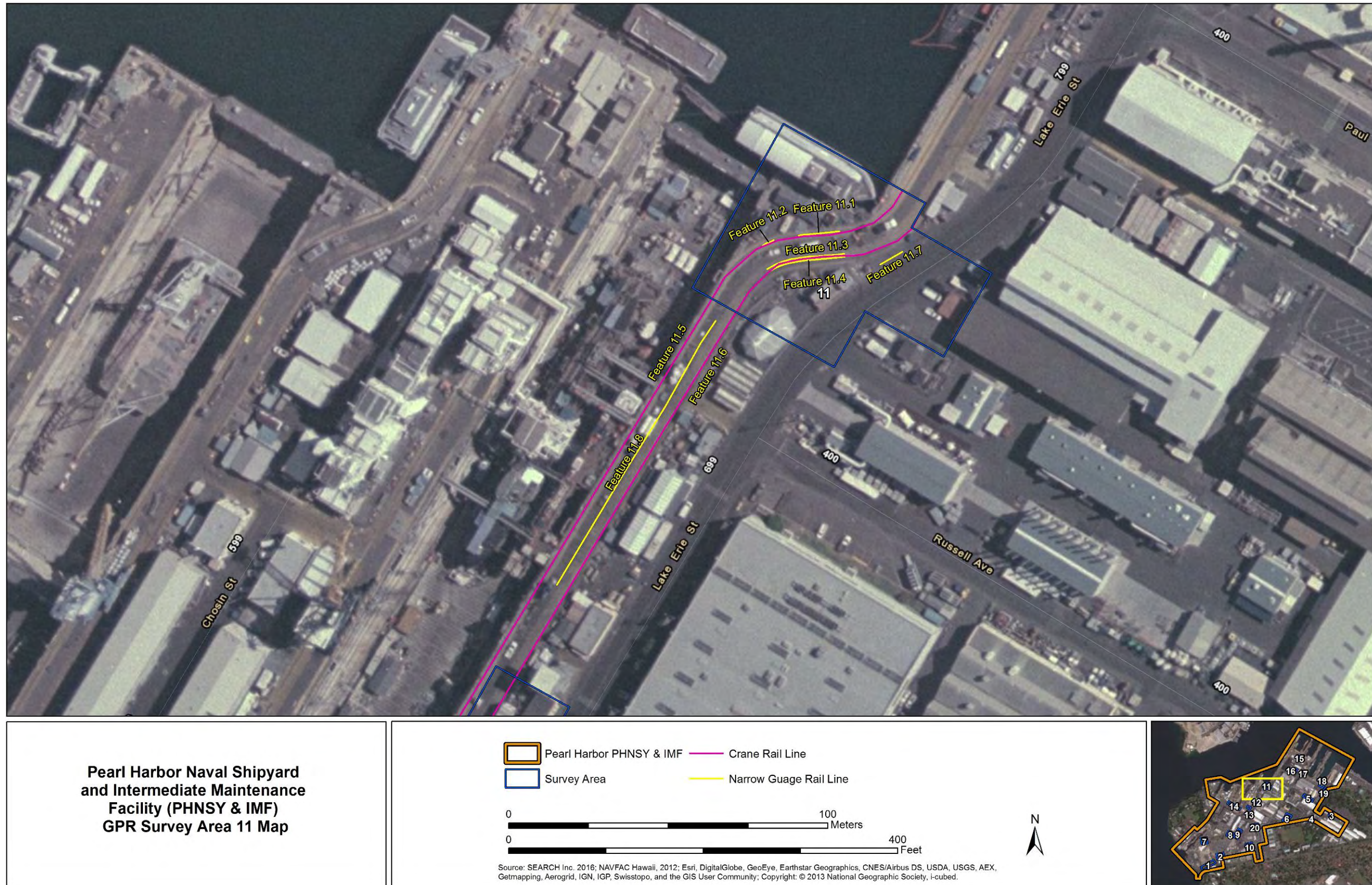


Figure 132. Map of Survey Area 11 (Dry Dock No. 1) and Rail Types.





**Figure 133. Survey Area 11 looking east across crane rails toward Fac. 5.**

adjacent to the Forge, Shipfitting & Boiler Maker's Shop, Machine Shop, and Pipes and Plumbing Shop<sup>286</sup>. By 1926, the line expanded to include a dual gauge track around the perimeter of the dry dock. The line serviced both narrow and standard gauge railroad cranes until 1943, when they were replaced by the 25-ton and 50-ton portal cranes<sup>287</sup>. In addition to the dual gauge tracks, a 28-foot gauge track was

<sup>286</sup> Bureau of Yards and Docks, US Naval Station Pearl Harbor T.H. Plan of Improvements, map 1400-17-13. Record Group 71: Bureau of Yards and Docks (National Archives and Records Administration, College Park, Maryland, August 1912).

<sup>287</sup> HAER HI-68, "Exterior Cranes, Waterfront Crane Track System (U.S. Naval Base, Pearl Harbor, Naval Shipyard, Locomotive Cranes, HI-68 Portal Cranes, Floating Cranes, Bridge Gantry Cranes) Waterfront Crane Track System Pearl Harbor Honolulu County Hawaii"

installed to support the new cranes<sup>288</sup>. All three rails continued to operate around the Dry Dock; standard gauge rail was removed by 1951. By the end of 1954, the inter-shipyard railway was also abandoned<sup>289</sup>. The rail system was replaced with additional portal cranes and truck transportation that utilized First Street.

Due to constant activity on Port Royal Street, with workers traversing the area between the Foundry and the Dry Dock, loading operations being conducted on a nearby docked vessel, and vehicle traffic, only one formal GPR survey grid was constructed. The grid was located between Port Royal Street and the new portion of the dock, encompassing the active crane lines. The amplitude map (**Figure 134**) shows three rails on each edge of the grid. While one of the indicated rails is the visible crane rail, the two additional rails appear to have been paved over with asphalt and concrete.

These tracks (Features 11.1 through 11.4) ran the length of the GPR survey grid. Informal survey of the eastern and western boundaries showed that the lines were cut at either end of the GPR survey grid. Feature 11.1 and 11.2 are an alignment of the same track, running along the northern portion of the survey block. The rail was previously cut, causing a 25.97 meter gap in the line. Features 11.3 and 11.4 are parallel lines along the southern edge of the block.

<sup>288</sup> Bureau of Yards and Docks, Navy Yard Pearl Harbor, T.H, map 1400-3-106. Record Group 71: Records of the Bureau of Yards and Docks (National Archives and Records Administration, College Park, Maryland, June 30, 1943).

<sup>289</sup> *Livingston*, "Navy Narrow Gauge at Pearl Harbor."

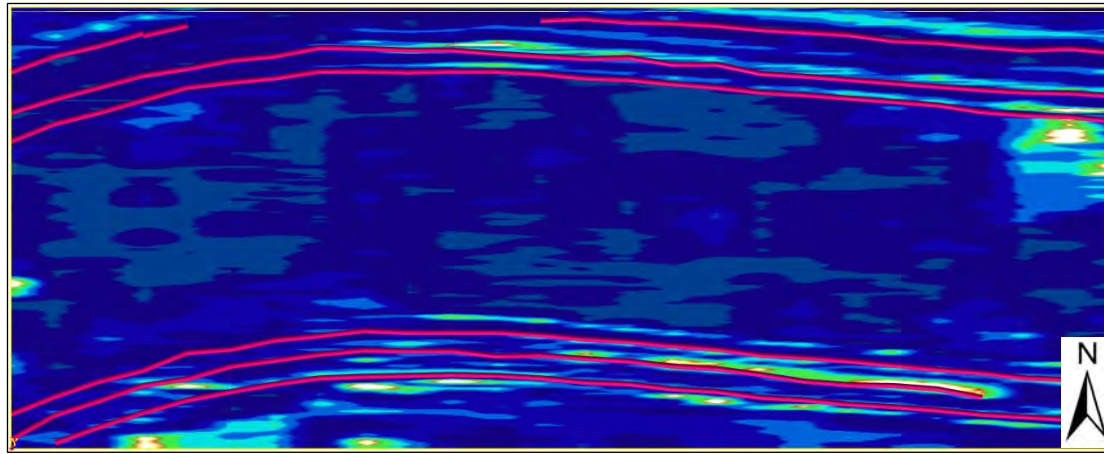


Figure 134. Amplitude map showing a series of rails in Survey Area 11.

The crane rails (Features 11.5 and 11.6) wrap around the entirety of Dry Dock 1; however, only a 461.25-meter section was recorded with GPS because the remaining areas were either active or within restricted areas. The crane lines are also located within Survey Areas 12 and 13. One additional extant surface narrow gauge track (Feature 11.7) was located east of the survey area, adjacent to Port Royal Street, and was cut at both ends. Informal GPR survey indicated that the line was removed during utility installation.

During the recording of the crane lines, a pedestrian survey of the area between Survey Area 11 and 12 located an additional double rail line (Feature 11.8) that extends through the center of the existing crane track. Portions of the line were visible between gaps in the storage containers located in this area. The rail line was missing in areas with clear subsurface utilities located in the alignment. Two portions of Feature 11.8 include merges in the track lines that once operated along the dry dock (Figure 135).



Figure 135. Feature 11.8, looking southwest at narrow gauge rails running parallel to crane rails at Dry Dock No. 1.

The extant rails, with the exception of the Features 11.5 and 11.6 (crane rails), are associated with the construction of Dry Dock 1. The tracks were installed in 1919 and featured a dual gauge rail system to accommodate several locomotive cranes. The standard gauge rails were removed prior to 1951 and the narrow gauge rails were abandoned in place three years later. According to the GPR results, portions of the narrow gauge rail have been removed during the installation of utilities or improvement of the dock and surrounding facilities. The crane rails, installed in 1943, are currently active within the CIA.

### ***xii. Survey Area 12***

Survey Area 12 is a 0.54-acre area located between Port Royal Street (formerly First Street) and the eastern edge of Dry Dock 1 (Figures 136-138). Several temporary buildings were located within the middle of the survey area. Visual inspection of the area found several utilities between the temporary structures and along the western edge of Port Royal Street. Active crane rails were located along the western portion of the survey area. The projected historic railway alignment was directly below buildings. In order to catch possible extant portions of the rails, the area was surveyed using opportunistic transects between the buildings and along Port Royal Street. Transects on the eastern edge of the survey area were intended to catch the spurs coming off of the line that was beneath the buildings. SEARCH recorded two extant surface rail features within the survey area (Table 12).



**Figure 136. Survey Area 12, looking southwest along the east wall of Dry Dock No.1.**

**Table 12. Survey Area 12 Extant Features.**

Feature	Length (m)	Type
12.1	17.96	Surface
12.2	222.66	Surface

Construction of Dry Dock 1 began in 1912 and early maps indicate that a narrow gauge track was laid along First Street, adjacent to the Forge, Shipfitting & Boiler Maker's Shop, Machine Shop, and Pipes and Plumbing Shop<sup>290</sup>. This survey area is located southwest of the early Machine Shop. Rail lines were installed in 1919 during the completion of the dry

<sup>290</sup> Bureau of Yards and Docks, US Naval Station Pearl Harbor T.H. Plan of Improvements, map 1400-17-13. Record Group 71: Bureau of Yards and Docks (National Archives and Records Administration, College Park, Maryland, August 1912).



dock. By 1926, the line was expanded to include a dual gauge track around the perimeter of the dry dock. Several spurs were created in this area to service the nearby buildings. The track serviced both narrow and standard gauge railroad cranes. The locomotive cranes continued operation until 1943 when they were replaced by the 25-ton and 50-ton portal cranes<sup>291</sup>. In addition to the dual gauge tracks, a 28-foot gauge track was installed to support the new cranes<sup>292</sup>. All three rails continued to operate around the Dry Dock; by 1951, standard gauge rail was removed and the inter-shipyard railway was retired in 1954<sup>293</sup>.

During fieldwork, historic maps indicated that the First Street line is underneath several temporary structures. However, the crane line and abandoned narrow gauge lines are still visible adjacent to the Dry Dock. Crane lines were previously recorded as Features 11.5 and 11.6. Two additional surface features (Features 12.1 and 12.2) were recorded within the survey area. Both features align with Feature 11.8, but portions of this line were removed. Feature 12.1 is a single track that was cut at both ends where there are visible manholes. Feature 12.2 is located 5 meters west and

continues around Dry Dock 1, through Survey Area 13, until its termination point along the western side of the dock.

GPR survey of the area indicated that spaces between the buildings contained several utility lines leading to the structures. Transects along Port Royal Street indicated that the historic rail line spurs were removed and the area was filled in by the utility trenches (**Figure 139**). Subsurface survey of the western portion of Survey Area 12 indicated that only the visible surface rails were extant.

The extant rails, with the exception of the Features 11.5 and 11.6 (crane rails), are associated with the construction of Dry Dock 1. The tracks were installed in 1919 and featured a dual gauge rail system to accommodate several locomotive cranes. The standard gauge rails were removed in 1951 and the narrow gauge rails were abandoned in place in 1954. According to the GPR results, portions of the narrow gauge rail have been removed during the installation of utilities or improvement of the dock and surrounding facilities. The crane rails, installed in 1943, are currently active within the CIA.

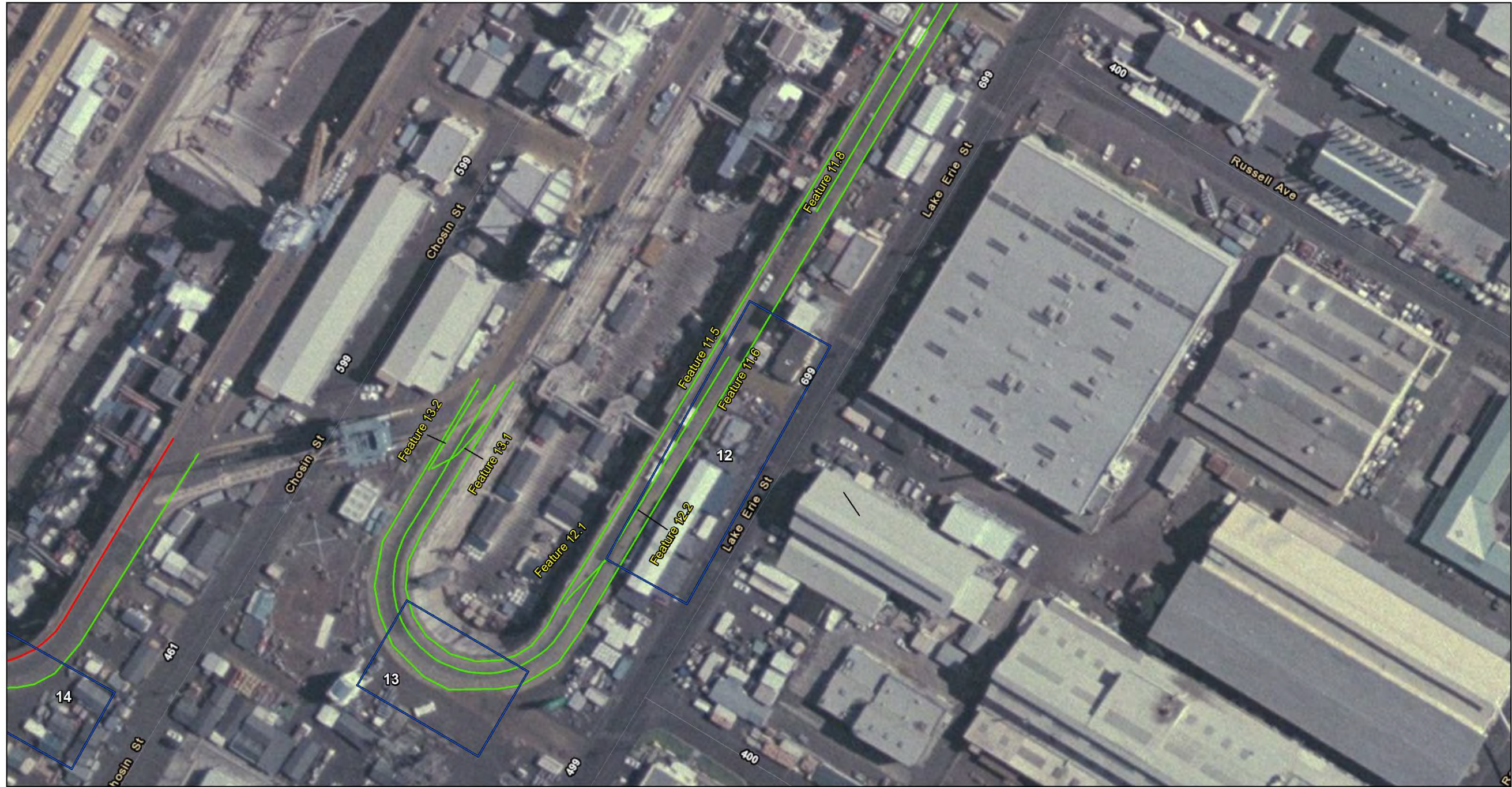
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<sup>291</sup> HAER HI-68, "Exterior Cranes, Waterfront Crane Track System (U.S. Naval Base, Pearl Harbor, Naval Shipyard, Locomotive Cranes, HI-68 Portal Cranes, Floating Cranes, Bridge Gantry Cranes) Waterfront Crane Track System Pearl Harbor Honolulu County Hawaii"

<sup>292</sup> United States, Department of the Navy, *Building the Navy's Bases in World War II: History of the Bureau of Yards and Docks and the Civil Engineer Corps, 1940-1946*, 2 vols. (Washington, DC: US Government Printing Office, 1947).

<sup>293</sup> *Livingston, Oahu's Narrow-Gauge Navy Rail.*





**Pearl Harbor Naval Shipyard  
and Intermediate Maintenance  
Facility (PHNSY & IMF)  
GPR Survey Area 12 Map**

- Pearl Harbor PHNSY & IMF
- Survey Area
- Surface Rail Line
- Subsurface Rail Line



Source: SEARCH Inc. 2016; NAVFAC Hawaii, 2012; Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, Swisstopo, and the GIS User Community; Copyright: © 2013 National Geographic Society, i-cubed.



Figure 137. Map of Survey Area 12 (Head of Dry Dock No. 1 and 2) and Results.



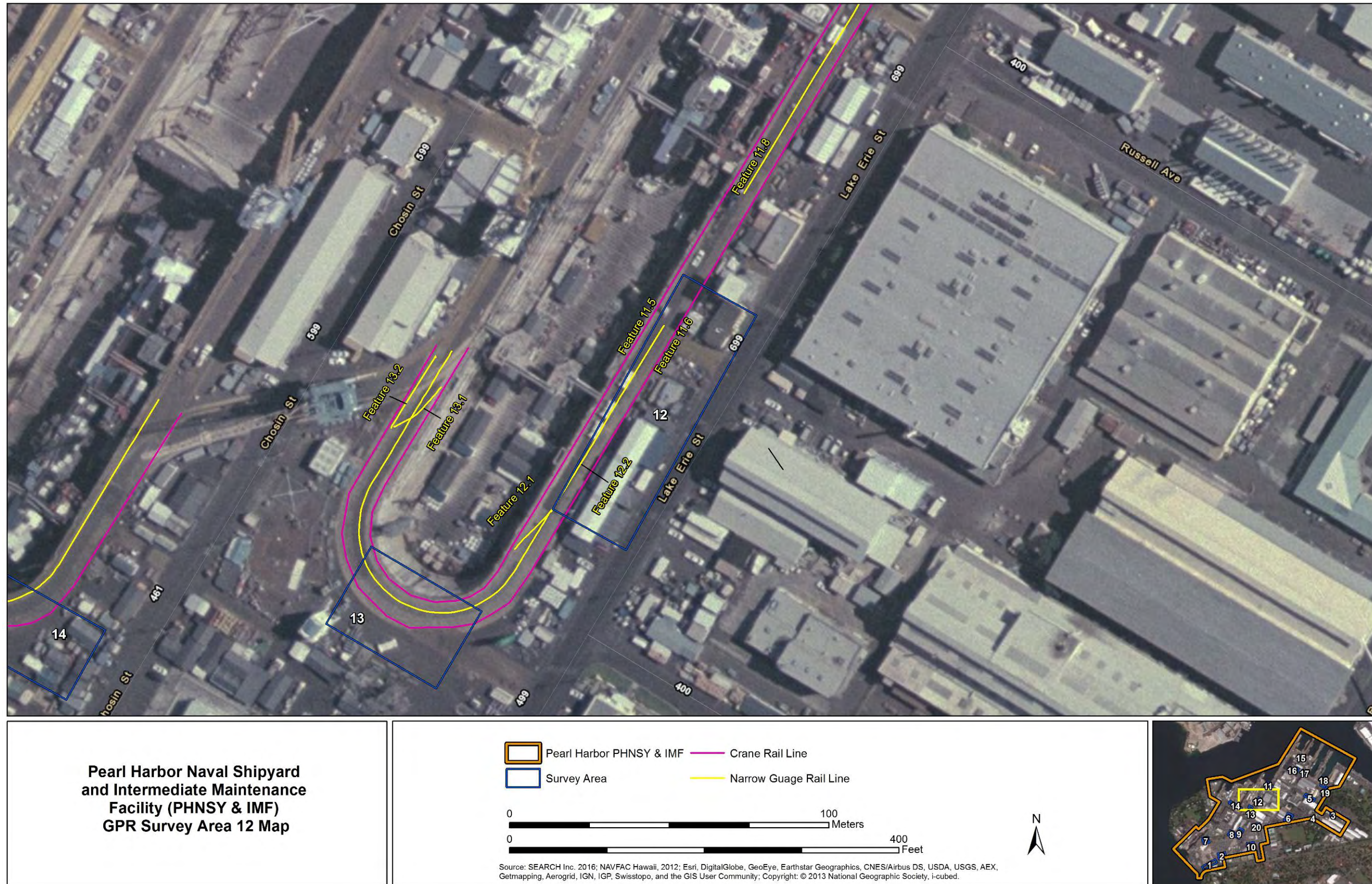


Figure 138. Map of Survey Area 12 (Head of Dry Dock No. 1 and 2) and Rail Types.



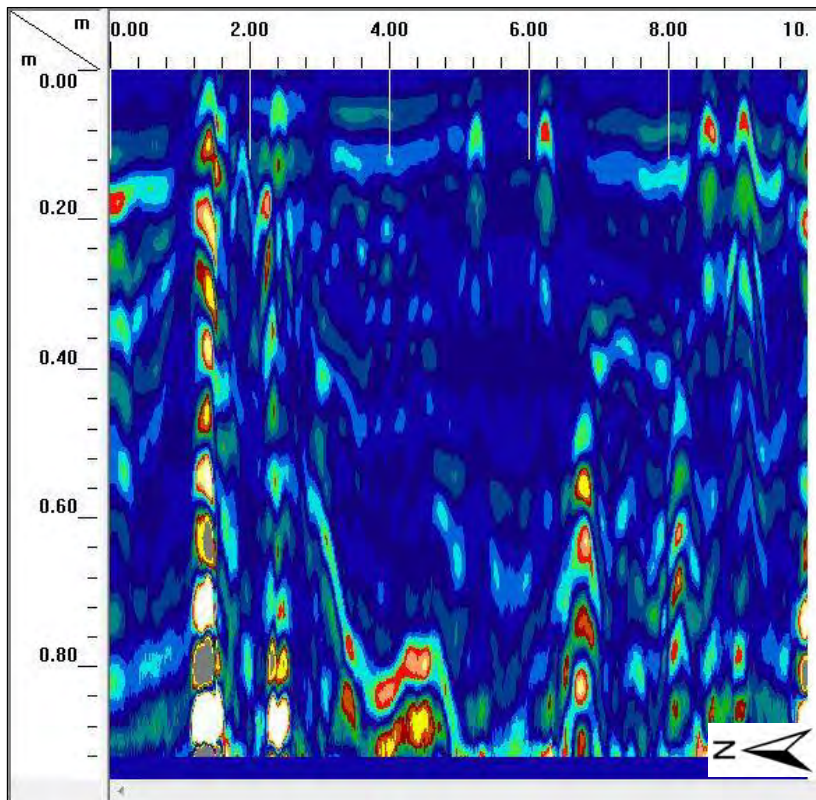


Figure 139. Radargram from Survey Area 12 showing reflections consistent with utilities.

**xiii. Survey Area 13**

Survey Area 13 is a 0.27-acre area southwest of Dry Dock 1 between Port Royal Street (formerly First Street) and Fifth Street (Figures 140-142). A walkthrough of the survey area found that the rails continued the pattern seen along the eastern edge of Dry Dock 1, within Survey Areas 11 and 12 and between Survey Areas 12 and 13. SEARCH located two

additional extant surface tracks along the western side of Dry Dock 1, between the crane rails (Table 13).

**Table 13. Survey Area 13 Extant Features.**

Feature	Length (m)	Type
13.1	19.75	Surface
13.2	27.50	Surface



Figure 140. Survey Area 13, looking east toward Fac. 1670 at head of Dry Dock No. 1.

Construction of Dry Dock 1 began in 1912 and early maps indicate that a narrow gauge track was laid along First Street, adjacent to the Forge, Shipfitting & Boiler Maker’s Shop, Machine Shop, and Pipes and Plumbing Shop<sup>294</sup>. This survey

<sup>294</sup> Bureau of Yards and Docks, US Naval Station Pearl Harbor T.H. Plan of Improvements, map 1400-17-13. Record Group 71: Bureau of Yards and



area is located southwest of the early Machine Shop. By 1926 the line expanded to include a dual gauge track around the perimeter of the dry dock. Several spurs were created in this area to service the nearby buildings, including the Cement yard and Hopper House. The track serviced both narrow and standard gauge railroad cranes. The locomotive cranes continued operation until 1943 when they were replaced by the 25-ton and 50-ton portal cranes<sup>295</sup>. In addition to the dual gauge tracks, a 28-foot gauge track was installed to support the new cranes<sup>296</sup>. All three rails continued to operate around the Dry Dock. Prior to 1951, standard gauge rail was removed, and the inter-shipyard railway was also abandoned shortly after<sup>297</sup>.

Due to constant activity along the Dry Dock, GPR survey consisted of transects between a newly constructed facility and the southern edge of Dry Dock 1. The radargram (**Figure 143**) shows three rails located within the survey area. All three rails were previously recorded as Features 11.5, 11.6, and 12.2.

Historic maps showed no additional lines within the survey areas, and all lines indicated on the map were visible on the surface. A pedestrian survey of the western edge of Dry Dock 1 located two previously cut extant surface rails. Features 13.1 and 13.2 consist of two parallel tracks merging into a single line between the crane rails. Both lines were cut where they intersected the crane rails.

The extant rails, with the exception of the Features 11.5 and 11.6 (crane rails), are associated with the construction of Dry Dock 1. The tracks were installed in 1919 and featured a dual gauge rail system to accommodate several locomotive cranes. The standard gauge rails were removed prior to 1951 and the narrow gauge rails were abandoned in place. According to the GPR results, portions of the narrow gauge rail have been removed during the installation of utilities or improvement of the dock and surrounding facilities. The crane rails, installed in 1943, are currently active within the CIA.

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Docks (National Archives and Records Administration, College Park, Maryland, August 1912).

<sup>295</sup> HAER HI-68, "Exterior Cranes, Waterfront Crane Track System (U.S. Naval Base, Pearl Harbor, Naval Shipyard, Locomotive Cranes, HI-68 Portal Cranes, Floating Cranes, Bridge Gantry Cranes) Waterfront Crane Track System Pearl Harbor Honolulu County Hawaii."





<sup>296</sup> Bureau of Yards and Docks, US Naval Station Pearl Harbor T.H. Plan of Improvements, map 1400-17-13. Record Group 71: Bureau of Yards and Docks (National Archives and Records Administration, College Park, Maryland, August 1943).

<sup>297</sup> *Livingston*, Oahu's Narrow-Gauge Navy Rail.





**Pearl Harbor Naval Shipyard  
and Intermediate Maintenance  
Facility (PHNSY & IMF)  
GPR Survey Area 13 Map**

	Pearl Harbor PHNSY & IMF		Surface Rail Line
	Survey Area		Subsurface Rail Line

0 100 Meters  
0 400 Feet

Source: SEARCH Inc. 2016; NAVFAC Hawaii, 2012; Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, Swisstopo, and the GIS User Community; Copyright © 2013 National Geographic Society, i-cubed.







Figure 141. Map of Survey Area 13 (Head of Dry Dock No. 1 and 2) and Results.





**Pearl Harbor Naval Shipyard  
 and Intermediate Maintenance  
 Facility (PHNSY & IMF)  
 GPR Survey Area 13 Map**

	Pearl Harbor PHNSY & IMF		Crane Rail Line
	Survey Area		Narrow Gauge Rail Line

0 100 Meters  
 0 400 Feet

Source: SEARCH Inc. 2016; NAVFAC Hawaii, 2012; Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, Swisstopo, and the GIS User Community; Copyright: © 2013 National Geographic Society, i-cubed.



Figure 142. Map of Survey Area 13 (Head of Dry Dock No. 1 and 2) and Rail Types.



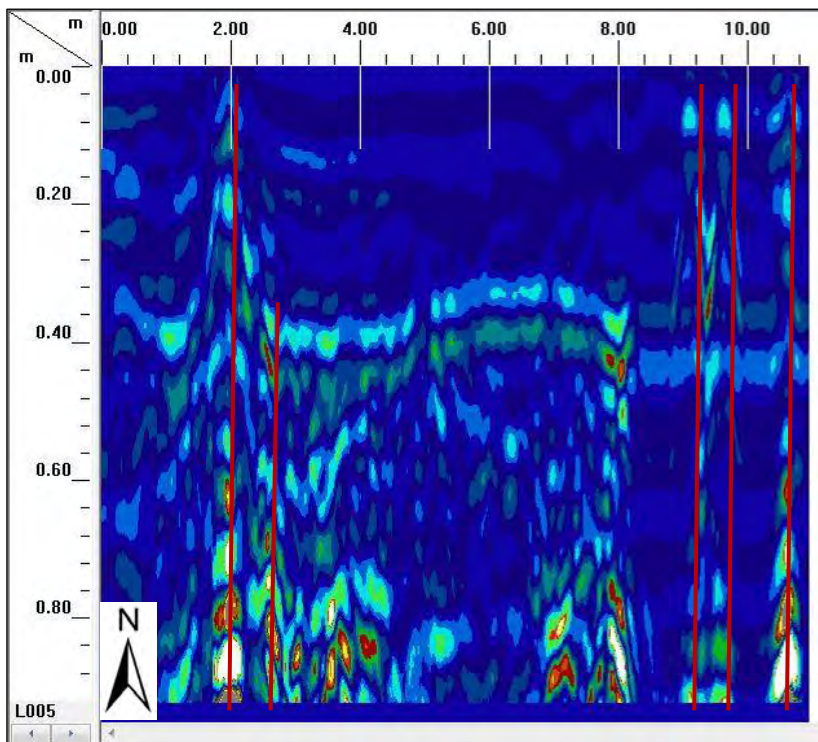


Figure 143. Radargram from Survey Area 13 showing reflections consistent with rails.

**xiv. Survey Area 14**

Survey Area 14 is a 0.89-acre area southwest of Dry Dock 2 along Third Street, between Fifth Street and Ingersoll Avenue (formerly Avenue G) (Figures 144-146). Initial investigations of the area found active crane rails were located throughout the survey area. The southern section of the survey area was used as a container storage area and parking lot. SEARCH located two surface features and one subsurface feature within and adjacent to the survey area (Table 14).

**Table 14. Survey Area 14 Extant Features.**

Feature	Length (m)	Type
14.1	407.55	Surface
14.2	241.54	Surface
14.3	175.03	Subsurface



Figure 144. Survey Area 14, looking northeast between Dry Dock No. 1 and Dry Dock No. 2.

Review of the historic maps found that construction of Dry Dock 2 began in 1941. The dry dock was completed in 1942 and contained both dual gauge and 28-foot gauge tracks surrounding the dock. The lines also linked to tracks surrounding Dry Dock 3, located to the west. In the same year, two crane line spurs were installed to connect the tracks surrounding Dry Dock 1 with Dry Dock 2. The rail system was replaced in 1954 with portal cranes and truck transportation that utilized Third Street and Avenue G.



Dry Dock 2 and the crane lines were in constant use during the GPR survey. Temporary restricted areas were setup by dock workers and crane operators along the east and west sides of the dock. The activity and layout of the rails within the survey area limited the ability to collect data. SEARCH utilized transects to survey between the active lines. Initial prospecting indicated there were additional rails between the extant crane rails.

The crane rails (Features 14.1 and 14.2) were evident on the surface and captured with GPS to the extent that SEARCH crew was not interfering with crane operation or entering restricted area. A subsurface study was conducted between the crane rails within Survey Area 14. After processing the GPR data, a narrow gauge track (Feature 14.3) was evident across all transects southeast of Dry Dock 2 and was located 3 meters from the inner (northeastern) surface crane rail (**Figure 147**). The formal survey of the southern parking lot indicated that the former line within the Avenue G right-of-way was removed and replaced with utilities.





The extant rails are associated with the construction of Dry Dock 2. The tracks were installed in 1941 and featured a dual gauge and crane rail system. Standard gauge tracks were removed prior to 1951 and the narrow gauge rails were abandoned in place in 1954. The GPR survey was limited to the survey area due to active use of the crane rails. There was no indication that these rails were cut and may extend further around the dock.

Navy Historical Architect, Jeff Dodge, conducted an additional pedestrian survey west of Survey Area 14 on June 29, 2016. Mr. Dodge recorded extant dual rail tracks under the center of the main portal crane tracks along the Marine Railway. An additional set of intact tracks near Dry Dock 2 were previously covered with a layer of asphalt. Cracks in the asphalt indicated a possible track west of Dry Dock 1, aligned with the previous set. Tracks were cut and replaced with steel plates at the intersection of the portal crane rails. Dual gauge tracks are also visible on the survey of the pavement west of Survey Area 14, inside the portal crane rails, curving toward Dry Dock 4. The rail line is cut and stops at the intersection of Ingersoll Avenue. These areas were not previously surveyed by SEARCH due to continuous use of the Shipyard, security measures, and shipping containers and steel plates covering any exposed dual gauge rail track.





**Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility (PHNSY & IMF) GPR Survey Area 14 Map**

	Pearl Harbor PHNSY & IMF		Surface Rail Line
	Survey Area		Subsurface Rail Line

0 100 Meters  
0 400 Feet

Source: SEARCH Inc. 2016; NAVFAC Hawaii, 2012; Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, Swisstopo, and the GIS User Community; Copyright: © 2013 National Geographic Society, i-cubed.



Figure 145. Map of Survey Area 14 (Head of Dry Dock No. 1 and 2) and Results.



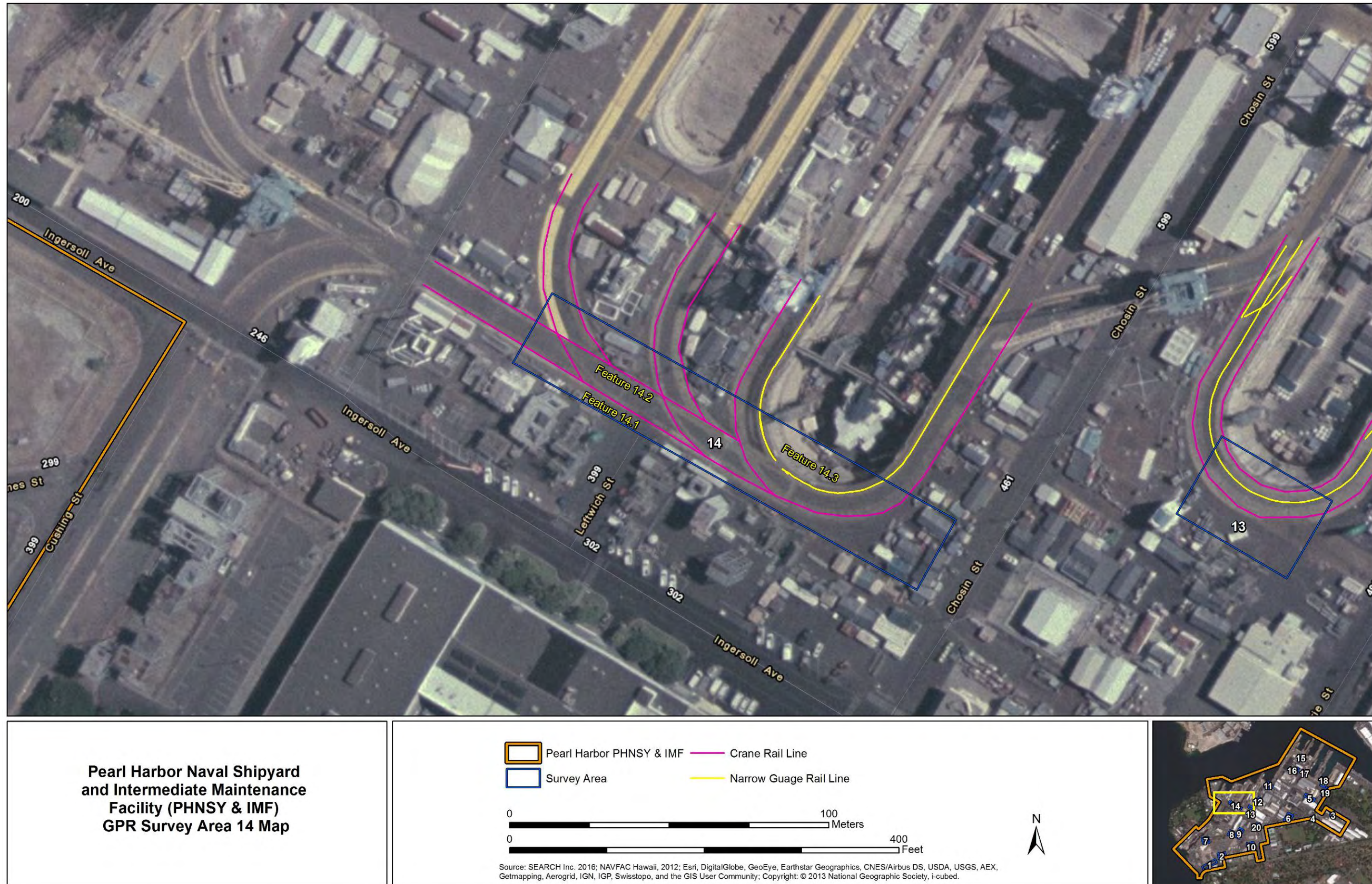


Figure 146. Map of Survey Area 14 (Head of Dry Dock No. 1 and 2) and Rail Types.



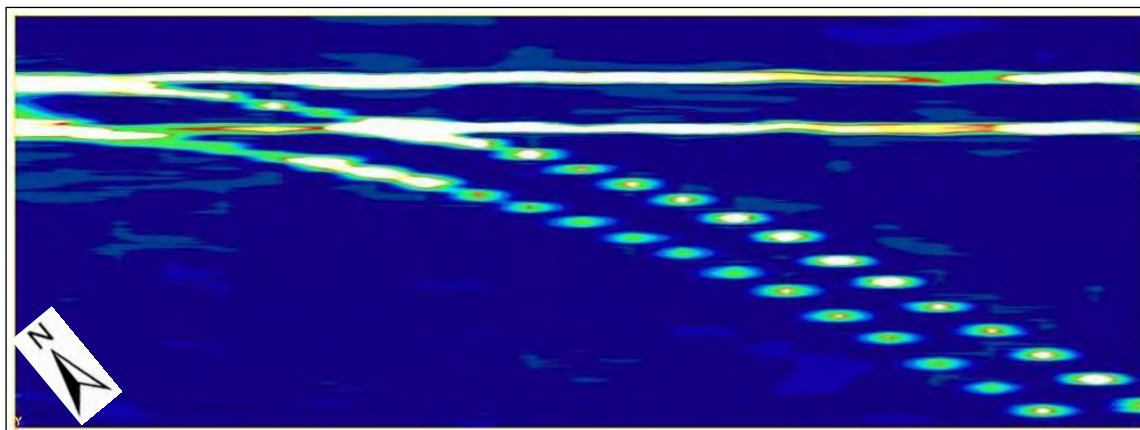


Figure 147. Amplitude Map from Survey Area 14 showing reflections consistent with rails.

**xv. Survey Area 15**

Survey Area 15 is a 0.43-acre area located in the northeastern portion of the CIA, along Port Royal Street (formerly Avenue A). The predetermined survey boundaries included a section of Port Royal Street, between the active crane rails, and the hazardous waste storage facility (Building 211) (Figures 148-150). Several metal storage containers were located near between the Repair Basin and Pier No. 1. Initial pedestrian reconnaissance noted two extant large crane rails (Features 15.1 and 15.2) on the surface as well as three possible rail traces in the asphalt. GPR prospecting indicated significant trenching for utilities within the area, particularly in the southwestern portion of the survey area. SEARCH located seven extant surface and three subsurface rails (Table 15).

Table 15. Survey Area 15 Extant Features.

Feature	Length (m)	Type
15.1	1135.52	Surface
15.2	583.05	Surface
15.3	69.57	Subsurface
15.4	14.37	Subsurface
15.5	7.38	Subsurface
15.6	121.41	Surface
15.7	222.41	Surface
15.8	4.05	Surface
15.9	66.79	Surface
15.10	13.01	Surface

Review of the historic maps found that the area was originally developed in 1919 to accommodate the Torpedo Boat Piers. At this time, a narrow gauge rail line linked the wharf, located to the southeast, to these piers. The Marine Railway was





**Figure 148.** Survey Area 15, at head of Repair Basins looking east with Fac. S100 to right.

expanded between Pier No. 1 and Pier No. 2 in the 1930s<sup>298</sup>. Configuration of the rails remained this way until 1945 and the completion of the Repair Basin. Earlier rails were removed and replaced with 28-foot gauge crane rails and narrow gauge lines connecting rails along Avenue B and Avenue C. The narrow gauge lines were abandoned in place in 1954.

Within Survey Area 15, the conditions allowed for the construction of a grid within the road. This was done to assess the rails that appeared to be buried in the asphalt between

<sup>298</sup> United States Navy. Navy Yard Pearl Harbor, Territory of Hawaii: 14<sup>th</sup> Naval District Showing Conditions on June 30, 1938. Map. 30 June 1938. Record Group 71, National Archives and Records Administration, Cartographic Section, College Park, Maryland.

the larger extant rails. During the field survey, two other alignments of rails were noted in the data, though there were significant disturbances seen. The processed GPR data showed three sets of rails within the surveyed area (Features 15.3, 15.4, and 15.5) (**Figure 151**). Two of these alignments were seen crossing the western portion of the grid. The third set of rails is in the southeast corner. Though historic maps show rails orthogonally crossing the grids, none of these were seen in the data. This suggested that the original lines from 1919 and 1926 right-of-ways were previously removed. Additional informal prospecting occurred across the available area. Large containers of grit from sandblasting occupy much of the space adjacent to Building 211 and limited the accessibility of the southern portion of the survey area.

Pedestrian survey of the area found that extant portions of track were located along Pier No. 1 (Features 15.6 and 15.7), along Port Royal Street (Feature 15.8), and between Building 67A and Building 129 (Features 15.9 and 15.10), located south of the survey area. Visible portions of the rails were recorded using GPS.

The crane rails, Features 15.1 and 15.2, were recorded using GPS in accessible areas along Port Royal Street and Pier No. 2. The measurable portions of Features 15.1 and 15.2 were 1,135.52 meters and 583.05 meters long, respectively. The features wrapped around the adjacent repair basins and along Port Royal Street. The rails continue along the repair basins, but were not recorded as they were in restricted areas. Subsurface rails along Port Royal Street matched the historic alignment on the northern edge of Building 92, Building S100,



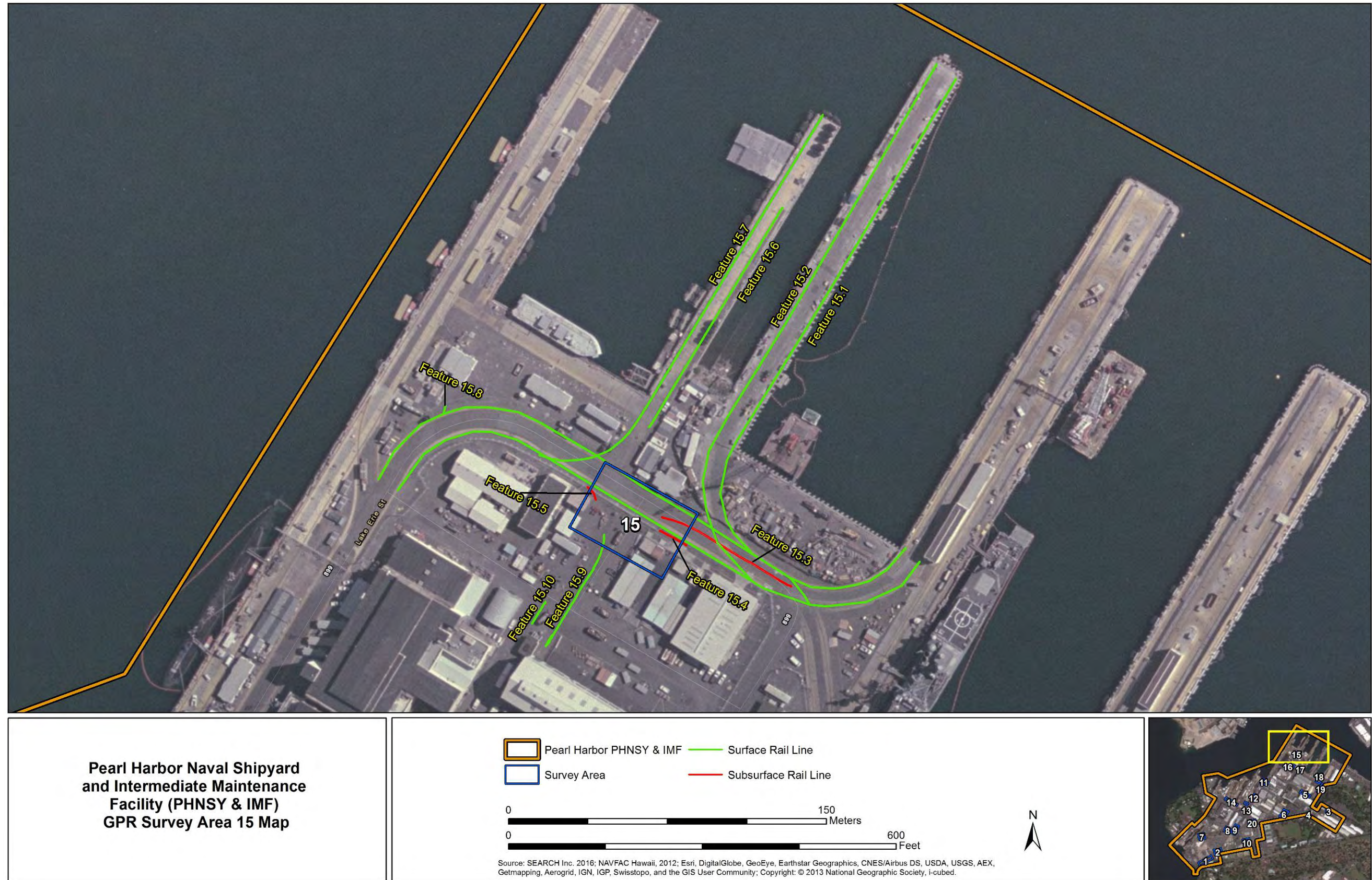


Figure 149. Map of Survey Area 15 (10-10 Slip and Repair Basin B-14) and Results.



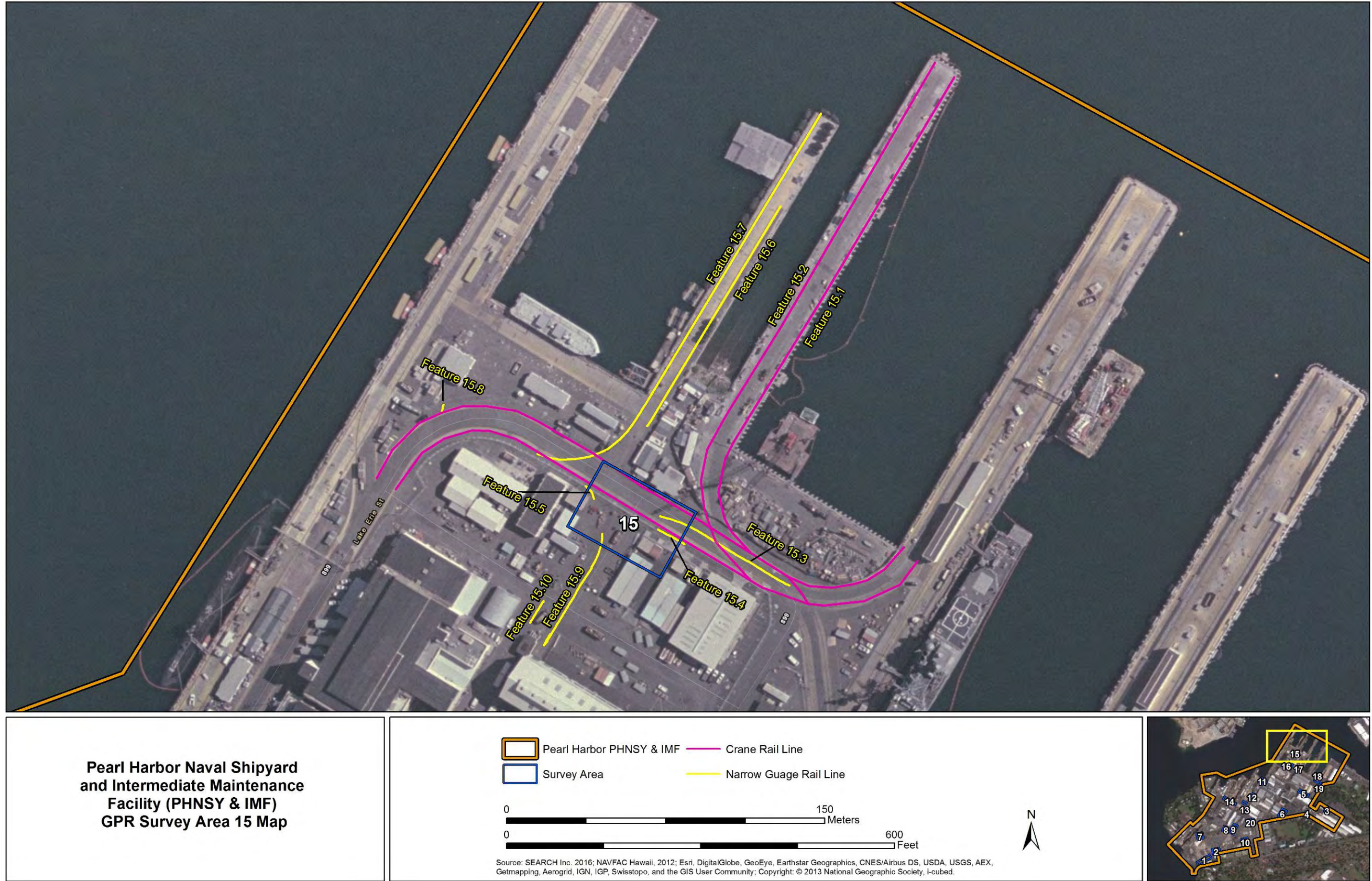


Figure 150. Map of Survey Area 15 (10-10 Slip and Repair Basin B-14) and Rail Types.



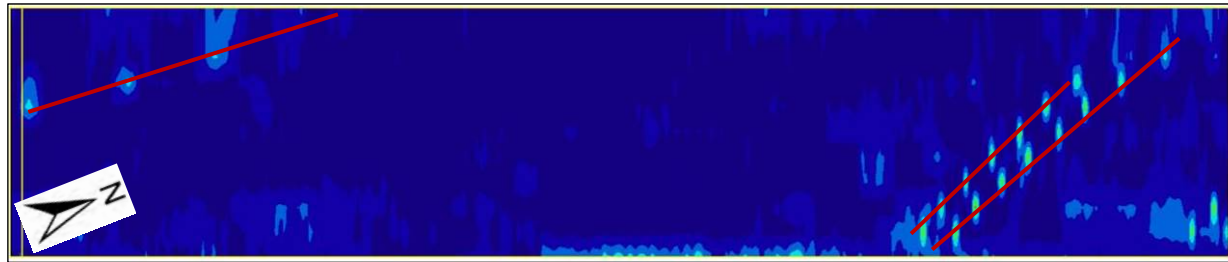


Figure 151. Amplitude map showing intact rails going across a survey grid in Survey Area 15.

and Building 211. Feature 15.3 extended outside the survey areas eastern boundary. Feature 15.4 was a 14.3-meters parallel section. Feature 15.5 was located on the western edge of the survey boundary. All three features were previously cut.

Features 15.6 and 15.7 were located on Pier No. 1 (**Figure 152**). Both features were visibly cut in multiple locations



Figure 152. Features 15.6 and 15.7, looking north toward Bravo 6.

where mesh drain holes were drilled. Feature 15.6 was located on the eastern most edge of the pier and extends from the midpoint of the dock to the beginning of Port Royal Street. Feature 15.7 extends along the western portion of the dock, from the northern end of the dock to Port Royal Street. The line crossed the street, curving west to merge with the no longer extant Sixth Street line. Both rails were visibly cut on either edge of the active crane lines. Feature 15.8 was located 81 meters west of the survey and represented a small section of rail line that once serviced 10-10 Pier.

South of the survey area were two extant features visible within the deteriorating asphalt. Feature 15.9 represents a track that crossed Avenue B before turning west and merging with the Pier No. 1 historic line. Feature 15.10 is a remnant of a parallel track that terminated at Avenue B.

The extant narrow gauge rails are most likely associated with the construction of the repair basin and 10-10 Slip. GPR survey and recording of visible surface rails do not correspond with early rail alignments but with alignments traced in 1945. Early rail lines were either removed or redirected to match the



crane tracks that connect the repair basins and Sixth Street rail.

### **xvi. Survey Area 16**

Survey Area 16 is a 0.18-acre area within a storage and work area, located on the corner of Club Road and Seventh Street (formerly Avenue C and Second Street), between Buildings 67, 67A, and 129 with limited available space (**Figures 153-155**). SEARCH conducted a pedestrian survey between the concrete pads and stored shipping containers. Informal GPR transects were placed in the small areas between the containers and along the south side of Building 129. Several utilities were located in the area including a water line, sewer manholes, and utility boxes. Evidence of pit excavations, capped with



**Figure 153. Survey Area 16, looking west from northeast corner of survey area.**

concrete, were located on the northern side of Building 67 and eastern side of Building 67A. Review of the historic rail line maps showed three lines previously traversing Seventh Street into the predefined survey area. As a result, SEARCH relocated the survey area to the east to incorporate Seventh Street between Survey Areas 16 and 17 (**Figure 156**). SEARCH located two subsurface extant rails adjacent to the survey area (**Table 16**)

**Table 16. Survey Area 16 Extant Features.**

Feature	Length (m)	Type
16.1	6.14	Subsurface
16.2	1.62	Subsurface

Development of the survey area began in 1919 with the construction of Second Street. Development continued with the construction of Building 67 (1926) and a Repair Basin Field Office, Building 129 (1938). Completion of the Repair Basin, in 1938, brought with it the development of the rail system around the basin. Rail lines crossed west over Second Street to merge with the Avenue C line, between Buildings 67 and 129. The line was rerouted in 1941 during the construction of Building 67A. After merging with the Avenue C line, the rail curved north between Buildings 67A and 129. A spur was installed to bring the rail into the western portion of Building 129. The line within the survey area remained unaltered until portions of it were removed during the installation of utilities.





**Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility (PHNSY & IMF) GPR Survey Area 16 Map**

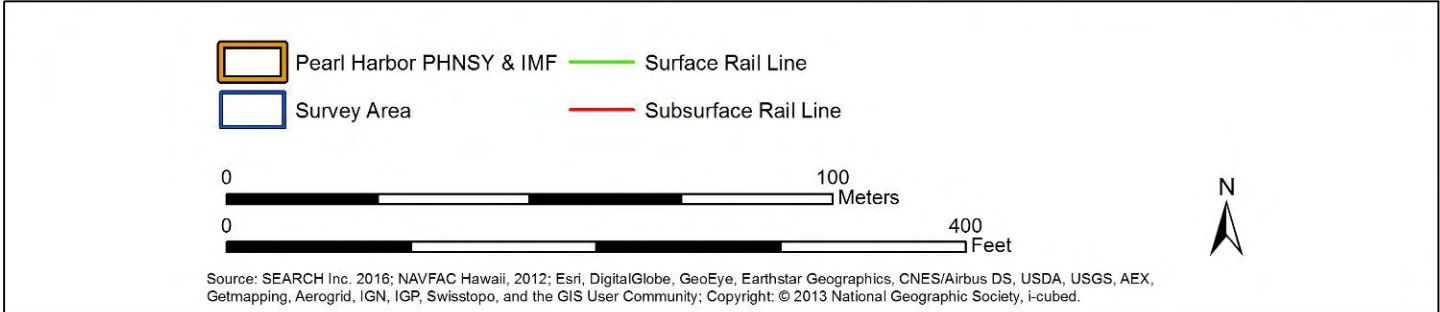






Figure 154. Map of Survey Area 16 (B67 Storage and Repair Basin B-14) and Results.





**Pearl Harbor Naval Shipyard  
 and Intermediate Maintenance  
 Facility (PHNSY & IMF)  
 GPR Survey Area 16 Map**

	Pearl Harbor PHNSY & IMF		Crane Rail Line
	Survey Area		Narrow Gauge Rail Line

0 100 Meters  
 0 400 Feet

Source: SEARCH Inc. 2016; NAVFAC Hawaii, 2012; Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, Swisstopo, and the GIS User Community; Copyright: © 2013 National Geographic Society, i-cubed.



Figure 155. Map of Survey Area 16 (B67 Storage and Repair Basin B-14) and Rail Types.





Figure 156. Survey Area 16, looking southeast from northwest corner of survey area.

Seventh Street is bisected by the Repair Basin fence. Three grids, interconnected through a single coordinate system, were aligned northeast to southeast. During the GPR survey, two features (**Figure 157**) were located within the Repair Basin, where two lines historically merged before crossing

Seventh Street. Pedestrian survey of the area located a sewer utility line at the western end of the features.

Feature 16.1, located on the southeastern side of Seventh Street, is a 5-meter section of line aligned east to east. The section was cut during the installation of a sewer utility to the east and an electrical utility to the west. Feature 16.2 is located 3.86 meters to the northwest of Feature 16.1. Feature 16.2 represents a merging line connecting the Repair Basin with the Avenue C rail. The feature is a 2.58-meter section, previously cut during the same utility lines that cut Feature 16.1.

Features 16.1 and 16.2 are most likely associated with the initial installation of rail lines during the completion of the Repair Basin and construction of Building 129. While the surrounding area was altered in 1941, this extant portion of rail remains in its original position. Pedestrian and GPR survey of the remaining area found no evidence of additional extant rails.

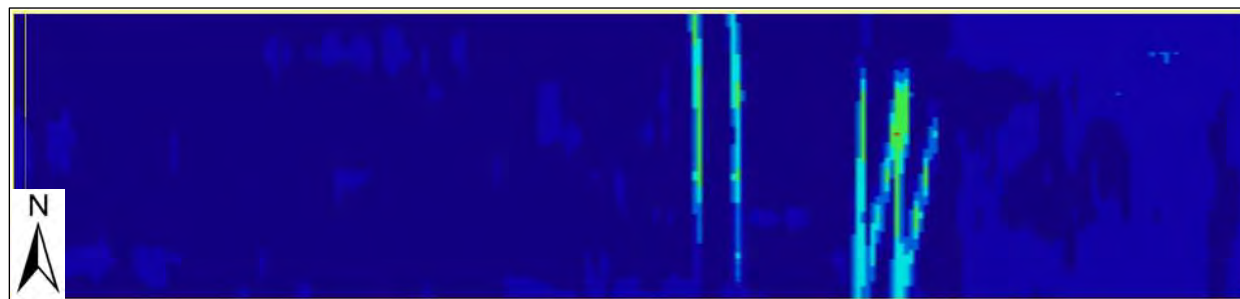


Figure 157. Amplitude map from Survey Area 16 showing reflections consistent with rails.

**xvii. Survey Area 17**

Survey Area 17 is a 0.52-acre area on the corner of Seventh Street and Club Drive, adjacent to the Repair Basin (B14) (Figures 158-160). The majority of the study area is a temporary lay down for construction materials and storage containers. SEARCH conducted a pedestrian survey between the stored material and shipping containers. GPR transects were placed in the small open areas between the containers and along the throughout the survey area and along the southwest of the repair basin. Utility trenches and manholes were located within the survey area. SEARCH recorded 10 above-ground features and one subsurface feature within Survey Area 17 (Table 17).



Figure 158. Survey Area 17, looking southeast down Hopper Avenue to the right.

**Table 17. Survey Area 17 Extant Features.**

Feature	Length (m)	Type
17.1	61.86	Surface
17.2	70.11	Surface
17.3	63.70	Surface
17.4	3.28	Surface
17.5	6.37	Surface
17.6	6.34	Surface
17.7	33.87	Surface
17.8	18.89	Surface
17.9	9.12	Surface
17.10	11.51	Surface
17.11	8.17	Subsurface

Development of this survey area is contemporaneous with that of Survey Area 16. All the features within Survey Area 17, except Features 17.3 and 17.4, were constructed in 1938. Features 17.8-17.11 match that of 16.2 and the realignment of the Avenue C line in 1941. Features 17.3 and 17.4 were expansions of an Avenue C spur that paralleled Building 139; this line connected Avenue C with Facility S132 to the north. The lines within Survey Area 17 are associated with the construction and expansion of the adjacent repair basins.

Features 17.1 and 17.2 are portions of the extant crane rail currently in use at the Repair Basin. Due to the activity and security in the area, only a 70.11-meter portion of each rail was recorded; however, the crane rail system extends around each of the three Repair Basins.





**Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility (PHNSY & IMF) GPR Survey Area 17 Map**

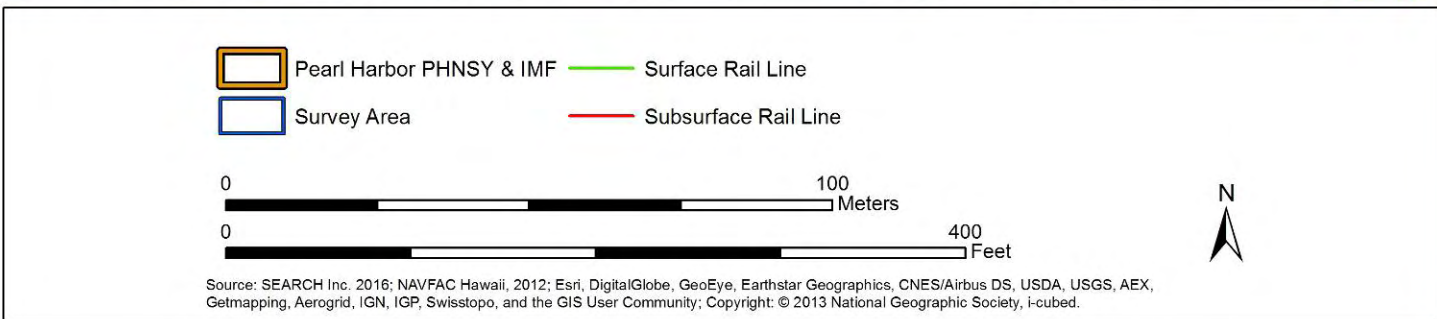


Figure 159. Map of Survey Area 17 (B67 Storage and Repair Basin B-14) and Results.



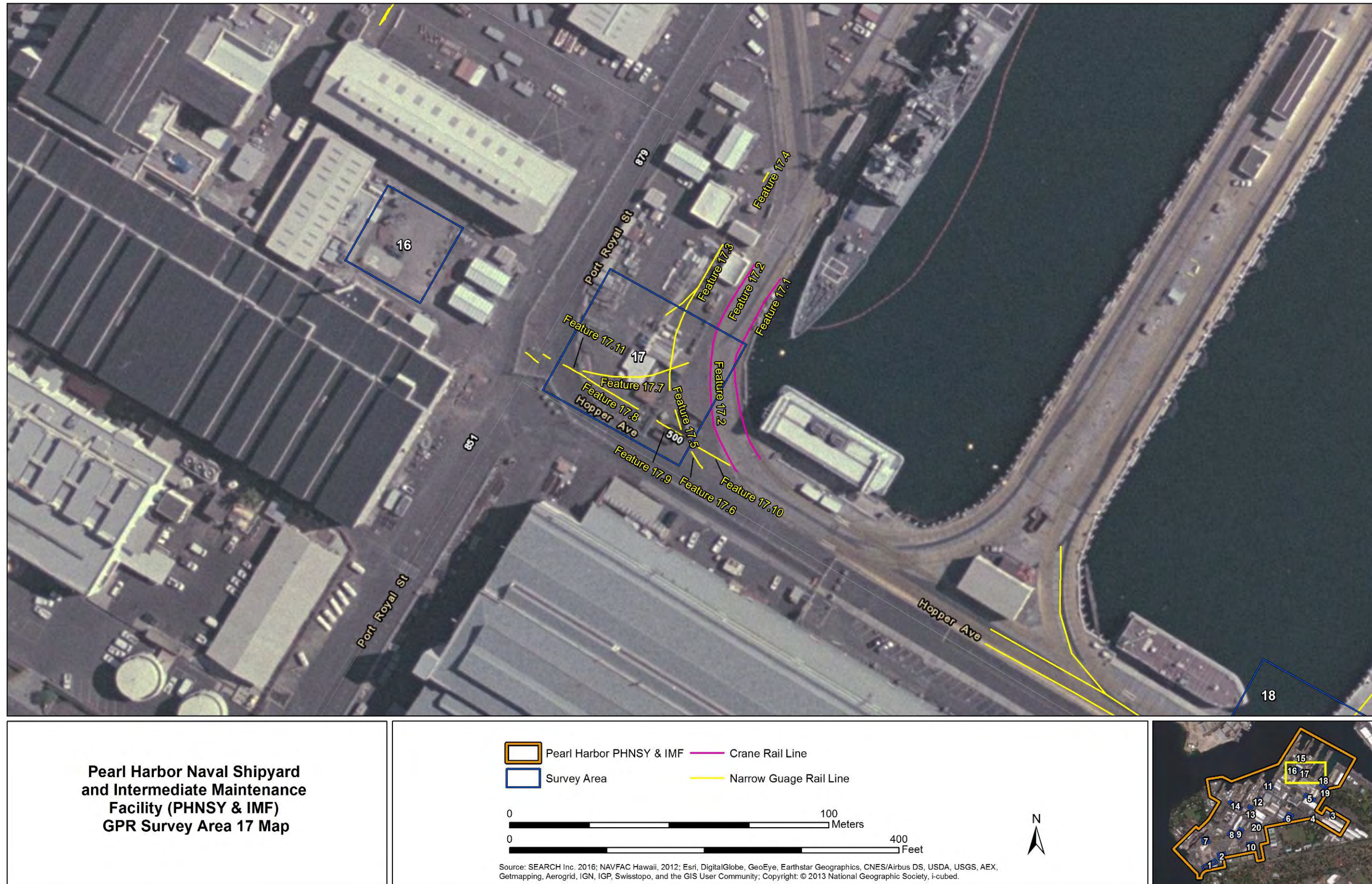


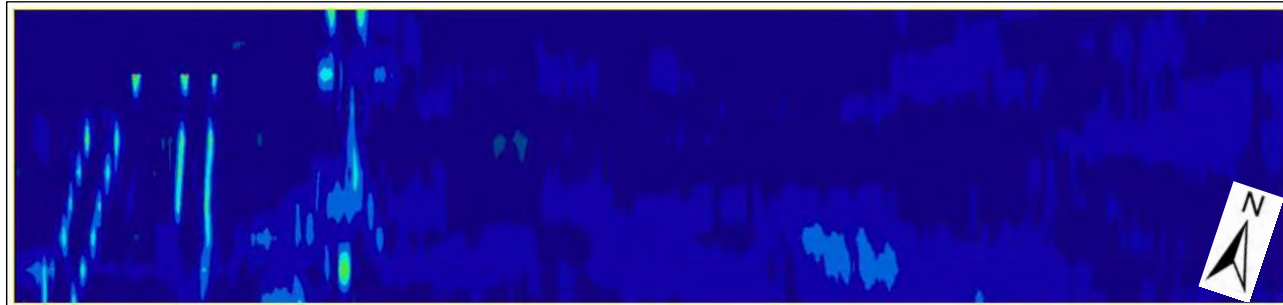
Figure 160. Map of Survey Area 17 (B67 Storage and Repair Basin B-14) and Rail Types.



Feature 17.3 is a surface extant of a split rail that ran parallel to Building 139. The rail splits south of the building to include an additional 13.83-meter branch. Feature 17.4, north of Building 139, is a continuation of the previous feature's rail alignment. Additionally,

Features 17.5 and 17.6 are also continuations of this rail alignment. Both features curve southeast along Avenue C. Feature 17.7 represents a portion of the narrow gauge line that ran between the crane rails along the Repair Basin. The extant portion curves southwest before merging with the Avenue C line. This line merges into the alignment represented by Features 17.8, 17.9, 17.10, and 17.11. Features 17.8, 17.9, and 17.10 represent a total of 39.49 meters of the broken Avenue C line. A meter long portion of both Features 17.7 and 17.8 (**Figure 161**), westernmost extents, are located underneath the asphalt and were found using GPR. There is a half-meter break in the line before the merge continues as Feature 17.11.

Surface features were visibly cut at both ends of the extant features. Features 17.3 and 17.7 had portions of the left rail missing (**Figure 162**). Feature 17.10 was visibly cut at the crane rail intersection and did not continue. Subsurface rail lines were cut below the fence line. GPR survey in Survey Area 16, along Seventh Street, confirmed this missing section of rail.



**Figure 161. Amplitude Map from Survey Area 17 showing reflections consistent with rails.**



**Figure 162. Feature 17.3, looking north.**

**xviii. Survey Area 18**

Survey Area 18 is a 0.57-acre area within the CIA, along the southwestern side of the Repair Basin (B19), west of Building 72 (Figures 163-165). The repair basin was not occupied during the survey, though this area remained busy with personnel due to the presence of an access gate to the CIA in the southeastern portion of the Survey Area, small restaurant within the eastern temporary structure, and docked naval vessel. A formal grid could not be established. In order to assess the presence or absence of other rails within Survey Area 18, transects were collected approximately every 10 meters. Pedestrian survey noted a large utility trench between the crane rails with perpendicular culverts. Both this and the GPR survey found that the decking along the eastern side of the dock was replaced recently. Subsurface testing found that the decking was homogenous and contained rebar.



**Figure 163. Survey Area 18, looking northeast across Hopper Avenue looking toward Fac. 72.**

SEARCH recorded two subsurface and two surface extant narrow gauge rails, as well as two crane rails within the survey area (Table 18). Features 18.1 and 18.2 represent a portion of crane rails connecting the three repair basins within a single rail network. The recorded crane rails are located on the southern side of B19 and span 475.23 meters and 386.18 meters, respectively, northeast towards East Quay. Crane rails extended further but were not recorded in the restricted or active work areas.

**Table 18. Survey Area 18 Extant Features.**





Feature	Length (m)	Type
18.1	475.23	Surface
18.2	386.18	Surface
18.3	27.24	Subsurface
18.4	35.67	Subsurface
18.5	16.55	Surface
18.6	10.94	Surface

The GPR data indicated two sets of rails are present up to the edges of the rebuilt portion of the deck (Figure 166). Northeast of the rebuilt area, rails are extant on the surface. Feature 18.3 is a subsurface alignment running east to west along the southeast of the repair basin. The feature ended prior to the end of the transects. Feature 18.4 is a parallel track, 9 meters south of Feature 18.3. The feature ends before the last western transect.





**Pearl Harbor Naval Shipyard  
and Intermediate Maintenance  
Facility (PHNSY & IMF)  
GPR Survey Area 18 Map**

 Pearl Harbor PHNSY & IMF	 Surface Rail Line
 Survey Area	 Subsurface Rail Line

0 150 Meters  
0 600 Feet

Source: SEARCH Inc. 2016; NAVFAC Hawaii, 2012; Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, Swisstopo, and the GIS User Community; Copyright: © 2013 National Geographic Society, i-cubed.



Figure 164. Map of Survey Area 18 (Repair Basin B-19) and Results.



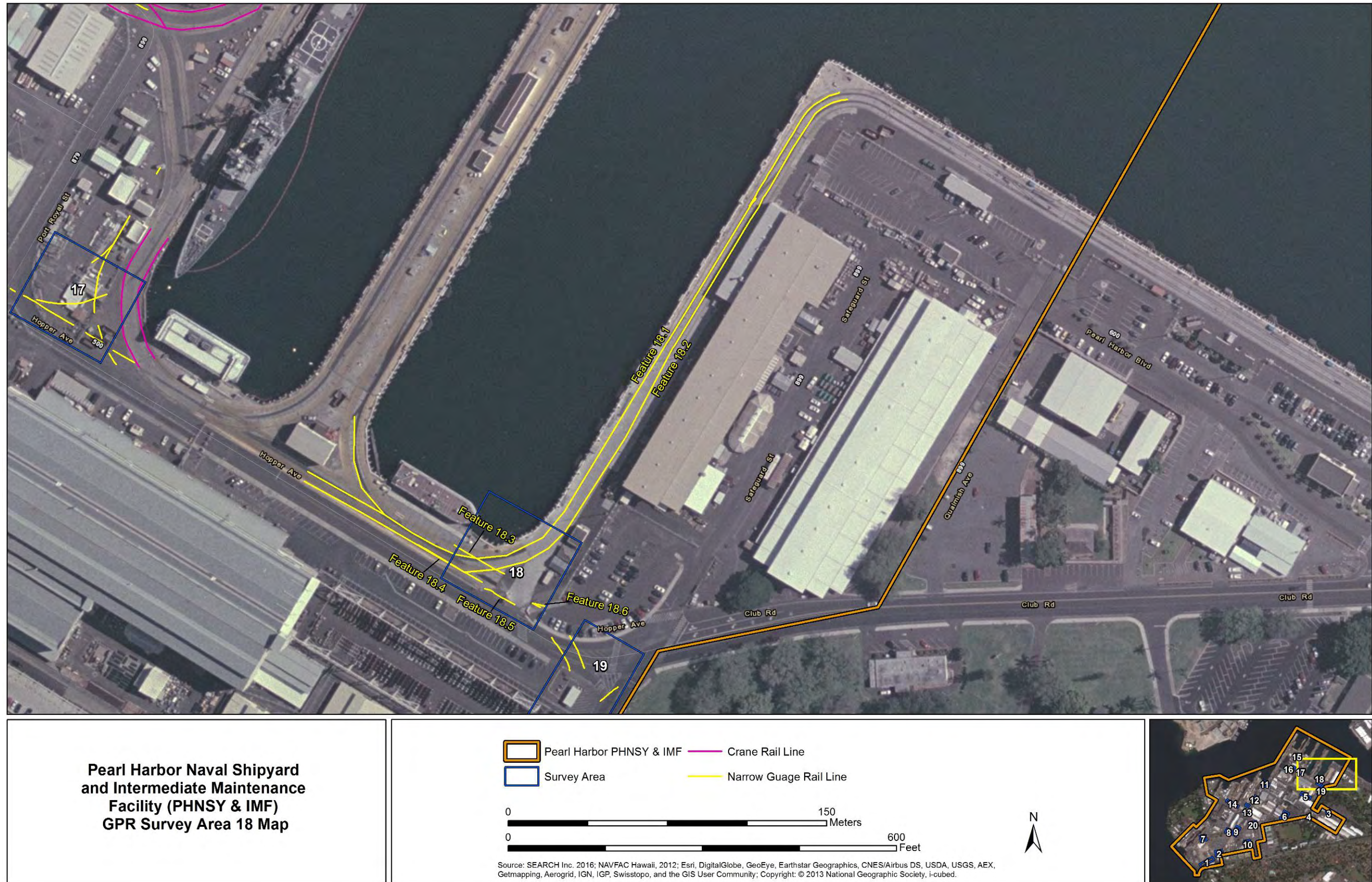


Figure 165. Map of Survey Area 18 (Repair Basin B-19) and Rail Types.



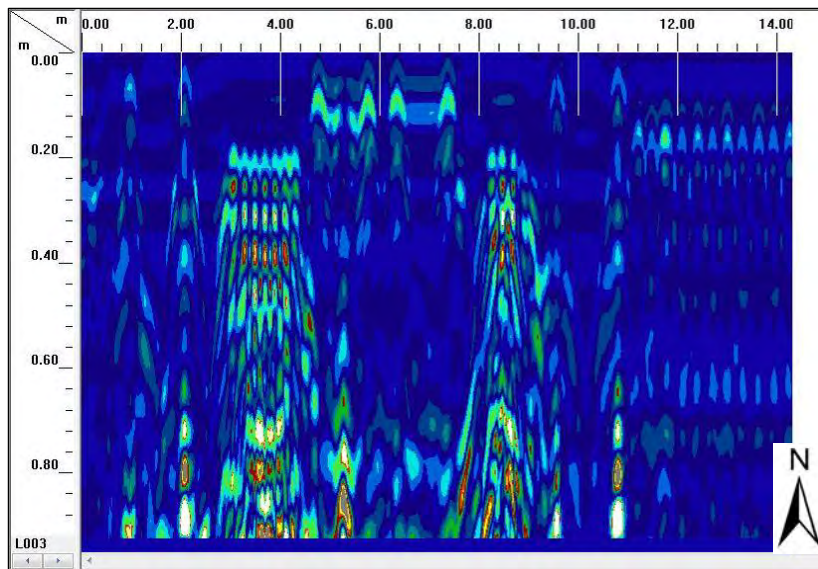


Figure 166. Radargram from Survey Area 18 showing rebar reflections consistent with portion of rebuilt deck.

Features 18.5 and 18.6 are extant surface narrow gauge rails located in the southeast corner of the survey area. Feature 18.5 is a continuation of Feature 18.4, but was cut during the installation of a water utility. Feature 18.6 represents the merger of two tracks leading to a line on club road and the eastern side of Building 72. The feature is visibly cut on the surface, where new asphalt was laid down for the road and nearby parking lot (Figure 167).

Development of this survey area is contemporaneous with that of Survey Areas 16 and 17. All the features within Survey Area 18 were constructed in 1938 along with the Repair Basin. The crane rails (Features 18.1 and 18.2) originally ended at the East Quay Substation, but were expanded in 1942 to include



Figure 167. Feature 18.6, looking southeast from southeast corner of Area 18.

access to Docks 22-25 and the Ferry Slip. By 1951, the crane line extended to the end of the Southeast Loch. The alignment of the narrow gauge rail features remaining the same until operation ceased.

#### ***xix. Survey Area 19***

Survey Area 19 is a 0.93-acre area located on the corner of Safeguard Street and Club Road (formerly Avenue C and Fourth Street) (Figures 168 and 169). Survey was limited to the roadway and northern parking lot, near Building 68. Construction of a formal survey grid proved impossible due to heavy traffic at this intersection and the presence of an active bus station. GPR prospecting transects and chalk were used to





**Figure 168.** Survey Area 19, at northwest corner of the survey area looking southwest.

identify subsurface rails under the asphalt. Rail lines were clearly visible in the field radargrams (**Figure 170**). Transects were placed at 5-meter intervals between the two sidewalks along Safeguard Street. Within Survey Area 19, four features were located within the middle of Safeguard Street (**Table 19**).

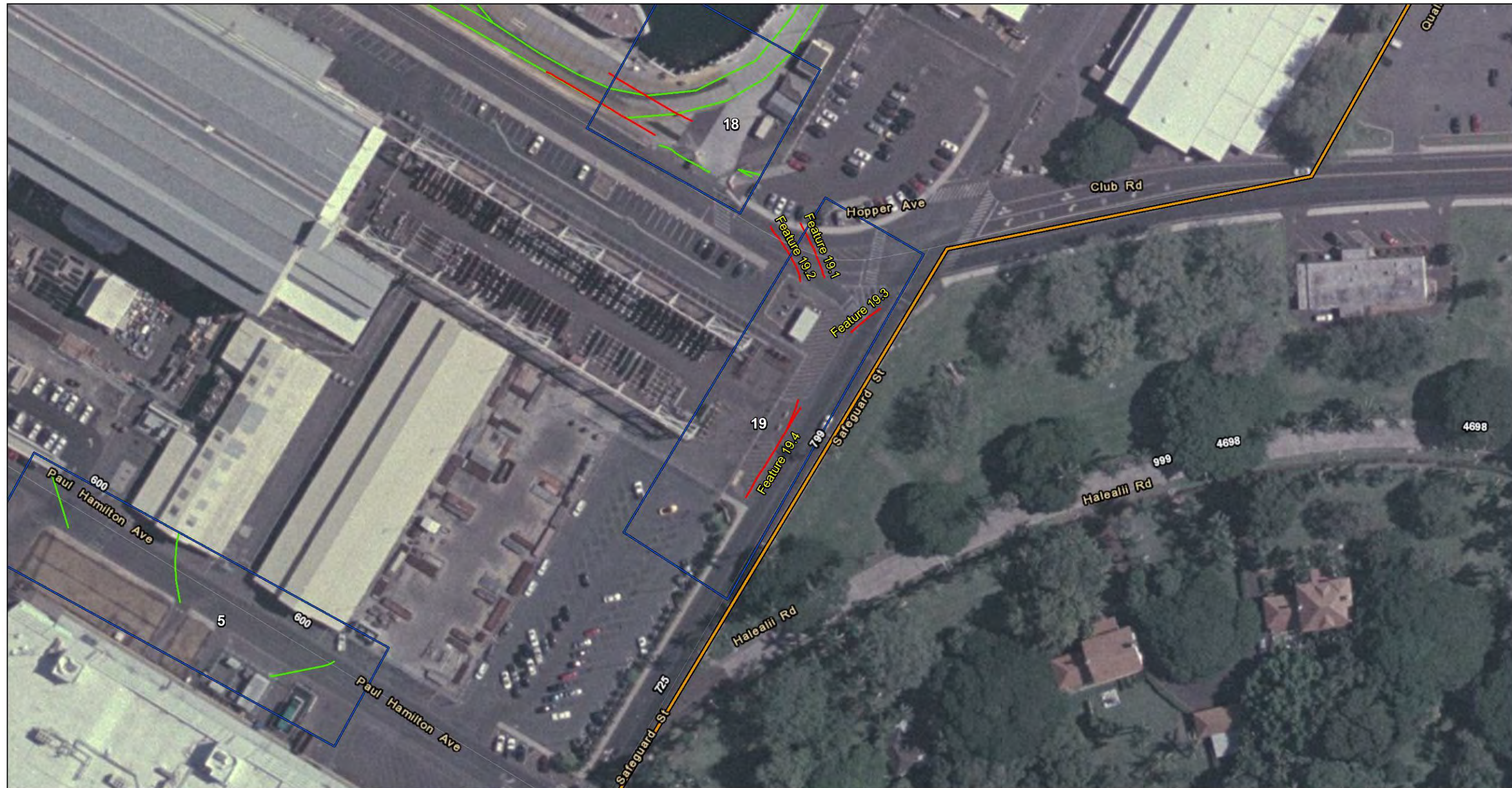
**Table 19. Survey Area 19 Extant Features.**

Feature	Length (m)	Type
19.1	17.04	Subsurface
19.2	18.14	Subsurface
19.3	10.97	Subsurface
19.4	38.73	Subsurface





The GPR survey revealed clear gaps where the rails were removed during subsurface utility installation or other phase of work.

Survey Area 19 is located on Fourth Street, which was a realigned street in 1919. A rail line was added to the eastern side of the street to service Buildings 68 and 72. The rail line was moved to the western side of the street in 1938 as part of the larger railway expansion to the repair basins. The rail line remained the same until 1945 when the northwestern spur was cut and replaced with Club Road. The remaining portions of the line ran until they were abandoned in place in 1954.





**Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility (PHNSY & IMF) GPR Survey Area 19 Map**

	Pearl Harbor PHNSY & IMF		Surface Rail Line
	Survey Area		Subsurface Rail Line

0 100 Meters  
0 400 Feet

Source: SEARCH Inc. 2016; NAVFAC Hawaii, 2012; Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, Swisstopo, and the GIS User Community; Copyright: © 2013 National Geographic Society, i-cubed.

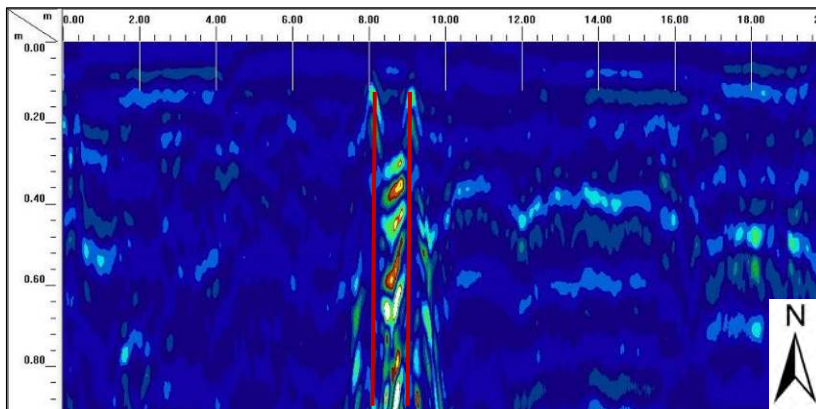


Figure 169. Map of Survey Area 19 (Former 4<sup>th</sup> Street [Safeguard Street] Storehouse Access) and Results.



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**Figure 170.** Radargram of Survey Area 19 showing reflections of subsurface rails.

GPR transects located Features 19.1 and 19.2 on the northwestern side of the road intersection. The two features were parallel and curved southeast from the CIA towards Safeguard Street. The features began and ended in the same locations. Feature 19.3 spanned the intersection, crossing Safeguard Street near the bus depot. This section is in line with Feature 19.4 which is underneath the western sidewalk, parallel to Safeguard Street. The can be seen within parallel cracks in the asphalt (**Figure 171**). The feature ends at the basalt rock Naval Shipyard sign.

The extant subsurface rails are remnants of the 1938 expansion along Fourth Street. Features 19.1 and 19.2 are spurs from the central Fourth Street line, heading northwest towards the repair basins. Feature 19.3 is a remnant of the northeast spur that was cut during the construction of Club Road. Feature 19.4 is a portion of the central line that spurs into Features 19.1 and 19.2.



**Figure 171.** Features 19.4 looking south/southwest.

#### **xx. Survey Area 20**

Survey Area 20 is a 1.3-acre area located in the fenced CIA area, near Building 58, and includes Central Avenue to the south. The survey encompassed the former Transportation Building parking lot and storage area, Central Avenue, and the northeast corner of Building 625 open work area (**Figures 172 and 173**). Pedestrian survey noted a large utility trench along the eastern façade of Building 58. Several parallel cracks leading from the open bays of Building 58 southeast towards the CIA fence line and Central Avenue. The crack alignments were partially hidden underneath metal containers and heavy equipment. SEARCH expanded the survey area to include Building 58, surrounding area, and Ingersoll Avenue (formerly Avenue G) to the north. Due to the arrangement of stored materials, formal GPR grids were limited to the expanded



Figure 172. Survey Area 20, looking northeast along Central Avenue.

area, along the CIA fence line, and along Ingersoll Avenue. Due to the limited access within the remaining storage area, GPR prospecting was conducted in small open spaces. Rails were marked in chalk. GPR transects were used across the highly active Central Avenue. SEARCH recorded 11 subsurface and three surface extant features (**Table 20**)

Building 58 was located outside of the predetermined survey area but was included because of the extant rails present within the building and its historic function as the Transportation Building. The building served maintenance facility for the entire railway system. Both narrow and standard gauge rails were located within the building (**Figure 174**). All rail lines leading out of the building were cut during

Table 20. Survey Area 20 Extant Features.

Feature	Length (m)	Type
20.1	88.72	Subsurface
20.2	84.92	Subsurface
20.3	60.63	Subsurface
20.4	47.92	Subsurface
20.5	54.32	Subsurface
20.6	66.80	Subsurface
20.7	41.95	Subsurface
20.8	43.68	Subsurface
20.9	43.16	Subsurface
20.10	29.85	Subsurface
20.11	16.22	Subsurface
20.12	14.88	Surface
20.13	12.63	Surface
20.14	124.90	Surface





the installation of a perpendicular utility trench that ran the length of the building. Several parallel cracks were observed on the opposite side of the trench, running southeast towards a historic junction, located just off the Central Avenue line. Eleven rail lines were located within the building.

The GPR unit was used in the small open spaces between storage containers to verify that the rails were extant. Portions of all 11 rails were extant within the storage area; however, all were cut near the location of the historic junction line. The features were recorded north to south as Features 20.1 through 20.11. The GPR data collected indicate rails immediately below the asphalt in the same arrangement seen in historic maps. The converging rails can be clearly seen in an amplitude map of the grid. The rail these alignments lead to would be outside of the fence. The rails show no indication of being disturbed across the gridded area.





**Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility (PHNSY & IMF) GPR Survey Area 20 Map**

 Pearl Harbor PHNSY & IMF	 Surface Rail Line
 Survey Area	 Subsurface Rail Line

0 100 Meters  
0 400 Feet

Source: SEARCH Inc. 2016; NAVFAC Hawaii, 2012; Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, Swisstopo, and the GIS User Community; Copyright: © 2013 National Geographic Society, i-cubed.



Figure 173. Map of Survey Area 20 (Former Locomotive Engine-House) and Results.



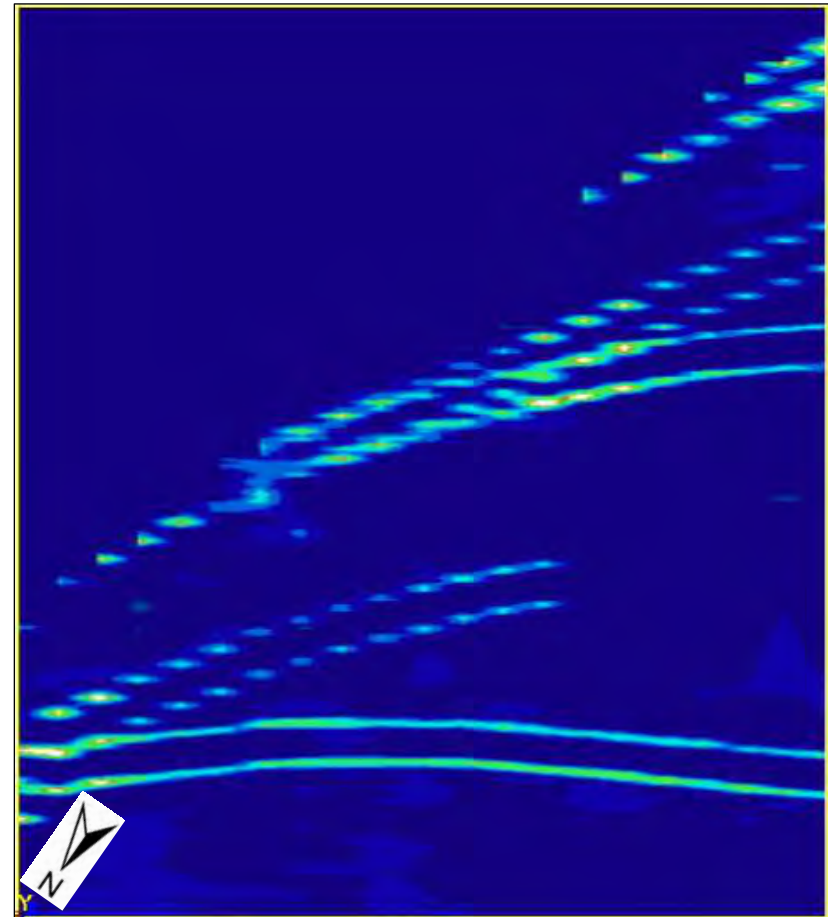
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**Figure 174.** Building 58 (Transportation Building), former Engine House, looking southwest from Ingersoll Avenue.

Formal grids were placed to the southeast of Building 58 along the fence to test the presence or absence of the junction. During fieldwork, five sets of rails (Features 20.1 through 20.5) were identified in the radargrams, in an alignment running from the nearby Building 58 out of the CIA (**Figure 175**). Data collected along the edge of the fence but outside of the grid showed individual rail lines rather than a single line, indicating the main line these spurs run is outside of the fence. The projected location of the main rail line is in the road; the road is currently below the grade of rails, indicating that the main line was removed.

Across the remainder of Survey Area 20, the GPR documented readings consistent with rails in front of the bays. Transects in the available areas in front of Building 58 indicate generally



**Figure 175.** Amplitude map showing reflections consistent with rails.

intact rails. These include one set of triple rails outside the westernmost of the work bays of Building 58. The rails in this area were missing within the footprint of buried utility line, but otherwise the signals indicate these rails are intact in the locations indicated on historic maps.

The GPR data from survey in the road, in a fenced-in storage yard, and in a small grassy area did not indicate the presence of buried rails in these locations. GPR data were reviewed from across the survey area in the map-projected locations of historic rails. These areas clearly experienced greater impacts from construction; this is also evidenced on maps, as these areas have seen new building while the area immediately south of Building 58 has been fairly consistent. It is likely the rails depicted in these areas on historic maps were removed at some point in the past.

Three extant surface rails were located within or adjacent to Survey Area 20. Feature 20.12 was located 10 meters east of the predefined survey boundary and is a 14.88-meter extant portion of track that services Buildings 299, 624, and 625. Feature 20.13 was located at the southeast corner of the CIA fence line and is an extant portion of the Central Avenue junction track that led to the transportation building. The remnant feature is cut on both sides and measures 12.62 meters long. Feature 20.14 is a 124.9-meter section of the Central Avenue line located on the southern side of the road.

Ground penetrating radar survey of selected areas of Pearl Harbor provided indication of intact rails across the historic facility. In some places, the rails were seen on the surface or were evident due to linear cracks in the asphalt. The rails corresponded with their mapped locations, and the presence or absence of rails could usually be ascertained within a few minutes through prospecting.

The Central Avenue track line was established in 1919 and remained relatively unaltered until 1942 when a small spur was created to divert cars into a contractor repair shop (no longer extant) north of Central Avenue. When the transportation building (Building 58) was constructed, 11 new lines were built to divert cars from the Central Avenue spur into the open repair bays. The junction line was expanded by 1945 in order to provide a thruway. The lines remained unaltered until the track was abandoned in place.

Features 20.1 through 20.11 are remnants of the construction of Building 58 and the expansion of the rail line into its repair bays. Feature 20.12 is located along the Avenue G line, realigned in 1943 during the construction of the junction line. Feature 20.13 is a remnant of the junction line. Feature 20.14 is the oldest alignment of the group and is an existing remnant of the Central Avenue line, constructed in 1919.



## 2.5: ANALYSIS AND EVALUATION

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The purpose of this investigation is to apply approved architectural methodological approaches to assess the NRHP condition, integrity, and significance of the extant historic railroad system and associated features within the Shipyard. Resources recorded during the survey were evaluated according to the NRHP criteria both individually and as possible contributing elements to a historic district. SEARCH relied on National Register Bulletins in determining the NRHP eligibility of the extant features:

- National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation of Districts, Sites, Buildings, Structures, and Objects
- National Register Bulletin 18: How to Evaluate and Nominate Designed Historic Landscapes.

### A. National Register Criteria

For a property to be eligible for listing in the NRHP, it must meet specific criteria established by the Secretary of the Interior, under the authority of the NHPA. The criteria for listing, which are codified in 36 CFR 60, establish two thresholds. The property must be:

- A. Associated with events that have made a significant contribution to the broad patterns of our history; or
- B. Associated with the lives of persons significant in our past; or

- C. An embodiment of distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction; or
- D. A property that has yielded, or may be likely to yield, information important in prehistory or history.

NRHP-eligible districts must possess “a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development.”<sup>299</sup>

In addition to historic significance, the property must maintain its historic integrity. Historic integrity is “the authenticity of a property’s historic identity, evidenced by the survival of physical characteristics that existed during the property’s prehistoric or historic period.”<sup>300</sup> Integrity includes the seven traits of location, design, setting, materials, workmanship, feeling, and association. Furthermore, “to retain historic integrity a property will always possess several, and usually most, of the aspects. The retention of specific aspects of

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<sup>299</sup> United States Department of the Interior. *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation*. US Department of the Interior, National Park Service, Cultural Resources. US Government Printing Office, Washington, DC, 1998, 5.

<sup>300</sup> United States Department of the Interior. *National Register Bulletin 16: How to Complete the National Register Registration Form*. US Department of the Interior, National Park Service, Cultural Resources. US Government Printing Office, Washington, DC, 1997, 4.

integrity is paramount for a property to convey its significance.”<sup>301</sup>

The historic research and analysis found that the Naval Shipyard railway system was an integral part of the development of the PHNSY & IMF. Beginning in 1909, the Navy Yard rail system was an extension of the O. R. & L. system, already in operation on O’ahu. Seeing a need to transport material and personnel to the burgeoning naval reservation, O. R. & L. extended the Puuloa line to the reservation boundary. In order to utilize the system, the Navy purchased and built a narrow gauge rail system. The system was operational in 1912. During a series of rapid expansion, the Navy developed standard gauge lines within the Coaling Plant and dual gauge lines adjacent to the dry dock, while also expanding their narrow gauge rail to connect industrial buildings with the dry dock facilities. The system underwent several realignments between 1919 and 1941.

PHNSY saw rapid growth during World War II, including the construction of new dry docks and repair basins. The railway system quickly expanded to meet growing demand of the expanding shipyard. Several extensions off the two main lines (Avenue D and Central Avenue) were built to connect new industrial buildings with the administrative area and dry docks. In 1943, locomotive cranes were replaced with larger cranes, utilizing 28-foot gauge rails. By the end of the war,

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<sup>301</sup> United States Department of the Interior. *National Register Bulletin 16: How to Complete the National Register Registration Form*. US Department of the Interior, National Park Service, Cultural Resources. US Government Printing Office, Washington, DC, 1997, 44.

truck transportation supplanted the rail system, leaving much of it unused. All of the remaining standard gauge tracks were removed, leaving only the narrow gauge and crane lines.

A resurgence of rail use occurred during the Korean War (1951–1954). Truck transportation was not able to carry the load of wartime efforts, so the rail system was renovated and reused. Expansion of the rail line occurred only in one area, along Central Avenue near the Bridge Gantry No. 1. After the war ended in 1954, the rail line was again replaced with truck transportation. The narrow gauge tracks were abandoned in place and the rail stock was sold off. Only the crane rails remained in use. These rails continue to be utilized in the CIA.

Evaluation of the eligibility of the Shipyard railway system for the NRHP is based on its significance as an interconnected linear feature of the historic Navy Yard. Individual features are not independent and constitute various secondary right-of-ways, spurs, and loop lines of a larger system. As such, individual features are cannot be treated separately. The rail system was evaluated as possible contributing elements to a historic district. These contributing elements constitute the development and expansion of the historic Navy Yard between 1938 and 1945. This period of significance reflects a time in which the Shipyard and railway system saw significant realignment and expansion. Although the railway system was utilized throughout the shipyard during earlier periods, the system was realigned between 1938 and 1945 to unify the industrial facilities with the Shipyard’s dry docks and repair basins. The railway was abandoned after the surrender of Japanese forces in 1945 and replaced with truck

transportation. Although a resurgence in use occurred during the Korean War (1951–1954), use of the railway was temporary. The system was abandoned once again in 1954.

- ***NRHP Criterion A – Associated with events that have made a significant contribution to the broad patterns of our history***

Within the context of World War II, the Shipyard railway is an interconnected linear feature that supported the construction of the Navy Yard and maintenance of naval vessels. The rail system was an active component of the Navy’s mission to service the Pacific Naval Fleet. Narrow gauge rolling stock provided raw materials from industrial shops to the workers and cranes located at the dry docks and repair basins. Locomotive and, later, portal cranes serviced vessels in need of repair.

Based on Criterion A, the Shipyard railway system would be eligible for listing in the NRHP.

- ***NRHP Criterion B – Associated with the lives of persons significant in our past***

Generally, under Criterion B, the association with individuals has been focused on persons of significant stature within politics, statesmanship, science, arts and architecture, history, and many other fields. The link between an individual and the property is usually direct, such as the home of that person or where something of significance was invented by that person. The background research and the historic context developed

for this report revealed no significant individuals directly linked to the Shipyard rail system.

- ***NRHP Criterion C – An embodiment of distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction***

Under Criterion C, the association focuses on characteristics of a style, high artistic value, or as a representative example of a famous architect or engineer. The Shipyard railway system does not include any of these features; however, like many railroads, the system represents a significant effort in design, construction, and engineering. The Shipyard railway is unique from many others in that the system was constructed using narrow gauge rail during a time when standard gauge was the accepted benchmark. The Navy chose a narrow gauge system in order to tie into the existing sugar plantation rails, utilized by the O. R. & L. throughout Oahu. Consequently, locomotives, box cars, flat cars, and track were easily acquired on island, without maintaining a direct supply line with the mainland United States.

While standard gauge rail was used within the Shipyard, it was confined to the Coal Station and dual gauge tracks along the Dry Dock. Dual gauge tracks allowed the Navy to utilize 25-ton locomotive cranes to hoist larger loads. Standard and dual gauge tracks were abandoned after 1943, when locomotive cranes were replaced by larger portal cranes and their



associated 28-foot gauge tracks. The Shipyard rail system continued to utilize narrow gauge locomotives to supply material to the larger cranes.

Based on its unique engineering qualities, the Shipyard railway system would be eligible for listing in the NRHP.

- ***NRHP Criterion D – A property that has yielded, or may be likely to yield, information important in prehistory or history***

Archaeological investigations, completed using GPR, were done as part of this survey. While extant portions of the fragmentary railway system were found throughout PHNSY & IMF, background research and historical research provide evidence of the original railway alignment, its expansion and realignment, and its connections between industrial facilities and the shipyard repair facilities. Though additional portions of trackage may exist within the Shipyard, it does not have the potential to yield additional information important to prehistory or history.

### ***i. Evaluation of Integrity***

The second requirement for a property to be eligible for listing in the NRHP is that the property must possess integrity of location, design, setting, materials, workmanship, feeling, and association.

*National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation* defines integrity as “the ability

of a property to convey its significance.” The Bulletin continues, “The evaluation of integrity is sometimes a subjective judgment, but it must always be grounded in an understanding of a property’s physical features and how they relate to its significance”<sup>302</sup>.

The extant rail features maintain their historic integrity of location. The pedestrian and GPR survey of PHNSY & IMF found that only fragmentary portions of the pre-1945 railway system are extant outside the CIA. Even though fragmentary portions of the rail line remain, the alignment of the extant tracks match those indicated in historic documents and maps between 1938 and 1951. However, due to the wide distribution of fragmentary rail lines, dating back to multiple time periods, and periodic replacement of tracks, including the system wide refurbishment in 1951, they do not retain their integrity of setting, workmanship, feeling, and association.

In contrast, rail lines located within the CIA have retained their integrity over time. The crane line right-of-way is similar to that of the original lines installed along Dry Docks 1, 2, and 3 and the Repair Basins in 1943. Extant and fragmentary narrow gauge lines are still located in their original 1938–1951 alignments, between the crane rails. The alignments convey the relationship between the locomotive system and the crane rails within the period of significance. The current

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<sup>302</sup> United States Department of the Interior. *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation*. US Department of the Interior, National Park Service, Cultural Resources. US Government Printing Office, Washington, DC, 1998, 44.

alignment of the crane rails also matches their historic right-of-way. Portal cranes, matching the style and dimensions of the historic equipment, continue to be utilized in the same manner as that in the period of significance. Within the CIA, both the fragmentary narrow gauge rail lines and actively used crane rails retain their integrity of design, setting, workmanship, feeling, and association.

It is the opinion of SEARCH that the PHNSY & IMF rail system, within the CIA, is a significant historic resource as a possible contributing element to a larger historic district. The rail system meets the NRHP Criterion A and C for its association with the expansion of the Shipyard and its mission to service the Pacific Fleet during World War II. The rail system was an integral part of buildup, ship construction, and maintenance. Extant rail features within the CIA match those of the historic right-of-ways, dated within the period of significance, and retain a high degree of integrity. Individual rail sections are not eligible for listing on the NRHP as structures.

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## 2.6: TIERED TREATMENT RECOMMENDATIONS

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Recommendations for the treatment of extant surface and subsurface lines have been tiered, based on the evaluation by recommendation of NAVFAC Hawaii. Extant lines located outside of the CIA will require a separate set of treatment guidelines than those within the CIA. These recommendations will ensure that the PHNSY & IMF historic rail system retains its eligibility and integrity as a contributing element to a historic district.

### A. Shipyard (Outside the CIA)

Rail lines within this area include the historic alignments and secondary lines associated with Avenue D and Central Avenue right-of-ways. Proposed projects affecting rail lines in this area shall be submitted for review by NAVFAC Hawaii's Cultural Resource Management (CRM) office to determine the effects on the historic property as required under Section 106 of the National Historic Preservation Act (NHPA), 1996 as amended. The project proponent shall be responsible to record using GPS, high-resolution photograph, and provide as-built drawings showing the locations of the Historic rail lines in relation to the project prior to start of construction. The qualified Navy Historical Architect (HA) shall make a determination whether to remove the extant section of rail or preserve in place. The Navy HA is a person meeting the professional qualifications under Standard (a) in "The Secretary of the Interior's Historic Preservation Professional Qualifications Standards" (Federal Register Vol. 62, No. 119, p. 33719, 1997).

The pilings related to the former Bridge Gantry No. 1 are also located in this area. As part of the NAVFAC Hawaii's CRM Office's review, the Navy HA shall make a determination whether to move, remove, or preserve in place the cement blocks.

### B. Shipyard Controlled Industrial Area

Rail lines within the CIA have retained their integrity and are significant to the rail system as a whole. Significance includes the eligibility of extant tracks to a larger historic district as contributing elements. The system reflects the Navy's expansion and use of the Shipyard within the period of significance (1938–1945). Contributing elements to the historic system include the active crane rails, abandoned narrow gauge, and dual gauge rails within the crane right-of-way, and extant surface and subsurface rails located on Port Royal Street, Club Road, Avenue D, Third Street, and around the docks, wharves, repair basins, industrial buildings, and along the Southeast Loch.

Proposed projects affecting rail lines within the CIA shall be submitted for review by NAVFAC Hawaii's CRM office to determine the effects on the historic property as required under the NHPA, 1966 as amended. The CRM office shall determine whether the proposed undertaking will require formal Section 106 consultation or can be reviewed under the 2012 CNRH Programmatic Agreement. The qualified Navy HA shall make a determination whether to remove the extant section of rail or preserve in place.

The project proponent shall be responsible to meet the documentation requirements for the affected historic rail lines and submit to the NAVFAC Hawaii CRM office. This includes the recordation of extant rail lines using GPS, high-resolution photography, and provision of as-built drawings showing the locations of the historic rail lines in relation to the project prior to start of construction. Monitoring of construction activities is required for project areas within or adjacent to extant surface or subsurface rail lines. Any subsurface rails will be recorded on archaeological site forms using GPS hardware and will be photographed. Extant narrow gauge and crane rails will be preserved in place and their GPS location uploaded to NAVFAC Hawaii's GeoReadiness Explorer (GRX), to supplement and expand the data recorded on buried rails during this undertaking.

#### ***i. Inadvertent Discoveries***

Within all portions of the Shipyard, inadvertent discoveries of extant rail lines will be brought to the attention of the NAVFAC Hawaii Cultural Resource Management Office. Extant tracks will be recorded using GPS. Any subsurface rails will be recorded on archaeological site forms using GPS hardware and will be photographed using a high-resolution professional camera. The qualified Navy HA shall make a determination whether to remove the extant section of rail, outside the CIA, or preserve in place. Rails located within the CIA will be preserved in place.

## 2.7: CONCLUSIONS

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The *Pearl Harbor Naval Shipyard & Intermediate Maintenance Facility Mapping and Inventory Survey and Historic Context Report of the Historic Railroad Tracks and Train Rails System Throughout Pearl Harbor Naval Shipyard & IMF, Pearl Harbor Hawai'i* was conducted to meet a stipulated condition for “no adverse effect” determination in a Section 106 consultation for MCON Project P-307. This report provides the historic context and evaluation of historic train rails extant within the Shipyard. All extant rail features were evaluated as contributing elements of a historic district under the NRHP Criteria for significance, condition, and integrity.

The Pearl Harbor Shipyard rail system was developed as a permanent rail system in 1912 that was expanded to connect vital industrial buildings with Dry Dock 1. Minor changes to the rail right-of-ways occurred between 1912 and 1939. Locomotive engines and cranes were used to deliver materials and assist the manufacture and repair of naval vessels. The system underwent realignment and a period of rapid expansion during World War II. Between 1938 and 1945, the system connected all the major industrial buildings, the expanded dry dock facilities, repair basins, as well as naval supply areas. Expansion of the system included dual gauge rails around the dry docks and installation of 28-foot gauge crane rails to support 25-ton and 50-ton portal cranes. The system was in operation until 1945, when truck transportation supplanted rail shipping methods. The system was renovated and reused during the Korean War; however, shortly after, the rail system was abandoned in place in 1954.

Based on the historical research, the Shipyard rail system is associated with the development and evolution of the historic Navy Yard and are components of the landscape of PHNSY & IMF. For a property to be eligible for inclusion in the NRHP, it “must meet one of the National Register Criteria for Evaluation” by:

- Being associated with an important historic context, and
- Retaining historic integrity of those features necessary to convey its significance.

SEARCH found the rail system was associated with an important historic context, under NRHP Criteria A and C. Historic integrity of the rail line necessary to convey significance was found with the PHNSY & IMF Controlled Industrial Area (CIA). While fragmentary, extant historic rail lines retain their association with the dry docks and repair basins. Narrow gauge tracks in this area are within the historic right-of-ways used to deliver materials to locomotive and overhead cranes. Crane rails and the crane right-of-way, constructed in 1943, are still used by overhead portal cranes. However, portal crane rails at waterfront areas outside the CIA frequently remain, but are abandoned in place.

Conversely, extant portions of the rail system outside of the current Controlled Industrial Area were found to be a widely distributed system of short fragments, dating back to multiple time periods. The majority of the rail equipment and lines were removed during the buildup of the Shipyard’s infrastructure; however, many of the rail right-of-ways with its



bedding, grading, loading platforms, trestles and landscape features remain intact. While these features still exist, these features do not retain historic integrity necessary to convey significance.

It is the opinion of SEARCH that the historic railroad tracks within PHNSY & IMF Controlled Industrial Area are contributing elements to a historic district and consist of a network of lines that have retained their historic integrity.

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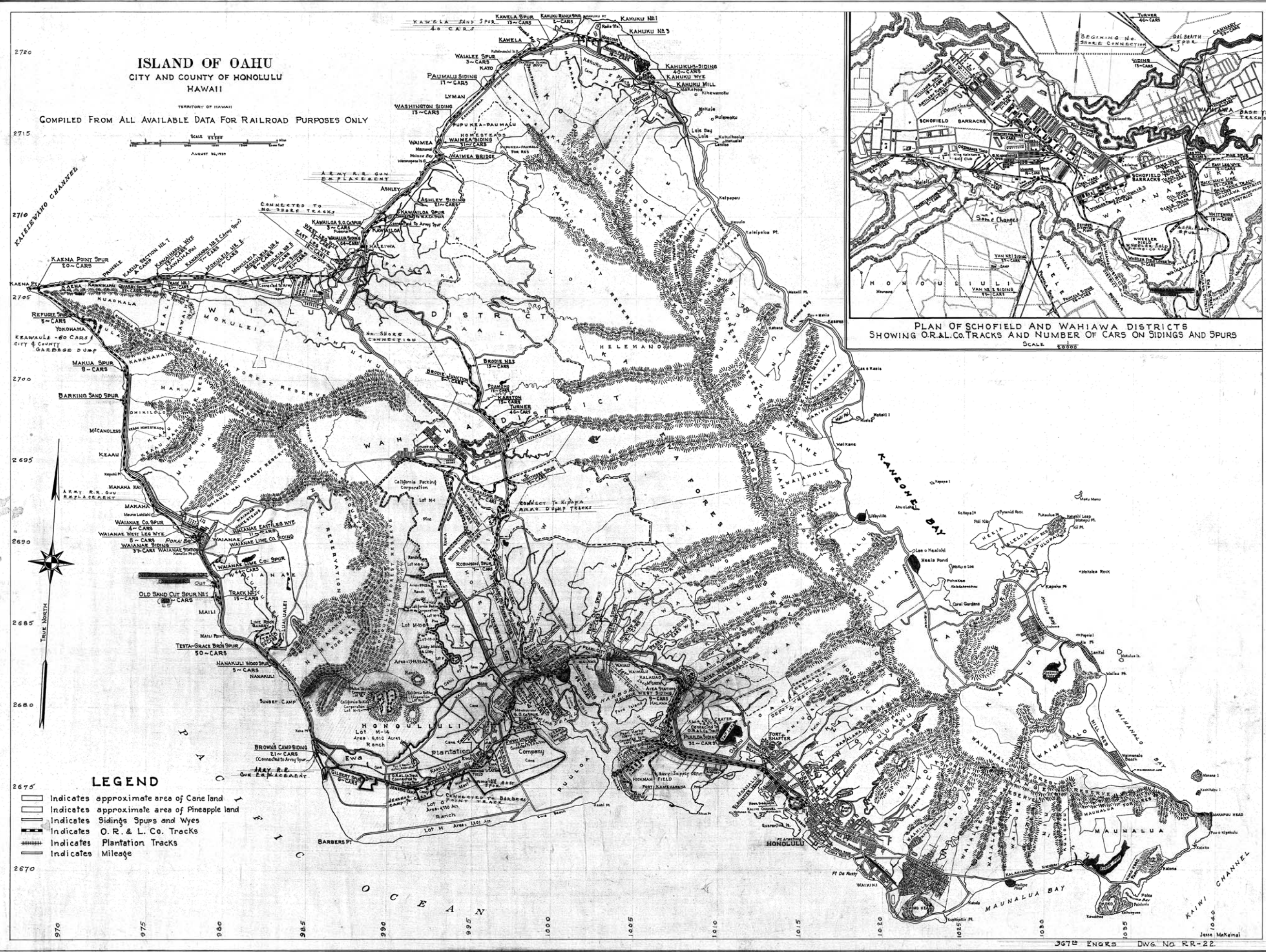


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**APPENDIX A.**  
**LARGE SCALE MAPS**



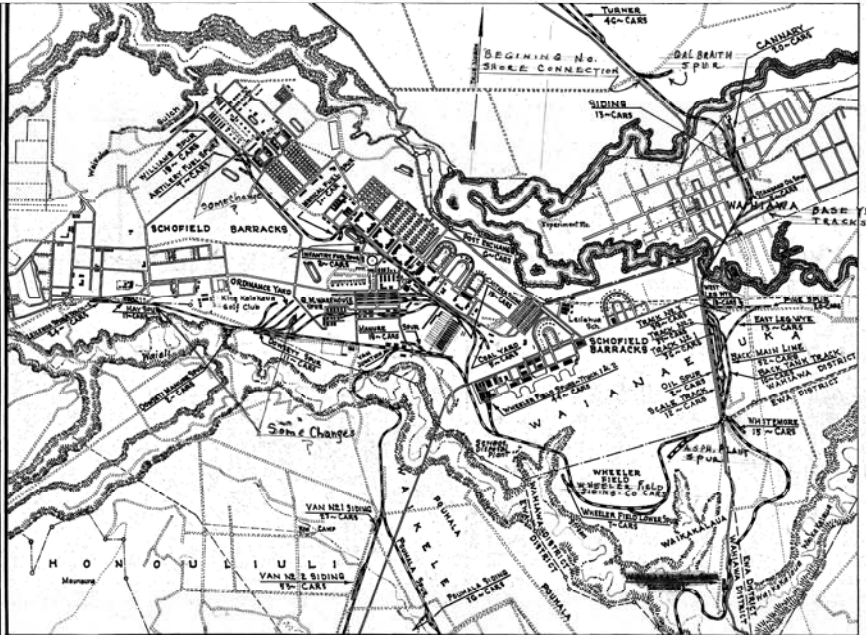




**ISLAND OF OAHU**  
CITY AND COUNTY OF HONOLULU  
HAWAII

COMPILLED FROM ALL AVAILABLE DATA FOR RAILROAD PURPOSES ONLY

SCALE 1:50,000  
AUGUST 26, 1919



PLAN OF SCHOFIELD AND WAHIAWA DISTRICTS  
SHOWING O.R. & L. CO. TRACKS AND NUMBER OF CARS ON SIDINGS AND SPURS  
SCALE 1:25,000

**LEGEND**

- ▭ Indicates approximate area of Cane land
- ▭ Indicates approximate area of Pineapple land
- Indicates Sidings Spurs and Wyes
- Indicates O. R. & L. Co. Tracks
- Indicates Plantation Tracks
- Indicates Mileage

Map 1

**LEGEND**

EDITION OF JUNE 7, 1921  
REVISIONS: AUG. 31, 1921  
JUNE 9, 1922.  
MAY 15, 1925; OCT. 31, 1928,  
NOV. 17, 1934.

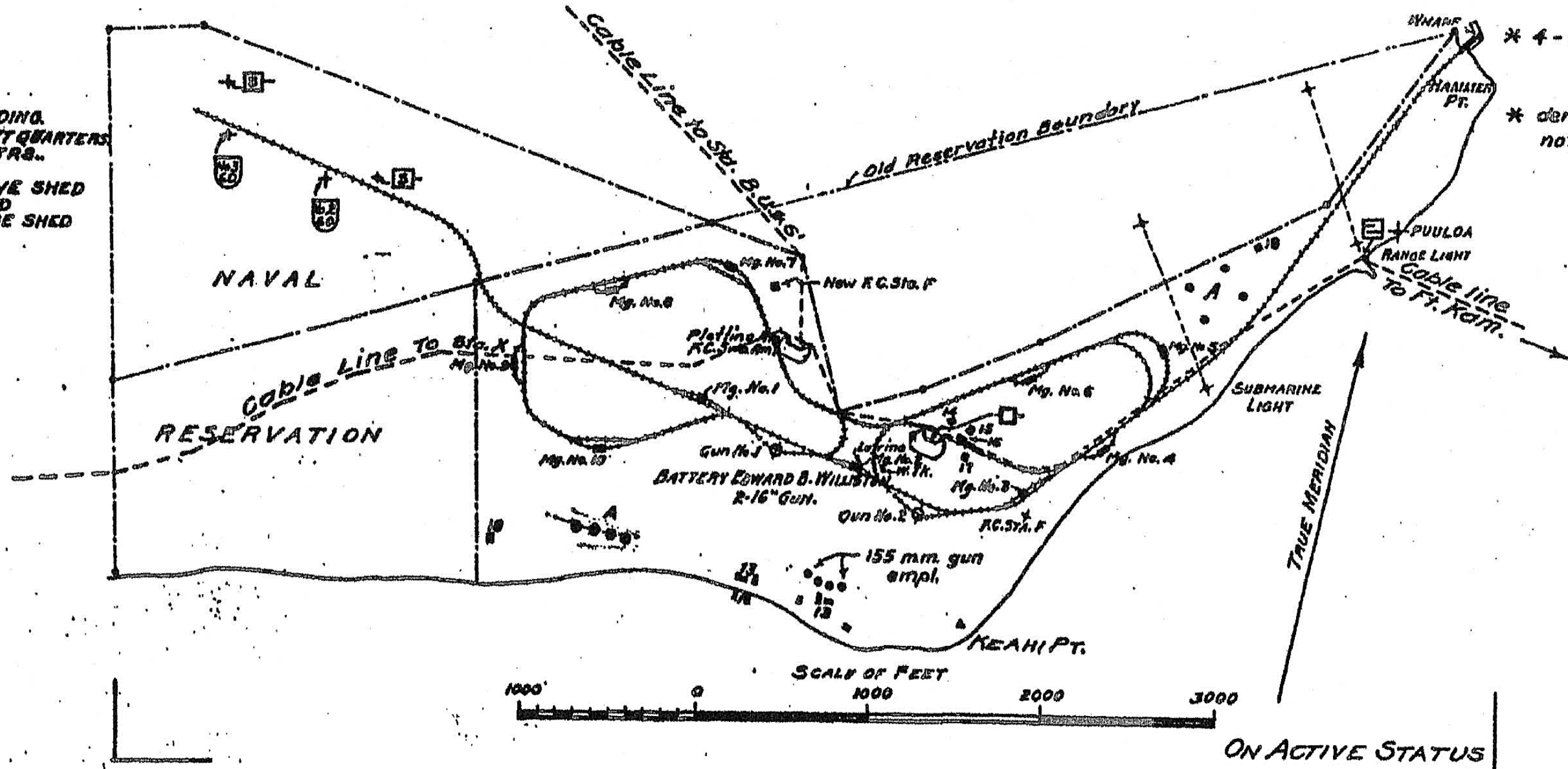
SERIAL NUMBER [REDACTED]

PEARL HARBOR, T. H.  
FORT WEAVER

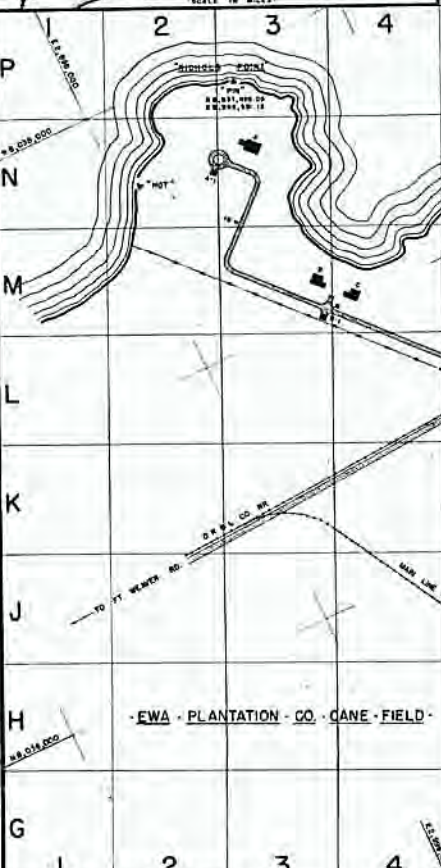
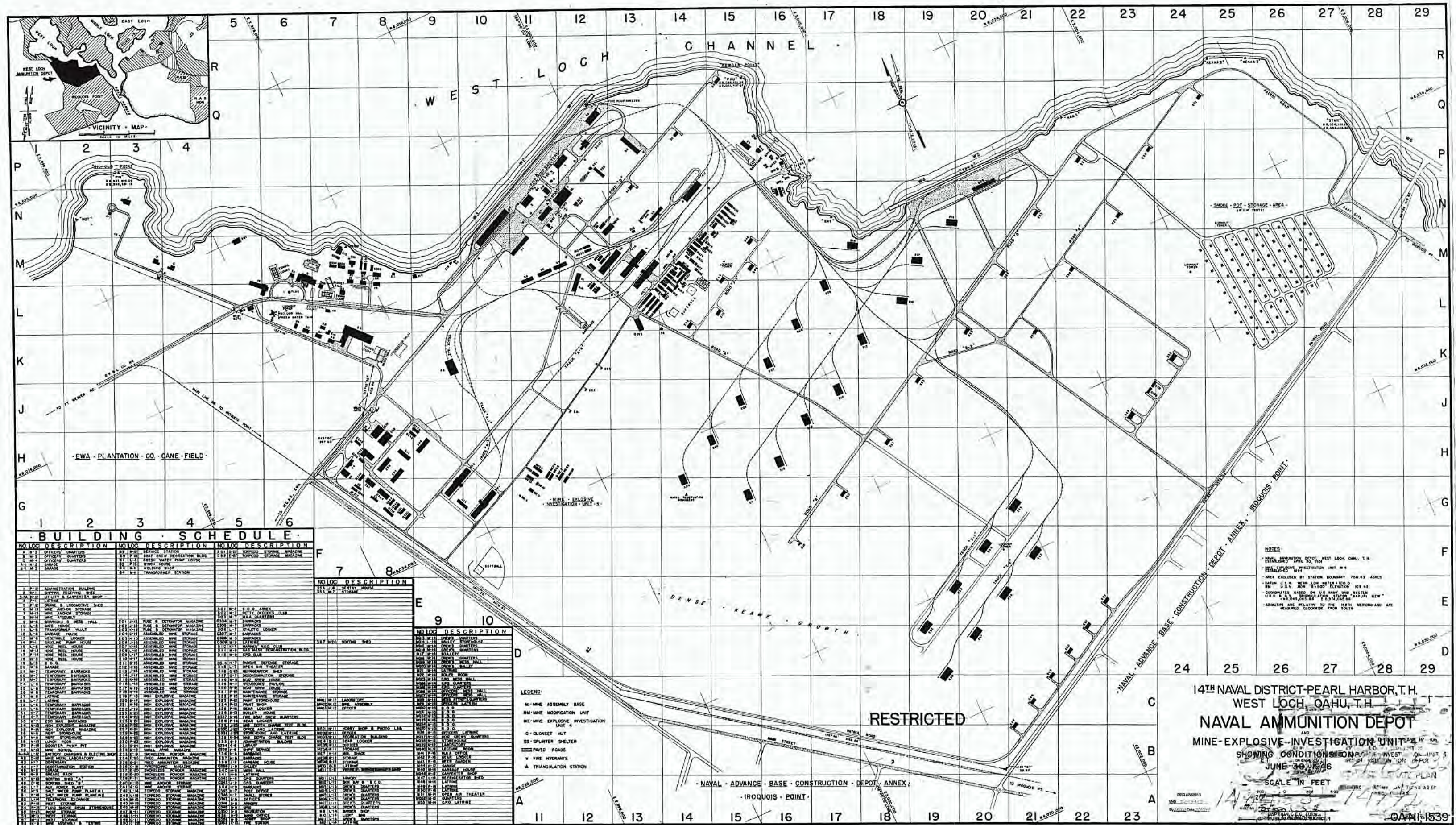
BATTERIES  
WILLISTON 2-16"  
A. ANTI-AIRCRAFT G.

BOAT LANDING  
DETACHMENT QUARTERS  
CREWS' QTRS.  
OIL SHED.  
LOCOMOTIVE SHED  
PAINT SHED  
A. STORAGE SHED

\* 4 - 155 m.m. gun  
\* denotes armam  
not mounted







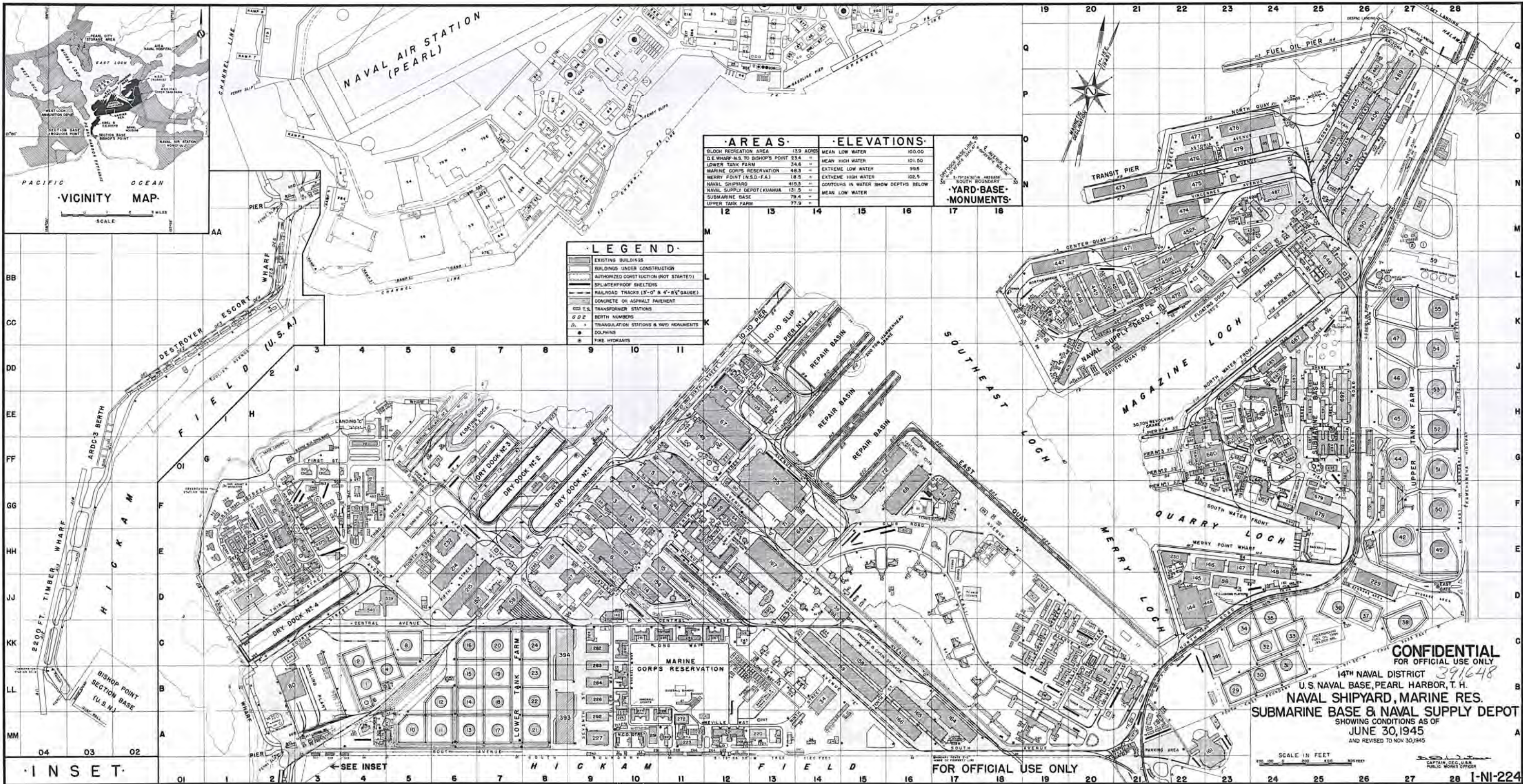
BUILDING SCHEDULE		
NO	LOC	DESCRIPTION
1	M-1	OFFICERS QUARTERS
2	M-2	OFFICERS QUARTERS
3	M-3	OFFICERS QUARTERS
4	M-4	OFFICERS QUARTERS
5	M-5	OFFICERS QUARTERS
6	M-6	OFFICERS QUARTERS
7	M-7	OFFICERS QUARTERS
8	M-8	OFFICERS QUARTERS
9	M-9	OFFICERS QUARTERS
10	M-10	OFFICERS QUARTERS
11	M-11	OFFICERS QUARTERS
12	M-12	OFFICERS QUARTERS
13	M-13	OFFICERS QUARTERS
14	M-14	OFFICERS QUARTERS
15	M-15	OFFICERS QUARTERS
16	M-16	OFFICERS QUARTERS
17	M-17	OFFICERS QUARTERS
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99	M-99	OFFICERS QUARTERS
100	M-100	OFFICERS QUARTERS

NO	LOC	DESCRIPTION
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109	M-109	OFFICERS QUARTERS
110	M-110	OFFICERS QUARTERS
111	M-111	OFFICERS QUARTERS
112	M-112	OFFICERS QUARTERS
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147	M-147	OFFICERS QUARTERS
148	M-148	OFFICERS QUARTERS
149	M-149	OFFICERS QUARTERS
150	M-150	OFFICERS QUARTERS

- LEGEND:
- M - MINE ASSEMBLY BASE
  - MM - MINE MODIFICATION UNIT
  - ME - MINE EXPLOSIVE INVESTIGATION UNIT 4
  - G - GLOUSEL HLT
  - SS - SPLINTER SHELTER
  - PR - PAVED ROADS
  - F - FIRE HYDRANTS
  - Δ - TRIANGULATION STATION

14<sup>TH</sup> NAVAL DISTRICT-PEARL HARBOR, T.H.  
 WEST LOCH, OAHU, T.H.  
**NAVAL AMMUNITION DEPOT**  
 AND  
 MINE-EXPLOSIVE INVESTIGATION UNIT 4  
 SHOWING CONDITIONS ON DATE INVESTIGATION UNIT 4  
 JUNE 30, 1946  
 SCALE IN FEET  
 1" = 100'  
 1" = 200'  
 1" = 400'  
 1" = 800'  
 1" = 1600'





AREAS		ELEVATIONS	
BLOCK RECREATION AREA	13.9 ACRES	MEAN LOW WATER	100.00
D.E. WHARF #13 TO BISHOP'S POINT	83.4 "	MEAN HIGH WATER	101.50
LOWER TANK FARM	34.6 "	EXTREME LOW WATER	98.5
MARINE CORPS RESERVATION	48.3 "	EXTREME HIGH WATER	102.5
MERRY POINT (N.S.D.-P.A.)	18.5 "	CONTIGUOUS IN WATER SHOW DEPTHS BELOW	
NAVAL SHIPYARD	415.3 "	MEAN LOW WATER	
NAVAL SUPPLY DEPOT (KUAHUA)	131.5 "		
SUBMARINE BASE	79.4 "		
UPPER TANK FARM	77.9 "		

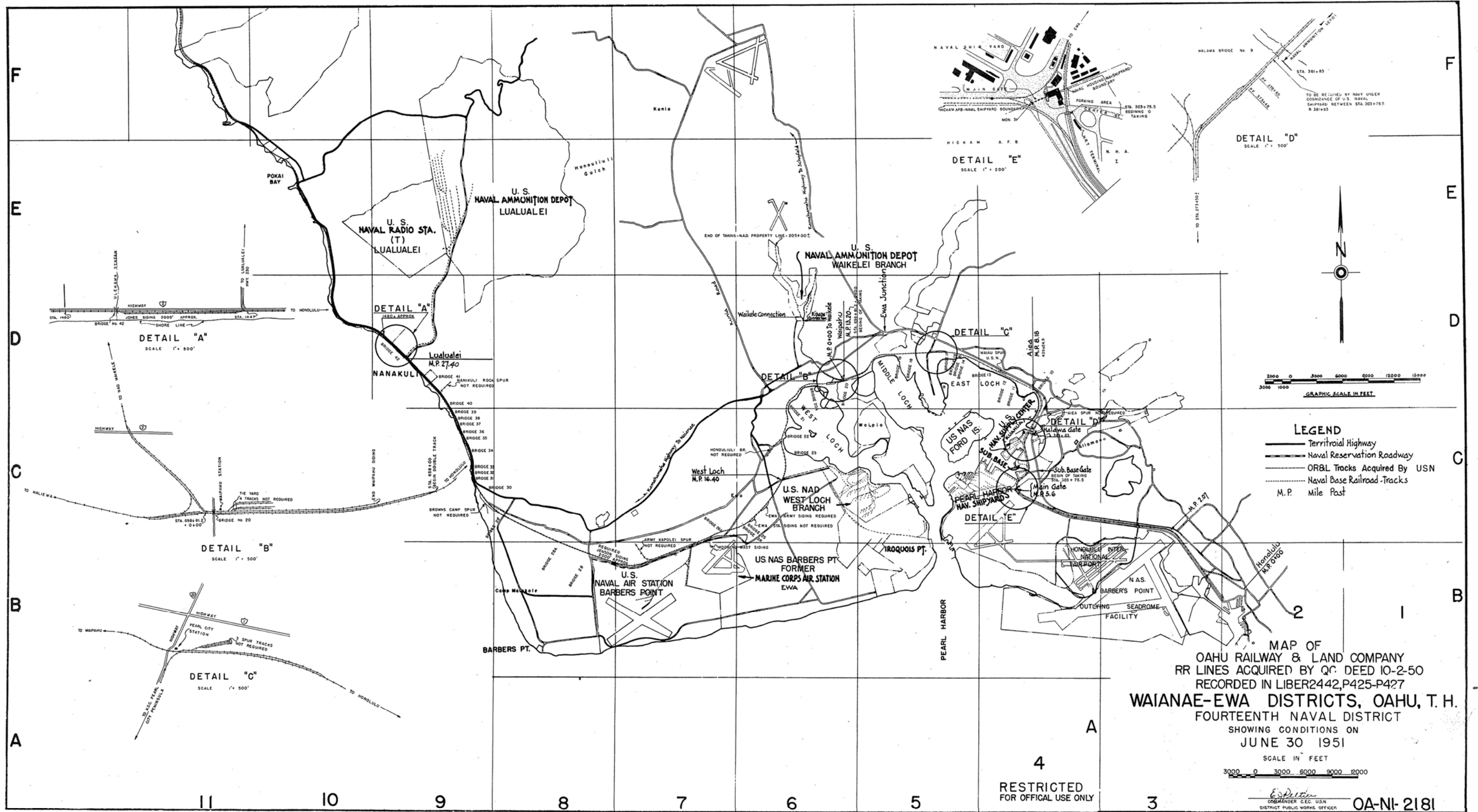
LEGEND	
[Solid Grey Box]	EXISTING BUILDINGS
[Dotted Box]	BUILDINGS UNDER CONSTRUCTION
[Dashed Box]	AUTHORIZED CONSTRUCTION (NOT STARTED)
[Wavy Line]	SPLINTERPROOF SHELTERS
[Double Line]	RAILROAD TRACKS (3'-0" & 4'-8 1/2" GAUGE)
[Thin Line]	CONCRETE OR ASPHALT PAVEMENT
[Square with T]	T.S. TRANSFORMER STATIONS
[Circle with 2]	BERTH NUMBERS
[Triangle]	TRIANGULATION STATIONS & WAD MONUMENTS
[Star]	DOLPHINS
[Circle with H]	FIRE HYDRANTS

**CONFIDENTIAL**  
 FOR OFFICIAL USE ONLY  
 14TH NAVAL DISTRICT 391648  
 U.S. NAVAL BASE, PEARL HARBOR, T. H.  
 NAVAL SHIPYARD, MARINE RES.  
 SUBMARINE BASE & NAVAL SUPPLY DEPOT  
 SHOWING CONDITIONS AS OF  
 JUNE 30, 1945  
 AND REVISED TO NOV 30, 1945

1400-3-140

Map 4





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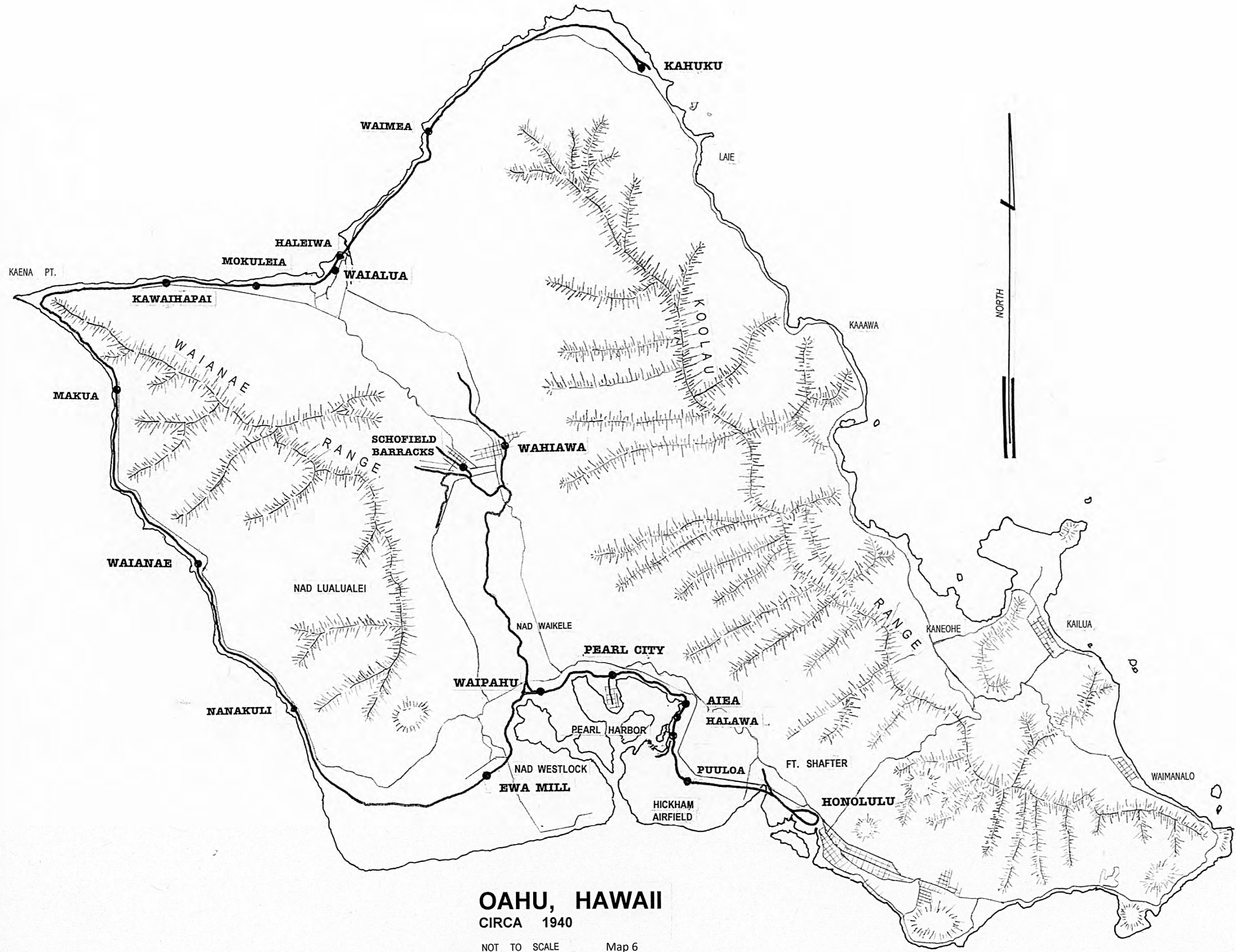
RESTRICTED

OA-NI-2181

WAIANAE-EWA, OAHU, T. H.

Map 5

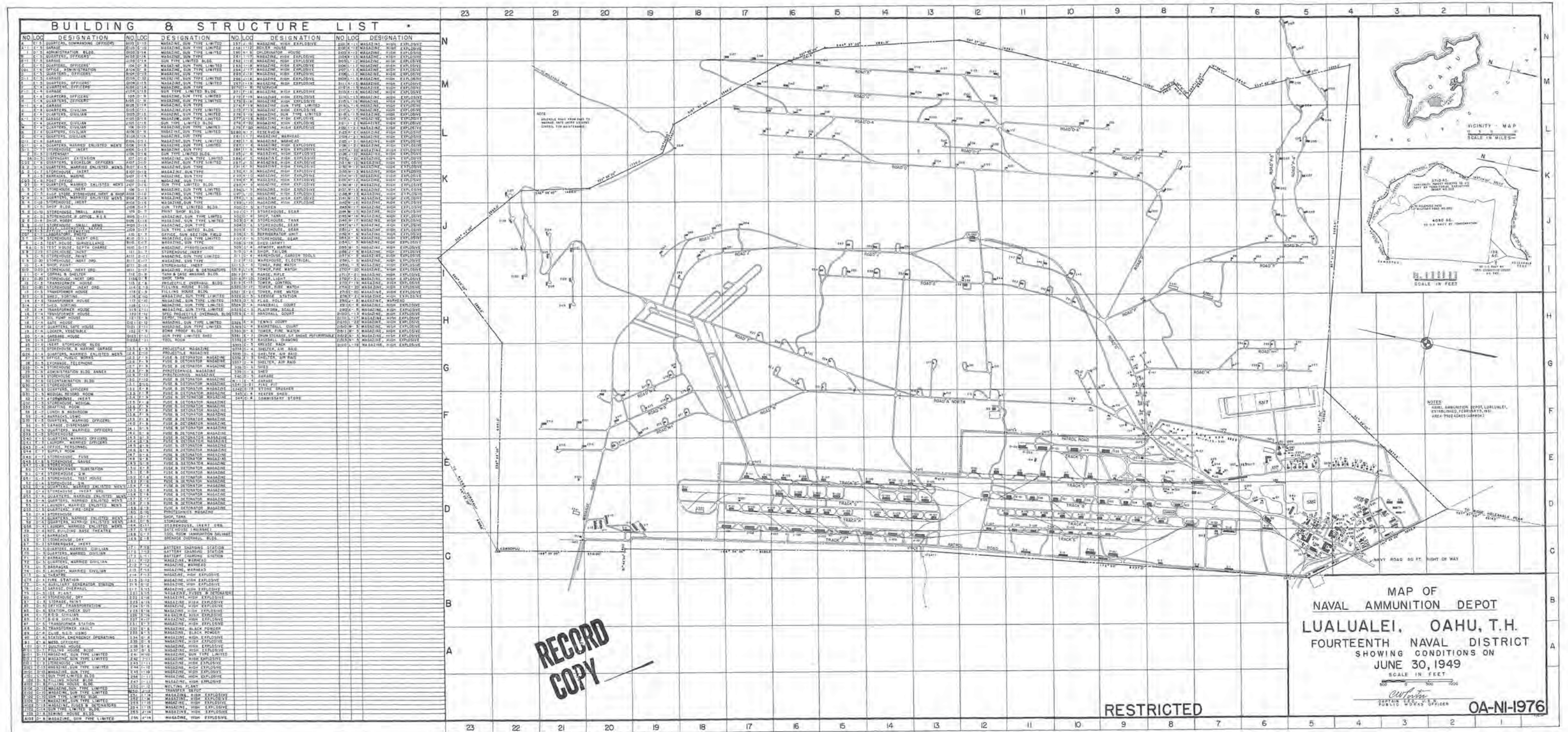
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**OAHU, HAWAII**  
CIRCA 1940

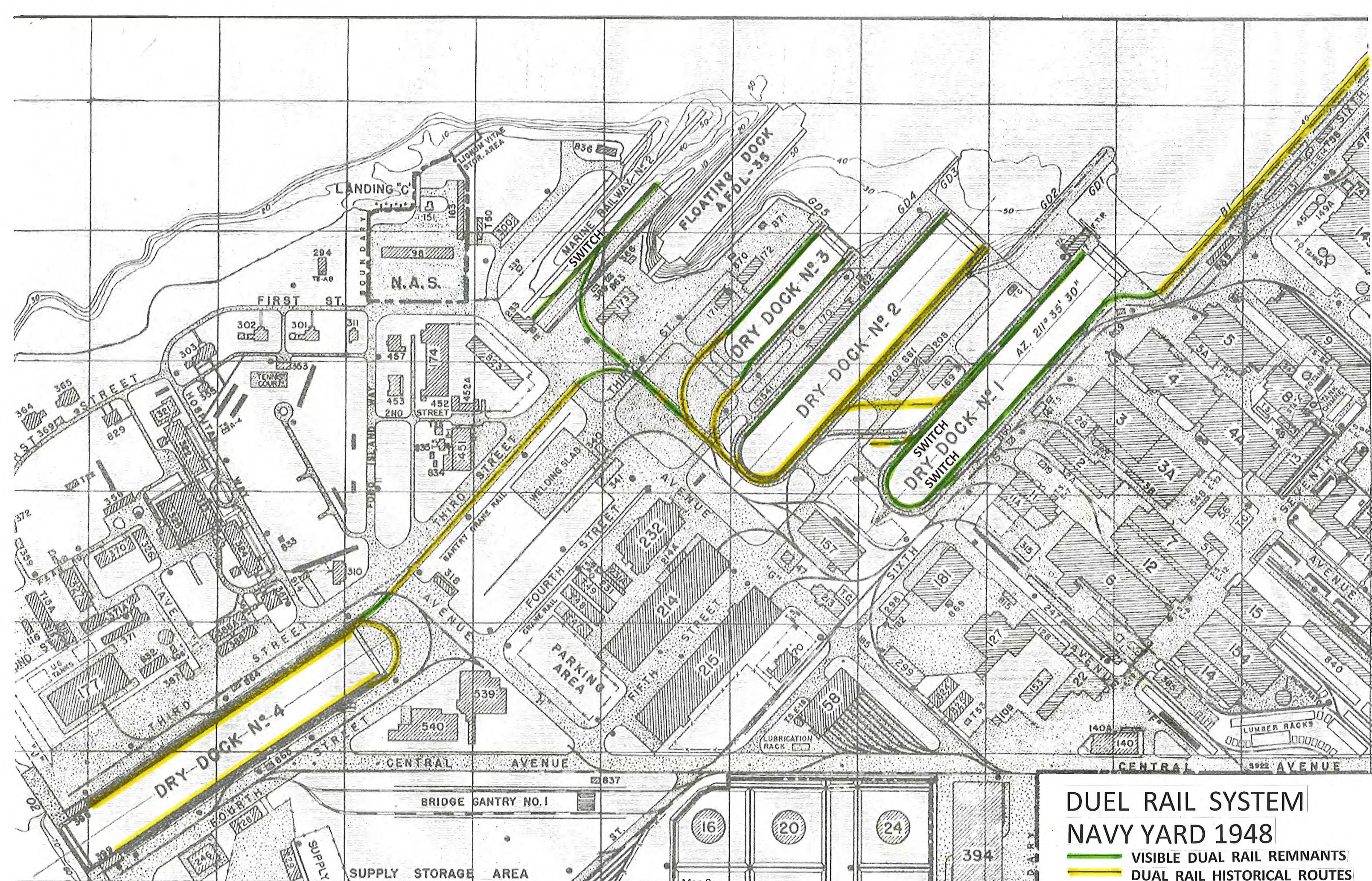
NOT TO SCALE      Map 6





Map 7

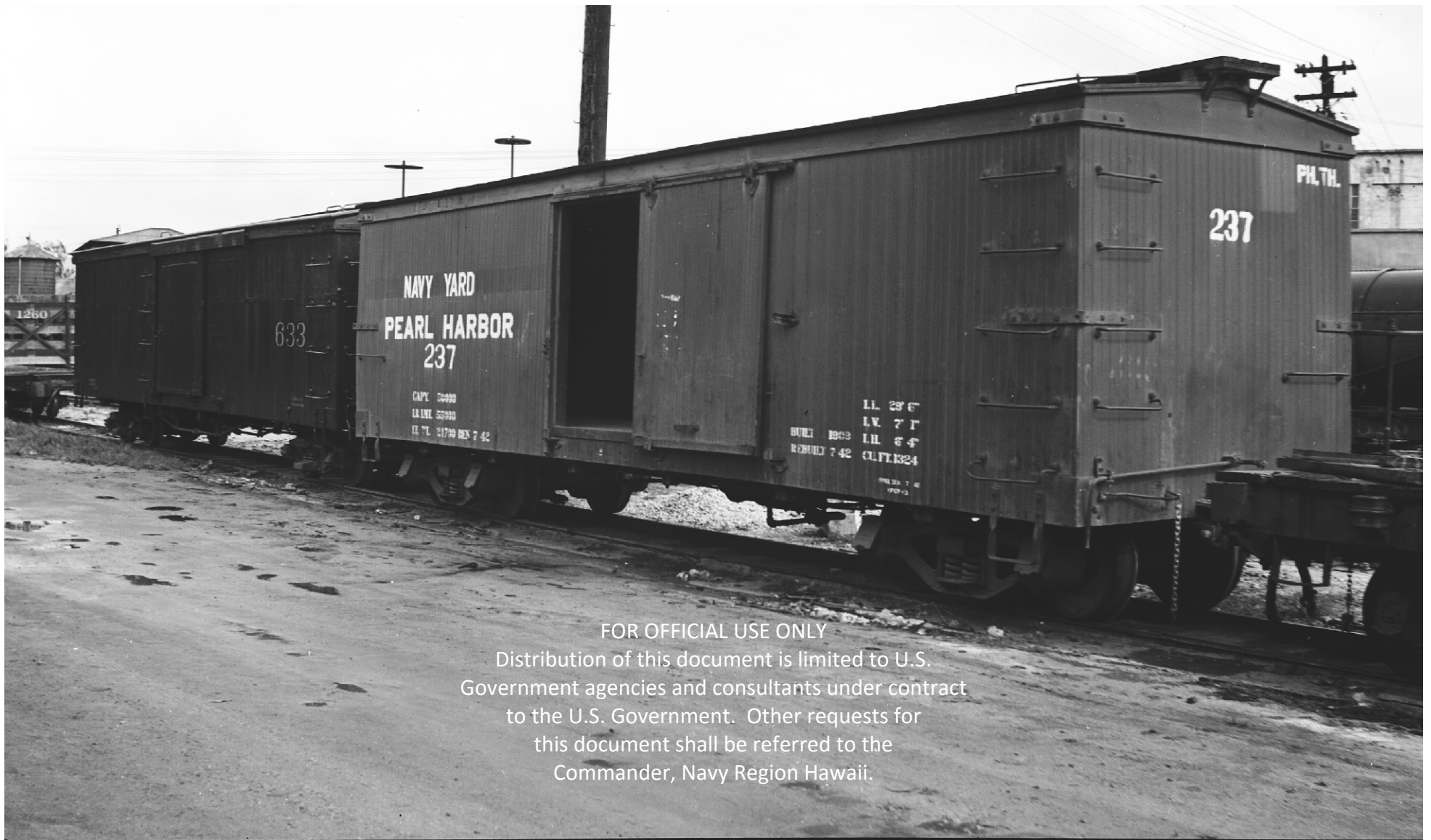




# DUEL RAIL SYSTEM NAVY YARD 1948

- VISIBLE DUAL RAIL REMNANTS
- DUAL RAIL HISTORICAL ROUTES





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