

## Oahu's 8-inch Naval Turret Batteries 1942-1949

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*This essay focuses on the four unprecedented 8-inch naval turret batteries emplaced on Oahu in 1942, when eight twin-gun mounts from the aircraft carriers Lexington and Saratoga became available to the Hawaiian Department for use as seacoast artillery. The batteries are generally referred to here by the original names assigned by the Hawaiian Seacoast Artillery Command during the war, although all four batteries were renamed for army officers in 1946.*

On January 17, 1942, Rear Adm. William S. Pye, acting commander in chief Pacific Fleet, asked if the Hawaiian Department, U.S. Army, was interested in 8-inch naval mounts and guns that might be removed from navy vessels. The Hawaiian Department immediately replied in the affirmative.(1)

Known to the navy as "mounts," and to the army as "turrets," they were available because the navy planned to replace the 8-inch/55 main batteries of the carriers USS *Lexington* (CV-2) and her sister ship USS *Saratoga* (CV-3) with updated 5-inch/38 dual-purpose twin-gun mounts. These could be used in the antiaircraft role in keeping with current ideas of aircraft carriers' tactical role.



USS *Saratoga* (CV-3). USN, NHC

Possibly two of *Saratoga's* four twin-gunned 8-inch/55 Mk IXM2 mounts were removed at Pearl Harbor, where she briefly stopped for emergency repairs before proceeding to Bremerton Navy Yard in Puget Sound after being torpedoed by the Japanese submarine *I-16* on January 11, 1942, 500 miles southwest of Hawaii. *Saratoga* left Pearl Harbor before the army could arrange to move the mounts. It has never been conclusively established whether the mounts were removed at Pearl Harbor or at Bremerton. In any event, all four of *Saratoga's* 8-inch mounts were presented to the Hawaiian Department on January 26, 1942.(2)

On January 26, 1942, after *Saratoga's* 8-inch mounts were made available, the Hawaiian Department commander, Lt. Gen. Delos C. Emmons, authorized the district engineer to obtain from the navy at Pearl Harbor "some 8-inch naval guns with turrets and transport the material to a safe place selected by the engineer." Emmons wrote that it was intended to install the guns on land in the near future; the district engineer would be advised as to the location of each installation at a later date.(3)

General Emmons graduated in 1909, No. 61 in his class at West Point, and was commissioned a 2<sup>nd</sup> Lieutenant of infantry. Detailed to the Signal Corps Aviation Section for pilot training in 1916, he transferred to the Air Service in 1920. Emmons served in Hawaii as CO, 18<sup>th</sup> Composite Air Wing, and Hawaiian Department air officer at Fort Shafter, from March 1934 to July 1936. Col. Albert K.B. Lyman (ranked 15<sup>th</sup>), the Hawaiian Department engineer, was a West Point classmate; the most famous personality of the class, Gen. George S. Patton, Jr., ranked 46<sup>th</sup>.(4)

On February 4, 1942, the Hawaiian Department operations officer (G-3) sent a memorandum to the departmental chief of staff: "Relative to removal of 8" turrets from *Saratoga*, Navy has guns and turrets ready to be removed and are waiting for Army to take them. They will not put them on the dock, but want them hauled away as soon as removed from the ship. Ship is preparing to leave Pearl Harbor and guns must be obtained prior to her departure." The G-3 recommended an early decision relative to the 8-inch turret positions so the district engineer could transport them to the proper sites.(5)

In the same memorandum, Maj. Gen. Henry T. Burgin, Hawaiian Department chief of artillery and CG of the Hawaiian Separate Coast Artillery Brigade (HSCAB), recommended: "Two turrets in the gun position located at Broady [sic] Camp No. 4. Two turrets to be emplaced at the gun position in the vicinity of Aliamanu Crater." The department chief of staff concurred with both locations in a communiqué to General Emmons.

When selecting locations for the naval turret (NT) batteries, General Burgin desired to extend fields of fire, chiefly for those areas in which current coverage was light, while placing the turrets far enough inland to function as second lines of defense and to reduce the difficulty of protecting them against small raiding parties.

### Battery Sites

By February 15, 1942, General Burgin had selected sites well inland at higher elevations to emplace the turrets. The first position was at Brodie Camp No. 4, 775 feet above sea level about one-half mile southwest of Highway 12 (now known as Kamehameha Highway), which accessed the North Shore from the town of Wahiawa and nearby Schofield Barracks, and some four miles ESE of the Waialua sugar mill.

The second location was on the southern portion of Oahu on the Samuel M. Damon Estate at Salt Lake, between 170 and 190 feet above sea level, about one-half mile southwest of the south rim of Aliamanu Crater and some 440 yards north of the present day Salt Lake Boulevard. The site was within a small volcanic crater just west of Salt Lake.

The second North Shore site, and the third battery to be constructed, was at Opaepala (*o'-pa-ay-oo'-la*, "red shrimp" in Hawaiian), roughly five miles ESE of the small coastal village of Haleiwa on the Anahulu Flats near Opaepala Gulch at around 1120 feet in elevation. It was some two miles northeast of Brodie Camp No. 4. The Opaepala site was above the Waialua Agriculture Company's sugarcane fields on lands leased from the Bernice Pauahi Bishop Estate, now know as Kamehameha Schools.

The fourth and final site was at the southeastern portion of the island around the 1200-foot elevation of Wiliwilinui (*wee'lee-wee'lee-noo-ee*) Ridge. (The large wiliwili tree was also known as tiger's claw or Indian coral tree.) It was some 3.3 miles NE of Diamond Head Crater, and some 1.25 miles north

of Highway 1 (now Kalanianaʻole Highway), also on land belonging to the Bishop Estate. Wiliwili Ridge is a spine of the larger Koolau Mountain Range.

### Battery Names and Coordinates

<u>Site</u>	<u>Coordinates</u>
Brodie-BCS	21-32-56.54N/158-04-10.92W
Opaecula-Barbette No. 2	21-34-04.48N/158-01-43.34W*
Salt Lake	21-20-55.60N/157-55-01.55W**
Wilridge-Barbette No. 1	21-17-55.23N/157-45-44.55W

\* Located beneath paved tennis court.

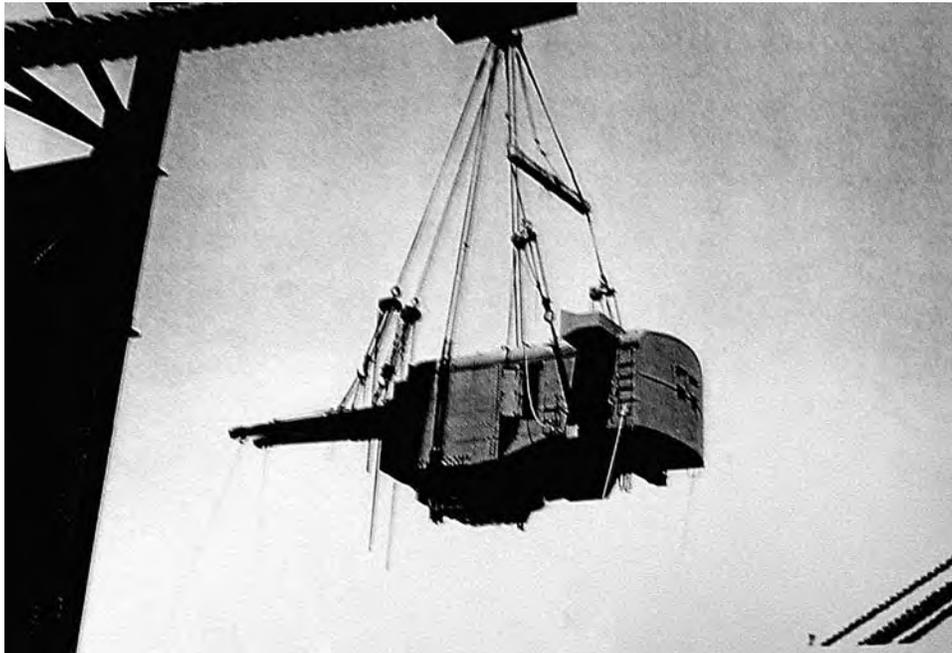
\*\* Gunned area west of suspected battery site.

Coordinates via ©2007 Google™ (Earth).

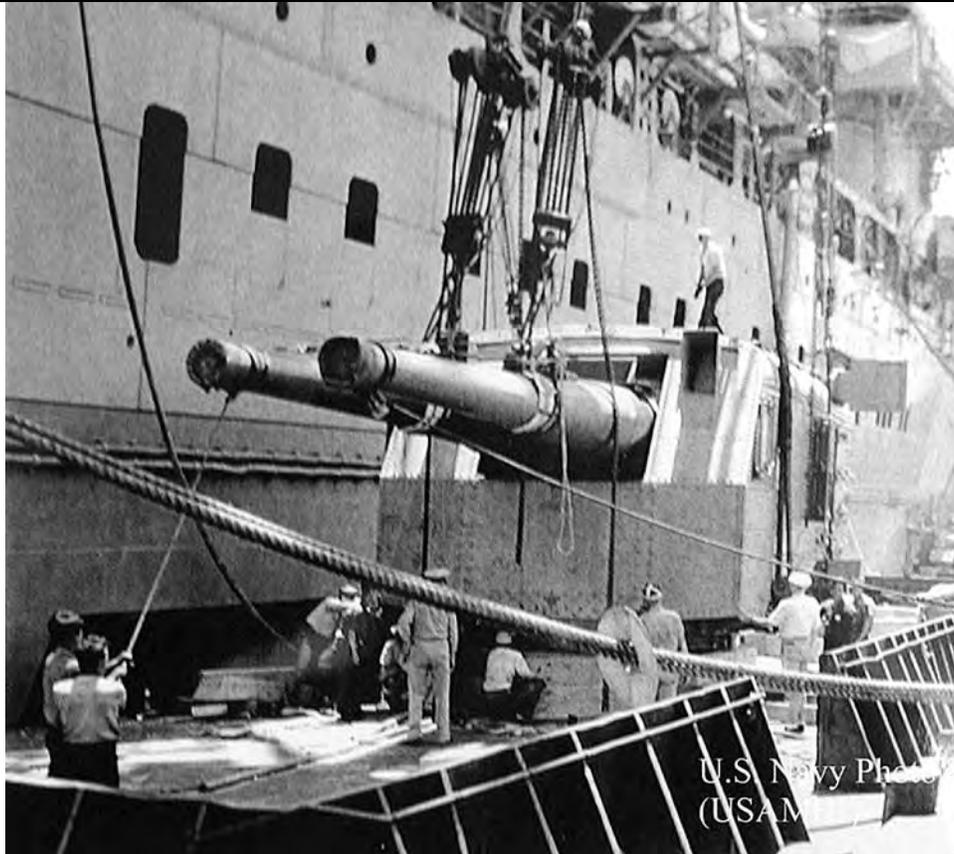
### Turret Mounts Turned over to the Army

The district engineer was directed to start construction on the first two battery sites after *Saratoga's* four 8-inch turret mounts were obtained by the Hawaiian Department; construction began at the Brodie and Salt Lake sites on March 10, 1942. From these locations the turret mounts could fire 31,860 yards (18.1 miles), adequate to cover both the shoreline within their range and hostile shipping offshore.(6)

*Lexington's* four 8-inch mounts were removed at Pearl Harbor on March 30, 1942, and made available to the Hawaiian Department four days later. *Lexington* was sunk by Japanese naval aircraft on May 8, 1942, during the Battle of the Coral Sea, before she could be outfitted with the 5-inch/38 mounts.(7)

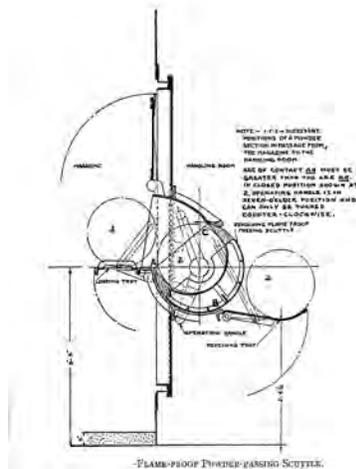


8-inch gun mount being lifted from U.S.S. Lexington to a Pearl Harbor pier on March 30, 1942.  
USN Photo, U.S. Army Museum of Hawaii (USAMH)



One of USS Lexington's two forward 8-inch gun mounts after removal at Pearl Harbor.  
*USN Photo, USAMH*

On April 4, 1942, Rear Adm. William R. Furlong, commandant of the Pearl Harbor Navy Yard, wrote General Emmons that the chief of naval operations had authorized removal of the 8-inch battery from *Lexington* and their transfer to the Army. Time constraints did not allow the dismantling of *Lexington's* mounts as was done with *Saratoga's*. The mounts were stored intact at the Waipio Point Naval Reservation (Pearl Harbor), along with spare parts and other material, which were turned over to the navy yard supply officer until required by the army. Admiral Furlong specified that the transfer of the mounts and other material to the army be completed at the earliest feasible date and that the mounts be taken to an army site. Furlong requested an army officer be sent to the navy yard to confer with Industrial Department officers relative to transporting the turrets.(8)



Powder-passing scuttles used with naval broadside guns.  
*Naval Ordnance, 1939*

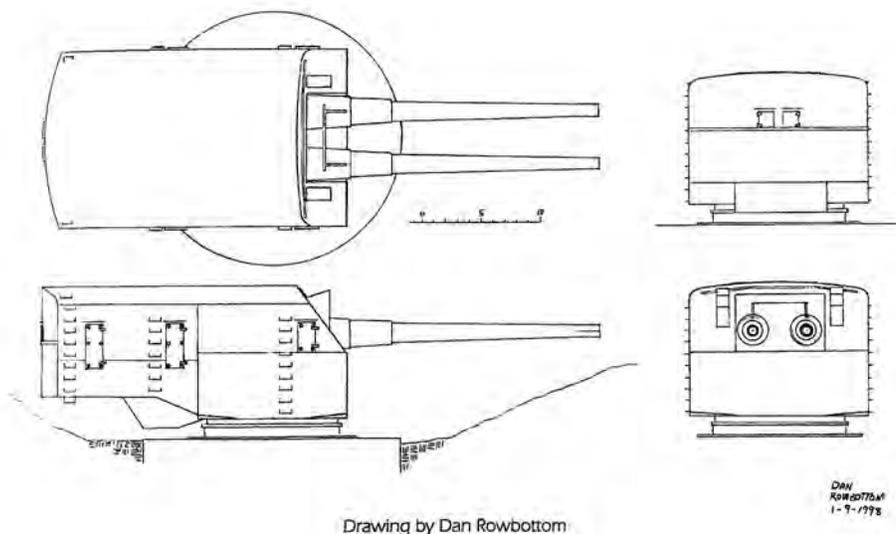
On April 8, 1942, Colonel Lyman, Hawaiian Department engineer, requested the navy provide “All appurtenant ammunition handling gear, including particularly eight powder passing scuttles (bulkhead type), and such horizontal conveyors and slides as are available be also furnished.”(9)

Lyman’s second request to Furlong on April 15, 1942, regarded dismantling *Lexington’s* 8-inch gun mounts. Lyman requested that the heaviest piece of the turret assembly not weigh more than 40 tons, as “the equipment available for hauling and the condition of the battery roads would not permit handling of loads in excess of that weight.”(10)

This marked the first time naval turret mounts had been emplaced on shore as seacoast artillery for the U.S., and paved the way for two even larger and more complex NT batteries built later on Oahu, the 14-inch NT batteries Arizona and Pennsylvania. The 8-inch NT battery project was completely foreign to the design division of the district engineer’s office; the whole layout of the batteries required considerable ingenuity on their part. Upon completion, however, the batteries proved very successful, being rated four of the best seacoast batteries.(11)

Capt. Lawrence Guyer (USMA ‘29), Hawaiian Seacoast Artillery Command (HSAC), was instrumental in establishing numerous seacoast batteries on Oahu, including the four 8-inch turret mounts and the colossal Batteries Arizona and Pennsylvania. In early 1942, Captain Guyer donned diving gear and joined navy divers in examining *Arizona’s* two aft turrets at Pearl Harbor to determine if they could be salvaged, and was awarded the Bronze Star for his meritorious conduct. As a lieutenant in 1940, Guyer had been engaged in reactivating the old harbor defenses of Portsmouth, NH, rebuilding submarine mine and seacoast defenses around Fort Constitution.(12)

The HSAC was formed when the HSCAB was disbanded on March 16, 1942, separating anti-aircraft from seacoast artillery. Brig. Gen. Robert C. Garrett, CG HSAC, was given administrative and tactical jurisdiction over all seacoast artillery units within the Hawaiian Department.(13) Antiaircraft artillery came under the Hawaiian Antiaircraft Command, and Major General Burgin became CG Hawaiian Artillery Command and Hawaiian Department artillery officer.



8-inch/55-caliber naval turret mount.

*Dan Rowbottom from American Seacoast Defenses, used with permission by artist*

## Batteries and Gun Serial Numbers

<u>Battery</u>	<u>Gun Serial Nos.</u>	<u>Removed From</u>
Brodie	495, 537, 508, 509	<i>Saratoga</i>
Opaeula	496, 497, 498, 503	<i>Lexington</i>
Salt Lake	516, 510, 518, 517	<i>Saratoga</i>
Wilridge	519, 520, 521, 522	<i>Lexington</i>

## Heights of Trunnions to Nearest Foot(14)

<u>Battery</u>	<u>No. 1 Turret</u>	<u>No. 2 Turret</u>
Brodie	774	775
Opaeula	1121	1124
Salt Lake	198	179
Wilridge	1201	1199

## 8-inch/55 Mk IXM2 Naval Gun

Weight:	30 tons
Length, o.a.:	449 inches (37.43 feet)
Projectile weight:	260 lbs AP, Mk XX
Propellant charge:	90 lbs NC
Muzzle velocity:	2,800 f/s
Maximum range:	31,860 yds (18.1 miles) at 41°
Elevation	+41°/-5°
Loading angle:	5°
Rate of fire:	3-4 rounds per min.
Recoil:	29.65 in.
Approximate barrel life:	715 rounds
Elevating rate:	6° per sec.
Train rate:	3.5° per sec.
Twin mount weight:	187 tons

Source: John Campbell, *Naval Weapons of World War Two*, (Annapolis: Naval Institute Press, 1985). Guns mounted on *Lexington*-class aircraft carriers and on heavy cruisers *Houston*, *Chicago*, and *Astoria*. NavWeaps.com, "Naval Weapons of the World, From 1880 to Today."

Each 8-inch NT mount included a pair of guns mounted in one slide, both guns elevating and traversing as one unit.(15) Each turret mount was equipped with one elevation receiver and one train (azimuth) receiver.

Naval data receivers installed in the 8-inch turret mounts included elevation indicator Mk VIII, equipped with two zero-reader-type motors, and train indicator and transmitter Mk IX, equipped with two zero-reader-type motors. Data transmission was by self-synchronous "Arma Type" system of control operating on 120 volts, 60-cycle single phase. The on-carriage fire control receivers and indicators were manufactured by the Arma Engineering Co. under Contract No. 60397.(16)

The 8-inch gun-mount housings were lightly armored, only providing shelter from the weather and possibly flying splinters. As an added precaution against flying splinters, both turrets at Wilridge were bunkered. Similar bunkers were proposed for the other sites, but it is not known if these were put in place at the other three batteries.

### Work Orders for Batteries

Army engineers issued the following job and work orders for the batteries:(17)

1. Brodie Camp: Job Order (J.O) 440-WW and Work Order (W.O.) 600.118-A-13.
2. Salt Lake: J.O. 727-V, W.O. 600.118-H-73.0 and 600.118-A-12.0.
3. Opaepala: J.O. 726-W and W.O. 600-118A-11.2.
4. Wilridge: W.O. 600.118-595.

Army engineers and civilian contractors worked around the clock to complete the batteries, as invasion fever ran high from the December 7, 1941, Pearl Harbor attack until mid-1943. General Emmons authorized the use of lighting during the blackout, having assigned the projects a priority just below that of airfield construction.

The lightly armored turrets and splinterproof battery commanders' stations were the major above-ground features of the 8-inch NT batteries. All the batteries were constructed of reinforced concrete by cut and cover, with projectile and powder magazines, gasproof plotting rooms, and bombproof generator rooms 15 to 40 feet below the surface.

All 8-inch NT mounts were designed for 360° fire without interfering with each other. The batteries had a high rate of fire (12-16 rounds per battery per minute). The North Shore batteries, Brodie and Opaepala, covered the waters to the north, east, and west, and as far south as the Pearl Harbor entrance. The South Shore batteries, Salt Lake and Wiliwilinui Ridge (called Battery Wilridge), covered the waters to the south, southeast, and southwest, including the approaches to Honolulu and Pearl Harbors, and could also fire north.

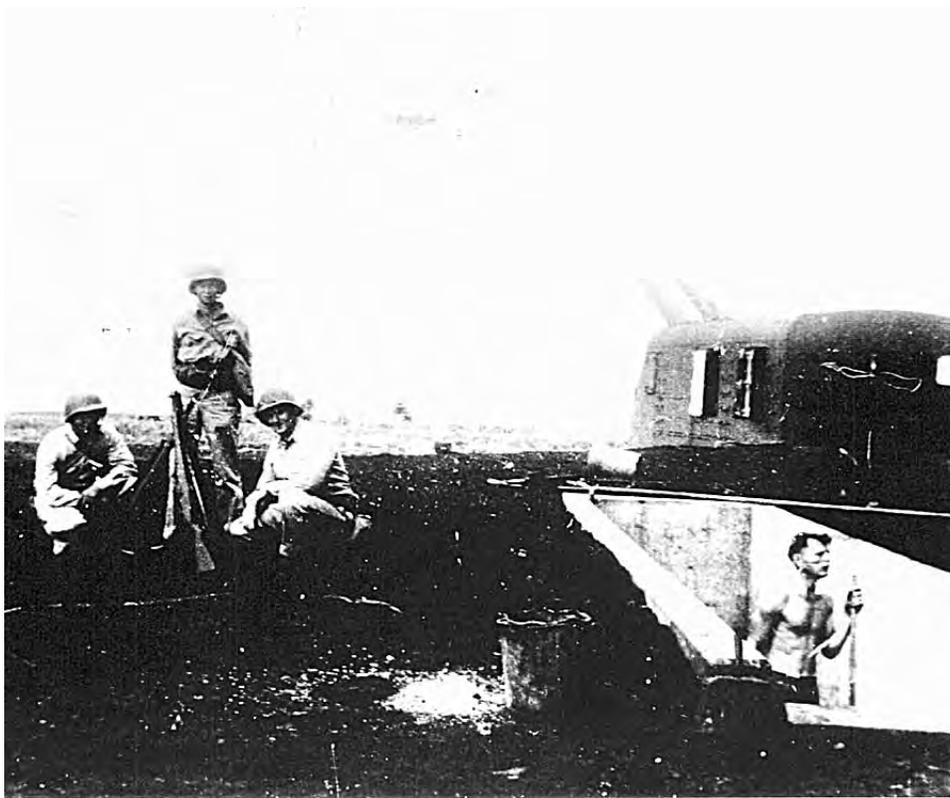
Walter V. Higbee, former CO of Battery Wilridge, described concentration points on land, "such as roads, bridges, etc. that we could lay fire on in case of invasion." The battery was supplied with 8-inch HE projectiles for such targets, as well as AP rounds for use against cruisers. Higbee wrote that the gun crews had been trained by navy personnel and that supplies related to the guns were drawn from Pearl Harbor.(18)

### Fire Control Equipment

It was planned to use the original fire control equipment for the batteries, which included Mk XVIII naval optical gun directors with attached Mk III Ford rangekeepers, and Mk XX directors, in conjunction with Mk 33 Bausch and Lomb rangefinders mounted in four of the turrets. However, they were replaced later in 1944 with a standard army fire control system.(19)

The Mk XVIII optical gun director with the Mk III rangekeeper was the first modern director in *Lexington*-class aircraft carriers and *Salt Lake City*-class cruisers. Sights were automatically set for range and deflection by the rangekeeper, using tilting mirrors rather than the standard method of moving the telescope proper. Arma Engineering developed the system, Hannibal Ford the director and rangekeeper.(20)



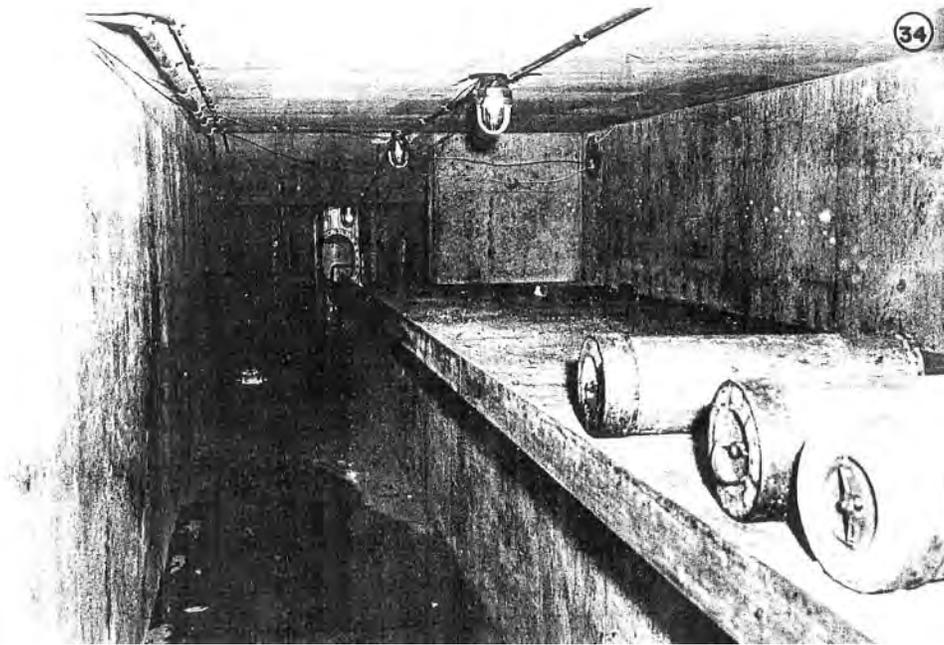


8-inch/55 naval turret mount at Battery Brodie in the summer of 1942.  
*USAMH Photo from American Seacoast Defenses*



Steel barbette of Turret No. 1 at Battery Wilridge (Kirkpatrick). *Author, 2002*

The 12-foot-diameter barbettes varied in depth from 6 feet at Salt Lake to 15 feet at Wilridge. Naval-type watertight doors at the base of the barbette connected to the magazine. Each magazine contained a room for powder and a room for projectiles. The rooms for 250 powder charges were approximately 12 feet 6 inches by 30 feet by 7 feet inside height (measurements varied slightly at each battery); rooms for 250 projectiles were about 10 by 30 feet with a 7-foot ceiling. Together, the rooms formed the legs of a “V,” with the barbette at the vertex. Each magazine included a tool room and a gallery that led to the surface. An additional 600 projectiles were to be stored in racks in the open. Powder and projectiles were elevated to the turret mounts by the shipboard elevating mechanisms.



One of Battery Brodie's two powder rooms c. May 1942, showing powder canisters on table and powder scuttle faintly visible at the far end of the table on the left. *Army CoE Photo, NARA*

A small concrete corridor running underneath the barbette slab from the projectile room at the right rear of the barbette carried cables for electrical power and data transmission, in addition to compressed air lines from an accumulator supplied by an air compressor. The lines were routed to a pipe above the guns, then to each gun via tubing to a gas ejector valve near the breech. The compressed air cleared the gun tubes of any gases remaining after firing. The turrets could be trained and elevated manually or electrically.(23)

The batteries were furnished with a splinterproof concrete battery command and director building (12 by 15 feet), except for Wilridge, which included a double-tier “L” shaped structure. All 8-inch NT batteries were eventually equipped with SCR-296A fire control radars, with operating cabinets typically housed in 15 by 17-foot buildings.(24)

Target data was plotted in 24 by 30-foot bombproof and gasproof plotting rooms.(25) The rooms were equipped with a vertical escape shaft at one end. Metal staple ladders affixed to the wall led to small housings on the roofs with steel-plate doors.

Each battery was provided with a 21 by 34-foot bombproof concrete generator building (dimensions varied slightly at each battery), which housed standby generators powered by internal-combustion engines, an electrical switchboard, and a fuel tank. A DERP-FUDS team inspected the power room



Opening in the floor of Battery Wilridge (Kirkpatrick) Turret No. 1's barbette for electrical, data transmission, and compressed air lines that were routed to the turret mount. *Author, 2002*



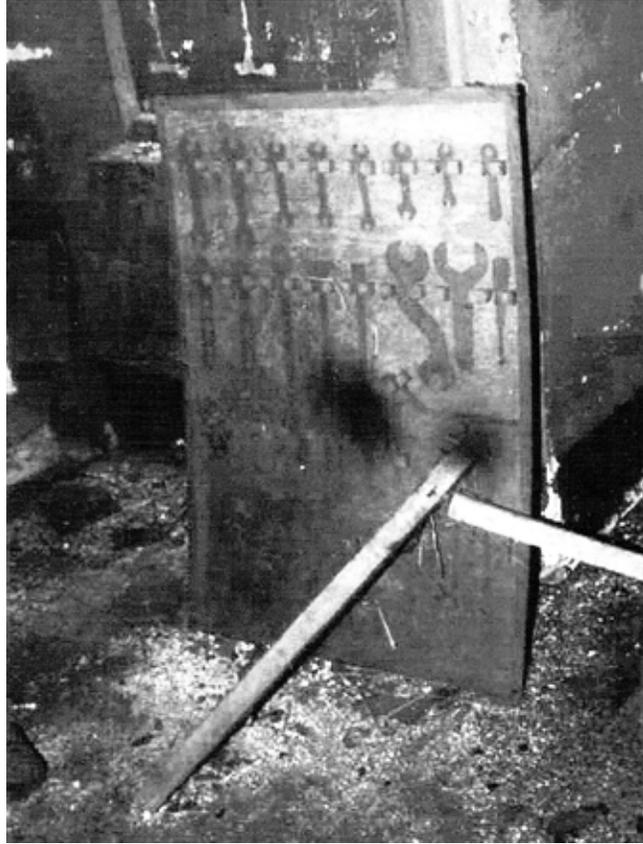
Double-tiered BCS of Battery Wilridge (Kirkpatrick) with radar operating/FCSWBD room on the left. *Author, 2002*



Typical escape housings found atop 8-inch NT battery plotting rooms.  
This example is at Battery Opaeula (Riggs). *Author, 2002*



Door to escape hatch in FC switchboard room, Plotting Room No. 2, Battery Opaeula (Riggs).  
*Author, 2002*



Tool board inside power room of Battery Brodie (Ricker). *William C. Gaines*



Concrete vent housing, Battery Wilridge (Kirkpatrick) power room. *Author, 2002*

at Battery Wilridge (Kirkpatrick) in 1994 and determined that it had been equipped with two large generators and a smaller auxiliary generator, as evidenced by three concrete mounting slabs (two large and one small) on the floor. Fuel tanks for the generators were buried, either in the floor (Brodie) or outside the structure (Wilridge). The motors at Battery Wilridge exhausted via pipes routed through a vertical shaft that exited above ground; a ventilated aboveground concrete housing covered the shaft at Battery Wilridge. It is not known how the Salt Lake battery power room discharged its exhaust. A July 2002 site inspection of the Opauala site by the author failed to turn up any such housing. John Varney, a veteran of Battery Brodie, drew a rough sketch of the power generator room showing three exhaust pipes exiting above the roof. The Brodie and Salt Lake batteries were the first built and refinements were probably incorporated in the last of the series constructed at Wiliwilinui Ridge.(26) The primary source of electricity for the 8-inch NT batteries was commercial power.

Cantonments were composed of theater-of-operations structures, and generally included administration buildings, officers' and enlisted quarters and latrines, mess halls and kitchens, motor pools, PXs, recreation rooms, supply rooms, water distribution systems and storage tanks, sewage disposal systems and cesspools, as well as commercial electrical distribution systems and back-up generators.

The Hawaiian Department engineer was charged with building the dining rooms, kitchens, and latrines, and was to furnish the batteries with pre-fabricated houses to be erected by troop labor.(27)

All four battery sites were extensively camouflaged, including dummy gun positions to make up for the lack of antiaircraft defenses.(28)

Antiaircraft and perimeter defense was provided by the batteries' organic weapons. The April 11, 1944, T/O & E for HQ & HQ Battery, Harbor Defense, called for either two M1A2 37 mm guns on M2A1 mount or two M1 40 mm guns on M2 carriages, two M1917A1 .30 cal. MGs, and two M2 .50 cal. water-cooled AAMGs per 8-inch battery. It is not known if the batteries received 37 mm or 40 mm AWs after April 1944.

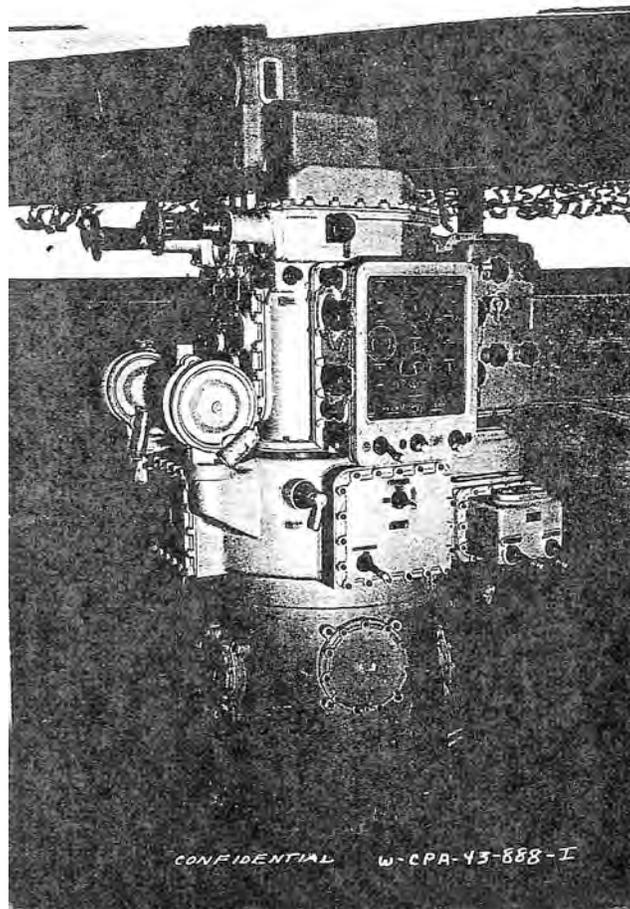
### **Gun Directors Removed**

At the time of the installation of the 8-inch NT batteries, no other fire control equipment was available, and it was believed that the naval directors could furnish adequate firing data. Experience proved otherwise, however, and the batteries were equipped with the standard seacoast artillery horizontal-base fire control system, which was used exclusively as of September 12, 1944. On that date, the chief of staff HSAC recommended to the CG Central Pacific Base Command that the navy directors (Mk XVIII and attached Ford Mk III rangekeeper) in the BCSs of Batteries Brodie, Salt Lake, and Wilridge be returned to the navy. Engineers and ordnance would remove the directors as soon as arrangements were made with the navy to accept them. At the request of the navy, the director and rangekeeper at Battery Opauala were returned to the navy for use aboard ship prior to September 12, 1944. The directors were removed from Batteries Brodie, Salt Lake, and Wilridge on January 11, 1945.(29)

### **SCR-296A Radars**

In February and March of 1943, SCR-296A radars were installed at Batteries Wilridge and Opauala, in that order. The Salt Lake and Brodie batteries received their SCR-296A radar sets by August.(30) Adjoining batteries were able to use the target data from the 8-inch NT batteries' radars.

The SCR-296A radar normally required 20 kW commercial AC power, but each set was usually provided with two emergency PE-84C, 25 kW, 120V, 60-cycle portable backup generators that weighed 5,000 pounds. Fuel was normally stored in a 1,000-gallon underground storage tank. PE-84C generators could not be more than 150 feet from the radar operating room to avoid excessive power loss.(31)



Naval optical gun director with attached Ford Mk III rangekeeper at Wilridge.  
*U.S. Army Photo*

### **M8 Gun Data Computers Requested**

General Garrett, CG HSAC, wrote his superior, Maj. Gen. Henry T. Burgin, CG Central Pacific Base Command, on September 25, 1944, requesting the four 8-inch NT batteries be equipped with M8 gun data computers and M9 data transmission systems, in addition to M-19 azimuth transmitters to upgrade the base-end stations. The M8 gun data computers (GDC) were being manufactured for the 155 mm M1 and the 6 and 8-inch Gun Project batteries on Oahu, but there was no provision to equip the 8-inch NT batteries with the computers.

The M8 GDC would require modifications to include the navy 8-inch/55 Mk IXM2 gun for the 260 pound Mk XX AP (navy) shell at both 2700 and 3000 f/s and the 240 pound HE Shell M103 at 2900 f/s. Transmission senders and receivers required modification, as the naval types employed degrees and minutes instead of degrees and hundredths.(32) To achieve a velocity of 2700 f/s with the Mk XX shell required two equal charges totaling about 98 pounds; 3000 f/s called for two equal charges totaling about 105 pounds.(33)

As of November 20, 1945, no M8 GDCs had been supplied to the 8-inch NT batteries, as production of the computers came to a halt after termination of hostilities with Japan. Col. Frank A. Bogart, acting director of the Planning Division, Army Service Forces, wrote Lt. Gen. Robert C. Richardson, Jr., CG Army Forces Middle Pacific, on November 20, 1945, informing him of a proposal to modify

155 mm GDCs for use with fixed seacoast guns. If authorized, five units would be allocated to the Hawaiian harbor defenses, presumably three of the 6-inch-gun type and two of the 8-inch-gun type. Bogart mentioned some of the special difficulties involved with converting the M8 GDC for 8-inch NT type:

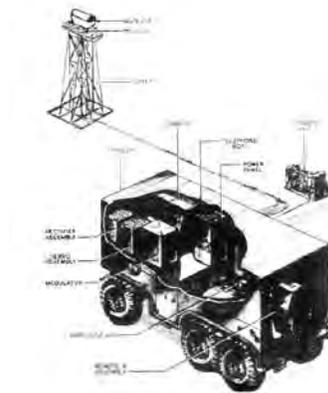
1. Height of site modifications due to the extreme elevation of the turret batteries.
2. The computation and design of separate ballistic elements for the different ammunition employed in the navy gun.
3. A suitable sub-caliber weapon for the Mk IX navy gun has not been standardized; hence ballistic units for sub-caliber firings cannot be incorporated in the computer.
4. A suitable data transmission system is not now available.

If the M8 GDCs were still desired for the 8-inch NT batteries, Colonel Bogart requested General Richardson submit a list of the batteries to be equipped with the computers and order of their priorities. Noting there were only four 8-inch NT batteries in existence, with no plan to build others, Bogart questioned whether the expense involved in designing and procuring special computers and auxiliary equipment was warranted, and questioned the necessity of allocating gun data computers to the 8-inch NT batteries rather than to other 8-inch or 6-inch project batteries on Oahu.(34)

General Richardson's order of priority for M8 GDCs was given as Batteries 301, 302, 405, 407, 304, Wilridge, Salt Lake, 303, Brodie, and Opaepala.(35) The project batteries ranked 1, 2, 3, 4, 5, and 8, while the 8-inch NT Batteries ranked 6, 7, 9, and 10.

### AN/FPG-1 Fire Control Radars

The May 31, 1945, "Study of Seacoast Battery Requirements, Hawaiian Islands," by a board of officers of the 2274<sup>th</sup> Hawaiian Seacoast Artillery Command recommended that SCR-296 radar sets then in use by the 6-inch and 8-inch NT batteries be replaced by AN/FPG-1 sets. The AN/FPG-1 was a medium-range fixed seacoast artillery radar. It could furnish exact positions at 28,000 yards to gun directors or other gun positioning apparatus, and the maximum operating range of the set was 80,000 yards. The transmitter/receiver antenna was mounted atop a 25-foot steel tower. If commercial power was not available, emergency power was furnished by PU-26/U gasoline-powered generator units on steel skids, supplying three-phase, 60-cycle power. It is not known whether AN/FPG-1 sets were placed in operation in the Hawaiian Islands.(36)



AN/MPG-1 radar and support equipment, mobile version of AN/FPG-1.

## Assigned Base-End Stations as of September 20, 1944

<u>Battery</u>	<u>Station Name/Location</u>	<u>Assignment</u>
Brodie	S' (Kepuhi)	B1
	S (Kaena Pt.)	B2
	W (Puu Kamananui)	B3
	DPF Brodie	B4
	O (Pupukea)	B5
	K (Kahuku)	B6
	M (Kaipapau)	B7
Opaepa	S (Kaena Pt.)	B1
	W (Puu Kamananui)	B2
	DPF Brodie	B3
	BC Opaepa	B4
	O (Pupukea)	B5
	K (Kahuku)	B6
	M (Kaipapau)	B7
Salt Lake	Makakilo	B1
	C (Aliamanu Crater)	B2
	Round Top	B3
	Wilhelmina Rise	B4
	D (Diamond Head)	B5
Wilridge	D (Diamond Head)	B1
	DPF BCS Wilridge	B2
	H' (Koko Head)	B3
	H (Makapuu Head)	B4
	Podmore (Lanikai)	B5



Makakilo (Hill) FC Station (el. 972 feet), a double station built in WWII, served as B1 of Battery Salt Lake.  
*Author, 2001*



Makapuu Head Fire Control Station "H" (el. 647 feet), a double station built in 1943, served as the B4 of Battery Wilridge. *Author, 2001*

## Assigned SCR-296 Radar as of September 20, 1944

<u>Battery</u>	<u>Station Name</u>	<u>Location</u>
Brodie	BCS Brodie	Brodie Camp No. 4
	Btry Opaepala	Opaepala Reservoir
	K (Kahuku)	Punamano (Hill)
	Btry Haleiwa	Kawailoa RY siding
Opaepala	BCS Opaepala	Opaepala Reservoir
	Btry Brodie	Brodie Camp No. 4
	K (Kahuku)	Punamano (Hill)
	Btry Haleiwa	Kawailoa RY siding
Salt Lake	BCS Salt Lake	Salt Lake
	Btry Wilridge	Wiliwilinui Ridge
	Btry Hatch	Ft. Barrette
	Btry Closson	Ft. Kamehameha
Wilridge	BCS Wilridge	Wiliwilinui Ridge
	Btry Pennsylvania*	Mokapu Point
	Btry Randolph	Ft. DeRussy
	Btry Adams	Black Point

\* Battery Pennsylvania was not yet operational.(37)

### Battery Brodie

On February 5, 1942, the Brodie site was selected, 15.177 acres of pineapple land at the Hawaiian Pineapple Company's Brodie Camp No. 4, one of a number of field workers' camps on the island. An additional 29.628-acre building restriction was included as a gunfire easement.(38)

The location was also an important junction for the Command and Fire Control Cable System of subterranean communications cables that branched out to gun batteries, searchlight positions, observation posts, base-end stations, and other military units strung along the North Shore.

John H. Varney recalled driving a survey party to the pineapple fields north of Schofield Barracks in January or February of 1942. At the time, Varney was a truck driver assigned to a field artillery unit at Schofield Barracks. The squad of men was headed by lieutenant and a sergeant, who spent several hours surveying the area without benefit of instruments, while the men placed red ribbons where they were ordered. Back at Schofield Barracks, the lieutenant admonished the men not to speak to anyone regarding what they had done in the pineapple fields. A few days later, the lieutenant came with a three-foot roll of plans, and Varney took the survey party back to the pineapple fields.

Ironically, Varney was subsequently assigned to the motor-pool section of the gun battery being built at the survey site between Schofield Barracks and the village of Waialua, which he called "Battery Brodie No. 4."(39)

The battery was given a high priority, second only to emplacing the eight 8-inch M1888 railway guns in concrete at Ulupau and Kahuku.(40) Construction by the Honolulu district engineer and civilian contractors commenced on March 10, 1942.



John Varney outside barracks at Battery Brodie, c. 1942. *John Varney Collection (Hereafter: Varney)*

By April 9, 1942, concrete had been poured for the floors, sidewalls, and roofs of all galleries, and for the base of the barbette of Emplacement No. 1. The steel barbette had been hauled to the site and set up in position in the pit. Work on the No. 2 gun position reportedly progressed the same, except the steel barbette had not been set in the pit.(41)

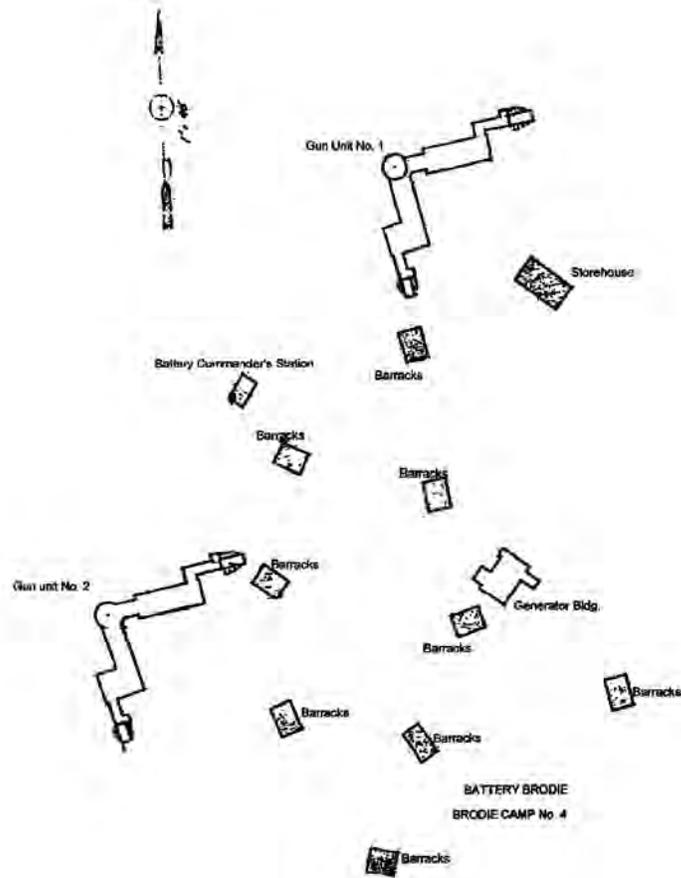
As of May 19, 1942, the turrets had been installed and proof fired, and trenches for the electrical cables from the power plant to the director and turrets were completed. The remainder of the work consisted of electrical work in the galleries leading to the turrets; powder charges could not be stored in the magazines until that work was completed. Upon completion of the electrical work in the galleries, the battery could be fired using Case II, whereby the range was calculated in the plotting room and the gunner determined the azimuth. Personnel in charge of construction included Captain Bullock, CE, Mr. Anthony, district engineer, Mr. Kestley, 3<sup>rd</sup> Area engineer, Mr. Melcher, construction foreman, and Mr. Campbell, electrical foreman.(42)

To accommodate the equipment and operators for the SCR-296A radar, an additional room was built onto the existing BCS at the left (west) wall, entered through the observation room of the observation station. This meant the observation slot on the left side of the observation room had to be closed. The radar antenna was mounted atop the roof of the radar operating room on a 25-foot tower.(43) The rooftop was accessed by metal rungs attached to the back (south) wall of the structure. On Oahu, SCR-296A antenna array were usually disguised as water tanks with cylindrical wooden coverings.

The naval Mk XVIII optical gun director with attached Mk III Ford rangekeeper was mounted on a raised concrete triangular base on the floor of the BCS; the naval Mk XX computer was in a subterranean room outside the BCS, accessed via an outside passageway. Computer cables were routed from the computer room via a narrow passageway to the floor of the BCS.

The HSAC reported that a single station equipped with a DPF instrument, known as “DPF Brodie,” was to have been built west of the battery, the exact location not given.(44)

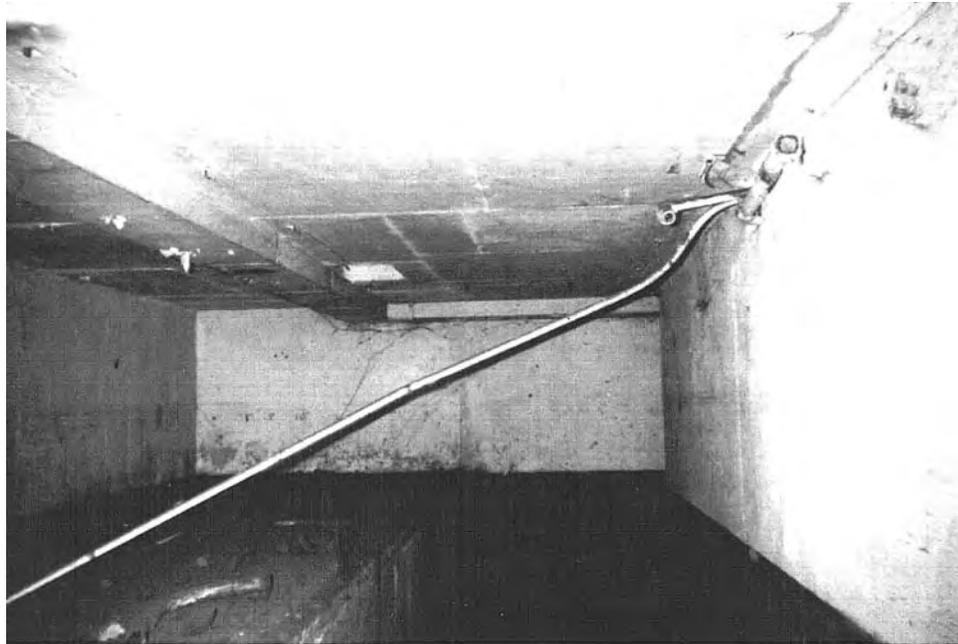
Saratoga Gun Group consisted of Batteries Brodie and Opaepala. Battery Brodie housed the command post (CP) for the group in an underground storeroom that was adapted as a gasproof plotting room/fire control switchboard room.



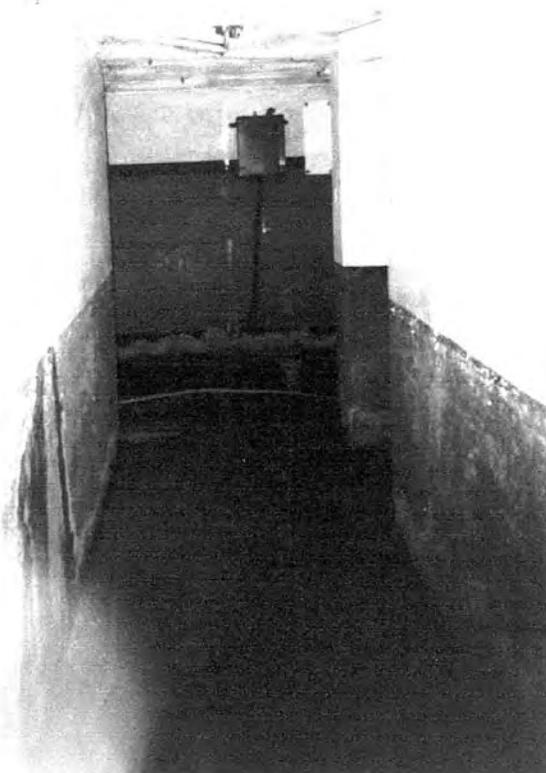
Battery Brodie. *NARA*



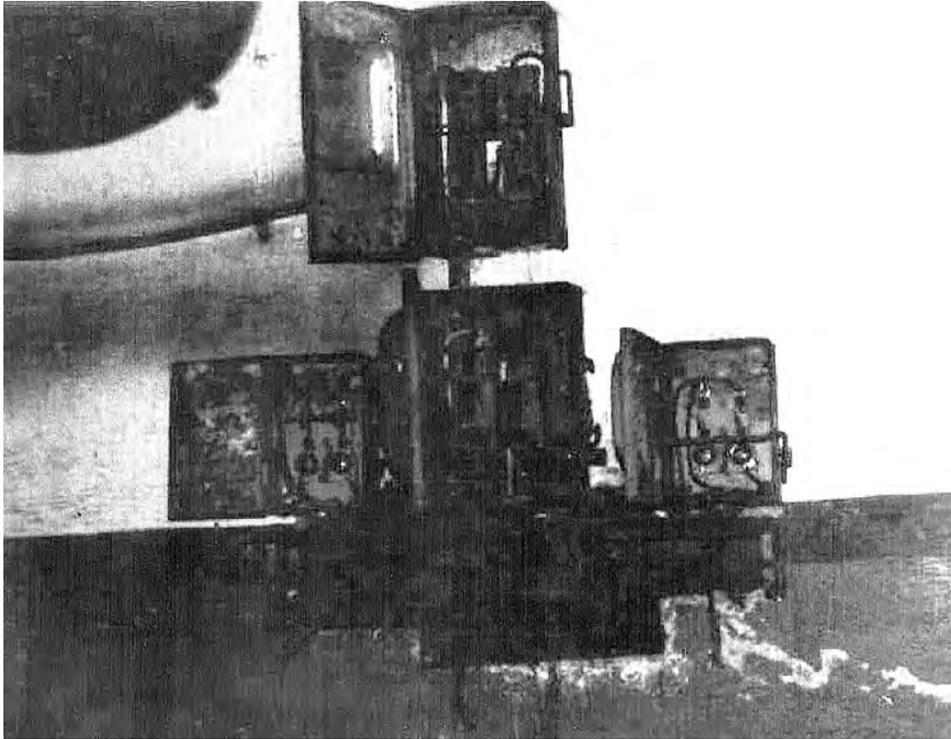
Floor of Brodie's BCS showing manhole to a passageway leading to Mk XX naval computer room.  
*Author, 2002*



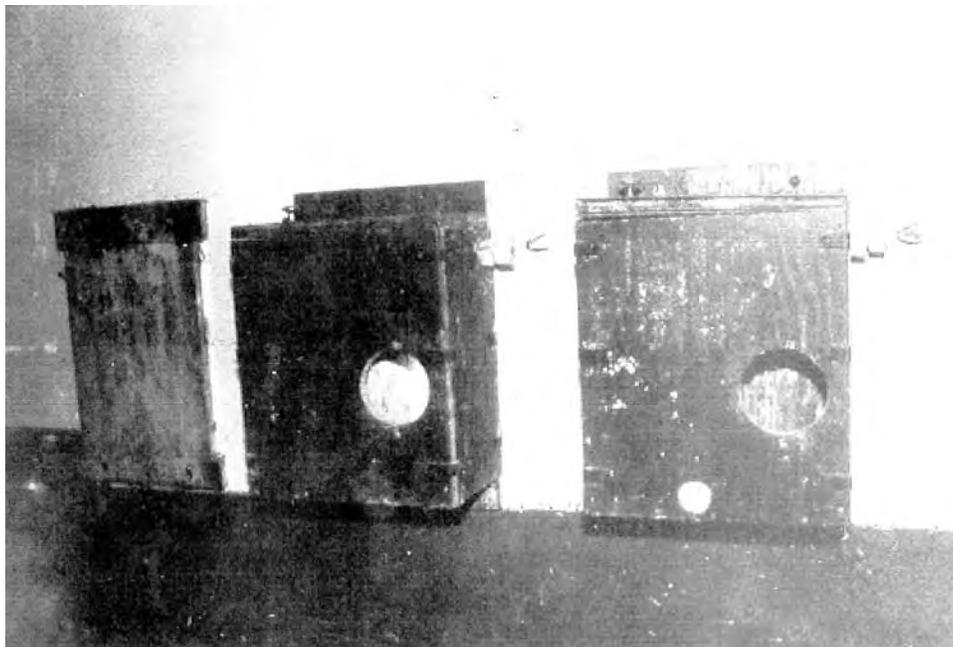
Projectile Room No. 1 at Battery Brodie (Ricker), looking towards the rear. Entry is from passageway at distant right. *William C. Gaines*



Passageway outside of Projectile Room No. 1 at Battery Brodie (Ricker); passageway is at the rear of the room. *William C. Gaines*



Electrical boxes on wall of switchboard room (formerly supply room) at Battery Brodie (Ricker).  
*William C. Gaines*



Telephone boxes on wall of Plotting Room No. 1 at Battery Brodie (Ricker). *William C. Gaines*

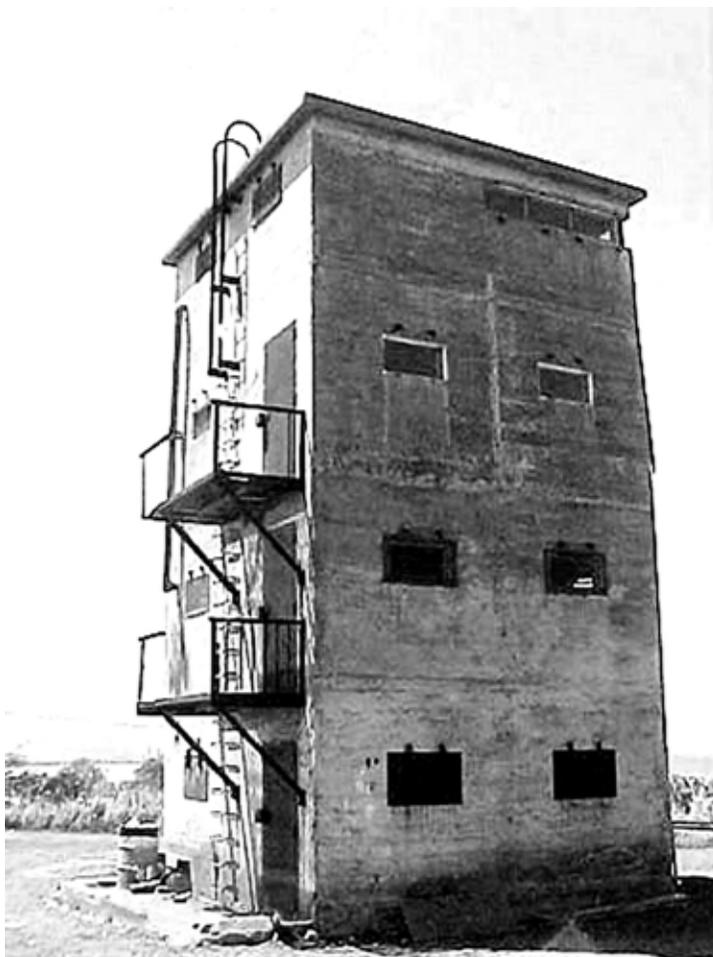
### Manning the Battery

The 809<sup>th</sup> Coast Artillery (CA) Harbor Defense (HD) Battery (Separate) was activated in May 1942 with personnel from Battery D, 41<sup>st</sup> CA (Railway) Regiment. The 809<sup>th</sup> manned Battery Brodie until the unit was redesignated Battery D, 41<sup>st</sup> CA Regiment, on May 22, 1943.

Battery D continued to man the turrets until May 1944, when the 41<sup>st</sup> CA was inactivated and Battery D's personnel activated the 832<sup>nd</sup> CA (HD) Battery (Separate). The 832<sup>nd</sup> manned the turrets through most of the summer of 1944, until inactivated on August 14, 1944. Personnel were then transferred from the 832<sup>nd</sup> to Battery C, 56<sup>th</sup> CA (HD) Bn, which continued to man Battery Brodie. On October 10, 1944, the Saratoga Gun Group was shut down and all tactical functions were transferred to the North Shore Groupment.(45)

The North Shore Groupment CP was on the Kawaihoa Military Reservation, Tract "E," in four-story reinforced-concrete coast artillery Station "T." The coordinates are 21-36-26.36N/158-04-54.14W, .9 miles east of Highway 1 (Kamehameha Highway), and some 160 yards southwest of a possible buried Panama mount of Battery Kawaihoa (four 155 mm GPFs on Panama mounts) pointed out to the author during a field trip in July 2002, coordinates: 21-36-31.17N/158-04-52.59W). All coordinates are via ©2007 Google™ (Earth).

The Kawaihoa 155 mm gun position was frequently used by North Shore batteries for firing practice.



North Shore Groupment CP/Fire Control Station "T," Kawaihoa, Oahu, east wall. *Author, 2002*

John Varney recalled that the first battery commander of the 809<sup>th</sup> was Captain Simmons, assisted by Lieutenant Haines and 1<sup>st</sup> Sergeant Whitesides. Sergeant Tedesco was in charge of Turret No. 1. Orders for the battery (and presumably for the Saratoga Gun Group) were brought from the Groupment CP. The battery commander's driver, PFC Robinson, drove the CO's command car to the groupment CP, where orders were obtained almost daily.(46)

Varney remembered that until the battery reached full strength the truck drivers assigned to the motor pool were required to fill in where needed, including guard duty. He was assigned to one of two powder magazines where the watertight powder cans were taken off the storage rack and carried to an elevator. It took two men to handle the 90 lb. powder can, one to hold it stable while the other unscrewed the lid then pulled out the powder bag by its strap. Powder bags were placed on a small elevator and hoisted up to the "circle deck." In the underground powder magazine, there was a lot of noise when both guns of the turret above were fired.

A total of 96 rounds were fired by both turrets from the Brodie position in 1944. On March 28, 1944, a record service night practice was conducted, firing 22 rounds at a towed target after four trial shots. Battery personnel conducted a special day service practice with two 155 mm guns at the Kawailoa position, firing 18 rounds satisfactorily. The 1942 and 1943 totals have not been found.(47)



Two soldiers stroll down Brodie Battery's street; pineapple workers' camp is on the right.

*Varney*

The pineapple workers' camp, adjacent to the battery, occasionally suffered broken window glass during firing practices.(48) Varney recalled that both guns in the turret mount fired simultaneously, and that during firing practice, only one turret fired while the other remained on standby, to conserve ammunition. He remembered driving one of the battery's 2-1/2 ton trucks to Pearl Harbor on several occasions to pick up spare parts for the guns.

Supplies were picked up at a small depot in the little seaside town of Haleiwa, where the truck drivers went to a drive-thru roofed structure, with supplies for each North Shore outfit on piles on the loading docks, with each unit's name on a sign. Motor vehicles from Brodie and other units were serviced in Haleiwa, in a commandeered site that may once have been a service station.

Both turret mounts were camouflaged, when not in use, by ersatz roofs of wood and corrugated tin that resembled nearby pineapple workers' houses. The two halves split down the middle, to be removed by two men who placed them on the sides of the turrets before gunnery exercises, repositioning the structures after the exercise concluded. Battery Brodie's support buildings, i.e. mess hall and PX, were also camouflaged with similar rooflines.(49)



Battery Brodie's No. 1 Turret Mount showing rooftop camouflage structure of corrugated tin and timber that was removed before firing. Photo was damaged during a flood of Monroeton, PA. *Varney*



809<sup>th</sup> CA Battery preparing for inspection in front of barracks, c. 1942-43. *Varney*



Mess hall at Battery Brodie. *Varney*

The 809<sup>th</sup> detached a corporal to care for the pack mules in a corral near the Waialua Sugar Mill. These were used to supply nearby fire control stations (Station “W” at Puu Kamananui and one atop Puu Iki west of the battery).



The 809<sup>th</sup>'s “muleskinner” tended the pack mules kept at a corral near the Waialua Sugar Mill. The mules supplied nearby base end stations for Battery Brodie and other batteries. *Varney*

Battery C, 56<sup>th</sup> CA (HD) Bn, continued to man Brodie's turrets until early 1945, when the battery was transferred to the Quartermaster Depot on the Sand Island in Honolulu Harbor, leaving behind a small caretaking detail. The detail was soon deactivated and the personnel were transferred to HQ Battery, Harbor Defenses of Kaneohe Bay and North Shore, which assumed the caretaking duties of the battery. The armament was removed in 1948.(50)

#### Antiaircraft and Perimeter Defense

Varney described the antiaircraft and close-in defense from 1942 to early 1944 as a mix of five MGs, .30 cal. water-cooled MGs of 1918 vintage and .50 cal. Small arms included .30 cal. M-1 Garand rifles and .45 cal. automatic pistols. Two MG dugouts were on the west side of the battery, two on the east side, and one between the turrets. Camouflage netting propped by a wood framework that resembled a small storage building rooftop covered the MG dugouts. (51)

On May 13, 1944, the first firing mission using OQ-2A target aircraft was flown from catapults at Haleiwa Airstrip on the north shore. The HSAC received authorization to use the airstrip for its two target planes on August 1944. Varney recalled that a small red radio-controlled drone flew over the battery twice towing a target sleeve, which the gunners firing at the sleeve missed altogether. The drone was controlled by a C-47, which maintained a respectable distance from the battery. Varney heard that marines fired at the sleeve and downed the drone.

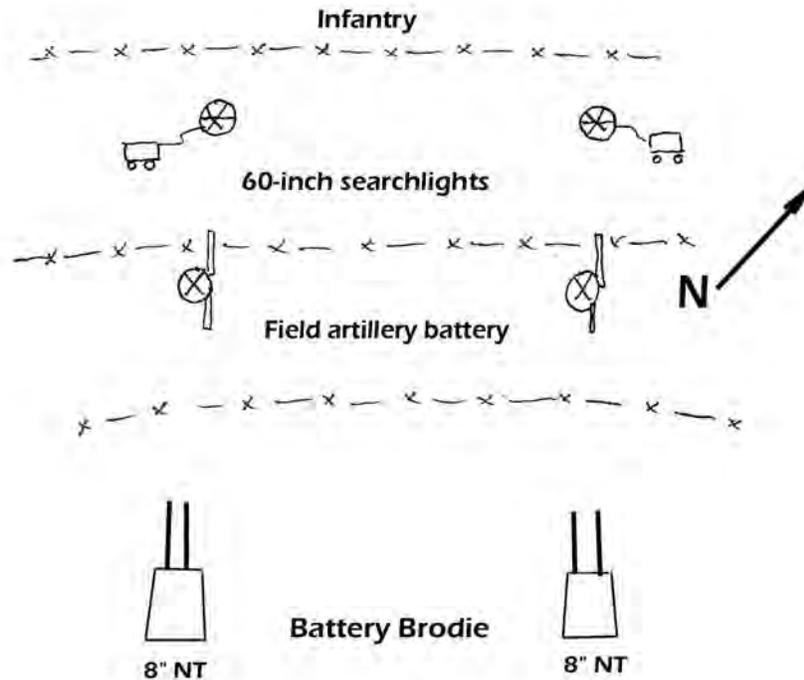
The entire battery compound was surrounded by several strands of barbed wire on 10-foot poles; a sentry manned a single gate at the middle of the south perimeter.

On occasion, the members of the 809<sup>th</sup> CA Battery would don full packs and combat gear and go on physical conditioning marches. As with all coast artillery units in Hawaii, the troops of the 809<sup>th</sup> were prepared to function as infantry should the enemy overrun the defensive positions nearer the beach. Their shooting skills with their M-1 Garands were honed at the Schofield Barracks firing range.



Crewmembers prepare OQ-2A for launching at Haleiwa Airfield, c. 1944-45. *U.S. Army Photo*

Varney's rough sketch of the defense line from Waialua Bay to the battery included infantry, followed by barbed wire, then a pair of portable 60-inch searchlights with another line of barbed wire, and a battery of field artillery (caliber unknown) over whose heads the guns of Battery Brodie fired.



Defense line, ca. 1942-43. *Adapted from Varney*

### Renaming the Battery

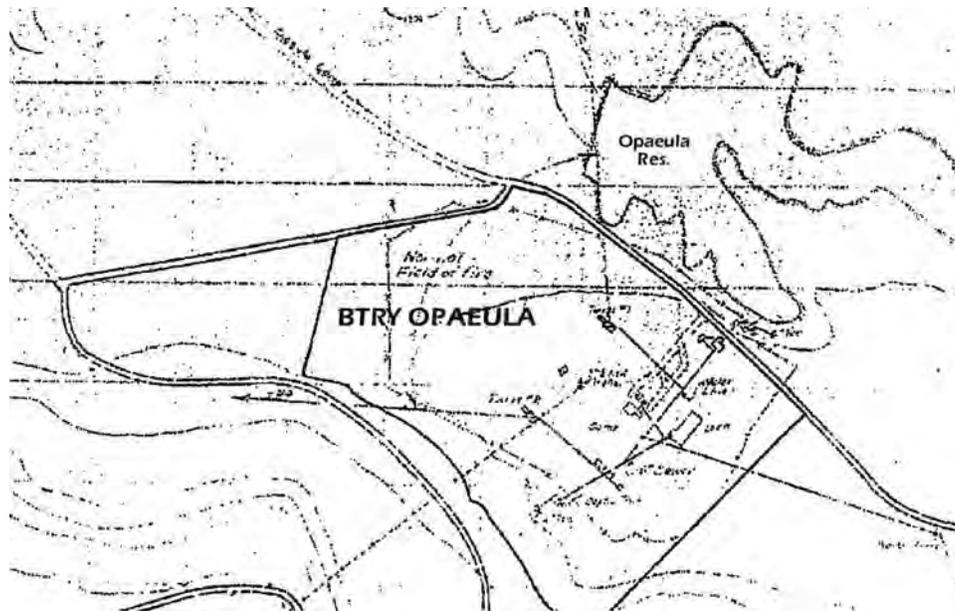
On August 27, 1946, War Department General Order No. 96 renamed Battery Brodie Battery George Ricker, in honor of Lt. Col. George W. Ricker, CAC.(52) Colonel Ricker and Maj. Gen. Herbert A. Dargue, commander of the First Air Force, were killed in an airplane crash in December 1941 in California. Prior to his death, Ricker was director of the Department of Enlisted Specialists of the Coast Artillery School and commanding officer of the Enlisted Division of the school from August 1940 until September 1941. Colonel Ricker had earlier been honored by having an army mine planter of the 1942-44 series named after him; when the ship was transferred to the navy in 1944 it became

the USS *Planter* (ACM-2).(53) The battery was abandoned altogether sometime in 1948 and the guns and turret mounts were cut up for scrap.

### Real Property Transactions

The land upon which Battery Brodie was built is recorded at the Hawaii Bureau of Conveyances under Tax Map Key Number: 6-5-2: Parcel 11. On September 30, 1945, an “Option for Purchase of Land” under Contract No. W-49-040-eng-3226, between the Waiialua Liquidating Co., Ltd. (WLCL) and the Hawaiian Pineapple Co., Ltd. (HPCL), provided the United States the opportunity to acquire 15.77 acres comprising Battery Brodie. A “Battery Gun-Fire Easement” was also recorded on that date. The United States accepted the option for land purchase on May 28, 1946. On December 14, 1948, Helemano Co., Ltd. (HCL), successor to WLCL and HPCL acquired fee title to the land encompassing Battery George W. Ricker (Brodie). On August 31, 1951, it was mutually agreed by HCL and the United States to cancel Contract Number W-49-040-eng-3226. The federal government quitclaimed all rights, title, and interest in purchasing the Battery George W. Ricker property.

On June 30, 1955, HCL retroactively granted the United States of America an easement or right-of-way for construction, use, and maintenance of a dirt roadway to Battery George W. Ricker. The easement reserved the right for the Grantor and tenants to use the developed roadway in addition to the Grantee (the U.S. Army). No quitclaim of cancellation of the easement was found, however real property records stated that, “Provided that if the R/W is not used by the Grantee for a period of 2 consecutive years, all rights and privileges herein conveyed shall cease and determine, subject to covenants.” (54)



Map showing location of Battery Opaëula (Riggs). *Honolulu Dist. Engineer, USAMH*  
(*annotations by author*)

### Battery Opaëula

Army engineers staked out the Opaëula position on the Anahulu Flats by April 9, 1942. Construction plans and estimates as well as drawings were prepared by the Design Division of the Honolulu District Engineer’s Office under Colonel Lyman, who also held the title of Hawaiian Department

engineer. Construction began in May 1942 and was generally completed by August.

Projectile rooms in the magazines built at Opaepala included a handling table some six feet wide and three feet high that extended almost the full length of the room, which was some 30 feet long with a 7-foot ceiling.(55) The other three batteries received similar projectile-handling tables.



FC switchboard room inside Plotting Room No. 2 at Battery Opaepala (Riggs). *Author, 2002*

Two separate underground plotting rooms were built at the Opaepala site, both some 200 feet to the rear of Turret No. 2, about 100 feet apart in the adjoining Opaepala Gulch. Access to the plotting rooms was via a concrete staircase and walkway that led down the back slope of the gulch. The plotting room closest to the turret mounts serviced the battery from about halfway down the staircase on the left. The protected entrance to the lowest plotting room was some 70 feet farther down the walkway on the right. It was originally planned as a CP for the Saratoga Gun Group, which was at Battery Brodie. An additional room in the structure housed the battery fire control switchboard.(56) Both plotting rooms were equipped with emergency escape housings at one end, capped with pyramid roofs.

Battery command functions were housed in a single-story reinforced-concrete structure similar to Battery Brodie's original BCS prior to the addition of its radar operating room. The BCS was equipped with an octagonal concrete instrument pier on the floor that mounted the Mk XVIII naval optical gun director with attached Mk III Ford rangekeeper. A room beneath the BCS, accessed through a manhole with a metal ladder, originally housed the Mk XX naval gun computer. The room was gasproofed and equipped with Chemical Warfare System (CWS) gasproofing centrifugal blower and canister hooked up to an air duct. Ventilation was provided by a large T-shaped concrete pipe vent at ground level at the left rear of the BCS.

A fire control station (FCS) atop a steel tower was erected behind the turret mounts at the battery. The station was equipped with a DPF instrument and was listed by the HSAC as a single station. The FCS is faintly visible in a photograph of one of the battery's 8-inch mounts, the observation station above the tree line. The fire control tower was declared surplus and removed sometime after July 5, 1945.(57)



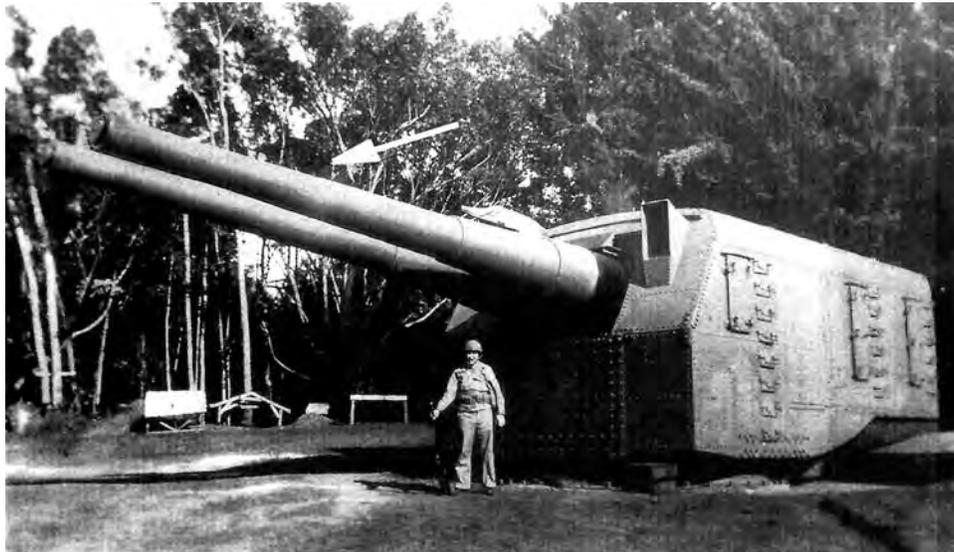
Interior of Plotting Room No. 1 at Battery Opaeula (Riggs). *Author, 2002*



Part of the CWS equipment on the interior wall of Plotting Room No. 1 at Battery Opaeula (Riggs).  
*Author, 2002*



Interior of subterranean computer room at Battery Opauala's BCS showing CWS centrifugal blower motor and associated duct. *Author, 2002*



Arrow points to tower that supported a FC station at Battery Opauala. *William C. Gaines Collection*

To accommodate the SCR-296A fire control radar, a separate radar operating room some 40 feet long was constructed to the right-rear of Turret No. 1, in a partially buried "elephant iron" structure that resembled a large Quonset hut.(58)



Stairs to radar operating room at Battery Opaepala (Riggs). *Author, 2002*



Interior of radar operating room at Battery Opaepala (Riggs), showing "elephant iron" construction. *Author, 2002*

Battery Opaepala's base camp was at the rear of both turrets, between the power generator room and Opaepala Road.

#### Manning the Battery

The battery was initially manned by the 810<sup>th</sup> CA (HD) Battery (Separate), organized from personnel of Battery B, 41<sup>st</sup> CA (Ry) Regiment, that had manned Battery Haleiwa's 8-inch railway guns also on the North Shore. The 810<sup>th</sup> manned the battery until May 1943, when it was inactivated and its personnel assigned to Battery E of the reactivated and reorganized 41<sup>st</sup> CA, which had been redesignated from railway artillery to harbor defense.

On August 6, 1942, all four guns (two turrets) were proof fired by the 810<sup>th</sup> CA - three reduced charge rounds followed by three service rounds. The HSAC accepted the battery after the successful proof firing.

Target practices were usually carried out once a week, firing one round from each gun at a hypothetical target off the north shore. During service practices about three times a year, some three-dozen 260 lb. navy AP shot were fired at a high-speed target towed by either a destroyer or a minesweeper. On February 11, 1942, eight rounds of HE ammunition were fired. Two firing exercises were conducted in July 1943 in which almost 50 AP projectiles were fired 20,000 yards (11.4 miles) into the ocean. At a battle practice on December 2, 1943, each turret expended some 10 rounds. Battery E, 41<sup>st</sup> CA, conducted a day service practice on March 28, 1944, firing 28 rounds from both turrets. On May 19, they fired 16 rounds in a night service practice.(59)

Battery Opaepala fired 116 rounds in 1944. On October 19, 1944, battery personnel fired two 155 mm guns at the Kawailoa position in a special day practice. Eighteen 155 mm rounds were fired at a towed target with satisfactory results.(60)

In May 1944, Battery E was inactivated and its personnel assigned to Battery F, 16<sup>th</sup> CA, which continued to man the Opaepala turrets. On August 14, 1944, Battery F was inactivated and its personnel were transferred to Battery B, 56<sup>th</sup> CA (HD) Bn. Battery Opaepala's last service practice was a daylight session held on November 9, 1944, in which Battery B fired 28 rounds. Battery B continued to man the battery until it was taken out of service on December 26, 1944. Battery B then transferred to the Sand Island Quartermaster Depot, leaving a small caretaking detail behind until the battery was inactivated on April 2, 1945, and its personnel were assigned to HQ Battery, Harbor Defenses of Kaneohe Bay and North Shore, which provided the caretaking detail for the battery through the end of the war.(61) The armament was removed in 1948.

#### Antiaircraft and Perimeter Defense

Perimeter and antiaircraft defense was presumably provided by the battery's organic machine gun section. It is not known how many machine gun dugouts were built at the battery. One machine-gun position examined during a July 2002 inspection by the author was across Opaepala Road, northeast of the present entrance to Opaepala Ranch. The emplacement included a single 3-inch-diameter galvanized pipe, 4-3/4 feet high in the middle, imbedded in concrete with a metal pintle atop, surrounded by a concrete wall about 5 feet high and 5 inches thick that included one collapsed section on the east.

#### Battery Renamed

Battery Opaepala was renamed by W.D. G.O. 96 on August 27, 1946, after Col. Carroll G. Riggs, CAC, who died on December 18, 1943. Colonel Riggs was killed along with 11 others in the crash of a B-24 bomber in Australia while serving with the federalized 197<sup>th</sup> CA (AA), New Hampshire National Guard.(62)



Machine-gun position northeast of Battery Opaepala's Gun No. 1. The cable was added in recent times to help climb a nearby gulch. *Author, 2002*

### **Battery Salt Lake**

The Salt Lake battery occupied 88.42 acres leased from the Samuel M. Damon Estate. On June 26, 1946, the U.S. Government obtained fee title to 86.23 acres and perpetual easement over 2.19 acres from the estate by civil action under Civil No. 746 for \$21,803.00. Included in the fee parcel were 15 acres leased from the estate in July 1944 by the War Department, and 5.6 acres leased to Samuel Renny Damon in 1926.

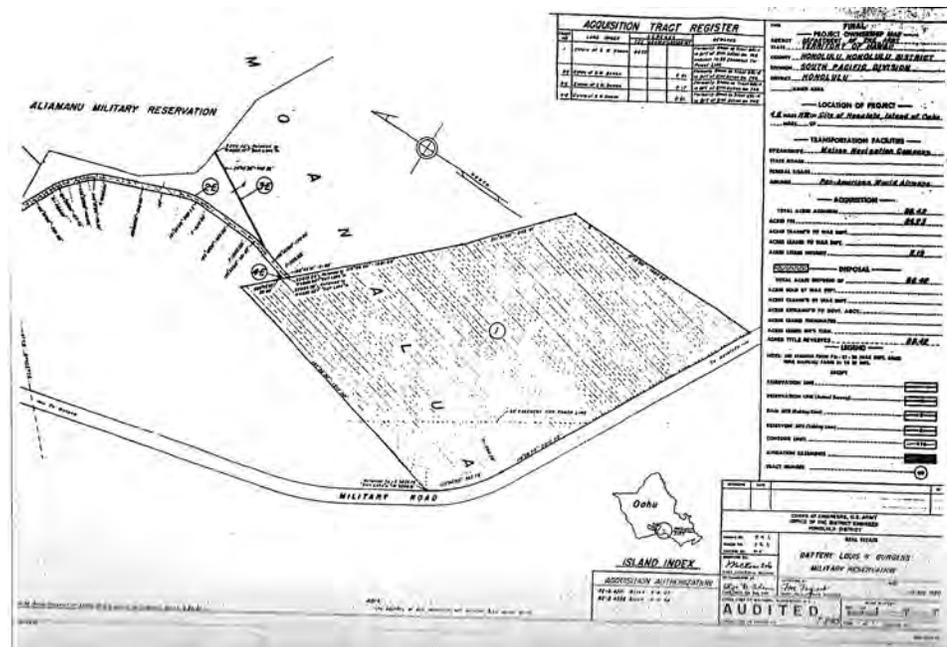
The Salt Lake Military Reservation's southern boundary abutted and was accessed by a military road from Puuloa Road, with another easement that ran off the right from the south gate of the Aliamanu Military Reservation to the battery site. In 1946, when the battery was named "Louis R. Burgess," the Salt Lake Military Reservation was renamed the Louis R. Burgess Military Reservation.(63)

Construction by the Honolulu District engineer and civilian contractors started on March 10, 1942. By April 9, 1942, the floors for all the galleries and for the bases of the barbettes had been poured; forms and reinforcing bars had been placed for the sidewalls; bridges leading to the battery site had been strengthened and roads repaired preparatory to hauling the steel barbettes to the site.(64)

In October 1942, dislodged rocks fell near the entrances of the magazines during proof firing. Continued firing of the guns threatened to block the entrances, resulting in a request to either cover the surrounding terrain with gunite or revet the walls of the magazine entrances.(65) The decision was made to cover the slope with gunite, as observed by the author in 2006.

On October 20, 1942, Lt. Col. C.D. Baker of the Honolulu District Engineer's Office reported completion of the following constructions at Battery Salt Lake:(66)

1. Circular 8in. naval gun barbette, 11 feet, 10 inches in diameter by 6 feet.
2. Reinforced concrete (reinf. conc.) projectile magazine, 30 x 10 feet; compressor room, 8 x 11 feet, and reinf. conc. entrance tunnel, 50 x 4 feet.



Battery Salt Lake/Burgess Land Acquisition Map. Honolulu Dist. Engineer's Office, USAMH



Gunited slope in the area believed to be the general site of Battery Salt Lake (Burgess). Author, 2006

3. One reinf. conc. battery command post, 24 x 30 feet.
4. Radar room, reinf. conc., 14 x 18 feet.
5. Generator room, reinf. conc., 30 x 21 feet.
6. Plotting room, reinf. conc., 18 x 25 feet, 10 inches, & entrance ramp, 10 x 3 feet, 6 inches.
7. Ready magazines (2)(box type), reinf. conc., 3 x 3 feet.
8. One reinf. conc. underground bldg., inside dimensions, 20 feet long x 13 feet wide with an 8-foot clear ceiling height.

9. One redwood tank, 12 feet diameter x 10 feet.
10. Ten barracks, 16-man, demountable type, 16 feet, 8 inches x 30 feet.
11. Admin. bldg., 16 feet, 8 inches x 20 feet.
12. Officers' mess hall, 16 feet, 8 inches x 30 feet.
13. EM mess hall, 160-man, 20 x 90 feet.
14. Latrines (4), 18 x 25 feet.
15. Supply bldg., 18 x 30 feet.
16. PX bldg., 16 x 20 feet.
17. Storage bldg. (2), 16 x 30 feet.
18. Hollow tile cesspool, 12 x 20 feet.

On November 15, 1943, Maj. Andrew P. Jaeger, CAC, and two other inspectors examined the completed work and reported the following discrepancies:(67)

1. Turret mechanical limit stops as called for in the original plans, which were to be replaced by electrical cut-off stops, were not installed.
2. Metal cover for cable draw box behind Turret No. 2 was reported as being in mill manufacture. With the advent of the rainy season, metal cover should be forwarded.
3. Gun director in battery CP was placed on sunken welded metal table instead of raised circular concrete pedestal due to construction error in calculation of height of director's optical system which required the cutting of a hole in the floor to lower entire unit, which proved unsatisfactory.

Recent change of ammunition rendered extant cam and gear ratios within the gun director useless for the tactical needs of the battery. Modification was recommended by the assistant ordnance officer of the HSAC on November 13, 1943, no work had been done as of that date.

4. Ready box type magazines, 3 x 3 feet, were not installed; primer/fuze magazines substituted were found to be satisfactory.

5. Redwood tank, 12 x 10 feet, was installed per plan; the present site was not satisfactory due to insufficient "head." Change of location recommended.

6. The administration building, officers' mess hall, supply building, and PX and storage buildings were not built by the engineer office, and buildings constructed by battery personnel were substituted. Of the four latrines called for, only two had been built.

The executive officer of the 15<sup>th</sup> CA, Col. Russell E. Bates, wrote the CG HSAC on December 20, 1943, about the above inspection of the Salt Lake battery and recommended acceptance of the substitutions as listed by Major Jaeger with the exception of the two latrines not constructed.

Lt. Col. Earl Fielding, AG HSAC, wrote the Hawaiian District engineer on December 31, 1943, accepting the transfer of completed work at Battery Salt Lake with the notation that the two additional latrines were not needed.(68)

#### Antiaircraft and Perimeter Defense

With respect to the battery's antiaircraft and perimeter defenses, there has been no information to indicate any weapons were used in these defenses other than the organic weapons issued to the battery.

### Manning the Battery

In May 1942, a cadre of one officer and 20 enlisted men was formed from units in the Harbor Defenses of Pearl Harbor as the nucleus of the newly activated 805<sup>th</sup> CA (HD) Battery (Separate) that was to man the turrets at Salt Lake. The 805<sup>th</sup> was activated on May 21, 1942, the day the guns were test fired with six rounds from each turret. Additional troops filled out the ranks of the 805<sup>th</sup> during the remainder of May and the first weeks of June, bringing its wartime strength to three officers and 156 enlisted men.

The 805<sup>th</sup> manned the Salt Lake battery until May 24, 1943, when it was redesignated Battery F, 15<sup>th</sup> CA Regiment. Battery F held seven target practices between January 3 and May 20, 1944, firing 76 rounds. Battery F manned the turrets until August 14, 1944, when the 15<sup>th</sup> CA was inactivated. The personnel of Battery F were reassigned to Battery A, 54<sup>th</sup> CA (HD) Bn, which continued to man the turrets, while firing another 38 rounds from the position between October 25 and November 1, 1944. At the end of December 1945, the manning detachment was reduced to a caretaking detail of some 18 men. The battery's armament was removed in 1948.(69)

### Battery Renamed

W.D. G.O. 96 renamed Battery Salt Lake in March 1946 as Battery Louis R. Burgess, in honor of Col. Louis R. Burgess who died on December 17, 1938. Colonel Burgess was a former commander of the Harbor Defenses of Pearl Harbor and Fort Kamehameha.(70)

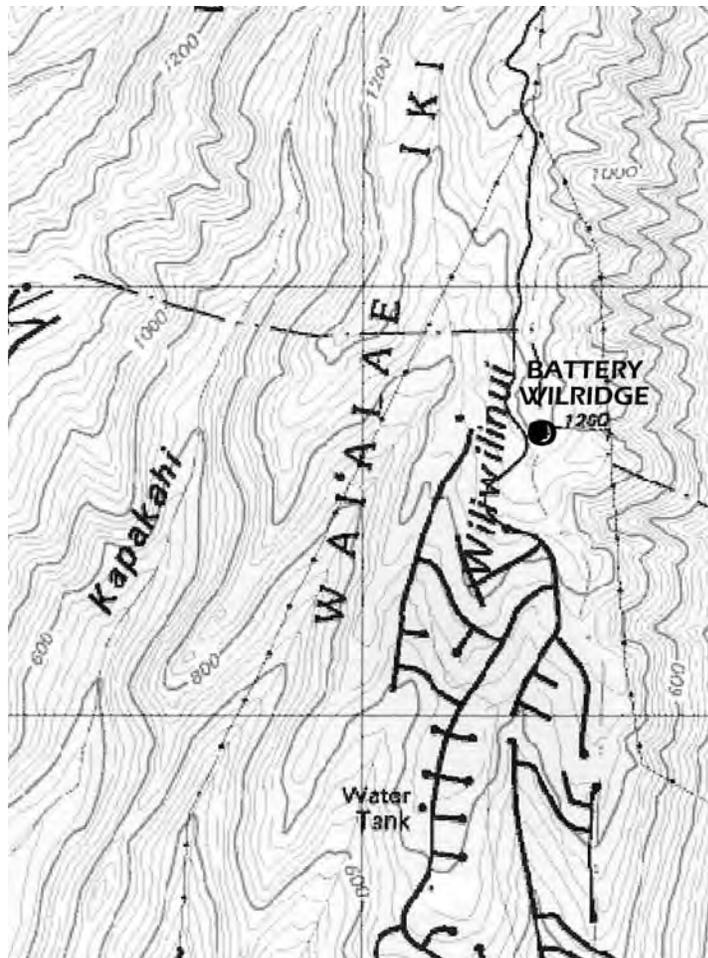
### Battery Wilridge

Battery Wilridge was named for Wiliwilinui Ridge, a spur of the larger Koolau Mountain Range. Initial plans called for the battery to be built at "Wilhelmina Rise," an East Honolulu subdivision and a World War II double base-end station that served as the B4 for Battery Salt Lake. It was on a slope that ran to the top of the Koolau Mountain Range, north of Diamond Head Crater. Discussions between the Hawaiian Artillery Command and its subordinate Hawaiian Seacoast Artillery Command about the battery location were held in April and May of 1942. Several other sites were investigated, including Makapuu Head on the easternmost point of Oahu, and two Windward Coast sites, Ulupau Head on the Mokapu Peninsula and Kaaawa Point. On May 27, 1942, Wiliwilinui Ridge to the east of Wilhelmina Rise was finally selected as the battery site.(71)

Construction of Battery Wilridge commenced on June 15, 1942, and the army occupied the lands in July 1942. Work was completed by December 26, 1942.

On September 18, 1942, George Wiles, area engineer, reported that the guns were ready to be fired upon installation of temporary power, to be hooked up by the next day. The plotting room, BCS, powerplant housing, auxiliary ammunition shelter, and sewer system had not been completed as of September 18, 1942.(72)

On May 23, 1943, the district engineer reported to CG HSAC the work completed at Wiliwilinui, Oahu, T.H., under Work Order No. 600.118-595 and Addenda Nos. 1, 2 and 4a: two 8-inch dual turrets and barbettes, one dummy gun, projectile and powder room for each turret, director and command post building, bombproof plotting room, generator building, metallic igloo magazine (20 x 20 feet), administration building (16 x 20 feet), officers quarters (16 x 30 feet), 20 portable barracks (16 by 20 feet), post exchange, recreation and supply buildings, mess hall, kitchen, and latrines. Civil works included two 12,000-gallon water storage tanks with pumping station, access roads, camouflage and utilities, sewage disposal system with six cesspools, and electrical and telephone systems.(73)



Map showing location of Battery Wilridge (Kirkpatrick.)



Camouflaged BCS at Battery Wilridge. Note SCR-296A radar antenna disguised to resemble a water tank, and camouflage netting that resembled house rooftops. *NARA*

Maj. John S. Hartnett of the 16<sup>th</sup> CA inspected the completed work and reported that several of the inclosed drawings showed details for gasproofing the radar room and the turrets. Unless the air used for the hoists in the turrets was filtered, gasproofing was useless in the turrets.(74)



NE corner of radar operating room of Battery Wilridge (Kirkpatrick), showing valve connected to outside T-shaped ventilator of concrete pipe. *Author, 2002*



Lower level of the Wilridge (Kirkpatrick) BCS, showing niche for the Mk XX naval computer. Holes in the back wall are conduits for data transmission and power lines. *Author, 2002*

On May 23, 1943, Col. R.E. Dingeman, CO 16<sup>th</sup> CA, reported to General Garrett, CG HSAC, that the inspection of Battery Wilridge had been completed and the work was satisfactory with the exceptions as noted by Major Hartnett. Colonel Dingeman requested that the unfinished work be completed before the project was transferred to the troops.

From close to 1200 feet elevation, both turrets had a larger field of fire, greater range, and more than double the rate of fire of Battery Granger Adam's pair of M1888M2A1 guns at the Black Point Military Reservation, a sub-post of Fort Ruger some 3½ miles southwest of Wilridge.

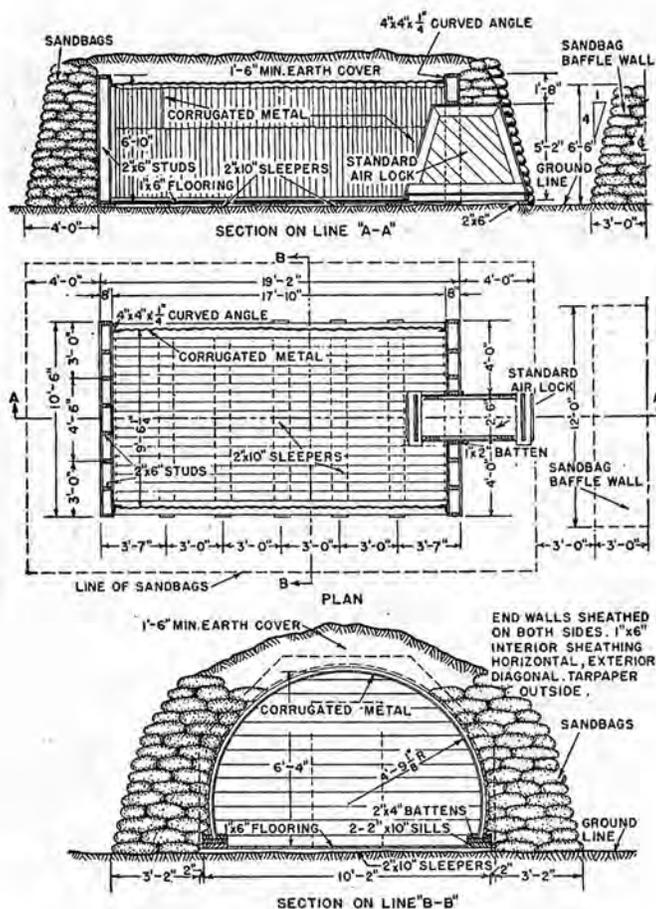
Battery Wilridge was the last of the four 8-inch NT batteries to be constructed, and it incorporated several design changes. The BCS was two-tier "L" shaped, a roomier structure with two observation rooms and a combination radar/fire control switchboard room. One plotting room was built at the site compared to the North Shore batteries that each included two.(75) (It is not known how many plotting rooms were built at Battery Salt Lake.)

The BCS housed the Mk XVIII optical gun director on the second level, while a small space, 9 feet wide by 3 feet deep behind the lower observation room housed the Mk XX computer. The antenna for the SCR-296A fire control radar was mounted atop the radar room, covered with a cylindrical wood structure to resemble a water tank.

The bottom observation station was about 13 feet long by 6 feet wide, with a 7-foot ceiling. Observation slots some 16 inches high ran the length of the south, east, and west walls, about 53 inches above the floor. The observation slots were covered on the outside by steel shutters about ¼ inch thick affixed to hinges below the observation slot, which lowered to open. The upper-level observation station was slightly larger at 13 feet long by 10 feet wide, with similar observation slots and shutters. The fire control switchboard/radar operating room, entered through a door on the right interior wall of the BCS, measured 15 feet long by 11 feet wide. A 2-foot-diameter concrete air duct was attached to the upper northeast corner of the back or north wall, with a T-shaped concrete pipe vent, found knocked off its base during a March 1992 site visit.

The power plant some 75 to 100 feet behind (north) of the BCS housed emergency generators and switching equipment in case commercial power was interrupted. A fuel storage tank for the generator motors was buried on the east side of the structure. The only portion of the power plant housing that protruded above ground was the intake/exhaust shaft housing.

A DERP-FUDS team headed by Wil Chee Planning inspected Battery Kirkpatrick (Wilridge) on March 6, 1992, and February 12 and May 26, 1993, to locate and record hazardous conditions, toxic substances, and unexploded ordnance. The inspection team recorded a brief description of the reinforced-concrete single-room powerplant: 30 feet long by 23 feet wide with a ceiling height of some 14 feet. Entry/exit was via a 7-foot-wide door some quarter-inch thick about 14 feet below grade. Two raised concrete platforms on the floor 15 feet long by 4 feet wide formerly mounted two large generators (no longer present). Above each platform was a 6-inch-diameter steel pipe presumed to be an exhaust. A vertical vent shaft was some 4 feet south of each concrete platform, about 5 feet wide by 5 feet deep by 20 feet tall. Several horizontal conduits were found at the southwest corner of the room. A 3-inch-diameter pipe ran vertically down one of the vent shafts, then horizontally along the ceiling, terminating above a smaller raised concrete platform thought to have mounted a smaller generator.(76) The author's supposition is that due to the power plant being within 75 to 100 feet of the radar operating room, the smaller generator may have been a PE-84C to supply emergency power to the SCR-296A radar.



Shelter of corrugated metal, also called "elephant iron." *FM 5-15*

Access to the barracks compound was via a concrete stairway some 100 feet west of the power room. The outdoor motor pool and a partially buried small arms magazine of "elephant iron" resembling a Quonset hut were roughly 800 feet south of the turrets, some 100 feet lower in elevation.

Commercial power was carried to the site on some 32 power poles, with nine 10 KVA transformers, that scaled the ridge from the coast road, formerly Highway 1, now Kalaniana'ole Highway.

### Manning the Battery

A provisional battery was formed in late 1942 from a detachment of Battery F, 55<sup>th</sup> CA (TD), and men detailed from Batteries D, 16<sup>th</sup> CA (HD); A, C, and D, 57<sup>th</sup> CA (TD); C, 41<sup>st</sup> CA (Ry); and HQ and HQ Battery, 2<sup>nd</sup> Bn, 55<sup>th</sup> CA (TD). The provisional battery was augmented with men from the 804<sup>th</sup> and 808<sup>th</sup> CA (HD) Batteries, and was designated the 806<sup>th</sup> CA (HD) Battery (Separate). The 806<sup>th</sup> manned the Wilridge turrets until the summer of 1943, when it was inactivated and its personnel used to reactivate Battery D, 16<sup>th</sup> CA.

On May 30, 1944, Battery D, 16<sup>th</sup> CA, was transferred, less men and material, from Battery Wilridge to Battery 405 on the slopes of Puu Papaa in the HD of Kaneohe Bay and North Shore. The former personnel of Battery D, 16<sup>th</sup> CA, remained at Battery Wilridge, designated as a detachment of Battery B, 15<sup>th</sup> CA. In mid-August 1944, the 15<sup>th</sup> CA was inactivated and the officers and men of Battery B activated Battery E, 54<sup>th</sup> CA (HD) Bn, which manned the turrets until early 1945, when Battery

E was transferred to Kahuku Point on the North Shore and Battery A, 56<sup>th</sup> CA (HD) Bn, manned the turrets until April 9, 1945, when Battery A was inactivated.(77)

Five firing practices were held in 1944 in which a total of 80 rounds were expended, 56 rounds on September 23.(78)

A 34-man caretaking detachment from the 608<sup>th</sup> CA (HD) Battery (Separate) maintained Battery Wilridge's turrets through the end of the war. The 608<sup>th</sup> was inactivated on October 31, 1946, and HQ and HQ Detachment, 58<sup>th</sup> CA Bn, assumed caretaking duties until March 1946, when Battery D, 54<sup>th</sup> CA Bn, was reorganized and redesignated as the 84<sup>th</sup> CA (HD) Battery (Separate), four officers and 247 enlisted men posted at Fort Ruger. The 84<sup>th</sup> was inactivated on June 30, 1946; Battery D, 2274<sup>th</sup> Hawaiian Seacoast Artillery Command, from Fort Ruger performed caretaking duties thereafter. The battery was disarmed in 1949.(79)

#### Antiaircraft and Perimeter Defense

No information has been found to indicate specifics regarding antiaircraft and perimeter defenses of the battery other than whatever automatic weapons, rifles, and small arms were issued to the battery.



Lt. Lewis S. Kirkpatrick. *Courtesy of Mary Kirkpatrick*

### Battery Renamed

W.D. G.O. 96 renamed Battery Wilridge in honor of Lt. Col. Lewis Spencer Kirkpatrick, 59<sup>th</sup> CA (HD) Regiment, who commanded Fort Drum during the Japanese siege of the Manila Bay forts during the early months of World War II. After he was ordered to surrender Fort Drum, he was taken to Fort Mills on Corregidor Island, where he succumbed to pneumonia while a prisoner of war on April 27, 1943. Kirkpatrick was a 1924 graduate of West Point and a native of Oklahoma City, OK.(80)

### Real Property Transactions

Approximately 95.68 acres including utility and road easements was acquired from the Bernice P. Bishop Estate by the army through license dated September 1, 1943, and lease W-414-eng-6277, date unknown. The license was terminated in December 1944 and the lease terminated in August 1945. A "Declaration of Taking" (Civil No. 592) was filed retroactively in August 1945 for 83.81 acres. In a judgment filed in March 1951, the 83.81 acres were excluded from the taking, and returned to the former owners.(81)

The 298<sup>th</sup> Regimental Combat Team, Hawaii National Guard, sought the use of the former military reservation as a training area. After a lengthy period of negotiation, an agreement was reached with the estate allowing training from February to May 1951, with restrictions on cutting trees, excavating, overnight camping and fires, and live firing.(82)

Another, separate seacoast battery was built on the slopes of Wiliwilinui Ridge on a separate tract of the military reservation of the same name, Battery Wili, also known as Willy.

### Battery Wili

Battery Wili, with Panama mounts for four 155 mm GPF guns, replaced the alternate firing position atop Koko Head. The site was around the 500-foot elevation of the ridge, some 3,000 feet south of Battery Wilridge. Fatigue parties from Battery E, 55<sup>th</sup> CA Regiment, assigned to Fort Ruger, constructed the emplacements.

The preliminary phase of the battery construction was completed by December 21, 1942; settling rounds were fired from the battery's four guns on December 30. Battery E remained at the position for two weeks and fired a target practice on January 8, 1943, after which they returned to their quarters at Fort Ruger on the 12<sup>th</sup>. Battery E returned to the Wiliwilinui Ridge position on February 1, 1943, and continued to man it until alerted for transfer in September 1943 and withdrawn from Battery Wili in October. It was deployed to Tarawa Atoll in the beginning of 1944. Battery Wili was left in the care of Battery D, 16<sup>th</sup> CA, which manned Battery Wilridge in the summer of 1943. Other units, including Battery F, 55<sup>th</sup> CA, also used the isolated site for firing practice. A total of 144 rounds were fired from the Wili position in 1944. (83)

### Concluding Remarks

The addition of the four 8-inch NT batteries to Oahu's seacoast defenses greatly decreased the need for the narrow-gauge (36-inch) 8-inch railway guns. Two of the four 8-inch railway batteries (Kahuku and Ulupau/Sylvester) were dismounted from their M1918MI railway cars and permanently mounted in concrete emplacements that provided more stable firing platforms, leaving only two railway batteries (Browns Camp and Haleiwa) on Oahu.



Looking southeast toward Battery Brodie (Ricker) with scrub forest and wild grasses. *Author, 2002*

Remnants of Batteries Ricker (Brodie), Riggs (Opauala), and Kirkpatrick (Wilridge) are extant on private property with limited or no access.

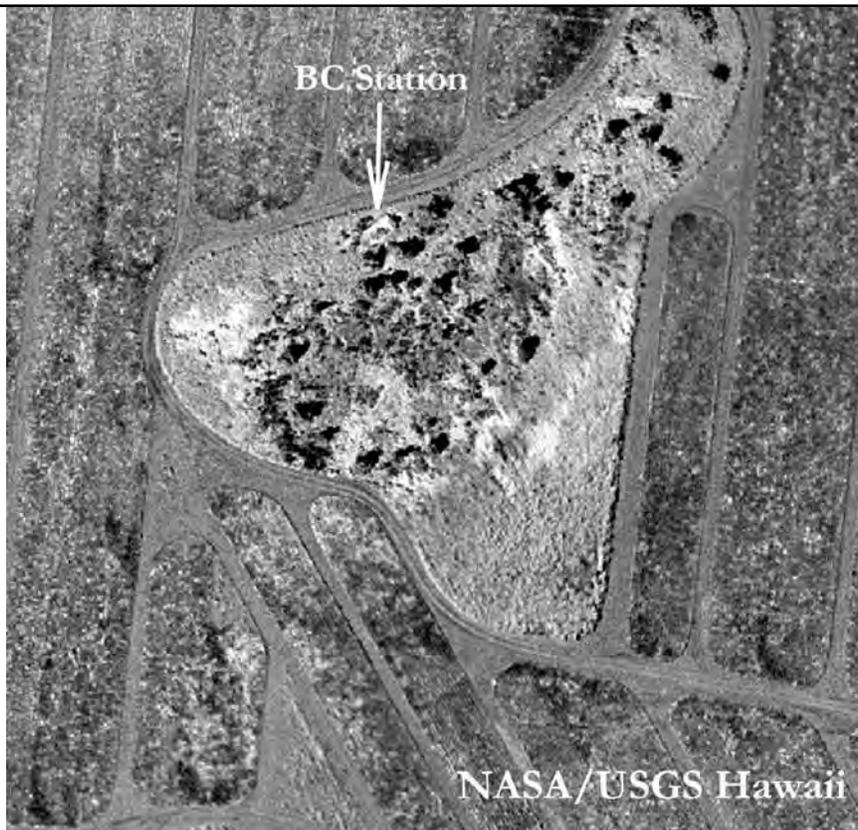
The remains of Battery Ricker are chiefly buried underground in a scrub forest, largely covered by field grasses six feet and higher. Only three structures were above grade in a 2002 site inspection by the author, the BCS/radar operating room and two escape hatch housings for the underground plotting rooms. The battery site borders pineapple fields owned by Dole Food Company, Inc. (DFCI) and is ordinarily off limits to visitors.

A representative of DFCI, Richard McCormack, informed the Towill DERP-FUDS inspection team that the company had unsuccessfully attempted to demolish the structures of former Battery Ricker with a D-8 bulldozer.

An underground storage tank no larger than 1,000 gallons found beneath the floor of the power plant room at Battery Ricker during the inspection did not contain any toxic substances.(84)

Battery Riggs' remnants included the BCS, elephant iron radar operating room, and Barbette No. 1 (Barbette No. 2 is buried beneath a tennis court). Barbette No. 1 provided access to the short corridor that led to the underground projectile room via a narrow crawl space.

Both of the battery's plotting rooms were accessible, although in the lower of the two, it was necessary to crawl through a narrow opening in the dirt that covered the entrance in July 2002. The site is ordinarily off limits to the public, but Richard Rogers, the caretaker of "Opauala Ranch," may grant special permission to visit under special circumstances, providing he is available to escort the individual(s). There are numerous hazards to be found at the site, as is the case at most abandoned coast artillery sites; good physical conditioning and agility is a plus when visiting the property.



Battery Brodie (Ricker) site. Arrow points to the BCS. *Aerial photography/imagery courtesy of USGS National Geospatial Program Office (Hereafter: USGS.)*



“Opaeula Ranch,” site of Battery Opaeula (Riggs). Arrow points to tennis court built over No. 2 barbette. *USGS*



View of the site believed to be the location of Battery Salt Lake (Burgess). Arrow points to large gunned area on the inner aspect of a small crater. USGS



Large mansion constructed over the remains of Battery Wilridge (Kirkpatrick). Arrows point to existing steel barbettes of both turrets. USGS

The only aboveground evidence of Battery Salt Lake (Burgess) is the large gunited area on the inner aspect of a small crater located in a housing subdivision. It is not known if any of the battery's subterranean structures are extant.

Battery Kirkpatrick was partially accessible in 2003; the remnants were located on private property, the BCS, power room and portions of the gun barbets and support magazine rooms have been incorporated into the design of a large mansion. Both turret barbets remain exposed in a recent aerial photograph.

### Acknowledgements

The author wishes to express gratitude to William Gaines, who reviewed the draft, provided photographs, copies of his manuscript dealing with the coast artillery installations and organizations on Oahu, site inspection reports of former Batteries Ricker and Riggs, and several e-mail letters concerning the 8-inch NT batteries. Bolling Smith provided material from NARA, College Park, MD. The author would further like to thank Al Grobmeier; Terrence McGovern; Dan Rowbottom; Mary Kirkpatrick, daughter of the late Lt. Col. Kirkpatrick; Judith Bowman, curator of the U.S. Army Museum of Hawaii; Henry Wolter, U.S. Geological Survey, Honolulu Office; and the U.S. Army Corps of Engineers, Pacific Ocean Division, Fort Shafter, Hawaii.

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