KA'ENA POINT SATELLITE TRACKING STATION
Ka'ena Point, Wai'anae Mountains above Keawaula Bay
Waialua
Honolulu County
Hawaii

HAER HI-97
HAER HI-97

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

FIELD RECORDS

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240-0001

ADDENDUM TO:
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PHOTOGRAPHS

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ADDENDUM TO:

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KA‘ENA POINT SATELLITE TRACKING STATION

This is an addendum to a 6-page report previously transmitted to the Library of Congress.

Location: Ka‘ena Point, Wai‘anae Mountains above Keawaula Bay
Waialua, Honolulu County, Hawai‘i

United States Geological Survey (USGS) Ka`ena Point, Hawaii Quadrangle,
Universal Transverse Mercator Coordinates

Building 11:	2384475.05 m N, 578663.95 m E
Building 35:	2385334.02 m N, 576326.56 m E
Building 39005:	2384575.05 m N, 578471.49 m E
Building 39006:	2385304.93 m N, 576375.77 m E

Present Owner: Headquarters, Air Force Space Command
150 Vandenberg Street, Suite 1105
Peterson Air Force Base, CO 80914

Present Occupant: United States Air Force
Detachment 3, 21st Space Operations Squadron
50th Space Wing
P.O. Box 868
Waianae, Hawai‘i 96792-0868

Present Use: Satellite Tracking Station

Significance: Ka‘ena Point Satellite Tracking Station (KPSTS) is a radio receiving and transmitting facility that occupies approximately 153 acres of land leased from the State of Hawai`i, including easements and rights-of-way. KPSTS was originally established in 1958 to support the CORONA/Discoverer Satellite Program.

The CORONA/Discoverer Program was a covert surveillance and satellite reconnaissance program run by the United States (U.S.) in the 1950s and 1960s that was instrumental in the development of radar and surveillance technological advancements. The nation’s first satellite reconnaissance program was named Discoverer. Since the program was classified, it became known by its codeword CORONA although CORONA is not an acronym. The antenna equipment and support structures, and command stations, located within KPSTS, then known as “HULA,” supported the CORONA/Discoverer programs with data retrieval, tracking and relay; as well as gathering orbit and trajectory data to aid in the recovery of surveillance film capsules that were ejected from the satellites.

During the Cold War years when suspicions between the U.S. and the Soviet Union were high, concerns over the manufacture of nuclear weapons by the Union of Soviet Socialist Republics (U.S.S.R.) spurred the innovations in the U.S. reconnaissance missions. Space surveillance satellites captured photographs of suspect weapons storage and

manufacturing locations within the Soviet Union at increasingly higher resolution throughout the duration of the CORONA/Discoverer program.[1] Global mapping and terrain imagery became an indispensable part of military intelligence. The last CORONA/Discoverer mission flight was in 1972.

Selected History Timeline of Events that Influenced the CORONA/Discoverer Program [2]

1946	First Post-war nuclear bombs explode in Operation Crossroads
1947	Central Intelligence Agency (CIA) established; Army separates from Air Force (AF)
1954	U-2 Program begins
1957	Soviets launch Sputnik I
1958	National Aeronautic Space Administration (NASA) established; Advanced Research Projects Agency (ARPA) est.; Air Force WS-117-L cancelled (and reconstituted as CORONA secretly)
1959	First series of “Special students” from Air Force Aeronautical Charting and Information Center (ACIC) arrive at Ohio State University (OSU); Army World Geodetic Datum (WGD59) finished
1960	First successful CORONA/Discoverer mission; Francis Gary Powers and U-2 shot down over Soviet Union; RACOMS Program begins
1961	Bay of Pigs invasion; TALENT-KEYHOLE security protocols formalized; National Reconnaissance Office (NRO) established
1962	Cuban Missile crisis; first successful CORONA-ARGON mission; first “Advanced” CORONA/Discoverer KH-4 mission
1965	Escalation of wars in Vietnam and Laos
1966	Secret Department of Defense (DOD) study suggests applications of classified reconnaissance information by nominally civilian federal agencies
1966	U.S. Geological Survey (USGS) begins Building E-1 at new National Mapping Division (NMD) center in Virginia

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1 USNSSDC 1960: n.p. United States National Space Science Data Center, U. N., 20 August 1960. “Discoverer 14: NSSDC ID: 1960 -010A.” Accessed 21 January 2012. <http://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1960-010A>

2 Cloud 2002: 262. Cloud, J. “American Cartographic Transformations During the Cold War.” In *Cartography and Geographic Information Science*, Vol. 29, No. 3, pp. 261-282, 2002.

Selected History Timeline of Events that Influenced the CORONA/Discoverer Program (continued)

1967	Six-Day War, Soviet invasion of Czechoslovakia, first CORONA/Discoverer KH-4B mission; Outer Space Treaty signed
1968	First color films flown in CORONA/Discoverer missions; Civilian Applications Committee (CAC) formed
1969	Strategic Arms Limitations Talks (SALT) begin in Finland; Apollo 11Astronauts reach the Moon; Military Geographic Information Systems (MGIS) Program begins
1971	First HEXAGON satellite reconnaissance mission
1972	Last CORONA/Discoverer Mission; SALT Treaty signed; World Geodetic System of 1972 (WGS72) completed; Most DOD and IC service-level mapping and geodesy service agencies consolidated into the Defense Mapping Agency (DMA)
1973	Office of Management and Budget Mapping Agency Task Force recommends consolidation
1975	Vietnam War ends
1978	President Carter publicly acknowledges the U.S. employs satellite reconnaissance
1992	NRO is officially recognized to exist; President Clinton elected
1995	Authorization for the declassification of CORONA; the CAC is acknowledged to exist

As a result of the contributions of the CORONA/Discoverer program, KPSTS is significant for its contributions to America's history in the science and space exploration advances during the Cold War. KPSTS was a vital part of the U.S. military reconnaissance mission during the early development of our nation's Satellite Command and Control Network.

PART I. HISTORICAL INFORMATION

A. Physical History:

1. Date of Erection: 1959-1992

2. Architects/Engineers: Ralph M. Parsons Company (1958), Burns & Roe, Inc. (1967), Norman Engineering Company (1967), Clarence Fong Architects (1967), U.S. Department of the Air Force (1972), Geometrics, Inc. (1978), and Paul Louie & Associates (1992).

3. Original and Subsequent Owners: Kingdom of Hawai‘i (1843-1893)
Republic of Hawaii (1893-1900)
Territory of Hawaii (1900-1959)
State of Hawai‘i (1959-present)
James Campbell (18?-1900)
Estate of James Campbell (1900-present)
U.S. Department of the Army (1940-1958) (Lessee)
U.S. Department of the Air Force (1958-present) (Lessee)

4. Builders and Contractors: A number of different contractors, a number of whom remain unidentified, erected the buildings at Ka‘ena Point Satellite Tracking Station. The known contracting agencies include the U.S. Army Corps of Engineers and known contractors include Geometrics, Inc.

5. Original Plans and Construction: The original site included multiple land tracts leased from the Territory of Hawai`i and private land owners comprising a total of 106 acres in 1958. As the installation's operations grew, future site expansions encompassed approximately 200 total acres leased in 1994. Some land in recent years has been returned to the State of Hawai`i. The entire facility currently (2013) includes 153 acres of lease land, right-of-way, and easements. In 1958 construction drawings were produced by Parsons in Inglewood, California for the VHF Telemetry Antennae and Tri-Helix Antennae project at Ka`ena Point Satellite Tracking Station. Original plans are located in the Administration Building, Ka‘ena Point Satellite Tracking Station, Waianae, O‘ahu.

6. Alterations and Additions: A guardhouse is relatively unaltered, a satellite control building has been enlarged with multiple additions, and two radomes remain in relatively unaltered condition following the addition of mechanical upgrades. One radome on the west end of the satellite control building was damaged as a result of high winds in 1968 and was not replaced.[3]

B. Historical Context:

Ka`ena Point Satellite Tracking Station (KPSTS) is a receiving and transmitting facility that occupies approximately 153 acres of land leased from the State of Hawai`i, including easements and rights-of-way. The antenna equipment, support structures, and command stations, located within KPSTS supported the CORONA/Discoverer programs with data retrieval, tracking and relay; as well as gathering satellite orbit and trajectory data to aid in the recovery of surveillance film capsules that were ejected from the satellites.

[3] Report on the Congressional Hearings regarding the damaged Radome at KPSTS 1968:n.p.

The CORONA/Discoverer Program was a covert surveillance and satellite reconnaissance program run by the U.S. in the 1950s and 1960s that was instrumental in the development of radar and surveillance technological advancements. The last CORONA/Discoverer mission flight was in 1972. Earth-orbiting satellites equipped with photographic film were operated remotely before space vehicles were able to successfully return from space. Film canisters were ejected from the satellites and retrieved with aircraft. In the case of Hawai`i, C-119 "Flying Boxcars" from Hickam Air Force Base (AFB) used rear cable attachments to capture the parachutes that had deployed upon re-entry. Later the C-130 aircraft was used during vehicle recovery operations.

During the Cold War years when suspicions between the U.S. and the Soviet Union were high, concerns over the manufacture of nuclear weapons by the U.S.S.R. spurred the innovations in the U.S. reconnaissance missions. Space surveillance satellites captured photographs of suspect weapons storage and manufacturing locations within the Soviet Union at increasingly higher resolution throughout the duration of the CORONA/Discoverer program. Global mapping and terrain imagery became an indispensable part of military intelligence. Tracking equipment at KPSTS helped to monitor the satellite's orbit, receive and transmit data.

In 1958 construction drawings were produced by Parsons in Inglewood, California for the Department of the Air Force Ballistic Missile Division as part of the Air Research and Development Command (ARDC) for the VHF Telemetry Antennae and Tri-Helix Antennae project at Ka`ena Point Satellite Tracking Station .[4] The installation became active in 1959 as part of the ARDC Weapons System 117L (WS-117L). [5] In 1965, the elliptical VHF Telemetry Antenna at KPSTS, operating at frequencies between 240-280 mHz, contributed orbital telemetry data in support of the Saturn SA-7 vehicle during powered flight.[6]

KPSTS radar sensors contributed to the United States Strategic Command Space Control and Space Surveillance (USSTRATCOM) agency's network of 29 space surveillance sensors which tracked and identified objects continuously.[7] The role of KPSTS's radar-

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4 Ralph M. Parsons Company, As-Built Drawing #199-11-3, Sheet 16, 1958. Parsons, Ralph M., Company. "VHF Telemetry Antennae and Tri-helix Antennae at KPTS[,] Floor Plan, Elevation, Section for Pedestal." As-Built Drawing #199-11-3, Sheet 16. U.S. Air Force Ballistic Missile Division (ARDC), Inglewood, California, 1958.

5 Arnold, David C. Spying from Space: Constructing America's Satellite Command and Control Systems. 2005: 5.

6 Ely 1965: 1, 6, 8. Ely, Olen and Parley Howell. *National Aeronautics and Space Administration Technical Memorandum X-53250: Radio Frequency Evaluation of SA-7 Vehicle*. Huntsville, Alabama: George C. Marshall Space Flight Center: pp 1, 6, 8, 1965.

7 USSTRATCOM 2011: n.p. USSTRATCOM. "USSTRATCOM Space Control and Space Surveillance." Accessed 18 January 2012.< http://www.stratcom.mil/factsheets/USSTRATCOM_Space_Control_and_Space_Surveillance>

type sensors in the U.S. Space Surveillance Network (SSN) included prediction of surface impact of re-entering objects and notification to Federal Emergency Management Agency (FEMA) and Public Safety Canada if the trajectory indicated landfall in North America or Hawai`i. [8]

By July 1962, a 60 foot/ 18 meter diameter reflector-type telemetry antenna R-1162 produced for Philco-WDL and developed by Radiation, Inc. was in operation at KPSTS for tracking satellites. [9,10] The KPSTS TLM-18 antenna provided reflector-type telemetry for the CORONA/Discoverer vehicles during their orbit .[11] This auto-tracking model was part of the Eastern Pacific Range Tracking and Telemetry project and operated at frequencies between 216-260 mHz .[12] The TLM-18 antenna at KPSTS Building 39000 contributed to the mission of the U.S. SSN remote tracking station installations that operated during the mid-1960s.

As the Air Force began to develop a standardized command and control system, known as the Air Force Satellite and Control Facility (AFSCF), KPSTS was instrumental in the first successful satellite support mission using the new central command model in 1966.[13] In 1968, a Space Ground Link Subsystem (SGLS) antenna was installed at KPSTS for Building 39005.[14] The SGLS allowed each commanding station to use a single self-

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8 USSTRATCOM 2011: n.p. USSTRATCOM. “USSTRATCOM Space Control and Space Surveillance.” Accessed 18 January 2012. < http://www.stratcom.mil/factsheets/USSTRATCOM_Space_Control_and_Space _Surveillance>

9 Amis 1962: 14-17. Amis III, A.B. and M.L. Cox. “Vital to Ground Support Equipment: Antenna Performance.” In *Ground Support Equipment (GSE),*Vol. 4, No. 3, pp. 14-17, 1962.

10 Coxe 1959: 87-89. Coxe, Frank S. IRE Transactions on Space Electronics and Telemetry: Operational Characteristics of the TLM-18 Automatic Tracking Telemetry Antenna. June 1959: pp. 87-89.

11 Arnold, David C., Col. Personal communication sent via electronic mail to Kathryn Ladoulis Urban. 24 January 2012. Honolulu, O`ahu.

12 Amis 1962: 14-17. Amis III, A.B. and M.L. Cox. “Vital to Ground Support Equipment: Antenna Performance.” In *Ground Support Equipment (GSE),*Vol. 4, No. 3, pp. 14-17, 1962.

13 Arnold, David C. Spying from Space: Constructing America’s Satellite Command and Control Systems. 2005: 5.

14 Higginbotham 1993: n.p. Higginbotham, Briggs & Associates. *Ka`ena Point Satellite Tracking Station Natural Resource Management Plan.* Colorado Springs, Colorado: Higginbotham/Briggs Associates, 1993

tracking ground antenna to transmit information to compatible vehicle equipment on board the satellite for a specified period of time .[15] According to the *Final Environmental Assessment for Hawai`i Tracking Station A-Side Antenna Remote Block Upgrade at KPSTS, Hawai`i* report, the existing antenna mounted on the pedestal of Bldg 39005 is a 60 ft/ 18 meter reflector-type antenna. [16]

In the last years of the CORONA/Discoverer Program, in 1971 and 1972, KPSTS made improvements to its radar system capability in support of the Space Missile Command.[17] The United States Air Force Space Command Space Surveillance Network (AFSPC SSN) radar-type sensors became active in 1972 at KPSTS on O`ahu when the AN/FPQ-14 antenna built by RCA was operational at Building 41.[18] The KPSTS radar pulse antenna was utilized by the SSN as part of its tracking radar to gather data in terms of electronically tracking an objects' range, velocity, and direction .[19] This governmental sensor system was initially developed for the Missile Test Project to serve as a missile warning network but later evolved to function as a space surveillance operation .[20] [21]

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[15] Arnold, David C. Spying from Space: Constructing America's Satellite Command and Control Systems. 2005: 5.

[16] USSMSC 2011: n.p. United States Space and Missile Systems Center, Acquisition Civil/ Environmental Engineering, "Final Environmental Assessment for Hawai`i Tracking Station A-Side Antenna Remote Block Change Upgrade at Ka`ena Point Satellite Tracking Station, Hawai‘i." Los Angeles Air Force Base, California: Satellite Control and Network Systems Division, Space and Missile Systems Center, 2011.

[17] RTIC 1989: n.p. Research Triangle Institute Center (RTIC) for Systems Engineering. *Final Baseline Assessment Western Space and Missile Center (WSMC) July 1989. Contract No. DTR-57-87-C-00116.* Washington, D.C.: U.S. Department of Transportation Office of Commercial Space Transportation, 1989.

[18] Greisbach 2011: 11-580. Greisbach, Gallado and Jacob. "Simulating Space Surveillance Networks." In *AAS Astrodynamics Specialist Conference Proceedings*, pp. 1-20, 2011.

[19] Australian Space Academy 2010: n.p. Australian Space Academy. "A Guide to Orbital Space Debris." Accessed 24 January 2012. <http://www.spaceacademy.net.au/watch/debris/gsd/gsd.htm#track>

[20] Greisbach 2011: 11-580. Greisbach 2011: 11-580. Greisbach, Gallado and Jacob. "Simulating Space Surveillance Networks." In *AAS Astrodynamics Specialist Conference Proceedings*, pp. 1-20, 2011.

[21] RCA Service Company n.d.: i. RCA Service Company. Book II: AN/FPQ-6 and AN/TPQ-18 Instrumentation Radar, Part I DAS-037 Training Program Student Handout. Patrick AFB, Florida: Missile Test Project Technical Training, n.d.

KPSTS radar tracking operations ceased in 2007 and the radar tracking antenna atop Building 35 has been removed.

Through the years, KPSTS has also supported other Department of Defense (DOD) space programs, including a satellite communications network (i.e., Advent), the Missile Detection and Alarm System (MIDAS), the Satellite and Missile Observation System (SAMOS), and the North American Aerospace Defense (NORAD) Command .[22] The current mission of KPSTS is to provide uninterrupted support (i.e., telemetry, tracking, command, and data retrieval functions) for DOD space vehicles and other high-priority space programs supported by the Air Force Satellite Control Network (AFSCN). KPSTS is one of eight satellite tracking stations that make up the common user segment of the AFSCN. At least two transponder-type sensors, HULA A and HULA B, are operational, used to track active satellites at KPSTS, and they are part of the AFSCN .[23] In addition, during the Cold War era, KPSTS served as one of the foreground stations receiving real-time space and atmospheric weather data from Defense Meteorological Satellite Program (DMSP) satellites orbiting Earth.[24] [25]

As a result of the contributions of the CORONA/Discoverer program, KPSTS is associated with America's history in the science and space exploration advances during the Cold War. KPSTS now supports various missions and programs of the military and government/civilian agencies. KPSTS is currently managed and operated by Det 3, 21 Space Operations Squadron (SOPS), of the 50 SW, 14th AF, and U.S. Air Force Space Command. The 50 SW, based at Schriever AFB, Colorado, is responsible for the on-orbit control and evaluation of DOD space vehicles. Its continued operation is essential to our nation for the protection of the Pacific region and the interests of the U.S. in space exploration.

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22 CH2M Hill 2003: 1-1. CH2M Hill, Inc. *Final Decision Document to Support No Further Response Action Planned (NFRAP) for AOC EA03 (Cesspool).* Brooks City-Base, Texas: Air Force Center for Environmental Excellence, Environmental Services Office, Environmental Restoration Division (AFCEE/ERD), 2003.

23 Greisbach 2011: 1-20. Greisbach 2011: 11-580. Greisbach, Gallado and Jacob. "Simulating Space Surveillance Networks." In *AAS Astrodynamics Specialist Conference Proceedings*, pp. 1-20, 2011.

24 USSMC 2009: n.p. United States Space and Missile Command Public Affairs Office, 1 October 2009. "Los Angeles Air Force Base Space Missile Command Defense Meteorological Program." Accessed 22 January 2012. <http://www.losangeles.af.mil/library/factsheets/factsheet.asp?id=5321>

25 Ezell 1999: n.p. Ezell, Linda N. NASA Historical Data Book: Volume III, Programs and Projects, 1969-1978, Chapter 6, NASA History Office, 1988: n.p.

PART II. ARCHITECTURAL STATEMENT:

A. General Statement:

1. Architectural Character: Located at Ka‘ena Point, on a southwestern face of a ridge of the Waianae Mountain Range in the vicinity of Ka‘ena Point State Park and the Ka‘ena Point Natural Area Preserve, is a group of twenty-one buildings associated with the KPSTS. The installation includes four significant buildings which were erected from 1959-1972, three of which have been nominally altered at various dates afterward. They include a guardhouse, identified as Building No. 11, a satellite control station, Building No. 35, and two antenna support structures/pedestals with associated radomes, identified as Building Nos. 39005 and 39006. (See photographic documentation HAER HI-97-01 through HAER HI-97-10). The significance of Buildings 35 and Building 39006 are also associated with their juxtaposition. Computer equipment used for data relay and upload used in the early control stations associated with the SGLS were generally located adjacent to or within the same building structure that housed the antenna equipment. Buildings 11 and 39005 are located in a different area of the tracking station, and in close proximity to the Administration and headquarters building.

2. Condition of Fabric: The guardhouse, satellite control building, and radomes are in good condition.

B. Site:

1. Landscaping/ Setting: The installation is located on the Kua‘okala Ridge of the Waianae Mountain Range, with sheer cliff faces which extend upward some 1,280 feet from a rocky shoreline with intermittent sand beaches and dunes below. The ridge is uneven and ranges in elevation from 1,281feet above sea level at the guardhouse, (Building No. 11), to 959 feet at the westernmost antenna support structure/pedestal and its associated radome, (Building No. 39006). The buildings and radomes, because of their form and light color, are in stark contrast to the dark hues of the surrounding vegetation and rugged natural terrain. A paved road provides access to the buildings; has a grass right-of-way that is maintained as a firebreak; and is well-maintained. Beyond the right-of-way, however, the landscape remains in its natural state. With the exception of the guardhouse, each building is located on a site that is enclosed by a chain link security fence with a security access-code controlled gate to prevent unauthorized entry.

2. General Building Orientation: The buildings are sited southeast-northwest along a narrow ridge, paralleling a paved access road, and their orientations vary. The guardhouse, Building No. 11, is oriented northwest-southeast, the satellite control building, Building No. 35, is sited southwest-northeast, and the antenna support structures/pedestals with associated radomes, Buildings Nos. 39005 and 39006, are entered from the southeast and southwest, respectively.

3. Buildings: The site includes a one-story guardhouse, identified as Building No. 11 (HAER HI-97-D), a one-and-one-half-story satellite control building, referred to as Building No. 35 (HAER HI-97-E), two two-story antenna support structures/pedestals

with associated radomes, referred to as Building Nos. 39005 (HAER HI-97-F) and 39006 (HAER HI-97-G). This is supplemental information to HAER No. HI-97, Ka`ena Point Satellite Tracking Station and Building 20 (HAER HI-97-A), Building 14111 (HAER HI-97-B), and Building 21 (HAER HI-97-C).

PART III. SOURCES OF INFORMATION:

A. Original Architectural/Engineering Drawings:

Burns & Roe, Inc. “[Building 39005] Floor Plan, Second Floor Plan, Antenna Platform Plan, Building Section,” Drawing No. KP-11, AW 70-03-01, Sheet 12, Los Angeles, California, 26 April 1967.

Fong, Clarence, Architects. “[Building 39005] Structural General Notes[,] Sections & Anchor Bolt Details,” AW 195-16-10, Sheet 13, Honolulu, Hawaii, 7 June 1967.

Geometrics, Inc. “Drawing List & Symbol Key[,]105M75.5 Radome,” Drawing No. 105M75.5-1, Sheet 1 of 15. Cambridge, Massachusetts, 1978.

_____. “Assembly Drawing, 105M75.5 Radome.” Drawing No. 105M75.5-2, Sheet 2 of 15.

_____. “Base Layout and Assembly Details [for] Radome 2[,] 105M75.5 Radome,” Drawing No. 105M75.5-4, Sheet 4 of 15.

Louie, Paul & Associates. “[Building 35] Site Plan, Fence Detail,” Drawing No. 04-14-92, Sheet A-1. Honolulu, Hawaii, April 1992.

_____. “Floor Plan, Reflected Ceiling Plan, Roof/Penthouse, Interior Elevations,” Drawing No. 04-14-92, Sheet A-2.

_____. “Exterior Elevations, Wall Sections,” Drawing No. 04-14-92, Sheet A-3.

Louie, Paul & Associates. “Foundation Plan, Building. Sections, Penthouse Roof Framing Plan,” Drawing No. 04-14-92, Sheet A-4.

_____. “[Building 39006] Floor Plan, Foundation Plan, Roof Framing Plan, Antennae Platform Floor Plan,” Drawing No. 04-14-92, Sheet A-2, April 1992.

_____. “Reflected Ceiling Plans, North & West Exterior Elevations,” Drawing No. 04-14-92, Sheet A-3, April 1992

_____. “Building Section, Wall Section of Antennae Platform, Wall Section of Radome Support, Roof Framing Plan,” Drawing No. 04-14-92, Sheet A-4, April 1992.

Norman Engineering Company. “[Building 35, Penthouse,] Architectural [and] Structural Sections & Elevations,” As-Built AW-30-05-05, Drawing No. A-2, Los Angeles, California, 30 August 1967.

Parsons, Ralph M., Company. “Guardhouse Plans and Details.” As-Built File #199-11-3, Drawing No. 1430-1A, A-6, Sheet 11. Los Angeles, California, 15 April 1958.

Parsons, Ralph M., Company. “VHF Telemetry Antennae and Tri-helix Antennae at KPTS[,] Floor Plan, Elevation, Section for Pedestal.” As-Built Drawing #199-11-3, Sheet 16. U.S. Air Force Ballistic Missile Division (ARDC), Inglewood, California, 1958.

U.S. Army Corps of Engineers. UASCE As-Built Drawing No. AW 99-11-3, Sheet 11; 1430-IA, A-6, Drawer 125. Waianae: Administration Building, Ka`ena Point Satellite Tracking Station.

_____. USACE As-Built AW 1199-16-10; Sheets 6, 17, 12 13, and 14. Ka`ena Point Drawing No. 60/03/02. Waianae: Administration Building, Ka`ena Point Satellite Tracking Station.

U.S. Department of the Air Force. Space and Missile Systems (AFSC). “[Building 39006] Civil, Plot & Utility Plan,” As-Built AW 35-47-01, Drawing No. C-1, Los Angeles, California, 20 January 1971.

_____. “Architectural Plans & Details,” Drawing No. A-1.

_____. “Structural Plans, Sections & Details,” Drawing No. S-1.

_____. “Structural Elevations, Sections & Details,” Drawing No. S-2.

_____. “Structural Plans Elevations, Plans, Sections & Details” Drawing No. S-3.

_____. DOAF As-Built Drawing No. KP-12, AW 199-70-1. Waianae: Administration Building, Ka`ena Point Satellite Tracking Station.

B. Early Views: Three early views were recorded from photographs which were located in the archives of the KPSTS Administration Building and have been included. (See photographic documentation for HAER HI-97-08 through HAER HI-97-10).

C. Interviews:

Arnold, David C., Col. Personal communication sent via electronic mail to Kathryn Ladoulis Urban. 24 January 2012. Honolulu, O`ahu.

Smith, Milton R. Interview with Kathryn Ladoulis Urban. Written notes. 19 April 2012. Waianae, O`ahu.

Smith, Milton R. Interview with KPSTS Environmental staff. Written notes. 24 July 2012. Waianae, O`ahu.

D. Bibliography:

Amis III, A.B. and M.L. Cox. “Vital to Ground Support Equipment: Antenna Performance.” In *Ground Support Equipment (GSE),*Vol. 4, No. 3, pp. 14-17, 1962.

Arnold, David Christopher. Spying from Space: Constructing America’s Satellite Command and Control Systems. College Station, Texas: Texas A & M University Press:2005: 5.

Australian Space Academy. “A Guide to Orbital Space Debris.” Accessed 24 January 2012. <http://www.spaceacademy.net.au/watch/debris/gsd/gsd.htm#track>

CH2M Hill, Inc. *Final Decision Document to Support No Further Response Action Planned (NFRAP) for AOC EA03 (Cesspool).* Brooks City-Base, Texas: Air Force Center for Environmental Excellence, Environmental Services Office, Environmental Restoration Division (AFCEE/ERD), 2003.

Cloud, J. “American Cartographic Transformations During the Cold War.” In *Cartography and Geographic Information Science*, Vol. 29, No. 3, pp. 261-282, 2002.

Coxe, Frank S. IRE Transactions on Space Electronics and Telemetry: Operational Characteristics of the TLM-18 Automatic Tracking Telemetry Antenna. June 1959: pp. 87-89.

Ely, Olen and Parley Howell. *National Aeronautics and Space Administration Technical Memorandum X-53250: Radio Frequency Evaluation of SA-7 Vehicle*. Huntsville, Alabama: George C. Marshall Space Flight Center: pp 1, 6, 8, 1965.

Ezell, Linda N. NASA Historical Data Book: Volume III, Programs and Projects, 1969-1978, Chapter 6, NASA History Office, 1988: n.p.

Federation of American Scientists. *The 6555th's Role in the Development of Ballistic Missiles: The Eastern Test Range in the 1950s.* Accessed 21 January 2012. <http://www.fas.org/spp/military/program/6555th/6555c3-2.htm>

Greisbach, Gallado and Jacob. “Simulating Space Surveillance Networks.” In *AAS Astrodynamics Specialist Conference Proceedings*, pp. 1-20, 2011.

Hannum, Warren T., Capt. “Discussion: Military Survey of O`ahu.” In *Professional Memoirs*, Engineer Bureau, United States Army, Vol. VI, No. 28, pp. 462-488. Washington, D.C.: Engineer School, Washington Barracks, D.C., 1914.

Hawaii TMK Service. “Zone 6, Section 9, Plats 01-03, Ka`ena Point, Waialua, O`ahu.” Honolulu: Hawaii TMK Service, 1984.

Higginbotham, Briggs & Associates. *Ka`ena Point Satellite Tracking Station Natural Resource Management Plan.* Colorado Springs, Colorado: Higginbotham/Briggs Associates, 1993.

K Design Group. “Historic Resources Inventory, KPSTS-11, KPSTS-35, KPSTS-39005, and KPSTS-39006.” Honolulu: K Design Group, 14 December 2011.

RCA Service Company. Book II: AN/FPQ-6 and AN/TPQ-18 Instrumentation Radar, Part I DAS-037 Training Program Student Handout. Patrick AFB, Florida: Missile Test Project Technical Training, n.d.

Research Triangle Institute Center (RTIC) for Systems Engineering. *Final Baseline Assessment Western Space and Missile Center (WSMC) July 1989. Contract No. DTR-57-87-C-00116.* Washington, D.C.: U.S. Department of Transportation Office of Commercial Space Transportation, 1989.

Territory of Hawaii. Tax Maps Bureau & Survey Department. “Ka`ena, Waialua, O`ahu, September 1933.”

_____. Territorial Highway Department, Division of Surveys and Rights of Way. “Land Court Application 1286[,] Subdivision of Land Court Application 1286…into Lots 1, 2, 3, 4 and 5[;] Redesignation of Easement 8…to Easements 8-A and 8-B, Situated at Ka`ena Point, Ka`ena, Waialua, O`ahu, T.H., February 11, 1959.”

United States Coast and Geodetic Survey. “Ka`ena Point, O`ahu, Hawaii.” Washington, D.C.: USGS, 1983.

United States House of Representatives Eighty-Seventh Congress Committee on Science and Astronautics, February 15, 1961 First Session, No. 1. “Discussion of U.S. Satellite Tracking System” Washington, D.C.: U.S. Government Printing Office, 1961.

United States National Space Science Data Center, U. N., 20 August 1960. “Discoverer 14: NSSDC ID: 1960 -010A.” Accessed 21 January 2012. <http://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1960-010A>

United States Space and Missile Command Public Affairs Office, 1 October 2009. “Los Angeles Air Force Base Space Missile Command Defense Meteorological Program.” Accessed 22 January 2012. <http://www.losangeles.af.mil/library/factsheets/factsheet.asp?id=5321>

United States Space and Missile Systems Center, Aquisition Civil/ Environmental Engineering, “Final Environmental Assessment for Hawai`i Tracking Station A-Side Antenna Remote Block Change Upgrade at Ka`ena Point Satellite Tracking Station, Hawai‘i.” Los Angeles Air Force Base, California: Satellite Control and Network Systems Division, Space and Missile Systems Center, 2011.

USSTRATCOM. “USSTRATCOM Space Control and Space Surveillance.” Accessed 18 January 2012. < http://www.stratcom.mil/factsheets/USSTRATCOM_Space_Control_and_Space_Surveillance>

Winkler, David F. “Searching the Skies: The Legacy of the United States Cold War Defense Radar Program.” Champaign, Illinois: United States Army Construction Engineering Laboratories, 1997.

PART IV. HISTORIANS

Historical research was conducted and the historical narrative was prepared by Kathryn Ladoulis Urban, AIA, K Design Group, Honolulu, while the architectural descriptions were prepared by Stanley Solamillo, also of K Design Group, and completed on July 16, 2012.

PART V. PROJECT INFORMATION

This Historic American Engineering Record (HAER) recording project was undertaken and funded by the United States Air Force Center for Environmental Excellence, Department of Defense as part of an agreed mitigation with the Architecture Branch, State Historic Preservation Division (SHPD) of the Hawai‘i Department of Land and Natural Resources. The recording team consisted of preservation architect Kathryn Ladoulis Urban, AIA, architectural historian Stanley Solamillo, as well as architectural photographers Steve Brinkman and Tony Martie.

Research for this project was conducted at the University of Hawai‘i Government Documents collection; the Joint Base Pearl Harbor Hickam 15 Airlift Wing Base historian office archive collection, at KPSTS Administration Building 10 archive drawing collection; the National Electronics Museum archives in Linthicum Heights, Maryland; the University of Notre Dame Hersburgh Library, South Bend, Indiana, in the General collection and Government documents collection; the Declassified Files section of the National Reconnaissance Office; as well as on-line sources from December 2, 2011 through July 12, 2012.

Initial site visits were performed from December 13 through 15, 2011 at KPSTS. A two day site visit and photographic fieldwork for HAER documentation as well as photography of archival construction and as-built drawings of KPSTS buildings No. 11, 35, 39005, and 39006 was performed from April 18-19, 2012. Additional HAER photography of existing measured drawings was performed on June 28, 2012.