# NEW WWVH FACILITY

Next year, WWVH, the Bureau's time and frequency station in the Pacific, will be broadcasting from a new site on Kauai in the Hawaiian Islands with an additional carrier frequency, increased power, and a revised format. As a result, far eastern parts of the world will have time and frequency broadcast service of unprecedented reliability. The new facility is now under construction on the west coast of Kauai and broadcasts will begin in the spring of 1971.

Obsolescence, propagation barriers, and a vanishing site are the reasons NBS is abandoning the Maui Island site from which WWVH has been broadcasting since 1948. Part of the station site was a man-made peninsula (which was acquired after World War II as surplus from the Navy) that has been eaten away by the erosive action of the sea. Mountains on both sides of the station interfere with transmission to the north and east where signals are urgently needed, and the equipment is old, obsolete, and in constant need of repairs.

A number of islands in the Pacific were considered by NBS when they began looking for a new site. There was Guam in the Marianas, the Marshalls, Wake, American Samoa, and all of the islands in the Hawaiian Chain. The site on Kauai was chosen for its smooth, level, unobstructed characteristics. It also offered commercially available water and power supplies, accessibility by improved roads, and an airport. In addition, the area is free from electromagnetic interference and there is room on the 35-acre site to space antenna arrays which are harmonically related so they will not interfere with each other.

Each array consists of two vertical masts spaced one-fourth wavelength apart and phased at 90 degrees. The antenna arrays will be located approximately 300 feet from the breaking surf and a radial ground screen around each array will extend over the beach to the ocean, thereby furnishing an infinite ground plane. The standby antennas and the building will be located inland approximately 350 feet from the center line of the operational antennas. In contrast to the old site at Kihei on Maui, this one has an established natural beachline which is not affected by the erosive action of the sea. The building, located inland, will be built on three-foot piers as a precaution against possible inundation by tidal waves.

Antenna towers will be made of galvanized steel pre-dipped in a paint with corrosion preventatives added to combat the effects of salt-water sprays. Transmission lines will be sealed with haberline jackets and buried to prevent corrosion, assure constant impedance, and minimize creeping caused by contraction and expansion.

Very-low-frequency signals (20 kHz) from WWVL, Fort Collins, Colo., will control the master clock at the station. The Fort Collins clock is controlled by the NBS atomic clock at the Boulder Laboratories.

Power at the new station will be increased from 2 kW to 10 kW and three technicians will be added to the staff so the facility can be manned around the clock. (The present low-power operation permits the station to be unmanned during certain periods of the day.) Present broadcast frequencies of 2.5, 5, 10, and 15 MHz will be supplemented with a new 20 MHz frequency to give additional coverage of the serviced area.

The directional antennas of the station will project a cardioid pattern of radio illumination which will cover Alaska to the North, New Zealand to the South, and some major cities of the Orient (Saigon, Singapore, Hong Kong and Calcutta). The Bureau's research on the new site included a computer study which shows that the new WWVH facility will give these key points in the Far East a reception reliability of from 90–99 percent during the hours between 0600 GMT and 1600 GMT, and only slightly less reliability during other hours.

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sis of statistically chosen samples for three elements of differing chemistry—manganese, potassium, and phosphorous. It is planned to issue the orchard leaves analyzed for 11 elements with a provisional certificate this year. They will be the usual fertilizer elements, nitrogen, phosphorous, potassium, calcium, and magnesium certified at an accuracy level of one percent, plus six of the more important trace elements—manganese, iron, copper, boron, arsenic, and zinc—certified at the five percent accuracy level. Once the work on orchard leaves is well along, homogeneity work will begin on the citrus leaves.

The sterilization of these materials by gamma radiation and their storage in sealed polyethylene bags should render these botanical samples stable for many years. This stability will enable NBS to issue these botanical samples as standard reference materials.

This work is an excellent example of cooperation between federal laboratories to achieve a goal beneficial to the public. The Office of Standard Reference Materials is grateful to A. Brynjolfson, J. Holliday, B. MacDonald, and F. Schaller of the U.S. Army Natick Laboratories for their interest, direction, and cooperation in accomplishing this work.