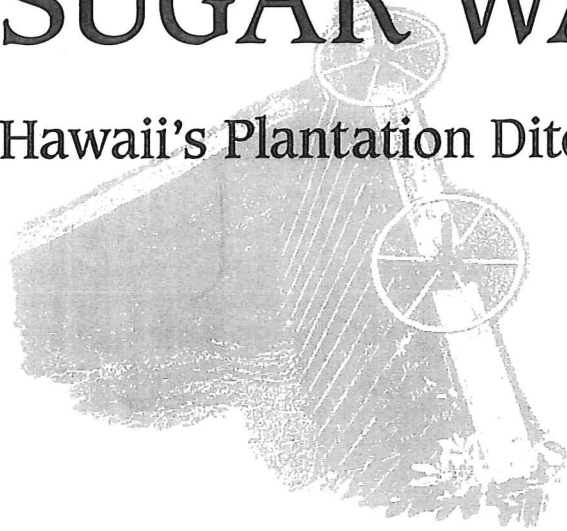


CAROL WILCOX

# SUGAR WATER

Hawaii's Plantation Ditches



A Kolowalu Book  
University of Hawai'i Press, Honolulu

**EXHIBIT** E-92

TRIAL EXHIBIT AB-163

## Sugar Water in Hawaii

U.S. Senate failed to ratify. King Kamehameha V continued this effort, sending an emissary to Washington in 1867. A treaty was approved by the U.S. president, his cabinet, and the Hawaiian legislature, but again it was defeated in the U.S. Senate, and again in 1869 and 1871. The cession of Pearl Harbor as part of reciprocity was discussed in 1873 during the reign of King Lunalilo, who died after reigning for only a year. He was succeeded in 1874 by King David Kalakaua, who in that same year became the first monarch of any country to visit Washington, where he petitioned President Grant and the Congress on behalf of reciprocity for Hawaii.

The Reciprocity Treaty was at last ratified by the U.S. Congress, and was signed by King Kalakaua in 1876. In addition to allowing tax-free trade for most products between Hawaii and the United States, it ceded to the United States certain rights to Pearl Harbor, rights that were later expanded. The overthrow of the Hawaiian Kingdom and establishment of the Provisional Government in 1893, and the country's subsequent annexation by the United States in 1898, ensured that these mutual benefits would continue. The Reciprocity Treaty was predicated on full government support of the fledgling sugar industry, including its efforts to develop water. Without that support, which included allowing the sugar planters to transport water out of the watershed, investors would not have been attracted to Hawaii.

Upon the adoption of the Reciprocity Treaty, prospective sugar planters began at once to invest in the development of both surface and groundwater. In 1878, with Baldwin and Alexander's successful Hamakua Ditch, and again in 1879, with James Campbell's successful artesian well, it was clear that water would be available in whatever quantities were needed, to be transported wherever needed. The water development systems went by the title of "ditches." It is a term both humble and misleading: misleading because they were not all ditches—many were mostly flumes, siphons, and tunnels—and humble because their size and scale were often quite large. And they were everywhere. Very few watersheds escaped the winding, burrowing network of ditches.

The development of Hawaii's surface water was unique in that it was done almost exclusively by the private sector. Water projects in the western United States, which was undergoing a parallel history of water development, were government-funded and controlled. The Hawaiian Kingdom, ever in debt, was unable to duplicate this effort. When Maui citizens petitioned King David Kalakaua to irrigate the dry plains of the Maui "commons," Kalakaua demurred. As the government explained in its 1878 agreement with Claus Spreckels: "The Hawaiian Government is not now ready or willing to undertake such works, and incur such expenses."<sup>1</sup> Although a dozen years later Kalakaua investigated the feasibility of bringing water out of Hawaii's Hama-

The changing times called for new ways to resolve disputes. In order to address conflicts associated with water rights and the newly established right to own land introduced by the *mahele*, King Kamehameha IV established Commissions of Private Ways and Water Rights in each region in 1860. These Water Commissions were the official courts of appeal. A glimpse into these troubled times is provided by Water Commissioner Daniels, who said in 1866: "There is going to be much trouble in Wailuku respecting Water as the plantations are taking all the water from the natives and I am sorry to say the natives will, if it continues, become very short of Kalo for food."<sup>9</sup> These commissions paralleled the *konohiki* system in several important respects, above all their local familiarity and accountability.

In 1888, Kalakaua consolidated the regional Commissions of Rights of Way and Water Rights into one commission for each area. In 1907, by which time Hawaii was a territory of the United States, the statute was changed so that the water commissioners were in fact the circuit court judges and the commissions ceased to exist. This centralization of authority differed fundamentally from the traditional water management and allocation system administered by a *konohiki*. It was difficult for a protesting farmer to expect redress from a formal, distant, and impersonal court.

The public record, however, seems to include little protest over the shift of water away from the land. The records of the commissioners would no doubt provide answers to the nature and depth of protest. But with two modest exceptions, these records have not been located. Therefore, we can only speculate why the remaining record—newspapers, court documents, oral tradition—is silent on this issue. For one thing, the decline of the Hawaiian population must have been the single overriding concern of the native people. In the 100 years after Captain Cook's arrival, the Hawaiian population decreased perhaps as much as 80 percent, leaving a native people of only 60,000 in 1876.<sup>10</sup> Some of the causes of this are known: introduced diseases became epidemic and lethal, the birth rate dropped dramatically, many young men joined ship crews and did not return. No group was spared, and just as the young King Kamehameha II and his Queen died in London in 1824, so at home did the *kabuna*, those teachers of dance and fishing, religion, and healing, and the *konohiki*, those in charge of overseeing the management of the land and its resources, the *ali'i*, the kings, queens, and chiefs, and the *maka'āinana*, the bulk and muscle of Hawaiian society. A degree of despair, fatalism, and chaos must have characterized those times. Large numbers of Hawaiians left their traditional homes in the rural areas. By the time of sugar's ascendancy, when the large water projects were diverting water away from the valleys and their villages, these villages did not have the population, organization, or will to protest.

## Sugar Water in Hawaii

*needs. The Court declared that surplus water went with the ahupuaas and ilis kupoos [sections of land] on which the waters originated making it possible for the industry to privately control most surface water sources; the Court said a water right gave the holder the power to divert the water to wherever he chose, a power crucial to sugar because most of the fields needing irrigation are distant from the water sources; adverse possession (technically here "prescription") of water rights became possible, making the stealing of a water right legal if you get away with it long enough; and early case references to riparian rights were in time weeded out or forgotten, and in any case never allowed to mature into a full-blown riparian system. Such a system, with its requirement that no one may divert outside the watershed nor take more water than would substantially diminish the natural flow of the stream, was anathema to sugar.<sup>13</sup>*

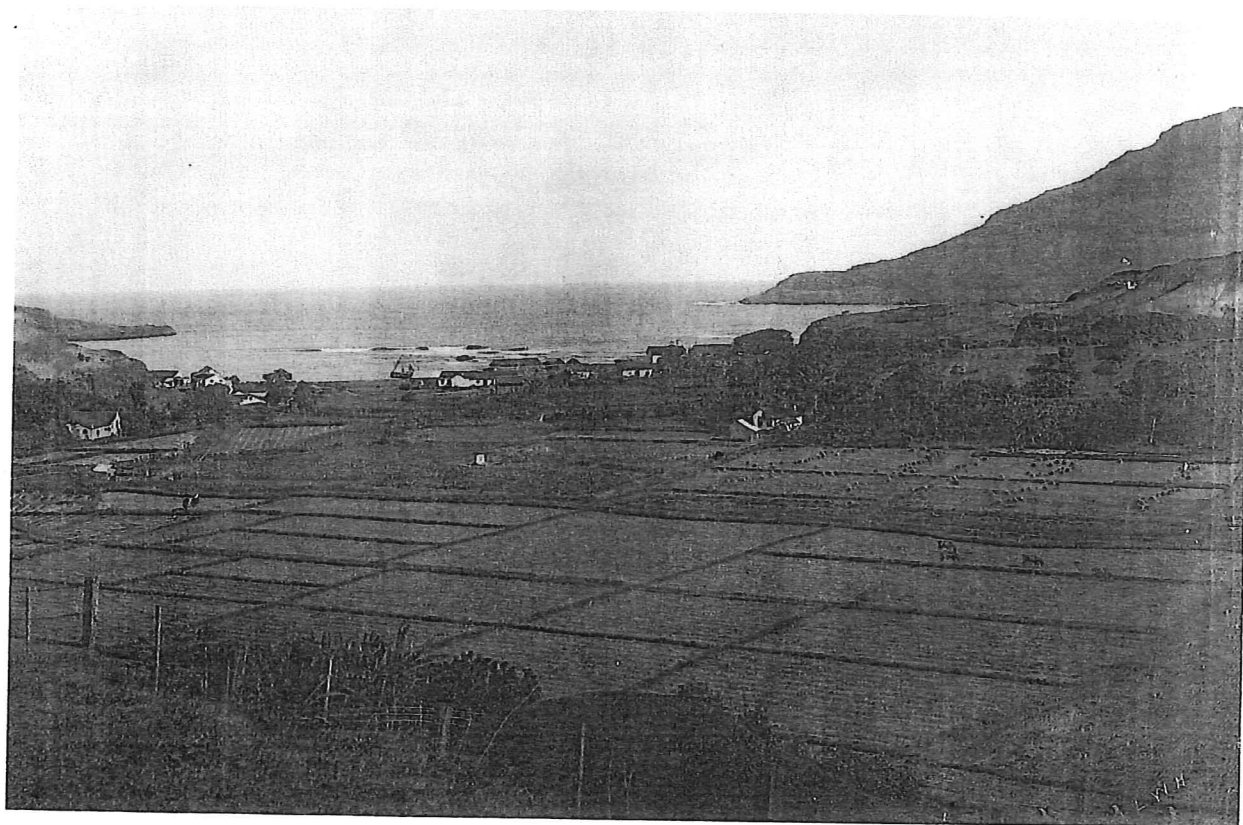
There were small but important rulings for riparian rights. There was a series of cases on Maui from 1902 to 1904, for example, which determined that HC&S could not deprive Wailuku Sugar of water in the lowlands. On Kauai, disputes over the water of the Hanapepe River led to a divided Hawaii Supreme Court decision in *Territory v. Gay* in 1930, which found that the upper 'ili did not have greater rights than a lower 'ili.<sup>14</sup> But the most important water cases occurred long after most water diversions were in place. And these were not between Hawaiian landowners or tenants and the sugar companies, but rather between two sugar companies in one case (the McBryde Decision) and between farmers and the Board of Water Supply in the other (the Reppun Decision).

The next great change in water use and rights occurred after World War II. During the 1940s Hawaii saw the increase of the military presence, tourism, and urban population. As Hawaii became less and less dependent on the sugar industry as the only source of income, the exclusive power it had enjoyed for decades began to wane. And with that loss of influence, it was natural that the industry's apparent absolute grip on water would be rethought.

There was again a shift in government's priorities for water and, not coincidentally, the makeup of the courts. This shift became even more pronounced after statehood, which brought significant changes in the composition of the Supreme Court. It was no longer dominated by justices with interests sympathetic to sugar. The new court shifted its emphasis to acknowledge some basic Hawaiian concepts of water law by way of two landmark cases: McBryde and Reppun.

*McBryde Sugar Co. v. Robinson*, also known as the Hanapepe Case,<sup>15</sup> brought up issues of water and the public trust. In 1973, the Supreme Court handed down what is generally accepted as Hawaii's most significant water decision in the twentieth century, known as the McBryde Decision. The con-





Nawiliwili with rice fields, 1913. For fifty years rice was the second-largest export after sugar. Ninety percent of Hawaii's rice was grown on Kauai and Oahu. Rice fields covered almost all of Kauai's lowlands, as well as the plains from Punchbowl to Diamond Head. (Photo: L. W. Hart. Private collection.)

ward, and from the public to the private. For years the Hawaiian government and then later the territorial government shared common goals with the sugar industry. During the territorial period, both the governor and justices of the Supreme Court were appointed by the U.S. president. Consequently, from 1900 to 1959, the Hawaii Supreme Court was composed of lawyers drawn from the prominent business interests whose commercial philosophy they upheld. As George Cooper summarized in his 1978 paper on the history of water rights:

*The Supreme Court in its approximately 50 water rights decisions prior to McBryde in 1973 has a rather perfect record of developing the law in ways conducive to sugar's*

and the pipes none at all from leakage.”<sup>6</sup> The ditch was not completed until the last days of the deadline imposed by the government lease—on 30 September 1878—by which time it had been extended to Nailiilihaele stream, intercepting the Kailua, Hoalua, Huelo, Hoolawa, and Honopou streams as well as smaller streams along the way. The costs of water projects in Hawaii were consistently underestimated, and Alexander’s estimate was no exception. The length of the new ditch was only 17 (not 25) miles; its cost was \$80,000 (not \$30,000).

Besides the hazard of spanning Maliko gulch, Baldwin and Alexander were facing equally fearsome obstacles on the political front. There was no greater challenge than that posed by Claus Spreckels, who was to build the Haiku (Spreckels) Ditch. Claus Spreckels came to the Kingdom of Hawaii in 1876. He controlled the sugar refinery operation on the West Coast and hoped to gain control of the cane production side of the industry as well. He became friend and adviser to King Kalakaua, aligning himself with the king against the emerging sugar planters. Spreckels granted loans to the financially overextended monarch. Control of water on East Maui quickly became the focus of a dramatic struggle pitting King Kalakaua and Claus Spreckels against Sam Alexander and Henry Baldwin.

In 1878, Spreckels acquired lands on the central Maui plains to start a new sugar plantation. He bought an undivided interest in 16,000 acres of the Waikapu Commons from Henry Cornwell and leased 24,000 acres of adjacent Wailuku Commons crown lands from the government for \$1000 a year. Several years later, through a process that smacked of corruption and deals, the legislature granted these lands to Spreckels in fee.

Spreckels lost no time petitioning the government for water rights to irrigate his new plantation. Kalakaua, in one of the most controversial acts of his reign, and after a late-night meeting with Spreckels and others in a hotel, sent a messenger at two in the morning dismissing his cabinet and installing a new one. This new cabinet granted Spreckels his water rights the following week. A loan from Spreckels to the king was executed that same day.

A most revealing provision of the lease gave Spreckels the right to all water not already in use at a certain date (30 September 1878)—a date that corresponded with the completion requirement date for the Hamakua Ditch. This meant that if Alexander and Baldwin’s Hamakua Ditch was not finished on schedule, Spreckels could lay claim to that water and possibly the Hamakua Ditch as well. Considering the delays being encountered at Maliko gulch, this was a good possibility. Nevertheless, the Hamakua Ditch was finished in September 1878, a few days within the time limit set by the lease. Alexander and

**Table 4 (cont.)  
Plantations and Ditches**

<i>Plantation and ditches</i>	<i>Date</i>	<i>Average flow (mgd)*</i>	<i>Capacity (mgd)</i>	<i>Comment</i>
Kamananui Ditch	1904			
Ito Ditch	1911			
<i>Kabuku Plantation Co.</i>		10†		
Punaluu Ditch	ca. 1906	10		
<i>Waimanalo Sugar Co.</i>				
Kailua Ditch				
Maunawili Ditch				
<b>Maui Plantations</b>				
<i>East Maui Irrigation Co.</i>		160†	440	
(Old) Hamakua Ditch	1878	(4)		Built by HDC
(Old) Haiku (Spreckels) Ditch	1879			Built by C. Spreckels
Lowrie Ditch (Lowrie Canal)	1900	(37)	60	Built by HC&S/MA
New Hamakua Ditch	1904	(84)		Built by MA
Koolau Ditch	1905	(116)	85	Built by HDC
New Haiku Ditch	1914	25	100	Built by HC&S/EMI
Kauhikoa Ditch	1915	(22)	110	Built by MA
Wailoa Ditch	1923	(170)	160– 195	Built by EMI; originally 160 mgd, later 195
<i>Wailuku Sugar Co.</i>		30†		
Waihee (Spreckels) Ditch	1882	10–2	20	Built by C. Spreckels; average is dropping
Waihee (Ditch) Canal	1907	27	50	Average is dropping
Nine other smaller ditches				
<i>Honolua Ranch &amp; Pioneer Mill Co.</i>		50†		mgd and average to 35 mgd
Honokohau Ditch	1904	20	35	Developed by Honolua Ranch, now ML&P; replaced by Honolua Ditch
Honolua (Honokohau) Ditch	1913	30–18	50– 70	
Honokowai Ditch	1918	6	50	Replaced 1898 flumes
Kahoma Ditch		3		
Kanaha Ditch		3.8		
Kauaula Ditch		4.5	25.5	Upgraded in 1929

## 8. East Maui

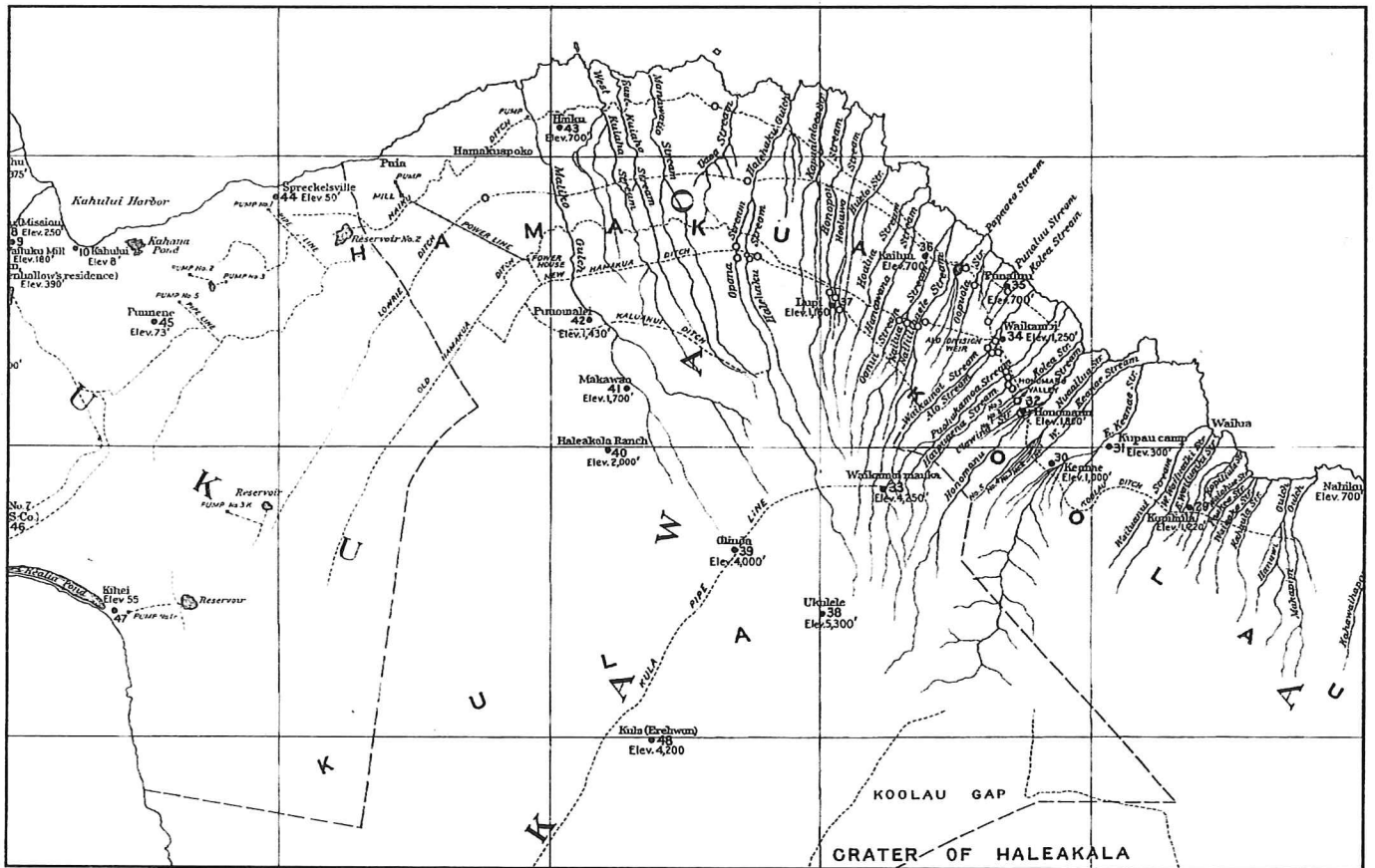
### EAST MAUI IRRIGATION COMPANY

The alphabet soup of Hawaii's companies gets especially thick on Maui. Samuel Alexander and Henry Baldwin were the founders of Alexander & Baldwin (A&B) and East Maui Irrigation Company (EMI). These two men started their illustrious career together in an informal partnership in 1869 with the purchase of 11.94 acres of Bush Ranch. In 1876 they formed the Hamakua Ditch Company and in 1878 completed the Hamakua Ditch—not to be confused with the 1904 Hamakua Ditch Company on Hawaii, which later changed its name to Hawaiian Irrigation Company, or that company's Upper and Lower Hamakua ditches.

During the ensuing decade Alexander and Baldwin's plantation was incorporated as the Paia Plantation and included Haliimaile Plantation (Grove Ranch), East Maui Plantation, and Seaside Farm. The agency of Alexander & Baldwin was established in 1894. The corporate partners gained control of Hawaiian Commercial and Sugar Company (HC&S) in October 1898, and Alexander & Baldwin then became agent for HC&S. It was a meteoric rise for the two men—from the new firm of Alexander & Baldwin, which had posted a net profit of \$2627.20 in 1895, to A&B, Ltd., which had accumulated assets of \$1.5 million at the time of its incorporation in 1900.

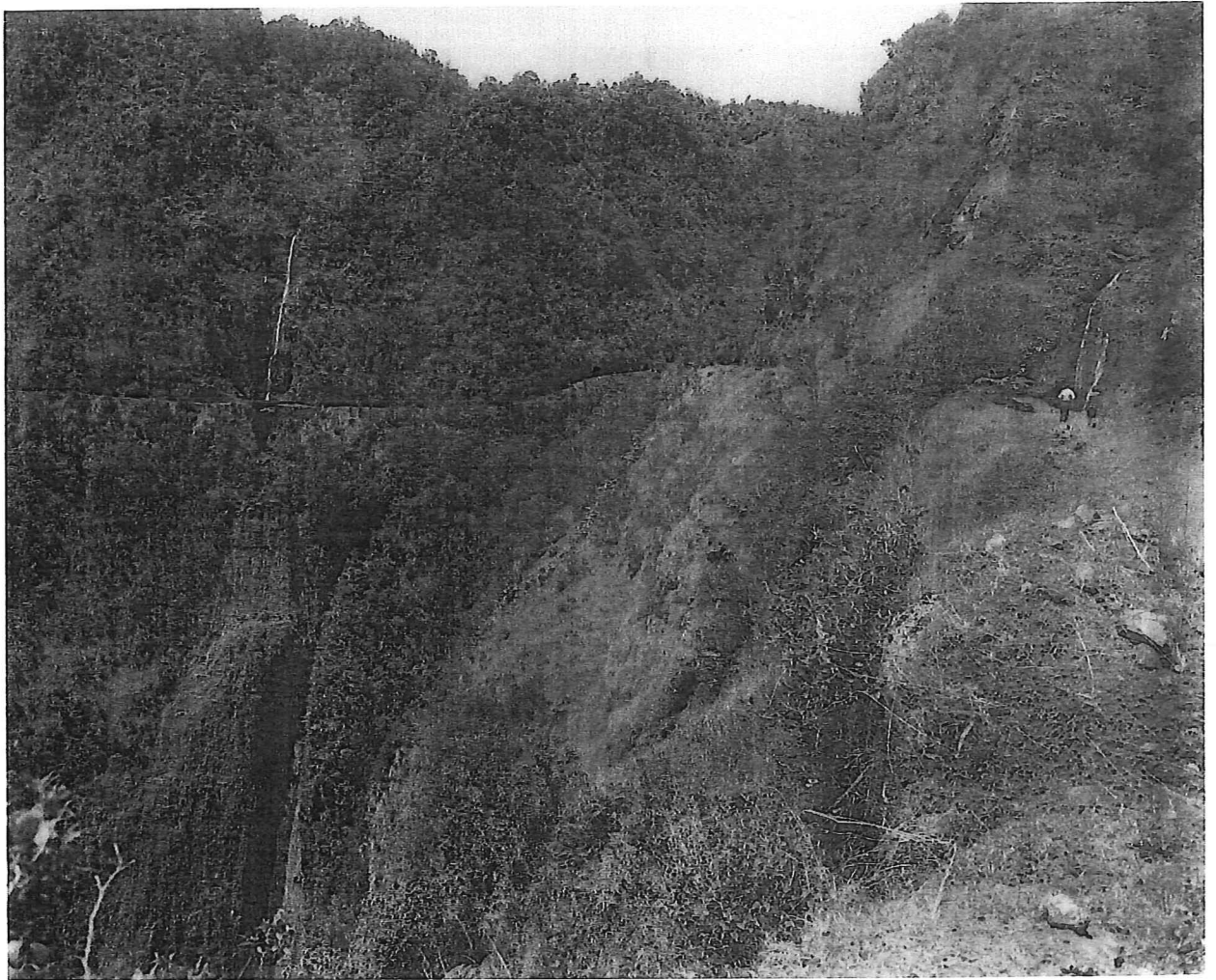
Immediately on acquiring HC&S, the partners started the Lowrie Ditch—also known as the Lowrie Canal—which started in the rain forest of Kailua in Makawao district. The ditch had two sources. The first was a reservoir at Papaea that was fed by two five- to six-mile ditches. The second source was Kailua stream where the diversion intercepted the source of the older Haiku Ditch and ran parallel to that ditch. (The old Haiku Ditch was abandoned between 1912 and 1929.)





1913 drainage map, East Maui. (USGS.)

The ditch was named after William J. Lowrie, manager of HC&S's plantation and mills at Spreckelsville. It was designed by engineer E. L. VanDerNeillen and supervised by Carl Jensen, who was reported in 1900 to be on his way to his "old home" in Denmark to recuperate. The work was done by Japanese laborers "under the supervision of one of the brightest Japanese in the Islands." Contracts were signed in July 1899; the work was finished in September 1900; the cost was \$271,141. With a capacity of 60 mgd, it was capable of irrigating 6000 acres. This 22-mile system was three-quarters open ditch and included these elements: seventy-four tunnels for a total of 20,850 feet, the longest being 1955 feet; nineteen flumes for a total length of 1965 feet; and twelve siphons with a total length of 4760 feet, the biggest being 250 feet deep



Ditch trails such as this one in the back of Honomanu Valley, Maui, reached into many pristine Hawaiian valleys to access ditches and tunnels. (Photo: D. Franzen.)

at Halehaku gulch. This ditch, by means of inverted siphons, ended at the 475 foot elevation, 257 feet above the Haiku Ditch.<sup>1</sup>

The next big project for the Hamakua Ditch Company was the Koolau Ditch, built in 1904–1905 under engineer M. M. O'Shaughnessy. The Koolau Ditch extended the water collection system another 10 miles toward Hana, around the Koolau Range to Makapipi, in 1904. The cost of Koolau Ditch was \$511,330. Its capacity was 85 mgd. This ditch traveled through more difficult

terrain than most other systems, and it presented greater logistical problems. O'Shaughnessy reported:

*The country was so steep and precipitous that little ditching could be employed, and it was necessary to make four and one-half miles of wagon road and eighteen miles of stone paved pack trails to facilitate during construction the transportation of supplies. About 4000 barrels of cement and 100,000 pounds of giant powder were used. In all ten mountain streams are intercepted, which are admitted into the main aqueduct through screens of grizzly bars spaced three-quarters of an inch apart.<sup>2</sup>*

There were 7.5 miles of tunnel and 2.5 miles of open ditch and flume. The thirty-eight tunnels, all dug out of solid rock, were 8 feet wide and 7 feet high. In length they averaged 1000 feet: the shortest was 300 feet and the longest 2710 feet. A total of 4.5 miles of 6-inch-thick concrete lining was used in the tunnels:

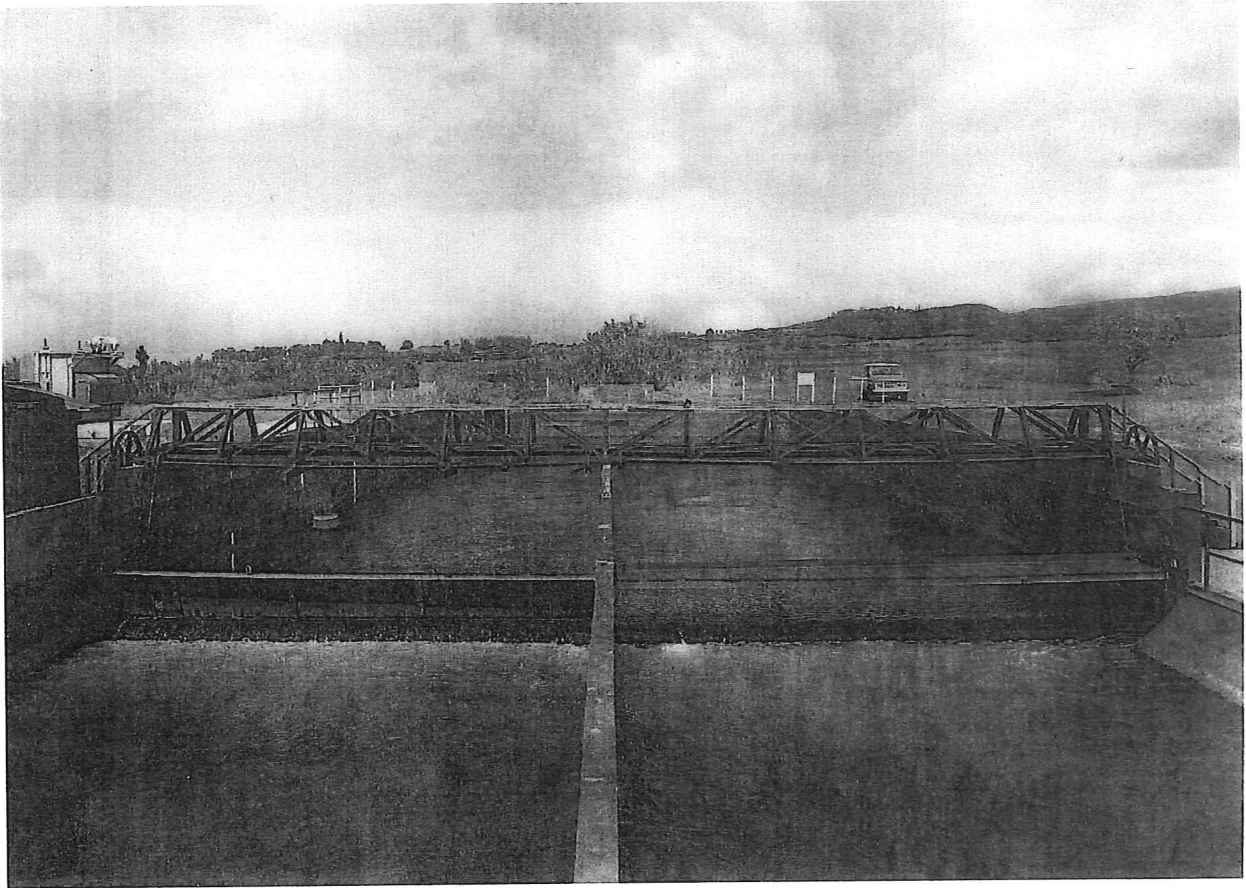
*The work was all done by Japanese with hand drills; ore cars were employed in moving the excavated materials, and it has cost finished about \$7 per lineal foot. The Japanese make excellent miners and rock men, and, owing to their small size, it was practicable to work four in a face, and, by working three 8-hour shifts, the whole work had to be completed in 18 months from the date of commencement, April, 1903.<sup>3</sup>*

The Koolau Ditch was later turned over to EMI, who lined and improved it at a cost of \$385,117. Originally it fed into the New Hamakua Ditch at Alo, but it was connected to the Wailoa Ditch upon its completion in 1923.

On 23 June 1908, Alexander & Baldwin formed the East Maui Irrigation Company to succeed the 1876 Hamakua Ditch Company. Its purpose was to develop and administer the surface water for all the plantations owned, controlled, or managed by Alexander & Baldwin. The EMI boundaries were from Nahiku to Maliko gulch and included all the area where surface water was developed. West of Maliko gulch was HC&S. In that same year, A&B gained control of Kihei Plantation.

Ditch building continued apace under the newly formed company. The New Haiku Ditch was completed in 1914 with a capacity of 100 mgd. It was mostly tunnel, partially lined, with a length of 54,044 feet. Kauhikoa Ditch was completed in 1915 with a capacity of 110 mgd and a length of 29,910 feet. Wailoa Ditch was started in 1918 and finished in 1923. Mostly tunnel, all lined, with a length of 51,256 feet, it had an original capacity of 160 mgd, later increased to 195 mgd. Once the ditch systems were completed, EMI then turned to building water development tunnels.

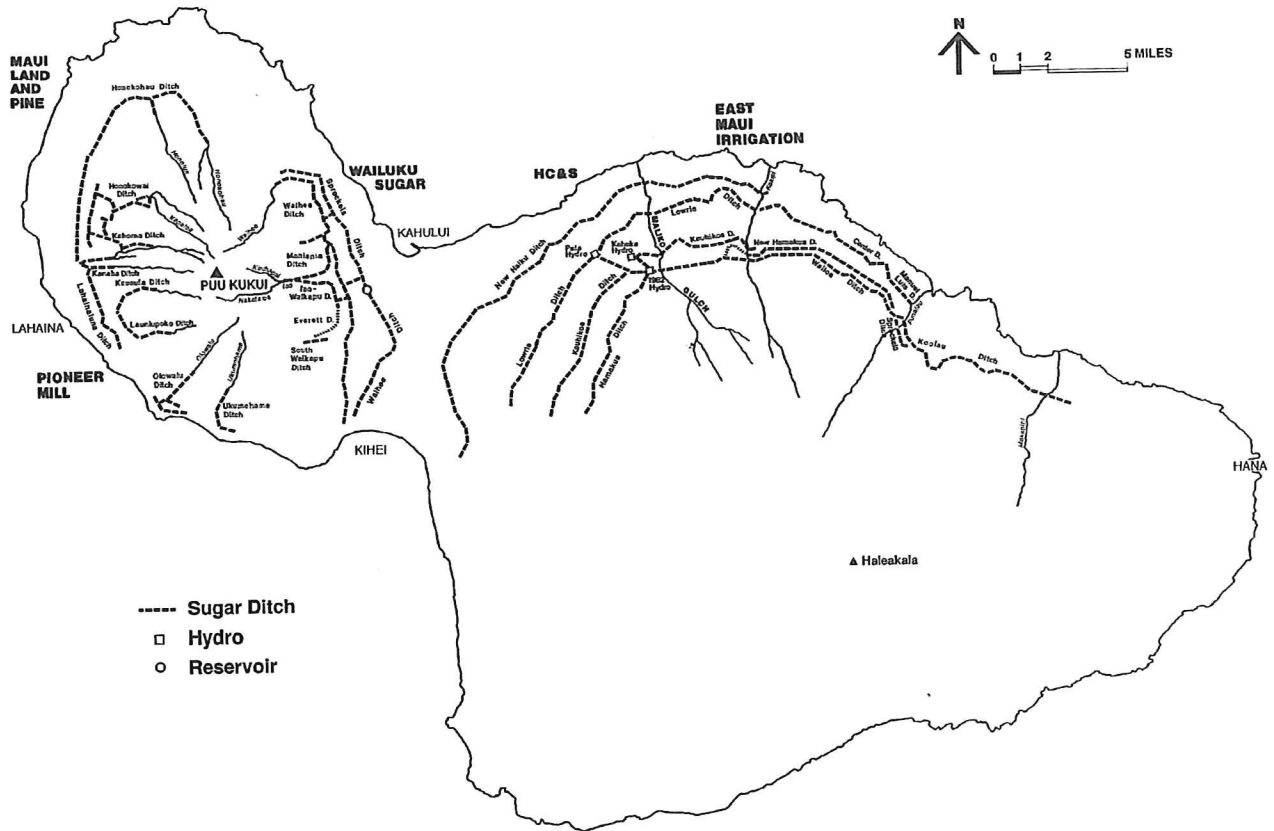
EMI's collection system had 388 separate intakes, 24 miles of ditch, 50 miles of tunnels, and twelve inverted siphons as well as numerous small



The Wailoa Canal has a greater median flow than any river in Hawaii. Water collected here at the Wailoa forebay drops through a low-head 500-kilowatt hydroelectric powerplant. (Photo: D. Franzen.)

feeders, dams, intakes, pipes, and flumes. Supporting infrastructure included 62 miles of private roads and 15 miles of telephone lines. The water source was primarily surface runoff from a total watershed area of 56,000 acres. Of this watershed, EMI owned 18,000 acres—the 38,000-acre balance belonged to the State of Hawaii. The state issued four licenses, named Huelo, Honomanu, Keanae, and Nahiku, to EMI for water arising on government land. Each license was initiated at a different time and dealt with differing conditions. The value of the water was determined by its accessibility and distance from fields, and the price was tied to the price of sugar. The state's share was determined by the percentage of rain falling on government land.





Major sugar plantations and ditches, Maui.

The huge and complex EMI system has developed and changed over the years at a cost of nearly \$5 million. The replacement cost is estimated to be at least \$200 million. Among the water entities, none compares to EMI. It is the largest privately owned water company in the United States, perhaps in the world. The total delivery capacity is 445 mgd. The average daily water delivery under median weather conditions is 160 mgd, although this ranges from 10 to 445 mgd. Its largest ditch, the Wailoa Canal, has a greater median flow (170 mgd) than any river in Hawaii. EMI supplies Maui County between 850 million and 1 billion gallons of water per year for domestic purposes.

East Maui Irrigation controlled only surface water to HC&S—groundwater was controlled by HC&S itself. But EMI could not always supply enough water to meet plantation requirements, which ranged as high as 200



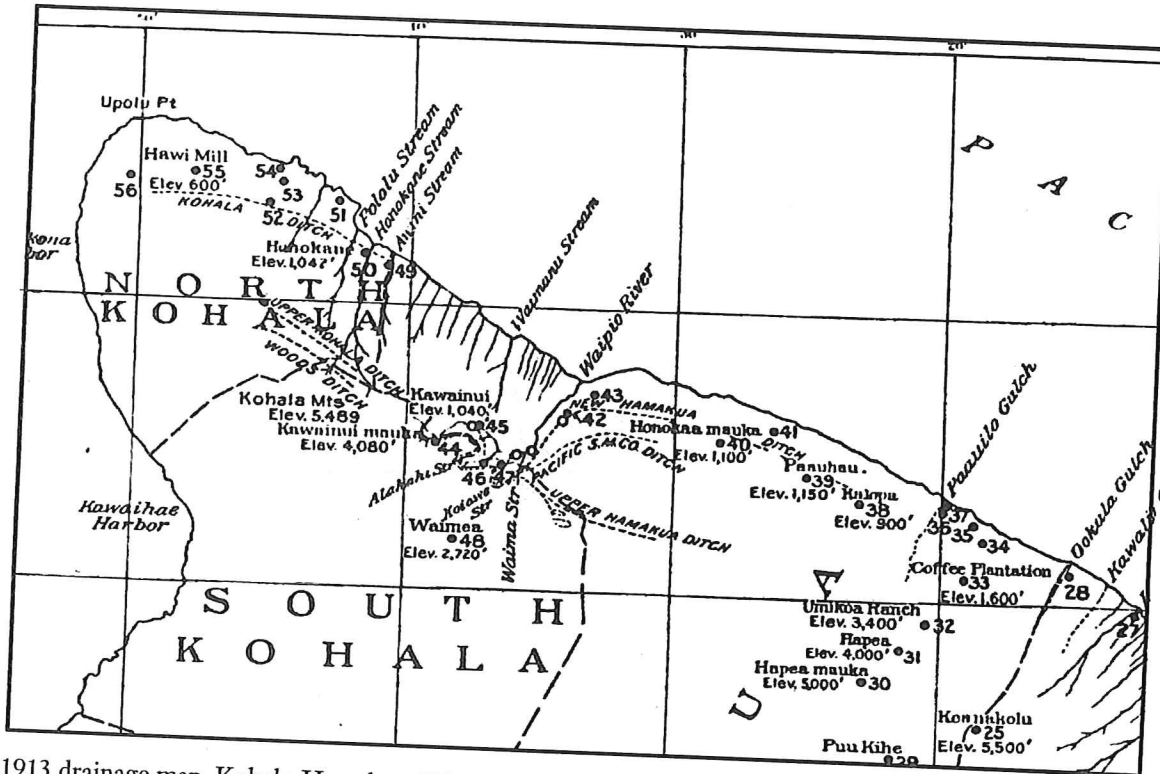
mgd. Thus, as in many of Hawaii's plantations, groundwater was a major source of supplemental irrigation water.

By 1931, HC&S was able to pump 144 mgd. To accomplish this it relied on deep and powerful pumping stations. Station 2 had equipment at 119 feet; Station 3, called Kihei A&B, had an underground chamber at 300 feet. The deepest was pump 18 at 500 feet. In dry times, pumps supplied up to 45 percent of the irrigation water. Pump 7, which struck water at approximately 125 feet, had a capacity of 40 mgd, and in 1931 was the most powerful pump in the world. It is one of several designated as "Maui-type basal water tunnel," which used a skimming tunnel to collect fresh water off the top of the basal lens. HC&S also received West Maui water from the Waihee Canal and Spreckels Ditch through agreements with Wailuku Sugar Company. By 1931, HC&S was producing about 32 percent of Hawaii's total sugar crop.

Maui Agricultural Company was formed in 1921 by the merging of seven small East Maui plantations: Haiku Sugar Company, Paia Plantation, Kailua Plantation, Kula Plantation, Makawao Plantation, Pulehu Plantation, and Kalialinui Plantation. HC&S, based in Puunene, and Maui Agricultural Company, based in Paia, merged in 1948, at which time Alexander & Baldwin owned about 35 percent of the stock of each company. This merger consolidated all of A&B's sugar plantations on Maui under HC&S. In 1962, HC&S merged with and became a division of Alexander & Baldwin, and EMI became a subsidiary of A&B.

EMI currently has four parallel levels of water development ditches, running from east to west across the East Maui mountains. From *mauka* to *makai* these are the Wailoa, New Hamakua, Lowrie, and New Haiku ditches. The Lowrie runs at a considerably lower elevation than the Wailoa, taking advantage of groundwater development between the two. Wailoa and Lowrie run all the time; New Hamakua and New Haiku run on surplus water from the other ditches or for delivery to the fields. Little remains of the early Hamakua and Haiku (Spreckels) ditches.

The last of the four state-issued water licenses to EMI expired in 1986. A&B and EMI alternately hold revocable year-to-year permits from the State of Hawaii at flat monthly rates.



1913 drainage map, Kohala-Hamakua. (USGS.)

of Brooklyn, New York, to again evaluate the possibility of bringing water out of the Kohala-Hamakua watershed. The Tuttle Report was completed in 1902. In Tuttle's opinion, the project was feasible.

As a result of the Tuttle Report's findings, two ditch companies were formed. The Kohala Ditch Company, established in 1904, built the Kohala Ditch. The Hamakua Ditch Company, formed around 1906, built the Upper and Lower Hamakua ditches (not to be confused with the Hamakua Ditch Company, started on Maui by Alexander & Baldwin, or with their 1878 Hamakua Ditch).

On 12 March 1904, J. S. Low acquired a license from the Territory of Hawaii for a period of fifty years to "enter upon, confine, conserve, collect, impound and divert all the running natural surface waters on the Kohala-Hamakua Watershed," a license that he assigned to the Kohala Ditch Company (KDC). The license stipulated that Low service all requesting customers.

Civil No. 19-1-0019-01 (JPC)

**Defendant A&B/EMI's Exhibit AB-163**

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