BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

July 28, 2003

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
Central Pacific Plaza, 4th Floor
220 South King Street
Honolulu, Hawaii 96813

Dear Ms. Salmonson:

Subject: Finding of No Significant Impact for the Board of Water Supply's Proposed Waimanalo Well III Production Facility, Access Road and Water Transmission Line, Koolaupoko, Oahu, Hawaii

The Board of Water Supply has reviewed the comments received during the Draft Environmental Assessment (EA) public comment period, which began on March 8, 2003. We have determined that the environmental impacts of this project have been adequately addressed as discussed in the Final EA and are therefore, issuing a Finding of No Significant Impact (FONSI). We request the FONSI be published in the next Office of Environmental Quality Control (OEQC) Bulletin.

The Draft EA was initially published for comments on May 23, 2002, but was republished because a statement was added indicating that the project may be funded by Federal monies through the State of Hawaii's Drinking Water State Revolving Fund (DWSRF) program. This disclosure was required prior to filing a FONSI in accordance with Hawaii DWSRF program requirements.

Attached are the completed OEQC bulletin publication form, project summary on diskette and four (4) copies of the Final EA.

If you have any questions, please contact Scot Muraoka at 748-5942.

Very truly yours,

FOR CLIFFORD S. JAMILE
Manager and Chief Engineer

Attachments

2003-08-23-OA-FEA

FINAL
Environmental Assessment

WAIMANALO WELL III

BWS Waimānalo Well III: Production Facility, Access Road & Water Transmission Line

Board of Water Supply
City and County of Honolulu
Honolulu, Hawaii

Prepared by:

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July 2003

Summary Sheet: BWS Waimānalo Well III Production Facility, Paved Access Road, Water Transmission Line

Project: The project involves construction of a water well production facility [Control Building (21 feet by 30 feet by 16 feet high) constructed of concrete masonry walls and concrete roof and a rectangular shaped Control Tank (16 feet by 12 feet by 22 feet high; 20,000 gallons) constructed of concrete; and a 6-foot high chain link fence surrounding the well production facility], access road and underground pipeline for pumping and transmission of water from the existing Board of Water Supply Well III (DLNR Well # 1942-01) to the BWS distribution system. Waimanalo Well III was drilled previously. The Control Building will have two separate rooms: one for the electrical controls for the well pump, and the other for a sodium hypochlorite (liquid chlorine) disinfection system. The well water will be pumped into the Control Tank and subsequently flow out of that tank to the connection point with the existing BWS 20-inch transmission pipeline in Nonokio Street. The pump *size is 0.5 mgd (million gallons per day) or 350 gpm (gallons per minute), operating at 24-hours per* day. The route of the access road and transmission pipeline would follow the alignment of an existing road to the well, and existing roads through agricultural fields and the dairy to the hook-up with the existing distribution system at Nonokio Street . Water pumped from Waimanalo Well III is for use in Waimanalo. BWS Waimanalo Well III replaces BWS Waimanalo Well I which has been taken out of service due to contamination by alachlor, and agricultural chemical. Electrical and telephone lines will be connected to the facility.

Location	Honolulu, O'ahu, Hawai'i; City and County of Honolulu; State of Hawaii
Tax Map Key Lat., Long.	4-1-08:05 (Well and production facility); :05, :80 (Access road & pipeline) N 21 degrees, 19.58 minutes; W 157 degrees, 42.35 minutes
Project Site Area, Elevation	5,500 sq. feet (well & production fac.); 34,000 sq. feet (access road & pipeline) 275 feet (well & production facility); 270 to 100 feet (access road & pipeline).
State Land Use District & Zoning	Agriculture (State Land Use District); County Development Plan - Agricultural; and Zoning - AG-2
Ownership	State of Hawaii; Meadow Gold (lessee from State)
Accepting Authority	Board of Water Supply, City and County of Honolulu, 630 South Beretania Street, Honolulu, Hawaii 96843; Clifford Jamile.
Applicant	Board of Water Supply, City and County of Honolulu, 630 South Beretania Street, Honolulu, Hawaii 96843; Contact Barry Usagawa, (808) 527-5235.
Consultant	Austin, Tsutsumi & Associates, Inc., 501 Sumner Street, Suite 521, Honolulu, Hawaii 96817-5031; Contact: Ivan Nakatsuka, (808) 533-3646.
Associated Consultant	Eugene P. Dashiell, AICP, Environmental Planning, 1314 South King St., Suite 951; Honolulu, Hawai'i 96814; Contact: Eugene Dashiell, (808) 593-8330; dashiell@lava.net; www.lava.net/environmental-planning
Required Permits and Approvals	Permits: DLNR-CWRM (Water use, well construction, pump installation); City-DPP (Building/grading). Approvals: DLNR-DLM (Use of State land); DLNR-HPD (Historic sites); DOA (Cross irrigation ditch).

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Appendices

1 Description of the Proposed Action

1.1 **Technical characteristics.** This section describes the location and purpose of the project and how it would be accomplished.

1.1.1 **Project background and purpose of this environmental assessment.** The Board of Water Supply (BWS), City and County of Honolulu, proposes to construct a production facility at the existing Waimanalo Well III and an access road and water transmission pipeline from the production facility to a connection point with the existing BWS system at Nonokio Street. The purpose of this environmental assessment is to report upon and fully disclose potential environmental impacts of the proposed project, and to identify any significant environmental impacts, if any. In this case, no significant environmental impacts of the proposed project have been identified. This environmental assessment is required because of the use of state lands and county funds.

1.1.2 **Location and purpose of the project**. Waimanalo Well III and the proposed Production Facility are located in Waimanalo, Oahu, Hawaii, approximately 0.6 miles south southeast of the inland end of Waikupanaha Street (location of Meadow Gold Dairy) at an elevation of 275 feet above mean sea level. The purposes of the project are to (1) replace Waimanalo Well I which is off-line due to alachlor contamination and (2) to meet the projected increase in demand for water in Waimanalo via the BWS's Waimanalo low service system. The Waimanalo Well III would reduce the amount of pumped water from Punaluu sent to Waimanalo.

Board of Water Supply funds will be used for development. This project, therefore, is subject to preparation of environmental documentation per requirements of Chapter 200, Title 11, Hawaii Administrative Rules (HAR), and Chapter 343, Hawaii Revised Statues (HRS). This Environmental Assessment addresses the limited environmental impacts anticipated for this project.

1.1.3 **Description of the project**. The project involves construction of a water well production facility, an access road, and a pipeline (See Exhibits A, B and 1 through 7). The project components consist of:

- Water Well (Waimanalo Well III, DLNR Well Number 1942-01). The well previously has been drilled and cased and the action was covered under a previous environmental assessment (see references). The well is already in place and is ready for production. The pump size 0.5 mgd (million gallons per day) or 350 gpm (gallons per minute), operating at 24-hours per day.

- Control Building. The Control Building will be of single-story construction, approximately 21 feet by 30 feet in size. It will be constructed on a concrete foundation and floor and of concrete masonry walls with a flat concrete roof. It will be approximately 16 feet in height above ground. The Control Building will house electrical controls, a hydro-pneumatic pump, and a chlorination system related to pumping water from the well and delivering potable water to the water transmission pipeline. Electrical power for the facility will be obtained from existing electrical transmission lines near the site.

- Control Tank. A rectangular (shape dictated by the limited area available at the project site) shaped Control Tank (16 feet by 12 feet in size; 20,000 gallons) constructed of reinforced concrete, about 22 feet high.

- Production Facility Fence. A 6-foot high chain link fence topped with barbed wire surrounding the well production facility will be constructed.

- Paved Access Road. There is an existing unpaved access road to Waimanalo Well III. This unpaved road will be paved to provide an all weather surface for reliable access. The paved portion of the access road will extend from the Well/Production Facility site downhill for a distance of approximately 1,430 feet to an existing unpaved road which extends from the Meadow Gold Dairy at the end of Waikupanaha Street in an eastern direction to a location near Waimanalo Well III.

- Underground Pipeline. An underground pipeline will be constructed for transmission of water from the existing BWS Waimanalo Well III to a connection point with the BWS system at Nonokio Street will be installed. The route of the pipeline would follow the alignment via existing roads through agricultural fields of Meadow Gold Dairy to the transmission line hook-up at Nonokio Street. The underground pipeline will be buried approximately three feet beneath the existing ground elevation, approximately within the access road leading to the well.

1.1.4 **Project Schedule and Estimated Cost.** A contractor will be retained by the BWS to construct the project. Construction is expected to begin in the Fiscal Year 2004 and last approximately 1.5 years. Work will primarily involve installation of one pump and appurtenances; construction of a control building with necessary security measures, electrical and related control devices, landscaping, transmission main, control tank, and an access road. Project funding is entirely by BWS. The estimated total cost of construction of the proposed project is approximately $2.5 million.

1.1.5 **Service Area.** Water provided by this system and originating from Waimanalo Well III is primarily intended to replace the yield of Waimanalo Well I which has been closed due to contamination by alachlor. Waimanalo Well III will serve the population of Waimanalo, and includes capacity intended to provide for projected growth due to construction of new housing by the State Department of Hawaiian Homes Lands.

1.2. **Socio-economic characteristics.** This section discusses the impacts of the proposed project on the community in terms of both social and economic effects.

1.2.1 **Economic impacts on the community at large.** This project will have a beneficial economic impact on the Oahu community at large because it aids in maintaining a reliable potable water system – a public health and safety purpose. The Waimanalo Well III will serve the Waimanalo community.

1.2.2 **Provision of income for the county or state and creation of employment opportunities in areas with high unemployment rates.** The project provides benefits through jobs related to its implementation.

1.2.3 **Targeted segment of the population.** The Waimanalo Community is the primary beneficiary of this project.

1.2.4 **Population density.** The project has no effect on population density, however availability of adequate potable water supplies is necessary for maintenance and growth of population. The purpose of the project is to replace a contaminated well and to continue to serve the existing and future Waimanalo population. (See paragraph 2.22 – Population, for additional information.)

1.2.5 **Recreational facilities.** There are no effects on recreational facilities because there are no such facilities at the site of the project.

1.2.6 **Child care provisions.** There are no child care provisions in relation to the proposed project.

1.2.7 **Relocations of residences.** No relocation of residences would occur. The nearest residence is approximately one half mile from the site of Waimanalo Well III.

1.2.8 **Costs of the proposed project and economic analysis.** The estimated total cost of construction of the proposed project is approximately $2.5 million.

1.3 **Environmental characteristics.** This section discusses the potential effects of the proposed project on the physical environment.

1.3.1 **Aesthetics and viewplanes.** The project will result in no significant change in the visual environment. The entire production facility site is screened by extensive growth of eucalyptus trees and other alien species such as Christmas berry and guava. The roadways are already existing and in place and the pipeline will be buried beneath the roadways.

1.3.2 **Air quality.** There would be some effects during construction and these would be mitigated per county and state rules. There would be no long term effects because the proposed project includes no air pollution sources and would not generate significant differences in traffic from the existing conditions.

1.3.3 **Traffic.** There will be little effect on traffic except during periods when construction materials are delivered to the site, a condition temporary during construction. Such traffic will consist of heavy trucks and trailers which can operate during off-peak traffic hours (8:30 AM to 3:30 PM) if necessary. They will follow existing regulations regarding road clean-up (if necessary) resulting from this traffic. Traffic on Waikupanaha Street may be affected by installation of the pipeline in the road right-of-way, and subject to delays. Traffic impacts will be localized to a few properties adjacent to Waikupanaha Street. Because the connection to Nonokio Street is from an open agricultural field, the effect on traffic will be minimized.

1.3.4 **Noise levels.** There will be some temporary increase in noise levels during construction of the project. This will occur during working hours. Contractor's equipment is required to meet Department of Health noise regulations.

1.3.5. **Effects on water quality.** The project will have no significant effect on water quality because there are no significant discharges to state waters related to the project. Temporary discharges due to pump installation, well testing or hydro-testing may result in discharges to open terrain (permits not required for discharges which are not state waters)

but not to streams or wetlands. During excavation for the pipeline, if construction dewatering is required, an NPDES permit will be applied for from the State Department of Health.

1.3.6 **Other environmental effects.** The well site is located at an elevation above identified flood hazard areas although portions of the transmission line are routed into certain flood hazard areas. [See Exhibit A – Zones X (areas outside the 500 year flood plain) & D (areas in which flood hazards are undetermined) as identified by the Federal Emergency Management Agency on the Flood Insurance Rate Map for the area.] Also, concerns were raised by the public (See Appendix E) about potential effects on the historic Wing King Reservoir (See Exhibit B) and its supposed spring water source due to pumping of water from Waimanalo Well III, but the BWS has determined that there will be no effect because of the distance from the reservoir which is down gradient from the well itself and approximately one third mile from the well site . There are no other environmental effects.

Pumping rates of Waimanalo Well III are planned to average 0.5 mgd. This rate will not cause the sustainable yield (8 mgd) of the Waimanalo aquifer to be exceeded. Present permitted uses of Waimanalo aquifer total 1.656 mgd. The available allocation is 6.344 mgd. (Source: CWRM, 12.6.00)

1.3.7 **Wellhead protection, known and potential points of contamination, and land uses.** The site for Waimanalo Well III was carefully selected to avoid known and potential points of contamination related to land uses in the area. Waimanalo Well III was required because of the need to replace the existing Waimanalo Well I which was closed in December 1995 because it had become contaminated by alachlor[1], an agricultural chemical. Waimanalo Well III (and Waimanalo Well II which also serves the Waimanalo Community) is located at an elevation higher than surrounding land uses where there is existing or potential points of contamination. Locations of known existing or potential points of contamination and Waimanalo Wells I, II and III are shown in Exhibit 6A. The existing or potential sources of contamination in Waimanalo include activities in the Agricultural LUD (State Land Use District) or the Urban LUD. Contamination from the Conservation LUD is considered unlikely because no development can take place there.

All potential or existing points of contamination are down-gradient[2] from Waimanalo Wells III and II. Both Waimanalo Wells III and II are located near the boundary between the Conservation and Agricultural LUD at elevations of 360 and 275 feet (above mean sea level) respectively. Waimanalo Well I, however, is located an elevation of 130 feet, which was not high enough to avoid contamination from alachlor, an agricultural chemical.

Waimanalo Well III is a lineal distance of over 3,000 feet from the bio-waste pond (elevation 70 feet) which was contaminated with nutrients and microbiological organisms from a defunct waste processing plant.[3] Well III is over 6,000 feet from Well I (elevation

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[1]Concentration levels were 2.2 micro-grams per liter of alachlor which is above an acceptable limit of 0.8 micro-grams per liter.

[2]Down-gradient as used here refers to the flow of groundwater which is generally from the mountains to the ocean, or in a north or north westerly direction in this area.

[3]This plant, formerly known as the "Unisyn" facility is closed, and the State has removed most of the waste from the pond.

130 feet). Well III is nearly 6,000 feet from the injection well field of the State's[4] wastewater treatment plant and from the numerous cesspools in the subdivision known as Waimanalo Beach. Well III is well-over 6,000 feet from Bellows Air Force Base which has some known points of contamination including a former Nike Missile launching area, miscellaneous underground fuel storage tanks and a solid waste landfill.

Protection of the wellhead area of Waimanalo Well III (and Well II, also) is provided by the close proximity up-gradient of the Conservation LUD.

The water table is approximately 252 feet below the ground surface. Therefore, any surface contaminants, such as agricultural chemicals and animal wastes, would need to travel approximately 252 feet through the ground to reach the groundwater. The more than 250-foot depth to water provides filtering of contaminants during the vertical travel time (months to years long) down to groundwater. Consequently, contamination of the well water from these contaminants is not anticipated. Also, direct contamination of the well is prevented by the grouted annulus (concrete ring around the well head)[5] and well seal at the top of the well.

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[4]This plant belongs to the State but is operated by the City and County of Honolulu.

[5]The "annulus", or "annular space" is the space between the well casing and the wall of the drilled hole. The annular space of all wells must be sealed with grout to prevent the downward passage of contaminants from surface and subsurface sources. Also, the well must have a concrete base (known as the "well seal") around the well casing at the ground surface.

2 Description of the Affected Environment

2.1 **Location.** BWS Waimanalo Well III and the proposed Production Facility are located in Waimanalo, Oahu, Hawaii, approximately 0.6 miles south southeast of the inland end of Waikupanaha Street (location of Meadow Gold Dairy) at an elevation of 275 feet above mean sea level (Exhibit A). Tax Map Keys: 4-1-08:05 and 80 (Exhibit B).

2.2 **Land ownership and tenancy.** BWS Waimanalo Well III and the proposed Production Facility are located on a site owned by the State of Hawaii and leased by Meadow Gold Dairy from the State of Hawaii (Exhibit B). Portions of the preferred route of the transmission line and access road are within Waikupanaha Street and Nonokio Street, and also on State of Hawaii property leased by Meadow Gold.

2.3 **County Zoning, State Land Use District.** The proposed project is in a State Agriculture District, and is zoned Ag-2 by the City and County of Honolulu. The land is designated Agriculture in the County Development Plan. A potable water well is a permitted use in both *land use classifications.*

2.4 **Special Management Area, Coastal Zone Management Consistency.** The proposed project is inland of the boundary of the SMA (Special Management Area).

2.5 **Land and water use.** The proposed project site consists of former sugar cane lands now fallow and overgrown with alien shrubs and trees, fallow pasture, and existing dirt access roads through agricultural fields and pasture. There are no perennial streams on the project site. There is an agricultural irrigation water ditch (Kailua Ditch) which is bridged at present via existing concrete pipe culverts with approximately two feet inside diameter. The source of irrigation water is an existing irrigation water reservoir approximately 0.7 miles to the west northwest of the project site. The preferred pipeline route will cross the upper reach of Inoaole Stream which has no perennial stream flow.

2.6 **Land and related water use plans.** Following is a discussion of land and water use plans which are related to the proposed plan.

2.6.1 **City and County of Honolulu, Koolaupoko Development Plan.** This plan designates the project site and surrounding area for agricultural use and the proposed project is consistent with this plan.

2.6.2 **State of Hawaii.** There are no specific State plans for this location and the project site and surrounding areas are designated as an Agricultural Land Use District. The proposed project is consistent with this designation.

2.6.3 **Federal.** There are no federal plans for the area.

2.7 **Flora.** There are no threatened or endangered flora at the project site. Plants in the area consist of introduced alien species, including eucalyptus, guava and Christmas berry, sweet corn and pasture grass. The proposed project will not have a significant negative impact on flora.

2.8 **Fauna.** There are no threatened or endangered fauna at the project site. No mammals were observed although likely mammals to be found in this type of habitat include mongoose, field mice, feral cats or dogs. Cattle are found in pastures adjacent to the project site. Birds are typical of this type of habitat and may include cardinals, doves, white eyes, and owls. The proposed project will not have a significant negative impact on fauna.

2.9 **Soils.** Soils in the vicinity of the proposed well site are classified by the U.S. Department of Agriculture Natural Resources Conservation Service as belonging to the Rockland-Stony step land association (Kaena very stony clay). These are steep to precipitous, well-drained to excessively drained, rocky and stony soils. (BWS, *Environmental Assessment for an Exploratory Well and Access Road at Waimanalo, Oahu*, 1994)

2.10 **Water Quality.** There are no perennial streams in the project area. Water quality of Waimanalo Well III is considered excellent and data for well water testing is included in Appendix D. The water quality data do not show any detectable lead.

2.11 **Historical, archeological sites; traditional practices and cultural impacts.** The proposed project pipeline will cross the Kailua Irrigation Ditch at three locations. The Ditch is eligible for inclusion on the federal and state registers of historic sites but although a draft nomination form has been prepared (Appendix B), it has not been submitted. The Ditch has status as an historic site under State and federal law and must be accorded full protection. Therefore a request has been made of the State Historic Preservation Division for permission and guidance to construct the project. There are also some other historic sites near the proposed project, but these will not be physically affected by any of the components of the proposed project. These features include a rock structure which is described in more detail in Appendix A. There will be no significant impacts to historic or cultural sites and mitigation is not proposed.

The botanical survey, archaeological inventory survey, as well as the review of historical records found no indication of culturally sensitive, specific traditional practices for this area. Further, during the current field work, no indication of ongoing native Hawaiian gathering practices were observed or encountered within the project area.

2.12 **Sensitive habitats or bodies of water adjacent to the proposed project.** With the exception of the Wing King Reservoir (about one third mile from the Waimanalo Well III site) there are no sensitive habitats or bodies of water adjacent to the proposed project.

2.13 **Flood Zone.** According to the Federal Emergency Management Agency Flood Insurance Rate Map (FIRM Panel 150001 0380E & 150001 0385E, 11/20/2000), the project is outside of known flood hazard areas (See Exhibit A), and is in zones designated X (areas outside the 500 year flood plain) & D (areas in which flood hazards are undetermined). The facility is located in Zone D. (Exhibit A).

2.14 **Topography.** Waimanalo Well III is located an elevation of 275 feet above sea level near the base of the nearly vertical northeast face of the Ko'olau range on land which slopes steeply to the north. The well and production facility site is level, however.

2.15 **Geology.** Windward Oahu is located on the north side of the Ko'olau Volcano. Long-term erosion weathering, mass wasting and marine influences have removed the northeast side of the volcano. Eventual linkage of their head walls joined to form the steep cliffs which are now characteristic of the windward side of the Ko'olau range. During this same period,

alluvial and marine sediments accumulated in the valleys as sea level rose and fell during glacial and inter-glacial periods.

A major feature of the Ko'olau range is an extensive dike system which formed in the rift zone. The dikes were formed when molten rock flowed into fissures in the volcano and then cooled and solidified. Because these flows solidified under pressure, they formed rock which is much denser and much less permeable than the older, surrounding lava flows. Rainfall not lost to evapotranspiration or surface runoff infiltrates into the highly porous Ko'olau basalt and is stored as groundwater between the relatively impermeable dikes.

2.16 **Groundwater Hydrology, Aquifer and Sustainable Yield.** Waimanalo Well III exploits perched water in water bearing basalt of the Koolau dike complex. This aquifer complex is identified by the State Commission on Water Resource Management as the Waimanalo aquifer (aquifer code 30604) which has a sustainable yield of 8 mgd (million gallons per day). The available allocation of this aquifer is 6.344 mgd (Exhibit A). The following table lists the wells permitted in the Waimanalo aquifer at this time.

Table 1 – Status of the Waimanalo Aquifer
Sustainable Yield = 8 mgd; Available Allocation = 6.344 mgd

Land Owner (Well No.)	Authorized Water Use (mgd, Permitted by CWRM)	Existing (E)		Planned /Pending (P)		Potential Future (E+P)	
		Pump Capacity	Average Use	Pump Capacity	Proposed Use	Pump Capacity	Proposed Use
Royal Hawaiian CC (2045-06, 2145-01, 2145-02, 2145-03)	0.155						0.155
C&C DWWM (2545-01)	0.025						0.025
State DHHL Reservation	0.124						0.124
Honolulu BWS Waimanalo Well II (1943-01)	0.452	1.008				1.008	0.452
Honolulu BWS Waimanalo Well I (2043-02)		0.288					0.000
Honolulu BWS Waimanalo Well III (Pending)				0.720	0.500	0.720	0.500
Honolulu BWS Waimanalo Tun. I (2044-03,2044-04,2045-03, 2045-05)	0.900						0.900
Total	1.656						2.156

Source: Adapted from data supplied by State Commission on Water Resource Management, 12.5.00.
Note: BWS Waimanalo Well I has been closed due to contamination by alachlor.

2.17 **Watershed and Aquifer Recharge.** The watershed is known as the Kahawai watershed (Exhibit A). It includes portions of the Koolau Mountains which are part of the Waimanalo area and from which the aquifer to be tapped is recharged. Rainfall in this recharge area may range between 40 and 60 inches annually (Atlas of Hawaii, 1998, Third Edition).

2.18 **Surface Water Hydrology.** There are no perennial streams in the Kahawai watershed. There are narrow drainage ways which flow intermittently, carrying runoff northward through the agricultural fields and across Waimanalo Beach to Waimanalo Bay. They are fed principally by runoff although some of their flow may originate from dike leak-age or marginal dike zone overflow. Waimanalo Well III is located inland of the Kailua and Maunawili ditches at an elevation of 275 feet above sea level. The ditches are man-made drainage channels used to carry water for irrigation of the surrounding agricultural lands. The ditch water originates from water tunnels in Maunawili Valley to the north. Water flows by gravity through a system of flumes, ditches and tunnels to Waimanalo. The ditches are usually dry except when water is required for irrigation. The State Department of Agriculture is in the process of lining the ditches with pipe to reduce water losses and maintenance requirements.

2.19 **Seismic Activity.** Earthquake risk in the vicinity is low because Oahu is classified as a Seismic Zone I (*area of least risk*) (*Uniform* Building Code, 1988). BWS has adopted use of more rigorous UBC Seismic Zone 3 standards for design purposes.

2.20 **Roadways and Site Access.** The site is accessed over mostly paved public roads (upper portion of Waikupanaha is unpaved) from Kalanianaole Highway to Hihimanu Street then via Waikupanaha Street to the Meadow Gold Dairy office. From that location, the well site is accessed via an unpaved road over land leased by Meadow Gold from the State. The proposed pipeline will follow this route from the well site to Waikupanaha Street, thence across agricultural lands to Nonokio Street (Exhibit B).

2.21 **Climate.** Average monthly temperature in the vicinity of the proposed well site is approximately 75 degrees F (Fahrenheit). It ranges from 72 degrees F in January to 78.5 degrees F in August (State of Hawaii Data Book, 1987). Opposed to the prevailing northeast trade winds off the ocean, the windward coast of Oahu experiences very little variation in temperature between day and night. Rainfall in the area originates when trade winds are intercepted and forced upward by the peaks of the Ko'olau range, dropping their moisture as they rise and cool. The proposed well site is in an area which receives a mean annual rainfall of about 75 inches (Atlas of Hawaii, 1973, Second Edition).

2.22 **Population.** In 1990, the population of Waimanalo was 9,055. The following table shows one possible population growth scenario in Waimanalo where population is projected to reach 11,520 by 2025. Actual population growth in Koolaupoko is likely to be less than 144,000 projected in this scenario because the focus of the Koolaupoko Sustainable Communities Plan (City and County of Honolulu, June 1999) is on directing growth to other areas outside of Koolaupoko. However, in Waimanalo, population growth will occur because of housing construction by the Department of Hawaiian Homes Lands (Koolaupoko Sustainable Communities Plan).

Table 2 – Population – 1990 to 2025			
Place **Year**	**1990**	**2000**	**2025**
Oahu	836,231	872,900	1,029,800
Koolaupoko District	117,694	122,200	144,000
Waimanalo	9,055	9,776	11,520
Sources: DBED&T, 1999 State Data Book. Years 2000 and 2025 for Koolaupoko and Waimanalo are estimates based on proportional populations in 1990.			

3 Major Impacts and Alternatives Considered

3.1 **Positive significant and beneficial impacts.** Positive and beneficial impacts of the proposed project, include an increase of 0.50 million gallons per day in the BWS main system and maintenance of a reliable potable water supply for BWS customers in Waimanalo.

3.2 **Negative significant impacts.** There are no negative significant impacts of the proposed project.

3.3 **Alternatives considered.** The following is a discussion of the alternatives which were considered during the formulation of the recommended project. (Drilling and development of Waimanalo Well III has been evaluated previously in another environmental assessment[6], see following paragraphs for summary). This present environmental assessment concerns the construction of the production facility, paving of the existing access road, and construction of a pipeline to transport water from *Waimanalo Well III to the existing* BWS main transmission lines. The production facility must be close by the well at elevation of 275 feet to provide a gravity flow of water and to maintain pressure. The existing unpaved access road itself is already in place. The alternatives considered here (see Exhibit 2) are for different routes of the transmission line. All alternatives must cross the Kailua Irrigation Ditch. Consideration of alternatives as described below was preceded by an evaluation of alternatives prior to test drilling of Waimanalo Well III and this evaluation was reported in a previous EA (see Appendix F – *Environmental Assessment for an Exploratory Well and Access Road at Waimanalo, Oahu*). The alternatives analysis from the previous EA is as follows:

A. "NO ACTION. The no action alternative would not meet the objectives of the Board of Water Supply for this project. This project is part of an overall groundwater development program intended to increase the municipal water supply to meet growing demand. If the Board's new water sources program is curtailed, it would not be able to provide adequately for the water needs of the population of the island in the future, which may result in restrictions in new development as well as regional water shortages."

B. "ALTERNATIVE SOURCES. The Board of Water Supply has considered a variety of other alternatives to the development of new groundwater sources. Alternatives considered include direct use of stream flow, blending and use of brackish water resources, demineralization of brackish water sources, desalinization of sea water and direct reuse of treated wastewater. None of these alternatives at this time offers the potential to economically or cost-effectively produce water supplies of the quality which can be obtained through the proposed program."

C. "DELAYED PROJECT. Delay in the proposed well testing program would increase the risk that population growth will lead to increasing water demands in excess of the available supplies. Delay of the project will not materially alter the environmental impacts of the project and has the potential to increase project costs."

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[6]Honolulu Board of Water Supply, *Environmental Assessment for an Exploratory Well and Access Road at Waimanalo, Oahu*, March 1994.

The Honolulu Board of Water Supply (BWS) has previously analyzed and investigated alternatives to potable groundwater. In the *Oahu Water Plan* (BWS, 1995, Final Draft), the BWS considered the alternatives of desalination, surface and brackish groundwater development, reclaimed water use and conservation of existing resources. With the exception of conservation, these alternatives tended to have higher development costs and technological challenges. These alternatives are summarized in the *Thomson Corner Well Exploratory Well Site Final Environmental Assessment - FONSI* (pages 4-2 and 4-3).

> "Treatment plants for desalination, treatment of brackish and surface water, and reuse of effluent wastewater share high capital and operation and maintenance costs. In addition to high costs, the use of these alternative sources is not without potential environmental concerns. Wastewater reuse, is additional plagued with concerns of potential health implications and possible soil contamination. The use of surface water sources could affect stream flows resulting in potential impacts to aquatic, riparian, cultural and recreational resources.
>
> Desalination
>
> "The desalination of brackish water and sea water could satisfy a portion of future demand and also provide for the maintenance and recovery of water quality in basal aquifers. Desalination plants could produce a local supply within areas of demand, thereby minimizing the need to transport water over long distances. The main disadvantage is the cost of production, which will increase water rates. Desalination will become increasingly feasible as the capital costs of developing marginal potable ground water sources from remote service areas approach the cost of constructing a desalination plant. However, the operation and maintenance costs of producing and distributing desalinated water are at least 10 times more than the cost of pumping groundwater. It would be preferred if desalination could be deferred until new technology reduces operating and maintenance costs or existing operating costs rise closer to desalination.
>
> Surface Water
>
> "A surface water study of Kahana, Punaluu and Waikele streams was funded by the BWS to explore the feasibility of potable development and infrastructure requirements. Findings indicate that the potable development of streams is not feasible due to environmental constraints and safe drinking water treatment and monitoring requirements.
>
> Reclaimed Water Use
>
> "Reclaimed water is produced through the treatment of raw wastewater to a quality that is suitable for non-potable water use. Public health concerns and high costs for dual water system

infrastructure limit the extent of reuse. Ongoing studies and discussions are required to review the costs, appropriate treatment level, quality of reclaimed water produced, and potential health implications of reclaimed water on various agricultural crops and potable aquifer sources.

Conservation

"Water conservation has significant potential to reduce demand and defer the need to develop potable supplies. The BWS has initiated an ambitious conservation program, including public education, inverted residential water rates, leak detection, low-flow plumbing fixtures, audits, drought tolerant plants, dual water systems, and water use restriction plans. In 1990, the conservation objectives of the BWS was to reduce per capita water use by 10 percent over five years. A separate water conservation unit in the BWS was established in April 1991 to monitor and help implement water conservation efforts. A reduction of approximately 7 percent was achieved by 1995. However, water conservation should not be construed as a substitute solution for the timely development of high quality ground water resources or other alternatives.

"As existing aquifer resources approach the sustainable yield limits for the island of Oahu, a combination of strategies are needed in order to provide the required water supply to support future growth. Until such time that alternative source development can reliably and economically supplement existing resources, conservation in conjunction with the development of potable groundwater will remain the preferred BWS management strategy." Source: *Thompson's Corner Well Exploratory Well Site EA and FONSI.*

3.3.1 **No-Action Alternative.** BWS has a legal requirement to provide potable water to the residents of the City and County of Honolulu. The proposed project would help to meet this requirement while the no action alternative would prevent the BWS from doing so. The no action alternative does not address the mandate of BWS to develop safe potable water resources for the residents of the City and County of Honolulu. The no-action alternative would result in a shortfall of water within the BWS system based on present plans because of the shut-down of BWS Waimanalo Well I. The no-action alternative prevents BWS from meeting the projected increases in customer demand in future years. Development of other water sources still would be required if Waimanalo Well III is not placed on-line for service to the community.

3.3.2 **Preferred Route (Meadow Gold Dairies) – Transmission Line Via Waikupanaha Street to Nonokio Street (Exhibit 2).** This route has the advantage of the existing Waikupanaha Street, which is paved, and readily accessible. This route is the longest and most costly of all alternatives. See Table 4, below, for a comparison of the transmission line lengths.

3.3.3 **Alternative Route 1 – Transmission Line to Lupe Street (Exhibit 2).** This route requires the least underground pipeline construction and would connect to an existing BWS main

pipeline beneath the surface of Lupe Street at its terminus where it meets an unpaved farm access road. However, due to land acquisition constraints, this route is unavailable.

3.3.4 **Alternative Route 2 –Transmission Line to Maniwaiola Street (Exhibit 2).** This route has the disadvantage of having no reasonable vehicular access from an existing paved road.

Table 3 – Alternative Transmission Line Lengths	
Alternative	Length (feet)
Preferred Alternative – to Nonokio Street	6,600
Alternative Route 1 – to Lupe Street	3,800
Alternative Route 2 – to Maniwaiola Street	4,700

4 Proposed Mitigation Measures

4.1 **Potential problems and appropriate mitigation including best management practices.** There are no potential problems related to the proposed project. Best management practices (see following paragraphs) will be applied with regards to traffic, dust and noise control, and water discharge (should any be required due to site conditions, a situation to be determined later, during detailed design and construction specification phases of the project).

4.2 **Mitigation or preservation plan prepared for the Department of Land and Natural Resources State Historic Preservation Division.** A preservation plan is as follows: Construction of the pipeline crossing the irrigation ditches will be done with minimal intrusion so that irrigation operations are not seriously affected nor impaired. The pipeline will be constructed below existing ground level, and beneath or under the bottom of the ditch. After construction, no effects will be discernable. The owner and operator of the ditch system (State Department of Agriculture) is in the process of placing pipelines in the ditch alignment to convey the water which at present is conveyed in an open ditch system. Replacement of the open ditch with a pipeline will reduce water losses and benefit farmers. The road and water transmission line crossing of the ditch by the BWS Waimanalo Well III Production Facility will not significantly affect the ditch or its historic values. Historic sites nearby the proposed project will not be physically disturbed. No mitigation is proposed because the historic sites will not be altered or affected by the proposed project, however temporary protection (see next paragraph) of existing archaeological sites may be provided if deemed necessary by the State Historic Preservation Officer.

Existing archaeological sites outside the specific project area, including the two stone features about 15 feet distant from the access road to Waimanalo Well III will be posted and fenced off if deemed necessary by the State Historic Preservation Officer to prevent the intrusion of personnel, vehicles, equipment, supplies or construction activity.

Because the archaeological sites are outside the specific project area, mitigation or a detailed preservation plan are not proposed or provided because the sites have not been disturbed by previous work in the area during drilling of Waimanalo Well III, and if necessary the sites can be afforded protection via fencing.

4.3. **Environmental Factors.**

4.3.1 **Aesthetics and viewplanes.** The project will result in no significant change in the visual environment. The entire production facility site is screened by extensive growth of eucalyptus trees and other alien species such as Christmas berry and guava. The roadways are already existing and in place and the pipeline will be buried beneath the roadways.

4.3.2 **Air quality.** Existing air pollution at the project site is minimal. There are no stationary sources of air pollution in the area. Construction activities and operation of heavy vehicles and equipment at the project site will generate temporary dust and pollution emissions. These impacts will cease when construction is complete. To mitigate impacts on air quality caused by the project activities, dust control measures will be undertaken by the project contractor. Such measures will include the use of dust screens and water sprinkling as necessary to minimize levels of fugitive dust. To minimize exhaust emissions, project contractors will properly maintain their internal combustion engines and comply with DOH

Administrative Rules (Title 11, Chapters 59 and 60 regarding Air Pollution Control). There would be no long term effects because the proposed project includes no air pollution sources and would not generate significant differences in traffic from the existing conditions.

4.3.3 **Traffic.** No significant or long-term impacts to Waikupanaha Street are expected with this project. There will be little effect on traffic except during periods when construction materials are delivered to the site. Such traffic will consist of heavy trucks and trailers. They will operate during normal working hours and will follow existing regulations regarding road clean-up (if necessary) resulting from this traffic. Normal working hours are considered to be between 6:30 AM and 5 PM week-days and excluding state, federal and local holidays.

4.3.4 **Noise levels.** No significant or long-term impacts in ambient noise levels to surrounding communities will occur. Communities are at least 1,500 feet or more from Waimanalo Well III. There will be some increase in noise levels during construction of the project. This will occur during normal working hours (typically within the period of 6:30 AM to 5 PM week-days and excluding state, federal and local holidays). Contractor's equipment is required to meet State Department of Health noise regulations (Title 11, Chapter 46, "Community Noise Control").

4.3.5. **Effects on water quality.** The project will have no significant effect on water quality because there are no significant discharges related to the project. Because the aquifer to be accessed is perched, and the recharge area is a steep, undeveloped "natural", mountainous area of the Koolaus, the presence of contaminants from urban or industrial sources is unlikely.

4.3.6 **Other environmental effects.** The site is located at an elevation above identified flood hazard areas.

4.3.7 **Flora.** There are no threatened or endangered flora at the project site.

4.3.8 **Fauna.** There are no threatened or endangered fauna at the project site.

4.3.9 **Soils.** Soil orders include Mollisols (generally well-drained) and Ultisols (which include some clay, iron and/or aluminum oxide).

4.3.10 **Water Quality.** There are no perennial stream in the project area. Water quality of Waimanalo Well III is considered excellent and data for well water testing is included in Appendix D.

4.3.11 **Historical, archeological and cultural sites.** The proposed project pipeline will cross the Kailua Irrigation Ditch, but the crossing will have no significant impact on the historic values of the ditch.

4.3.12 **Sensitive habitats or bodies of water adjacent to the proposed project.** There are no sensitive habitats or bodies of water adjacent to the proposed project.

4.3.13 **Flood Zone.** According to the Federal Emergency Management Agency Flood Insurance Rate Map (FIRM Panel 150001 0380E & 150001 0385E, 11/20/2000), the well site and pipeline route is outside of known flood hazard areas (See Exhibit A), and is in zones

designated X (areas outside the 500 year flood plain) & D (areas in which flood hazards are undetermined). The facility is located in Zone D.

4.3.14 **Seismic Activity.** The project site is located in the area of least seismic activity (Uniform Building Code, previously referenced), Seismic Zone 1. BWS design standards incorporate the more severe Seismic Zone 3.

5 Expected Determination

5.1 **Finding of No Significant Impact (FONSI).** The proposed project will not have significant effect on the environment and therefore preparation of an environmental impact statement is not required. This document constitutes a Notice of Negative Declaration/Finding of No Significant Impact for the proposed project. This determination was based on review and analysis of the "Significance Criteria" in Section 11-200-12 of the Hawaii Administrative Rules, as documented below.

5.2 **Findings and reasons supporting the determination including justifying evidence.**

5.2.1 *No irrevocable commitment to loss or destruction of any natural or cultural resource would result.* There are no listed sites in the project area, but the Kailua Irrigation Ditch ((State Number 50-80-15-4042) is the subject of a draft nomination paper which has been prepared. This site appears to be eligible for listing in the National and/or State Registers of Historic Places. The Kailua Irrigation Ditch consists of tunnels, shafts, water control gates, ditches and reservoirs for sugar cane irrigation system. At the project location the ditch still functions on varying days, and during varying crop seasons, to provide water to a nearby agricultural field. The proposed project would construct a pipeline beneath this ditch in three places and the visible and physical attributes of the ditch would not be affected, nor would the flow of water. Therefore, no mitigation is required. A letter from the State Department of Agriculture (August 16, 1999, see Appendix E) has no objections to the proposed project and informal communications with the Department indicates that they intend to replace the open ditch with a pipeline. There are some other archaeological sites near the BWS Waimanalo Well III site, but they are physically outside the project boundary and also will not be affected.

5.2.2 *The proposed project would not curtail the range of beneficial uses of the environment.* The proposed project will not affect the beneficial uses of the existing environment which is now in agricultural land use as either pasture, or fallow scrub brush.

5.2.3 *The proposed project would not conflict with the state's long-term environmental policies or goals and guidelines.* The state's environmental policies and guidelines as set forth in Chapter 344, Hawaii Revised Statutes, "State Environmental Policy", encompass two broad policies: conservation of natural resources, and enhancement of the quality of life. As determined in the previous environmental assessment for development of Waimanalo Well III, the proposed project would not significantly conflict with the state's environmental policies and quality of life would be maintained or enhanced through availability of reliable and safe drinking water.

5.2.4 *The proposed project will improve the economic and social welfare of the community and the state.* Maintenance of a reliable potable water supply contributes to the economic and social welfare of the community and of the state.

5.2.5 *The proposed project would not substantially affect public health.* The proposed improvements may benefit public health by maintaining a reliable and safe source of drinking water..

5.2.6 *No substantial secondary impacts, such as population changes or effects on public facilities, are expected.* The project maintains the reliability of the existing BWS system and does not cause substantial secondary impacts.

5.2.7 *No substantial degradation of environmental quality is expected due to the proposed project.* Construction activities will have minimal impacts. The well site was graded previously during development of the well, and access roads are in place. Excavation for installation of the pipeline will occur within these existing roads.

5.2.8 *No cumulative effect on the environment or commitment to larger actions will be involved.* The project has no cumulative effect on the environment or commitment to larger actions.

5.2.9 *No rare, threatened or endangered species or their habitats are affected.* No impacts are anticipated on any candidate, proposed or listed endangered species or their habitats. There are no known threatened/endangered species or their habitats within the project limits.

5.2.10 *The proposed project will not detrimentally affect air or water quality or ambient noise levels.* Construction activities may cause short-term impacts to air or noise quality, although there are no residences near the project. All state and county rules regarding construction practices will be adhered to.

5.2.11 *The proposed project will not detrimentally affect environmentally sensitive areas such as flood plains, tsunami zones, beaches, erosion-prone areas, geologically hazardous lands, estuaries, fresh waters or coastal waters.* The proposed project is not in a flood or tsunami area, is not near a beach, is not erosion-prone, is not in a geologically hazardous area, is not near an estuary, fresh or coastal waters. There will be no detrimental impacts in environmentally sensitive areas.

5.2.12 *The proposed project will improve scenic vistas and view planes identified in county or state plans or studies.* This project site is nearly one mile inland of the existing coastal road (Kalanianaole Highway), at the base of the Waimanalo Mountains, and obscured by thick growths of eucalyptus and other exotic species of plants. It is not in a scenic vista or view plan identified in county or state plans or studies, and will not be visible from Kalanianaole Highway – the major public vantage point looking inland.

5.2.13 *There will be no requirement for substantial energy consumption.* Construction of the project will not require substantial energy consumption.

5.3 **Compliance with the State of Hawai'i's Drinking Water State Revolving Fund (DWSRF) Program Requirements.** This project may be funded by Federal funds through the State of Hawai'i's Drinking Water State Revolving Fund (DWSRF) program. The U.S. Congress established the DWSRF program as a new Section 1452 of the Safe Drinking Water Act (SDWA), 33 U.S.C. 300j-12, by the SDWA Amendments of 1996, Public Law 104-182. The DWSRF was established to help prevent contamination through source water protection and enhanced water system management. It also emphasizes the needs of small water systems. The proposed project is consistent with the overall program intent to prevent potential contamination and with the program's emphasis on small water systems. This

document includes all of the environmental information required for compliance with the DWSRF program. The following sub-sections address the proposed project's relationship to Federal "cross-cutting" authorities.

5.3.1 ARCHEOLOGICAL AND HISTORIC PRESERVATION ACT (16 U.S.C. § 469A-1) AND NATIONAL HISTORIC PRESERVATION ACT (16 U.S.C. § 470(F)). The project site is located in an area that has been used extensively for agriculture for many years and no known archaeological or historic features exist within the project site boundaries. However, there are adjacent historic properties which will not be affected by the proposed project. The proposed project has been coordinated with the State of Hawai'i Historic Preservation Division (SHPD) of the Department of Land and Natural Resources. SHPD concurred with the project staff assessment that no historic properties will be. SHPD and the Office of Hawaiian Affairs were provided copies of the draft EA to ensure compliance with these statutes.

5.3.2 CLEAN AIR ACT (42 U.S.C. § 7506(c)). Air quality at the site of the proposed project is good. Only minor amounts of grading and excavation will be required for the project so that fugitive dust will not be a problem during construction. It is anticipated that a diesel-driven equipment will be used to during construction. Emissions from the diesels may slightly degrade air quality for the short period of time they are in operation. However, all applicable emission and ambient air quality standards will continue to be met. Consequently, no adverse health effects from this source are anticipated. Because of the distance of the project from residential areas it is unlikely that odor from the diesel exhaust will be noticeable. Normal operation of the proposed facilities will not produce on-site air emissions, will not alter air flow in the vicinity, and will have no other measurable effect on the area's micro-climate. The electrical power consumed in the operation of the wells will require additional power generation (and, therefore, fuel consumption and gaseous emissions) by electric utility producers. The increase represents such a small portion of total power use that its effect not be significant in and of itself.

5.3.3 COASTAL ZONE MANAGEMENT ACT (16 U.S.C. § 1456(c)(1)). Enacted as Chapter 205A, HRS, the Hawaii Coastal Zone Management (CZM) Program was promulgated in 1977 in response to the Federal Coastal Zone Management Act of 1972. The CZM area encompasses the entire state, including all marine waters seaward to the extent of the state's police power and management authority, including the 12-mile U.S. territorial sea and all archipelagic waters. The Hawai'i Coastal Zone Management Program focuses on ten policy objectives:

> Recreational Resources. To provide coastal recreational opportunities accessible to the public and protect coastal resources uniquely suited for recreational activities that cannot be provided elsewhere.
>
> Historic Resources. To protect, preserve, and where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.
>
> Scenic and Open Space Resources. To protect, preserve, and where desirable, restore or improve the quality of coastal scenic and open space resources.

Coastal Ecosystems. To protect valuable coastal ecosystems, including reefs, from disruption and to minimize adverse impacts on all coastal ecosystems.

Economic Uses. To provide public or private facilities and improvements important to the state's economy in suitable locations; and ensure that coastal dependent development such as harbors and ports, energy facilities, and visitor facilities, are located, designed, and constructed to minimize, adverse impacts in the coastal zone area.

Coastal Hazards. To reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.

Managing Development. To improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Public Participation. To stimulate public awareness, education, and participation in coastal management; and maintain a public advisory body to identify coastal management problems and provide policy advice and assistance to the CZM program.

Beach Protection. To protect beaches for public use and recreation; locate new structures inland from the shoreline setback to conserve open space and to minimize loss of improvements due to erosion.

Marine Resources. To implement the state's ocean resources management plan. Other key areas of the CZM program include: a permit system to control development within a Special Management Area (SMA) managed by the Counties and the Office of Planning; a Shoreline Setback Area which serves as a buffer against coastal hazards and erosion, and protects view-planes; and the Marine and Coastal Affairs. Finally, a Federal Consistency provision requires that federal activities, permits and financial assistance be consistent with the Hawaii CZM program.

The proposed project is located several miles from the coastline and is not within the County's SMA. It does not involve the placement, erection, or removal of materials near the coastline. The type and scale of the activities that it involves typically do not have the potential to significantly affect coastal resources. Finally, it is consistent with the CZM objectives that are relevant to a project of this sort.

A copy of this Final EA is being sent to the Office of Coastal Zone Management at the State of Hawai'i Department of Business, Economic Development, and Tourism The Department's response is expected to confirm the consistency of the project with the CZM Act.

5.3.4 ENDANGERED SPECIES ACT (16 U.S.C.1536(A)(2) AND (4). The Endangered Species Act (16 U.S.C. §§ 1531-1544, December 28, 1973, as amended 1976-1982, 1984 and 1988) provides broad protection for species of fish, wildlife, and plants that are listed as threatened or endangered in the U.S. or elsewhere. The Act mandates that federal agencies seek to conserve endangered and threatened species and use their authorities in furtherance of the Act's 11 purposes. Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for listed species. The Act outlines

procedures for federal agencies to follow when taking actions that may jeopardize listed species, and contains exceptions and exemptions.

Existing biota on and near the project site are discussed in this EA. The discussion documents the fact that there are no known rare or endangered species on or immediately around the site of the proposed project. Copies of the Draft EA were provided to the State Department of Land and Natural Resources (DLNR) for review and comment. The DLNR Department of Aquatic Resources did not comment on the Draft EA.

5.3.5 FARMLAND PROTECTION POLICY ACT (7 U.S.C. § 4202(8)). The U.S. Congress adopted the Farmland Protection Policy Act (FPPA, Public Law 97-98) on December 22, 1981. The U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) has national leadership for administering the FPPA. The effective date of the FPPA, rule (part 658 of Title 7 of the Code of Federal Regulations) is August 6,1984. The stated purposes of the FPP A are to: (a) Minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses and (b) Assure that Federal programs are administered in a manner that, to the extent practicable, will be compatible with State, unit of local government, and private programs and policies to protect farmland. "Farmland", as used in the FPPA, includes prime farmland, unique farmland, and land of statewide or local importance. "Farmland" subject to FPPA requirements does not have to be currently used for crop land. The proposed project does not take agricultural lands out of production. Although the well and production facility are located within an agricultural land use district, the actual site is at an elevation is above any lands uses for agriculture and the transmission line will be placed below ground generally withing existing roadways. Also, the proposed project (which serves only the neighboring community) replaces a well which has been put out of production due to an agricultural contaminant. Consequently, the project is in substantial compliance with the FPPA.

5.3.6 FISH AND WILDLIFE COORDINATION ACT (16 U.S.C. § 662). The Fish and Wildlife Coordination Act, as amended, authorizes the Secretaries of Agriculture and Commerce to require consultation with the Fish and Wildlife Service and the fish and wildlife agencies of States where the *"waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted. . . or otherwise controlled or modified"* by any agency under a Federal permit or license. Consultation is to be undertaken for the purpose of *"preventing loss of and damage to wildlife resources."*

The proposed project will not result in the diversion of any water body and will not result in impacts on fish or wildlife resources. The U.S. Army Corps of Engineers and the State Department of Land and Natural Resources were asked to comment on the Draft EA. The Corps of Engineers and the Commission on Water Resources Management have acknowledged that no waterways are affected. The DLNR Department of Aquatic Resources did not comment to the Draft EA.

5.3.7 FLOODPLAIN MANAGEMENT (42 U.S.C. § 4321). Based on the latest available Flood Insurance Rate Map for the area, the proposed project site lies outside a defined floodplain. The project does not involve property acquisition, management, or construction within a 100-year flood plain (Zones A or V), and it does not involve a "critical action" within a 500-year flood plain. Consequently, it is consistent with applicable regulations and guidance relating to floodplain management.

5.3.8 SAFE DRINKING WATER ACT (42 U.S.C. § 300H-3). The Safe Drinking Water Act (SDWA) is the principal federal law that ensures the quality of the nation's drinking water. Under SDWA, EPA sets standards for drinking water quality and oversees the states, localities, and water suppliers who implement those standards. The Safe Drinking Water Act requires that all public water systems meet stringent water quality standards. These standards cover a long list of potential chemical, radiological and biological contaminants. The standards distinguish between surface water and groundwater sources, with the testing and monitoring requirements for surface water and GWUDI sources being far greater than those for groundwater sources.

The primary purpose of the proposed project is to permit continued compliance with the standards mandated pursuant to the SDWA. Extensive testing has been conducted during well testing and periodic testing will be done in the future to ensure that the water is consistent with all State and Federal standards for potable water.

The Safe Drinking Water Act also provides the impetus behind the development of regulatory protection of principal or sole source aquifers. Part C of this Law pertains specifically to the protection of underground sources of drinking water, including the establishment of regulations on the injection of materials into subsurface aquifers in those areas of the United States where only one aquifer (principal or sole source aquifer) exists. Section 1424(e) of PL 93-523 states:

> *(e) If the Administrator determines, on his own initiative or upon petition, that an area has an aquifer which is the sole or principal drinking water source for the area and which, if contaminated, would create a significant hazard to public health, he shall publish notice of the determination in the Federal Register. After the publication of any such notice, no commitment for Federal financial assistance (through a grant, contract, loan guarantee, or otherwise) may be entered into for any project which the Administrator determines may contaminate such aquifer through a recharge zone so as to create a significant hazard to public health, but a commitment for Federal financial assistance may, if authorized under another Provision of law, be entered into to plan or design the project to assure that it will not so contaminate the aquifer.*

As identified by the U.S. Environmental Protection Agency, Region IX groundwater Office (http:www.epa.gov/OGWDW/swp/ssa/reg9.html), there are only two Sole Source Aquifers in Hawaii. They are the Southern Oahu Basal Aquifer on the Island of O'ahu and the Moloka'i Aquifer on the island of Moloka'i. The proposed project is outside either of these two areas.

5.3.9 PROTECTION OF WETLANDS (42 U.S.C. § 4321). There are no wetlands on or near the site. Neither are there food resources on the site that are important to wildlife that use wetlands elsewhere on the island. Copies of the *Draft EA* were sent to the U. S. Army Corps of Engineers and to the State Department of Land and Natural Resources Department of Aquatic Resources to ensure adequate consideration of this topic in the environmental review for this project.

5.3.10 WILD AND SCENIC RIVERS ACT (16 V.S.C.1271-1287). The purpose of this act, as stated in Section (b) of its preamble is as follows:

> *It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values. shall be preserved in free-flowing condition. and that they and their*

immediate environments shall be protected for the benefit and enjoyment of present and future generations. The Congress declares that the established national policy of dam and other construction at appropriate sections of the rivers of the United States needs to be complemented by a policy that would preserve other selected rivers or sections thereof in their free-flowing condition to protect the water quality of such rivers and to fulfill other vital national conservation purposes.

The proposed project does not involve any streams or rivers which have been listed by the U.S. National Park Service as candidates for designation as Scenic Rivers and the project is therefore not subject to the provisions of this Act. The project does not have the potential to affect the hydrology, water quality, or aquatic resources of any streams and therefore is consistent with the provisions of the Wild and Scenic Rivers Act.

5.3.11 WILDERNESS ACT (16 U.S.C. 1131) The purpose of this legislation is stated in Section 2(a) of the Act as follows:

In order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness. For this purpose there is hereby established a National Wilderness Preservation System to be composed of federally owned areas designated by Congress as "wilderness areas" and these shall be administered for the use and enjoyment of the American people in such manner as I will leave them unimpaired for future use and enjoyment as wilderness. and so as to provide , for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness; and no Federal lands shall be designated as "wilderness areas" except as provided for in this chapter or by a subsequent Act.

There are no designated Wilderness Areas near the proposed project and therefore the project is consistent with the provisions of the Act.

6 Identification of Agencies, Organizations and Individuals Consulted and Permits or Approvals Required

A copy of the draft environmental assessment has been sent to each of the following.

6.1 **State of Hawaii.**

6.1.1 Department of Land and Natural Resources (DLNR). DLNR must approve this project because of the use of state land, the extraction of sub-surface water, and the crossing of an historic site. The Commission on Water Resources Management waived jurisdiction for crossing the Kailua irrigation ditch. CWRM personnel have waived jurisdiction from crossing upper Inoaole Stream which is not perennial and which is normally a dry gulch.

DLNR, State Historic Preservation Division. The Division has noted that the Waimanalo irrigation system has been the subject of a draft nomination to the federal register of historic places.

6.1.2 Department of Health (DOH). Coordination with the Office of Environmental Quality Control has occurred through use of their guidelines for preparation of this environmental assessment.

DOH, Safe Drinking Water Branch. The Branch maintains records as to the quality of drinking water wells.

6.1.3 Department of Hawaiian Homes Lands (DHHL). Clients of the Department will be served by water from the proposed project

6.1.4 Department of Agriculture (DOA). The Department has approved the construction of the pipeline crossing the Kailua irrigation ditch with the condition that BWS and its contractor notify DOA of the construction schedule when crossing the pipeline. Also, DOA has requested that irrigation water flow be maintained on the days required by the users – for this to occur, close coordination must be maintained by BWS and its contractor with DOA.

6.1.5 Office of Hawaiian Affairs (OHA). OHA is an agency which may have comment regarding Hawaiian interests.

6.1.6. Office of Environmental Quality Control. OEQC is responsible for distribution of the draft EA public notice.

6.1.7. University of Hawaii, Environmental Center. The Center is responsible for obtaining comments from the University community regarding the proposed project.

6.2 **City and County of Honolulu.**

6.2.1 Honolulu Board of Water Supply (BWS). The BWS is the sponsor of this project.

6.2.2 Department of Planning and Permitting (DPP).

6.2.3 Department of Design and Construction (DDC).

6.2.4 Department of Facility Maintenance (DFM).

6.2.5 Fire Department.

6.3 **United States Government.**

6.3.1 U.S. Army Corps of Engineers (USACE). The COE waived jurisdiction over the waters of the Kailua irrigation ditch. COE personnel inspected the proposed pipeline crossing of upper Inoaole Stream and stated informally that crossing would likely not require a Corps permit, but that the draft EA should be sent to the Corps.

6.3.2 U.S. Geological Survey (USGS).

6.3.3 U.S. Fish and Wildlife Service (USFWS).

6.4 **Community, Organizations and Individuals.**

6.4.1 Neighborhood Commission: Waimanalo Neighborhood Board.

6.4.2 City Council Member John Henry Felix, 3rd Council District.

6.4.3 State Representative Joe Gomes, District 51.

6.4.4 State Senator Fred Hemmings, District 25.

6.4.5 Public Libraries: Waimanalo Public and School Library, State Main Library.

6.4.6. Meadow Gold Dairy.

6.4.7. Waimanalo Health Center.

6.5 **Public Involvement Prior to Preparation of the Environmental Assessment.** A Final Environmental Assessment was prepared for the Waimanalo Well III Exploratory Well and Access Road in March 1994. Copies of that EA, including the Comment and Response letters from that document (see Appendix F) have been included (see Appendix E) in the present EA.

6.6 **Permits or Approvals Required.** The following table summarizes the permits or approvals required for the proposed project. An NPDES permit for construction site storm water runoff is not required because the site is less than 5 acres in area. Construction dewatering is not anticipated for this project, however, if it is determined during the design stage that de-watering will be required, an NPDES general permit will be obtained. However, a de-watering permit may not be necessary if the discharge is to an open field and not to a state-regulated waterway. Hydro-testing (including chlorination and pressure testing) will be required, however an NPDES permit may not be required if discharge is to an open field and not to a state-regulated waterway. A decision on the need for an NPDES permit for hydro-testing will be made during the design phase. A grading permit is unlikely to be needed because the site was previously graded for Waimanalo Well III, but if it is determined during the design stage that a grading permit is necessary, a grading permit will be obtained.

Table 4 – Permits, Approvals and Reviews	
Permit or Approval	**Agency**
Permit – Water Use	DLNR, CWRM (Commission on Water Resource Management)
Permit – Well Construction	DLNR, CWRM (received previously by BWS)
Permit – Pump Installation	DLNR, CWRM
Review – Crossing Inoaole Stream	DLNR, CWRM. Stream Channel Alteration Permit (SCAP) not required.
Permit – Building or grading (need to be assessed during design phase)	Department of Planning and Permitting, City and County of Honolulu
Permit – NPDES, Construction de-watering, hydrotesting, or construction site storm water runoff (needs to be assessed during design phase).	DOH (State Department of Health) – need uncertain at this time, to be assessed during preparation of detailed engineering design, plans and specifications.
Approval – Crossing an historic site (Kailua Ditch) and constructing the access road near archaeological sites.	DLNR (State Department of Land and Natural Resources, Historic Preservation Division). See letter in Appendix E.
Approval – Use of State Land	DLNR, Land Management Division
Approval – Crossing Kailua Ditch	State Dept. of Agriculture. See letter in Appendix E.
Review – Crossing Inoaole Stream	U.S. Army Corps of Engineers (to review draft EA). Corps permit not required.
Review/Approval – Drinking Water State Revolving Fund (DWSRF) Loan Program	"This project may be funded by Federal Funds through the State of Hawaii's Drinking Water State Revolving fund (DWSRF) program, which would constitute a federal action, and will requre the project to meet all Hawaii DWSRF program requirements."

6.7 **Public Review and Comments on the Draft Environmental Assessment.** The Final Environmental Assessment incorporates comments received during public and agency review of the Draft Environmental Assessment. Copies of letters received and response letters by the Honolulu Board of Water Supply are included in Appendix E. Following is a summary of key comments.

6.7.1 Comment: (Waimanalo Neighborhood Board) *There was a shooting range on the property of the former dairy. Is there any impact of the lead bullets on groundwater in the area and on the proposed project?*

Response: Tests of the well water quality did not detect the presence of any lead. The geological barriers of thick alluvium and dike structures prevent lead from reaching groundwater and groundwater from the firing range site from reaching Waimanalo Wells III or II located are respective distances of 3,500 and 5,000 feet from the firing range.

6.7.2 Comment: (Office of Hawaiian Affairs) *If cultural remains or human burials are disturbed, work at the project should cease and the State Historic Preservation Division be notified.*

Response: If cultural remains or human burials are disturbed, work at the project will cease and the State Historic Preservation Division will be notified.

6.7.3 Comment: (State of Hawaii Dept. of Health, Safe Drinking Water Branch) *The Final Environmental Assessment and its notice of publication in The Environmental Notice must include several statements in order for the project to be eligible for Drinking Water State Revolving Fund program support.*

Response: The required statements have been incorporated into the Final Environmental Assessment (Table 4), and the publication notice will also incorporate the required statements. The Honolulu Board of Water Supply is in direct contact with the Safe Drinking Water Branch to coordinate these requirements.

6.7.4 Comment: (State of Hawaii Dept. of Health, Safe Drinking Water Branch) *The new source of water must be approved by the Director of Health.*

Response: The Honolulu Board of Water Supply is in direct contact with the Safe Drinking Water Branch to coordinate this requirement.

6.7.5 Comment: (State of Hawaii Dept. of Health, Safe Drinking Water Branch) *The Engineering report must identify potential contaminants and evaluate control measures; water quality analyses are required.*

Response: The Honolulu Board of Water Supply is in direct contact with the Safe Drinking Water Branch to coordinate these requirements.

6.7.6 Comment: (State of Hawaii Dept. of Health, Clean Water Branch) *A U.S. Army Corps of Engineers Permit may be required.*

Response: The U.S. Army Corps of Engineers has determined that the proposed project is not in their jurisdiction.

6.7.7 Comment: (State of Hawaii Dept. of Health, Clean Water Branch) *NPDES permits may be required.*

Response: Effluent discharges will be coordinated during the design phase of the project.

6.7.8 Comment: (State of Hawaii Dept. of Health, Clean Air Branch) *Adequate dust control measures are required.*

Response: Construction activities will comply with dust control requirements.

6.7.9 Comment: (State of Hawaii Dept. of Health, Noise, Radiation and Indoor Air Quality Branch) *Project activities must comply with Community Noise Control rules.*

Response: Construction activities will comply with noise control rules.

6.7.10 Comment: (Department of Land and Natural Resources, Commission on Water Resource Management) *Recommend incorporating this project into county's Water Use and Development Plan; Well Construction/Pump Installation Permit(s) are required; a Water Use Permit is required.*

Response: The project will be incorporated into the County's Water Use and Development Plan and the required permit applications submitted.

6.7.11 Comment: (Department of Land and Natural Resources, Land Division, Engineering Branch) *Corrections are required in the FEMA Panel Numbers show on pages 7 and 16 of the Draft Environmental Assessment; the project must comply with rules and regulations of the National Flood Insurance Program if the project site is later determined to be in a flood zone.*

Response: The Final Environmental Assessment includes the corrections and the requirements for compliance are acknowledged.

6.7.12 Comment: (Department of Land and Natural Resources, Historic Preservation Division) *As long as the project is constructed in accordance with the description in the Draft Environmental Assessment there should be no effect on historic properties and no further archaeological work is required.*

Response: Acknowledged; if cultural deposits or burials are discovered during excavation, the Division will be notified immediately.

References

City and County of Honolulu, Board of Water Supply, *Environmental Assessment for An Exploratory Well and Access Road at Waimanalo, Oahu*, March 1994.

City and County of Honolulu, Board of Water Supply, *Thomson Corner Well Exploratory Well Site Final Environmental Assessment - FONSI* (pages 4-2 and 4-3)

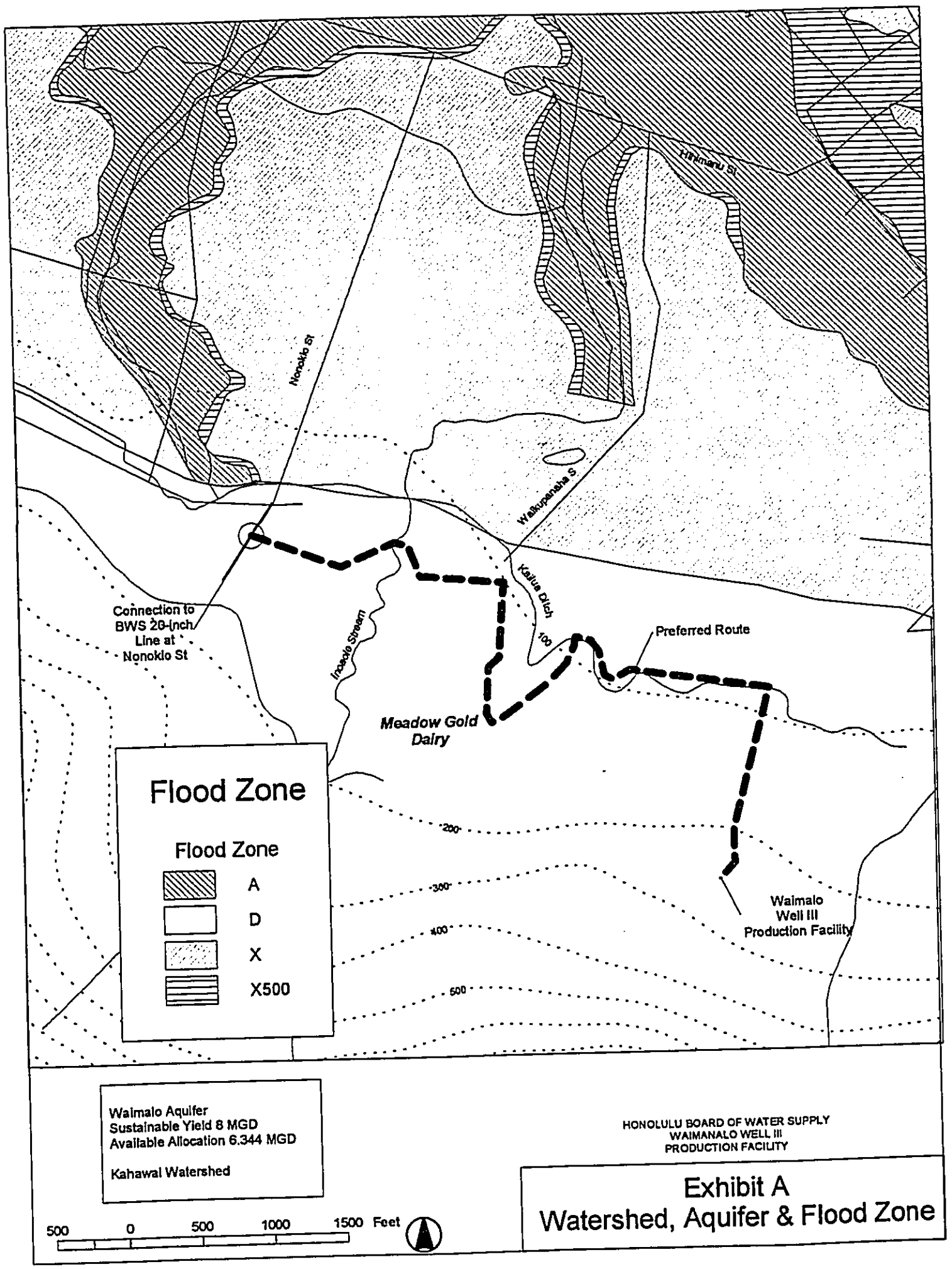
City and County of Honolulu, Department of Planning and Permitting, *Koolaupoko Sustainable Communities Plan*, June 1999.

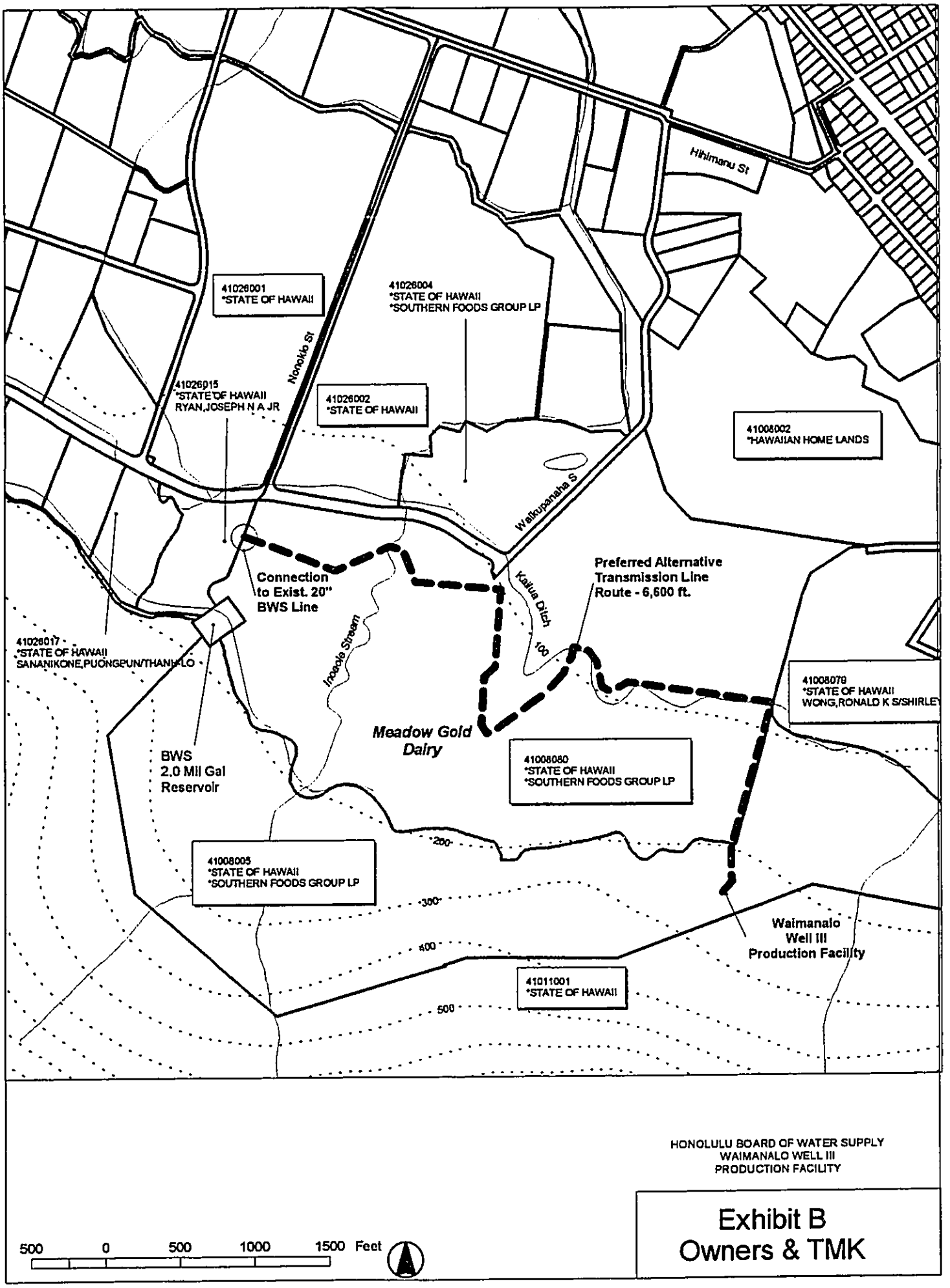
State of Hawaii, Department of Business, Economic Development and Tourism, *1999 State Data Book.*

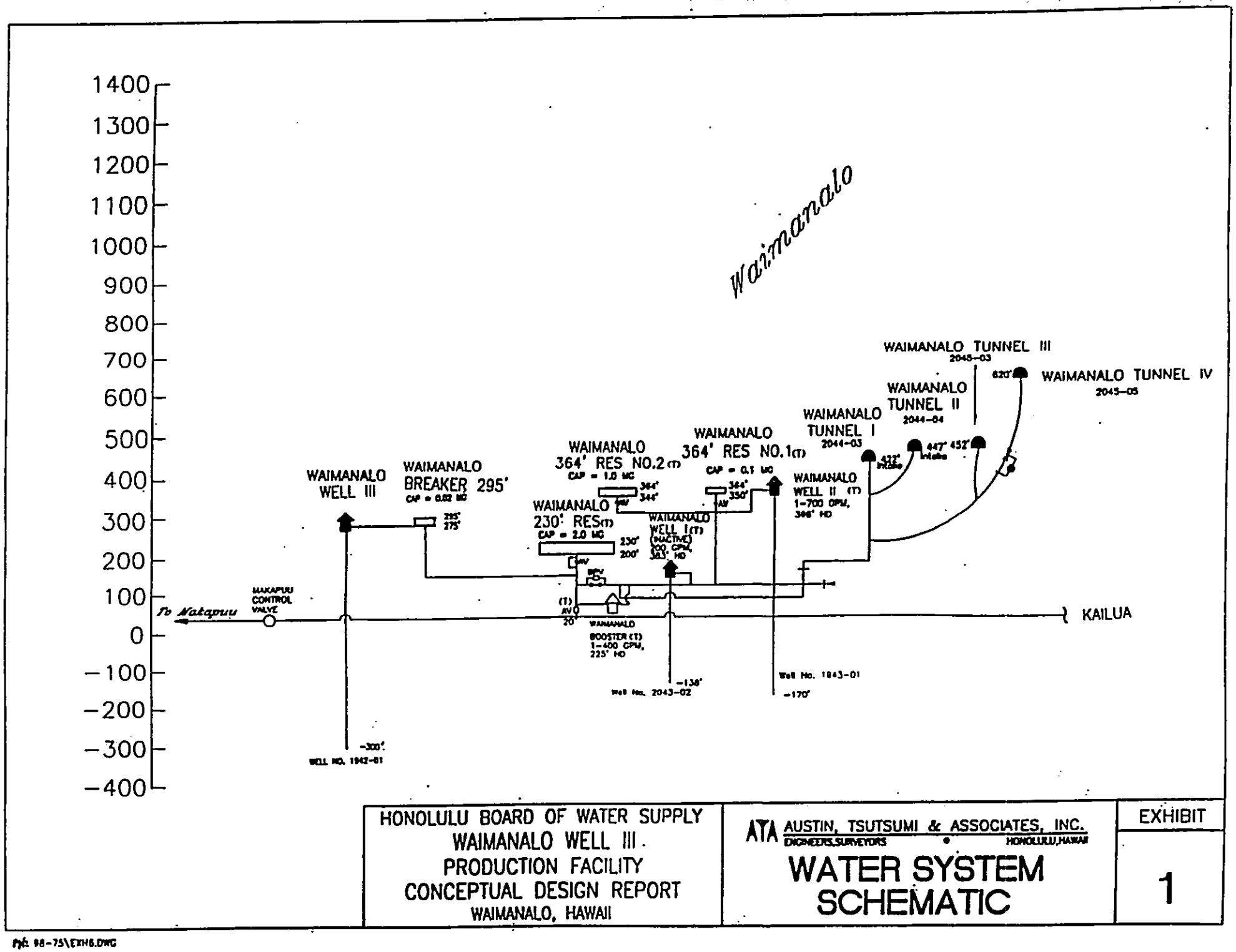
State of Hawaii, Department of Land and Natural Resources, Commission on Water Resource Management, Published and Unpublished Data, Wells and Permitted Use, 2000.

State of Hawaii, University of Hawaii, *Atlas of Hawaii*, Second Edition (1973) and Third Edition (1998).

U. S. Federal Emergency Management Agency, *Flood Insurance Rate Maps.*

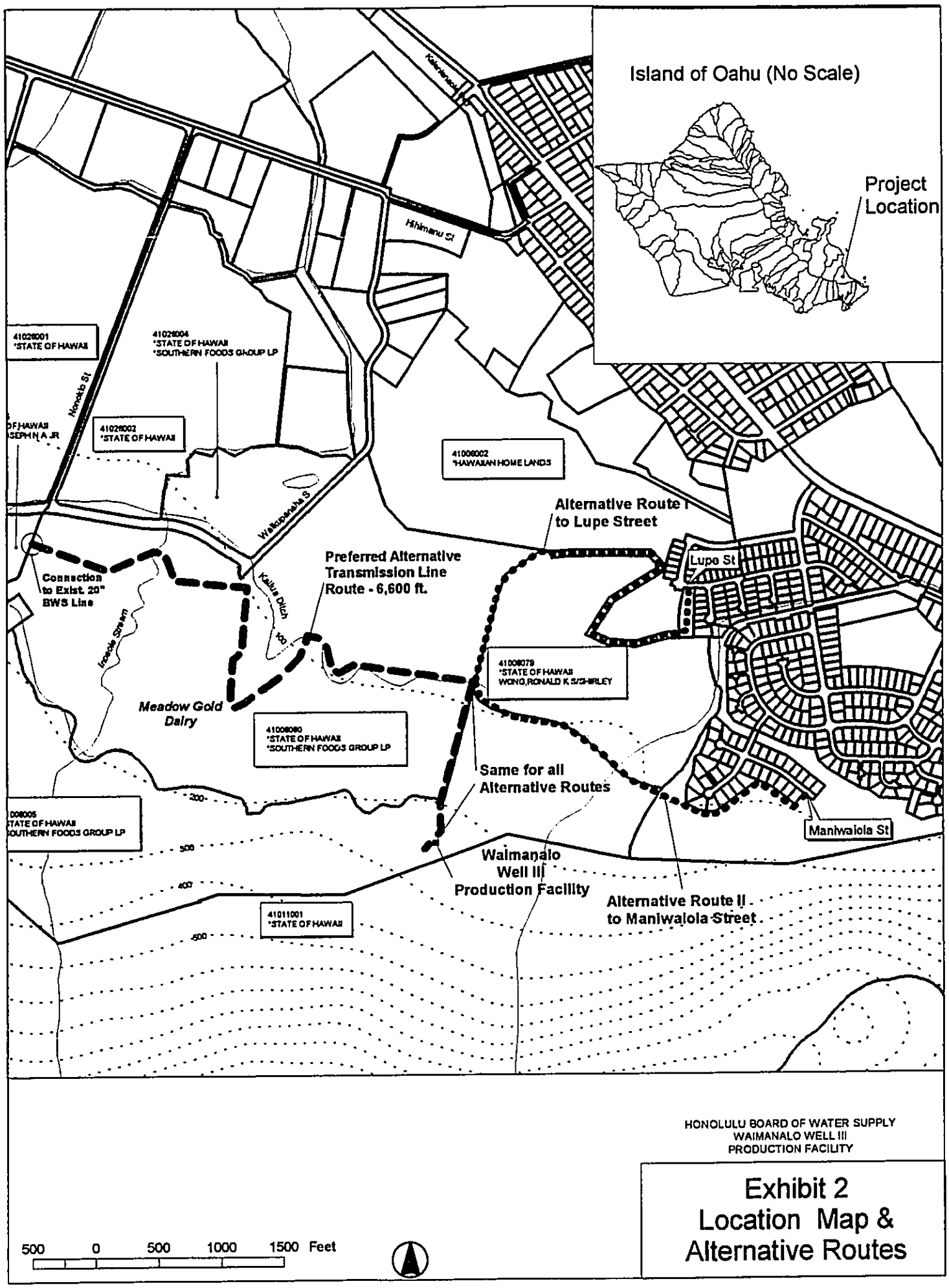

Hihimanu St
Nonokio St
Waikupanaha St
Kailua Ditch
100
Connection to
BWS 20-inch
Line at
Nonokio St
Inoaole Stream
Preferred Route
Meadow Gold
Dairy
200
300
400
500
Waimalo
Well III
Production Facility
Flood Zone
Flood Zone
A
D
X
X500
Waimalo Aquifer
Sustainable Yield 8 MGD
Available Allocation 6.344 MGD
Kahawai Watershed
500 0 500 1000 1500 Feet
HONOLULU BOARD OF WATER SUPPLY
WAIMANALO WELL III
PRODUCTION FACILITY
Exhibit A
Watershed, Aquifer & Flood Zone


Hihimanu St
41026001
*STATE OF HAWAII
41026004
*STATE OF HAWAII
*SOUTHERN FOODS GROUP LP
Nonokio St
41026015
*STATE OF HAWAII
RYAN,JOSEPH N A JR
41026002
*STATE OF HAWAII
41008002
*HAWAIIAN HOME LANDS
Waikupanaha S
Connection
to Exist. 20"
BWS Line
Preferred Alternative
Transmission Line
Route - 6,600 ft.
Kailua Ditch
100
Inoaole Stream
41026017
*STATE OF HAWAII
SANANIKONE,PUONGPUN/THANH LO
41008079
*STATE OF HAWAII
WONG,RONALD K S/SHIRLEY
Meadow Gold
Dairy
41008080
*STATE OF HAWAII
*SOUTHERN FOODS GROUP LP
BWS
2.0 Mil Gal
Reservoir
200
300
400
500
41008005
*STATE OF HAWAII
*SOUTHERN FOODS GROUP LP
Waimanalo
Well III
Production Facility
41011001
*STATE OF HAWAII
HONOLULU BOARD OF WATER SUPPLY
WAIMANALO WELL III
PRODUCTION FACILITY
Exhibit B
Owners & TMK
500 0 500 1000 1500 Feet



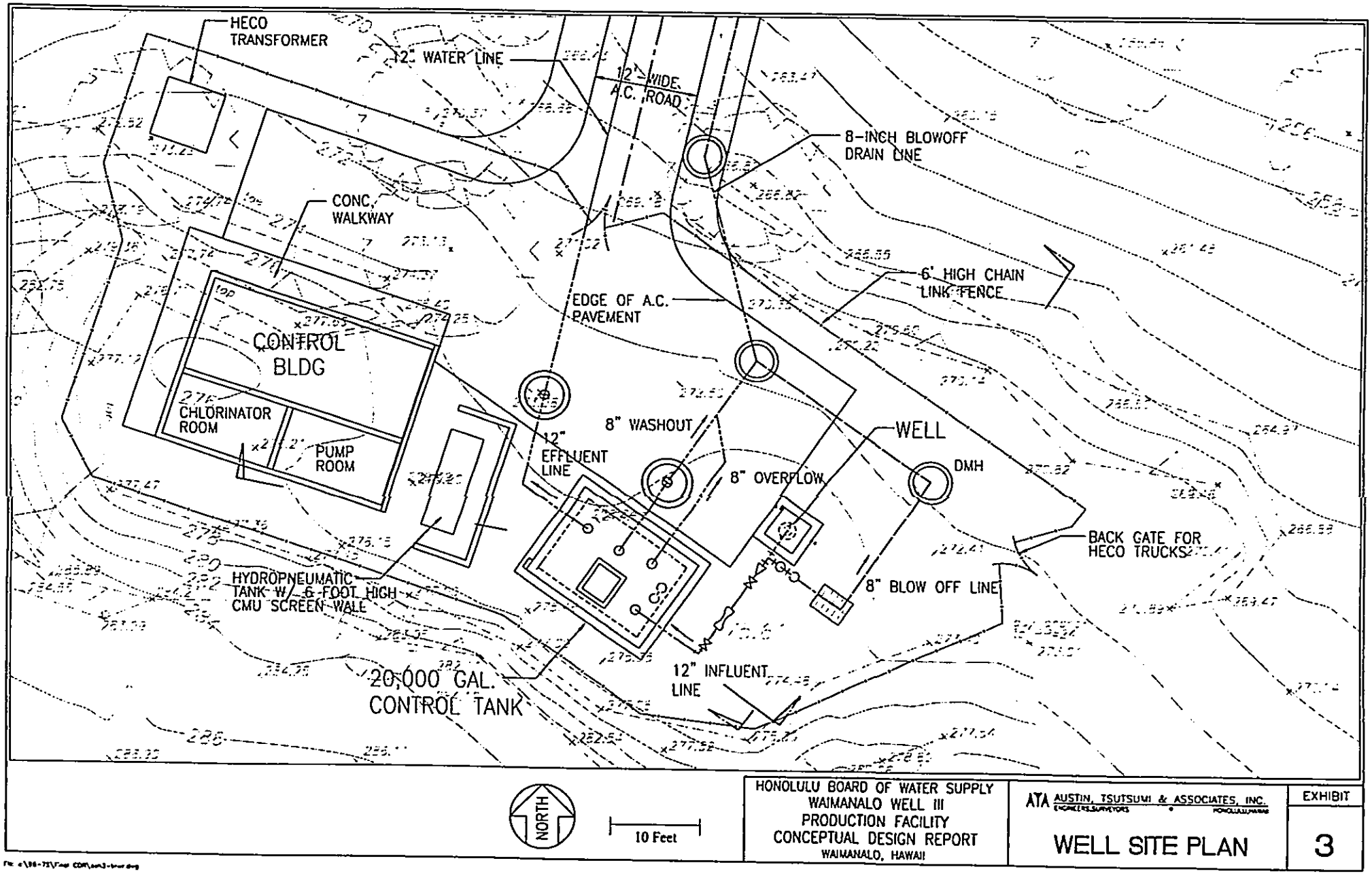
HONOLULU BOARD OF WATER SUPPLY WAIMANALO WELL III. PRODUCTION FACILITY CONCEPTUAL DESIGN REPORT WAIMANALO, HAWAII	AUSTIN, TSUTSUMI & ASSOCIATES, INC. ENGINEERS, SURVEYORS • HONOLULU, HAWAII WATER SYSTEM SCHEMATIC	EXHIBIT 1

File: 98-75\EXH8.DWG



HONOLULU BOARD OF WATER SUPPLY
WAIMANALO WELL III
PRODUCTION FACILITY

Exhibit 2
Location Map & Alternative Routes

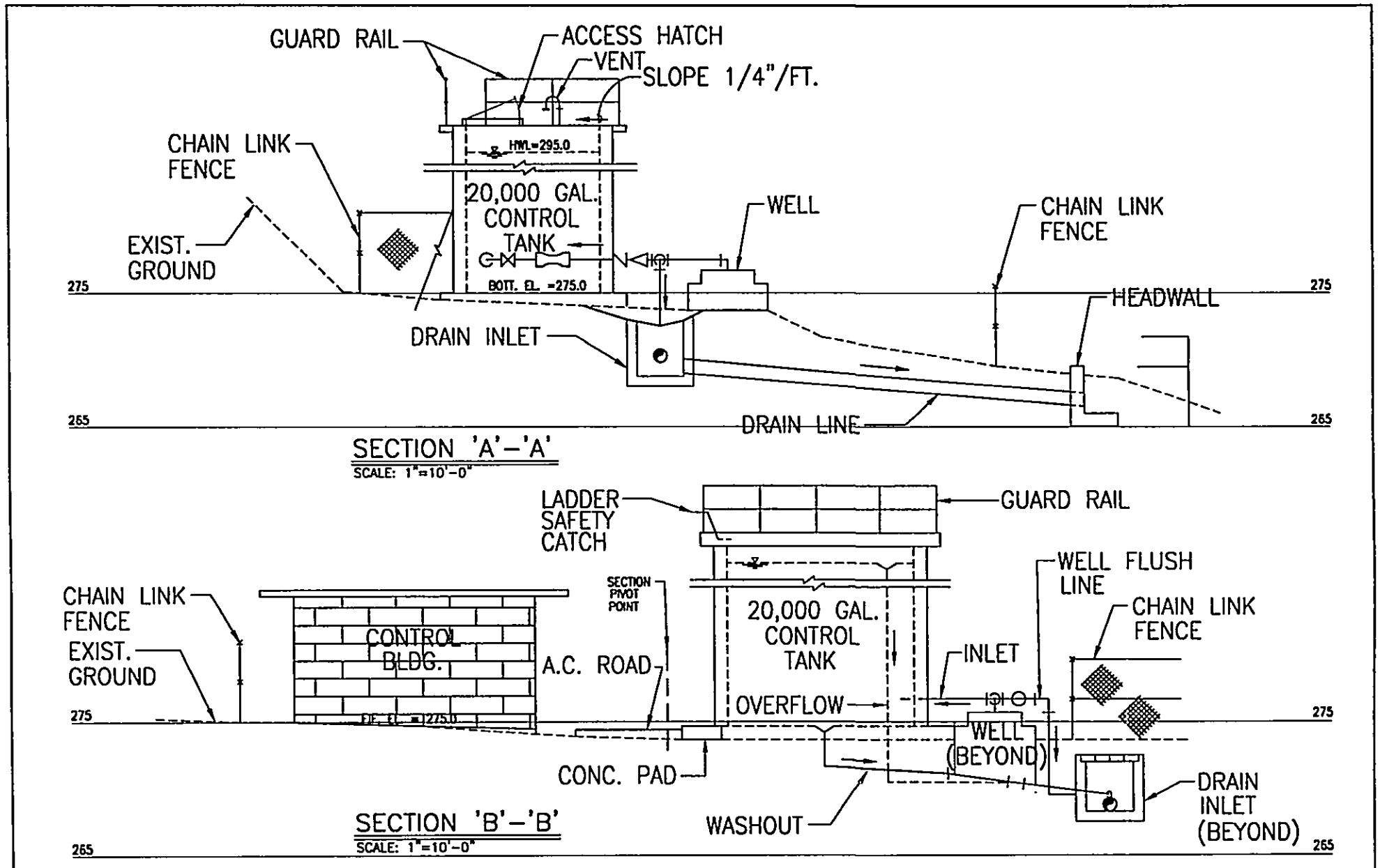


HONOLULU BOARD OF WATER SUPPLY
WAIMANALO WELL III
PRODUCTION FACILITY
CONCEPTUAL DESIGN REPORT
WAIMANALO, HAWAII

ATA AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS/SURVEYORS • HONOLULU/MAUI

WELL SITE PLAN

EXHIBIT 3



HONOLULU BOARD OF WATER SUPPLY WAIMANALO WELL III PRODUCTION FACILITY CONCEPTUAL DESIGN REPORT WAIMANALO, HAWAII	AUSTIN, TSUTSUMI & ASSOCIATES, INC. ENGINEERS, SURVEYORS • HONOLULU, HAWAII **WELL SITE SECTIONS**	EXHIBIT **4**

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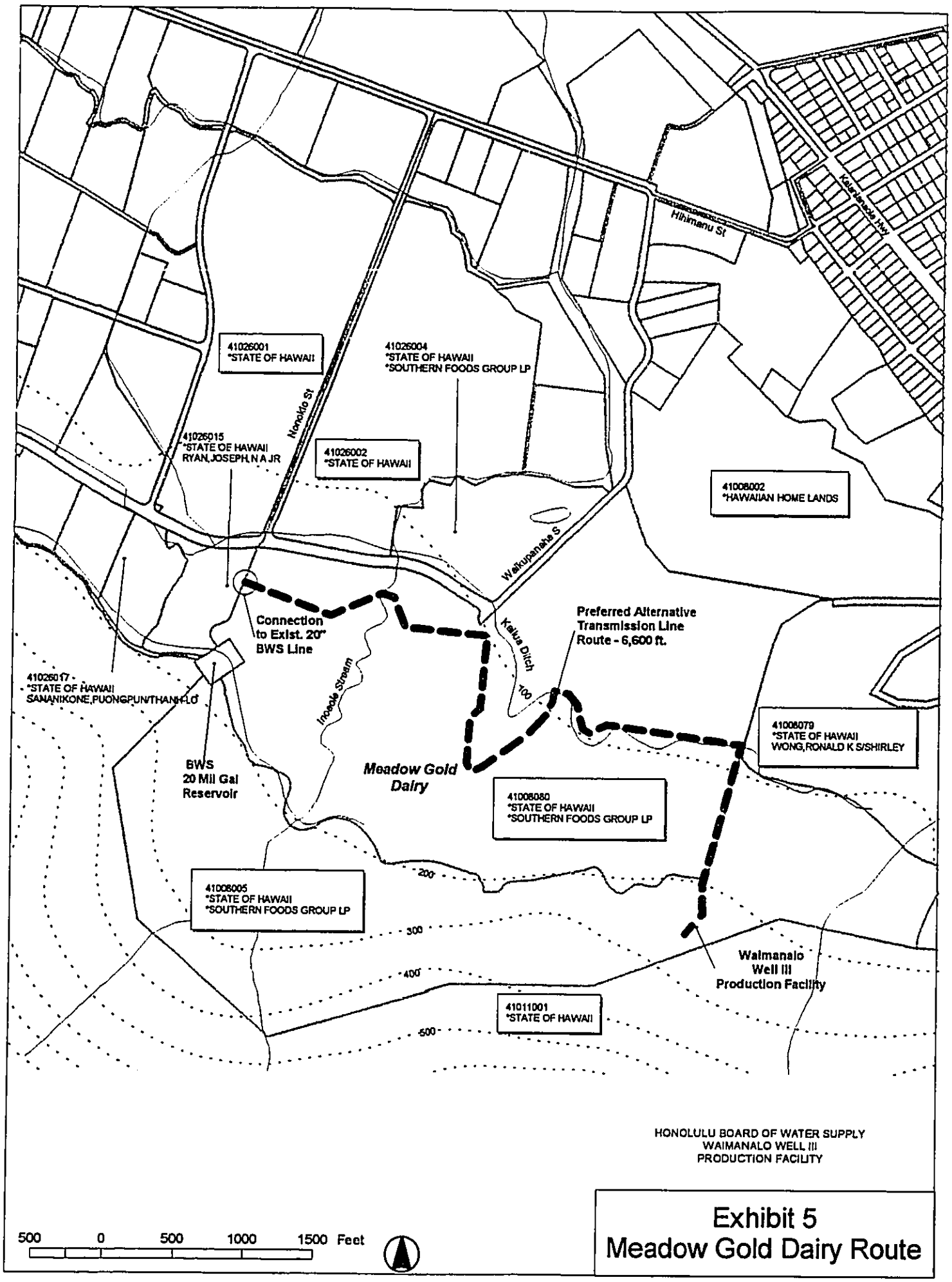
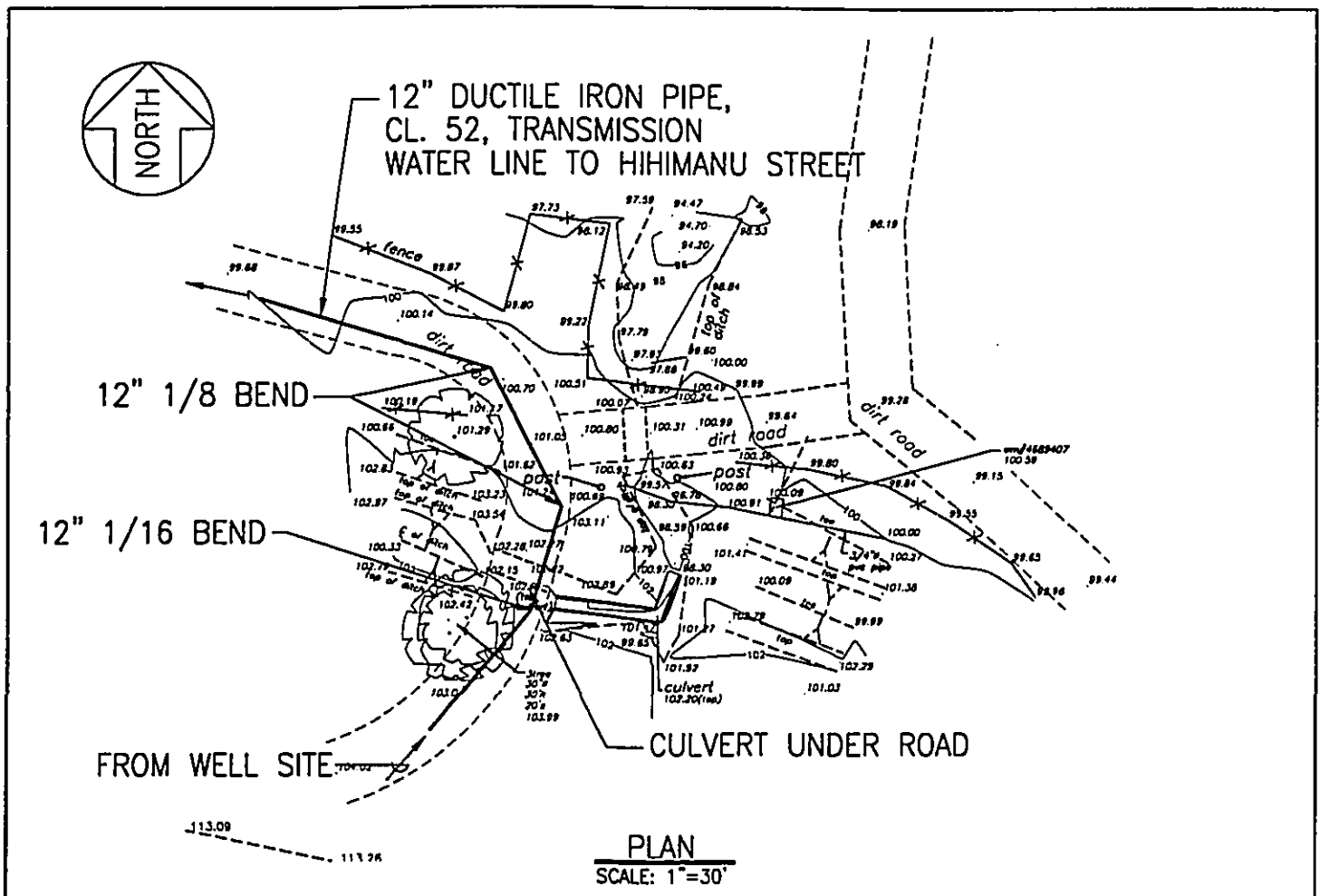
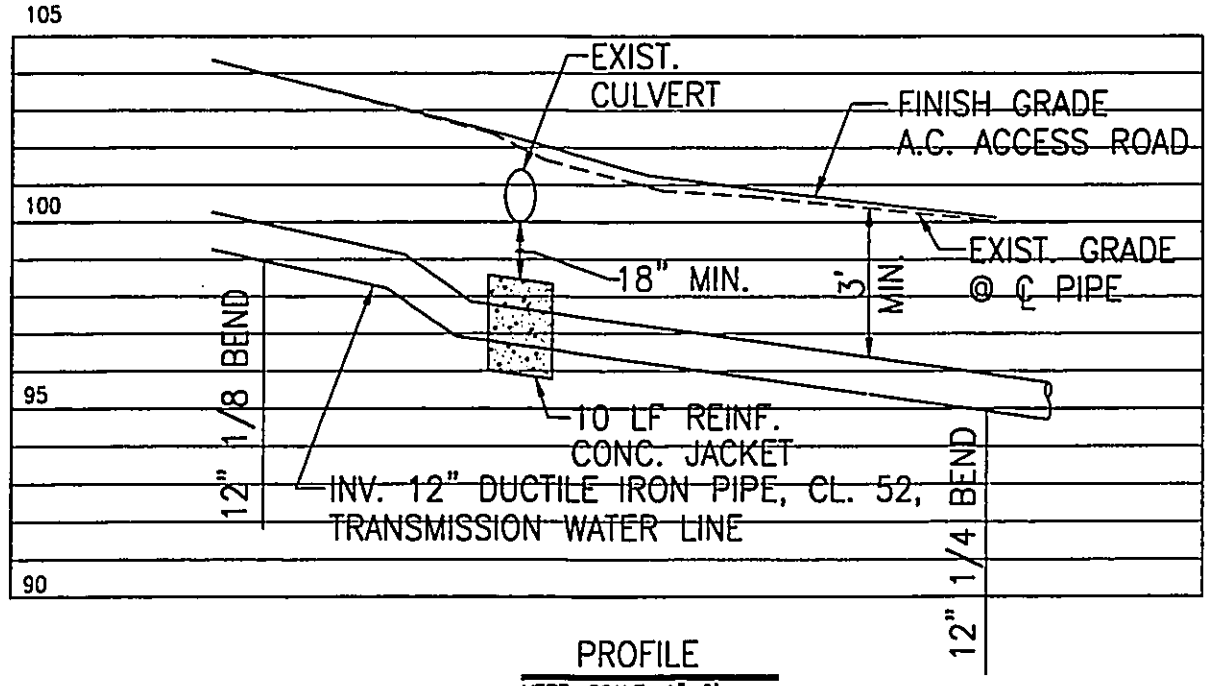


Exhibit 5
Meadow Gold Dairy Route



PLAN
SCALE: 1"=30'



PROFILE
VERT. SCALE: 1"=5'
HOR. SCALE: 1"=30'

HONOLULU BOARD OF WATER SUPPLY WAIMANALO WELL III PRODUCTION FACILITY CONCEPTUAL DESIGN REPORT WAIMANALO, HAWAII	AUSTIN, TSUTSUMI & ASSOCIATES, INC. ENGINEERS,SURVEYORS • HONOLULU,HAWAII 1ST DITCH CROSSING	EXHIBIT 6

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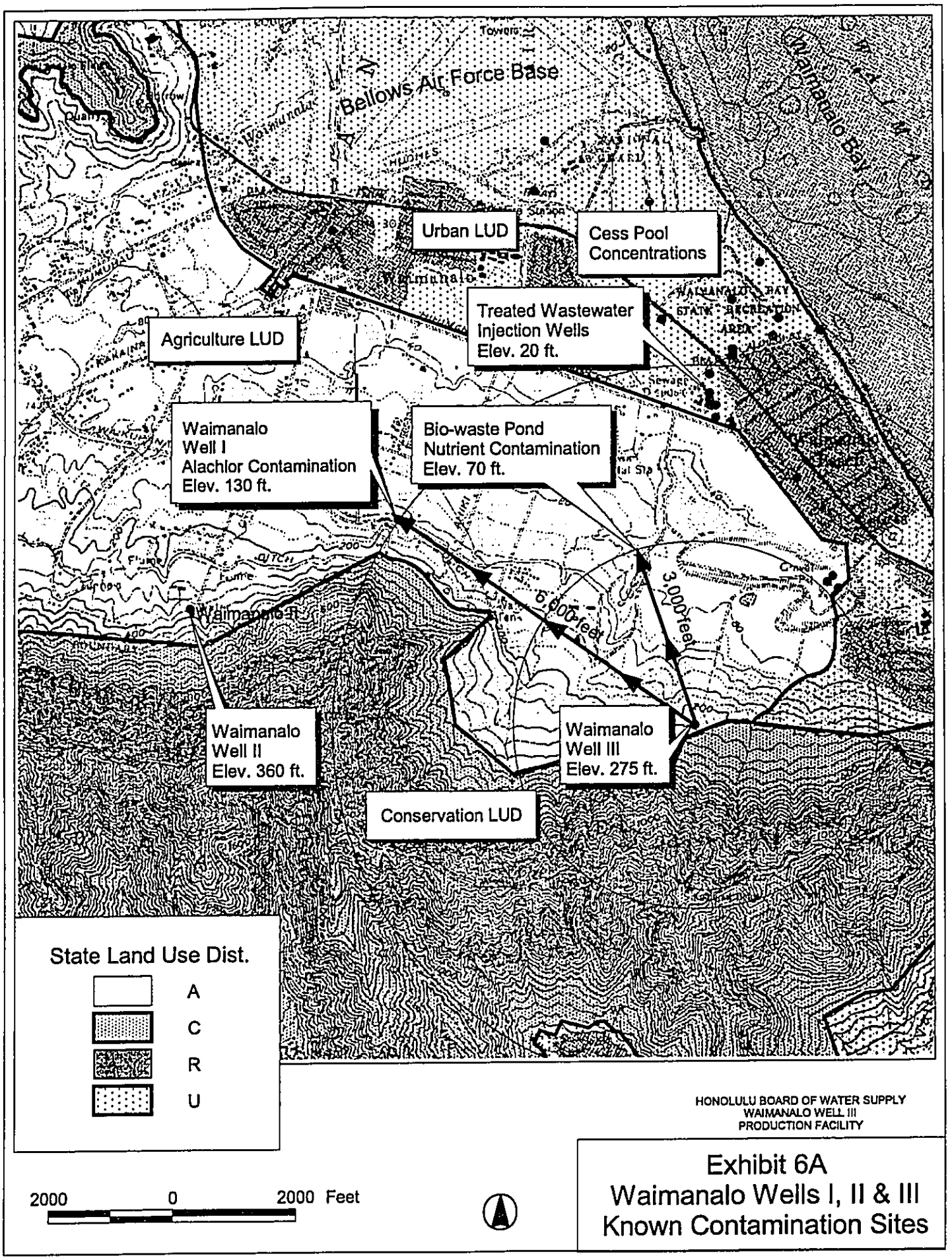


Exhibit 7 - Photo Page. Waimanalo Well III development, access road and transmission line.
E. P. Dashiell, AICP, July 17, 1999.

Figure 1. Irrigation Ditch is "bridged" by an existing concrete pipe culvert. This is the main stem of the ditch facing its point of origin in Maunawili. Road crossing shown above is to the well site (to left of photo).

Figure 2. This wooden gate with an opening about 1-foot by 1-foot is used to control water from the main stem of the ditch to the end user – a grower of sweet corn. The second road crossing is over the concrete pipe culvert immediately behind this gate.

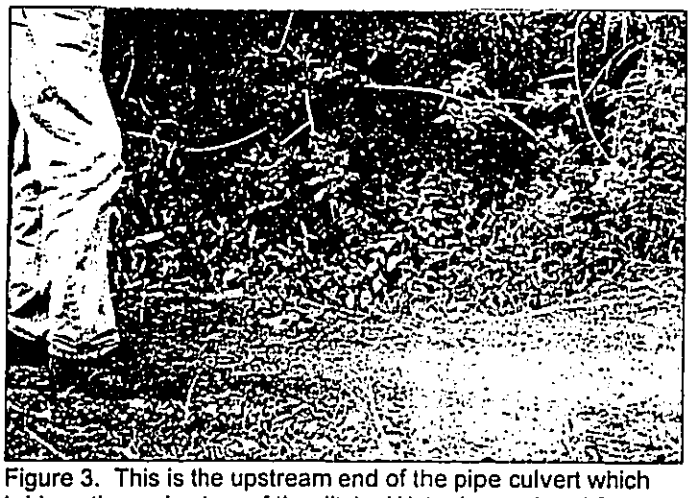


Figure 3. This is the upstream end of the pipe culvert which bridges the main stem of the ditch. Water is regulated from the originating reservoir and only flows during certain periods, or during certain days, depending on crop cycle and water availability.

Figure 4. This is the downstream end of the pipe culvert described in Figure 2, which conveys water to the corn field.

Appendices

A Archaeological Report

B Registration Form, National Register of Historic Places, Kailua Ditch System/Kailua Ditch System (Draft)

C Botanical Report

D Laboratory Report, Waimanalo Well III

E Coordination, Comment and Response Letters

F Environmental Assessment for an Exploratory Well and Access Road at Waimanalo, Oahu (excluding appendices)

Appendix A

Archaeological Report

ASC0182

ADDENDUM ARCHAEOLOGICAL INVENTORY SURVEY: NEW PREFERREDTRANSMISSION ROUTE BWS WAIMANALO WELL III WAIMANALO, KO`OLAUPOKO, O`AHU (TMK 4-1-08:80)

by

Aki Sinoto

for

Austin Tsutsumi & Associates, Inc.
501 Sumner Street, Suite 521
Honolulu, Hawaii 96817-5031

August 2001

Aki Sinoto Consulting
2333 Kapiolani Blvd. No. 2704
Honolulu, Hawaii 96826

INTRODUCTION

Supplementary surface, walk-through survey of a new preferred route, under consideration by the Board of Water Supply for the transmission of water produced by the proposed Waimanalo Well III facility, was undertaken by Aki Sinoto Consulting on Tuesday, June 26, 2001. The current survey is an addendum to the original inventory survey completed in August of 1999 and revised in February 2001 with a previous preferred route.

PROJECT AREA

The project area consists of a pipeline corridor primarily located within or paralleling existing roadways in the Meadow Gold area. The corridor skirts existing buildings in the currently abandoned Unisyn facility and continues along a dirt road that parallels and crosses Inoaole Stream. West of the stream, the corridor crosses an open field to an easement between existing residential lots on the east side of Nonokio Street, at the northern terminus of the proposed transmission alignment (Figs. 1-4). The project area is located within State land, under lease to the Southern Foods Group (TMK 4-1-08:80), in Waimanalo *ahupua`a*, Ko`olaupoko District, O`ahu Island.

METHODS

The entire length of the new route, from the Meadow Gold Dairy area through the former Unisyn Biowaste Technology facility, across the intermittently flowing Inoaole Stream, through open land, to its terminus at Nonokio Street was examined. The areas surrounding the stream and the banks were closely inspected for any buried structural or portable cultural remains.

RESULTS OF SURVEY

No surface or exposed subsurface cultural remains were encountered during the current survey. The eastern half of the corridor occurs in previously developed area with cattle paddocks, dairy facilities, paved areas of the former Unisyn facility, and existing roadways. The western half of the corridor traverses an open field which has previously been cleared for agriculture and traverses *mauka* of the existing residential lots to Nonokio Street, just below the Waimanalo 230 Reservoir (water tank), where it will be connected to an existing 20-inch BWS pipeline.

No historic irrigation ditch or tunnel features were encountered along the new alternate route. No artifacts or other cultural remains were observed on the surface, exposed in embankments or other areas of surface disturbance.

Subsurface testing was not considered to be warranted during the inventory and addendum surveys since the two newly recorded sites were located outside of the project limits and the transmission corridor occurred within existing roadways and areas extensively disturbed previously by agricultural or other development-related (Unysis and Meadow Gold) activities.

RECOMMENDATIONS

Although no significant cultural remains were encountered during the surface survey, archaeological monitoring during trenching for the transmission line should be implemented. Prior to construction commencement, an archaeological monitoring plan shall be prepared for approval by the State Historic Preservation Division of the Department of Land and Natural Resources. This plan shall define the requirements and scope of archaeological monitoring.

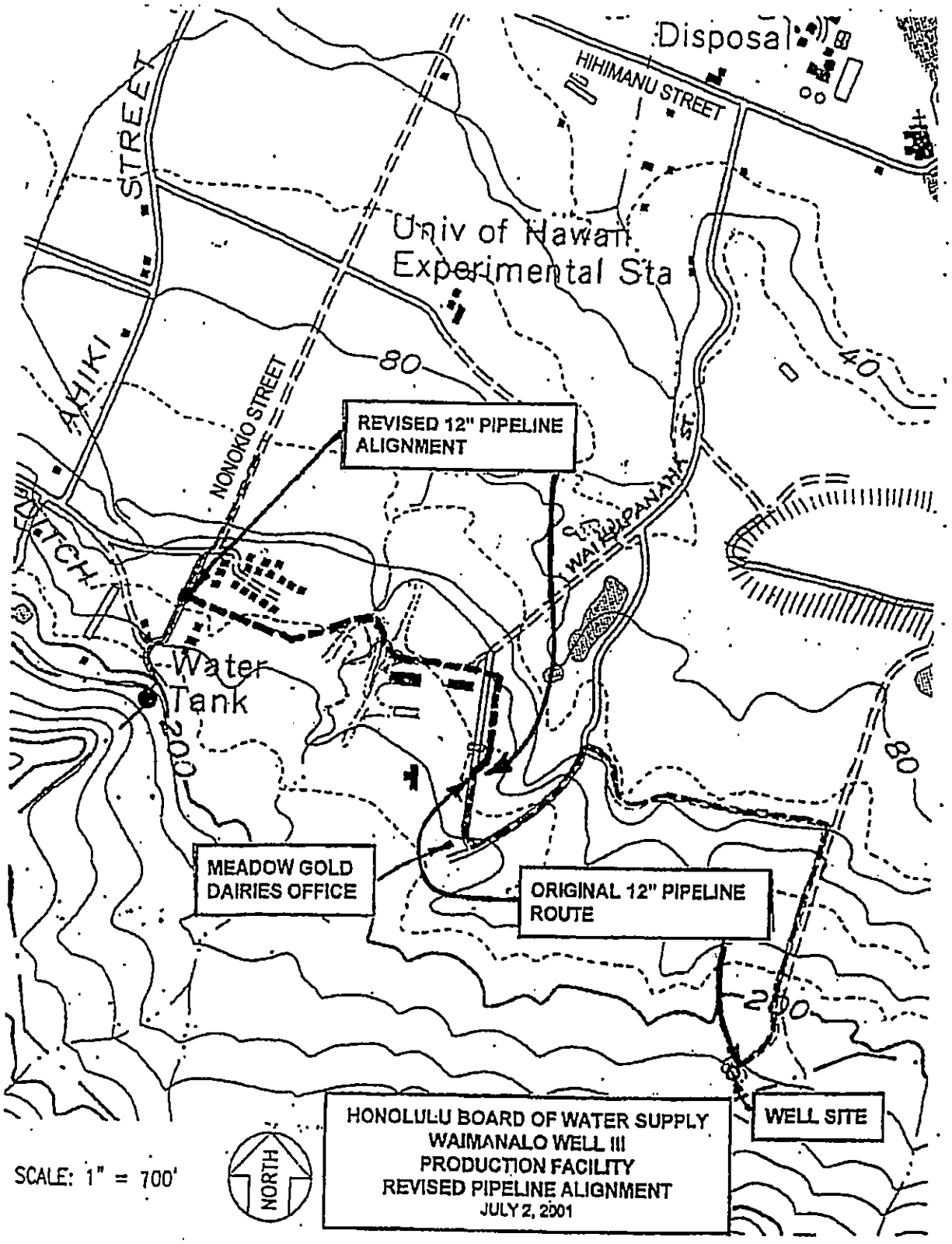


Figure 1. Map Showing the New Alternate Route Alignment

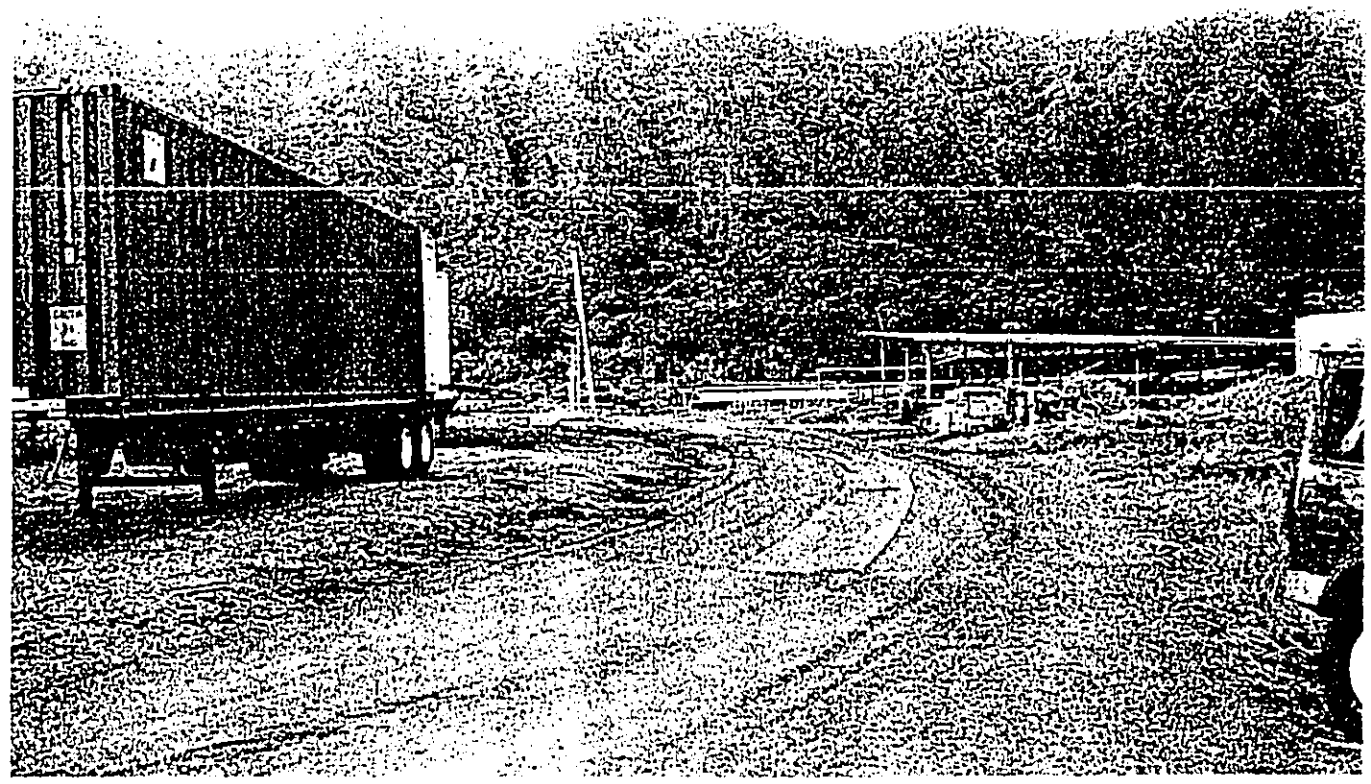
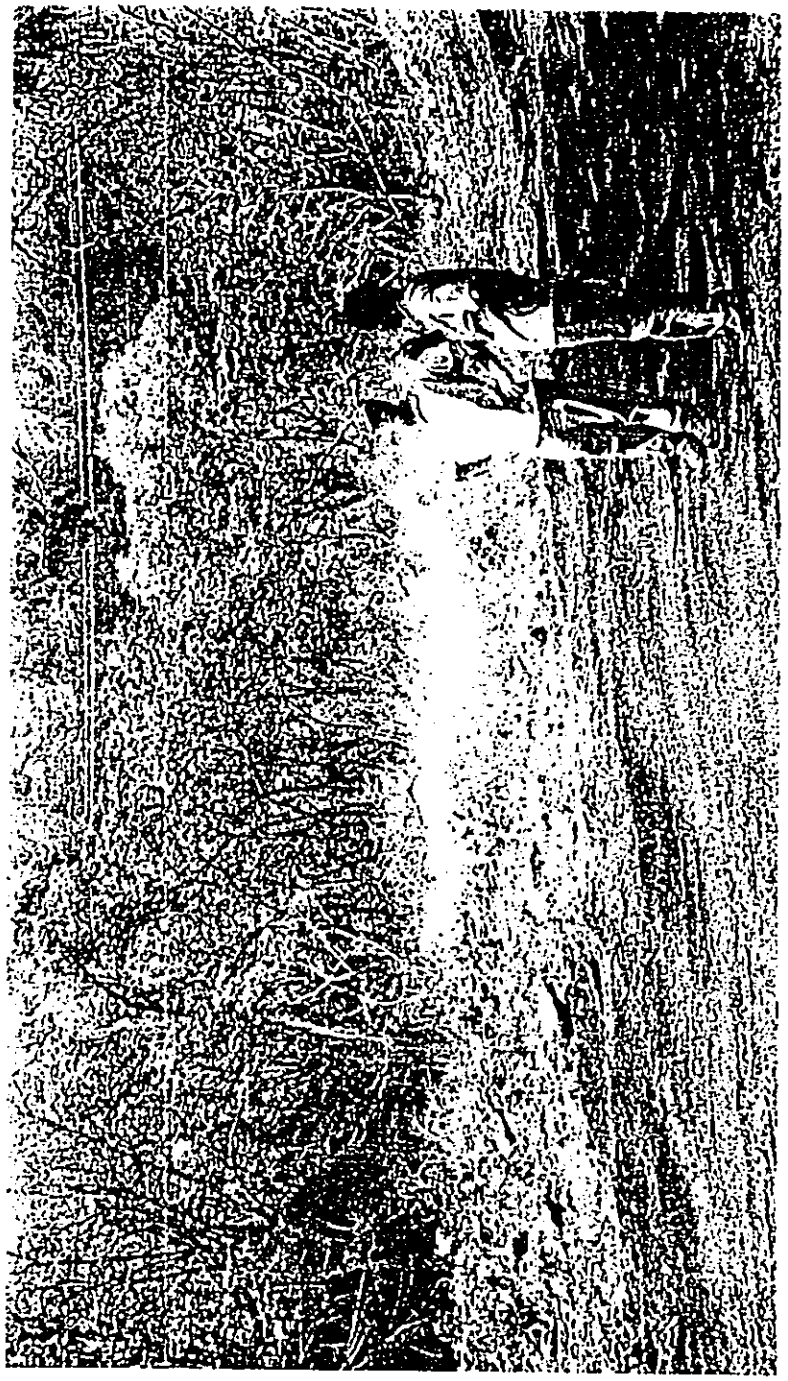


Figure 2. (top) View of Initial Portion of Corridor through Meadow Gold Dairy area. to south
(bottom) View if Roadway Paralleling Inoaole Stream. to north



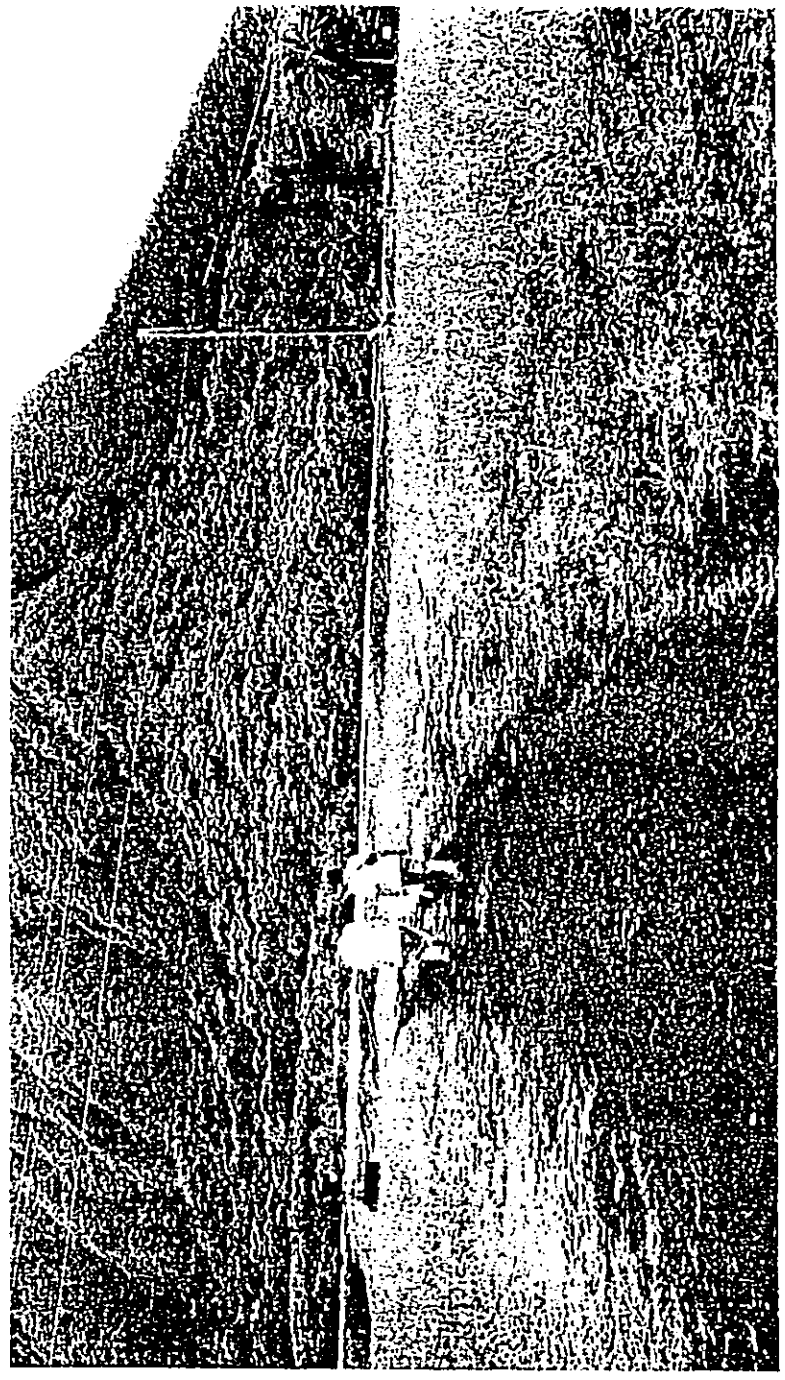


Figure 3 (top) View of Inaole Stream Crossing, to north
(bottom) View of Open Field, to west

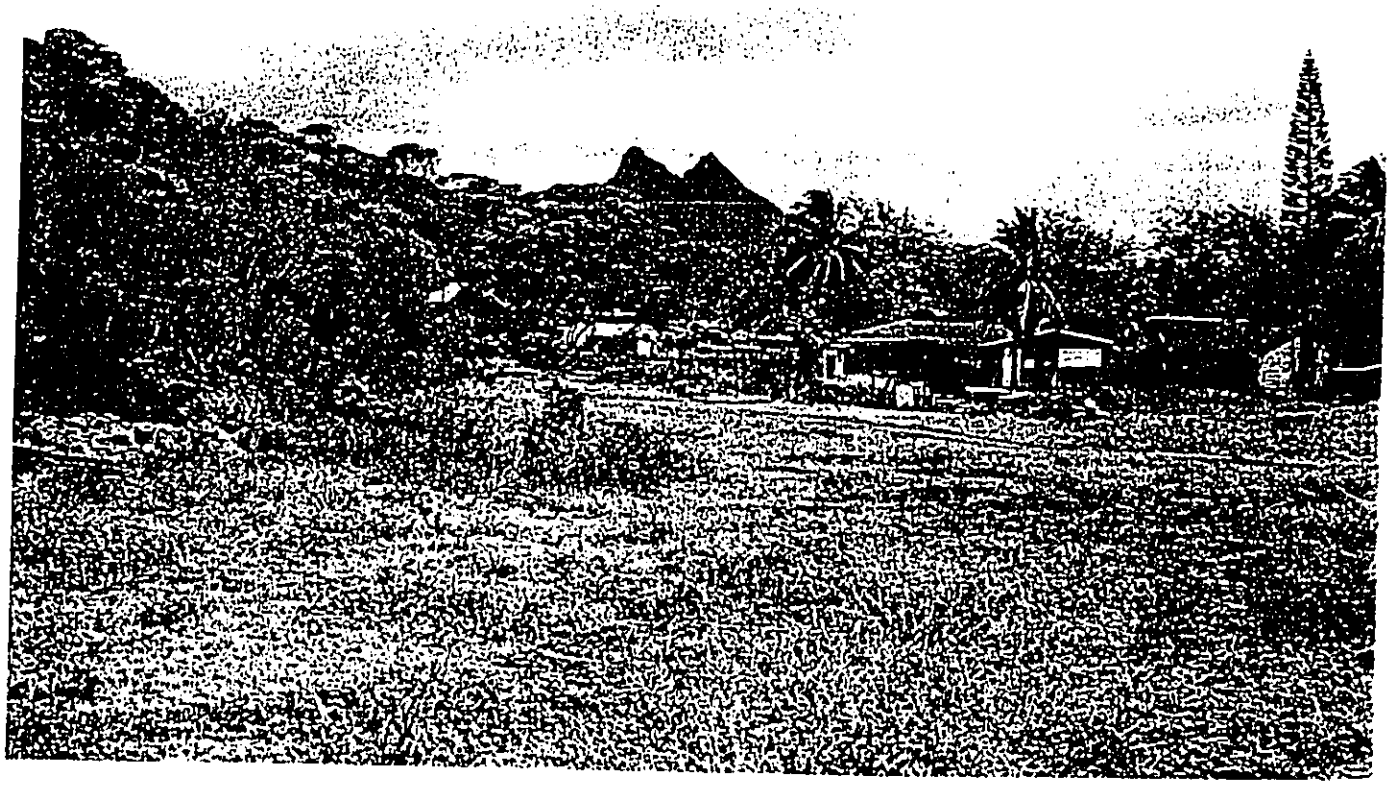


Figure 4. (top) View of Tailings along the Periphery of the Open Field, to south
(bottom) View of Existing Houses at Western Terminus of Route, to west

ASC0121

ARCHAEOLOGICAL INVENTORY SURVEY
BWS WAIMANALO WELL III
WAIMANALO, KO'OLAUPOKO, O'AHU
(TMK:4-1-08:05, 79, & 80)

by

Patricia Drolet, Ph.D.
and
Aki Sinoto

for

Austin Tsutsumi & Associates, Inc.
501 Sumner Street, Suite 521
Honolulu, Hawaii 96817-5031

Draft August 1999
Review Draft February 2001

Aki Sinoto Consulting
2333 Kapiolani Blvd. No. 2704
Honolulu, Hawaii 96826

ABSTRACT

An archaeological inventory survey was undertaken in conjunction with an environmental assessment being prepared for the development of Waimanalo Well III, in Waimanalo, Ko`olau Poko, O`ahu Island, as proposed by the Board of Water Supply of the City and County of Honolulu. The project area consisted of the well production facility located at the foot of the Ko`olau Range and the preferred corridor for the transmission pipeline right-of–way located between the well site and Hihiwai Street.

Extensive surface assessment, historical documents and literature search, and review of previous archaeology in the vicinity were conducted. Three areas of significance and one possible remnant of a historic railroad were found to be within the project area. Of the three, one was previously recorded; the Kailua Ditch ,a part of the Waimanalo Irrigation System. Two stacked stone structures located near the well facility were previously unknown and underwent mapping and other documentation.

The railroad bern was considered to lack integrity and no longer significant. The two structures are located outside pf the construction impact zone and are recommended for avoidance and preservation. The portion of the Kailua Ditch will be crossed at three localities by the transmission pipeline and appropriate mitigative and protection measures during and following pipeline installation should be implemented.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

An archaeological inventory survey in Waimanalo, Ko'olaupoko, O'ahu, was completed by Aki Sinoto Consulting of Honolulu, at the request of Austin Tsutsumi & Associates. The survey was undertaken in conjunction with an environmental assessment being prepared for the development of a freshwater-well production facility, transmission line, and associated infrastructure proposed by the Board of Water Supply, City and County of Honolulu. The fieldwork was conducted by Aki Sinoto and Paul Titchenal, M.A. The historic research was undertaken by Patricia Drolet, Ph.D. The original fieldwork was conducted in June 1999 and an additional surface assessment was undertaken in June 2000 when the preferred transmission route was changed.

PROJECT LOCATION

The Waimanalo Well III project area consists of the well and production facility (TMK4-1-08:05), access road, and transmission pipeline (TMK4-1-08:05&80). The 3,500 square-foot well facility is located at the base of the Ko'olau Mountains, in currently unused agricultural lands, immediately below the electric transmission corridor at the 275 foot elevation. The 1,430 linear-foot access road and 8,400 linear-foot transmission pipeline corridors begin at the 275 foot elevation and terminate around 20 ft. amsl (Fig. 1). The lower sections of the transmission corridor traverse existing paved and unpaved roadways within the Meadow Gold Dairy property, through Waikupanaha Street and onto Hihiwai Street.

ENVIRONMENT

Waimanalo is located in the Ko'olau Poko District on the Island of O'ahu. The traditional *ahupua'a* covers approximately 7,000 acres (2832.8 ha) (Belt Collins 1995:2-18-19) or almost 11 mi^2 (28 km^2) (Bartholomew and Associates 1959:9). Natural boundaries extend from the Ani'aninui ridge and Keolu Hills in the north to the Ko'olau Poko range in the south and southwest. Waimanalo Bay defines the eastern boundary while the Waimanalo Forest Reserve in the Ko'olau Range is the western boundary (Belt Collins 1995:2-18;19). Prominent geographical features include Puu o Kona rising to an elevation of 2,200 feet (670.5 m) (Bartholomew and Associates 1959:9) and Waimanalo Stream (traditionally known as Puha Stream) which drains the northwest part of the valley creating a basin area of 5 mi^2 (12.9 km^2) (Park Engineering 1991:4-7).

The topography is characterized by three gradients: coastal plain and inland area with gently rising slopes less than 12%; the Ko'olau Poko foothills from 12-20% and from the slopes to the

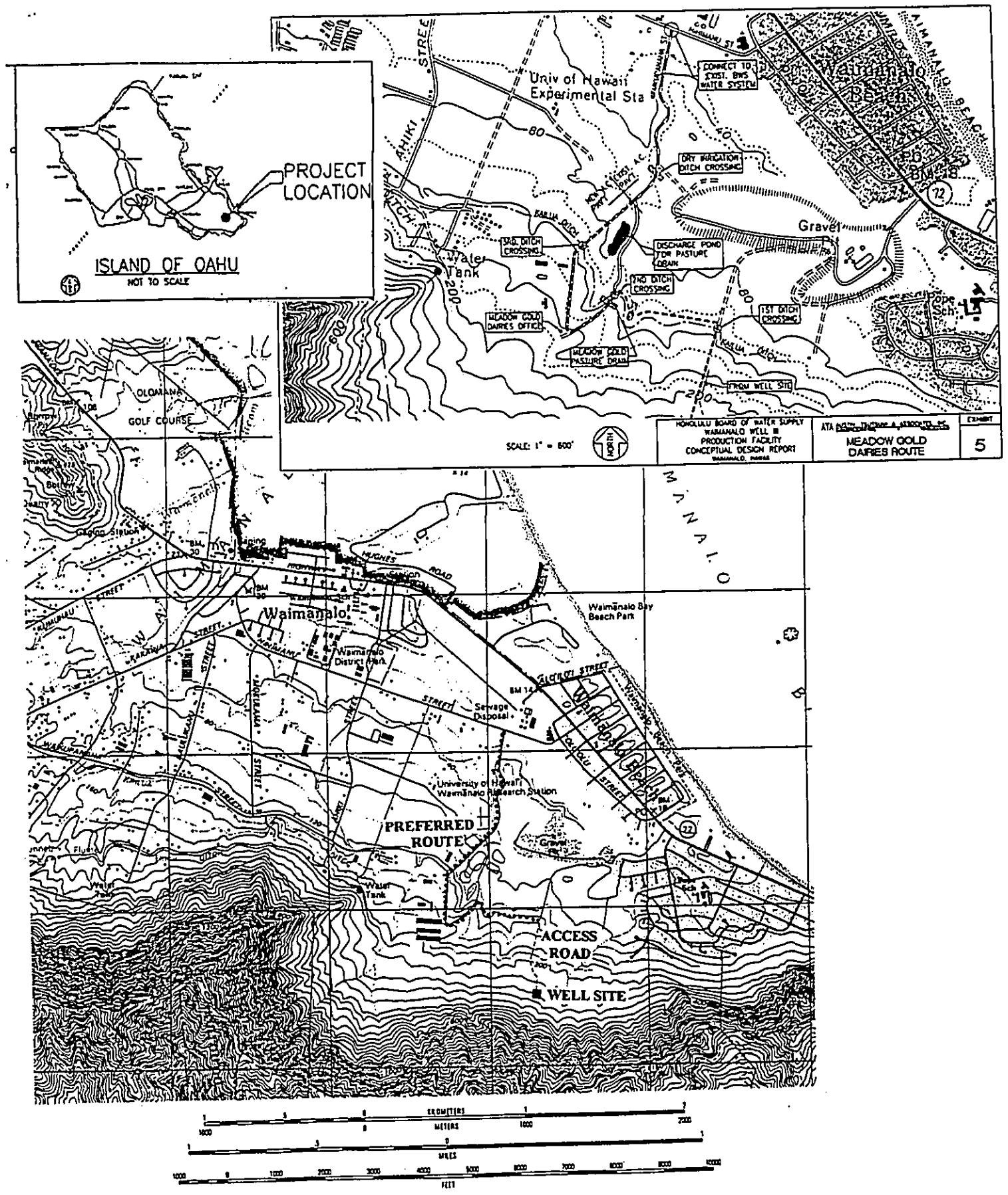


Figure 1. Location of Project Area on USGS Koko Head Quadrangle and on Project Location Map by Austin Tsutsumi & Associates.

crest with gradients from 20% to almost vertical (Hawaii Pacific Engineers 1998:3-7). Coastal plain sediments are composed of coral inter-bedded with reddish-brown, alluvial clays and silts, which eroded from the foothills (Hawaii Pacific Engineers 1998:3-7). The inland and foothill areas to the north and west have soils which are basaltic bedrock, Koolau Dike Complex and Koolau Basalts, part of the Ko'olau Volcano Caldera structure. Numerous openings in the basalt including lava tubes, clinker layers and joints provide for groundwater storage and flow (Belt Collins 1995:4-2). Along the southwestern section of Waimanalo, the silty clays and loams belong to the Kaneohe, Lolekaa and Waikane series (Fukunaga and Associates 1984:8).

Waimanalo Stream, with the traditional name of Puha Stream, is the only perennial water source in the valley, fed by the dry weather tributaries of Ainoni, Makawao and East Maunawili Streams (Fukunaga and Associates 1984:2). Average annual rainfall is between 50"(1270 mm) on the coast to 100" (2540 mm) per year, with the increase in the inland and Ko'olau foothill area. There is rapid runoff and moderate to severe erosion due to the deep and well-drained soils, slopes and ridges (Hammatt and Borthwick 1988:8).

The steep rising slopes provide for runoff and water channeling into the Waimanalo basin extending 5 mi^2 (12.9 km^2) and emptying into Waimanalo Bay. This area, however, has few perennial streams, and water channeling in historic times has occurred through the man-made Maunawili Ditch system. Constructed in 1878, the ditch extends above the 400 ft (121.9 m) elevation from the Ani'aninui Ridge in upper Maunawili Valley and continues east to Waimanalo, paralleling the Waimanalo Forest Reserve in the Ko'olua Poko Range (Kilbey 1980:3). The Ditch consists of 16,000 ft (4876.8 m) of lined and unlined open ditches, tunnels, and elevated wooden flumes (Fukunaga and Associates 1984:2). Water is supplied by the Ainoni, Makawao and East Maunawili Streams, as well as the Palapu, Omao, West Maunawili and Olomana Streams, which are all tributaries of Maunawili Stream (Fukunaga and Associates 1984:14). Several dry-weather springs (Omao, Kapakahi, Aioni, Pikoaukea, Makawao) feed into the ditch (Bartholomew and Associates 1959:52 Plate 16). Three tunnels channel water into the ditch system in Maunawili, referred to as the Clark, Fault, and Korean tunnels. In Waimanalo; the tunnels were previously referred to as C & B and Plantation Tunnels (Bartholomew and Associates 1959:52, Plate 16), and were later designated as the Board of Water Supply (BWS) Waimanalo Water Tunnels (Hawaii Pacific Engineers1998:322, Fig. 3-8). Two active wells, Board of Water Supply Waimanalo Wells I and II, and a proposed third Well III are located east of the Maunawili and Waimanalo water tunnels, where Well III is located near the Waimanalo

Forest Reserve (Hawaii Pacific Engineers 1998:322, Figure 3-8). Currently, Well I has been closed due to chemical contamination and Well III is intended to replace its yield. Two reservoirs, Kailua and Maunawili, are located on the upper slopes in the eastern part of the ditch by the BWS Waimanalo Water Tunnels I-IV (Hawaii Pacific Engineers 1998:322, Figure 3-8).

Flora along the beach and inland area is composed of ironwood (*Casuarina equisetifolia*), *koa-haole* (*Leucaena leucocephala*) and *wili laike* or Christmasberry (*Schinus terebinthifolius*). Mixed forest species of Eucalyptus (*Eucalpytus spp.*), red sandalwood (*Adenanthera paumina*), *'ulei* (*Osteomeles anthyllidfilia*) (Kuck and Tongg 1958) and *koa-haole* are found along the foothills to the north, west and south (Belt Collins Appendix I:3-7). Within the project area, Eucalyptus is the dominant high cover vegetation with localized stands of mango (*Mangifera indica*). For a more comprehensive inventory of flora, the reader is referred to the botanical consultant's report included as Appendix C in the Environmental Assessment document.

Terrestrial fauna include endangered bird species of short eared owl (*Asio falmmeus sandwichensis*), black necked stilt (*Himantopus mexicanus knudseni*), Hawaiian duck (*Anas wyvilliani*), Hawaiian coot (*Fulica alai*) and common moorhen (*Ballinula chloropus sandwicensis*) (Belt Collins 1995:4-31). Aquatic fauna includes one native species of goby (*Awaous stamineus*) found in Waimanalo Stream (Belt Collins 1995:4-11). Mountain shrimp (*Atya bisulcata*), Tahitian prawn (*Macrobachium lar*), crayfish (*Procambarus clarkii*), short fin molly (*Peocilia mexicana*), green swordtail (*Xiphophorus helleri*) and pond snail (*Melania sp.*) are present in Maunawili Ditch (Fukunaga and Associates 1984:18).

METHODS

The three-fold objective of the current study consisted of; determining the presence/absence of historic properties, evaluating their significance, and recommending appropriate measures to mitigate any adverse effects of the proposed development. Major scope items for the current investigation included: historical background and literature search, review of previous archaeological research, surface survey, and preparation of a report synthesizing the resultant data. Also consultation with the State Historic Preservation Division (SHPD) of the Department of Land and Natural Resources, other pertinent agencies, and interested community groups and individuals was to be undertaken as warranted.

Fieldwork consisted of walking systematic transects throughout the project area by a two-person team in the area of the well facility. Within the area of the transmission line and access road corridors, one person walked the length of the corridor. Plane-table mapping of previously unrecorded features was conducted using a Tamura Telescopic Alidade and metic stadia rod. Photographic recording was done using color film on a 35mm format. Standard archaeological procedures were followed during recording, documentation, and all other phases of the current undertaking..

Searches for historical background and previous archaeological research information were conducted at; the Hamilton Library of the University of Hawaii, the Survey Office of the State Department of Accounting and General Services, the State Historic Preservation Division Library, the State Bureau of Conveyances, the Bishop Museum Library, and the Hawaii State Library.

HISTORIC LAND TENURE AND USE

Early historic sources mention Waimanalo as one reference place on eastern O'ahu. Several of the earliest maps by Ursula Emerson in 1833 (Fitzpatrick 1985:108) and the Lahainaluna School in 1838 (Fitzpatrick 1985:110-111) locate Waimanalo along the Puha (now Waimanalo) Stream as well as the boundaries of the *ahupua'a*. Other early maps by Kepohoni in 1839 (Fitzpatrick 1985:114), James Wyld in 1843 (Fitzpatrick 1985:144-145) and the US Exploring Expedition in 1844 (Fitzpatrick 1985:101) indicate that Waimanalo was populated although depicting no structures. Few historic accounts mention Waimanalo prior to 1850. In 1828 Levi Chamberlain described the Waimanalo area as a considerable settlement with dogs, hogs and fowl (Hammatt and Borthwick 1988:12). A small Catholic chapel existed in the early 1840s where a priest visited periodically to conduct mass (Schoofs 1978:98). Waimanalo is also mentioned as a place named in several Hawaiian legends by Fornander (1969: v. II: 262; 1974:v.1: 300), Sterling and Summers (1978:245;246) and Thrum (1912:212).

Land use within the *ahupua'a* of Waimanalo prior to 1850 followed traditional Hawaiian subsistence practices. As crown land owned by Kamehameha I and Kamehameha III, Hawaiians engaged in agriculture and arboriculture in the lowlands and gently sloping foothills together with exploiting marine food resources (Carson 1997:12;21) along the coast. Taro (*Colocasia esculenta*) was grown in irrigated terraces while sweet potatoes (*Ipomoea batatas*) were cultivated in the valley basin and along the sandy plains (Handy and Handy 1972:155).

Breadfruit (*Artocarpus incisus*), mountain apple (*Eugenia malaccensis*), *kukui* (*Aleurites moluccana*), and coconut (*Cocos nucifera*) were planted in the valley while the stream banks were covered with *ti* (*Cordyline terminalus*) and paper mulberry or *wauke* (*Broussonetia papyrifera*) (Sterling and Summers 1978:244). Fish were raised in *lo'i* (pondfield) fishponds while a coastal fishpond named Pahonu perhaps kept sea turtles for the *ali'i* (Belt Collins 1995 Appendix C: 2-19). Waimanalo Bay provided many marine resources including various fish, sea urchin (*Echinoderms*) and turtles (*Chelonia mydas* and *Eretmochelys imbricata*). The bay also offered logistical sea access to eastern O'ahu in defensive battles, although Waimanalo played a minor role in traditional warfare (Kamakau 1961:168).

Traditional land use and tenure changed in Waimanalo as a result of the Great Mahele after 1850. The entire *ahupua'a* of Waimanalo except for 8 *kuleana* was leased to Thomas Cummins for 50 years (Indices of Awards). Cummins, a foreigner who married into the Liloa line of Hawaiian nobility, converted the 6,970 acres (2820.6 ha) to pasture to breed cattle, sheep, and race horses (Belt Collins 1995:Appendix E:7). The native Hawaiian population of Waimanalo *ahupua'a* suffered a decline, a phenomenon repeated throughout the Hawaiian Islands (Carson 1997:8). The area directly adjacent to the Waimanalo Forest Reserve included *kuleana* granted in 1850 to Piimoku (LCA 234-K) (Bureau of Conveyances V. 2:1131) and to Keoni (LCA 235-00) (Bureau of Conveyances V. 5:22). Native Hawaiians who continued to farm on their deeded land plots had to fence out cattle to protect their crops. Many Hawaiians including Piimoku and Keoni sold their *kuleana* to Cummins (Bureau of Conveyances 1886:Book 98:324) or to the plantation company he eventually formed (Bureau of Conveyances 1879:Book 136:492; 1892:Book 136:493), thereby gaining an additional 200 acres (80.0 ha) to his land holdings. The Cummins Ranch became known as a recreational retreat accessed by sea transport, a pier, and eventually train transport which was frequented by Hawaiian royalty who enjoyed the horse races and other forms of entertainment (Cummins 1913:235).

In the 1870s pasture was replaced first by rice and then by sugarcane. Together with a change in land use was a change in the population and ethnic mix of the area. Chinese immigrants settled in Waimanalo and planted rice along the Waimanalo River under agreement with Cummins (Bureau of Conveyances 1878: Book 59:134; 1879: Book 60:464; 1881: Book 68:143,463,467, 470,474, 477, 480; 1884: Book 89:330 (Char and Char 1988:35)). As a result of the Reciprocity Treaty of 1875 between the Territory of Hawaii and the United States giving sugar growers a free market (Bartholomew and Associates 1959:14), Chinese rice farmers switched to planting sugarcane

(Honolulu Advertiser 1931:1; Hammatt and Borthwick 1988:17). Sugarcane became so profitable that between 1877-1881, Thomas Cummins' son, John, converted 900-1000 acres (364.2-404.6 ha) of ranchland to sugarcane (Conde and Best 1973:364). The Waimanalo Sugar Company, founded by Cummins and chartered in 1878 (Honolulu Advertiser 1950:ed.pg; Honolulu Star Bulletin 1935:9) hired Chinese contract laborers (Interior Department 1878) who lived in plantation houses and workers' quarters (Conde and Best 1973:364). Other immigrant populations of Japanese and Filipinos arrived to work in the fields and sugarcane mill (Char and Char 1988:36), replacing the native population living in grass huts (Honolulu Star Bulletin 1935:9). Figures 2-4 depict the changes that took place in Waimanalo from the latter part of the 19th to the early 20th Centuries.

The Waimanalo Sugar Company under Cummins and later a succession of owners (e.g.W.G. Irwin and Co.; Hind, Rithet, and Miller; C. Brewer; the Waimanalo Agricultural Development Company) (Bartholomew and Associates 1959: 14; Char and Char 1988:36; Hawaii Star 1894:3) dominated the major economic activity of sugarcane production and processing from the late 1800s to mid-1900s. Expanding its operations to cultivate up to 2,600 acres (1052.1 ha) of sugarcane, the Waimanalo Sugar Company built a mill for processing (1881) and installed a train line (1881) and pier (1883), called Cummins Landing, for land and sea transport (Char and Char 1988:35-36; Conde and Best 1973:364).

Maunawili Ditch was constructed in 1878 to bring irrigated water to the plantation fields (Fukunaga and Associates 1984:2; Park Engineering 1991:4-17). In the 1930s the sugar company undertook renovations of the ditch; 21 elevated wooden flumes that served as aqueducts were replaced with redwood, many of the ditches were lined with concrete, and wooden pipes were replaced with concrete ones (Hammatt and Borthwick 1988:18). A 1917 map of Waimanalo Plantation shows the Maunawili Ditch (Fig. 5) and a 1927-1930 edition of the USGS Koko Head Quadrangle shows the Maunawili and Kailua Ditches (Fig. 6).

By mid-century (1950s) there was a change from large-scale plantation agriculture to small-scale individual farming in Waimanalo. This change was the result of a series of factors. First, was the loss of land from military acquisition of coastal property for a military reservation in 1917, which continued to expand its holdings through 1941 (Belt Collins 1995: Appendix E:1). Second, was the sale of beach lots south of the military base for private residences, and last, were the heavy losses on sugarcane production (Honolulu Advertiser 1939:13; Honolulu Advertiser 1940:9;

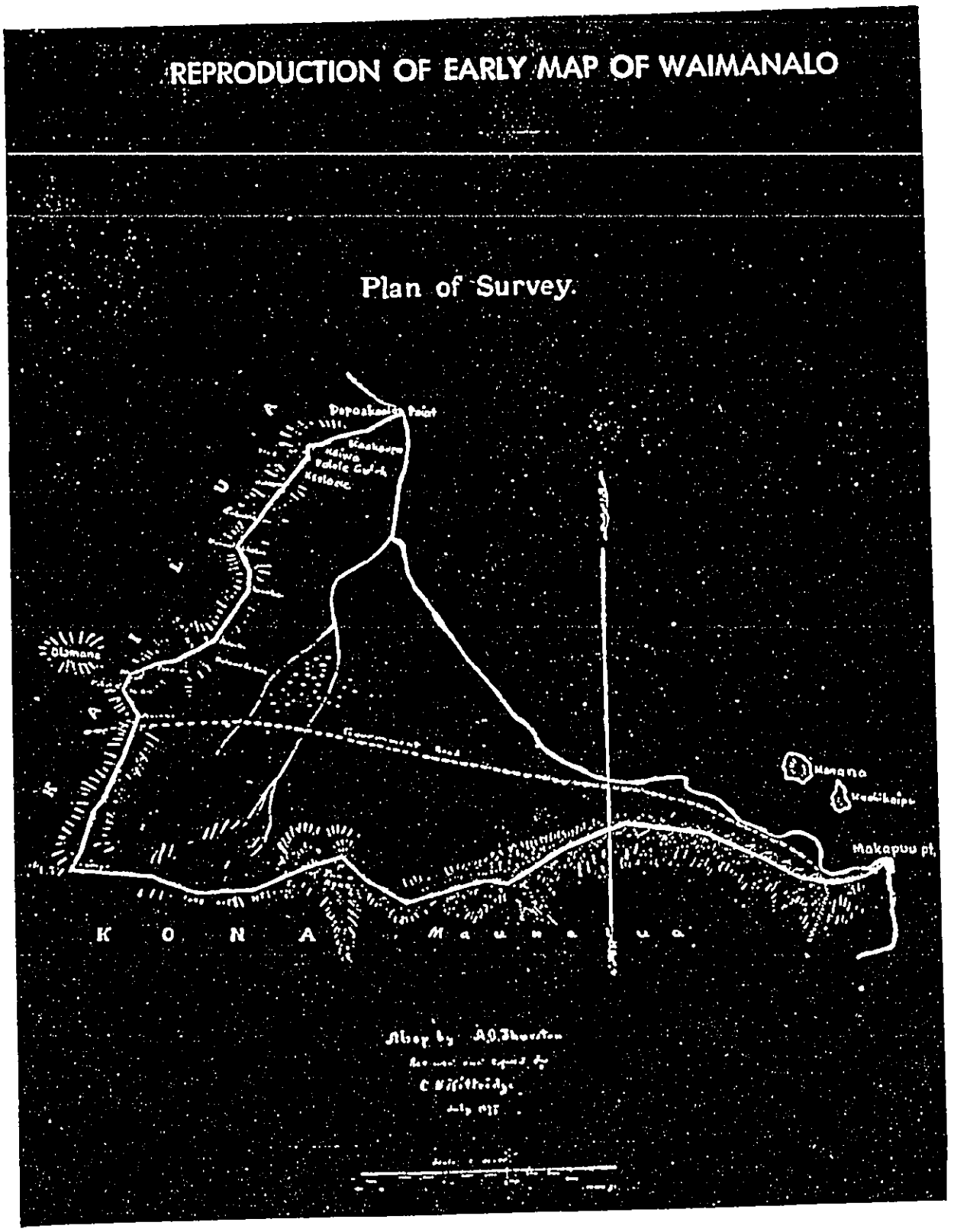


Figure 2. Map of Waimanalo by A.G. Thurston Dated July 1875.

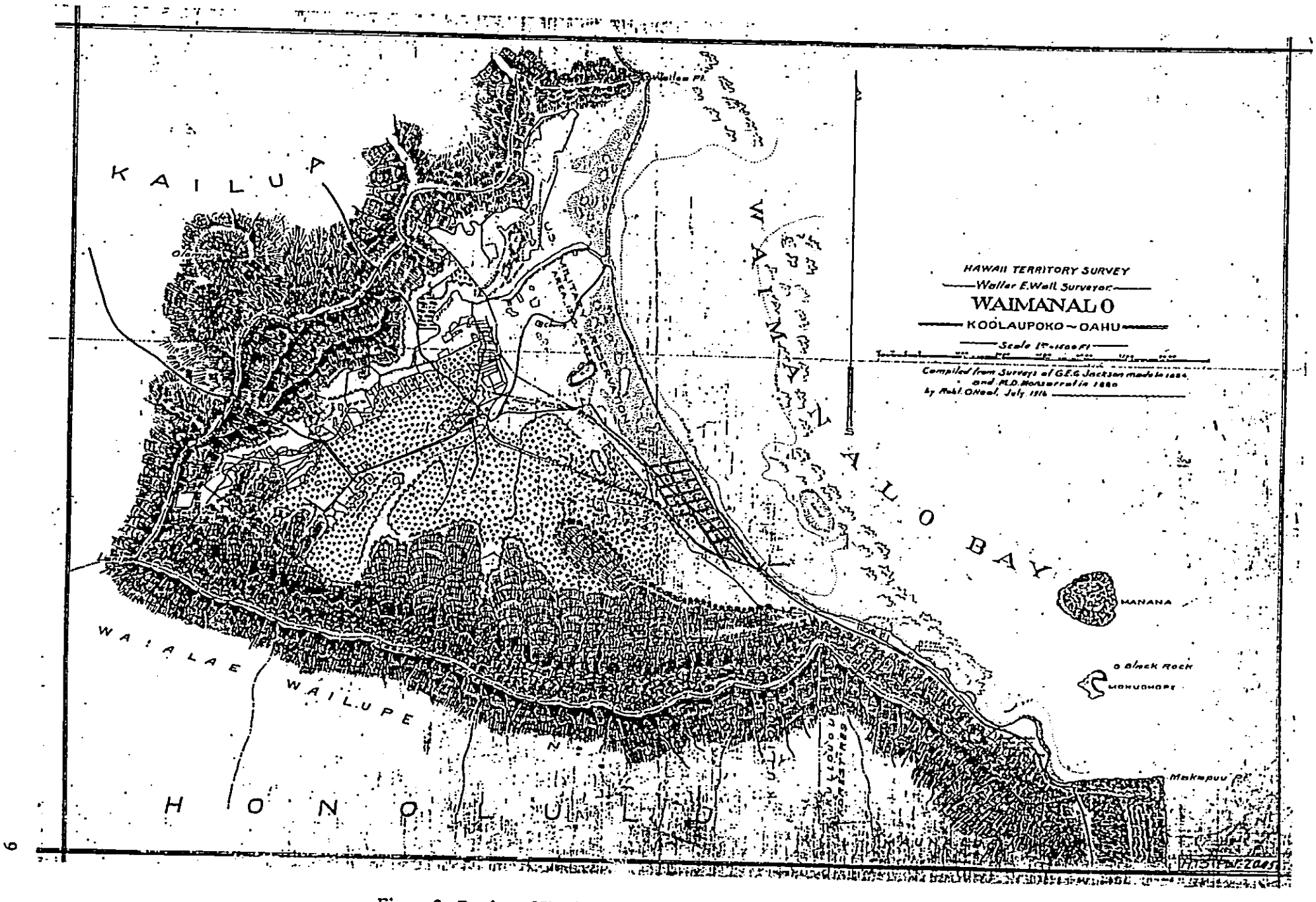


Figure 3. Portion of Territorial Survey Map of Waimanalo in 1880.

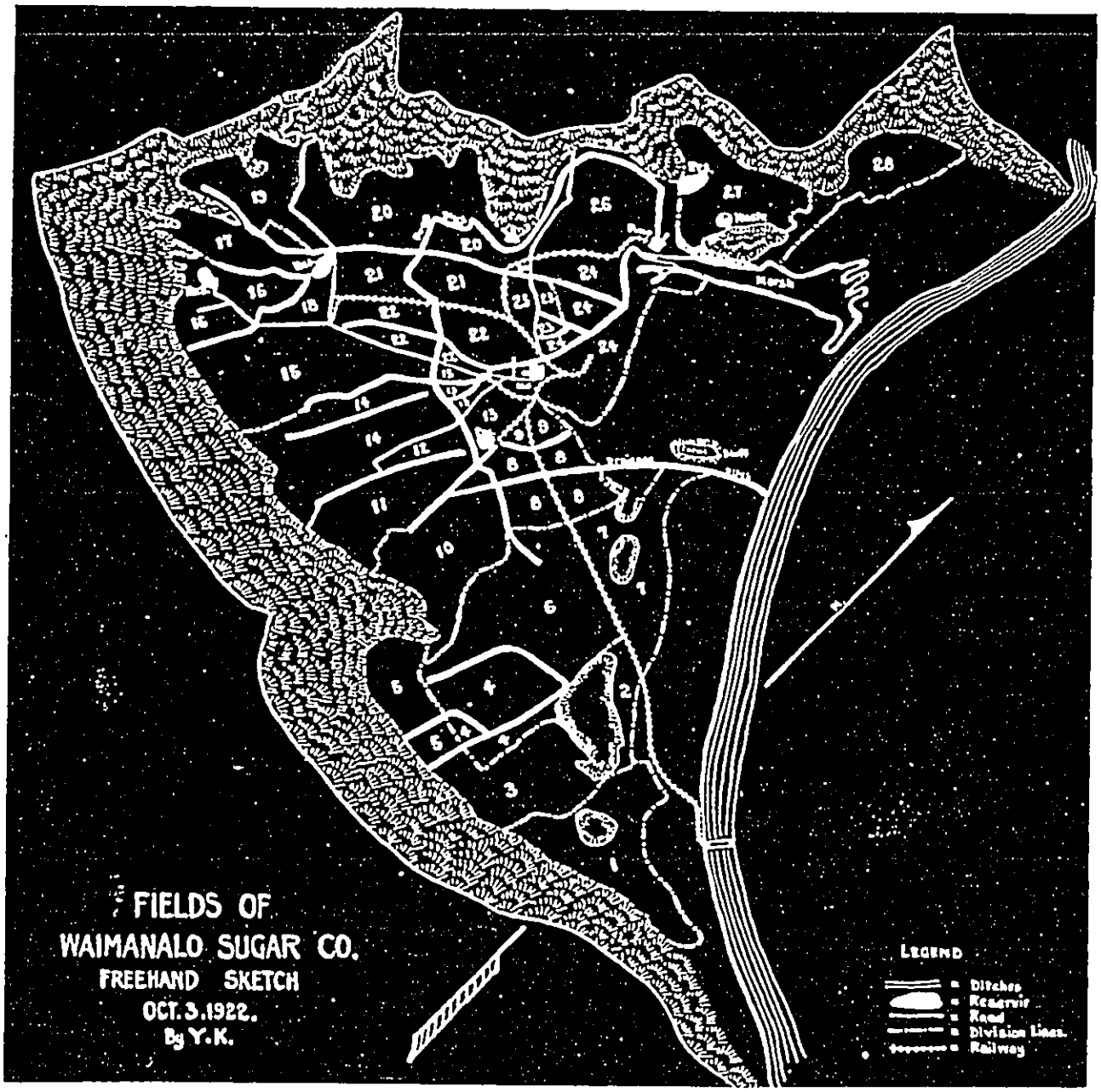


Figure 4. A 1922 Map Showing the Sugar Cane Fields of Waimanalo.

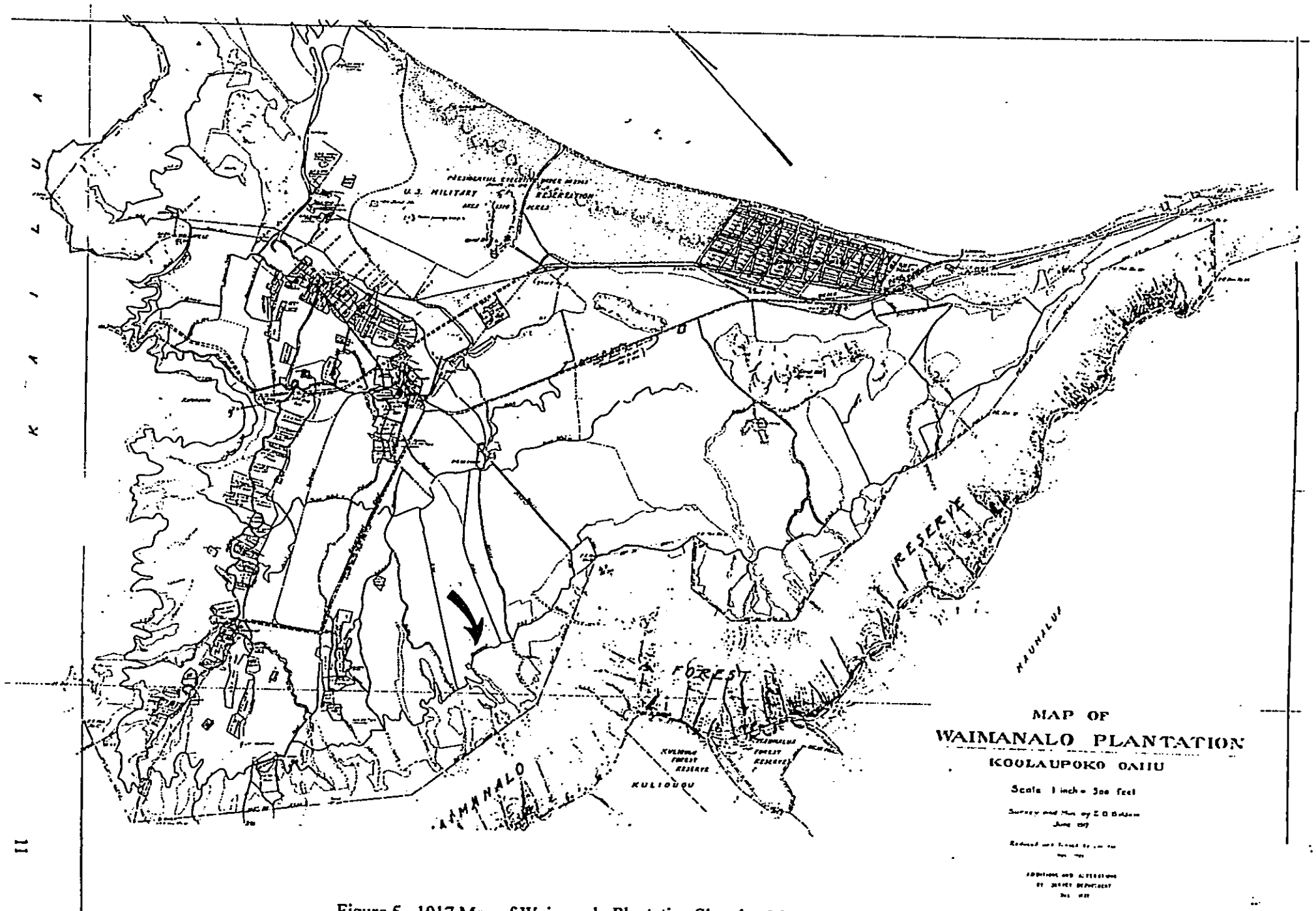


Figure 5. 1917 Map of Waimanalo Plantation Showing Maunawili Ditch.

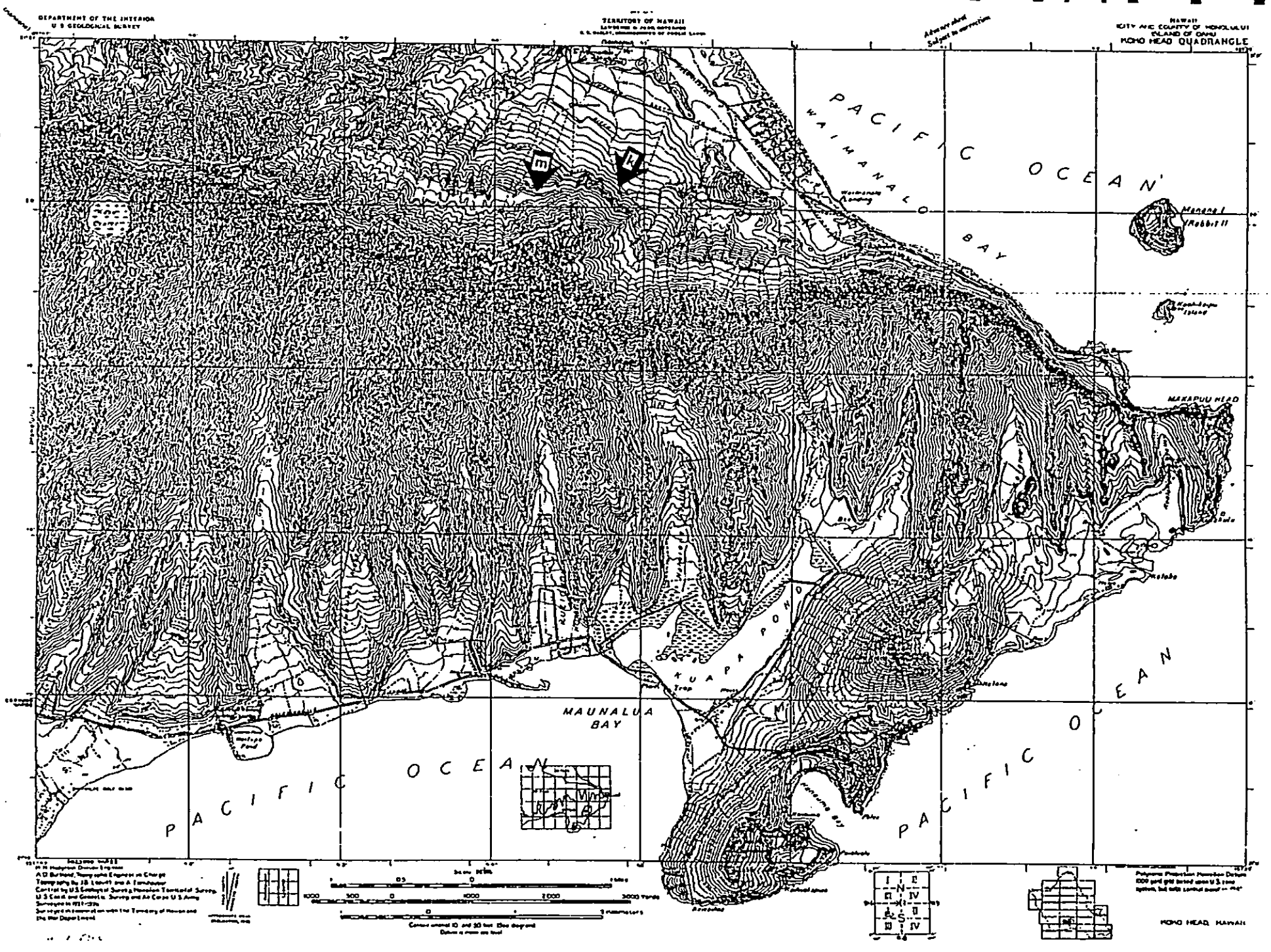


Figure 6. 1927-30 Series USGS Koko Head Quadrangle Showing Maunawili and Kailua Ditches.

Honolulu Advertiser 1944:6; Honolulu Star Bulletin 1947:1). The Waimanalo Sugar Company was liquidated in 1947 (Honolulu Advertiser 1947:8; Honolulu Star Bulletin 1947:1) and as fee simple lots were made available (Honolulu Star Bulletin 1947:4), native Hawaiians again populated the area. Sugarcane production ended in 1953 when the lease of succeeding operations by the Waimanalo Agricultural Development Company expired. Land reverted to the Territory of Hawaii and the Territorial Land Office (now DNLR) developed the Waimanalo Farm Lots Subdivision for agriculture (Belt Collins 1995 Appendix C: 2-20-21; Park Engineering 1991:2-3).

Maunawili Ditch was in continuous use during sugarcane production to irrigate the fields. When the Waimanalo Agricultural Development Company lease expired, so did their lease to the ditch system (Fukunaga and Associates 1984:2). The Hawaii Irrigation Authority that became the Hawaii Water Authority continued to maintain the irrigation system (Bartholomew and Associates 1959:17). In 1984, proposed improvements to the ditch including; replacing wooden flumes and unlined ditches, enclosing a conduit system, and installing access roads, were to affect the upper portion of the ditch system in Ani' nuinui Ridge (Fukunaga and Associates 1984:6). Part of the Ditch system, where it begins in the Ani'nuinui Ridge, is on lands owned by Harold K. Castle Trust Estate (Fukunaga and Associates 1984:10, Figure 11-2) and leased to the Kaneohe Ranch Co. Ltd. and Hawaii Sugar Planters Association. In 1984, the State of Hawaii was buying water from Kaneohe Ranch Co. on a yearly basis (Fukunaga and Associates 1984:2). The lower part of Maunawili Ditch runs along the lower slopes of the Waimanalo Forest Reserve (Bartholomew and Associates 1959: Plate 6).

Table 1 presents a timeline of important events in the history of Waimanalo. For a brief synthesis of the cultural history of Waimanalo, the reader is referred to the report entitled; *Archaeological Research of Areas Proposed for Development of Military Housing and Expansion of Military Training at Bellows Air Force Station, O`ahu; Task 1: Literature Review of the cultural Resources of the Bellows Area* (Tuggle 1997)

PREVIOUS ARCHAEOLOGY IN THE PROJECT VICINITY

The majority of archaeological work to date in the Waimanalo area has focused on the Bellows Site (50-80-15-511) within the military reservation, where investigations suggested evidence for early coastal settlement (Kirch 1974). However, Carson (1997), Athens (1998) and Tuggle (1994), among others, believe coastal habitation was temporary while permanent settlements

Table 1.

TIMELINE OF SIGNIFICANT HISTORICAL EVENTS IN WAIMANALO

1850	*ahupua'a* of Waimanalo, 6,970 acres leased to Thomas Cummins for 50 yrs. Cummins to breed cattle, race horses, and sheep
1855	Kamehameha IV deeded Waimanalo to Wm. Webster Wm. Webster mortgaged land to W. Lee. Mortgage ended in 1857
1856	Wm. Webster mortgaged land to J.H. Lafrenz
1860	½ of Waimanalo bought by R. Baxter Armstrong from T. Cummins
1870s	Chinese rice farmers used land under agreement with Cummins. Planted rice along Puha Stream in areas of Waimanalo farm Lots and Olomana Golf Course Chinese built 2 reservoirs called: Tai Lee (close to Hawaii Irrigation Office) and Wing Kee (below Foremost Dairy)
1876	Chinese stopped growing rice and began to grow sugarcane with Reciprocity Treaty between Territory of Hawaii and
1877	Cummins built sugar mill, completed in 1881
1878	Waimanalo Sugar Co. established Waimanalo Irrigation System installed by Waimanalo Sugar Co. Apr. 5
1880	Waimanalo Sugar Co. chartered John Cummins began sugar mill
1881	Waimanalo Sugar Co. began to grind cane Jan. 17 Apr.1 trains took cane to mill
1883	Built steamboat wharf
1885	W.G. Irwin and Co. gained control of Waimanalo Sugar co.
1890	Cummins controlled Waimanalo Sugar Co. bought cane from Chinese farmers
1892	226 Chinese workers employed at Waimanalo Sugar Co.
1894	Cummins sold majority of stock to R.P. Rithet, J.E. Miller and Robert Hind
1898	Waimanalo Sugar Co. began to grow own sugarcane
1910	Irwin and Co. merged with C. Brewer
1911	Maunawili Ditch appears on 1911 map
1913	Cummins died Sold unexpired lease of Waimanalo to Waimanalo Sugar Co. for $2,000
1918	Cummins trustees sold fee simple lands and unexpired term of lease to Waimanalo Sugar Co. for $52,500
1920	Brewer and Co. purchased Maunawili Ranch and water rights from W. Irwin's daughter. Ranch originally owned by Colonel James Boyd
1922	Irrigation flume system extended through 1926
1923	Waimanalo Sugar Co. had 3,304 or 6,970 acres. Loss due to fee simple purchase of *kuleana* lands, Hawaiian Home lands, military acquisition, public sale of beach lots Pumps installed, tunnel and flume system tapped Kawainui Swamp
1924	2500 acres of Maunawili Ranch sold to C. Brewer and Co.
1935	George Bennett, new Waimanalo Sugar Co. manager replacing George Chalmers, rebuilt flumes, concreted open ditches
1938	C. Brewer and Co. sold lease to Waimanalo Agricultural Development Co.
1941	Kaneohe Ranch Co. purchased water rights from C. Brewer for $220,000
1940s	Castle bought Mauanwili ranch
1947	Castle bought Kaneohe Ranch
1947	Liquidation of Waimanalo Sugar Co. Sold to Waimanalo Agricultural Development Co.
1953	Sugar production ended with Waimanalo Agricultural Development Co. after lease of water rights to ditch system expired
1956	DLNR created Farm lots Subdivision in central part of Waimanalo valley to promote agriculture
1984	Maunawili Ditch – Harold Castle Trust Estate leased to Kaneohe Ranch Co. and Hawaii Sugar Planters Assoc.

occurred inland near freshwater sources for agriculture and arboriculture (Carson 1997:5-6). Little evidence exists, however, regarding workshops, habitation structures, extent of ponds, shrines, and temples.

Based on the sheer number of investigations focused at Bellows, it should be no surprise that the majority of recorded archaeological sites in Waimanalo are located on Bellows Air Force Station (BASF) (see Tuggle 1994 for a detailed site description). Within the Bellows Archaeological Area are 10 Hawaiian sites, 3 historic sites related to the Waimanalo Sugar Plantation, and 5 sites related to military history. Tuggle (1997) provides a comprehensive inventory of the cultural resources of BASF and also presents an interpretive overview of the resources.

Investigations carried out along the coast, south of BASF at Waimanalo Bay State Recreation Park by Cox (1977) and Yent and Griffin (1979) found no cultural remains. Davis (1976) described two sites; one with a culturally sterile layer (Site 50-80-15-513) although Pearson (1971) had found burials, and Site 512 with cultural remains (charcoal, fire cracked basalt, burnt coral, *kukui* nut, fish and mouse bone).

Several historic sites have been recorded for the coast and offshore areas of Waimanalo. Pahonu Turtle Pond (Site 10-80-15-1037), a coastal fishpond or place where turtles were kept for *ali'i* (Belt Collins 1995: Appendix C:2-19). Manana (Rabbit) Island (Site 50-80-15-489,490) comprises two fish shrines, where evidence of burials was previously noted (Sterling and Summers 1978:255-256). In addition, two other shrines are mentioned. A possible coastal shrine described by Finsch consisted of a ring of basalt stone atop a small dune (Carson 1997:27). Sterling and Summers (1978:251) mention a small fishing shrine in the southeast sector of Waimanalo.

Investigations in the inland valley areas (Sinoto and Pantaleo 1993-1994) and in Waimanalo Agricultural Park (Barrera 1984; Park Engineering 1991) have found no prehistoric sites or cultural remains. However, in the foothills and slopes, several sites have been recorded. Hammatt and Borthwick (1988) recorded two historic sites. Both are agricultural terraces, upslope from Maunawili Ditch. Site 1 (50-80-15-4008) consists of multiple terrace walls, *lo'i*. 20-60 ft (6.10-18.29 m) long and 2-3 ft (.61-.91 m) high but with no associated habitation sites (Hammatt and Borthwick 1988:27); Site 2 (50-80-15-4009) has multiple terraces, *lo'i*, 4-5 ft (1.22-1.52 m) high, also with no associated habitation (Hammatt and Borthwick 1988:27). Site 2

corresponds to LCA 2635 which was awarded to Kahunanui who had taro patches and a house lot (Belt Collins 1995:Appendix E:30, Figure 3). McAllister recorded a possible place of refuge or *pu`uhonua*, Site 50-80-15-383 along the southeastern area of Waimanalo Stream (1933:191). Haununaniho *pu`uhonua*, was located on a small hill. He also recorded a heiau, Site 50-80-15-381, on the edge of the cane fields. The unnamed structure was 250 x 130 feet (76.20-39.62 m) with a upper terrace 10 feet (3.05 m) above the lower terrace (McAllister 1933:191).

Research and investigations near Maunawili Ditch have found no archaeological sites (Fukunaga and Associates 1984:22). Neller's photo survey (1980, 1981) of the Waimanalo Ditch System (Site 50-80-15-4042) did not provide any data on nearby habitation or agricultural features.

Along the gently sloping foothills of the Waimanalo Forest Reserve are two recorded *heiau*, one to the west and the other to the east. Pohakumui *heiau* (50-80-15-382) described by McAllister as *a small heiau measuring 50 x 90 ft (15.24 x 27.43 m) was located where the Maunawili Ditch* tunnel passes under the hill on which the heiau stands (Sterling and Summers 1978:247). The *heiau* consisted of a roughly rectangular enclosure incorporating a small enclosure paved with stones and fronted by a stone terrace. An oval mound of stones may have held a vertically placed image (McAllister 1933:191). The second *heiau* is referred to as Pueo *heiau* by Bartholomew and Associates (1959:Plate 2), although later maps do not provide a name (Hawaii Pacific Engineers 1998:3-87: Figure 3-18). Sterling and Summers report this as a possible *heiau* (Site 24), a large structure measuring approximately 130 x 110 feet (39.62 x 33.53 m) with the northwest wall in fairly good condition (Sterling and Summers 1978:247). Figure 7 shows the locations of some of the archaeological sites mentioned here and Figure 8 depicts the major irrigation ditches and location of Well III.

Only one previous study has been undertaken within the current project area. This study completed by the Bishop Museum in 1993 (Dixon) was a reconnaissance survey of five well sites on O`ahu, as part of an Environmental Impact Assessment for exploratory water wells proposed by the Board of Water Supply, City and County of Honolulu. Well III was included as one of the five well sites in this study. Dixon (1993:13) found no cultural remains in a partially graded area due to ranching, at the Board of Water Supply Well III location. He concluded that the area was peripheral to water resources and traditional or historic population centers and therefore was not a probable area of habitation or agricultural use (Dixon 1993:10).

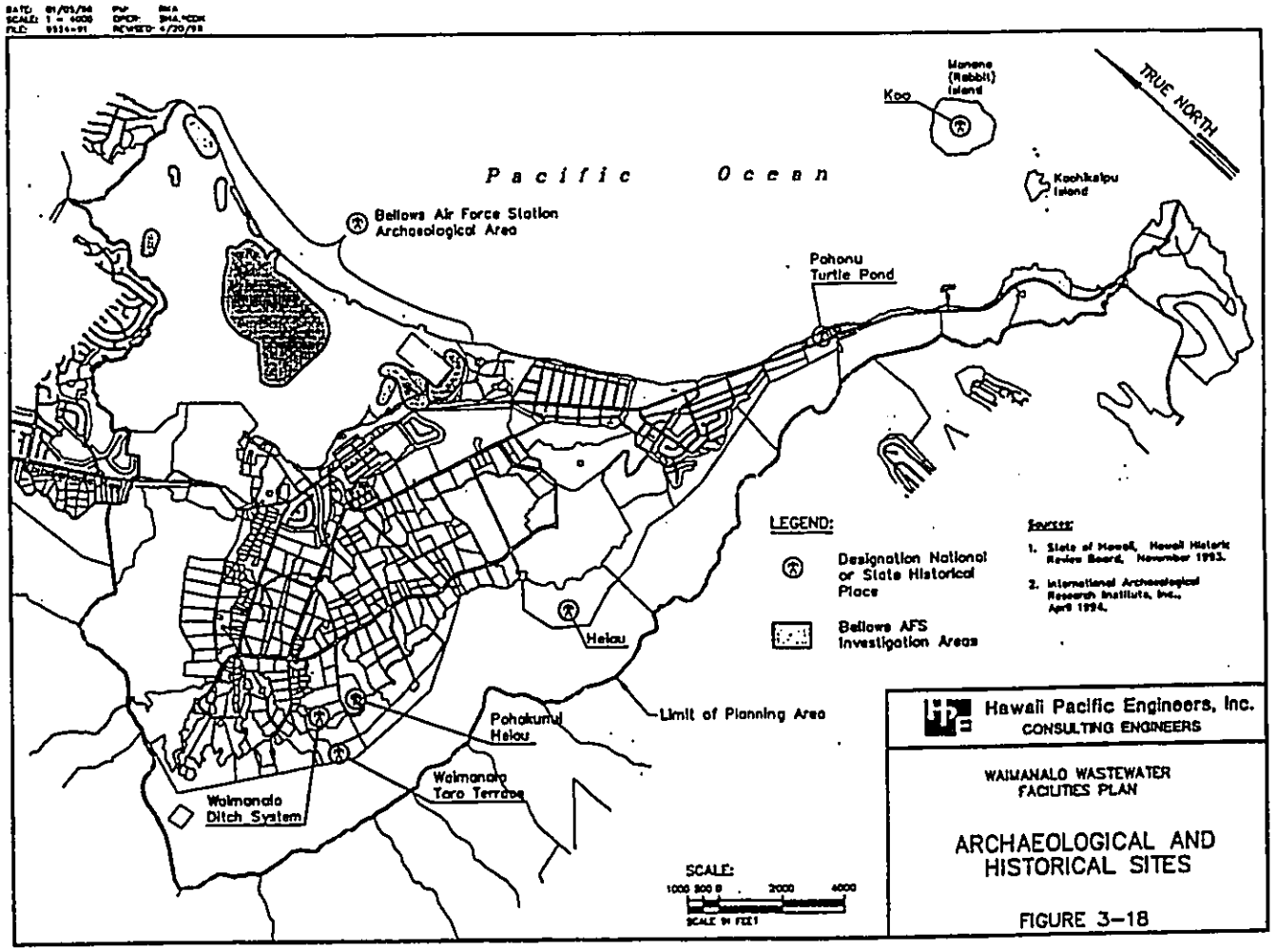


Figure 7. Locations of Some Prominent Archaeological Sites of Waimanalo.
(map by Hawaii Pacific Engineers, Inc.)

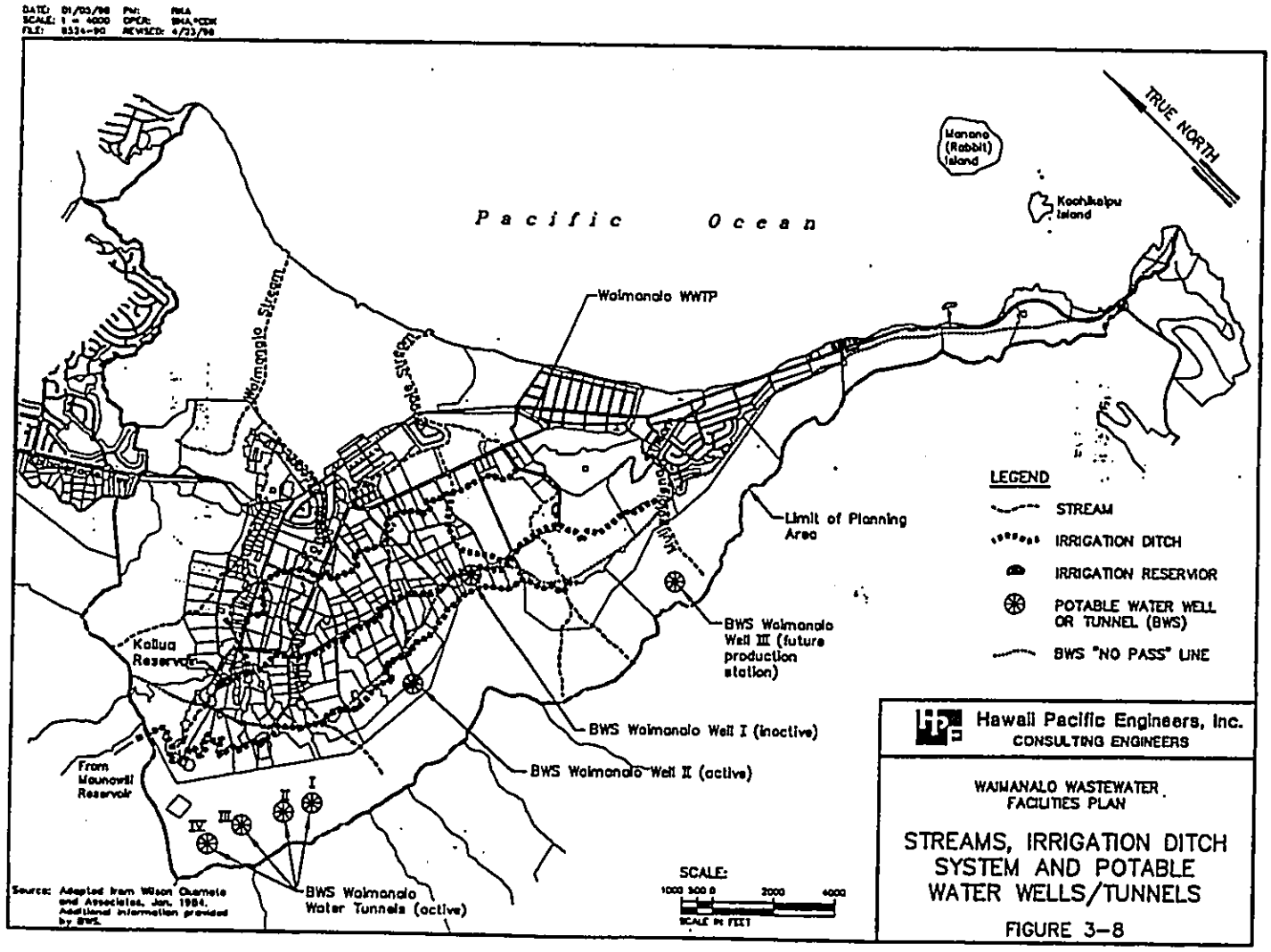


Figure 8. Location of Ditch Systems and BWS Well III. (Map by Hawaii Pacific Engineers, Inc.)

RESULTS OF SURVEY

The current inventory survey resulted in the identification of two previously unrecorded stone features located adjacent to the access road near the well facility. The preferred route of the transmission pipeline corridor crosses the Kailua Ditch (Fig. 9) three times within the Meadow Gold parcel prior to reaching Waikupanaha Street. No other archaeological features or remains are present within the preferred transmission corridor. One remnant historic site, a railroad berm from the cane train, is located along a section of Alternative Route 1.

KAILUA DITCH

The Kailua Ditch is one of the three constituent subdivisions of the 114-year old Waimanalo Irrigation System (State Site 50-80-15-4042). The Maunawili Ditch system and the Waimanalo Pump Ditch system comprise the other two parts. These ditches measure 17,100; 13,000; and 9,000 linear-feet respectively. Along its length, a variety of water transporting structures ranging from open earthen ditches and cement or stone-faced ditches to wooden flumes and tunnels characterize this system. The Kailua Ditch appears to have been constructed sometime between 1917 and 1927 according to maps of Waimanalo from that period (see Figs. 5 & 6).

Within the project area, at the so called "First Ditch Crossing" locale, the Kailua Ditch is an open earthen channel, roughly 2.5 meters in width at the top, .80 meter in width at water level, and .40 meter in depth (Fig. 10). Several modifications are apparent at the subject locale since a dirt road also crosses the ditch. Underlying the road crossing is a 36" diameter cement culvert. Immediately east of the crossing is a mortar and stone lined section leading to a wooden sluice gate (Fig. 11) at the opening of a secondary ditch that runs in a northerly alignment perpendicular to the main ditch. The secondary ditch goes under the eastern fork of the dirt road through a rock and cement culvert. The open portion of the secondary channel measures 1.70 meters wide at the top, .60 meter wide at water level, and .70 meter deep.

To the west of the crossing, the channel which was still open during the initial field work period during 1999 had been piped into a 12′ diameter PVC pipe prior to the second field assessment in 2000. The *makai* portions of the ditch, including the "Second" and "Third Ditch Crossings," have previously been piped.

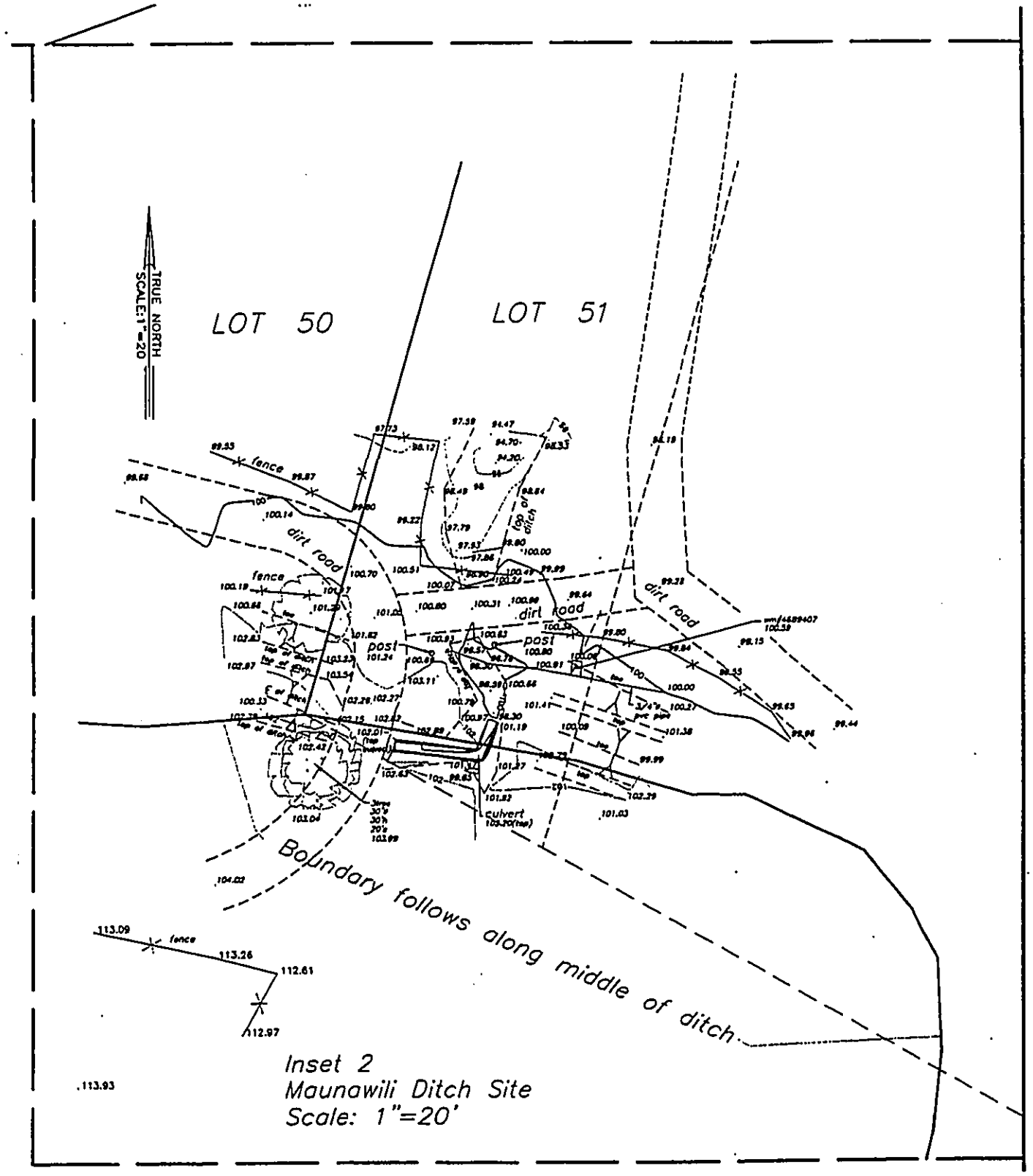


Figure 9. Plan of "First Ditch Crossing." (Map by Austin Tsutsumi & Associates)

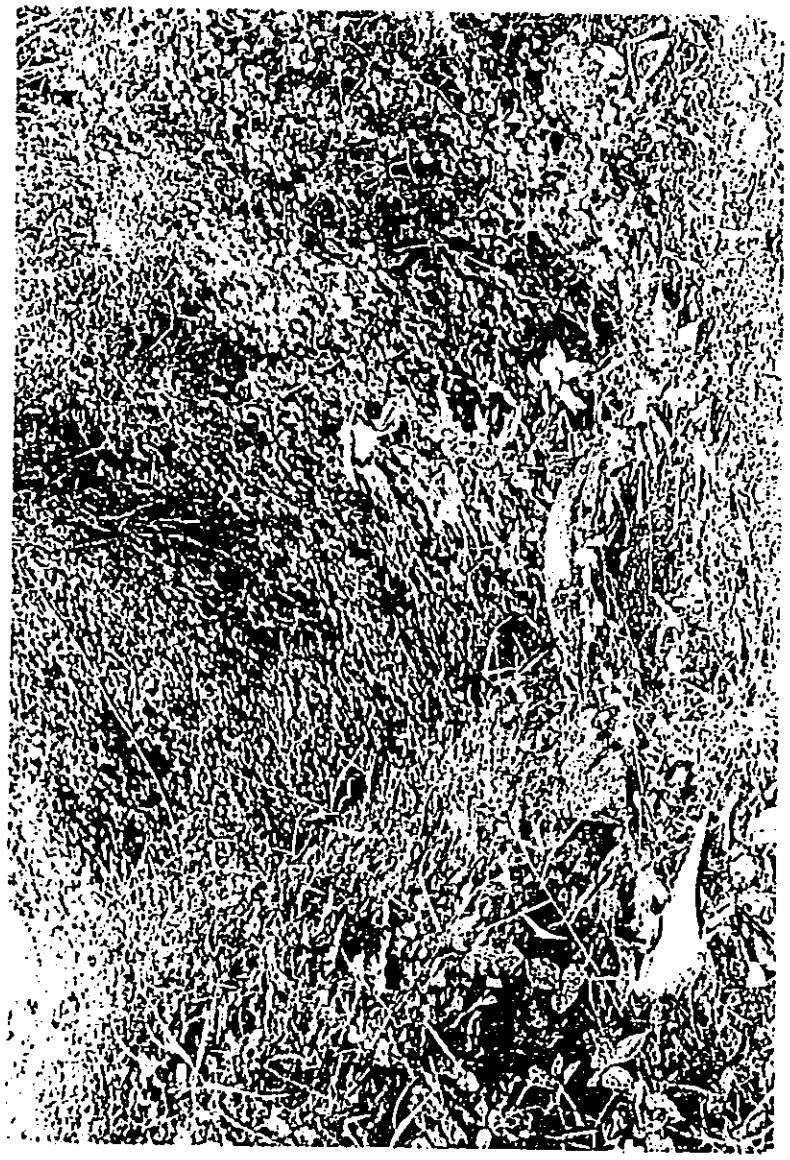


Figure 10. Kailua Ditch at First Crossing, View to West.

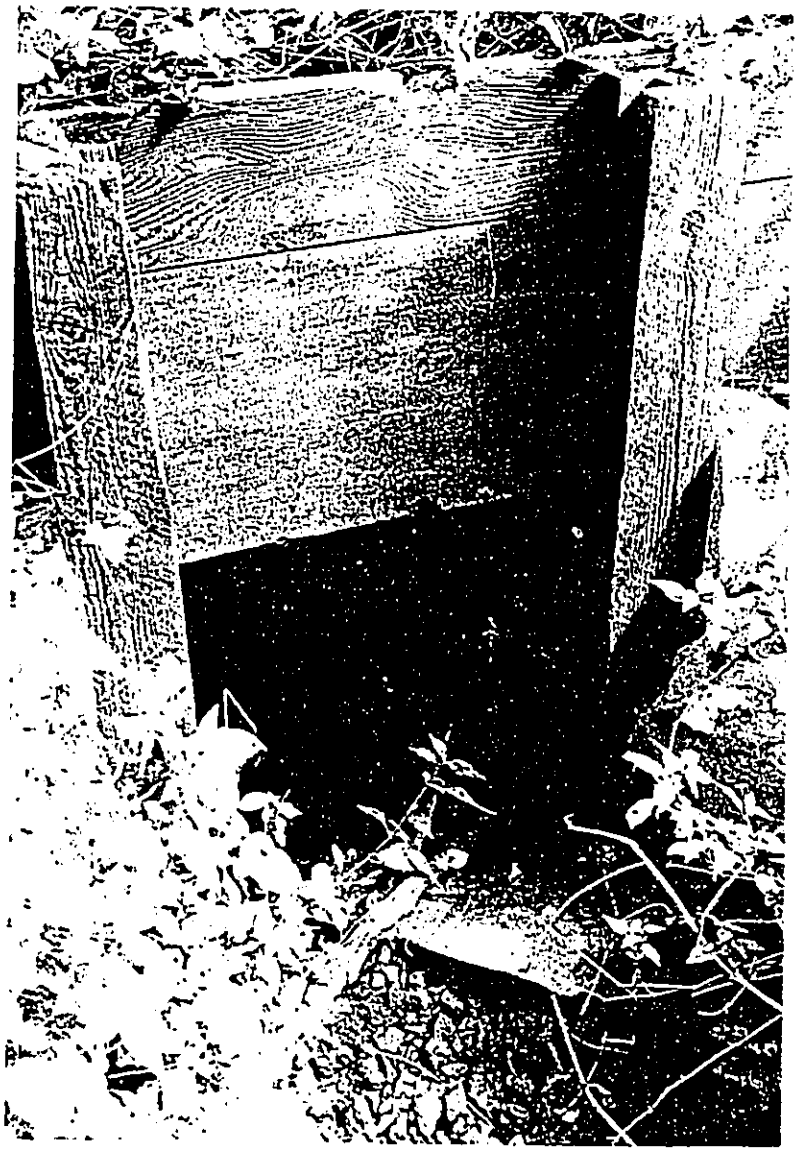


Figure 11. Wooden Sluice Gate at Opening to Secondary Ditch at First Crossing, View to North.

REMNANT RAILROAD BERM

After the transmission route passes alongside of the corn field, the Alternate Route 1 corridor runs along a raised dirt road from a point roughly two thirds of the total length from the well facility. The width of this feature is roughly 2.5 meters and its height ranges from 1.5 to 3.0 meters above the ground on either side. Old maps depict a railroad that connected the mill to the wharf and this remnant feature is located in the approximate alignment of the tracks. However, no fragments of rail, ties, or other artifacts associated with a railroad were seen during the survey. The Historic Architecture Branch of the State Historic Preservation Division had no records documenting this railroad.

TWO STONE FEATURES

Near the well production facility, to the west of the access road are two stacked stone features. The first (Feature 1), a low-lying, faced stone platform is located c. 40 meters NNW of the well. The second (Feature 2), a rectangular, faced stone platform is located c. 33 meters NNE of the first structure (Fig. 12). These features were designated Site 50-80-15-5876.

Site 50-80-15-5876 Feature 1

This feature is a stepped platform with a semi-circular upper platform and an amorphous lower platform with an elongated extension. It measures roughly 7 meters in length, 5.6 meters in width, and ranges from 1.10 to .35 meters in height. The perimeter of the structure is faced with 4-5 courses of small boulders and the interior is filled with small boulders and cobbles (Figs 13 and 14). The interior fill is not leveled, but slightly mounded in places and undulating. It is built on sloping ground and its long axis is oriented north/south. A *ti* (*Cordyline terminalis*) plant was growing on its southeastern periphery.

Site 50-80-15-5876 Feature 2

Located down-slope and towards the NNE of Feature 1, this feature is a rectangular platform with faced sides with 5-6 courses of boulders of various sizes. The feature also incorporates some natural bedrock outcrops on its southern end. It measures c.8.5 meters in length, 3 meters in width, and ranges in height from .50-1.40 meters. Its interior is filled with small boulders and cobbles, but the fill is not leveled (Figs. 15 and 16). This feature is built on sloping ground and its long axis is oriented north/south. It occurs in an area where mango (*Mangifera indica*) trees of fairly uniform size are growing in evenly spaced rows, and several rows of what may be planting furrows are still visible on the ground.

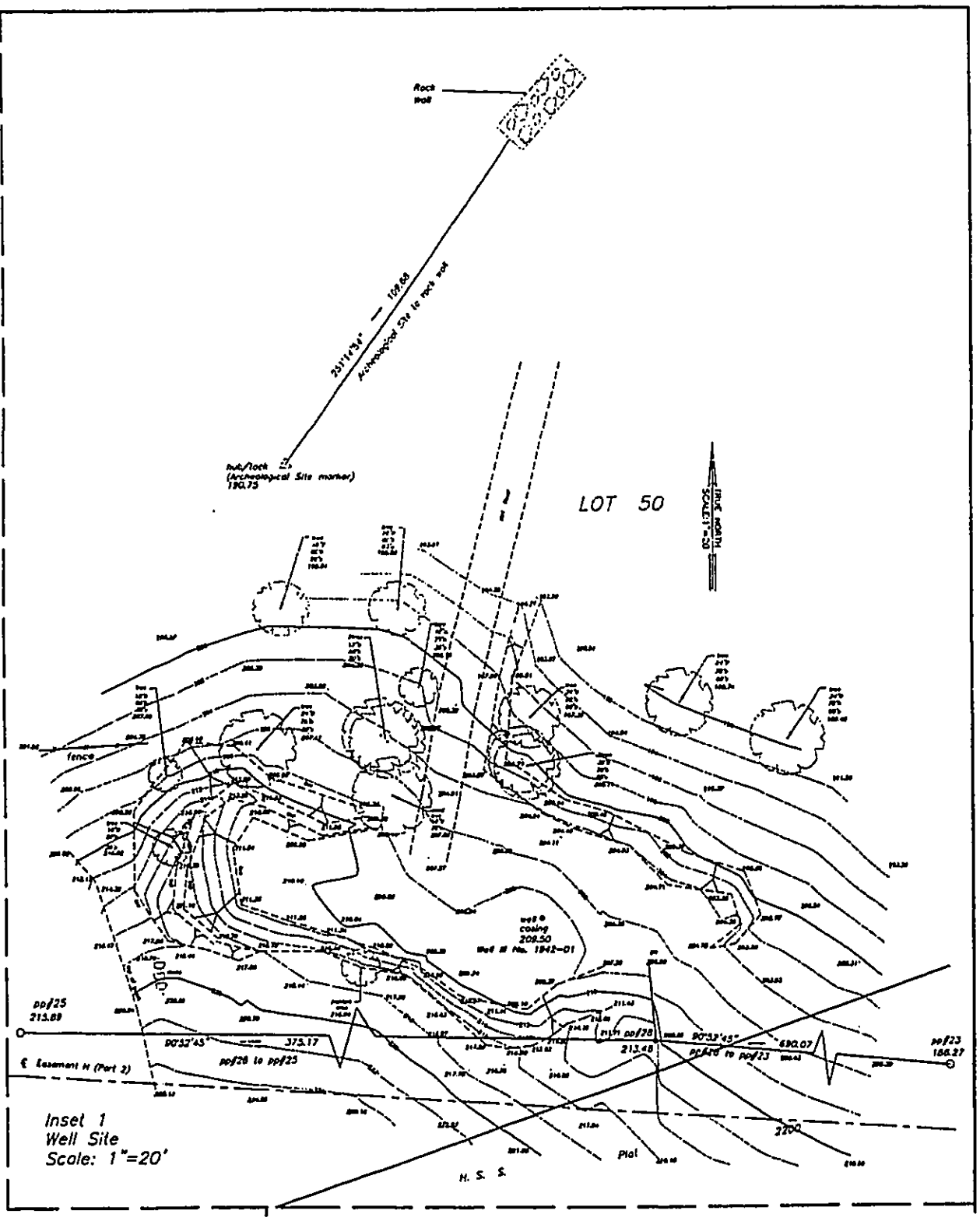


Figure 12. Inset of the Waimanalo Well III Production Facility
(Map by Austin Tsutsumi & Associates)

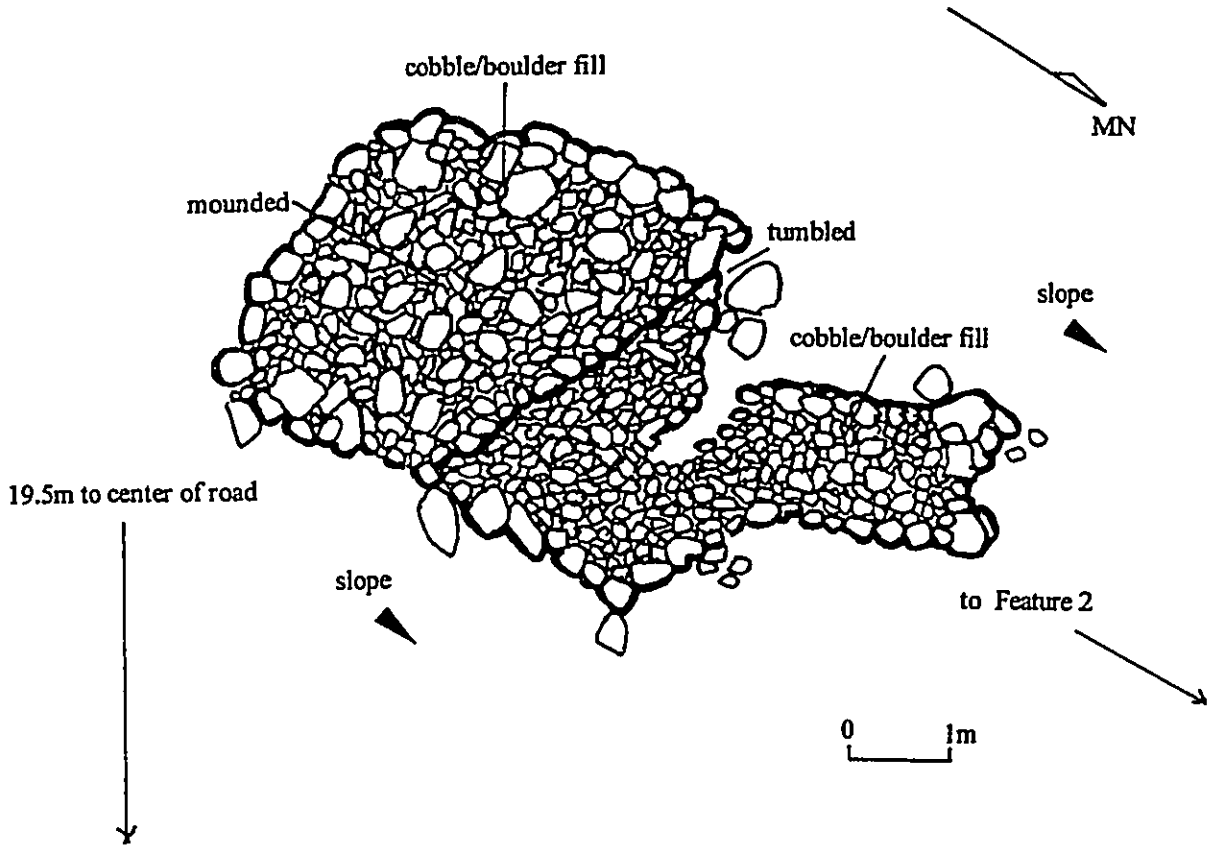


Figure 13. Plan View of Site 5876 Feature 1.

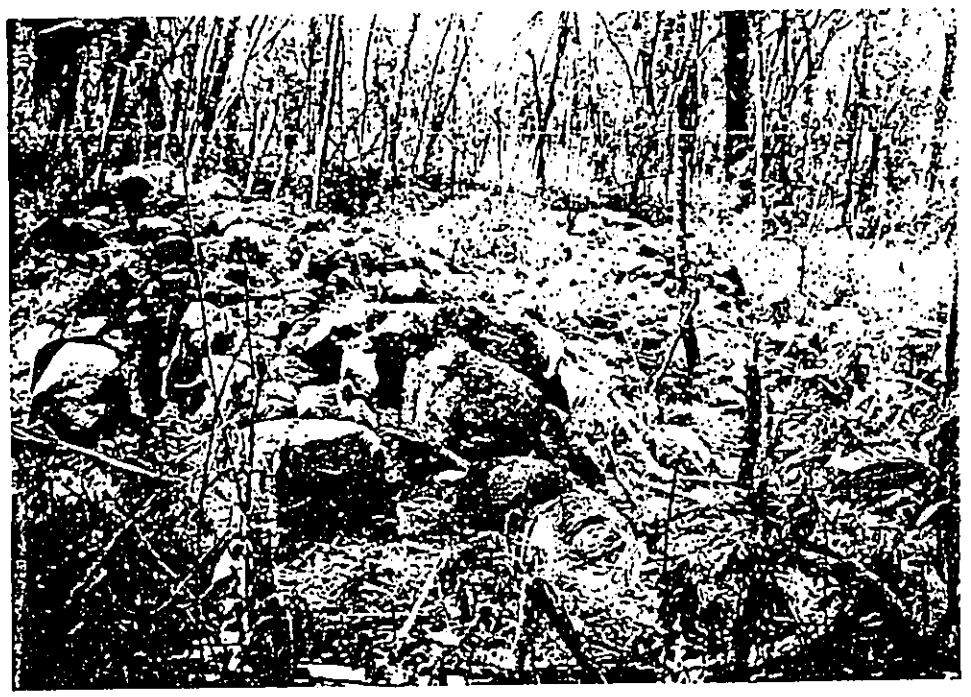


Figure 14. (top) Site 5876 Feature 1 to NW. (bottom) Site 5876 Feature 1 to SE.

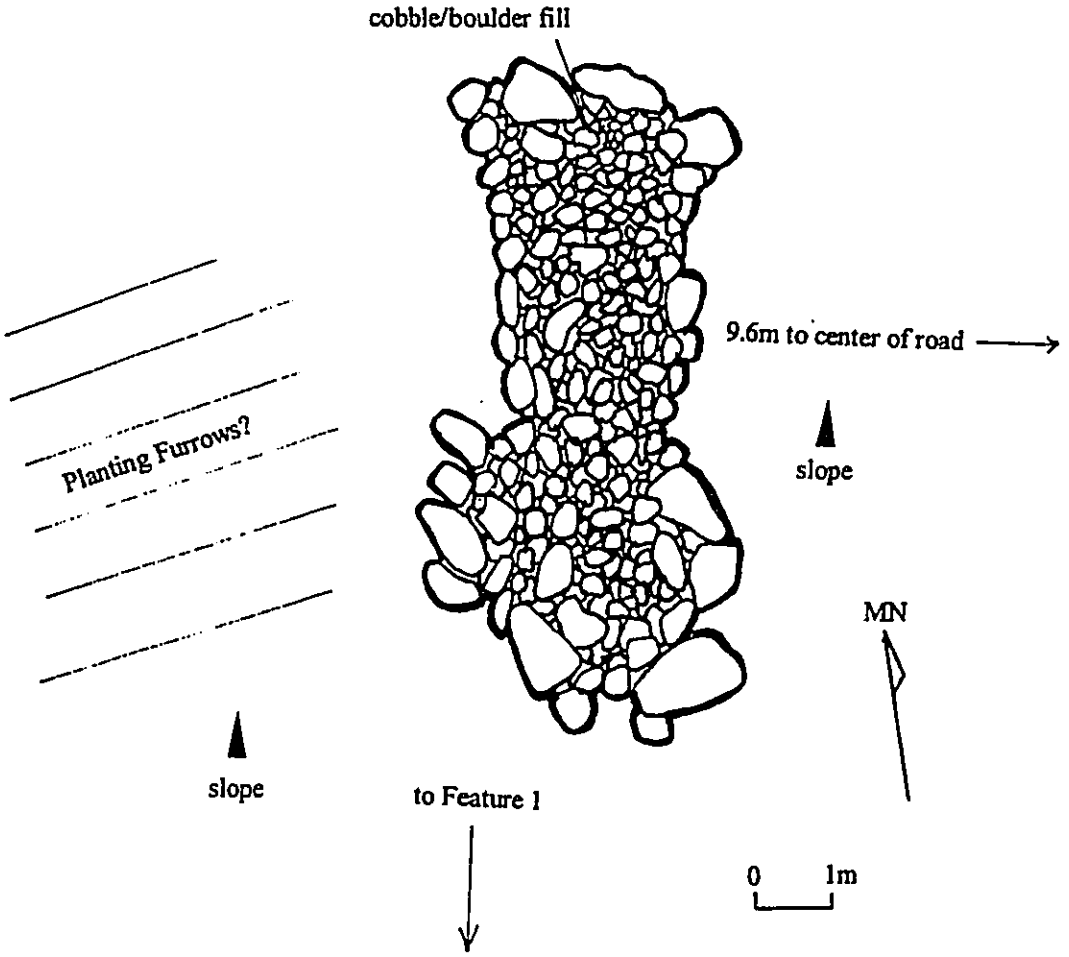


Figure 15. Plan View of Site 5876 Feature 2.

Figure 16. (top) Site 5876 Feature 2 to S. (bottom) Site 5876 Feature 2 to N.

No artifacts or midden was found in association with either feature. Due to the distance from the access road, these features will not be affected by the construction. Since both features were located beyond the formal project boundaries, subsurface testing was not undertaken.

DISCUSSION

The newly recorded Site 5876 and the existing segment of the Kailua Ditch are considered significant; however, the remnant railroad berm, with minimal integrity, is no longer significant.

The Kailua Ditch is part of the Waimanalo Irrigation System (Site 4042), an extensive complex that appears to be eligible for nomination to the National Register. Thus, some mitigation measures are necessary at the "First Ditch Crossing" to ensure that the ditch is not adversely impacted during construction of the pipeline. The "Second" and "Third" crossings will not be affected since the "ditch" has been previously converted to a buried pipeline at these locales.

The atypical morphology of Site 5876 Features 1 and 2, the presence of a possible mango orchard, as well as some ground surface alteration that may be planting furrows, suggest historic period origins for both features. According to some of the historic maps, the area appears to be beyond or above the sugar cultivation zone. However, this elevation may have, during the historic period, supported smaller scale agriculture and habitation. Although a conclusive functional interpretation is not yet possible, these features may represent historic period clearing mounds constructed by ethnic immigrants who resided in Waimanalo as laborers for the plantation. Similar, formal structures have been recorded and interpreted as historic clearing mounds in the Kaumana and Puainako areas of Hilo on Hawaii Island with confirmation from informants (Eble 1997 and Sinoto and Komori 1979). According to the informants, facing the exterior of the structures prevents tumbling of the accumulated stones. The rough character of the surface of the fill precludes use of the structures for habitation or other activities. Also the construction of the upper surfaces appears a bit crude for burial platforms and other possible ceremonial functions. The absence of associated artifacts or midden also appears to preclude any repetitive activities.

INITIAL SIGNIFICANCE ASSESSMENTS

Initial significance has been assessed for the archaeological sites recorded in the project area. These assessments are based on the Hawaii Register of Historic Places significance evaluation criteria. The five criteria are:

Criterion A: This specifies association with events or broad patterns important to the history of a region, island, or Hawaii in general;

Criterion B: This reflects association with persons important to the history of a region, island, or Hawaii in general;

Criterion C: This applies to sites that reflect architectural achievements or are excellent examples of a specific type of site;

Criterion D: This specifies that the site has yielded or has the potential to yield information significant for our understanding of traditional culture, history, prehistory, and/or foreign influences on traditional culture and history of a region, island, or Hawaii in general; and

Criterion E: This applies to sites perceived by the contemporary community as having traditional cultural value.

The existing segments of the Kailua Ditch, as an integral part of the Waimanalo Irrigation System, are considered significant under multiple criteria, Criterion A, C, and D. This type of transport system for irrigation water is directly associated to the advent of large scale agricultural ventures during the historic period, Criterion A. In Waimanalo this occurred around 1878. The open ditch, flume, and tunnel segments are excellent examples of the irrigation water transport system, Criterion C. The remaining segments of the ditch have yielded and have the potential to yield more information significant to our understanding of the history of this region, Criterion D.

Site 5876 is considered significant solely for its information content, or Criterion D.

RECOMMENDATIONS

No further archaeological procedures are warranted for Site 50-80-15-5876 since the features are beyond the impact area of the current project. Features 1 and 2 are recommended for *in situ* preservation. The features should be clearly marked during construction to ensure avoidance.

The segment of the Kailua Ditch at the "Ditch Crossing" needs to be protected during installation of the transmission pipeline. All structural features, such as stone linings, culverts, and wooden sluice gates should be avoided by the construction-related excavation activities. Following installation of the pipeline, during back-filling, care should be taken to avoid burying the open ditch.

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Appendix B

Registration Form, National Register of Historic Places, Maunawili Ditch System/Kailua Ditch System (Draft)

NPS Form 10-900 OMB No.10024-0018

(Oct. 1990)

United States Department Of the Interior
National Park Service

DRAFT

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in *How to Complete the National Register of Historic Places Registration Form* (National Register Bulletin 15A). Complete each item by marking "x" in the appropriate box or by entering the information requested. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer, to complete all items.

1. Name of Property

historic name Waimānalo Irrigation System

other name/site number Maunawili Ditch System/Kailua Ditch System

2. Location

street & number portions of TMK 4-2-09 & 4-2-10 and 4-1-8; 4-1-10; 4-1-11; 4-1-13; 4-2-27 ☐ not for publication

city or town Kailua & Waimānalo ☒ vicinity

state Hawaii code HI county City & County of Honolulu code 045 zip code 96734 & 96795

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended, I hereby certify that this ☐ nomination ☐ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. I recommend that this property be considered significant ☐ nationally ☐ statewide ☐ locally. (☐ See continuation sheet for additional comments.)

Signature of certifying official/Title Date

State or Federal agency and bureau

In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. (☐ See continuation sheet for additional comments.)

Signature of certifying official/Title Date

State or Federal agency and bureau

4. National Park Service Certification

I hereby certify that the property is: Signature of the Keeper Date of Action

☐ entered in the National Register.
☐ See continuation sheet.
☐ determined eligible for the National Register
☐ See continuation sheet.
☐ determined not eligible for the National Register.
☐ removed from the National Register.
☐ other. (explain:)

73

Waimānalo Irrigation System — City & County of Honolulu, Hawaii
Name of Property — County and State

5. Classification

Ownership of Property (Check as many boxes as apply)
☐ private
☐ public-local
☒ public-State
☒ public-Federal

Category of Property (Check only one box)
☐ building(s)
☐ district
☐ site
☒ structure
☐ object

DRAFT

Number of Resources within Property (Do not include previously listed resources in the count.)

Contributing	Noncontributing	
		buildings
		sites
7 types (see narrative description)		structure
		Total

Name of related multiple property listing
(Enter "N/A" if property is not part of a multiple property listing.)
N/A

Number of contributing resources previously listed in the National Register
1) two terraces 50-80-15-516

6. Function or Use

Historic Functions (Enter categories from instructions)
AGRICULTURE/irrigation facility

Current Functions (Enter categories from instructions)
AGRICULTURE/irrigation facility

7. Description

Architectural Classification (Enter categories from instructions)
Other/irrigation structures

Materials (Enter categories from instructions)
foundation earth, concrete piers
walls wooden, concrete
roof
other earthen ditches, flumes, (cont' narrative description)

Narrative Description
(Describe the historic and current condition of the property on one or more continuation sheets.)

The 114-year old Waimānalo Irrigation System is a 17+ mile-long water collection and conveyance system in a 1,170-acre area, which has been in continuous operation since 1878 when it was first designed and built for providing water to the Waimānalo Sugar Company. The Waimānalo Irrigation System is comprised of three subdivisions: The Maunawili Ditch system, the Kailua Ditch system Waimānalo Pump Ditch system. All three are continuous lines of ditches and flumes leading from the tunnel, spring or reservoir sources to the farms in Waimānalo where the water is provided for agriculture.

The ditches, flumes and tunnels of the Waimānalo Irrigation System are located in the lush vegetation on the southern slopes of the Waimānalo Forest Reserve in Maunawili and Waimānalo Valleys under the awe-inspiring cliffs (*pali*) of the Ko'olau Ridge in the Ko'olaupoko District on the island of O'ahu. The Maunawili system is generally at the 400 ft. elevation along the heavily wooded cliffs while much of the Waimānalo system descends onto the fertile farming valley at the 50 ft. elevation in Waimānalo Valley. Geographically, the Waimānalo Irrigation System carries water from the nearby mountainous Maunawili Valley where rainfall is between 83 to 100 inches per year and where numerous springs and streams provide an ample water supply to Waimānalo Valley where agricultural lands are flatter, broader and soils deeper, but where rainfall (41 inches per year), springs and Waimānalo Stream are insufficient for the agricultural needs of the land.
74 (continued)

Other (#7) continued

The structure of the irrigation system is made up of 17+ miles of built-up earthen embankments for reservoirs, blasted-out earth/rock tunnel, cement-lined tunnel, earth-lined ditches, stone-faced ditches, cement-lined ditches, a few redwood flumes on trestles traversing gullies, and low plastic-lined redwood flumes at or near ground level, blasted-out tunnels, and iron pipes inserted into dike tunnels for tapping the perched dike water.

The structures include :

A) unlined and plastic-lined open earthen ditches, stone-lined ditches and cement ditches: 1) 13.68 miles of supply ditches, 2) 17.48 miles of distribution ditches, 3) 2.11 miles of distribution pipes, 4) 3.8 miles of other ditches.

B) 6 tunnels in Maunawili Valley: 1) The Clark Tunnel built on the "left branch" feeder stream to Maunawili Stream by Dr. W.O. Clark, C. Brewer and Co. geologist who supervised the construction of the Clark, Cooke, and Korean Tunnels between 1922 and 1926 (Takasaki et al, 1969), 2) Cooke Tunnel built on the Omao Stream, 3) the Korean Tunnel located where the feeder streams come together to form Makawao Stream. The name suggests that Korean laborers built the tunnel, however, no supporting documentation has yet been found, 4) The Fault Tunnel, located above the ditch in Makawao Valley and which unlike the other tunnels this is just a pipe sunk into the dike system rather than a part of a stream system, 5) Aniani Tunnel under Anianinui Ridge merely conveys water between Maunawili and Waimānalo Valleys and is not a resource. There are also 6 wells in Waimānalo: 1 and 2) Plantation tunnels, 3 and 4 "City and County" Tunnels, and Wells no. 408 and 420. A tunnel and flume system was completed in 1923 to tap water from Kawainui Marsh and pumps were installed to deliver water to Waimānalo. Mr. Richard Frazier was a supervisor at Maunawili Ranch in the 1920s and 30s and he would ride on horseback every day to clean and maintain the Maunawili section of the ditch system (Personal communication, 1991).

C) Excess flow from Waimānalo Stream, the only stream in the Waimānalo Valley which approaches perennial flow - was diverted and stored in an area called "Waimānalo Lagoon." Intermittent flow from other streams, drainage from irrigated fields, and even domestic sewage were stored in this lagoon, which was an important source of irrigation water during the dry summer months. Presently, this Lagoon system is not being used.

D) 33 redwood flumes still exist of a former 52 flumes in 1985. Only 1 of these flumes is in Maunawili Valley, the other 32 are in Waimānalo.

E) 3 earthen embankment reservoirs feed the system (Maunawili Reservoir, Kailua Reservoir, and Wing King Reservoir), all in Waimānalo.

This listing is an inventory of the various parts of the ditch system.

Description (#7) continued

The irrigation flume system was extended from 1920-1926 integrating additional surface and ground water. Between 1900 and 1924, five water development tunnels were driven in upper Maunawili Valley to supplement the flow of the ditch.

The Waimānalo Irrigation system was first constructed in 1878 by the Waimānalo Sugar Company for Waimānalo Plantation, and during its hey day the company had twenty-six hundred acres planted in sugar cane. However, the practice of transporting water from one location to another for agriculture is a continuation of pre-historic agricultural practices in Hawaii. In both Waimānalo (NRHP Nomination Form 50-80-15-516) and Maunawili Valleys there are extant stone-faced and earthen ditches from pre-Contact days which were used to transport water from springs and streams to irrigate taro fields.

There are access 4-wheel drive right-of-ways along most the Ditch system in Maunawili Valley. The golf course development underway has plans to relocate the access road in Maunawili Valley. In Waimānalo, rural paved roads parallel many of the ditches and provide easy access for maintenance. Water is delivered through the

Description (#7) continued

system on Monday, Wednesday and Friday. On Tuesday and Thursday a five-man team walks the open ditch system for cleaning and repairs.

The Reciprocity Treaty of 1876 stimulated entrepreneurs like Thomas Cummins to go into sugar growing for a potentially free market became available. By January 1881, close to 1,000 acres in Waimānalo had been planted in sugarcane and mill grinding operations were started. Water was brought in from the upper reaches of Maunawili, ditch and tunnel construction being completed by 1878 (Takasaki et al. 1969:110). Water development continued to expand and by 1900, the "flume and ditch system was 4½ miles long and diverted all of Maunawili Stream water into Waimānalo Valley" (Ibid.: 110-111).

Dr. W. O. Clark, geologist for C. Brewer and Co., Ltd, in the early 1900's, supervised the construction of these additional tunnels and ditches in Maunawili Valley. The supply ditch in Maunawili was extended to intercept all water available above the ditch elevation as far to the west as Omao Stream" (Austin 1953:4). These water developments were covered by "leases or water licenses from the Kaneohe Ranch Co., to C. Brewer and Co., to secure 50% matching federal funds for a $12 million project to upgrade Waimānalo Irrigation System. The tunnels were a historic aspect of hydro-engineering when tunnels were dug with pipes breaching the perched water which collected in lava tubes which occur in the ancient Ko'olau Volcano whose hot spot at one time was in the center of the present nearby Kawainui Marsh and one side of the outer rim is the Ko'olau Mountain Range.

"Between 1922 and 1926, the Clark, Cooke, and Korean Tunnels were driven, and the Maunawili ditch system was extended" (Ibid:111). These developments delivered about 2 MGD of water to Waimānalo Valley" (*Ibid.*)

In the 1930s major reconstruction was undertaken under George Bennett's managership of Waimānalo Sugar Company.

> During the last five years (i.e. prior to 1940) Mr. Bennett has rebuilt all the old flumes which bring the Maunawili water to the fields using redwood, good for 15 years or more; concreted the open ditches; and has replaced the old wooden pipes with concrete siphons (Condé and Best, 1973:376).

The Waimānalo Sugar Company dissolved in 1947 and the operation of the ditch system became the responsibility of the Waimānalo Agricultural Development Company. Hawaii Water Authority, as part of the State Department of Land and Natural Resources (DLNR) took over in 1953. The 1953 general plan for Waimānalo called for the district to remain basically agricultural and rural. To ensure such land use the plan called for repairs to the irrigation system in order to provide adequate water resources to promote the rural agricultural lifestyle. The State Department of Agriculture took over in 1989, supporting the previous planning efforts to promote and maintain lands in agricultural use and thus continues to maintain and improve the ditch systems to this end.

The Hawaii Sugar Planters Association (HSPA) opened a new station up high in Maunawili valley for the purposes of breeding cane. The results were even more favorable they they had foreseen. While the steep hills and the bottom lands of Maunawili were not ideal for sugar cane growing, the climate and its fairly frequent cloud cover is ideal for cane tasseling, i.e. breeding. Different varieties of cane from all over the world are bred or developed in Maunawili. Only a station in the Barbados rivals Maunawili's breeding station. On rare occasions, you may notice several nights in a row when lights are on all night high up in the valley. When this occurs the HSPA breeders are using the lights to delay the flowering of the clones of the different varieties. The HSPA uses water from the Maunawili Ditch system during dry periods.

The Kailua Ditch is only partially in use now, and the northwestern most part of the Maunawili Valley Ditch has also been temporarily abandoned and water is no longer pumped from Kawainui Marsh. But 75% of the original

NPS Form 900a

OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places
Continuation Sheet

DRAFT

Section number 7 Page 3

Waimānalo Irrigation System
City & County of Honolulu, Hawaii

Description (#7) continued
system is still in use. The system underwent its first set of major repairs in the 1930s and some fifty years later, following an overall general plan for encouraging and maintaining diversified agricultural development in Waimānalo (Bartholomew and Assoc., 1959) another major set of repairs was undertaken. Basically, the most recent repairs (1988-1989) were done to improve the efficiency of the system, primarily by replacing leaky flumes with piping. Most of the wooden flumes are prone to weather deterioration and vandalism. These improvements allowed Waimānalo Irrigation System to provide more water to farmers in Waimānalo.

NPS Form 10-900

OMB No.10024-0018

(Oct. 1990)

United States Department Of the Interior
National Park Service

DRAFT

National Register of Historic Places
Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in *How to Complete the National Register of Historic Places Registration Form* (National Register Bulletin 16A). Complete each item by marking "x" in the appropriate box or by entering the information requested. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer, to complete all items.

1. Name of Property

historic name Waimānalo Irrigation System

other name/site number Maunawili Ditch System/Kailua Ditch System

2. Location

street & number portions of TMK 4-2-09 & 4-2-10 and 4-1-8; 4-1-10; 4-1-11; 4-1-13; 4-2-27 ☐ not for publication

city or town Kailua & Waimānalo ☒ vicinity

state Hawaii code HI county City & County of Honolulu code 045 zip code 96734 & 96795

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended, I hereby certify that this ☐ nomination ☐ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. I recommend that this property be considered significant ☐ nationally ☐ statewide ☐ locally. (☐ See continuation sheet for additional comments.).

Signature of certifying official/Title Date

State or Federal agency and bureau

In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. (☐ See continuation sheet for additional comments.)

Signature of certifying official/Title Date

State or Federal agency and bureau

4. National Park Service Certification

I hereby certify that the property is: Signature of the Keeper Date of Action

☐ entered in the National Register.
☐ See continuation sheet.
☐ determined eligible for the National Register
☐ See continuation sheet.
☐ determined not eligible for the National Register.
☐ removed from the National Register.
☐ other. (explain:)

Waimānalo Irrigation System
Name of Property

City & County of Honolulu, Hawaii
County and State

8. Classification

Ownership of Property (Check as many boxes as apply)
- ☐ private
- ☐ public-local
- ☒ public-State
- ☐ public-Federal

Category of Property (Check only one box)
- ☐ building(s)
- ☐ district
- ☐ site
- ☒ structure
- ☐ object

DRAFT

Number of Resources within Property (Do not include previously listed resources in the count.)

Contributing	Noncontributing	
		buildings
		sites
7 types (see narrative description)		structure
		Total

Name of related multiple property listing
(Enter "N/A" if property is not part of a multiple property listing)
NA

Number of contributing resources previously listed in the National Register
11 taro terraces 50-80-15-516

9. Function or Use

Historic Functions (Enter categories from instructions)
AGRICULTURE/irrigation facility

Current Functions (Enter categories from instructions)
AGRICULTURE/irrigation facility

7. Description

Architectural Classification (Enter categories from instructions)
Other/irrigation structures

Materials (Enter categories from instructions)
foundation earth, concrete piers
walls wooden, concrete
roof
other earthen ditches, flumes, (cont' narrative description)

Narrative Description
(Describe the historic and current condition of the property on one or more continuation sheets.)

The 114-year old Waimānalo Irrigation System is a 17+ mile-long water collection and conveyance system in a 1,170-acre area, which has been in continuous operation since 1878 when it was first designed and built for providing water to the Waimānalo Sugar Company. The Waimānalo Irrigation System is comprised of three subdivisions: The Maunawili Ditch system, the Kailua Ditch system Waimānalo Pump Ditch system. All three are continuous lines of ditches and flumes leading from the tunnel, spring or reservoir sources to the farms in Waimānalo where the water is provided for agriculture.

The ditches, flumes and tunnels of the Waimānalo Irrigation System are located in the lush vegetation on the southern slopes of the Waimānalo Forest Reserve in Maunawili and Waimānalo Valleys under the awe-inspiring cliffs (*pali*) of the Ko'olau Ridge in the Ko'olaupoko District on the Island of O'ahu. The Maunawili system is generally at the 400 ft. elevation along the heavily wooded cliffs while much of the Waimānalo system descends onto the fertile farming valley at the 50 ft. elevation in Waimānalo Valley. Geographically, the Waimānalo Irrigation System carries water from the nearby mountainous Maunawili Valley where rainfall is between 83 to 100 inches per year and where numerous springs and streams provide an ample water supply to Waimānalo Valley where agricultural lands are flatter, broader and soils deeper, but where rainfall (41 inches per year), springs and Waimānalo Streams are insufficient for the agricultural needs of the land.
74 (continued)

NPS Form 900a
OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

DRAFT

National Register of Historic Places
Continuation Sheet

Section number 7 Page 1

Waimānalo Irrigation System
City & County of Honolulu, Hawaii

Other (#7) continued

The structure of the irrigation system is made up of 17+ miles of built-up earthen embankments for reservoirs, blasted-out earth/rock tunnel, cement-lined tunnel, earth-lined ditches, stone-faced ditches, cement-lined ditches, a few redwood flumes on trestles traversing gullies, and low plastic-lined redwood flumes at or near ground level, blasted-out tunnels, and iron pipes inserted into dike tunnels for tapping the perched dike water.

The structures include :

A) unlined and plastic-lined open earthen ditches, stone-lined ditches and cement ditches: 1) 13.68 miles of supply ditches, 2) 17.48 miles of distribution ditches, 3) 2.11 miles of distribution pipes, 4) 3.8 miles of other ditches.

B) 6 tunnels in Maunawili Valley: 1) The Clark Tunnel built on the "left branch" feeder stream to Maunawili Stream by Dr. W.O. Clark, C. Brewer and Co. geologist who supervised the construction of the Clark, Cooke, and Korean Tunnels between 1922 and 1926 (Takasaki et al, 1969), 2) Cooke Tunnel built on the Omao Stream, 3) the Korean Tunnel located where the feeder streams come together to form Makawao Stream. The name suggests that Korean laborers built the tunnel, however, no supporting documentation has yet been found, 4) The Fault Tunnel, located above the ditch in Makawao Valley and which unlike the other tunnels this is just a pipe sunk into the dike system rather than a part of a stream system, 5) Ariani Tunnel under Aniani nui Ridge merely conveys water between Maunawili and Waimānalo Valleys and is not a resource. There are also 6 wells in Waimānalo: 1 and 2) Plantation tunnels, 3 and 4 "City and County" Tunnels, and Wells no. 408 and 420. A tunnel and flume system was completed in 1923 to tap water from Kawainui Marsh and pumps were installed to deliver water to Waimānalo. Mr. Richard Frazier was a supervisor at Maunawili Ranch in the 1920s and 30s and he would ride on horseback every day to clean and maintain the Maunawili section of the ditch system (Personal communication, 1991).

C) Excess flow from Waimānalo Stream, the only stream in the Waimānalo Valley which approaches perennial flow - was diverted and stored in an area called "Waimānalo Lagoon." Intermittent flow from other streams, drainage from irrigated fields, and even domestic sewage were stored in this lagoon, which was an important source of irrigation water during the dry summer months. Presently, this Lagoon system is not being used.

D) 33 redwood flumes still exist of a former 52 flumes in 1985. Only 1 of these flumes is in Maunawili Valley, the other 32 are in Waimānalo.

E) 3 earthen embankment reservoirs feed the system (Maunawili Reservoir, Kailua Reservoir, and Wing King Reservoir), all in Waimānalo.

This listing is an inventory of the various parts of the ditch system.

Description (#7) continued

The irrigation flume system was extended from 1920-1926 integrating additional surface and ground water. Between 1900 and 1924, five water development tunnels were driven in upper Maunawili Valley to supplement the flow of the ditch.

The Waimānalo Irrigation system was first constructed in 1878 by the Waimānalo Sugar Company for Waimānalo Plantation, and during its hey day the company had twenty-six hundred acres planted in sugar cane. However, the practice of transporting water from one location to another for agriculture is a continuation of pre-historic agricultural practices in Hawaii. In both Waimānalo (NRHP Nomination Form 50-80-15-516) and Maunawili Valleys there are extant stone-faced and earthen ditches from pre-Contact days which were used to transport water from springs and streams to irrigate taro fields.

There are access 4-wheel drive right-of-ways along most the Ditch system in Maunawili Valley. The golf course development underway has plans to relocate the access road in Maunawili Valley. In Waimānalo, rural paved roads parallel many of the ditches and provide easy access for maintenance. Water is delivered through the

Description (#7) continued

system on Monday, Wednesday and Friday. On Tuesday and Thursday a five-man team walks the open ditch system for cleaning and repairs.

The Reciprocity Treaty of 1876 stimulated entrepreneurs like Thomas Cummins to go into sugar growing for a potentially free market became available. By January 1881, close to 1,000 acres in Waimānalo had been planted in sugarcane and mill grinding operations were started. Water was brought in from the upper reaches of Maunawili, ditch and tunnel construction being completed by 1878 (Takasaki et al. 1969:110). Water development continued to expand and by 1900, the "flume and ditch system was 4½ miles long and diverted all of Maunawili Stream water into Waimānalo Valley" (Ibid.: 110-111).

Dr. W. O. Clark, geologist for C. Brewer and Co., Ltd, in the early 1900's, supervised the construction of these additional tunnels and ditches in Maunawili Valley. "The supply ditch in Maunawili was extended to intercept all water available above the ditch elevation as far to the west as Omao Stream" (Austin 1953:4). These water developments were covered by "leases or water licenses from the Kaneohe Ranch Co., to C. Brewer and Co., to secure 50% matching federal funds for a $12 million project to upgrade Waimānalo Irrigation System. The tunnels were a historic aspect of hydro-engineering when tunnels were dug with pipes breaching the perched water which collected in lava tubes which occur in the ancient Ko'olau Volcano whose hot spot at one time was in the center of the present nearby Kawainui Marsh and one side of the outer rim is the Ko'olau Mountain Range.

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Description (#7) continued
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Appendix C

Botanical Report

CHAR & ASSOCIATES
Botanical/Environmental Consultants
4471 Puu Panini Ave.
Honolulu, Hawaii 96816
(808) 734-7828

13 August 2001

Austin Tsutsumi & Associates, Inc.
501 Sumner Street, Suite 521
Honolulu, Hawaii 96817-5031

Attention: Ivan K. Nakatsuka

SUBJECT Waimanalo Well III Production Facility
Revised Waterline Alignment

Dear Mr. Nakatsuka:

The revised alignment would cross the Meadow Gold Dairy property, mauka of the former Unisyn site. It would then cross Inoaole Stream and pastureland to Nonokio Street where it would feed into an existing 20 inch waterline from the Waimanalo 230 Reservoir.

An inspection of the botanical resources was made on 07 March 2001 with Eugene Dashiell (Environmental Planning Services) and Lisa Applegate (Austin Tsutsumi & Associates, Inc.). Minor adjustments to the route were reviewed on 13 July 2001. The primary objectives of the botanical studies were to provide a general description of the vegetation along the alignment and to search for threatened and endangered species as well as species of concern.

The plant names used in this report follow Wagner et al. (1990), and Wagner and Herbst (1999). The few recent name changes are those recorded in the Hawaii Biological Survey series (Evenhuis and Eldredge 1999-2000).

Description of the Vegetation

The alignment will follow along an existing dirt road for the most part. Where it passes through the dairy property, the road supports patches of weedy, mosty annual herbaceous species and grasses. These include Bermuda grass (Cynodon dactylon), swollen fingergrass (Chloris barbata), wiregrass (Eleusine indica), false mallow (Malvastrum coromandelianum), Calyptocarpus vialis, Cuba jute (Sida rhombifolia) and Spanish needle (Bidens pilosa).

In some places alongside the road, there are patches of scrub vegetation which contain koa haole (Leucaena leucocephala) and castor bean (Ricinus communis) shrubs and clumps of Guinea grass (Panicum maximum).

Along the Inoaole Stream segment, koa haole/Guinea grass scrub is found on the banks of the stream. A few large trees of Java plum (Syzygium cumini) and Formosan koa (Acacia confusa) also occur here. On the bottom of the dry streambed, California grass (Brachiaria mutica) and castor bean are abundant. Also locally common on this segment are Chinese violet (Asystasia gangetica) and Neonotonia wightii.

Between the stream and Nonokio Street, the alignment crosses pastureland dominated by low mats of California grass and Guinea grass which has been periodically mowed. Other plants which occur here in smaller numbers include Bermuda grass, wiregrass, false mallow, and spiny amaranth (Amaranthus spinosus).

Discussion

The revised route crosses land which has been disturbed for a long period of time. As a result, the vegetation is dominated by introduced or alien species such as koa haole, Guinea grass, California grass, etc. Introduced species are all those plants which were brought to the Hawaiian Islands by humans, intentionally or accidentally, after Western contact, that is, Cook's arrival in the islands in 1778. We did not observe any native plants along this revised route. No threatened and endangered species or species of concern (U.S. Fish and Wildlife Service 1999; Wagner et al. 1999) occur along the revised route.

The revised route through the dairy property and then to a connection point with the existing waterline on Nonokio Street is not expected to have a significant negative impact on the botanical resources.

Sincerely,

Winona P. Char

References

Evenhuis, N.L. and L.G. Eldredge, editors. 1999-2000. Records of the Hawaiian Biological Survey. Bishop Museum Occasional Papers Nos. 58-64.

U.S. Fish and Wildlife Service. 1999. U.S. Fish and Wildlife Service species list, plants. March 23, 1999. Pacific Islands Ecoregion Office, Honolulu, HI.

Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1990. Manual of the flowering plants of Hawai'i. 2 vols. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI. Bishop Museum Special Publication 83.

Wagner, W.L., M.M. Bruegmann, D.R. Herbst, and J. Q.C. Lau. 1999. Hawaiian vascular plants at risk: 1999. Bishop Museum Occasional Papers. No. 60: 1-58.

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CHAR & ASSOCIATES
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(808) 734-7828

07 August 2000

Austin, Tsutsumi & Associates, Inc.
501 Sumner Street, Suite 521
Honolulu, Hawaii 96817-5031

Attention: Ivan K. Nakatsuka

SUBJECT: BWS Waimanalo Well III
Access Road and Waterline Alignment

Dear Mr. Nakatsuka:

An inspection was made for the proposed access road and waterline route through the Meadow Gold Dairy property on 27 June 2000. The alignment begins at the ditch crossing and follows along an existing crushed coral lined road through pasture land. It then continues past the dairy feed lots, the dairy field office, and on to Waikupanaha Street. An earlier study (Char 1999) covered the area between the well site and the ditch crossing.

The present survey focused on the unmaintained portions of the alignment between the ditch crossing and the dairy feed lots. From the dairy field office and along Waikupanaha Street, the roadside vegetation is periodically mowed and landscaped in places.

The primary objectives of the survey were to provide a general description of the vegetation along the unmaintained portions of the corridor and to search for threatened and endangered species as well as species of concern. The plant names used in this report follow Wagner et al. (1990). The few recent name changes are those recorded in the Hawaii Biological Survey series (Evenhuis and Miller 1995-1998; Evenhuis and Eldredge 1999).

Description of the Vegetation

The crushed coral lined road between the ditch crossing and the dairy feed lots is partially overgrown with weedy vegetation, primarily down the middle of the road. This weedy mix of species consists of annual grasses and smaller herbaceous species. The

most abundant species are swollen fingergrass (Chloris barbata), wiregrass (Eleusine indica), Bermuda grass (Cynodon dactylon), and cheese weed (Malvastrum coramandelianum). Other species found here in smaller numbers include Heliotropium procumbens var. depressum, spiny amaranth (Amaranthus spinosus), hairy horseweed (Conyza bonariensis), Calyptocarpus vialis, and khaki weed (Alternanthera pungens).

Alongside the road, the scrub vegetation consists of dense mats of California grass (Brachiaria mutica) with scattered clumps of Guinea grass (Panicum maximum) and shrubs of sourbush (Pluchea carolinenis) and koa haole (Leucaena leucocephala). In places, Neonotonia wightii, a pasture legume which forms low vining mats, is locally abundant.

Where the road crosses a drainageway, the vegetation consists of dense clumps of Guinea grass and low mats of ivy gourd vine (Coccinia grandis). A few scattered plants of koa haole, castor bean (Ricinus communis), and elephant grass (Pennisetum purpureum) are also found in this drainageway.

Where the road passes the feed lots, there are a few large, old Formosan koa trees (Acacia confusa) and koa haole shrubs along the makai edge. A dense cover of Guinea grass is found between the woody components in this area.

Discussion

The vegetation on the proposed access road and waterline alignment consists almost exclusively of introduced or alien species. The only native plants observed during this survey were the popolo (Solanum americanum) and koali 'awa (Ipomoea indica). Both are indigenous, that is, they are native to Hawai'i and elsewhere. None of the plants found during the field studies is a threatened and endangered species or a species of concern (U.S. Fish and Wildlife Service 1999). This is not surprising since the site has been disturbed for a long time, first by sugar cane cultivation and later by the dairy operations. The earlier botanical study (Char 1999) reached similar conclusions.

The proposed alignment through the Meadow Gold property and down to Waikupanaha Street is not expected to have a significant negative impact on the botanical resources.

Please do not hesitate to contact me should you have any questions regarding the findings from this study.

Sincerely,

Winona P. Char

Winona P. Char

References

Char, W.P. (Char & Associates). 1999. Botanical Resources Assessment, Waimanalo Well III Production Facility, Ko'olau Poko District, O'ahu. Prepared for Austin, Tsutsumi & Associates, Inc. July 1999.

Evenhuis, N.L. and S.E. Miller, editors. 1995-1998. Records of the Hawaii Biological Survey. Bishop Museum Occasional Papers Nos. 41-56.

Evenhuis, N.L. and L.G. Eldredge, editors. 1999. Records of the Hawaii Biological Survey. Bishop Museum Occasional Papers Nos. 58-59.

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BOTANICAL RESOURCES ASSESSMENT
WAIMANALO WELL III PRODUCTION FACILITY
KO'OLAU POKO DISTRICT, O'AHU

by

Winona P. Char
CHAR & ASSOCIATES
Botanical Consultants
Honolulu, Hawai'i

Prepared for: AUSTIN, TSUTSUMI & ASSOCIATES, INC.

July 1999

BOTANICAL RESOURCES ASSESSMENT
WAIMANALO WELL III PRODUCTION FACILITY
KO'OLAU LOA DISTRICT, O'AHU

INTRODUCTION

The Honolulu Board of Water Supply (BWS) proposes to develop its existing exploratory well site at TMK 4-1-08:5. The work will include construction of a control building and control tank, and installation of piping, pumps, perimeter fencing, and other appurtenances. Power for the facility will come from an existing electrical powerline that runs behind the well site. An access road and waterline are also proposed.

The well site is located at an elevation of about 210 ft. at the base of the northeast face of the Ko'olau Range. The well site is surrounded by mixed introduced forest and a large Eucalyptus planting. The proposed access road and waterline alignment will follow down the forested slopes to the north of the well site, and then through pastures leased to Meadow Gold Dairies. The alignment crosses a small irrigation ditch and continues onto farmland presently under corn cultivation. The proposed alignment will connect to the waterline and pavement at the end of Lupe Street.

Two reconnaissance site visits were made with the project engineers on 27 October 1998 and 14 May 1999 to familiarize the subconsultants with the location of the well site and to identify the preferred alignment. Field studies to assess the botanical resources on the project site were conducted on 23 July 1999 by two botanists. The primary objectives of the survey were to provide a description of the vegetation, search for threatened

and endangered species as well as species of concern, identify areas of potential environmental problems or concerns and propose appropriate mitigation measures.

A walk-through survey method was used. Notes were made on plant associations and distribution, substrate types, topography, exposure, disturbances, etc. Plant identifications were made in the field; plants which could not be positively identified were collected for later identification in the herbarium, and for comparison with the recent taxonomic literature.

DESCRIPTION OF THE VEGETATION

The plant names used follow Wagner et al. (1990). The few recent changes in plant names are those recorded in the Hawaii Biological Survey series (Evenhuis and Miller, eds. 1995-1998).

Well Site

The existing exploratory well site consists of a more or less level, grassy area surrounded by a forest of mixed introduced tree species and a large stand of Eucalyptus trees immediately downslope of the well site. A biological assessment of the area was conducted prior to the installation of the exploratory well (Mehrhoff 1992; Maguire Group Inc. 1994).

Clumps of Guinea grass (Panicum maximum) and sourgrass (Digitaria insularis) cover most of the well site. Scattered here and there are a few shrubs of koa haole (Leucaena leucocephala) and pluchea (Pluchea carolinensis), and young trees of fiddlewood (Citharexylum caudatum). Other plants found here include sensitive plant or puahilahila (Mimosa pudica), Chinese violet (Asystasia gangetica), koali 'awa (Ipomoea indica), coral berry (Rivina humilis), ivy gourd (Coccinia grandis), and wild bittermelon (Momordica

charantia).

A description of the forested area is presented in the discussion on the access road and waterline alignment which follows.

Access Road and Waterline Alignment

Along its upper section, the proposed alignment crosses through a forest composed of a mixture of various tree species which include fiddlewood, silk oak (Grevillea robusta), Java plum (Syzygium cumini), gunpowder tree (Trema orientalis), and mango (Mangifera indica), 30 to 40 ft. tall. A large stand of Eucalyptus sp., 50 to 80 ft. tall, is found just below the well site. The subcanopy layer consists of scattered clumps of koa haole shrubs, 15 to 20 ft. tall, and a few shrubs of Christmas berry (Schinus terebinthifolius), ti (Cordyline fruticosa), guava (Psidium guajava), and noni (Morinda citrifolia). A few papaya plants (Carica papaya) can also be found along the edge of the forest. Ground cover consists primarily of clumps of Guinea grass and sourgrass, and patches of coral berry, 2 to 3 ft. tall.

Below the forested section of the alignment, from about 200 ft. elevation, down to the ditch crossing, at about 100 ft. elevation, the vegetation is open pastureland. The upper slopes support dense mats of California grass (Brachiaria mutica) while the middle slopes are covered by a thick mat of sourgrass, 2 to 3 ft. tall. The very dense grass cover tends to exclude other plant species. Weedy herbs and small shrubs are much more abundant on the lower end of the pasture where it is more level; this end of the pasture appears to be overgrazed. Grass cover consists of low mats of Bermuda grass (Cynodon dactylon) with patches of sourgrass. Plants with prickly fruits or stems are abundant here and include spiny amaranth (Amaranthus spinosus), lion's ear (Leonotis nepetifolia), and cocklebur (Xanthium strumarium). Other species

found here in large numbers are goosefoot (Chenopodium murale), prickly sida (Sida spinosa), nodeplant (Synedrella nodiflora), cheese weed (Malvastrum coromandelianum), and Mexican tea (Chenopodium ambrosioides).

The banks of the irrigation ditch are lined by koa haole shrubs along with a few fiddlewood, Christmas berry, and Java plum. Scattered here and there among the woody components are robust clumps of Guinea grass. In places, ivy gourd and Glycine wightii can be found climbing over the koa haole shrubs. In the irrigation ditch the succulent-stemmed honohono herb (Commelina diffusa) is abundant. Other plants found growing along the water's edge include barnyard rice (Echinochloa crus-galli), Ruellia sp., nodeweed, moon flower (Ipomoea alba), and California grass.

The alignment follows an existing road where it crosses the corn fields. The pipeline will be placed underground down the middle of the dirt and coral-lined road. A weedy strip of vegetation is found down the middle of the road and consists primarily of Bermuda grass, swollen fingergrass (Chloris barbata), and wire-grass (Eleusine indica) with several herbaceous species. These include cheese weed, Spanish needle (Bidens pilosa), spiny sida, fir-leaved celery (Ciclospermum leptophyllum), etc. At the time of this survey, most of the corn fields had been harvested and the fields plowed under. Only a few small weedy patches lined the roadside; these consisted primarily of kaliko (Euphorbia heterophylla) and cow pea (Macroptilium lathyroides).

Where the alignment follows adjacent to an old quarry, the vegetation along the road consists of koa haole scrub, 5 to 12 ft. tall. Ground cover is largely California grass with scattered clumps of Guinea grass. Ivy gourd vine is abundant in this scrub vegetation. Near the gate that exists the corn fields, the koa

haole shrubs have been cut back to 3 to 5 ft. tall. In this more open area, shrubs of the native, orange-flowered 'ilima (Sida fallax) and the fuzzy-leaved 'uhaloa (Waltheria indica) are common.

DISCUSSION AND RECOMMENDATIONS

The vegetation on the well site and proposed access road/waterline alignment is dominated by introduced plants such as koa haole, Guinea grass, sourgrass, corn, etc. Introduced plants are all those plants which were brought to the Hawaiian Islands by humans, intentionally or accidentally, after Western contact, that is, Cook's discovery of the islands in 1778. Mixed introduced forest and a large Eucalyptus planting are found around the well site and upper portion of the alignment. The remainder of the alignment passes through pastureland and actively cultivated corn fields. Koa haole scrub is found where the alignment follows adjacent to an old quarry.

None of the plants found during the field studies is a threatened and endangered species or a species of concern (U.S. Fish and Wildlife Service 1999). All of the plants can be found in similar lowland, disturbed habitats throughout the main Hawaiian Islands. A survey of the nearby 7-acre Waimanalo Kupuna Housing Project (Char 1997) recorded similar findings.

Only four native species were observed during the field studies. Three small trees of wiliwili (Erythrina sandwicensis), 12 to 15 ft. tall, were found just outside of the well site on the west side. 'Ilima (Sida fallax) and 'uhaloa (Waltheria indica) are common in the low, open scrub near the gate to the corn fields. Vines of koali 'awa (Ipomoea indica) are found on the well site and in the koa haole scrub. The wiliwili is endemic, that is, it

is native only to the Hawaiian Islands. It is locally common in dry forests, on leeward slopes of all the main islands. The other species are all indigenous, that is, they are native to the islands and elsewhere.

There is little of botanical interest on the well site, on the proposed access road/waterline alignment, and on the lands adjacent to these areas. The proposed project is not expected to have a significant negative impact on the botanical resources. There are no botanical reasons to impose any restrictions, conditions, or impediments to the project.

LITERATURE CITED

Char, W.P. (Char & Associates). 1997. Botanical resources study, Waimanalo Kupuna Housing Project, Ko'olau Poko District, island of O'ahu. Prepared for Kauahikaua & Chun/Architects. June 1997.

Evenhuis, N.L. and S.E. Miller, eds. 1995-1998. Records of the Hawaii Biological Survey. Bishop Museum Occasional Papers Nos. 41-56.

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Appendix D

Laboratory Report, BWS Waimanalo Well III

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Post-it® Fax Note 7671	Date 7/15/99	# of pages ▸ 23
To Ivan Nakatsuka	From Scot Muraoka	
Co./Dept. Austin, Tsutsumi & Assoc.	Co. BWS	
Phone # 533-3646	Phone # 527-5221	
Fax # 526-1267	Fax # 527-5703	

Barry —
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FILE SWGR Report!

Laboratory Report

for

Honolulu, City of
Board of Water Supply Lab
630 S Beretania St
Honolulu , HI 96843
Attention: Ron Fenstemacher
Fax: 808 527-6195

Waimanalo Well

RECEIVED
JUL 15 1999
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
Honolulu, Hawaii 96817-5032

MONTGOMERY WATSON LABS.
SUBMITTED ON
MAR 07 1996
HDS Hillary Strayer

Report#: 25395

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Report
Comments
#25395

Group Comments

Result for TCDD analysis submitted by Quanterra Environmenta
l Services.

Report Summary of positive results, PR25395

Analyzed			Result	MDL	UNITS
	960206005	WAIMANALO III (1942-01)			
02/18/96	Data Entry		03/05/96		--
02/14/96	Data Entry		02/15/96		--
02/07/96	Nitrate		3.5	.440	MGL
02/07/96	Nitrate-N by IC		0.8	.100	MGL
02/10/96	Data Entry		02/12/96		--
02/10/96	Data Entry		02/19/96		--
02/12/96	Calcium, Flame AA		30.	1.000	MGL

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Laboratory
Report
#25395

Honolulu, City of
Ron Fenstemacher
Board of Water Supply Lab
630 S Beretania St
Honolulu , HI 96843

Samples Received
06-feb-1996 11:13:32

Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilution
IMANALO XIII (1942-01) (960206005) Sampled on 02/05/96								
	02/13/96	46978	(ML/EPA 218.1)	Chrom., Plano AA	38	ug/l	1.0	1
	02/13/96	46859	(ML/SM4500-CN F)	Cyanide	ND	mg/l	0.025	1
2/13/96	02/14/96	47030	(ML/EPA 548.1)	Endothall	ND	ug/l	5.0	1
	02/05/96	45322	(EPA/ML 340.2)	Fluoride	ND	mg/l	0.10	1
	02/14/96	46839	(ML/EPA 547)	Glyphosate	ND	ug/l	6.0	1
2/13/96	02/12/96	46977	(EPA/ML 245.1)	Mercury	ND	ug/l	0.50	1
	02/07/96	45848	(ML/EPA 300.0	Nitrite, Nitrogen by IC	ND	mg/l	0.20	1
2/13/96	02/16/96		(EPA 1613	2,3,7,8 - TCDD	ND	PGL	3.6	1
			525 Semivolatiles by GC/MS					
2/12/96	02/13/96	46169	(ML/EPA 525.2)	2,6-Dinitrotoluene	ND	ug/l	0.10	1
2/12/96	02/13/96	46169	(ML/EPA 525.2)	alpha-Chlordane	ND	ug/l	0.050	1
2/12/96	02/13/96	46169	(ML/EPA 525.2)	Acenaphthylene	ND	ug/l	0.10	1
2/12/96	02/13/96	46169	(ML/EPA 525.2)	Alachlor	ND	ug/l	0.050	1
2/12/96	02/13/96	46169	(ML/EPA 525.2)	Aldrin	ND	ug/l	0.050	1
2/12/96	02/13/96	46169	(ML/EPA 525.2)	Anthracene	ND	ug/l	0.020	1
2/12/96	02/13/96	46169	(ML/EPA 525.2)	Atrazine	ND	ug/l	0.050	1
2/12/96	02/13/96	46169	(ML/EPA 525.2)	Benz[a]Anthracene	ND	ug/l	0.050	1
2/12/96	02/13/96	46169	(ML/EPA 525.2)	Benzo[a]Pyrene	ND	ug/l	0.020	1
2/12/96	02/13/96	46169	(ML/EPA 525.2)	Benzo[b]Fluoranthene	ND	ug/l	0.020	1
2/12/96	02/13/96	46169	(ML/EPA 525.2)	Benzo[g,h,i]Perylene	ND	ug/l	0.050	1
2/12/96	02/13/96	46169	(ML/EPA 525.2)	Benzo[k]Fluoranthene	ND	ug/l	0.020	1
2/12/96	02/13/96	46169	(ML/EPA 525.2)	Di(2-Ethylhexyl)phthalate	ND	ug/l	0.60	1
2/12/96	02/13/96	46169	(ML/EPA 525.2)	Butylbenzylphthalate	ND	ug/l	0.50	1
2/12/96	02/13/96	46169	(ML/EPA 525.2)	Bromacil	ND	ug/l	2.0	1
2/12/96	02/13/96	46169	(ML/EPA 525.2)	Butachlor	ND	ug/l	0.050	1
2/12/96	02/13/96	46169	(ML/EPA 525.2)	Caffeine	ND	ug/l	0.020	1
2/12/96	02/13/96	46169	(ML/EPA 525.2)	Chrysene	ND	ug/l	0.020	1
2/12/96	02/13/96	46169	(ML/EPA 525.2)	Dibenz[a,h]Anthracene	ND	ug/l	0.050	1
2/12/96	02/13/96	46169	(ML/EPA 525.2)	Di-(2-Ethylhexyl)adipate	ND	ug/l	0.60	1
2/12/96	02/13/96	46169	(ML/EPA 525.2)	Diethylphthalate	ND	ug/l	0.50	1

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Laboratory
Report
#25395

Honolulu, City of
(continued)

Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilution
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Dieldrin	ND	ug/l	0.20	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Dimethylphthalate	ND	ug/l	0.50	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Dinoseb	ND	ug/l	10	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Di-n-Butylphthalate	ND	ug/l	0.50	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Endrin	ND	ug/l	0.10	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Fluorene	ND	ug/l	0.050	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	gamma-Chlordane	ND	ug/l	0.050	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Hexachlorobenzene	ND	ug/l	0.050	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Hexachlorocyclopentadiene	ND	ug/l	0.050	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Heptachlor	ND	ug/l	0.040	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Heptachlor Epoxide	ND	ug/l	0.020	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Indeno(1,2,3,c,d)Pyrene	ND	ug/l	0.020	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Isophorone	ND	ug/l	0.50	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Lindane	ND	ug/l	0.020	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Methoxychlor	ND	ug/l	0.050	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Metribuzin	ND	ug/l	0.050	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Molinate	ND	ug/l	0.050	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Metolachlor	ND	ug/l	0.20	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	trans-Nonachlor	ND	ug/l	0.050	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Pentachlorophenol	ND	ug/l	0.050	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Phenanthrene	ND	ug/l	1.0	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Prometryn	ND	ug/l	0.020	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Propachlor	ND	ug/l	0.50	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Pyrene	ND	ug/l	0.030	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Simazine	ND	ug/l	0.050	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Thiobencarb	ND	ug/l	0.020	1
02/12/96	02/13/96	46169	(ML/EPA 525.2)	Trifluralin	ND	ug/l	0.10	1
			(Surrogate	) Perylene-d12	103	% Rec		
			Aldicarbs					
	02/13/96	46816	(ML/EPA 531.1)	3-Hydroxycarbofuran	ND	ug/l	2.0	1
	02/12/96	46816	(ML/EPA 531.1)	Aldicarb (Temik)	ND	ug/l	0.50	1
	02/12/96	46816	(ML/EPA 531.1)	Aldicarb sulfone	ND	ug/l	0.50	1
	02/13/96	46816	(ML/EPA 531.1)	Aldicarb sulfoxide	ND	ug/l	0.50	1
	02/12/96	46816	(ML/EPA 531.1)	Oxyamyl	ND	ug/l	2.0	1
	02/12/96	46816	(ML/EPA 531.1)	Carbofuran (Furadan)	ND	ug/l	0.50	1

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Honolulu, City of (continued)

Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilution
	02/12/99	46516	(ML/EPA 531.1)	Carbaryl	ND	ug/l	2.0	1
	02/12/99	46516	(ML/EPA 531.1)	Methiocarb	ND	ug/l	2.0	1
	02/12/99	46516	(ML/EPA 531.1)	Metomyl	ND	ug/l	1.0	1
	02/12/99	46516	(ML/EPA 531.1)	Oxamyl (Vydate)	ND	ug/l	2.0	1
			(Surrogate)	DBOC	120	% Rec		
			Diquat and Paraquat					
02/05/99	02/09/99	45863	(ML/EPA 549)	Diquat	ND	ug/l	0.40	1
02/05/99	02/09/99	45863	(EPA 549)	Paraquat	ND	ug/l	2.0	1
			EPA Method 504.1					
02/14/99	02/18/99	46769	(ML/EPA 504)	1,2-Dibromoethane	ND	ug/l	0.010	1
02/14/99	02/18/99	46769	(ML/EPA 504)	1,2,3-Trichloropropane	ND	ug/l	0.10	1
			(Surrogate)	1,2-dibromopropane	87.9	% Rec		
			Herbicides by 515.1					
02/08/99	02/10/99	46508	(ML/EPA 515.1)	2,4,5-T	ND	ug/l	0.20	1
02/08/99	02/10/99	46508	(ML/EPA 515.1)	2,4,5-TP (Silvex)	ND	ug/l	0.20	1
02/08/99	02/10/99	46508	(ML/EPA 515.1)	2,4-D	ND	ug/l	0.20	1
02/08/99	02/10/99	46508	(ML/EPA 515.1)	2,4-DB	ND	ug/l	2.0	1
02/08/99	02/10/99	46508	(ML/EPA 515.1)	Dichlorprop	ND	ug/l	0.50	1
02/08/99	02/10/99	46508	(ML/EPA 515.1)	Acifluorfen (qualitative)	ND	ug/l	0.20	1
02/08/99	02/10/99	46508	(ML/EPA 515.1)	Bentazon	ND	ug/l	0.50	1
02/08/99	02/10/99	46508	(ML/EPA 515.1)	Dalapon (qualitative)	ND	ug/l	1.0	1
02/08/99	02/10/99	46508	(ML/EPA 515.1)	3,5-Dichlorobenzoic acid	ND	ug/l	0.50	1
02/08/99	02/10/99	46508	(ML/EPA 515.1)	DCPA	ND	ug/l	0.20	1
02/08/99	02/10/99	46508	(ML/EPA 515.1)	Dicamba	ND	ug/l	0.080	1
02/08/99	02/10/99	46508	(ML/EPA 515.1)	Dinoseb	ND	ug/l	0.20	1
02/08/99	02/10/99	46508	(ML/EPA 515.1)	Pentachlorophenol	ND	ug/l	0.040	1
02/08/99	02/10/99	46508	(ML/EPA 515.1)	Picloram	ND	ug/l	0.10	1
02/08/99	02/10/99	46508	(ML/EPA 515.1)	4-Nitrophenol (qualitative)	ND	ug/l	5.0	1
			(Surrogate)	2,4-Dichlorophenylacetic acid	102	% Rec		

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Honolulu, City of (continued)

Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilution
			ICPMS Metals					
	02/15/99	46623	(EPA/ML 200.8)	Arsenic, Total, ICAP/MS	ND	ug/l	5.0	1
	02/15/99	46622	(EPA/ML 200.8)	Barium, Total, ICAP/MS	ND	ug/l	10	1
	02/12/99	46622	(EPA/ML 200.8)	Beryllium, Total, ICAP/MS	ND	ug/l	1.0	1
	02/15/99	46622	(EPA/ML 200.8)	Cadmium, Total, ICAP/MS	ND	ug/l	0.50	1
	02/15/99	46622	(EPA/ML 200.8)	Chromium, Total, ICAP/MS	ND	ug/l	5.0	1
	02/15/99	46622	(EPA/ML 200.8)	Copper, Total, ICAP/MS	ND	ug/l	10	1
	02/15/99	46622	(EPA/ML 200.8)	Nickel, Total, ICAP/MS	ND	ug/l	5.0	1
	02/15/99	46622	(EPA/ML 200.8)	Lead, Total, ICAP/MS	ND	ug/l	5.0	1
	02/15/99	46622	(EPA/ML 200.8)	Antimony, Total, ICAP/MS	ND	ug/l	2.0	1
	02/15/99	46622	(EPA/ML 200.8)	Selenium, Total, ICAP/MS	ND	ug/l	5.0	1
	02/15/99	46622	(EPA/ML 200.8)	Thallium, Total, ICAP/MS	ND	ug/l	1.0	1
			Nitrate by IC as NO3 & N					
	02/07/99	45857	(EPA/ML 300.0)	Nitrate-N by IC	0.8	mg/l	0.10	1
	02/07/99	45857	(ML/EPA 300)	Nitrate	3.5	mg/l	0.44	1
			SDWA Pesticides					
02/07/99	02/10/99	46156	(ML/EPA 508)	PCB 1016 Aroclor	ND	ug/l	0.10	1
02/07/99	02/10/99	46156	(ML/EPA 508)	PCB 1221 Aroclor	ND	ug/l	0.10	1
02/07/99	02/10/99	46156	(ML/EPA 508)	PCB 1232 Aroclor	ND	ug/l	0.10	1
02/07/99	02/10/99	46156	(ML/EPA 508)	PCB 1242 Aroclor	ND	ug/l	0.10	1
02/07/99	02/10/99	46156	(ML/EPA 508)	PCB 1248 Aroclor	ND	ug/l	0.10	1
02/07/99	02/10/99	46156	(ML/EPA 508)	PCB 1254 Aroclor	ND	ug/l	0.10	1
02/07/99	02/10/99	46156	(ML/EPA 508)	PCB 1260 Aroclor	ND	ug/l	0.10	1
02/07/99	02/10/99	46156	(ML/EPA 508)	Alpha-BHC	ND	ug/l	0.010	1
02/07/99	02/10/99	46156	(ML/EPA 508)	Alachlor (Alanex)	ND	ug/l	0.020	1
02/07/99	02/10/99	46156	(ML/EPA 508)	Aldrin	ND	ug/l	0.010	1
02/07/99	02/10/99	46156	(ML/EPA 508)	Beta-BHC	ND	ug/l	0.010	1
02/07/99	02/10/99	46156	(ML/EPA 508)	Chlordane	ND	ug/l	0.10	1
02/07/99	02/10/99	46156	(ML/EPA 508)	Chlorthalonil (Drconil, Bravo)	ND	ug/l	0.010	1
02/07/99	02/10/99	46156	(ML/EPA 508)	Delta-BHC	ND	ug/l	0.010	1
02/07/99	02/10/99	46156	(ML/EPA 508)	p,p' DDD	ND	ug/l	0.010	1
02/07/99	02/10/99	46156	(ML/EPA 508)	p,p' DDE	ND	ug/l	0.010	1

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Laboratory Report #25395

Honolulu, City of (continued)

Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilution
07/07/99	07/10/99	46156	[ML/EPA 508]	p,p' DDT	ND	ug/l	0.010	1
07/07/99	07/10/99	46156	[ML/EPA 508]	Dieldrin	ND	ug/l	0.010	1
07/07/99	07/10/99	46156	[ML/EPA 999]	Endrin Aldehyde	ND	ug/l	0.010	1
07/07/99	07/10/99	46156	[ML/EPA 508]	Endrin	ND	ug/l	0.010	1
07/07/99	07/10/99	46156	[ML/EPA 508]	Endosulfan I (Alpha)	ND	ug/l	0.010	1
07/07/99	07/10/99	46156	[ML/EPA 508]	Endosulfan II (Beta)	ND	ug/l	0.010	1
07/07/99	07/10/99	46156	[ML/EPA 508]	Endosulfan sulfate	ND	ug/l	0.010	1
07/07/99	07/10/99	46156	[ML/EPA 508]	Heptachlor	ND	ug/l	0.010	1
07/07/99	07/10/99	46156	[ML/EPA 508]	Heptachlor Epoxide	ND	ug/l	0.010	1
07/07/99	07/10/99	46156	[ML/EPA 508]	Lindane (gamma-BHC)	ND	ug/l	0.010	1
07/07/99	07/10/99	46156	[ML/EPA 508]	Methoxychlor	ND	ug/l	0.050	1
07/07/99	07/10/99	46156	[ML/EPA 508]	Toxaphene	ND	ug/l	0.50	1
			[Surrogate]	Dibutyl Chlorendate	104	% Rec		
			[Surrogate]	Tetrachloro-m-xylene	108	% Rec		

Volatile Organic Compounds

Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilution
	07/14/99	46043	[ML/EPA 502.2]	4-Chlorotoluene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Bromodichloromethane	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Benzene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Bromobenzene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Bromochloromethane	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Bromomethane	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	cis-1,2-Dichloroethene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Chlorobenzene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Carbon tetrachloride	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	cis-1,3-Dichloropropene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Bromoform	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Chloroform	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Chloroethane	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Chloromethane	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Dibromochloromethane	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	1,2-Dibromo-3-chloropropane	ND	ug/l	1.0	1
	07/14/99	46043	[ML/EPA 502.2]	Dibromomethane	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Dichlorodifluoromethane	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	1,2-Dibromoethane	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Ethylbenzene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Hexachlorobutadiene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Isopropylbenzene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Methylene chloride	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	m,p-Xylenes	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Naphthalene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	n-Butylbenzene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	n-Propylbenzene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	o-Xylene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Tetrachloroethene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	p-Isopropyltoluene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	sec-Butylbenzene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Styrene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	trans-1,3-Dichloroethene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	tert-Butylbenzene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Trichloroethene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	trans-1,2-Dichloropropene	ND	ug/l	0.50	1

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Honolulu, City of (continued)

Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilution
	07/14/99	46043	[ML/EPA 502.2]	4-Chlorotoluene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Bromodichloromethane	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Benzene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Bromobenzene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Bromochloromethane	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Bromomethane	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	cis-1,2-Dichloroethene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Chlorobenzene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Carbon tetrachloride	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	cis-1,3-Dichloropropene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Bromoform	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Chloroform	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Chloroethane	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Chloromethane	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Dibromochloromethane	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	1,2-Dibromo-3-chloropropane	ND	ug/l	1.0	1
	07/14/99	46043	[ML/EPA 502.2]	Dibromomethane	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Dichlorodifluoromethane	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	1,2-Dibromoethane	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Ethylbenzene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Hexachlorobutadiene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Isopropylbenzene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Methylene chloride	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	m,p-Xylenes	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Naphthalene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	n-Butylbenzene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	n-Propylbenzene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	o-Xylene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Tetrachloroethene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	p-Isopropyltoluene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	sec-Butylbenzene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Styrene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	trans-1,3-Dichloroethene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	tert-Butylbenzene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	Trichloroethene	ND	ug/l	0.50	1
	07/14/99	46043	[ML/EPA 502.2]	trans-1,2-Dichloropropene	ND	ug/l	0.50	1

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Honolulu, City of (continued)

Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilution
	02/14/99	45843	(ML/EPA 502.2)	Toluene	ND	ug/l	0.50	1
	02/14/99	45843	(ML/EPA 502.2)	Trichlorofluoromethane	ND	ug/l	0.60	1
	02/14/99	45843	(ML/EPA 502.2)	Vinyl chloride	ND	ug/l	0.40	1
			(Surrogate)	Bromofluorobenzene-ELCD	88	% Rec		
			(Surrogate)	Bromofluorobenzene-PID	98	% Rec		
			(Surrogate)	Chlorofluorobenzene-ELCD	87	% Rec		
			(Surrogate)	Chlorofluorobenzene-PID	98	% Rec		

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QC Batch #45848 Nitrite, Nitrogen by IC

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Nitrite, Nitrogen by IC	1.0	0.98	98.000	(90.00 - 110.00)	
LCS2	Nitrite, Nitrogen by IC	1.0	0.98	98.000	(90.00 - 110.00)	0.00
MBLK	Nitrite, Nitrogen by IC	ND				
MS	Nitrite, Nitrogen by IC	1.0	1.07	107.000	(80.00 - 120.00)	
MSD	Nitrite, Nitrogen by IC	1.0	1.09	109.000	(80.00 - 120.00)	1.9

QC Batch #45857 Nitrate by IC as NO3 & N

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
MBLK	Nitrate	ND				
LCS1	Nitrate-N	2.5	2.53	101.200	(90.00 - 110.00)	
LCS2	Nitrate-N	2.5	2.54	101.600	(90.00 - 110.00)	0.39
MS	Nitrate-N	2.5	2.64	105.600	(75.00 - 125.00)	
MSD	Nitrate-N	2.5	2.65	106.000	(75.00 - 125.00)	0.38

QC Batch #45863 Diquat and Paraquat

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Diquat	10.0	13.3	133.000	(70.00 - 130.00)	
MBLK	Diquat	ND				
MS	Diquat	10.0	10.0	100.000	(70.00 - 130.00)	
LCS1	Paraquat	10.0	12.5	125.000	(70.00 - 130.00)	
MBLK	Paraquat	ND				
MS	Paraquat	10.0	10.4	104.000	(70.00 - 130.00)	

QC Batch #45922 Fluoride

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Fluoride	0.67	0.68	101.149	(90.00 - 110.00)	
LCS2	Fluoride	0.67	0.68	101.149	(90.00 - 110.00)	0.00
MBLK	Fluoride	ND				
MS	Fluoride	0.909	1.01	111.111	(80.00 - 120.00)	
MSD	Fluoride	0.909	1.01	111.111	(80.00 - 120.00)	0.00

Spikes which exceed limits and Method Blanks with positive results are highlighted by Underlining.

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Honolulu, City of
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QC Batch #45970 Calcium, Flame AA

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Calcium, Flame AA	50	49.0	98.000	(90.00 - 110.00)	
LCS2	Calcium, Flame AA	50	46.9	93.800	(90.00 - 110.00)	2.3
MBLK	Calcium, Flame AA	ND				
MS	Calcium, Flame AA	50	62.1	124.200	(80.00 - 120.00)	
MSD	Calcium, Flame AA	50	52.8	105.600	(80.00 - 120.00)	16

QC Batch #46008 Herbicides by 515.1

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
MBLK	2,4,5-T	ND				
LCS1	2,4,5-TP (Silvex)	0.500	0.53	106.000	(67.00 - 130.00)	
LCS2	2,4,5-TP (Silvex)	0.500	NA		(67.00 - 130.00)	
MBLK	2,4,5-TP (Silvex)	ND				
MS	2,4,5-TP (Silvex)	0.500	0.52	104.000	(42.00 - 226.00)	
LCS1	2,4-D	1.00	0.96	96.000	(72.00 - 137.00)	
LCS2	2,4-D	1.00	NA		(72.00 - 137.00)	
MBLK	2,4-D	ND				
MS	2,4-D	1.00	0.91	91.000	(49.00 - 216.00)	
MBLK	2,4-DB	ND				
MBLK	3,5-Dichlorobenzoic acid	ND				
MBLK	4-Nitrophenol (qualitative)	ND				
MBLK	5-Hydroxydicamba	ND				
MBLK	Acifluorfen (qualitative)	ND				
LCS1	Bentazon	1.00	0.94	94.000	(75.00 - 134.00)	
LCS2	Bentazon	1.00	NA		(75.00 - 134.00)	
MBLK	Bentazon	ND				
MS	Bentazon	1.00	0.93	93.000	(70.00 - 170.00)	
MBLK	Chloramben (qualitative)	ND				
MBLK	DCPA	ND				
MBLK	Dalapon (qualitative)	ND				
MBLK	Dicamba	ND				
MBLK	Dichlorprop	ND				

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MBLK	Dinoseb	ND				
MBLK	Pentachlorophenol	ND				
MBLK	Picloram	ND				

QC Batch #46014 Aldicarbs

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	3-Hydroxycarbofuran	20.0	17.7	88.500	(83.00 - 120.00)	
MBLK	3-Hydroxycarbofuran	ND				
MS	3-Hydroxycarbofuran	20.0	21.0	105.000	(70.00 - 130.00)	
LCS1	Aldicarb (Temik)	20.0	21.0	105.000	(83.00 - 115.00)	
MBLK	Aldicarb (Temik)	ND				
MS	Aldicarb (Temik)	20.0	20.0	100.000	(70.00 - 130.00)	
LCS1	Aldicarb sulfone	20.0	19.6	98.000	(84.00 - 116.00)	
MBLK	Aldicarb sulfone	ND				
MS	Aldicarb sulfone	20.0	21.4	107.000	(68.00 - 130.00)	
LCS1	Aldicarb sulfoxide	20.0	19.0	95.000	(85.00 - 130.00)	
MBLK	Aldicarb sulfoxide	ND				
MS	Aldicarb sulfoxide	20.0	21.4	107.000	(70.00 - 130.00)	
LCS1	Baygon	20.0	19.2	96.000	(85.00 - 115.00)	
MBLK	Baygon	ND				
MS	Baygon	20.0	20.9	104.500	(70.00 - 130.00)	
LCS1	Carbaryl	20.0	17.0	85.000	(65.00 - 115.00)	
MBLK	Carbaryl	ND				
MS	Carbaryl	20.0	20.5	102.500	(70.00 - 130.00)	
LCS1	Carbofuran (Furadan)	20.0	18.3	91.500	(85.00 - 115.00)	
MBLK	Carbofuran (Furadan)	ND				
MS	Carbofuran (Furadan)	20.0	20.4	102.000	(70.00 - 130.00)	
LCS1	Methiocarb	20.0	16.3	81.500	(70.00 - 130.00)	
MBLK	Methiocarb	ND				
MS	Methiocarb	20.0	19.9	99.500	(70.00 - 130.00)	
LCS1	Methomyl	20.0	20.0	100.000	(83.00 - 113.00)	
MBLK	Methomyl	ND				
MS	Methomyl	20.0	20.2	101.000	(70.00 - 130.00)	
LCS1	Oxamyl (Vydate)	20.0	18.1	90.500	(85.00 - 115.00)	
MBLK	Oxamyl (Vydate)	ND				
MS	Oxamyl (Vydate)	20.0	21.1	105.500	(70.00 - 130.00)	

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QC Batch #46033 Glyphosate

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Glyphosate	50	55.4	110.800	(70.00 - 130.00)	
MBLK	Glyphosate	ND				
MS	Glyphosate	50	58.8	117.600	(70.00 - 130.00)	

QC Batch #46043 Volatile Organic Compounds

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
MBLK	1,1,2,2-Tetrachloroethane	ND				
LCS1	1,1,1-Trichloroethane	10.0	9.8	98.000	(100.00 - 120.00)	
LCS2	1,1,1-Trichloroethane	10.0	10.5	105.000	(100.00 - 120.00)	15
MBLK	1,1,1-Trichloroethane	ND				
MBLK	1,1,2,2-Tetrachloroethane	ND				
MBLK	1,1,2-Trichloroethane	ND				
MBLK	1,1-Dichloroethane	ND				
MBLK	1,1-Dichloroethene	ND				
MBLK	1,1-Dichloropropene	ND				
LCS1	1,2,3-Trichlorobenzene	10.0	10.1	101.000	(80.00 - 120.00)	
LCS2	1,2,3-Trichlorobenzene	10.0	10.2	102.000	(80.00 - 120.00)	0.99
MBLK	1,2,3-Trichlorobenzene	ND				
MBLK	1,2,3-Trichloropropane	ND				
MBLK	1,2,4-Trichlorobenzene	ND				
MBLK	1,2,4-Trimethylbenzene	ND				
MBLK	1,2-Dichlorobenzene	ND				
MBLK	1,2-Dichloroethane	ND				
MBLK	1,2-Dichloropropane	ND				
MBLK	1,3,5-Trimethylbenzene	ND				
MBLK	1,3-Dichlorobenzene	ND				
MBLK	1,3-Dichloropropane	ND				
MBLK	1,4-Dichlorobenzene	ND				
MBLK	2,2-Dichloropropane	ND				
MBLK	2-Chlorotoluene	ND				
MBLK	4-Chlorotoluene	ND				

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LCS1	Benzene	10.0	10.0	100.000	(80.00 - 120.00)	
LCS2	Benzene	10.3	10.3	103.000	(80.00 - 120.00)	3.0
MBLK	Benzene	ND				
MBLK	Bromobenzene	ND				
MBLK	Bromochloromethane	ND				
LCS1	Bromodichloromethane	10.0	9.6	96.000	(80.00 - 120.00)	
LCS2	Bromodichloromethane	10.0	9.6	96.000	(80.00 - 120.00)	4.3
MBLK	Bromodichloromethane	ND				
LCS1	Bromoform	10.0	10.4	104.000	(80.00 - 120.00)	
LCS2	Bromoform	10.0	10.3	103.000	(80.00 - 120.00)	0.96
MBLK	Bromoform	ND				
MBLK	Bromomethane	ND				
LCS1	Carbon tetrachloride	10.0	9.2	92.000	(80.00 - 120.00)	
LCS2	Carbon tetrachloride	10.0	10.1	101.000	(80.00 - 120.00)	11
MBLK	Carbon tetrachloride	ND				
MBLK	Chlorobenzene	ND				
MBLK	Chloroethane	ND				
LCS1	Chloroform	10.0	9.4	94.000	(80.00 - 120.00)	
LCS2	Chloroform	10.0	10.1	101.000	(80.00 - 120.00)	7.2
MBLK	Chloroform	ND				
MBLK	Chloromethane	ND				
LCS1	Dibromochloromethane	10.0	9.9	99.000	(80.00 - 120.00)	
LCS2	Dibromochloromethane	10.0	10.4	104.000	(80.00 - 120.00)	4.9
MBLK	Dibromochloromethane	ND				
MBLK	Dibromomethane	ND				
MBLK	Dichlorodifluoromethane	ND				
MBLK	Ethylbenzene	ND				
MBLK	Hexachlorobutadiene	ND				
LCS1	Isopropylbenzene	10.0	10.1	101.000	(80.00 - 120.00)	
LCS2	Isopropylbenzene	10.0	10.2	102.000	(80.00 - 120.00)	0.99
MBLK	Isopropylbenzene	ND				
MBLK	Methylene Chloride	ND				
MBLK	Naphthalene	ND				
MBLK	Styrene	ND				
LCS1	Tetrachloroethene	10.0	9.6	96.000	(80.00 - 120.00)	
LCS2	Tetrachloroethene	10.0	10.4	104.000	(80.00 - 120.00)	8.0
MBLK	Tetrachloroethene	ND				
MBLK	Toluene	ND				

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LCS1	Trichloroethene	10.0	8.9	89.0CG	(80.00 - 120.00)	
LCS2	Trichloroethene	10.0	8.7	87.0CG	(80.00 - 120.00)	4.4
MBLK	Trichloroethene	ND				
MBLK	Trichlorofluoromethane	ND				
MBLK	Trichlorotrifluoroethane (Freon	ND				
MBLK	Vinyl chloride	ND				
MBLK	cis-1,3-Dichloroethene	ND				
MBLK	cis-1,3-Dichloropropene	ND				
MBLK	m-p-Xylenes	ND				
MBLK	n-Butylbenzene	ND				
MBLK	n-Propylbenzene	ND				
MBLK	o-Xylene	ND				
MBLK	p-Isopropyltoluene	ND				
LCS1	sec-Butylbenzene	10.0	10.4	104.0CG	(80.00 - 120.00)	
LCS2	sec-Butylbenzene	10.0	10.4	104.0CG	(80.00 - 120.00)	0.00
MBLK	sec-Butylbenzene	ND				
MBLK	tert-Butylbenzene	ND				
LCS1	trans-1,2-Dichloroethene	10.0	10.0	100.0CG	(80.00 - 120.00)	
LCS2	trans-1,2-Dichloroethene	10.0	10.5	105.0CG	(80.00 - 120.00)	4.9
MBLK	trans-1,2-Dichloroethene	ND				
MBLK	trans-1,3-Dichloropropene	ND				

QC Batch #46050 — Endothall

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Endothall	35	38.1	113.4CG	(50.00 - 137.00)	
MBLK	Endothall	ND				
MS	Endothall	35	35.7	102.0CG	(62.00 - 126.00)	

QC Batch #46059 — Cyanide

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Cyanide	0.10	0.0910	91.0CG	(90.00 - 110.00)	
MBLK	Cyanide	ND				
MS	Cyanide	0.10	0.0966	96.6CG	(80.00 - 120.00)	
MSD	Cyanide	0.10	0.0919	91.9CG	(80.00 - 120.00)	3.1

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QC Batch #46156 — SDWA Pesticides

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
MBLK	Alachlor (Alanex)	ND				
LCS1	Aldrin	0.050	0.051	102.0CG	(56.00 - 126.00)	
LCS2	Aldrin	0.050	NA		(56.00 - 126.00)	
MBLK	Aldrin	ND				
MS	Aldrin	0.050	0.052	104.0CG	(56.00 - 126.00)	
MBLK	Alpha-BHC	ND				
MBLK	Chlordane	ND				
MBLK	Chlorthalonil (Dacomil, Bravo)	ND				
MBLK	Delta-BHC	ND				
LCS1	Dieldrin	0.100	0.097	97.0CG	(97.00 - 117.00)	
LCS2	Dieldrin	0.100	NA		(97.00 - 117.00)	
MBLK	Dieldrin	ND				
MS	Dieldrin	0.100	0.100	100.0CG	(97.00 - 117.00)	
MBLK	Endosulfan I (alpha)	ND				
MBLK	Endosulfan II (beta)	ND				
MBLK	Endosulfan sulfate	ND				
LCS1	Endrin	0.100	0.103	103.0CG	(50.00 - 110.00)	
LCS2	Endrin	0.100	NA		(50.00 - 110.00)	
MBLK	Endrin	ND				
MS	Endrin	0.100	0.106	106.0CG	(50.00 - 110.00)	
MBLK	Endrin Aldehyde	ND				
LCS1	Gamma-BHC (Lindane)	0.050	0.051	102.0CG	(59.00 - 119.00)	
LCS2	Gamma-BHC (Lindane)	0.050	NA		(59.00 - 119.00)	
MBLK	Gamma-BHC (Lindane)	ND				
MS	Gamma-BHC (Lindane)	0.050	0.053	106.0CG	(59.00 - 119.00)	
LCS1	Heptachlor	0.050	0.051	102.0CG	(69.00 - 133.00)	
LCS2	Heptachlor	0.050	NA		(69.00 - 133.00)	
MBLK	Heptachlor	ND				
MS	Heptachlor	0.050	0.052	104.0CG	(63.00 - 133.00)	
MBLK	Heptachlor Epoxide	ND				
MBLK	Methoxychlor	ND				
MBLK	PCB 1016 Aroclor	ND				
MBLK	PCB 1221 Aroclor	ND				

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MSLK	PCB 1232 Aroclor	ND			
MSLK	PCB 1242 Aroclor	ND			
MSLK	PCB 1248 Aroclor	ND			
MSLK	PCB 1254 Aroclor	ND			
MSLK	PCB 1260 Aroclor	ND			
MSLK	Toxaphene	ND			
MSLK	p,p' DDD	ND			
MSLK	p,p' DDE	ND			
LCS1	p,p' DDT	0.100	0.052	52.000	(62.00 - 162.00)
LCS2	p,p' DDT	0.100	NA		(62.00 - 162.00)
MSLK	p,p' DDT	ND			
MS	p,p' DDT	0.100	0.097	97.000	(62.00 - 162.00)

QC Batch #46169 525 Semivolatiles by GC/MS

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Acenaphthylene	3	3.33	111.000	(70.00 - 130.00)	
MSLK	Acenaphthylene	ND				
MS	Acenaphthylene	3	3.13	104.000	(70.00 - 130.00)	
LCS1	Alachlor	3	3.38	113.000	(70.00 - 130.00)	
MSLK	Alachlor	ND				
MS	Alachlor	3	3.30	110.000	(70.00 - 130.00)	
LCS1	Aldrin	3	3.00	100.000	(70.00 - 130.00)	
MSLK	Aldrin	ND				
MS	Aldrin	3	3.00	94.000	(70.00 - 130.00)	
LCS1	Anthracene	3	3.31	110.300	(70.00 - 130.00)	
MSLK	Anthracene	ND				
MS	Anthracene	3	3.10	103.000	(70.00 - 130.00)	
LCS1	Atrazine	3	3.17	105.500	(70.00 - 130.00)	
MSLK	Atrazine	ND				
MS	Atrazine	3	3.13	104.000	(70.00 - 130.00)	
LCS1	Benz[a]Anthracene	3	3.13	104.500	(70.00 - 130.00)	
MSLK	Benz(a)Anthracene	ND				
MS	Benz[a]Anthracene	3	3.06	102.000	(70.00 - 130.00)	
LCS1	Benzo(a)pyrene	3	3.10	103.000	(70.00 - 130.00)	
MSLK	Benzo(a)pyrene	ND				
MS	Benzo(a)pyrene	3	2.87	95.500	(70.00 - 130.00)	

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LCS1	Benzo(b)Fluoranthene	3	3.27	113.500	(70.00 - 130.00)
MSLK	Benzo(b)Fluoranthene	ND			
MS	Benzo(b)Fluoranthene	3	3.09	104.500	(70.00 - 130.00)
LCS1	Benzo(g,h,i)Perylene	3	3.16	105.000	(70.00 - 130.00)
MSLK	Benzo(g,h,i)Perylene	ND			
MS	Benzo(g,h,i)Perylene	3	1.98	99.000	(70.00 - 130.00)
LCS1	Benzo(k)Fluoranthene	3	3.36	112.000	(70.00 - 130.00)
MSLK	Benzo(k)Fluoranthene	ND			
MS	Benzo(k)Fluoranthene	3	3.07	102.500	(70.00 - 130.00)
MSLK	Bromacil	ND			
MSLK	Butachlor	ND			
LCS1	Butylbenzylphthalate	3	3.38	113.000	(70.00 - 130.00)
MSLK	Butylbenzylphthalate	ND			
MS	Butylbenzylphthalate	3	3.31	110.500	(70.00 - 130.00)
LCS1	Caffeine	3	3.01	100.500	(70.00 - 130.00)
MSLK	Caffeine	ND			
MS	Caffeine	3	1.02	91.000	(70.00 - 130.00)
LCS1	Chrysene	3	3.05	102.500	(70.00 - 130.00)
MSLK	Chrysene	ND			
MS	Chrysene	3	1.99	99.000	(70.00 - 130.00)
LCS1	Di(2-Ethylhexyl)phthalate	3	3.19	103.500	(70.00 - 130.00)
MSLK	Di(2-Ethylhexyl)phthalate	ND			
MS	Di(2-Ethylhexyl)phthalate	3	3.66	133.000	(70.00 - 130.00)
LCS1	Di-(2-Ethylhexyl)adipate	3	3.11	103.500	(70.00 - 130.00)
MSLK	Di-(2-Ethylhexyl)adipate	ND			
MS	Di-(2-Ethylhexyl)adipate	3	3.11	105.500	(70.00 - 130.00)
LCS1	Di-n-Butylphthalate	3	3.38	113.000	(70.00 - 130.00)
MSLK	Di-n-Butylphthalate	ND	19.35)V		
MS	Di-n-Butylphthalate	3	3.53	116.500	(70.00 - 130.00)
MSLK	Diuron	ND			
LCS1	Dibenz(a,h)Anthracene	3	3.01	100.500	(70.00 - 130.00)
MSLK	Dibenz(a,h)Anthracene	ND			
MS	Dibenz(a,h)Anthracene	3	1.86	93.000	(70.00 - 130.00)
MSLK	Dieldrin	ND			
LCS1	Diethylphthalate	3	3.68	123.000	(70.00 - 130.00)
MSLK	Diethylphthalate	ND			
MS	Diethylphthalate	3	3.51	125.500	(70.00 - 130.00)
MSLK	Dimethoate	ND			

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LCS1	Dimethylphthalate	3	2.23	111.500	(70.00 - 130.00)
MSLK	Dimethylphthalate	ND			
MS	Dimethylphthalate	2	2.14	107.000	(70.00 - 130.00)
LCS1	Endrin	3	2.27	113.500	(70.00 - 130.00)
MSLK	Endrin	ND			
MS	Endrin	2	2.42	121.000	(70.00 - 130.00)
LCS1	Fluorene	3	2.27	113.500	(70.00 - 130.00)
MSLK	Fluorene	ND			
MS	Fluorene	3	2.32	116.000	(70.00 - 130.00)
LCS1	Heptachlor	2	2.14	107.000	(70.00 - 130.00)
MSLK	Heptachlor	ND			
MS	Heptachlor	2	2.13	106.500	(70.00 - 130.00)
LCS1	Heptachlor Epoxide	3	2.11	105.500	(70.00 - 130.00)
MSLK	Heptachlor Epoxide	ND			
MS	Heptachlor Epoxide	2	2.15	107.500	(70.00 - 130.00)
LCS1	Hexachlorobenzene	3	1.95	97.500	(70.00 - 130.00)
MSLK	Hexachlorobenzene	ND			
MS	Hexachlorobenzene	2	1.87	93.500	(70.00 - 130.00)
LCS1	Hexachlorocyclopentadiene	3	2.15	107.500	(40.00 - 130.00)
MSLK	Hexachlorocyclopentadiene	ND			
MS	Hexachlorocyclopentadiene	2	2.16	108.000	(40.00 - 130.00)
LCS1	Indeno(1,2,3,c,d)Pyrene	3	2.03	101.500	(70.00 - 130.00)
MSLK	Indeno(1,2,3,c,d)Pyrene	ND			
MS	Indeno(1,2,3,c,d)Pyrene	2	1.83	91.500	(70.00 - 130.00)
MSLK	Isophorone	ND			
LCS1	Lindane	3	2.38	119.000	(70.00 - 130.00)
MSLK	Lindane	ND			
MS	Lindane	3	2.21	110.500	(70.00 - 130.00)
LCS1	Methoxychlor	3	2.44	122.000	(70.00 - 130.00)
MSLK	Methoxychlor	ND			
MS	Methoxychlor	3	2.27	113.500	(70.00 - 130.00)
MSLK	Metolachlor	ND			
MSLK	Metribuzin	ND			
LCS1	Molinate	3	2.41	120.500	(70.00 - 130.00)
MSLK	Molinate	ND			
MS	Molinate	3	2.38	119.000	(70.00 - 130.00)
LCS1	Pentachlorophenol	6	3.65	112.125	(70.00 - 130.00)
MSLK	Pentachlorophenol	ND			

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MS	Pentachlorophenol	6	10.1	126.250	(70.00 - 130.00)
LCS1	Phenanthrene	3	2.19	109.500	(70.00 - 130.00)
MSLK	Phenanthrene	ND			
MS	Phenanthrene	2	2.16	108.000	(70.00 - 130.00)
MSLK	Prometryn	ND			
MSLK	Propachlor	ND			
LCS1	Pyrene	3	2.12	106.000	(70.00 - 130.00)
MSLK	Pyrene	ND			
MS	Pyrene	2	2.10	105.000	(70.00 - 130.00)
LCS1	Simazine	3	2.12	106.000	(70.00 - 130.00)
MSLK	Simazine	ND			
MS	Simazine	2	2.11	105.500	(70.00 - 130.00)
LCS1	Thiobencarb	3	2.23	111.500	(70.00 - 130.00)
MSLK	Trifluralin	ND			
LCS1	alpha-Chlordane	3	2.00	100.000	(70.00 - 130.00)
MSLK	alpha-Chlordane	ND			
MS	alpha-Chlordane	3	2.05	102.500	(70.00 - 130.00)
LCS1	gamma-Chlordane	3	1.93	96.500	(70.00 - 130.00)
MSLK	gamma-Chlordane	ND			
MS	gamma-Chlordane	3	1.86	93.000	(70.00 - 130.00)
LCS1	trans-Nonachlor	3	2.02	101.000	(70.00 - 130.00)
MSLK	trans-Nonachlor	ND			
MS	trans-Nonachlor	3	1.98	99.000	(70.00 - 130.00)

QC Batch #46177 Mercury

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Mercury	1.50	1.41	94.000	(85.00 - 115.00)	
LCS2	Mercury	1.50	1.40	93.333	(85.00 - 115.00)	0.71
MSLK	Mercury	ND				
MS	Mercury	1.50	1.36	86.000	(80.00 - 120.00)	
MSD	Mercury	1.50	1.24	82.667	(80.00 - 120.00)	1.6

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QC Batch #46622 ICPMS Metals

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Antimony, Total, ICAP/MS	50	49.5	99.000	(85.00 - 115.00)	
MBLK	Antimony, Total, ICAP/MS	ND		0.000		
LCS1	Arsenic, Total, ICAP/MS	24	21.6	100.000	(85.00 - 115.00)	
MBLK	Arsenic, Total, ICAP/MS	ND		0.020		
LCS1	Barium, Total, ICAP/MS	100	99.6	99.600	(85.00 - 115.00)	
MBLK	Barium, Total, ICAP/MS	ND		0.000		
LCS1	Beryllium, Total, ICAP/MS	5	4.87	97.400	(85.00 - 115.00)	
MBLK	Beryllium, Total, ICAP/MS	ND		0.000		
LCS1	Cadmium, Total, ICAP/MS	20	19.4	97.000	(85.00 - 115.00)	
MBLK	Cadmium, Total, ICAP/MS	ND		0.000		
LCS1	Chromium, Total, ICAP/MS	100	103	103.000	(85.00 - 115.00)	
MBLK	Chromium, Total, ICAP/MS	ND		0.000		
LCS1	Copper, Total, ICAP/MS	100	98.8	98.800	(85.00 - 115.00)	
MBLK	Copper, Total, ICAP/MS	ND		0.000		
LCS1	Lead, Total, ICAP/MS	20	19.6	98.000	(85.00 - 115.00)	
MBLK	Lead, Total, ICAP/MS	ND		0.000		
LCS1	Nickel, Total, ICAP/MS	50	50.6	101.000	(85.00 - 115.00)	
MBLK	Nickel, Total, ICAP/MS	ND		0.000		
LCS1	Selenium, Total, ICAP/MS	20	20.3	101.500	(85.00 - 115.00)	
MBLK	Selenium, Total, ICAP/MS	ND		0.000		
LCS1	Thallium, Total, ICAP/MS	20	20.3	102.000	(85.00 - 115.00)	
MBLK	Thallium, Total, ICAP/MS	ND		0.000		

QC Batch #46760 EPA Method 504.1

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
DUP	1,2,3-Trichloropropane	0.15	0.14		(0.00 - 20.00)	
LCS1	1,2,3-Trichloropropane	1.00	0.93	93.000	(60.00 - 140.00)	
LCS2	1,2,3-Trichloropropane	1.00	1.05	105.000	(60.00 - 140.00)	12
MBLK	1,2,3-Trichloropropane	ND				
MS	1,2,3-Trichloropropane	1.00	0.86	86.000	(60.00 - 140.00)	
LCS1	1,2-Dibromo-3-chloropropane	0.10	0.09	90.000	(60.00 - 140.00)	

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LCS2	1,2-Dibromo-3-chloropropane	0.10	0.10	100.000	(60.00 - 140.00)	11
MBLK	1,2-Dibromo-3-chloropropane	ND				
MS	1,2-Dibromo-3-chloropropane	0.10	0.09	90.000	(60.00 - 140.00)	
LCS1	1,2-Dibromoethane	0.10	0.09	90.000	(60.00 - 140.00)	
LCS2	1,2-Dibromoethane	0.10	0.09	90.000	(60.00 - 140.00)	0.00
MBLK	1,2-Dibromoethane	ND				
MS	1,2-Dibromoethane	0.10	0.09	90.000	(60.00 - 140.00)	
DUP	Dibromochloropropane (DBCP)	ND	ND		(0.00 - 20.00)	
DUP	Ethylene Dibromide (EDB)	ND	ND		(0.00 - 20.00)	

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Appendix E

Coordination, Comment and Response Letters

Index of coordination, comment and response letters

Final EA

Date	From/to	Agency, person or group
5/29/02	From	Fire Department, City and County of Honolulu
7/10/02	To	Fire Department, City and County of Honolulu
5/31/02	From	Dept. of Planning and Permitting, City and County of Honolulu
	To	Dept. of Planning and Permitting, City and County of Honolulu
6/6/02	From	Dept. of Agriculture, State of Hawaii
7/10/02	To	Dept. of Agriculture, State of Hawaii
6/6/02	From	Office of Hawaiian Affairs, State of Hawaii
	To	Office of Hawaiian Affairs, State of Hawaii
6/10/02	From	U.S. Army Corps of Engineers, U.S.A.
7/1/02	To	U.S. Army Corps of Engineers, U.S.A.
6/10/02	From	Dept. of Health, Safe Drinking Water Branch, State of Hawaii
6/24/02	From	Dept. of Health, State of Hawaii
7/17/02	To	Dept. of Health, State of Hawaii
6/12/02	From	U.S. Geological Survey
7/15/02	To	U.S. Geological Survey
6/17/02	From	Dept. of Land and Natural Resources, Land Division, State of Hawaii
6/04/02	From	Commission on Water Resource Management, State of Hawaii
7/17/02	To	Commission on Water Resource Management, State of Hawaii
6/21/02	From	Office of Environmental Quality Control, State of Hawaii
7/15/02	To	Office of Environmental Quality Control, State of Hawaii
7/3/02	From	Dept. of Land and Natural Resources, Land Division, State of Hawaii
	To	Dept. of Land and Natural Resources, Land Division, State of Hawaii

Draft EA

Date	From/to	Agency, person or group
3/22/01	From	Commission on Water Resources Management, State of Hawaii
9/5/00	From	Commission on Water Resources Management, State of Hawaii
7/28/00	To	Commission on Water Resources Management, State of Hawaii
5/26/99	To	Commission on Water Resources Management, State of Hawaii
7/16/99	From	Commission on Water Resources Management, State of Hawaii
11/27/00	To	Historic Preservation Division, State of Hawaii
11/15/00	From	Historic Preservation Division, State of Hawaii
7/28/00	To	Historic Preservation Division, State of Hawaii
7/19/99	To	Dept. of Agriculture, State of Hawaii
8/16/99	From	Dept. of Agriculture, State of Hawaii
7/19/99	To	U.S. Army Corps of Engineers
7/22/99	From	U.S. Army Corps of Engineers
6/18/99	To	Dept. of Health from Board of Water Supply
3/30/99	From	Dept. of Health, State of Hawaii to Board of Water Supply
2/21/99	From	Waimanalo Citizens for a Health Future to Dept. of Health, State of Hawaii

WR-102/02

WAIMANALO NEIGHBORHOOD BOARD NO. 32

41-606 KALANIANAOLE HWY. • WAIMANALO, HAWAII 96795-1757
PHONE: (808) 527-5749 • FAX: (808) 527-5750 • INTERNET: www.co.honolulu.hi.us

2002 OCT 23 A 8:00

Oct 24 | 12 PM '02

October 20, 2002

Mr. Clifford Jamile
Manager, Board of Water Supply
630 S. Beretania Street
Honolulu, Hawaii 96813

Dear Manager Jamile;

The Waimanalo Neighborhood Board respectfully informs you of issues related to lead contamination of soil and groundwater due to a firearms firing range.

Our first concern is that Waimanalo residents have brought to our attention that Meadow Gold Dairies is the current owner of a firing range that may have been in operation for twenty years or more. The main dairy buildings have been demolished and our residents are concerned about the lead contamination of the soil as well as the proximity of the lead firing range residue to the Board of Water Supply well recently constructed less than 1000 feet west of the firing range.

Our second concern is that the firing range was not mentioned or investigated in the Environmental Assessment for the "BWS Waimānalo Well III" dated May 2002.

Meadow Gold Dairies property is located at 41-330 Waikupanaha Street. The enclosed photos should assist in locating the specific firing range site in relation to the drinking water well.

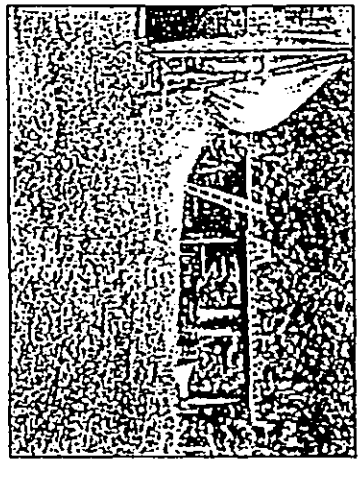
Please report your findings to the Neighborhood Board at the next scheduled meeting: Monday, November 18, 2002, at 7:30 p.m., at the Waimanalo Library.

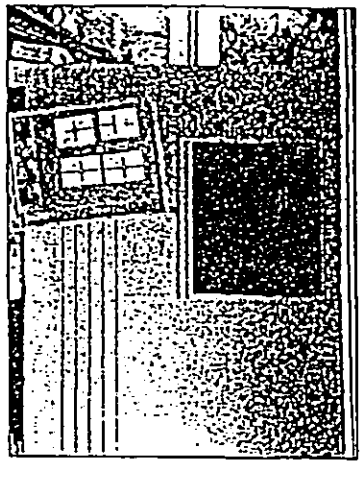
Thank you in advance for your assistance.

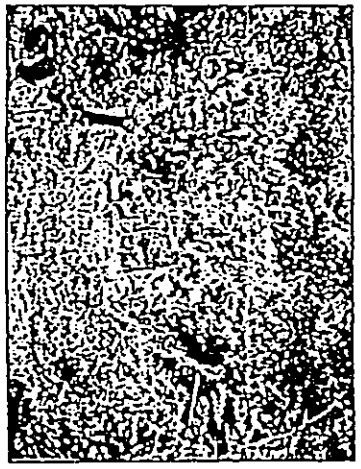
Sincerely Yours,

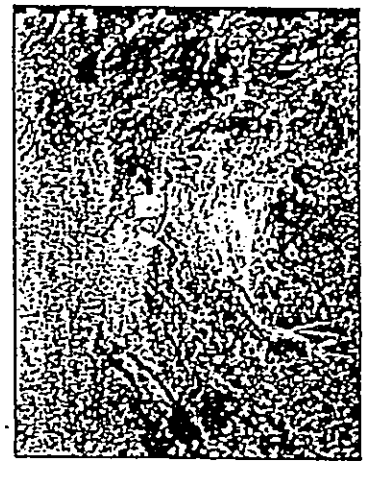
Wilson Kekoa Ho
Chair

Oahu's Neighborhood Board System - Established 1973









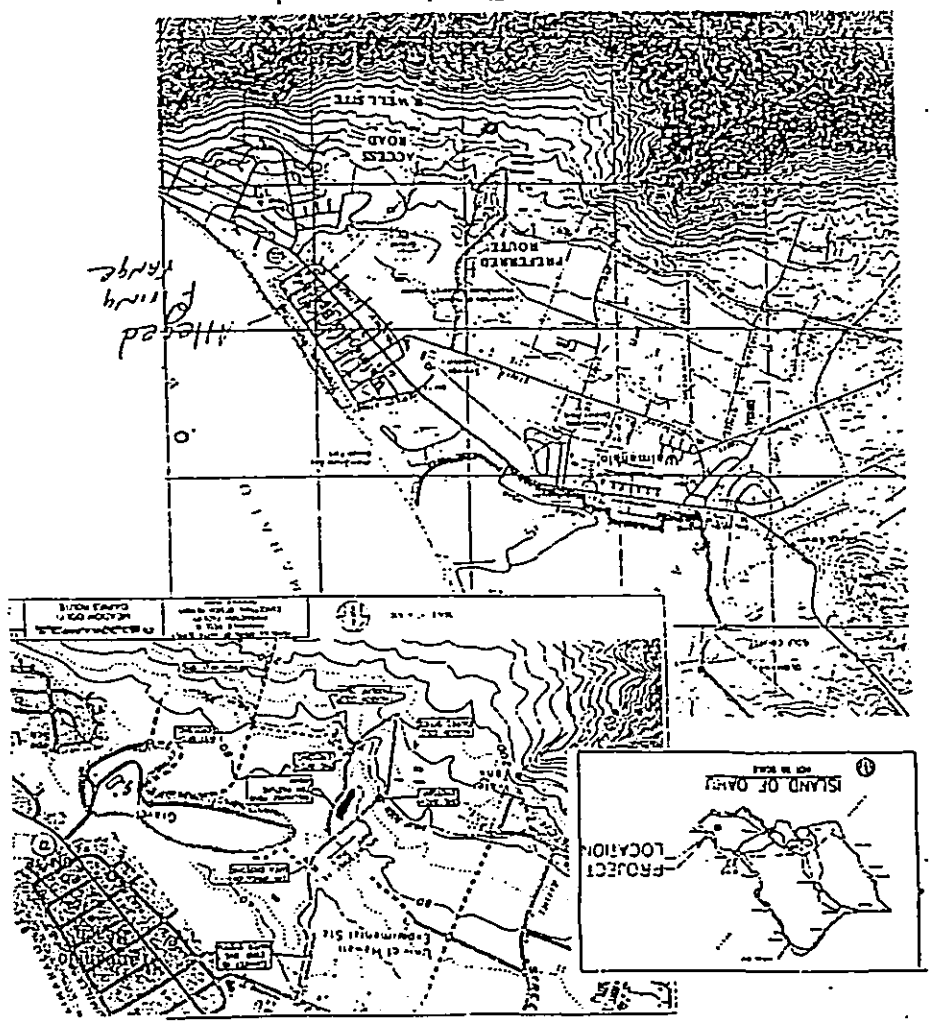
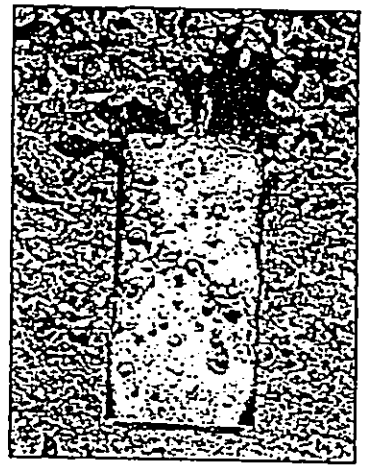
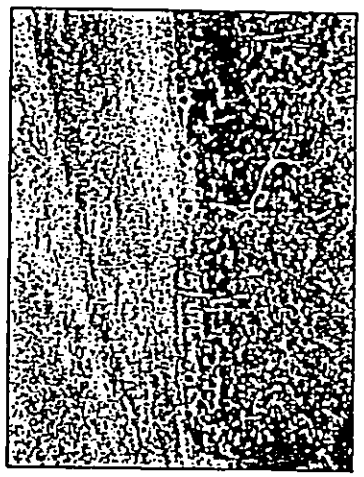


Figure 1. Location of Project Area on USGS Koko Head Quadrangle and on Project Location Map by Austin Tsutsumi & Associates.





BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

November 15, 2002

Mr. Wilson Kekoa Ho, Chair
Waimanalo Neighborhood Board No. 32
41-696 Kalanianaole Highway
Waimanalo, Hawaii 96795-1757

Dear Mr. Ho:

Subject: Your Letter of October 20, 2002 on Lead Contamination of Groundwater From a Firing Range

Thank you for your letter on concerns regarding lead contamination of water from a firing range located on Meadow Gold Dairy land in Waimanalo. We have the following responses to your letter:

The Board of Water Supply's (BWS) Waimanalo Wells are not impacted by lead from the firing range.

- The geologic barriers of thick alluvium and dike structures prevent lead from reaching groundwater and groundwater from the firing range site from reaching Waimanalo Wells III or Waimanalo Well II (attached map) located at respective distances of 3,500 feet and 5,000 feet from the firing range.
- Water quality analyses of these wells have not shown any detectable lead.

The firing range was not mentioned in the environmental assessment for Waimanalo Wells III because the existence of the firing range was unknown to BWS or its consultant that prepared the environmental assessment.

If you have any questions, please contact Chester Lao at 527-5286.

Very truly yours,

CLIFFORD S. JAMILE
Manager and Chief Engineer

GHO/CL/BK:eva
cc: Customer Care (J. Kaakua)
C. Lao

WR-102/02

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET • HONOLULU, HAWAII 96813
TELEPHONE: (808) 523-4414 • FAX: (808) 527-6743 • INTERNET: www.co.honolulu.hi.us

JEREMY HARRIS
MAYOR

RANDALL K. FUJIKI, AIA
DIRECTOR

LORETTA K.C. CHEE
DEPUTY DIRECTOR

2002/ELOG-1405(ry)

May 31, 2002

TO: CLIFFORD S. JAMILE, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

FROM: RANDALL K. FUJIKI, AIA, DIRECTOR
DEPARTMENT OF PLANNING A

SUBJECT: WAIMANALO WELL III DRAFT I

We have reviewed the subject document and have r

Thank you for the opportunity to comment. If you l
Young of our staff at 527-5839.

RKF:lh
Doc 157660

cc: Environmental Planning Services

NO RESPONSE LETTER ?

FIRE DEPARTMENT
CITY AND COUNTY OF HONOLULU
3375 KOAPAKA STREET, SUITE H425 • HONOLULU, HAWAII 96819-1869
TELEPHONE: (808) 831-7781 • FAX: (808) 831-7750 • INTERNET: www.co.honolulu.hi.us

JEREMY HARRIS
MAYOR

ATTILIO K. LEONARDI
FIRE CHIEF

JOHN CLARK
DEPUTY FIRE CHIEF

May 29, 2002

TO: CLIFFORD S. JAMILE, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

FROM: ATTILIO K. LEONARDI, FIRE CHIEF

SUBJECT: WAIMANALO WELL III DRAFT EA REQUEST FOR REVIEW AND COMMENTS

We received a memorandum from Mr. Eugene P. Dashiell of Environmental Planning Services, dated May 17, 2002, requesting our review and comments for the Draft Environmental Assessment to construct a production facility at the existing Waimanalo Well III and an access road and water transmission pipeline from the production facility to a connection point with the existing Board of Water Supply system at Nonokio Street.

The Honolulu Fire Department requests that the following be complied with:

1. Maintain fire apparatus access throughout the construction site for the duration of the project.

2. Notify the Fire Communication Center (523-4411) of any interruption in the existing fire hydrant system during the project.

Should you have any questions, please call Battalion Chief Kenneth Silva of our Fire Prevention Bureau at 831-7778.

Attilio K. Leonardi
ATTILIO K. LEONARDI
Fire Chief

AKL/SK:bh

cc: Eugene P. Dashiell, AICP

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

July 10, 2002

JEREMY HARRIS, Mayor

EDDIE FLORES, JR., Chairman
CHARLES A. STED, Vice-Chairman
JAN M.L.Y. AMI
HERBERT S.K. KAOPUA, SR.

BRIAN K. MINAAI, Ex-Officio
ROSS S. SASAMURA, Ex-Officio

CLIFFORD S. JAMILE
Manager and Chief Engineer

TO: ATTILIO K. LEONARDI, FIRE CHIEF
FIRE DEPARTMENT

FROM: BY for CLIFFORD S. JAMILE, MANAGER AND CHIEF ENGINEER

SUBJECT: YOUR MEMORANDUM OF MAY 29, 2002 REGARDING THE BOARD OF WATER SUPPLY'S WAIMANALO WELL III DRAFT ENVIRONMENTAL ASSESSMENT

Thank you for your memorandum regarding the Draft Environmental Assessment for the Board of Water Supply's Waimanalo Well III project.

During the duration of the project, fire apparatus access will be maintained throughout the construction site. In case of interruption in the existing fire hydrant system, the Fire Commission Center will be notified.

If you have any questions, please contact Scot Muraoka at 527-5221.

cc: Eugene P. Dashiell, AICP, Environmental Planning Services

Pure Water . . . our greatest need – use it wisely

BENJAMIN J. CAYETANO
Governor

RECEIVED
BD OF WATER SUPPLY
Jun 12 3 45 PM '02

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 South King Street
Honolulu, Hawaii 96814-2512

020552

JAMES J. NAKATANI
Chairperson, Board of Agriculture

LETITIA N. UYEHARA
Deputy to the Chairperson

Mailing Address:
P.O. Box 22159
Honolulu, Hawaii 96823-2159

Fax: (808) 973-9613

cc

June 6, 2002

Mr. Clifford S. Jamile
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Jamile:

RE: Waimanalo Well III Draft EA Request for Review and Comments

Thank you for the opportunity to review and comment on the above document. The Department of Agriculture has no comment at this time, however, requests that all work concerning the crossing of our ditch be coordinated with us.

Should you have any questions, please call Brian Kau, Acting Administrator and Chief Engineer of the Agricultural Resource Management Division, at 973-9473.

Sincerely,

JAMES J. NAKATANI
Chairperson, Board of Agriculture

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

JEREMY HARRIS, Mayor

EDDIE FLORES, JR., Chairman
CHARLES A. STED, Vice-Chairman
JAN M.L.Y. AMB
HERBERT S.K. KAOPUA, SR.

BRIAN K. MINAAI, Ex-Officio
ROSS S. SASAMURA, Ex-Officio

CLIFFORD S. JAMILE
Manager and Chief Engineer

July 10, 2002

Mr. James J. Nakatani, Chairperson
Department of Agriculture
State of Hawaii
1428 South King Street
Honolulu, Hawaii 96814-2512

Dear Mr. Nakatani:

Subject: Your Letter of June 6, 2002 Regarding the Board of Water Supply's Waimanalo Well III Draft Environmental Assessment

Thank you for your letter regarding the Draft Environmental Assessment for the Board of Water Supply's Waimanalo Well III project.

Any work involving the crossing of the Kailua ditch will be coordinated with your office.

If you have any questions, please contact Scot Muraoka at 527-5221.

Very truly yours,

for CLIFFORD S. JAMILE
Manager and Chief Engineer

cc: Eugene P. Dashiell, AICP, Environmental Planning Services

. HONE (808) 594-1888

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SD OF WATER SUPPLY
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020624
WR

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPIOLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

June 6, 2002

Jun 28 / 56 AM '02

Mr. Clifford S. Jamile
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu HI 96843

(HRD #02-605)

Subject: Draft Environmental Assessment (DEA) for
Waimanalo Well III,
TMK: 3-8-07: portion of 131

Dear Mr. Jamile:

Thank you for the opportunity to comment on the above referenced project. The Office of Hawaiian Affairs (OHA) offers the following comments.

Archaeological and Historical sites

Like any other project involving excavation or other ground disturbing activities, there is the possibility of inadvertent discoveries of cultural remains or human burials. Should this occur, work at the project should cease and The State of Hawai'i Historic Preservation Division be contacted. If you have any questions, please contact Mark A. Mararagan, policy analyst at 594-1756, or e-mail him at markm@oha.org.

Sincerely,

Jalna Keala

Jalna Keala
Acting Hawaiian Rights Division Director

cc: Eugene Dashiell, AICP – Environmental Planning Services
OHA Board of Trustees
OHA Administrator Clyde W. Namu'o

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

August 12, 2002

Ms. Jalna Keala
Acting Hawaiian Rights Division Director
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813

Dear Ms. Keala:

Subject: Your Letter of June 6, 2002 Regarding the Board of Water Supply's Waimanalo Well III Draft Environmental Assessment

Thank you for your letter regarding the Draft Environmental Assessment for the Board of Water Supply's Waimanalo Well III project.

We acknowledge that there is the possibility of inadvertent discoveries of cultural remains or human burials during ground disturbing activities. Should this occur, work will cease and the State Historic Preservation Division will be notified.

If you have any questions, please contact Scot Muraoka at 527-5221.

Very truly yours,

Barry Usagawa

for CLIFFORD S. JAMILE
Manager and Chief Engineer

cc: Eugene P. Dashiell, AICP, Environmental Planning Services

RECEIVED
BD OF WATER SUPPLY
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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FT. SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF

U20559

WR

June 10, 2002

Regulatory Branch

Jun 13 2 47 PM '02

Mr. Clifford S. Jamile
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Jamile:

This letter responds to the request, dated August 9, 2001, for comments on the draft environmental assessment (EA) for BWS Waimanalo Well III: Production Facility, Access Road & Water Transmission Line. Based on the information provided in the EA and a site visit by a member of my staff I have determined that Inoaole Stream is not a jurisdictional water of the United States at the proposed stream crossing because there is no indication of an ordinary high water mark. In addition, the waterline will cross the stream under the existing road, which does not exhibit the required characteristics of a jurisdictional wetland. I have therefore concluded that a Department of the Army (DA) permit will not be required for this project. This determination also applies to the new location for a stream crossing proposed by Tom Nance Water Resource Engineering.

If you have any questions concerning this determination, please contact William Lennan of my staff at 438-6986 or FAX 438-4060, and reference File No. 200200357.

Sincerely,

George P. Young, P.E.
Chief, Regulatory Branch

Copies Furnished:
Mr. Eugene P. Dashiell, AICP, Environmental Planning Services, 1314 South King Street, Suite 952, Honolulu, Hawaii 96814
Mr. Greg Fukumitsu, Vice President, Tom Nance Water Resource Engineering, 680 Ala Moana Boulevard, Honolulu, Hawaii 96813-5411

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

JEREMY HARRIS, Mayor

EDOE FLORES, JR., Chairman
CHARLES A. STED, Vice-Chairman
JAN M.L.Y. AHIN
HERBERT S.K. KAOPUA, SR.

BRIAN K. MINAAI, Ex-Officio
ROSS S. SASAMURA, Ex-Officio

CLIFFORD S. JAMILE
Manager and Chief Engineer

July 15, 2002

Mr. George P. Young, P.E., Chief
Regulatory Branch
Department of the Army
U. S. Army Engineer District, Honolulu
Fort Shafter, Hawaii 96858-5440

Dear Mr. Young:

Subject: Your Letter of June 10, 2002 Regarding the Waimanalo Well III Draft Environmental Assessment

Thank you for your letter regarding the Draft Environmental Assessment for the Board of Water Supply's Waimanalo Well III project.

We acknowledge that a Department of the Army permit will not be required for the project.

If you have any questions, please contact Scot Muraoka at 527-5221.

Very truly yours,

Barry Usagawa
for CLIFFORD S. JAMILE
Manager and Chief Engineer

cc: Eugene P. Dashiell, AICP, Environmental Planning Services

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O BOX 3378
HONOLULU, HAWAII 96801-3378

BRUCE S. ANDERSON, PH.D., M.P.H.
DIRECTOR OF HEALTH

In reply, please refer to:
EMD/SDWB

June 10, 2002

Mr. Clifford S. Jamile
City and County of Honolulu
Board of Water Supply
630 South Beretania Street
Honolulu, Hawaii 96843

Attention: Scot Muraoka

Dear Mr. Jamile:

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT FOR WAIMANALO WELL III, PRODUCTION FACILITY, ACCESS ROAD & WATER TRANSMISSION LINE

We have reviewed the Draft Environmental Assessment which proposes to convert an existing exploratory well in Waimanalo into a production well and have the following comments to offer:

1. The aforementioned project is currently on the Drinking Water State Revolving Fund (DWSRF) loan program priority list.

   To be eligible for DWSRF funding for this project, the following program requirements relevant to the environmental review process must be met:

   a. The Environmental Assessment must include a statement which notes: "This project may be funded by Federal Funds through the State of Hawaii's Drinking Water State Revolving Fund (DWSRF) program, which would constitute a federal action, and will require the project to meet all Hawaii DWSRF program requirements."

   b. The above statement must also be included in the notice published in The Environmental Notice, published per the State Environmental Review Process by the Office of Environmental Quality Control.

   c. The attached List of Federal Cross Cutters must be reviewed and addressed in the environmental assessment as applicable.

   d. The attached "EA Certification and Checklist" must be competed.

   e. The County must include the DWSRF Boiler Plates in the bid and specification documents and comply with all DWSRF and environmental requirements at the onset, and throughout the construction of the project.

   If the Honolulu Board of Water Supply is interested in funding this project through the DWSRF program please contact the DWSRF program and submit a loan application for the project. Please note to qualify for DWSRF funding the above requirements must be met for the environmental review process. Additionally, all other DWSRF requirements must be met to qualify for loan funding.

2. The Draft Environmental Assessment indicates that the project will include the development of a new source of potable water. Section 11-20-29 of Chapter 20 requires that all new sources of potable water serving a public water system be approved by the Director of Health prior to its use. Such an approval is based primarily upon the submission of a satisfactory engineering report which addressed the requirements set in Section 11-20-29.

3. The engineering report must identify all potential sources of contamination and evaluate alternative control measures which could be implemented to reduce or eliminate the potential for contamination, including treatment of the water source. In addition, water quality analyses, performed by a laboratory certified in the State of Hawaii , must be submitted as part of the report to demonstrate compliance with all drinking water standards. Additional tests may be required by the Director upon his review of the information submitted.

Should you have any questions, please call Denise Dang of the Safe Drinking Water Branch at 586-4258.

Sincerely,

WILLIAM WONG, P.E., CHIEF
Safe Drinking Water Branch
Environmental Management Division

DD:la

Enclosures

c: Environmental Planning Services
Attn: Eugene Dashiell
1314 South King Street, Suite 951
Honolulu, HI 96814

Office of Environmental Quality Control
Wastewater Branch
DWSRF File
DWSRF Project File

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801

BRUCE S. ANDERSON, PH.D., M.P.H.
DIRECTOR OF HEALTH

In reply, please refer to:
File:
02-141/epo

June 24, 2002

Mr. Eugene P. Dashiel, AICP
Environmental Planning Services
1314 South King Street, Suite 952
Honolulu, Hawaii 96814

Dear Mr. Dashiel:

Subject: Draft Environmental Assessment (DEA)
Waimanalo Well III Project
Tax Map Keys: 4-1-008:05 & 80

Thank you for the opportunity to review and comment on the subject proposal. The DEA was routed to the various branches of the Environmental Health Administration. We have the following comments.

Clean Water Branch (CWB)

1. The applicant should contact the Army Corps of Engineers to identify whether a federal permit (including a Department of Army permit) is required for this project. A Section 401 Water Quality Certification is required for "Any applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable waters...", pursuant to Section 401(a)(1) of the Federal Water Pollution Act (commonly known as the "Clean Water Act");

2. A National Pollutant Discharge Elimination System (NPDES) general permit coverage is required for the following discharges to waters of the State:

    a. Discharge of storm water runoff associated with industrial activities, as define in Title 40, Code of Federal Regulations, Sections 122.26(b)(14)(i) through 122.26(b)(14)(ix) and 122.26(b)(14)(xi);

    b. Discharge of storm water runoff associated with construction activities that involve the disturbance of five (5) acres or greater, including clearing, grading, and excavation;

    c. Discharge of treated effluent from leaking underground storage tank remedial activities;

d. Discharge of once through cooling water less than one million gallons per day;

e. Discharge of hydro-testing water;

f. Discharge of construction dewatering effluent;

g. Discharge of treated effluent from petroleum bulk stations and terminals; and

h. Discharge of treated effluent from well drilling activities.

Any person requesting to be covered by a NPDES general permit for any of the above activities should file a Notice of Intent with the Department of Health, Clean Water Branch (CWB) at least thirty (30) days prior to commencement of any discharges to State waters;

3. If construction activities involve the disturbance of one acre or greater, including clearing, grading, and excavation, and will take place or extend after March 10, 2003, an NPDES general permit coverage is required for discharges of storm water runoff into State waters; and

4. The applicant may be required to apply for an individual NPDES permit if there is any type of activity in which wastewater is discharged from the project into State waters.

If you have any questions, please contact the Clean Water Branch at (808) 586-4309.

Safe Drinking Water Branch (SDWB)

The proposed project is currently on the Drinking Water State Revolving Fund (DWSRF) loan program priority list. The SDWB will comment directly to the Honolulu Board of Water Supply.

If you have any questions, please contact William Wong, Safe Drinking Water Branch, at (808) 586-4258.

Clean Air Branch

Control of Fugitive Dust

There is a significant potential for fugitive dust emissions during the removal of debris and during the grading, trenching, and construction activities that would impact nearby residents and thoroughfares. It is recommended that a dust control management plan be developed which identifies and addresses all activities that have a potential to generate fugitive dust.

Implementation of adequate dust control measures during all phases of development and construction activities is warranted.

Construction activities must comply with provisions of Hawaii Administrative Rules, Chapter 11-60.1, "Air Pollution Control," Section 11-60.1-33, Fugitive Dust.

The contractor should provide adequate measures to control dust from the road areas and during the various phases of construction. These measures include, but are not limited to:

a. Planning the different phases of construction, focusing on minimizing the amount of dust generating materials and activities, centralizing on-site vehicular traffic routes, and locating potentially dusty equipment in areas of the least impact;

b. Providing an adequate water source at the site prior to start up of construction activities;

c. Landscaping and rapid covering of bare areas, including slopes, starting from the initial grading phase;

d. Controlling of dust from shoulders and access roads;

e. Providing adequate dust control measures during weekends, after hours, and prior to daily start-up of construction activities; and

f. Controlling of dust from debris being hauled away from project site.

If you have any questions regarding these issues on fugitive dust, please contact the Clean Air Branch at (808) 586-4200.

Noise, Radiation and Indoor Air Quality (NRIAQ) Branch

All project activities shall comply with the Administrative Rules of the Department of Health, Chapter 11-46, on "Community Noise Control".

If you have any questions, please contact the NRIAQ at (808) 586-4701.

Sincerely,

GARY GILL
Deputy Director
Environmental Health Administration

c: WWB
CAB

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

July 17, 2002

Mr. Gary Gill, Deputy Director
Environmental Health Administration
Department of Health
State of Hawaii
P. O. Box 3378
Honolulu, Hawaii 96801

Dear Mr. Gill:

Subject: Your Letter to Environmental Planning Services Dated June 24, 2002
Regarding the Waimanalo Well III Draft Environmental Assessment

Thank you for your letter regarding the Draft Environmental Assessment for the Board of Water Supply's Waimanalo Well III project.

We have the following response to your concerns:

1. Clean Water Branch

   a. The Department of the Army has indicated that a federal permit will not be required for this project because the proposed stream crossing has no indication of an ordinary high water mark and is not a jurisdictional water of the United States. In addition, the waterline will cross the stream under the existing road, which does not exhibit the required characteristics of a jurisdictional wetland.

   b. We acknowledge the various National Pollutant Discharge Elimination System permit requirements for discharges to waters of the State. Effluent discharge permits will be coordinated during the design phase of the project.

2. Safe Drinking Water Branch (SDWB)

   We are in direct contact with the Safe Drinking Water Branch regarding the Drinking Water State Revolving Fund loan program priority list.

3. Clean Air Branch

   We acknowledge that construction activities must comply with the provisions of Hawaii Administrative Rules, Chapter 11-60.1, "Air Pollution Control," Section 11-60.1-33, Fugitive Dust, including the dust control measures specified in your letter.

4. Noise, Radiation and Indoor Air Quality (NRIAQ) Branch

   We acknowledge that construction activities must comply with the provisions of Department of Health, Administrative Rules, Chapter 11-46, "Community Noise Control."

If you have questions, please contact Scot Muraoka at 527-5221.

Very truly yours,

Barry Usagawa

for CLIFFORD S. JAMILE
Manager and Chief Engineer

cc: Eugene P. Dashiel, AICP, Environmental Planning Services

020578

United States Department of the Interior

U.S. GEOLOGICAL SURVEY
WATER RESOURCES DISCIPLINE
677 Ala Moana Blvd., Suite 415
Honolulu, HI 96813
Phone: (808) 587-2400/Fax: (808) 587-2401

RECEIVED
BD OF WATER SUPPLY
Jun 17 1 03 PM '02

Mike Fukey WR
JUN 18 2002

June 12, 2002

Mr. Clifford S. Jamile
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Jamile:

Subject: Waimanalo Well III Draft Environmental Assessment
Request for Review and Comments

Thank you for forwarding the subject Draft Environmental Assessment for review and comment by the staff of the U.S. Geological Survey, Water Resources Division, Hawaii District office. We regret however, that due to prior commitments and lack of available staff, we are unable to review this document.

We appreciate the opportunity to participate in the review process.

Sincerely,

Gordon Tribble
District Chief

Enclosure

Cc: Mr. Eugene P. Dashiell, AICP
Environmental Planning Services
1314 South King Street, Suite 952
Honolulu, Hawaii 96814

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

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CLIFFORD S. JAMILE
Manager and Chief Engineer

July 15, 2002

Mr. Gordon Tribble, District Chief
Water Resources Discipline
U.S. Geological Survey
United States Department of the Interior
677 Ala Moana Boulevard, Suite 415
Honolulu, Hawaii 96813

Dear Mr. Tribble:

Subject: Your Letter of June 12, 2002 Regarding the
Waimanalo Well III Draft Environmental Assessment

Thank you for your letter regarding the Draft Environmental Assessment for the Board of Water Supply's Waimanalo Well III project.

We acknowledge that you are unable to review this document.

If you have any questions, please contact Scot Muraoka at 527-5221.

Very truly yours,

Barry Usagawa
for CLIFFORD S. JAMILE
Manager and Chief Engineer

cc: Eugene P. Dashiell, AICP, Environmental Planning Services

RECEIVED
BD OF WATER SUPPLY
Jun 13 3 55 PM '02

020597

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
P.O. BOX 621
HONOLULU, HAWAII 96809

June 17, 2002

LD-NAV
L-3013/3131/3355/3172/3095

BWSWHIIIDEA.RCH

Jun 13 3 01 PM '02

Clifford S. Jamile, Manager and
Chief Engineer
Board of Water Supply
City and Count of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96813

Dear Mr. Jamile:

SUBJECT: Draft Environmental Assessment (DEA)
Applicant: Board of Water Supply
Consultant: Environmental Planning Services (Eugene P. Dashiell, AICP)
Project: Waimanalo Well III, Oahu, Hawaii

Thank you for the opportunity to review and comment on the subject matter.

The Department of Land and Natural Resources' Land Division distributed copy of the subject DEA covering the proposed project to the following Department of Land and Natural Resources' Divisions for their review and comment:

Division of Aquatic Resources - Division of Forestry and Wildlife - Division of State Parks - Commission on Water Resource Management - Land Division Planning and Technical Services - Land Division Engineering Branch - Oahu District Land Office

Attached herewith is a copy of the Commission on Water Resource Management's comments dated June 28, 1994 and June 4, 2002.

The Department of Land and Natural Resources has no other comment to offer based on the attached responses. Should additional comments be received, they will be forwarded to your office at that time.

Should you have any questions, please contact Nicholas A. Vaccaro of the Land Division Support Services Branch at (808) 587-0438.

Very truly yours,

Charlene E. Unoki
for DIERDRE S. MAHIYA
Administrator

C: Oahu District Land Office

BENJAMIN J. CAYETANO
Governor of Hawaii

GILBERT S. COLOMA-AGARAN
Chairperson

BRUCE B. ANDERSON
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LINNEL T. NISHIOKA
Deputy Director

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

June 4, 2002

TO: Ms. Dede Mamiya, Administrator
Land Division

FROM: Linnel T. Nishioka, Deputy Director
Commission on Water Resource Management (CWRM)

SUBJECT: Waimanalo Well III Draft EA

Thank you for the opportunity to review the subject document. Our comments related to water resources are marked below.

In general, the CWRM strongly promotes the efficient use of our water resources through conservation measures and use of alternative non-potable water resources whenever available, feasible, and there are no harmful effects to the ecosystem. Also, the CWRM encourages the protection of water recharge areas, which are important for the maintenance of streams and the replenishment of aquifers.

[x] We recommend coordination with the county government to incorporate this project into the county's Water Use and Development Plan.

[ ] We recommend coordination with the Land Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

[ ] We are concerned about the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

[x] A Well Construction Permit and/or a Pump Installation Permit from the Commission would be required before ground water is developed as a source of supply for the project.

[x] The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit from the Commission would be required prior to use of the source.

[ ] Groundwater withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.

[ ] We are concerned about the potential for degradation of instream uses from development on highly erodible slopes adjacent to streams within or near the project. We recommend that approvals for this project be conditioned upon a review by the corresponding county's Building Department and the developer's acceptance of any resulting requirements related to erosion control.

[ ] If the proposed project includes construction of a stream diversion, the project may require a stream diversion works permit and amend the instream flow standard for the affected stream(s).

[ ] If the proposed project alters the bed and banks of a stream channel, the project may require a stream channel alteration permit.

[ ] OTHER:

CWRM is continuing the processing of the Pump Installation Permit application, per the attached letter dated June 26, 1994. However, the Pump Installation Permit will not be issued until the Water Use Permit is issued. Further, since the Water Use Permit in our files is on the old form, the BWS will need to reapply for the Water Use Permit using the current form (also attached).

If there are any questions, please contact Ryan Imata at 587-0255.

c: Eugene Dashiell, BWS

JOHN WAIHEE
Governor of Hawaii

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

KEITH W. AHUE
Chairperson

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J. DOUGLAS ING, ESQ.
RICHARD H. COX, P.E.
ROBERT G. BRAID

RAE M. LOUI, P.E.
Deputy

JUN 28 1994

Mr. Kazu Hayashida
Manager & Chief Engineer
Honolulu Board of Water Supply
630 South Beretania Street
Honolulu, HI 96843

Dear Mr. Hayashida:

Applications for Water Use Permit and
Well Construction/Pump Installation Permit
Waimanalo III Well (Well No. 1942-01)
Waimanalo Ground Water Management Area, Oahu

We acknowledge receipt, on May 13, 1994, of your applications for water use permit and combined well construction/pump installation permit for the Waimanalo III Well (Well No. 1942-01).

We have verified that Foremost Dairies is the lessee of the property at TMK 4-1-8:5, and the landowner is the State of Hawaii. Your applications have been forwarded to the Chairperson of the Board of Land and Natural Resources for his signature as landowner for the State of Hawaii.

Upon receipt of the signed applications, we will continue to process your application to drill and test the exploratory well. Your applications to install a pump and use the water should be made in light of the results of the pumping tests. Therefore, we will defer our review and processing of these applications pending the results of the drilling and testing. If you do not wish to proceed in this manner, please notify us in writing within the next 30 days.

If you have any questions, please call Lenore Nakama at 587-0218.

Sincerely,

RAE M. LOUI
Deputy Director

LN:ko

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

July 17, 2002

Ms. Linnel Nishioka, Deputy Director
Commission on Water Resource Management
Department of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

Dear Ms. Nishioka:

Subject: Your Letter of June 4, 2002 Regarding the Board of Water Supply's Waimanalo Well III Draft Environmental Assessment

Thank you for your letter regarding the Draft Environmental Assessment for the Board of Water Supply's Waimanalo Well III project.

We have the following response to your comments:

1. The proposed project will be incorporated into the City and County of Honolulu's Water Use and Development plan.

2. A Water Use Permit and a Pump Installation Permit will be obtained from the Commission before groundwater is developed as a source of supply. We acknowledge that the Pump Installation Permit will not be issued until the Water Use Permit is issued. A revised Water Use Permit application will be submitted using the most current application form.

If you have any questions, please contact Scot Muraoka at 527-5221.

Very truly yours,

Barry Usagawa

for CLIFFORD S. JAMILE
Manager and Chief Engineer

cc: Eugene Dashiell, AICP, Environmental Planning Services
Dierdre Mamiya, DLNR, Land Division

RECEIVED
BD OF WATER SUPPLY
Jul 11 '02

020661

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
P.O. BOX 621
HONOLULU, HAWAII 96809

July 3, 2002

Jul 11 10 29 AM '02

WR

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L-3013/3131/3355/3172/3095/3189

Clifford S. Jamile, Manager and
Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96813

Dear Mr. Jamile:

SUBJECT: Draft Environmental Assessment (DEA)
Applicant: Board of Water Supply
Consultant: Environmental Planning Services
Project: Waimanalo Well III, Oahu, Hawaii

This is a follow-up to our letter (Ref.: BWSHWIIIDEA.RCM) to you dated June 17, 2002, pertaining to the subject matter.

Attached herewith is a recently received copy of the Land Division Engineering Branch comment.

The Department of Land and Natural Resources has no other comment to offer on the subject matter.

Should you have any questions, please contact Nicholas A. Vaccaro of the Land Division Support Services Branch at (808) 587-0438.

Very truly yours,

for DIERDRE S. MAMIYA
Administrator

C: Oahu District Land Office

DEPARTMENT OF LAND AND NATURAL RESOURCES
Land Division
Engineering Branch

COMMENTS

Please correct the FEMA Community Panel Numbers on pages 7 and 16, Item Flood Zone of the Draft Environmental Assessment Document. The project site according to FEMA Community Panel Numbers 150001 0380 E (November 20, 2000) and 1500010385 E (November 20, 2000), is located in Zones X (Not shaded) and D. Zone X is an area determined to be outside of the 500-year floodplain while Zone D is an area where flood hazards are undetermined.

However, if future studies determine that the project sites are within the flood zone, the project must comply with rules and regulations of the National Flood Insurance Program (NFIP) and all applicable County Flood Ordinances. If there are questions regarding the NFIP, please contact the State Coordinator, Mr. Sterling Yong, of the Department of Land and Natural Resources at 587-0248.

Signed: Andrew M. Monden
ANDREW M. MONDEN, CHIEF ENGINEER

Date: 6/25/02

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

August 12, 2002

COPY

Ms. Dierdre S. Mamiya, Administrator
Land Division
Department of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

Dear Ms. Mamiya:

Subject: Your Letter of July 3, 2002 Regarding the Board of Water Supply's Waimanalo Well III Draft Environmental Assessment

Thank you for your letter regarding the Draft Environmental Assessment (EA) for the Board of Water Supply's Waimanalo Well III project.

The recommended corrections to the Federal Emergency Management Agency Community Panel numbers will be incorporated into the Final EA. We acknowledge that the project must comply with the rules and regulations of the National Flood Insurance Program and all County Flood Ordinances if future studies determine that the project site is within the flood zone.

If you have questions, please contact Scot Muraoka at 527-5221.

Very truly yours

Barry Usagawa

for CLIFFORD S. JAMILE
Manager and Chief Engineer

cc: Eugene P. Dashiell, AICP, Environmental Planning Services

BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENT QUALITY CONTROL
235 SOUTH BERETANIA STREET
SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186

GENEVIEVE SALMONSON
DIRECTOR

June 21, 2002

Mr. Clifford Jamile, Manager and Chief Engineer
Board of Water Supply, City and County of Honolulu
630 South Beretania Street
Honolulu, Hawai'i 96843

Dear Mr. Jamile:

Subject: Draft EA for the Waimānalo Well III, Production Facility, Access Road & Water Transmission Line, O'ahu

Thank you for the opportunity to review the subject document. We do not have any comments. Should you have any questions, please call Jeyan Thirugnanam at 586-4185.

Sincerely,

Genevieve Salmonson
Director

c: Eugene Dashiell

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

JEREMY HARRIS, Mayor

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BRIAN K. MINAAI, Ex-Officio
ROSS S. SASAMURA, Ex-Officio

CLIFFORD S. JAMILE
Manager and Chief Engineer

July 15, 2002

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Ms. Salmonson:

Subject: Your Letter of June 21, 2002 Regarding the
Waimanalo Well III Draft Environmental Assessment

Thank you for your letter regarding the Draft Environmental Assessment for the Board of Water Supply's Waimanalo Well III project.

We acknowledge that the Office of Environmental Quality Control does not have any comments on the proposed project.

If you have any questions, please contact Scot Muraoka at 527-5221.

Very truly yours,

for CLIFFORD S. JAMILE
Manager and Chief Engineer

cc: Eugene P. Dashiell, AICP, Environmental Planning Services

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING, ROOM 555
601 KAMOKILA BOULEVARD
KAPOLEI, HAWAII 96707

GILBERT S. COLOMA-AGARAN, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DEPUTIES
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LINNEL NISHIOKA

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND
STATE PARKS

August 9, 2002

Mr. Clifford S. Jamile
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

LOG NO: 30196
DOC NO: 0206EJ38

Dear Mr. Jamile:

SUBJECT: Chapter 6E-8 Historic Preservation Review – Request for Comments
Waimanalo Well III Draft EA
Waimanalo, Ko'olauloa, O'ahu
TMK: (1) 4-1-008:005, 080

Thank you for the opportunity to comment on the DEA for the Waimanalo Well III and the proposed production facility in Waimanalo. The facility will consist of an existing well site, a single-story concrete control building, a 20,000 gallon control tank (16 feet by 12 feet by 22 feet high) enclosed by a 6-foot high chain link fence. An existing unpaved access road to the existing well will be paved and extended another 1,430 feet. Also included in the project is an underground pipeline for transmission of water from the existing well to a connection point with the BWS system at Nonokio Street. The pipeline route follows the alignment of exiting roads and will be buried approximately 3-feet below surface. Our review is based on historic reports, maps, and aerial photographs maintained at the State Historic Preservation Division; no field inspection was made of the project areas. We received the DEA for comment on May 20, 2002, and requested additional archaeological information from your planning consultant; we received the requested information on August 8, 2002, and can now provide our response.

The DEA includes in Appendix A, two archaeological inventory survey reports conducted for this project (*Archaeological Inventory Survey BWS Waimanalo Well III Waimanalo, Ko'olaupoko, O'ahu*, ASC Consulting, Review Draft February 2001 and *Addendum Archaeological Inventory Survey: New Preferred Transmission Route BWS Waimanalo Well III, Waimanalo, Ko'olaupoko, O'ahu* ASC Consulting August 2001). In November 2000 SHPD reviewed an earlier draft of the *Archaeological Inventory Survey BWS Waimanalo Well III Waimanalo, Ko'olaupoko, O'ahu* report. At that time we requested that additional information be provided on the two stone features encountered during the survey. The revised report, included in the Appendix, has clarified that these features lie outside the impact area of the proposed project and we now find the report acceptable.

We believe that the construction of the production facility and access road will have no effect on significant historic sites. The two stone features identified during the survey are located

outside of the impact area and will be protected fenced off to prevent damage during routine construction activities. In addition, a supplemental, walk-through survey was conducted of a new preferred route for the transmission line; the walk-through survey results are included as an addendum to the original inventory survey (see above). No surface or exposed subsurface cultural deposits were identified during the survey, however subsurface testing was not conducted because the final pipeline corridor had not been selected.

We believe that the archaeological survey work has been successfully executed. We do not, however, concur with the recommendation for archaeological monitoring. Your archaeological consultant recommended that archaeological monitoring, in accordance with approved monitoring plan, be carried out during construction. Since no historic sites have been found within the project area during the inventory and supplemental surveys, and since alluvial soils underlie the entire project area, we believe that archaeological monitoring is unwarranted. We believe instead that no further archaeological work is required.

According to the DEA the pipeline will cross the Kailua Irrigation Ditch, which is eligible for the National and Hawaii Register of Historic Places at three locations. The DEA states that the pipeline crossings, which will be below existing ground level and the Ditch, will have 'no effect' on the visual or physical character of the Ditch. We agree with that no historic properties will be affected by the Waimanalo Well III project.

Should you have any questions, please feel free to contact Sara Collins at 692-8026 or Elaine Jourdane at 692-8027.

Aloha,

Don Hibbard, Administrator
State Historic Preservation Division

EJ:jk

c: Eugene P. Dashiell, AICP, Environmental Planning Services, 1314 South King St., Suite 952, Honolulu, Hawaii 96814

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

October 22, 2002

Mr. Don Hibbard, Administrator
State Historic Preservation Division
Department of Land and Natural Resources
State of Hawaii
Kakuhihewa Building, Room 555
501 Kamokila Boulevard
Kapolei, Hawaii 96707

Dear Mr. Hibbard:

Subject: Your Letter of August 9, 2002 Regarding the Board of Water Supply's Waimanalo Well III Draft Environmental Assessment

Thank you for your letter regarding the Draft Environmental Assessment for the Board of Water Supply's Waimanalo Well III project.

We concur with your comments and will not perform archaeological monitoring during construction. We will follow normal practices of immediately notifying your office should any cultural or human remains be uncovered during construction activities.

If you have any questions, please contact Scot Muraoka at 527-5221.

Very truly yours,

Barry Usagawa

for CLIFFORD S. JAMILE
Manager and Chief Engineer

cc: Eugene P. Dashiell, Environmental Planning Services

Index of coordination, comment and response letters

Date	From/to	Agency, person or group
3/22/01	From	Commission on Water Resources Management, State of Hawaii
9/5/00	From	Commission on Water Resources Management, State of Hawaii
7/28/00	To	Commission on Water Resources Management, State of Hawaii
5/26/99	To	Commission on Water Resources Management, State of Hawaii
7/16/99	From	Commission on Water Resources Management, State of Hawaii
11/27/00	To	Historic Preservation Division, State of Hawaii
11/15/00	From	Historic Preservation Division, State of Hawaii
7/28/00	To	Historic Preservation Division, State of Hawaii
7/19/99	To	Dept. of Agriculture, State of Hawaii
8/16/99	From	Dept. of Agriculture, State of Hawaii
7/19/99	To	U.S. Army Corps of Engineers
7/22/99	From	U.S. Army Corps of Engineers
6/18/99	To	Dept. of Health from Board of Water Supply
3/30/99	From	Dept. of Health, State of Hawaii to Board of Water Supply
2/21/99	From	Waimanalo Citizens for a Health Future to Dept. of Health, State of Hawaii

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

GILBERT S. COLOMA-AGARAN
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LINNEL T. NISHIOKA
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

MAR 22 2001

Mr. Eugene Dashiell, AICP
1314 South King Street, Suite 951
Honolulu, Hawaii 96814

Dear Mr. Dashiell:

Thank you for your faxed letter dated March 13, 2001, requesting whether a Board of Water Supply waterline crossing in the upper reaches of Inaole Watercourse requires a stream channel alteration permit.

The watercourse was observed on March 16, 2001, north of the Meadow Gold Dairy animal feed storage facility. The Inaole Watercourse was dry at this reach without any indication of flowing water or aquatic vegetation. Since this reach is not considered to be a stream, a stream channel alteration permit will not be required for the installation of the waterline.

If you have any questions regarding this letter, please call David Higa at 587-0249.

Sincerely,

LINNEL T. NISHIOKA
Deputy Director

DH:sd

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BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

TIMOTHY E. JOHNS
CHAIRPERSON

BRUCE S. ANDERSON
ROBERT G. GIRALD
BRIAN C. NISHIOKA
DAVID A. NOBRIGA
HERBERT M. RICHARDS, JR.

LINNEL T. NISHIOKA
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

SEP - 5 2000

Mr. Eugene P. Dashiell
1314 South King Street, Suite 951
Honolulu, Hawaii 96814

Dear Mr. Dashiell:

This is in response to you letter dated July 28, 2000, relating to several proposed pipeline routes from BWS Well 1942-01. It is our understanding that a previous alternative route is now designated as the "preferred route."

You requested clarification as to whether a stream channel alteration permit (SCAP) would be required for installation of a pipeline at the location shown on the map identified as "Figure 6, BWS Waimanalo Well III Project, Access Road Pipeline." It is our understanding that the proposed pipeline route crosses Kailua Ditch, then runs down the centerline of the access road to Meadow Gold Dairy, then down the center of Waikupanaha Street to the BWS connection at Hihimanu St.

The site inspection conducted June 23, 1999, confirmed that the natural watercourses that cross the access road east of the Meadow Gold Dairy and west of the BWS Waimanalo III Well do not have sufficient flowing water to support aquatic life and do not have instream uses. Therefore, this watercourse is not considered to be a "stream" as defined in the Hawaii Revised Statutes §174C-3. In addition, even if a "stream" were present, routing the pipeline down the center of an existing roadway might not require a scap so long as no alteration to the bed and banks of the stream occurred. A stream channel alteration permit will not be required for the proposed work.

Thank you for coordinating with us on our permit requirements. Should you have any questions, please contact David Higa of the Commission staff at 587-0249.

Sincerely,

LINNEL T. NISHIOKA
Deputy Director

SKS:sd

Eugene P. Dashiell AICP
1314 South King Street, Suite 951
Honolulu, Hawai'i 96814

Telephone/FAX: 808.593.8330
Cell Phone/Voice Mail: 371.0745
E-mail: dashiell@lava.net

Member, American Institute of Certified Planners

July 28, 2000

Dave Higa
CWRM
DLNR
State of Hawaii
Honolulu, HI 96814

Dear Mr. Higa:

Subject: BWS Well III - Access road and Pipeline

Reference: CWRM Letter to Dashiell, dated July 16, 1999 (copy enclosed)

The Board of Water Supply has chosen the alternate route which is different from the preferred route for the subject access road and pipeline. The alternate route and the preferred route were inspected by a member of your staff (and myself) in July of 1999. BWS staff would like to verify that an un-named drainage-way crossing, along the alternate route is not under your jurisdiction. I believe that the reference letter is describing the un-named stream in question, but we want to be sure. I have enclosed a map and a photograph of the actual concrete pipe culvert for this drainage-way, and these materials may may assist your determination.

The alternate route will cross the Kailua Ditch, as does the original preferred route, but just past the crossing point, the alternate route will be in approximately in the centerline of the access road up to the Meadow Gold Dairy, and then down approximately the center of Waikupanaha Street to a BWS connection at Hihimanu St.

Please call me (593-8330) if you have comments or questions.

Sincerely yours,

Eugene P. Dashiell

Enclosures: Photos and maps

Waimanalo - BWS Well III

Close up of outlet end of pipe culvert, about 3-feet in diameter. Capacity is diminished by about one half because of sediment deposits.

Road crossing at drainage ditch outlet of pipe culvert. Top of concrete pipe culvert can be seen at bottom of photo. Elevation of road bed is about 8 to 10 feet above top of pipe culvert.

View from outlet end through pipe culvert to inlet. Note infill of pipe from sediment.

Eugene P. Dashiell AICP
1314 South King Street, Suite 951
Honolulu, Hawai'i 96814

Telephone/FAX: 808.593.8330
Cell Phone/Voice Mail: 371.0745
E-mail: dashiell@lava.net

Member, American Institute of Certified Planners

May 26, 1999

Dave Higa
CWRM
DLNR
State of Hawaii
Honolulu, HI 96814

Dear Mr. Higa:

Subject: BWS Well III-Access road and pipeline

I have attached a USGS map at 2X scale showing the approx. location of the well and proposed access road and pipeline route. There is an existing access road to the well, via Meadowgold. That access road is dirt and gravel. It crosses the irrigation ditch via a concrete pipe culvert. However, the proposed access road would be paved, and the water transmission pipeline would be buried beneath the access road. This proposed road would go in a different direction from the existing Meadowgold route. I have shown this proposed route via a dashed line.

This is a pretty crude map and it if is unreadable, I will provide you with a hard copy with improved detail. As best I can tell, the entire site/project is in the Agricultural Land Use District. The TMK for the well itself is 4-1-08:05.

Thanks for looking at this. I am checking to see if the CWRM has jurisdiction and if you would require a SCAP if we need to bury the pipeline under the irrigation ditch. I am not sure how they intend to bridge the ditch. The drill rig was able to use the existing pipe culvert and maybe it would suffice. But the preference for installation of the pipeline is underground/under the ditch. We could place if over the ditch, but they would prefer to bury it. Please call me (593-8330) if you have comments or questions.

Sincerely yours,

Eugene P. Dashiell

Enclosure

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

JUL 16 1999

Mr. Eugene Dashiell
Environmental Planning
1314 South King Street, Suite 951
Honolulu, Hawaii 96814

Dear Mr. Dashiell:

BWS Well III – Access Road and Pipeline

This is in response to your facsimile, dated May 26, 1999, requesting we determine if several proposed pipeline routes from BWS III (State Well 1942-01), Oahu (TMK:4-1-8 various) will require stream channel alteration permits (SCAP). We appreciate your assistance during the field inspection of several watercourses by a member of our staff on June 23, 1999.

You inquired specifically if the watercourse (an open ditch) that crosses the current BWS III access road is subject to a SCAP. We contacted the Department of Agriculture (DOA) and found that the ditch in question receives water from the DOA's 60 million gallon reservoir located at the end of Mahailua Street. The water is partially piped to the open ditch to irrigate the corn fields northeast of the well. This ditch is not a natural watercourse, and is not considered to be a "stream". Therefore, that watercourse is not subject to a stream channel alteration permit.

We also looked at a dry gulch east of the Meadowgold Dairy and a watercourse called Huli Lined Channel or Muliwaiolena Stream. These inspections confirmed that these watercourses do not have sufficient flowing water to sustain aquatic life and do not have instream uses. Therefore, a stream channel alteration permit will not be required.

Thank you for consulting us on our permit requirements. Should you have any questions, please contact David Higa of the Commission staff at 587-0249.

Sincerely,

LINNEL T. NISHIOKA
Deputy Director

SKS:ky

Eugene P. Dashiell AICP
1314 South King Street, Suite 951
Honolulu, Hawai'i 96814

Telephone/FAX: 808.593.8330
Cell Phone/Voice Mail: 371.0745
E-mail: dashiell@lava.net

Member, American Institute of Certified Planners

November 27, 2000

State Historic Preservation Division
Attention: Ms. Sara Collins
601 Kamokila Blvd., Room 555
Kapolei, Hawaii 96707

Dear Ms. Collins:

Subject: BWS Well III - Access road and Pipeline (TMK: 4-1-008: 005, 079 & 080

Thank you for your letter of November 15 regarding the subject project. Please note that the two features shown in the archaeological report are outside the project limits. They are a minimum of 15 feet from an existing access road, which is to be paved, and even further from the production facility and well site. I have attached a map depicting the locations of the features in relation to project components.

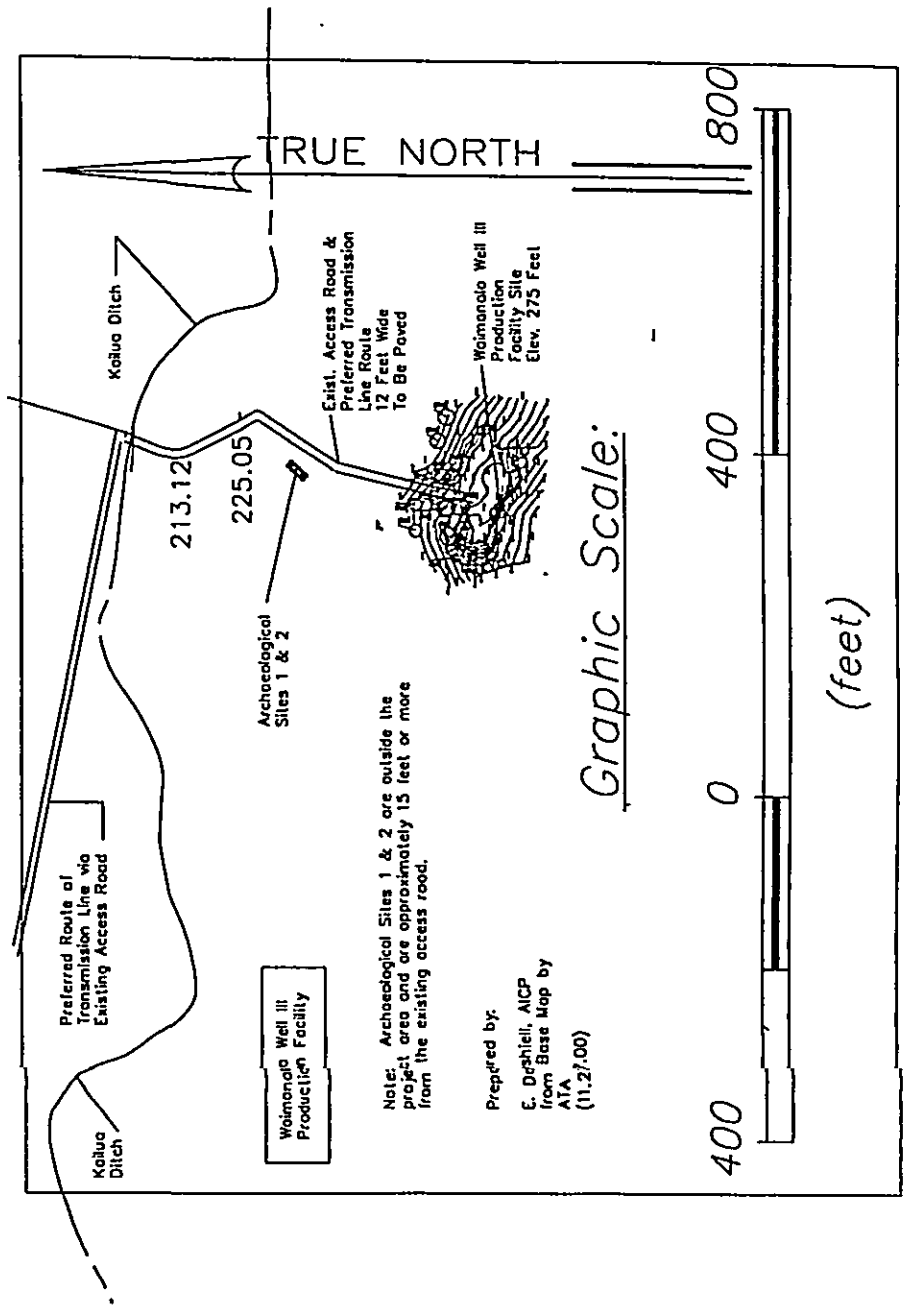
Please call me (593-8330) if you have comments or questions.

Sincerely yours,

Eugene P. Dashiell

Enclosures: Map

Copies: Austin Tsutsumi & Assoc.; A. Sinoto



BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawaii 96707

November 15, 2000

Mr. Eugene P. Dashiell
Eugene P. Dashiell AICP
1314 South King Street, Suite 951
Honolulu, Hawaii 96814

LOG NO: 26420 ✓
DOC NO: 0010SC18

Dear Mr. Dashiell:

SUBJECT: Chapter 6E-8 Historic Preservation Review of a Draft Report Documenting the Results of an Archaeological Inventory Survey for the Proposed Board of Water Supply (BWS) Waimanalo Well III
Waimanalo, Ko'olaupoko, O'ahu, TMK: 4-1-008: 005, 079 & 080

Thank you for the opportunity to review and comment on a draft report documenting the results of an archaeological inventory survey in Waimanalo, O'ahu (Drolet & Sinoto 1999. Archaeological Inventory Survey BWS Waimanalo Well III Waimanalo, Ko'olaupoko, O'ahu [TMK: 4-1-08: 05, 79 & 80]. Aki Sinoto Consulting ms.).

The survey area appears to have been covered adequately, finding a total of three historic sites: a stepped platform, a rectangular platform, and the Kailua Ditch (known to be a contributing property of site 4042). We cannot conclude our review, however, until more information is provided concerning the two platform features that are described. Specific comments on this matter are provided in Attachment I. Once we receive the requested information, we anticipate concluding our review rapidly.

Should you have any questions, please feel free to contact Sara Collins at 692-8026.

Aloha,

DON HIBBARD, Administrator
State Historic Preservation Division

SC:amk

ATTACHMENT I

INVENTORY SURVEY REPORT FOR THE PROPOSED BWS WAIMANALO WELL III
AKI SINOTO CONSULTING

Two Stone Features

Page 23: Are these features within the project area for the proposed well? If so, they must be properly evaluated and recorded. Evaluation should include test excavations to examine construction and to look for cultural materials. Then, the features' probable function and age, as well as significance will need to be assessed. Until we receive this information, we cannot complete our review. Also, please depict the two features clearly on a map of the surveyed area(s), and obtain State site numbers for them as needed.

Eugene P. Dashiell AICP
1314 South King Street, Suite 951
Honolulu, Hawai'i 96814

Telephone/FAX: 808.593.8330
Cell Phone/Voice Mail: 371.0745
E-mail: dashiell@lava.net

Member, American Institute of Certified Planners

July 28, 2000

Sara Collins
State Historic Preservation Division
DLNR
State of Hawaii
Honolulu, HI

Dear Mr. Collins:

Subject: BWS Well III - Access road and Pipeline

We request authorization from your agency for permission to "cross" the Kailua Ditch in Waimanalo. I have enclosed some photographs and maps of the route. The actual "crossing" of the BWS pipeline follows an existing access road, and pipe culvert "crossing" of the Ditch. At present, the Department of Agriculture is continuing to place ditch water in a PVC 12-inch pipe, but they have not yet reached the crossing point for the subject project, though they may reach it before the subject project is constructed. In either case, the subject project would install the transmission beneath the ditch/pipeline and not disturb the flow, except very briefly perhaps, during construction. The access road at the crossing point of the ditch, would be the same road which exists at present, although it would be paved with asphalt.

The alternate route will cross the Kailua Ditch from the well site and just past the crossing point, the alternate route will be in approximately in the centerline of the access road up to the Meadow Gold Dairy, and then down approximately the center of Waikupanaha Street to a BWS connection at Hihimanu St.

I have enclosed a copy of the draft archeological appendix to the EA we are preparing for this project.

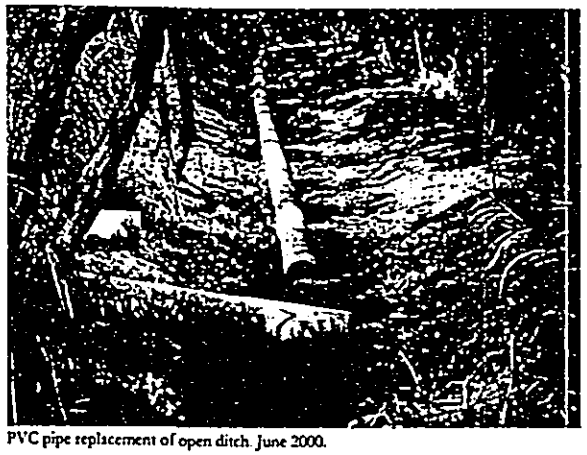
Please call me (593-8330) if you have comments or questions.

Sincerely yours,

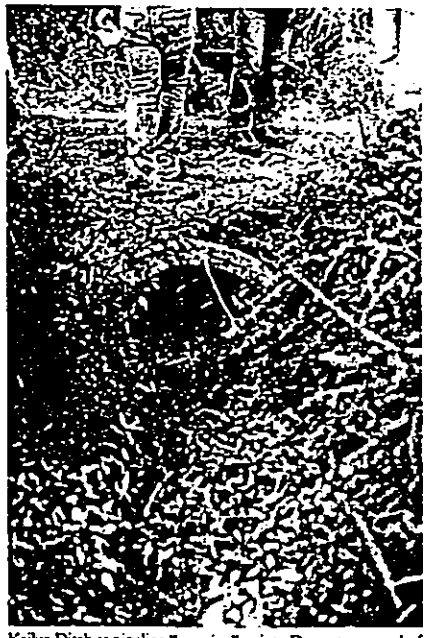
Eugene P. Dashiell

Enclosures: Photos and maps

Waimanalo - BWS Well III



PVC pipe replacement of open ditch. June 2000.



Kailua Ditch at pipeline "crossing" point. Downstream end of ditch which flows through existing pipe culvert. Proposed transmission line would "cross" beneath ditch at approximately this location, culvert might be modified to strengthen roadbed crossing. DOA is anticipated to replace open ditch with PVC pipe at this location.

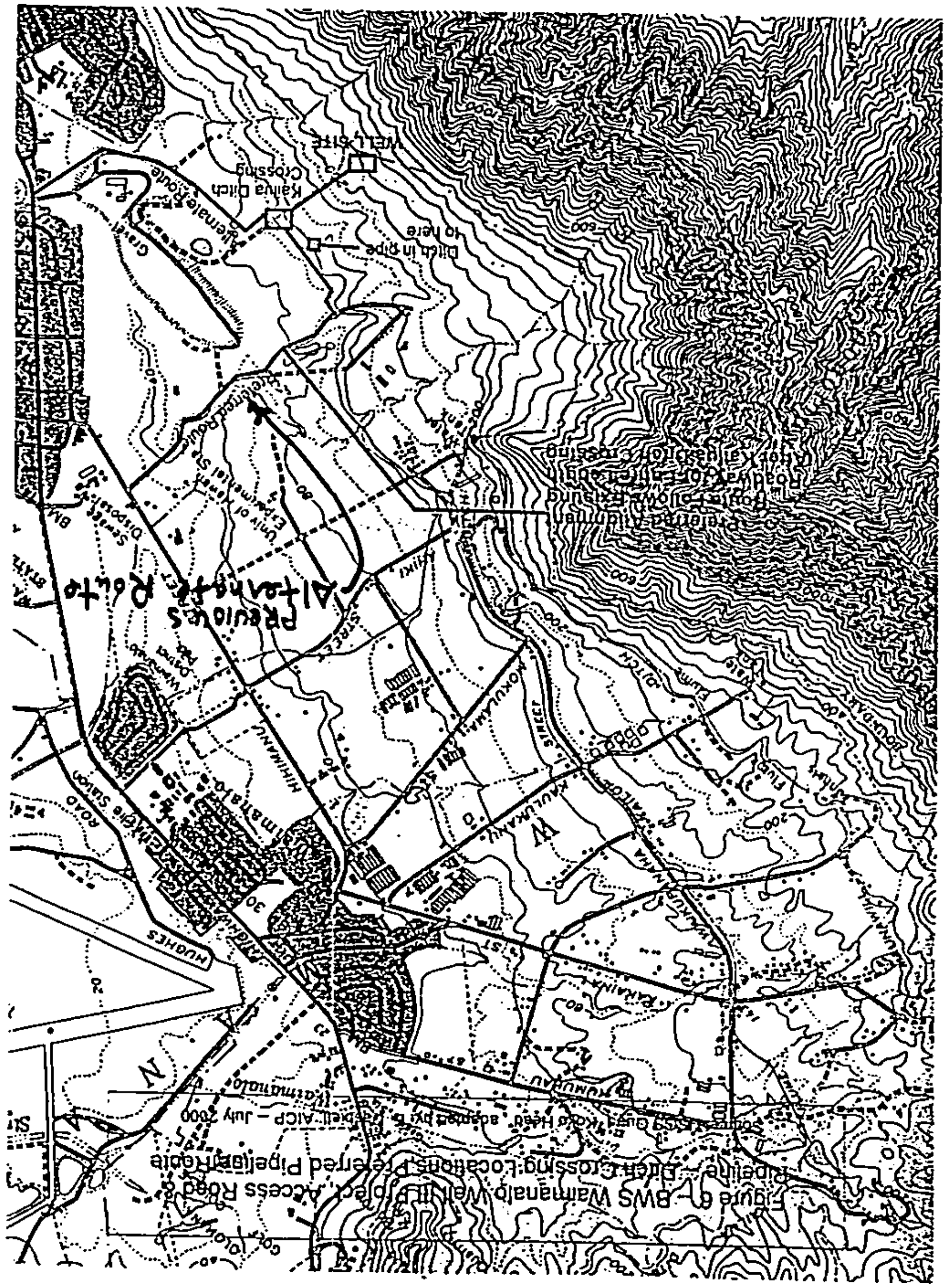
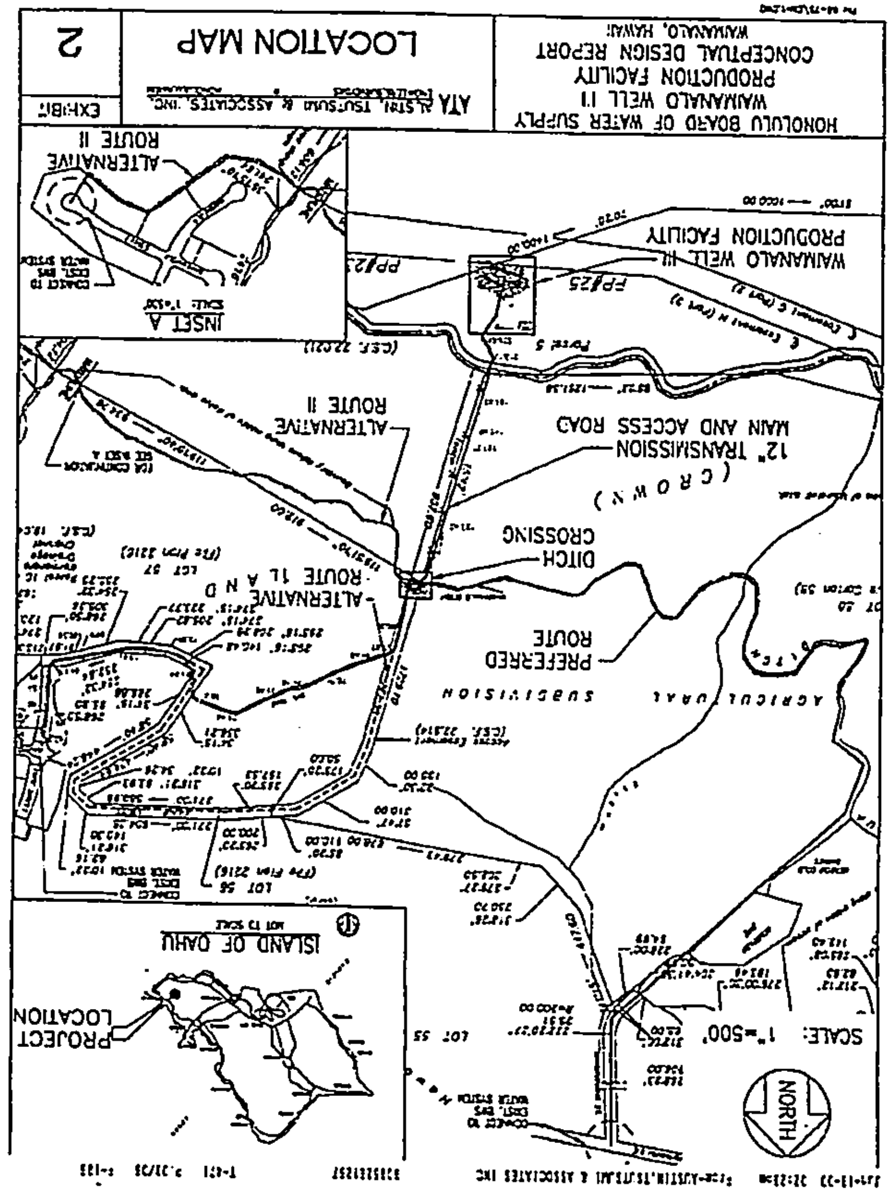


Figure 6 - BWS Waimanalo Well III Project, Access Road &
Pipeline - Ditch Crossing Locations, Preferred Pipeline Route
adapted by B. Campbell, AICP - July 2000
Previous Alternate Route
Univ of Hawaii Experimental Sta
Sewage Disposal
Alternate Route
Kailua Ditch Crossing
Ditch in pipe to here
WELL SITE
Gravel
HUGHES ROAD
HIHIMANU
STREET
KAULUKANAI
OKOLAMAHA
DITCH
Flume
Water Tank
Preferred Route following Existing Road or crossing Ditch


SCALE: 1"=500'
NORTH
ISLAND OF OAHU
NOT TO SCALE
PROJECT LOCATION
LOT 55
LOT 56
LOT 57
CONNECT TO EXIST. BWS WATER STATION
AGRICULTURAL SUBDIVISION
PREFERRED ROUTE
ALTERNATIVE ROUTE 1L A N D
ALTERNATIVE ROUTE II
DITCH CROSSING
(C R O W N)
12" TRANSMISSION MAIN AND ACCESS ROAD
WAIMANALO WELL III PRODUCTION FACILITY
FP/25
PP/25
Parcel 5
INSET A
HONOLULU BOARD OF WATER SUPPLY
WAIMANALO WELL III
PRODUCTION FACILITY
CONCEPTUAL DESIGN REPORT
WAIMANALO, HAWAII
ATA ALSTRI, TSUTSUMI & ASSOCIATES, INC.
LOCATION MAP
EXHIBIT
2

Eugene P. Dashiell AICP
1314 South King Street, Suite 951
Honolulu, Hawai'i 96814

Telephone/FAX: 808.593.8330
Cell Phone/Voice Mail: 371.0745
E-mail: dashiell@lava.net

Member, American Institute of Certified Planners

July 19, 1999

Agricultural Resources Management Division
Attention: Mr. Paul Matsuo
State of Hawaii Department of Agriculture
Post Office Box 22159
Honolulu, Hawaii 96823-2159

Dear Mr. Matsuo:

Subject: Request for Determination – Waimanalo Well III, Access Road and Pipeline, Honolulu Board of Water Supply – TMK:

I am requesting guidance and permission from you for implementation of the subject project.

The Honolulu Board of Water Supply has previously drilled Waimanalo Well III at elevation 270 feet and now proposes to develop the well for a yield of approximately 0.72 million gallons per day. To do so requires construction of a paved access road and pipeline from the well to a connection with the BWS transmission lines at lower elevations. The road/pipeline crossing proposed is over the ditch at two locations, which are close-by each other. This location is adjacent to the corn farm, at the end of the ditch.

The irrigation ditch is part of the Waimanalo Ditch Irrigation System which the first components were constructed for in the mid-1800's to divert water from Manuwili Stream/Valley to Waimanalo in order to irrigate cultivated sugar cane at the Waimanalo Sugar Company plantation. The Waimanalo Ditch Irrigation System is eligible for inclusion on the federal register of historic places and is identified as State of Hawaii Site Number 50-80-15-4042. We are in the process of coordinating with the State Historic Preservation Officer about this.

The Commission on Water Resources Management has waived jurisdiction of the ditch in-so-far as the subject project is concerned (see enclosed letter). We also have coordinated with the U.S. Army Corps of Engineers who we believe also will waive jurisdiction. The Honolulu Board of Water Supply is coordinating with the Department of Land and Natural Resources because they are the land managers for lands at the location of the well, and beneath the proposed access road and pipeline. The road and pipeline also will cross lands held by the Department of Hawaiian Homes Lands which has indicated a willingness for this project to continue.

I have attached the following information for your use in making the determination.

- Location map: USGS Quad, enlarged scale, with locations of the well and ditch crossings.

- Photographs of ditch at crossing point.

- Copy of historic preservation application document.

- Copy of letter from State Commission on Water Resources Management.

If you have questions, or require additional information, please call me at 593-8330 or 371-0745.

Sincerely yours,

Eugene P. Dashiell

Enclosures

IRRB 1780

BENJAMIN J. CAYETANO
Governor

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 South King Street
Honolulu, Hawaii 96814-2512

JAMES J. NAKATANI
Chairperson, Board of Agriculture

LETITIA N. UYEHARA
Deputy to the Chairperson

Mailing Address:
P.O. Box 22159
Honolulu, Hawaii 96823-2159

Fax: (808) 973-9613

August 16, 1999

Mr. Eugene P. Dashiell, AICP
Environmental Planning
1314 South King Street, Ste. 951
Honolulu, HI 96814

Dear Mr. Dashiell:

Subject: Request for Determination - Waimanalo Well III, Access Road and Pipeline, Honolulu Board of Water Supply

This is in response to your written request of July 19, 1999 for permission to construct two road/pipeline crossings over an open ditch from BWS III (State Well 1942-01) to a connection with the BWS transmission lines at lower elevations.

The ditch is used by the Department of Agriculture, Waimanalo Irrigation System, to transmit water to an adjacent corn farm located on TMK 1-4-1-08-79.

The department has no objections to BWS constructing the proposed ditch crossings.

Please coordinate the proposed work with Mr. Randy Teruya, District Manager, Waimanalo Irrigation System, at 973-9478.

Sincerely,

PAUL T. MATSUO, P.E.
Administrator-Chief Engineer
Agricultural Resource Management
Division

Eugene P. Dashiell AICP
1314 South King Street, Suite 951
Honolulu, Hawai'i 96814

Telephone/FAX: 808.593.8330
Cell Phone/Voice Mail: 371.0745
E-mail: dashiell@lava.net

Member, American Institute of Certified Planners

July 19, 1999

U.S. Army Engineer District
Attention: Mr. William Lennan
U.S. Army Corps of Engineers, Building T-1
Fort Shafter, Hawaii 96858

Dear Mr. Lennan:

Subject: Request for Determination – Waimanalo Well III, Access Road and Pipeline, Honolulu Board of Water Supply

Per our site inspection on July 14, 1999, I am requesting a determination for an exemption/waiver or permitting process, of jurisdiction, by the Corps of Engineers regarding the crossing of a small artificial/man-made irrigation ditch in Waimanalo, Oahu, Hawaii.

The Honolulu Board of Water Supply has previously drilled a Waimanalo Well III at elevation 270 feet and now proposes to develop the well for a yield of approximately 0.72 million gallons per day. To do so requires construction of an paved access road and pipeline from the well to a connection with the BWS transmission lines at lower elevations. The road/pipeline crossing proposed is over the ditch at two locations, which are close-by each other.

The irrigation ditch is part of Waimanalo Ditch Irrigation System which the first components were constructed for in the mid-1800's to divert water from Manuwili Stream/Valley to Waimanalo in order to irrigate cultivated sugar cane at the Waimanalo Sugar Company plantation. The Waimanalo Ditch Irrigation System is eligible for inclusion on the federal register of historic places and is listed as a State of Hawaii Site Number 50-80-15-4042. We are in the process of coordinating with the State Historic Preservation Officer about this.

The Commission on Water Resources Management has waived jurisdiction of the ditch in-so-far as the subject project is concerned. We also have coordinated with the U.S. Army Corps of Engineers who we believe also will waive jurisdiction. The Honolulu Board of Water Supply is coordinating with the Department of Land and Natural Resources because they are the land managers for lands at the location of the well, and beneath the proposed access road and pipeline. The road and pipeline also will cross lands held by the Department of Hawaiian Homes Lands which has indicated a willingness for this project to continue.

I have attached the following information for your use in making the determination.

- Location map: USGS Quad, slightly enlarged scale with locations of well and ditch crossings.

- Photographs of ditch at crossing point.

- Copy of historic preservation application document.

- Copy of historic preservation application document.

If you have questions, or require additional information, please call me at 593-8330 or 371-0745.

Sincerely yours,

Eugene P. Dashiell

Enclosures

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
FT. SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF

July 22, 1999

Regulatory Branch

Mr. Eugene P. Dashiell, AICP
Environmental Planning
1314 South King Street, Suite 951
Honolulu, Hawaii 96814

Dear Mr. Dashiell:

This letter responds to your request for a jurisdictional determination for the Waimanalo Well III, Access Road and Pipeline, dated July 19, 1999. Based on the information you provided and a site visit by a member of my staff I have determined that a Department of the Army permit will not be required for this project.

If you have any questions concerning this determination, please contact William Lennan of my staff at 438-9258, extension 13, and reference File No. 990000429.

Sincerely,

George P. Young, P.E.
Chief, Regulatory Branch

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843

Post-it® Fax Note 7671	Date 7/8/99 # of pages ▶ 3
To IVAN NAKATSUKA	From SCOT MURAOKA
Co./Dept.	Co. BWS
Phone #	Phone # 527-5221
Fax # 526-1267	Fax # 527-5703

June 18, 1999

Mr. William Wong, Chief
Environmental Management Division
Safe Drinking Water Branch
Department of Health
State of Hawaii
P. O. Box 3378
Honolulu, Hawaii 96801

RECEIVED
JUL 0 8 1999
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
Honolulu, Hawaii 96817-5031

Dear Mr. Wong:

Subject: Your Letter of March 30, 1999 Regarding the Board of Water Supply's Waimanalo Well III

Thank you for your letter regarding the Waimanalo Well III.

We provide the following comments to your concerns:

1. We are unaware of a reservoir by the name of Wing King Reservoir. There is an existing open reservoir located on the caprock near the abandoned quarry and about 2,200' makai of our well. There are no fresh water springs in the vicinity of the well. Meadow Gold Dairy is located makai about a half mile away. Waimanalo Waste Water Treatment Plant is nearly a mile away. A map showing the location of the well and the unnamed reservoir is enclosed.

   The well develops Koolau dike water recharged from deep infiltration of rainfall. The well is expected to develop up to 0.75 million gallons per day. The unnamed reservoir receives runoff and possibly input from the Maunawili irrigation system that feeds Waimanalo.

2. All agricultural activity occurs significantly down gradient of the Waimanalo Well III that groundwater contamination is unlikely. Agricultural activity and the reuse of treated wastewater and their potential for groundwater contamination were criteria for siting the well close to the northeast face of the Koolau Range, near the Waimanalo forest reserve and above the grazing pastures of the Meadow Gold Dairy.

3. The chemical water quality data for the well is enclosed; however, the microbiological data will be obtained after the permanent pump is installed.

4. We are presently preparing the Draft Environmental Assessment (EA) for the Waimanalo Well III pump station and access road. We will provide a copy of the Draft EA for your review and comments when it is completed. The Final EA for the exploratory well phase of the Waimanalo Well III, which provides a description of the affected environment, is enclosed.

6. The Waimanalo Well III will provide water for Waimanalo, thus negating the need to import Punaluu and Waiahe water into Waimanalo.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

CLIFFORD S. JAMES
Manager and Chief Engineer

Enclosures

SM/BU:js
cc: Eng.
C. Lau
E. Kawata
B. Usagawa
p.494/99

RECEIVED
APR 20 1999
AUSTIN, TSUTSUMI & ASSOCIATES, INC.
Honolulu, Hawaii 96817-5017

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801

99-494/99

March 30, 1999

To: Ivan Nakatsuka
(Austin Tsutsumi)
fax 526 1267
Plo. assist with our response.
Thanks. Scot Muraoka
5275221

Mr. Clifford Jamile
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Attention: Mr. Barry Usagawa

Dear Mr. Jamile:

SUBJECT: WAIMANALO WELL III

The Safe Drinking Water Branch received the enclosed letter from Mr. James Andrews, Waimanalo Citizens for a Healthy Future (WCHF), requesting the Waimanalo Well III to be evaluated under the Hawaii Source Water Assessment Program (HISWAP). Our record indicates that Waimanalo Well III is currently a monitoring well and has not been approved as drinking water source. Thus, this well is not required to be part of the HISWAP assessment. However, it is our understanding that the Honolulu Board of Water Supply (BWS) is proposing to convert this well into a drinking water source and is currently working on the Environmental Assessment. We would appreciate if BWS provide the following information for our records:

1. Is the Waimanalo Well III constructed near a Wing King Reservoir, a fresh water spring? Please provide us with the well location and description of the general area (such as diary operation, wastewater treatment plant).

2. Please provide us, if any, survey results such as water flow, volume, or hydrologic source of Waimanalo Well III and the Wing King Reservoir.

3. Please provide us, if any, chemical and/or microbiological water quality data that have been performed on Waimanalo Well III.

Jul-30-99 02:22pm From-AUSTIN,TSUTSUMI & ASSOCIATES INC 8085261267 T-884 P.03/05 F-488

Thank you for your attention and concern to these matters. If you should have any questions, please contact Ms. Queenie Kocori of the Safe Drinking Water Branch, Engineering Section, at 586-4258.

Sincerely,

William Wong

WILLIAM WONG, P.E., Chief
Safe Drinking Water Branch
Environmental Management Division

QK:la

Enclosures

c: Mr. James Andrews
WCHF
P. O. Box 320
Waimanalo, HI 96795 (w/o enclosure)

Mr. Erwin Kawata, BWS (w/o enclosure)

Waimanalo Citizens for a Healthy Future:
WCHF

PO BOX 320
WAIMANALO, HAWAII 96795
TELEPHONE (808)259 7473
FAX (808) 259 6870

February 21, 1999

Hawaii's Source Water Assessment Plan
Safe Drinking Water Branch
Department of Health
919 Ala Moana Boulevard, Suite 318
Honolulu, Hawaii 96814

RE: Source Water Protection Plan

Dear Bill Wong and Dave Yogi:

Waimanalo Well III may be a high risk well and should be evaluated under SWAP. It is a brand new well.

The Waimanalo area was a sugar producing area. During the late 1800's a reservoir was constructed near what is now the site of Waimanalo Well III. This reservoir, named the Wing King Reservoir, was used to tap a fresh water spring. There is no known survey of the Wing King Spring that determines the water flow, volume, or hydrologic source of the spring. The spring now receives the effluent reclaimed from rotting meats, fish, chicken, grease, and vegetable matter. The effluent deposited into the spring appears to contain sufficient decomposing organic matter that it bubbles with the gasses of decomposition (CH4, H2S, CO2, etc.). It appears, from random viewing, the Wing King Reservoir water level varies very little. No matter how much effluent is deposited into the spring or how much effluent is removed the surface level does not change. Is it possible that the effluent is creating sufficient pressure to force the effluent itself into whatever aquifer supplies the spring? This spring is a short distance, across slope, from the Waimanalo Well III site.

R-3 water is used for irrigation and the Waimanalo Well III is in the area designated for R-3 effluent irrigation. Water reuse permits have been applied for, issued, or under consideration for several sites near well III. The effluent, recovered from rotting food waste at the garbage processing facility, is now distributed at a 10+ acre farm. State DOA and federal NRCS will construct a 3.5 million gallon reservoir to receive R-1 effluent from the Waimanalo Wastewater Treatment Plant, combine it with the R-3 effluent in the Wing King Spring Reservoir, and distribute it throughout the area surrounding Waimanalo Well III. This might include the "well drawdown" area.

An additional factor placing Waimanalo Well III at risk is the a confined animal feeding operation nearby. Waimanalo Well III is located on a dairy. Over 2,600 head graze around the wellhead. The dairy, under prior ownership, used manure effluent as irrigation for 25 years near the site. It is my understanding that the manure irrigation raised the nitrogen content of the

Waimanalo Citizens for a Healthy Future:
WCHF

PO BOX 320
WAIMANALO, HAWAII 96795
TELEPHONE (808)259 7473
FAX (808) 259 6870

pasture grass to the point that it could not be used as dairy herd feed for several years of the recent past.

Lastly, Waimanalo Well I is out of service. Well I is 1/4 mile east of the new Waimanalo Well III. It was closed in 1995 due to alachlor, a sugar related chemical.

Waimanalo Well III is an important addition to the available water supply of the Honolulu area. Our acquired knowledge indicates this well will be supplying water to East Honolulu in the effort to alleviate the pending deficit of the Honolulu aquifer.

Please evaluate this important well under the SWAP. It may also assist in the numerical evaluation method you are developing by the relative importance of the well.

Sincerely,

James R. Andrews

Appendix F

Environmental Assessment for an Exploratory Well and Access Road at Waimanalo, Oahu (excluding appendices)

ENVIRONMENTAL ASSESSMENT

FOR AN EXPLORATORY WELL AND ACCESS ROAD

AT WAIMANALO, OAHU

Proposing Agency

HONOLULU BOARD OF WATER SUPPLY
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Contact

Barry Usagawa, 527-5235

Prepared by:

MAGUIRE GROUP INC.
1600 Kapiolani Boulevard, Suite 601
Honolulu, Hawaii 96814

March 1994

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INTRODUCTION AND SUMMARY

1.1 APPLICANT / PROPOSING AGENCY

Board of Water Supply, City and County of Honolulu

1.2 APPROVING AGENCY

Office of the Governor, State of Hawaii

1.3 AGENCIES CONSULTED IN MAKING THE ASSESSMENT

Office of Environmental Quality Control
Department of Land & Natural Resources

1.4 PROJECT OBJECTIVES AND BACKGROUND

In the fiscal year ending June 30, 1991, the Honolulu Board of Water Supply (BWS) system served a population of over 830,000. Average daily water demand on the island during this period was 156 million gallons (mg). According to BWS projections, average daily water demand in the year 2010 will be 191 mg, an increase of 23 percent.

To meet growing demands for water, BWS has initiated a comprehensive groundwater development program. As part of this program, BWS proposes to drill an exploratory well in Waimanalo to determine the yield and quality of water supplies which may be withdrawn from this location.

1.5 PROJECT AND SITE DESCRIPTION

The proposed exploratory well will be located in Waimanalo on State land handled by DLNR and leased to Meadow Gold Dairies. The site is located at the foot of the northeastern face of the Ko'olau range near the northern boundary of the Waimanalo Forest Reserve.

Access to the well site is available via unimproved agricultural roads through the Meadow Gold Dairies property and pastures. The project will involve extending an agricultural road about 250 feet to obtain access to the site and clearing a work area for test drilling. A hole about 12 inches in diameter will then be drilled to a depth of about 500 feet. Once the drilling is completed, a 12 inch diameter steel casing will be grouted into place in the hole about 350 feet down and a pump will be installed. A series of pumping tests will be conducted to determine the potential sustained yield and quality of water from the aquifer. Water from the pumping tests will be routed overland and discharged to either the Maunawili or the Kailua ditch.

Upon completion of the testing, the well driller will remove the pump, cap the well, and clean the area. The total project will require an estimated six to seven months to complete.

1.6 POTENTIAL IMPACTS, MITIGATION MEASURES, AND ALTERNATIVES

No significant adverse impacts are expected during the drilling and pump testing. Short-term impacts during construction of the well and testing will include localized soil disturbance and increases in noise resulting from site access and the operation of drilling equipment. No permanent impacts are anticipated. Mitigation measures will be carried out to minimize soil erosion and short-term impacts of equipment noise.

Alternatives to the project have been considered, and are: no action, development of alternative sources, and delaying the project. None of these alternatives would enable the Board of Water Supply to successfully achieve its stated objectives. Additionally developing sources at other sites should be considered.

1.7 GOVERNMENTAL PERMITS AND APPROVALS

The following permits and approvals will be required:

Well Construction Permit and Water Use Permit - Department of Land and Natural Resources

Grading Permit - Department of Public Works

CHAPTER 2
PROJECT DESCRIPTION

2.1 PROJECT SITE

The site for the proposed exploratory well is near the base of the northeast face of the Koolau Range between the pastures of the Meadow Gold Dairies and the Waimanalo Forest Reserve. Figure 3 is a regional map indicating the general location of the proposed well. Located at an elevation of about 240', the site slopes steeply to the north, toward the pastures of the dairy. It is accessible via the agricultural roads of the dairy and an unimproved road leading into the forest above (south of) the pasture. Figure 4 provides photographs of the site location.

The well site [TMK 4-1-08:5] is owned by the State and leased to Meadow Gold Dairies. It is designated on the City and County of Honolulu Development Plan Land Use Map as AGRICULTURE, land dedicated to agricultural use. The City lists the planned use of the site as agricultural although a subdivision (92-188) was proposed for part of the tract in 1992. The part of the tract to be occupied by the well site is presently forested land between a powerline easement and the upper edge of a field presently in use for grazing horses.

2.2 PROJECT FEATURES

The following table describes the features of this exploratory well site.

Item	Waimanalo Exploratory Well
Tax Map Key (TMK)	4-1-08:5
Total parcel area (acres)	142.41 Acres
Flood Insurance Rate Map (FIRM)	Flood Zone D Areas of undetermined, but possible, flood hazard

Project Features (cont'd)

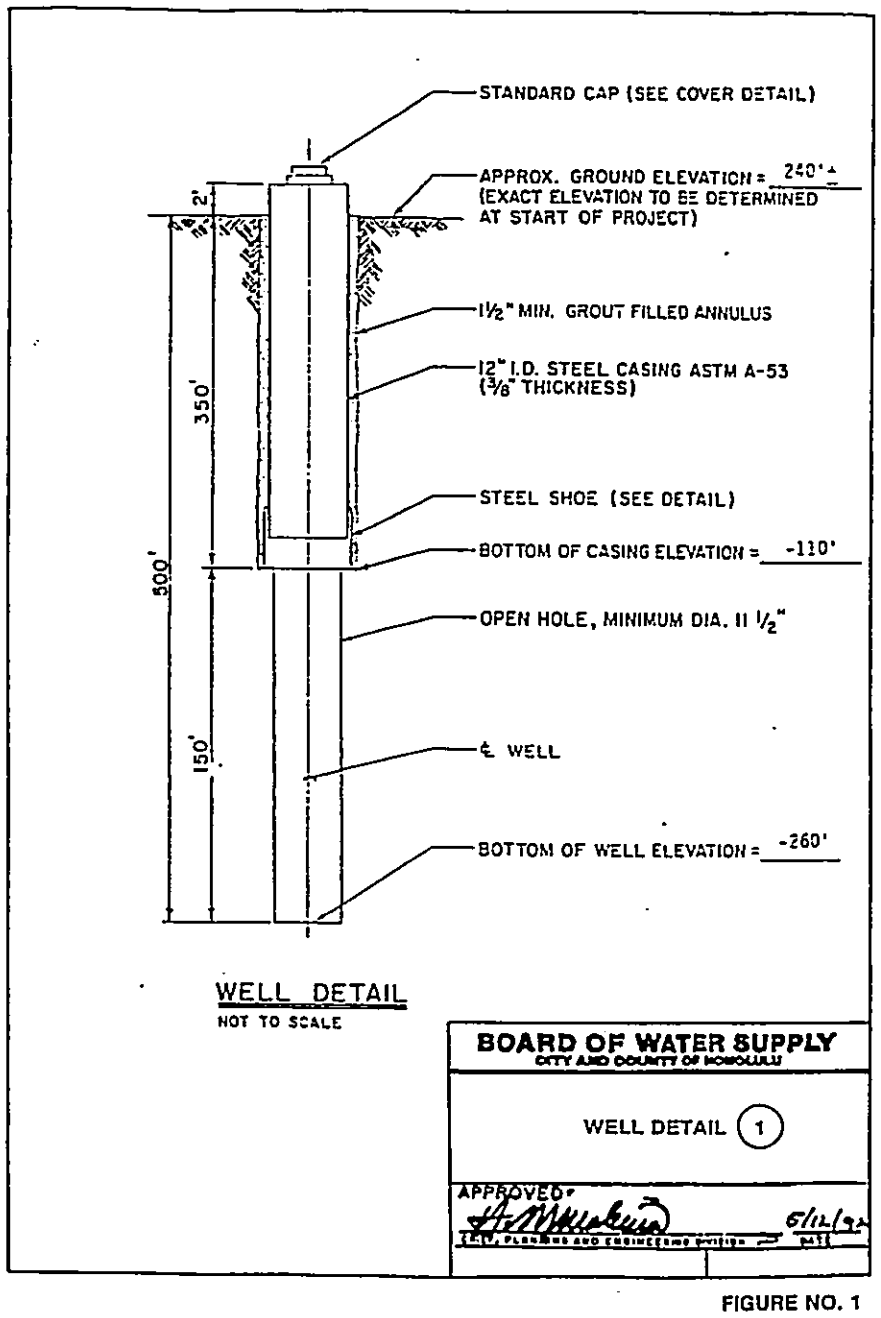
Item	Waimanalo Exploratory Well
State Land Use District	Agricultural
State Water Management Area	Windward Water Mgmt. Area
City & County of Honolulu Development Plan	Agriculture
City & County of Honolulu Zoning	AG-2
Estimated yield of production well	0.5 MGD
Type of Aquifer	Ko'olau Dike System (Perched)
Land Owner	State - handled by DLNR and leased to Meadow Gold Dairies
Nearest Access	Unimproved Agricultural Roads

2.3 PROPOSED FACILITIES AND ACTIVITIES

The project will involve installation of an access road, a test well, pumping and testing equipment. The access road will be installed by using a bulldozer to extend the existing forest road an additional 250' southward.

An area of about 5,500 square feet will be cleared and graded at the project site to accommodate well drilling and support equipment and necessary supplies. All excess material from the clearing and grading of the project site will be disposed at an approved location. Once the area has been cleared, a temporary fence may be erected to secure the project site.

Clearing and grading and test pumping operations will be restricted to hours from 7:30 a.m. to 3:30 p.m. on weekdays to minimize disturbance. No activities will occur on the project during weekends and holidays.



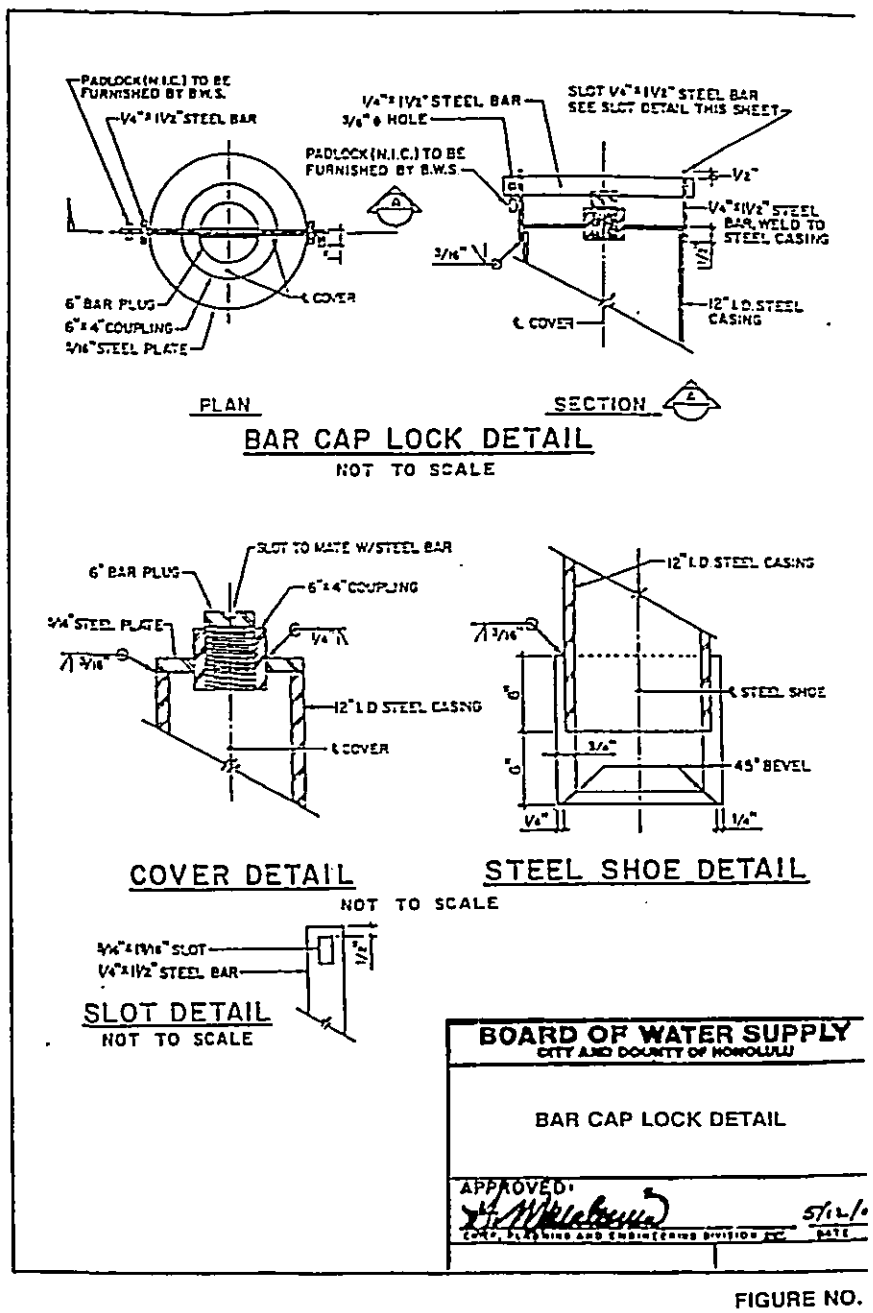
WELL DETAIL
NOT TO SCALE

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

WELL DETAIL (1)

APPROVED:
COMP. PLANNING AND ENGINEERING DIVISION — DATE 6/12/92

FIGURE NO. 1

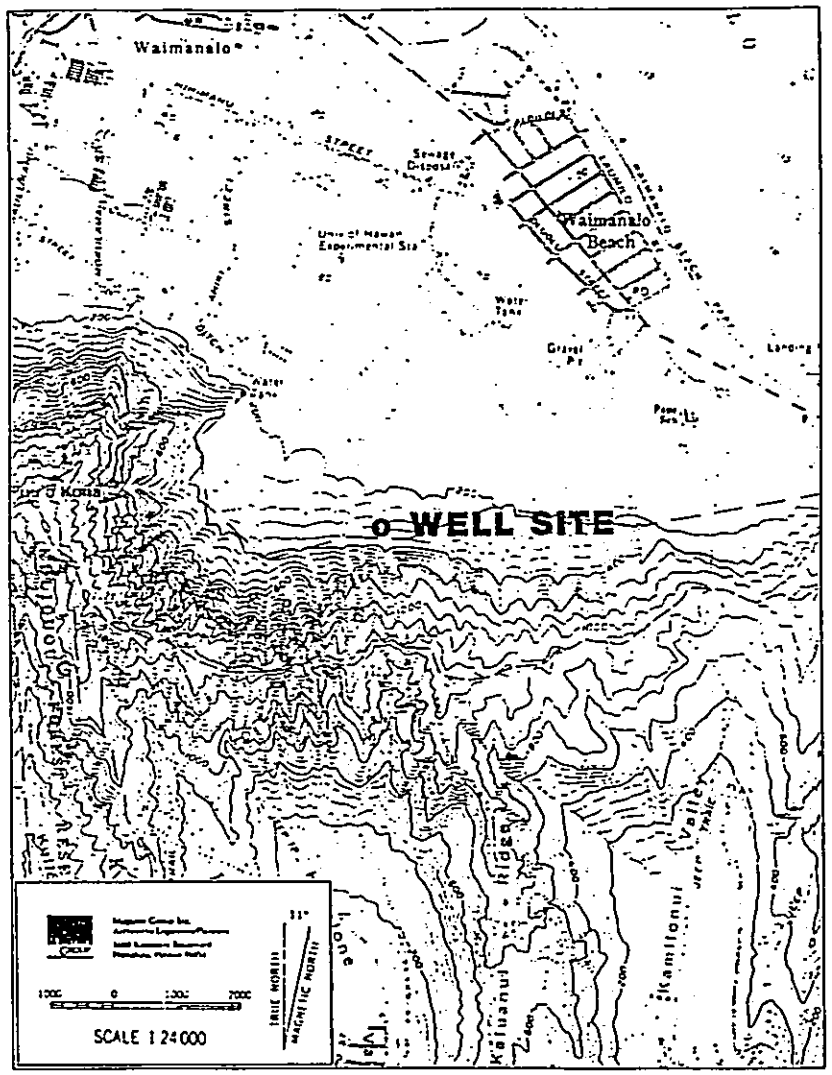


BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

BAR CAP LOCK DETAIL

APPROVED:
COMP. PLANNING AND ENGINEERING DIVISION — DATE 5/12/

FIGURE NO.



Location of the Proposed Waimanalo III Test Well

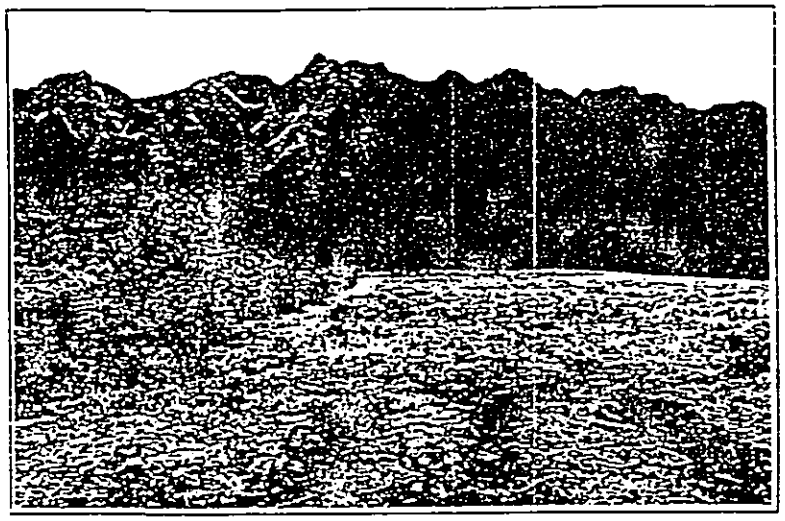


Photo 1: View Looking Southward toward Waimanalo III Site

Photo 2: Proposed Location of Waimanalo III Test Well

Once the site has been cleared and secured, a truck or trailer-mounted well drilling rig and other support equipment will be brought to the project site for the exploratory drilling operation. The truck engine or a self-contained engine will be used to provide power for the well drilling rig. A single well hole about 12 inches in diameter will be drilled at the project site to reach the groundwater source.

One of two existing types of drilling methods, either cable tool or rotary, will be used. The cable tool drilling method is performed by repeatedly raising and dropping a heavy drill bit until the desired depth has been reached.

All waste material from the cable tool drilling operation is bailed from the hole and collected in a pit constructed on the project site or discharged on the surface. In either case, the waste material will be disposed of in an approved manner. The waste material generated from this drilling method does not contain any contaminants. Depending on the depth and geologic formations encountered, the well drilling may require up to a maximum of six months to complete.

If the rotary method is used, a drill bit rotating at moderate speed will bore the well while drilling fluid is pumped down the drill stem to the bit at the bottom of the hole. The drilling fluid, bentonite, a fine clay material, is then forced back up the hole carrying drill cuttings to the surface where they are removed from the drilling mud by a screen. The mud is then collected in a mud tank mounted on the site of the drilling rig. The collected mud is recirculated from the mud tank and is not considered a hazardous material. No surface runoff of the drilling mud will be permitted. When the drilling is complete, the drilling mud will be taken away from the project site and disposed in an approved manner. Some drilling contractors use air and foam to lift cuttings rather than drilling mud for the entire operation.

Once the water table is reached, instead of drilling fluid, an air compressor will be used to pump air or an air foam mixture down to the drill bit. This will ensure that drilling mud does not enter the aquifer. This rotary drill method of drilling may require three to four weeks to complete.

Once the drilling is completed, a 12" diameter steel casing will be grouted into place within the bore hole to a depth of at least 50 feet below the water table. A test pump will be installed in the well. The pump will be used to withdraw water from the well to test water quality and potential yield. Two pumping tests will be conducted. The first will be a short-term test conducted over a 5 hour period to evaluate yield and drawdown. The second will be a long-term test involving continuous pumping over a five day period. When the test pumping has been concluded, the drilling contractor will remove the pump and discharge line, cap the well, remove all equipment and miscellaneous materials, and clean the work area.

If the results show that development of the water source penetrated by the well is feasible, the Board of Water Supply expects to convert the test hole for long-term production. This will require installation of a permanent pump, control station and pipelines. Production well development will be subject to the environmental review process as stipulated in Chapter 343, Hawaii Revised Statutes, and Chapter 200 of the State Department of Health Regulations.

2.4 PUMP TEST

Two types of pump tests will be conducted after the drilling operation is completed. The initial test, a step-drawdown or yield-drawdown test, involves pumping water from the well at various pumping rates to estimate the specific capacity (number of gallons withdrawn per foot of drawdown) of the well. The drawdown will be measured for each pumping rate. Once the drawdown has stabilized, the pumping rate will be changed and a new drawdown measured. A step-drawdown test may last up to five hours, and will be performed from about 9:00 a.m. to 2:00 p.m. on a weekday.

After the step-drawdown test has been completed, a five-day sustained pumping test will be undertaken. The well will be pumped 5 hours the first day, and 8 hours per day for the next four days. This test is designed to determine the sustainable capacity of the well, and monitor water quality. (The sustainable capacity of a well is the rate at which the well can

be continuously pumped without adversely affecting nearby existing wells or water quality.) Water pumped during the pump test will be collected and tested for organic compounds as required by the U.S. Environmental Protection Agency (EPA); heavy metals, minerals, hazardous materials, coliform and standard plate count for bacteria. The tests are performed by the BWS and, in some cases, by the State of Hawaii Department of Health.

Upon completion of the five-day pumping test, the well driller will then remove the pump, cap the well, and clean the area, removing all excess materials and wastewater withdrawn during test pumping. The well will be capped after testing to prevent misuse of the well such as for disposal of hazardous wastes, sewage, or household garbage. According to the U.S. Environmental Protection Agency Underground Injection Control Section, unplugged or improperly abandoned water wells can easily become receptacles for the disposal of waste which may contaminate the groundwater aquifer.

2.5 PROJECT SCHEDULE AND COST

The project schedule will depend upon approval of required permits and other necessary licenses. For planning purposes, the BWS estimates the exploratory well drilling will occur within the Fiscal Year 1993-94.

The project will cost an estimated $430,000. Funds for the project are available in the BWS budget for the fiscal year ending June 30, 1993.

2.6 NEED FOR THE PROJECT

The Board of Water Supply currently serves a population of more than 830,000 persons (Board of Water Supply 1982). Island-wide average daily water demand was about 156 million gallons per day (mgd). The Windward District, extending from Hauula to Waimanalo served approximately 125,000 to 130,000 residents in 1990. Water demand in the district is presently about 20 mgd. Windward sources will be used to meet Windward demands first before being diverted to the Honolulu district which accommodates half of

its demand from sources within the district, while the remainder imported from the Pearl Harbor District and the Windward District. Pumpage from the Pearl Harbor aquifer cannot be further increased without risking serious encroachment of sea water into the basal water lens. The Department of Land and Natural Resources, Commission on Water Resource Management, currently limits the Honolulu District's total allowed draft from the Pearl Harbor aquifer to 38.14 mgd. The Commission on Water Resource Management recently designated the windward district a Water Management Area. All water withdrawals within this area are controlled by the Commission.

The demand for the Windward District is projected to remain relatively constant, however, demand for water in the Honolulu District is projected to continue to increase to 92 mgd by the year 2010. During this period, island wide water demand is projected to rise by nearly 25 percent. To meet growing demand, the Board of Water Supply is seeking to identify, test, and develop new groundwater sources. Some of these new sources will be used to meet demand in the districts within which the sources are developed, some will be transferred to meet the growing demand in Honolulu. If the Waimanalo III source is determined to be feasible for development, an estimated 0.5 mgd may be added to the BWS system.

The BWS has considered a number of alternatives for production of potable water. Water conservation programs are already in place to try and reduce per capita water demand. Alternatives to expanded use of groundwater sources include desalination, development of surface systems, use of brackish sources with dilution, and recycling of treated wastewater. At present, each of these alternatives is presently considered unacceptable for technical, health, and/or cost reasons.

CHAPTER 3
EXISTING CONDITIONS

3.1 PHYSICAL ENVIRONMENT

3.1.1 Geology

Windward Oahu is located on the northside of the Ko'olau Volcano. Profound erosion by Windward Streams and marine influences have removed the formations leeward of the caldera to the Pali. Eventual linkage of their headwalls joined to form the steep cliffs which are now characteristic of the windward side of the Ko'olau range. During this same period, alluvial and marine sediments accumulated in the valleys as sea level rose and fell during glacial and inter-glacial periods.

A major feature of the Ko'olau range is an extensive dike system which formed in the rift zone. The dikes were formed when molten rock flowed into fissures in the volcano and then cooled and solidified. Because these flows solidified under pressure, they formed rock which is much denser and much less permeable than the older, surrounding lava flows. Rainfall not lost to evapotranspiration or surface runoff infiltrates into the highly porous Ko'olau basalt and is stored as groundwater between the relatively impermeable dikes.

3.1.2 Hydrology

The proposed well location has been selected so to tap into the water bearing basalts of the Koolau dike complex. It is located mauka of the Kailua and Maunawili ditch, between two small intermittent streams which originate high in the Waimanalo Forest Reserve. The ditches are man-made drainage channels used to carry water for irrigation of the surrounding agricultural lands. The ditch water originates from water tunnels in Maunawili Valley to the north. Water flows by gravity through a system of flumes, ditches and tunnels to Waimanalo. The ditches are usually dry except when water is required for irrigation.

The streams are narrow drainageways which flow intermittently, carrying runoff northward through the agricultural fields and across Waimanalo Beach to Waimanalo Bay. They are fed principally by runoff although some of their flow may originate from dike leakage or *marginal dike zone overflow.*

3.1.3 Topography

The proposed well site is located at an elevation of about 240' above sea level. It is located near the base of the nearly vertical northeast face of the Ko'olau range on land which slopes steeply toward the north.

3.1.4 Climate

Average monthly temperature in the vicinity of the proposed well site is approximately 75°. It ranges from 72° in January to 78.5° in August (State of Hawaii Data Book, 1987). Exposed to the prevailing northeast tradewinds off the ocean, the windward coast of Oahu experiences very little variation in temperature between day and night. Rainfall in the area originates when tradewinds are intercepted and forced upward by the peaks of the Ko'olau range, dropping their moisture as they rise and cool. The proposed well site is in an area which receives a mean annual rainfall of about 75" (Atlas of Hawaii, 1973).

3.1.5 Soil

Soils in the vicinity of the proposed well site are classified by the U.S. Department of Agriculture Soil Conservation Service (SCS) as belonging to the Rock land-Stony steep land association (SCS 1972). These are steep to precipitous, well-drained to excessively drained, rocky and stony soils. More specifically, the soils at the proposed site are classified as Kaena very stony clay.

The Kaena soils consist of very deep, poorly drained soils on alluvial fans and talus slopes. These soils developed in alluvium and colluvium from basic igneous material. The SCS

describes a representative profile as follows:

> "The surface layer is very dark gray clay about 10 inches thick. The next layer, 36 to more than 48 inches thick, is dark gray and dark grayish-brown clay that has prismatic structure. It is underlain by highly weathered gravel. The soil is very sticky and very plastic and it is mottled. It is slightly acid to neutral. ...there are many stones on the surface and throughout the profile. Runoff is medium to rapid, and the erosion hazard is moderate to severe."

Given the site slope and character of the vegetative cover at the well site, the erosion potential at the site is moderate. The soil capability classification is VIs. Class VI soils have severe limitations that make the generally unsuited to cultivation. Subclass VIs soils have very severe limitations because of stoniness or texture.

The proposed well site is on land which is not in agricultural use and is not suited to agricultural use. The U.S. Department of Agriculture Soil Conservation Service and the Hawaii Department of Agriculture do not classify Kaena soils as agricultural land (Dept. of Agriculture, 1977) of importance. The areas directly downgradient, through which access to the site would be obtained, are not classified as "prime" agricultural land by the Soil Conservation Service, but are classified as agricultural lands of importance to the state of Hawaii by the State Department of Agriculture.

3.1.6 Natural Hazards

According to the National Flood Insurance Program Flood Insurance Rate Map, the proposed well site is in zone D, an area in which flood hazards are undetermined (FEMA, 1987). This generally indicates that the risk of flooding within the area is not significant enough to warrant detailed study by FEMA. Given the site elevation and relationship to the stream, the risk of flooding of the site is negligible.

Earthquake risk in the vicinity is also minimal. The island of Oahu is classified as a Seismic Zone 1 area, in which damage would be minor in the event of an earthquake (Uniform Building Code, 1988).

3.1.7 Flora and Fauna

A biological assessment of the project area was performed in October of 1992 by the B.P. Bishop Museum biological staff. Their report on the site is appended to this Environmental Assessment. The dominant vegetation on the site is the forest cover, with an understory and groundcover consisting of those species listed in Table 1. Table 1 provides the scientific names of the plants found on the site, following the taxonomy and nomenclature of St. John (1973) and Wagner, Herbst and Sohmer (1990). The scientific name is followed by the Hawaiian name and/or the most widely used common name for the subject species. An asterisk before the plant name indicates that the plant was introduced to the Hawaiian Islands either by the aborigines or since Cook's arrival in the islands. As can be seen from Table 1, the vegetation on the site is composed predominantly of alien species.

None of the species found on this site are listed or proposed for listing on the federal list of threatened or endangered species (USFWS, 1990) and none are considered threatened, endangered or rare species at the state level (State of Hawaii, 1990).

TABLE 1
SPECIES IDENTIFIED ON THE WAIMANALO III SITE

Eucalyptus
Levcaena Levcephala
Rivina humilis
Koa Haole

3.1.8 Archaeological Resources

An archaeological inspection of the proposed well site was conducted in October of 1992 by archaeological staff of the B.P. Bishop Museum. Although that pedestrian survey could not have detected subsurface remains, it was felt that an inventory level survey was not warranted, since grading would be limited to previously disturbed areas immediately adjacent to and at the project site. The archaeologists report is appended to this

Environmental Assessment. Findings of the archaeologist generally indicate the possibility of archaeological remains being present. We therefore plan to have an archaeologist present to monitor all site work.

3.2 Socio-economic Environment

Located high above Waimanalo, with extensive agricultural fields between it and the nearest residences, the proposed well site is not in the immediate vicinity of any particular residential, commercial or industrial development. Its impact is expected to be regional in nature. The population on the island of Oahu has been steadily increasing. The Windward district is one of the locations within which marginal growth has been forecasted to occur. City, County and State population projections indicate that the Windward district population will reach 126,013 by the year 2000, with a predicted daily water usage of 20.20 million gallons. The proposed Waimanalo III test well is one of several sources of water proposed for development to meet the needs of expanding population within the Windward Water District.

CHAPTER 4
POTENTIAL IMPACTS AND MITIGATION MEASURES

4.1 TEMPORARY IMPACTS

The development of a test well at the Waimanalo III site will result in short-term impacts on the environment in the immediate vicinity of the project area. No significant adverse impacts are expected during the drilling and pump testing. Short-term impacts during construction of the well and testing will include localized soil disturbance causing fugitive dust and temporary increases in noise resulting from the operation of drilling equipment.

Localized soil disturbance will result from extension of the access road and from clearing and grading of the vicinity of the well head to provide a work area for installation of the well and pumping equipment. It is anticipated that the affected area will be relatively small, about 15'x 200' (3,000 sq. ft.) for the road and about 50'x 50' (2500 sq. ft.) for the work area. Because of the potential for soil erosion once the vegetation is removed from the Kaena soils, every effort will be made to minimize the amount of soil disturbance. A silt fence and erosion barriers will be used to minimize erosion during the clearing of the road and work area. A grading permit showing erosion control measures will be filed with the City Dept. of Public Works by the contractor. The site will be revegetated with grass species as soon as possible after completion of the installation and testing work.

Noise will be produced by the drilling equipment and by the operation of the test pump. This minor increase in noise levels will not result in any significant adverse impacts because of the distance between the well location and populated areas. All operations will be restricted to daylight hours.

4.2 IMPACTS ON STREAM FLOW AND STREAM ENVIRONMENT

The well testing will require that water be withdrawn from the aquifer penetrated by the well. This water will be discharged to the ground and will flow to the Maunawili ditch

resulting in a temporary increase in flow to adjacent fields. The increase in flow is expected to be within the range of peak flows normally experienced within the ditch system and will not result in any flooding or adverse impacts in downstream areas. Because of the extreme permeability of downgradient soils, it is expected that much of the water will be absorbed by the ground downgradient, recharging the basal lens of water in the Waimanalo area. Water from test pumping will be dissipated through baffles to minimize erosion and excessive turbidity.

4.3 IMPACTS ON AGRICULTURAL SOILS

As noted in Chapter 3, the proposed well site is located in an area which is not used for agriculture and is not suitable for agricultural use because of the steep grade. Access to the site will be obtained across agricultural lands of importance to the State of Hawaii, but will be confined to access roads which are already in existence across that land. The proposed action will have no impact on the agricultural capability of the Waimanalo area.

4.4 IMPACT ON ARCHAEOLOGICAL RESOURCES

As noted in Chapter 3, archaeological review has indicated the possibility of archaeological remains being present. We therefore plan to have an archaeologist present to monitor all site work.

4.5 IMPACTS ON SOCIO-ECONOMICS

The Board of Water Supply will be working closely with the State Department of Land and Natural Resources to address concerns regarding BWS source developments on State Lands. Water rights and water allocation issues should be addressed but in avenues beyond the scope of this exploratory well environmental assessment.

CHAPTER 5
ALTERNATIVES

5.1 NO ACTION

The no action alternative would not meet the objectives of the Board of Water Supply for this project. This project is part of an overall groundwater development program intended to increase the municipal water supply to meet growing demand. If the Board's new water sources program is curtailed, it would not be able to provide adequately for the water needs of the population of the island in the future, which may result in restrictions in new development as well as regional water shortages.

5.2 ALTERNATIVE SOURCES

The Board of Water Supply has considered a variety of other alternatives to the development of new groundwater sources. Alternatives considered include direct use of stream flow, blending and use of brackish water resources, demineralization of brackish water sources, desalinization of sea water and direct reuse of treated wastewater. None of these alternatives at this time offers the potential to economically or cost-effectively produce water supplies of the quality which can be obtained through the proposed program.

5.3 DELAYED PROJECT

Delay in the proposed well testing program would increase the risk that population growth will lead to increasing water demands in excess of the available supplies. Delay of the project will not materially alter the environmental impacts of the project and has the potential to increase project costs.

5.4 ALTERNATIVE WELL SITES

In addition to evaluating alternative water sources, the Board of Water Supply has plans to test a number of other potential sites for development of groundwater resources. These alternative sites also offer opportunities as groundwater supply sources, but are to be considered in addition to, rather than as alternatives to, the proposed well testing program. The Waimanalo III test location has been selected by the Board of Water Supply because it offers the potential to supply a significant quantity of high quality water which may not be obtainable at alternative sites. Developing and testing a well at the Waimanalo III site is the most reasonable alternative given the relative remoteness of the site and the insignificant impacts associated with its development.

CHAPTER 6
DETERMINATION

In accordance with Chapter 343, Hawaii Revised Statutes, it has been determined that an Environmental Impact Statement is not required for the proposed Waimanalo III exploratory well and test pumping. This determination has been made based primarily on the short duration of the project and its minimal impacts on the environment. The project will result in some negative impacts, but these can be minimized or alleviated by the suggested mitigation measures. The identified impacts have been determined to be less significant in comparison to the potential benefits to be provided by the water supplies which may be obtainable from the Waimanalo III well.

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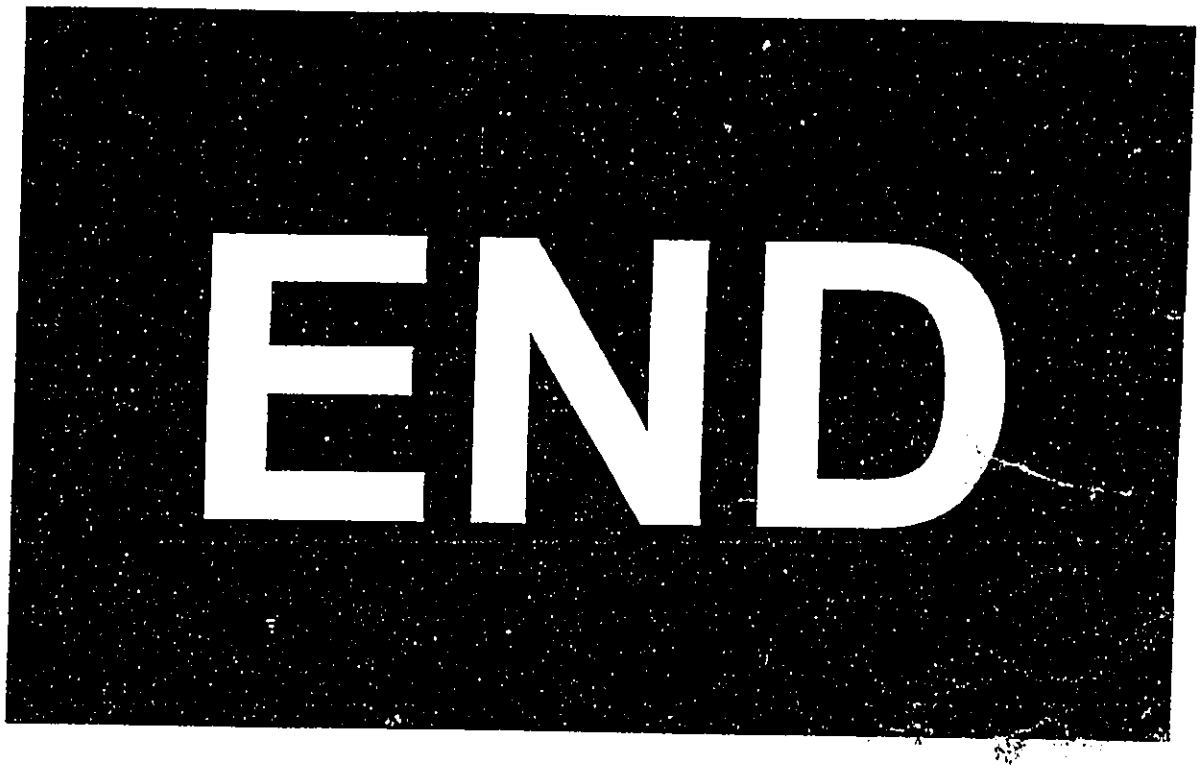

CERTIFICATION

I HEREBY CERTIFY THAT THE MICROPHOTOGRAPH APPEARING IN THIS REEL OF FILM ARE TRUE COPIES OF THE ORIGINAL DOCUMENTS.

2004
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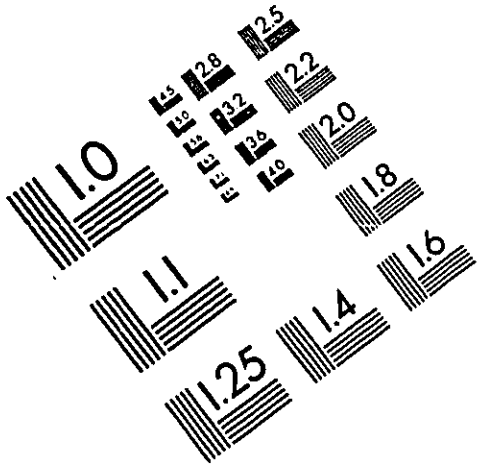
Julie Kaai
SIGNATURE OF OPERATOR



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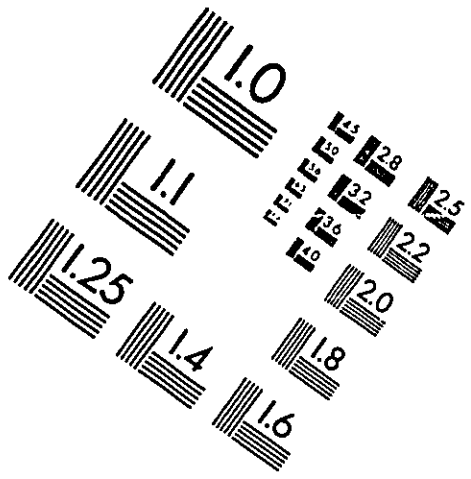

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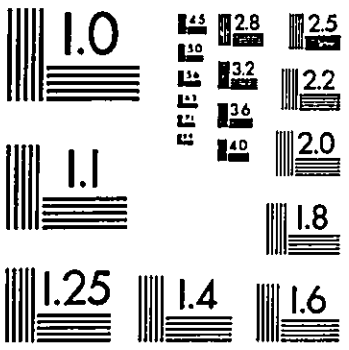

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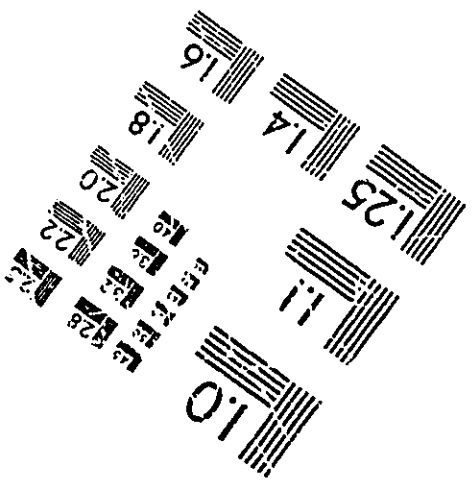

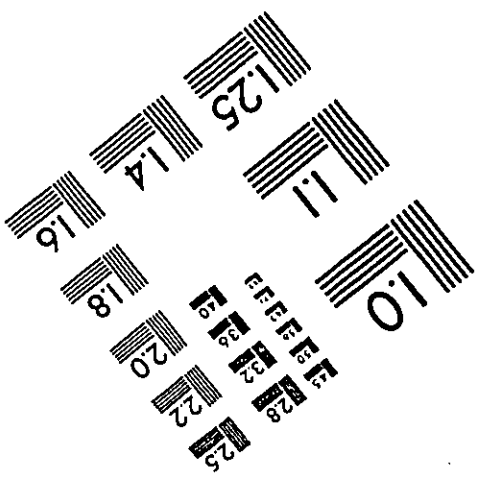

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DENSITY TARGET

DENSITY TARGET