BOARD OF WATER SUPPLY

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

December 14, 2001

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

Dear Ms. Salmonson:

Subject: Finding of No Significant Impact for Malaekahana Production Wells Development, TMK: 5-6-07: 01 (Portion), Ko'olauloa, Oahu, Hawaii

The City and County of Honolulu, Board of Water Supply has reviewed the comments received during the 30-day public comment period which began on September 8, 2001. As discussed in the Final Environmental Assessment (EA), we have determined that this project will not have significant environmental effects and have issued a Finding of No Significant Impact. Please publish this notice in the next Office of Environmental Quality Control (OEQC) Environmental Notice.

We have enclosed a completed OEQC Publication Form and four (4) copies of the Final EA.

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

Enclosures

2002-01-08-OA-FEA-

Final Environmental Assessment

MĀLAEKAHANA PRODUCTION WELLS

PREPARED FOR:
City & County of Honolulu
Board of Water Supply

PREPARED BY:
PLANNING SOLUTIONS

DECEMBER 2001

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CHAPTER 1 - PURPOSE AND NEED

1.1 BACKGROUND

1.1.1 HONOLULU BOARD OF WATER SUPPLY

The Honolulu Board of Water Supply (BWS) is a semi-autonomous agency established by the City Charter. It is responsible for the development, operation, and maintenance of O'ahu's municipal water system.

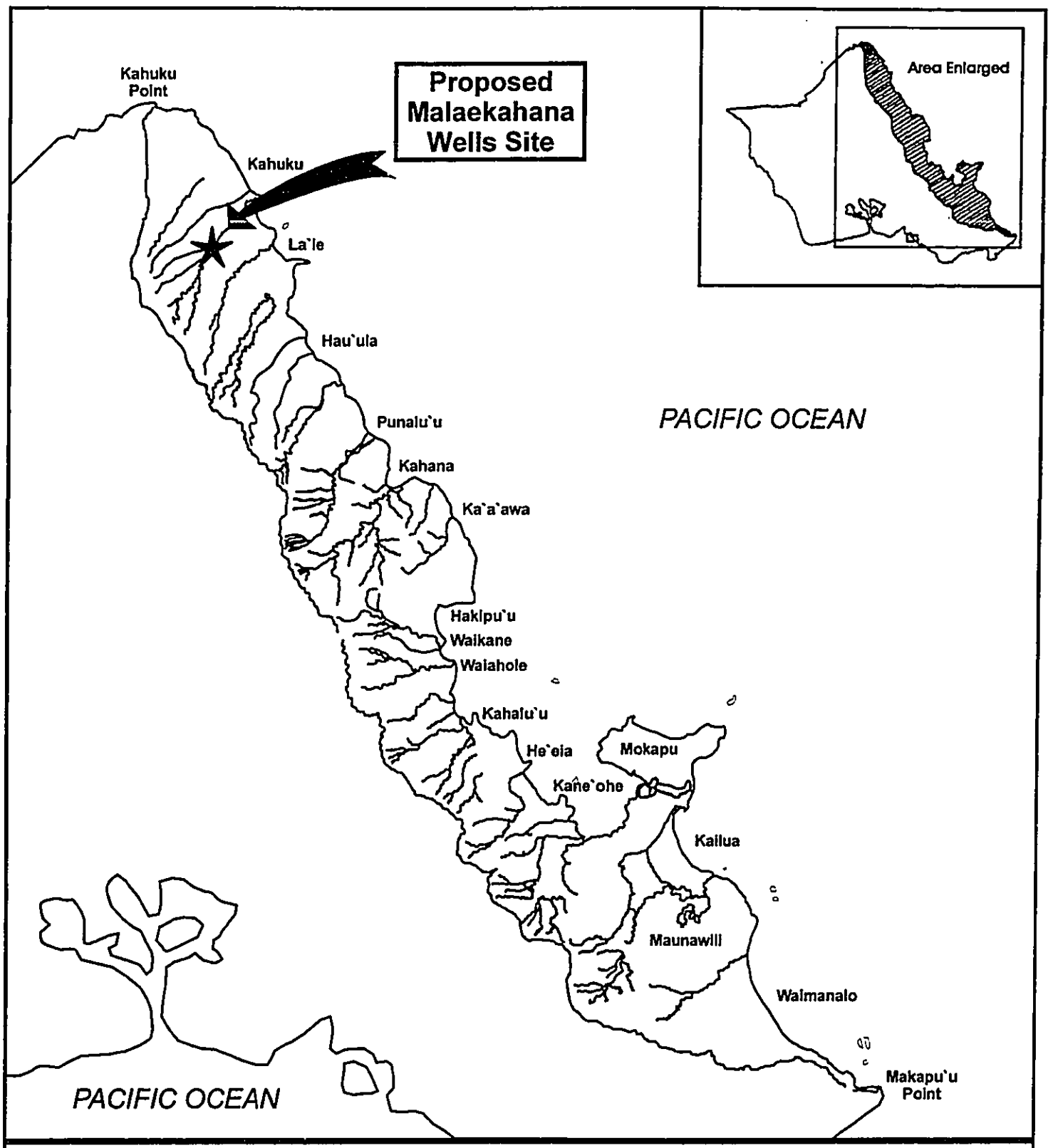
1.1.2 LONG-RANGE PLANS FOR THE WINDWARD O'AHU REGIONAL WATER SYSTEM

In carrying out this responsibility, the BWS and its staff conduct long-range planning, as well as regular day-to-day operations. In 1988, the BWS prepared a long-range plan and environmental impact statement (*Final Environmental Impact Statement for Windward O'ahu Regional Water System Improvements*) to guide its development of water system improvements in Windward O'ahu from Makapu'u Point to Mālaekahana (see Figure 1-1). That report, based on the water resource information available in the mid-1980s, outlined the improvements that the BWS might undertake over a period of several decades.

While some of the improvements that the BWS evaluated in the 1988 *FEIS* were budgeted, others were only in the planning stage and many were simply conceptual. That *FEIS* was formulated prior to the State Water Code of 1987, to the designation of the Windward District as a Water Management Area in 1992, and to the Supreme Court decision on the Waiāhole Ditch contested case in 2000. Subsequent to adoption of the State Water Code, the State has moved to protect and manage our water resources by the regulation and adoption of groundwater sustainable yields and in-stream flow standards for streams.

In-stream flow standards have recently been set for four Windward O'ahu streams (Waiāhole Stream, Waianu Stream, Waikāne Stream, and Kahana Stream), but they have not been established for streams in the Mālaekahana area. Given the inter-relationships between groundwater and surface water (especially in the dike systems of Ko'olaupoko), the BWS windward water plans are being re-evaluated. Until the State Commission on Water Resource Management (CWRM) completes the water supply plan, called the *Water Resources Protection Plan*, by setting in-stream flow standards for all streams, the BWS' long-range planning for Windward O'ahu will be guided by an emphasis on system reliability and watershed management programs and will seek partnerships with community, landowner, and government agency groups.

The BWS' reliability-related projects on Windward O'ahu include reservoirs in Kailua and Kāne'ohe and parallel water mains in Punalu'u, Kahekili Highway, and in Waimanālo. In Kahuku, which is a stand-alone system, reliability-related measures will consist of establishing an additional source, the Mālaekahana Wells. Extractions from these wells will not affect streams because the source is a basal aquifer rather than dike water.



Prepared For:
City and County of Honolulu
Board of Water Supply

Prepared By:
PLANNING SOLUTIONS

Source:
Figure 1 of the *Final EIS for Windward Oahu Regional Water Improvements*, August 8, 1988

Approximate Scale 1:200,000

N

Figure 1-1:

Board of Water Supply Windward Oahu Service Area

Malaekahana Production Wells

1.1.3 O'AHU WATER MANAGEMENT PLAN

The *O'ahu Water Management Plan (OWMP)* was enacted in 1990 to guide the City & County of Honolulu and the CWRM in planning, managing, and developing O'ahu's water resources. In January 1998, the City & County of Honolulu released an initial revision to the *OWMP* (Wilson Okamoto & Associates, Inc: January 1998). It contains adjusted sustainable yield estimates and a reexamination of Windward O'ahu's hydrology. In addition, it includes updated information regarding water use, future water needs, and water facility development plans and strategies.

The *OWMP* identifies the new water sources needed to provide sufficient potable water supplies for O'ahu's projected demand in the year 2020. The draft revision to the *OWMP* identifies eight potential well sites for the Ko'olau District. One of these is the Mālaekahana Wells.

1.2 NEED FOR THE PROPOSED MĀLAEKAHANA PRODUCTION WELLS

1.2.1 EXISTING SOURCES AND WATER USE

The BWS currently serves its customers in the Kahuku Service Area with a stand-alone system consisting of the Kahuku Wells Numbers 1 and 2 and an adjacent half-million gallon capacity reservoir located at an elevation of 228 feet (Figure 1-2).[1] It has two interrelated concerns regarding the potable water supply system in this area. The first is decreased reliability. The second is its inadequate supply capacity.

Reliability. Because the Kahuku Service Area is not connected to other parts of the BWS system, the BWS is unable to provide the high level of reliability it provides to customers in most areas. Because the existing Kahuku Wells are at the Kahuku 228' Reservoir site, a break along the 12" main connecting the Kahuku residents lots will cut-off water service to all of Kahuku Town until the break is repaired.

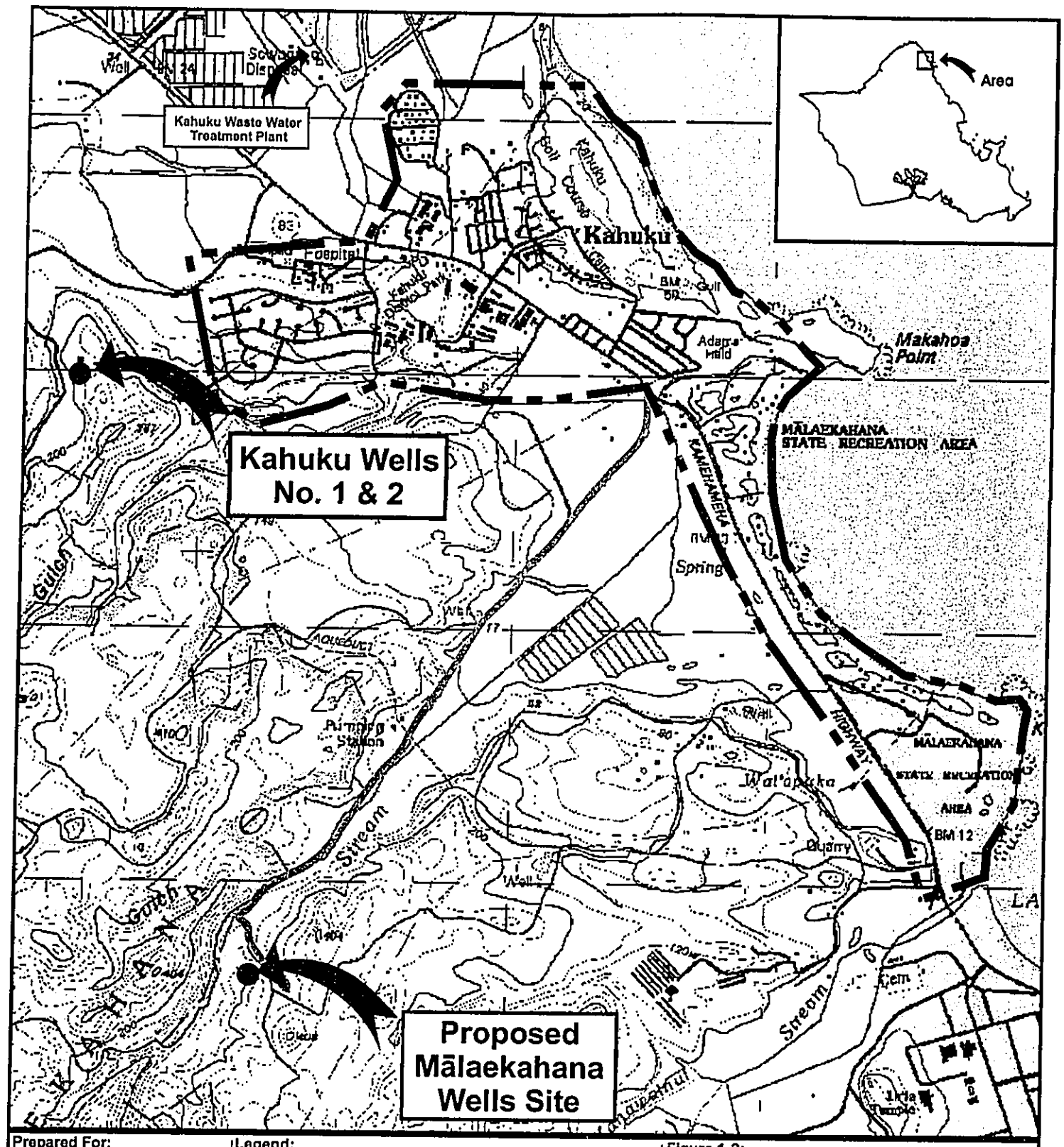
Supply Capacity. Based on BWS standards, the existing system has a capacity of 0.44 million gallons per day (MGD).[2] In 1999, average daily water withdrawals from Kahuku Wells 1 and 2 averaged 0.43 MGD, essentially the same as the system's rated capacity. During the 5-year period ending in 1998, the average water use was more than 0.52 MGD, an amount slightly above the rated capacity. Thus, the system is currently being used at or slightly above its design capacity. This situation has led to a moratorium on new development in Kahuku for several years.

Storage Capacity. BWS standards call for storage capacity equal to 1.5 times the average day demand. Using the 0.43 MGD average day use recorded in 1999 as the base, 0.645 million gallons (MG) would be needed to meet this BWS standard. More storage (1.167 MG)[3] would be required to meet the BWS standard with the anticipated growth. Both

[1] The BWS does not operate the two wells simultaneously. Instead, one is used as a backup.

[2] The BWS calculates the capacity as: (Pump capacity) / [(maximum day factor) * (pumping hours per day/total hours per day)]. Substituting the values for Mālaekahana: (1.0 MGD) / [(1.5) * (24 hours/16 hours)] = 0.44 MGD

[3] The 1.167 MG indicated is the product of the maximum day factor (1.5) times the sum of the existing use (0.43 MGD) plus the forecast additional use (0.328 MGD).


Area
Kahuku Waste Water Treatment Plant
Kahuku Wells No. 1 & 2
Proposed Mālaekahana Wells Site
Kahuku
Makahoa Point
MĀLAEKAHANA STATE RECREATION AREA
KAMEHAMEHA HIGHWAY
Pumping Station
Stream
Quarry
BM 12
Prepared For:
City & County of Honolulu
Board of Water Supply
Prepared By:
PLANNING SOLUTIONS
Source:
USGS (1999)
Legend:
Approximate BWS Service Area Boundary
Access Road
0
2000
4000 Feet
Contour Interval 40 Feet
N
Figure 1-2:
Approximate Geographic Limits of the Kahuku Service Area
Mālaekahana Production Wells

amounts exceed the existing reservoir capacity of 0.5 MG. The deficit in reservoir capacity makes it important to provide pumping capacity that conforms to the BWS standards.

1.2.2 FORECAST CHANGES IN WATER USE

Kahuku is designated as a low-growth area in the Koʻolauloa Sustainable Community Plan (SCP), which was adopted by the City & County of Honolulu on February 14, 2000 as Ordinance 99-72. The SCP calls for low-impact industrial (crafts, light assembly, etc.) and residential uses for the area in a compatible mix reminiscent of Kahuku's plantation heritage. In addition, the State of Hawaiʻi plans to expand the Kahuku High and Intermediate Schools and to improve the Mālaekahana Beach Park. While they represent relatively limited growth, these new uses will increase water use as estimated in Table 1-1.

1.2.3 POTENTIAL FOR ADDITIONAL WATER CONSERVATION

1.2.3.1 General Measures in Place

The Board of Water Supply actively promotes water conservation. It has undertaken several programs to help educate and assist Oʻahu residents and businesses on ways to reduce their water consumption. These methods include the use of xeriscaping, installation of low-flow plumbing fixtures, creation of dual water systems, and establishment of water use restrictions. In addition, the BWS has improved its ability to detect leaks throughout its transmission and distribution system with advanced technologies.

Table 1-1 Forecast New Water Supply Requirements

Planned Development	Estimated Requirement (MGD)
School and Park Improvements	0.148
Beach Lot Conversion from Kahuku Plantation Water System	0.045
Kahuku Villages Phase IV, 269 lots[4]	0.135
Total Projected Demand	0.328
Source: BWS January 13, 2000 Letter to City Council Committee on Planning & Public Safety,	

The BWS is also working to encourage those of its customers who use water for irrigation to shift to non-potable sources wherever practical. Since virtually none of its customers in the Kahuku area use the water they obtain from the BWS for irrigation, it is not possible to decrease demand from its existing Kahuku system through such source shifting.

As noted earlier, the per capita water consumption rates used to project 2020 water demand in the *Oʻahu Water Management Plan* are the same as the current rates.[5] These rates already

[4] It has been suggested that, since the Kahuku Village Phase IV housing development falls within a flood plain, this water commitment is not necessary and could be reallocated to other projects. However, BWS has contacted the Kahuku Village Association regarding this possibility, and the Association is not inclined to relinquish their existing water commitment. By letter of April 18, 2000 to the Mayor, the Association has requested City involvement to build affordable housing units. This indicates a need for housing in the Kahuku area, whether by City involvement or by private means.

account for the effects of the BWS' conservation efforts. Therefore, the need to develop new potable water sources cannot be eliminated by conservation efforts.

1.2.3.2 Recycled Water from the Kahuku Wastewater Treatment Plant

The Department of Environmental Services is examining the potential for recycling effluent from its Kahuku Wastewater Treatment Plant. However, this water does not represent a substitute for the water that the BWS could obtain from the proposed Mālaekahana Wells. There are two principal reasons for this.

- The recycled wastewater is suitable only for irrigation, not for domestic supply. Since irrigation use of water from the BWS Kahuku system averaged only 3,000 gallons per day in 1999 (i.e., about 7 percent of the total), use of treated effluent does not represent a practical means of significantly reducing the need for the additional source capacity that the proposed Mālaekahana Production Wells would provide.
- At present, the effluent volume averages approximately 120,000 gallons per day, and the Department estimates that this amount could be fully used at the adjacent Kahuku golf course and to supplement the Ki'i National Wildlife Refuge during dry periods. These beneficial uses of recycled water adjacent to the wastewater treatment plant are more cost effective than making recycled water available to present users of the BWS system in Kahuku.

1.2.4 INTEGRATED RESOURCE PLANNING

Since the 1960's, the BWS has historically produced a planning document for O'ahu. Titled the *Oahu Water Plan*, it was officially adopted by the Board of Water Supply. In 1987, the Governor signed the State Water Code into law. The Water Code required the preparation of the *Hawaii Water Plan*. The *Hawaii Water Plan* consists of four statewide plans (a Water Resources Protection Plan, a Water Quality Plan, a State Water Projects Plan, and an Agricultural Water Use and Development Plan) and a plan for each County (that for the City & County of Honolulu being the *O'ahu County Water Use and Development Plan*).

In response to the State Water Code statute, the Honolulu City Council in 1990 adopted Ordinance 90-62, "Water Management." The ordinance created the title *Oahu Water Management Plan* (*OWMP*) and made the County Planning Department (now the Department of Planning & Permitting) responsible for its preparation. The *OWMP* is more than just a plan for the municipal water system; it is a comprehensive plan for the management of all of O'ahu's water resources. The *OWMP* incorporates the findings of the other component plans of the *Hawaii Water Plan* as well as State and County land use plans.

The BWS is presently updating the *O'ahu Water Management Plan* using the IRP process The *O'ahu Integrated Resource Plan* (*IRP*) is a joint project of the Board of Water Supply, the Department of Planning and Permitting and the Department of Environmental Services of the City and County of Honolulu. *IRP* was conceived to address the water needs, both present and future, of the eight District Planning (DP) areas on Oahu. Its stated objectives are:

[5] Per capita water consumption varies by Development Plan district. Respective consumption rates are used to project water consumption for each DP district.

- To develop integrated water resource use and development strategies for varying future scenarios.
- To utilize least-cost planning with equal treatment of demand- and supply-side strategies
- To provide for facilitated interagency and public information and participation process
- Provide greater coordination and consistency between county, state, private and military water use planning.

BWS is providing the funding for the IRP. The State Commission on Water Resource Management (CWRM) is periodically briefed on the *IRP* progress, must approve the *IRP* scope of work and must ultimately adopt the *OWMP*.

The decision-making process for acceptance of the OWMP is as follows:

- The *IRP* consultants will compile the *OWMP* with extensive input from the public participation process.
- The *OWMP* will then be reviewed and adopted by the Board of Water Supply.
- Following its adoption by the BWS, the *OWMP will be* submitted to the City Department of Planning & Permitting who would administer the *OWMP's* review by the City Council and its adoption by City Ordinance. After the Mayor signs the ordinance into law, the City will submit the *OWMP* to the CWRM for approval.

The IRP process is incomplete and must include further public participation and planning development. However, it is clear that, for the Mālaekahana area, the domestic municipal water supply system is already operating at maximum capacity and cannot be augmented sufficiently by substitution of non-potable sources. The BWS believes that the proposed Mālaekahana Production Wells are needed if it is to meet the water needs of its customers in the Kahuku Service Area.

1.2.5 SUMMARY OF NEED FOR THE PROPOSED ACTION

In summary, the BWS believes that the proposed Mālaekahana Well project is needed for the following reasons:

- The current municipal water system is a stand-alone system, isolated from all other potable water supplies. The Mālaekahana Production Wells are needed to provide a second source for the residents of Kahuku, who deserve the same level of redundant, reliable water service available to the other communities of O'ahu.
- The Kahuku system is operating at design capacity and cannot provide for planned developments in the Water Service Area, including commitments for local and State projects.
- Water conservation measures, including low-flow water fixtures and other domestic conservation measures, advanced leak-detection systems, and use of non-potable water, cannot fulfill these commitments.
- As discussed below, there is available sustainable yield to accommodate the Mālaekahana Production Wells proposed here. Test pumping of exploration wells at the site have identified no impacts to the stream flow of the Mālaekahana Stream.

1.3 OVERVIEW OF THE PROPOSED ACTION

1.3.1 MĀLAEKAHANA EXPLORATORY WELLS

The BWS drilled the first Mālaekahana Exploratory Well in 1997.[6] Figure 1-3 shows the location of the well. It also shows the neighboring parcel TMK designations. Results of the pump tests that were run during December 1997 indicated that the well could provide a sustained yield of 700 gallons per minute (GPM), or approximately 1 MGD. The second exploratory well, which was funded by the State Department of Land and Natural Resources, was completed and tested in the summer of 1999. Based on information from the first exploratory well, the BWS is preparing this *Environmental Assessment* for the pump installation, pipeline construction, roadway improvements, and ancillary facilities needed to convert the exploratory wells into a production facility.

1.3.2 LOCATION AND EXISTING USE OF THE PROPOSED SITE

As shown in Figure 1-3 and Figure 1-4, the Mālaekahana Well site is located on a portion of TMK 5-6-07:01, which is owned by Campbell Estate. The site is southwest of Kahuku Town and approximately 1.75 miles inland from Mālaekahana Bay. The access easement to the site, which is also shown on Figure 1-3, crosses parcels 5-6-08:2, 5-6-06:6, 5-6-06:18, and 5-6-6:19. The width of the easement ranges from 20 to 45 feet. The dirt roadway within the easement is approximately ten feet wide near the well site, but it widens to as many as 20 feet as it crosses through the agricultural land closer to Kamehameha Highway.

The Mālaekahana Well site and the immediately surrounding area were grubbed and rough-graded at the time the first exploratory well was drilled and tested. The second exploratory well was drilled within this cleared area and pumping tests were completed in July 1999. Otherwise, the site is not being used.

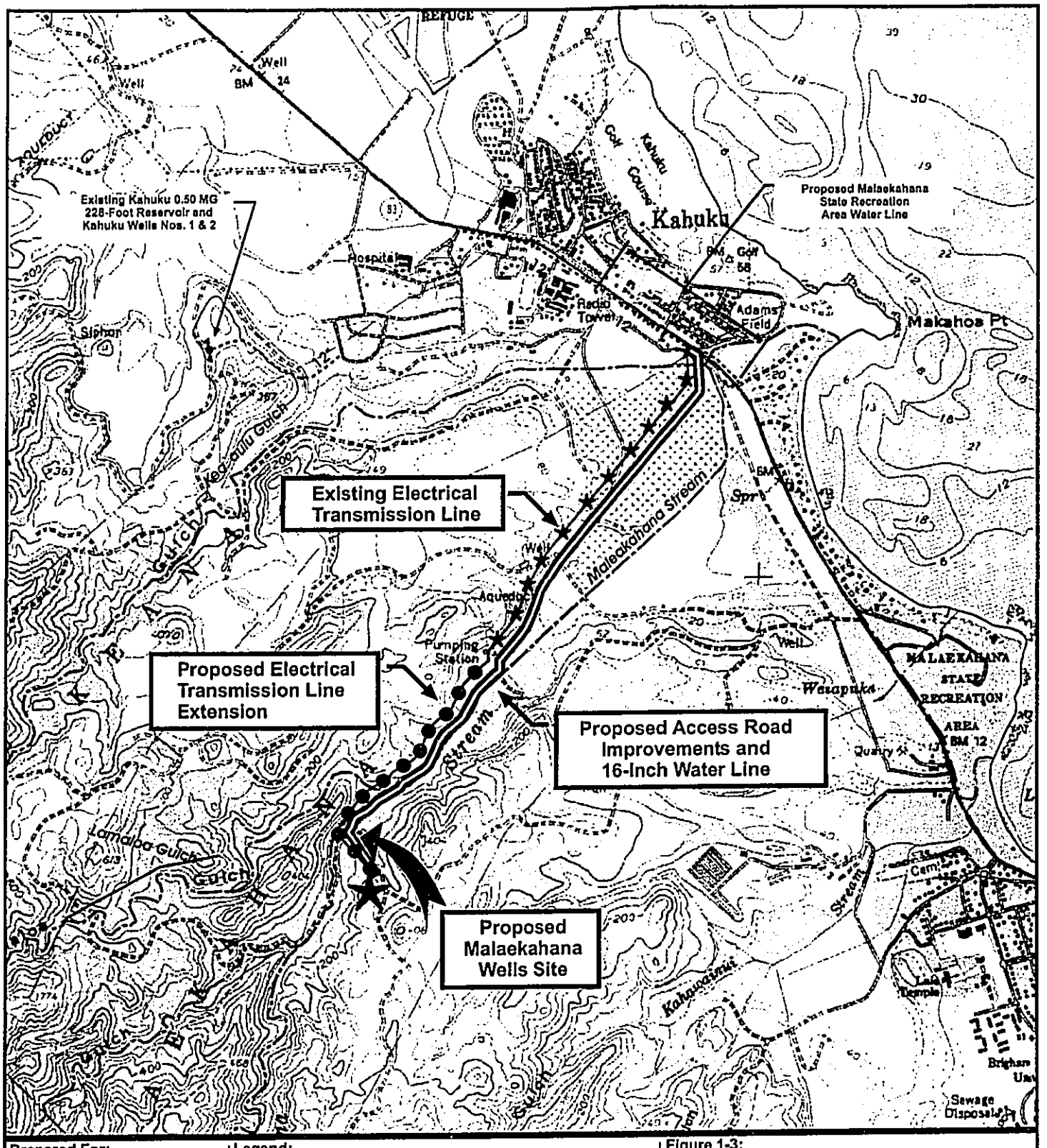
1.3.3 SUMMARY OF THE PROPOSED ACTION

The BWS proposes to convert the two existing exploratory wells at Mālaekahana into production wells. One well would be available at all times, with the other well being used as a standby well. In addition to the two wells, the BWS would construct access road improvements, pipeline connections, and a control building, as well as other ancillary facilities needed to convert the exploratory wells into production wells.

The addition of the two wells would increase the average-day supply capability of the total Kahuku system to 0.88 MGD. However, the BWS would only apply for State permitted use that is justified by Kahuku and Mālaekahana area demands. The BWS and the State would develop the project as a joint action. The approximate cost for the project is estimated at $2.9 million.

The objective of converting the two Mālaekahana Exploratory Wells into production wells is to allow the BWS to meet the forecasted domestic water needs in the Kahuku/Mālaekahana service area.

[6] This work followed preparation of an Environmental Assessment and the issuance of a Finding of No Significant Impact.



Prepared For:
City and County of Honolulu
Board of Water Supply

Prepared By:
PLANNING SOLUTIONS

Source:
TNWRE Inc., July 7, 1999
USGS 7.5" Kahuku Quad, 1983

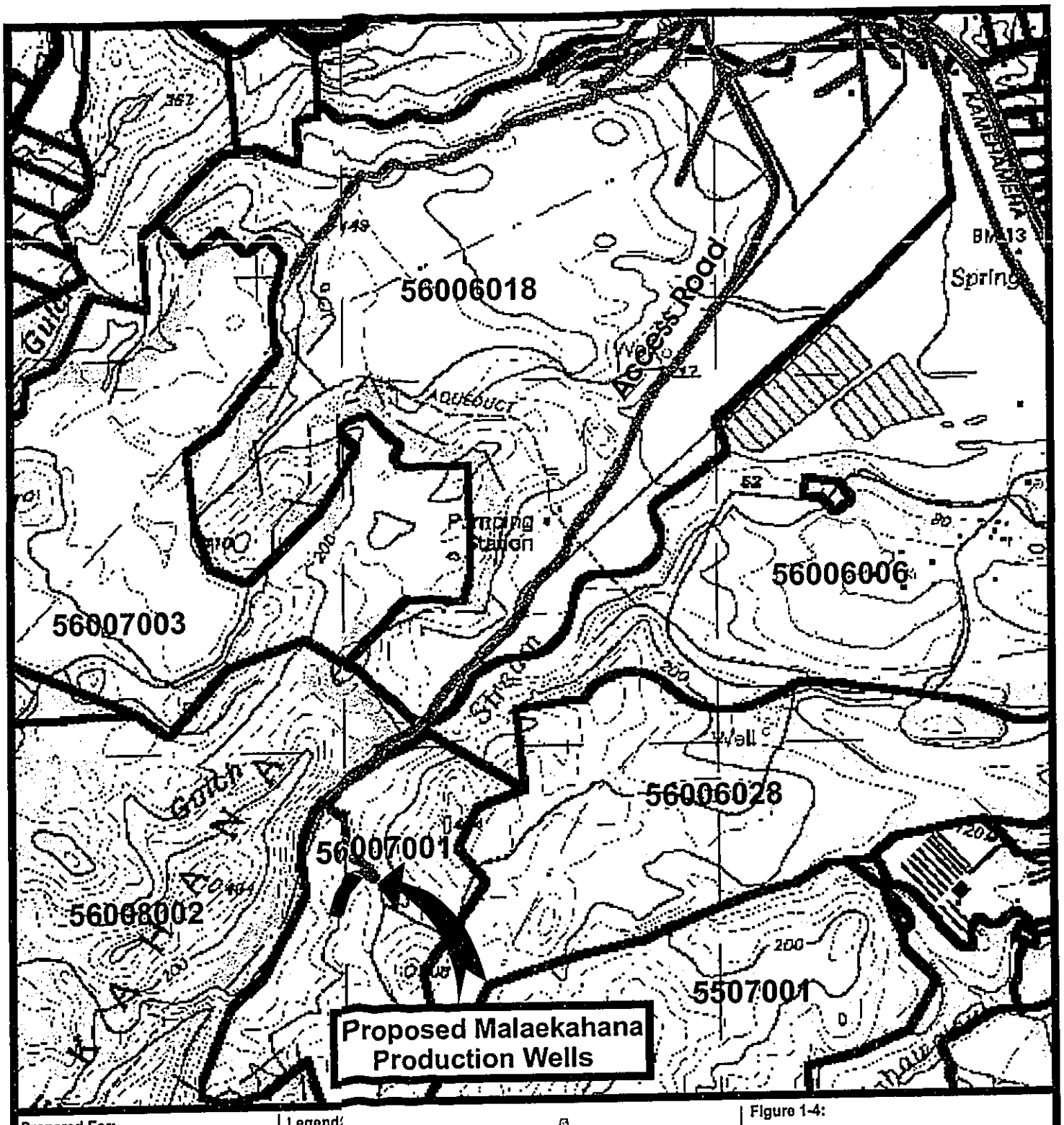
Legend:
- Access Road
- Existing Electrical Transmission Line
- Proposed Electrical Transmission Line Extension
- Stream/Gulch
- Water Line

0 2000 4000 Feet
Contour Interval 40 Feet
N

Figure 1-3:

Location of Proposed Facilities

Mālaekahana Production Wells



Prepared For:
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Board of Water Supply

Prepared By:
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Source:
USGS (1999)

Legend:
Proposed Well Site
Roadways
Tax Key Boundaries

0 250 500 750 1000
Yards

Figure 1-4:

Tax Map Key of Surrounding Areas

Malaekahana Production Wells

CHAPTER 2 - PROJECT DESCRIPTION

2.1 OVERVIEW OF THE PROPOSED FACILITIES AND ACTIVITIES

The BWS proposes to install a 1.0 MGD (75 horsepower) pump in each of the two Mālaekahana exploratory wells. It would also construct a control building, driveway, and ancillary facilities on the well site. In conjunction with the improvements to the well site, the BWS would upgrade portions of the existing access road and install a 16" transmission main connecting the wells to a 12" water main along Kamehameha Highway. The 12" main is presently being designed and constructed by the State. Finally, the BWS would extend electrical power service approximately 0.8 mile from its current terminus at a pumping station near Well No. 3957-01 to the well site. The locations of these proposed improvements are shown in Figure 1-3. They are described in detail below.

2.2 DESIGN AND CONSTRUCTION OF THE PROPOSED ACTION

2.2.1 SITE CHARACTERISTICS

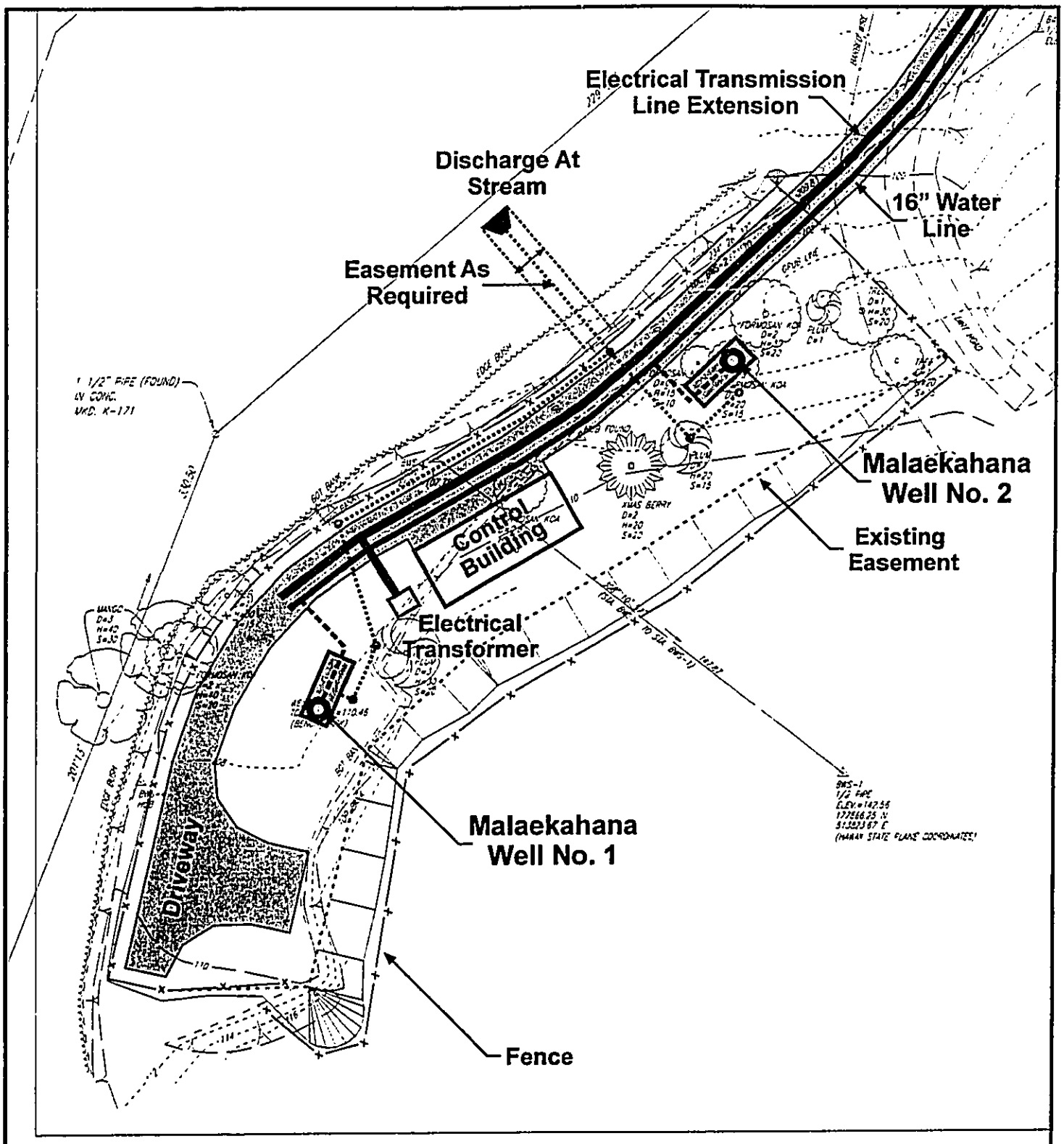
The site occupies approximately 0.35 acres of parcel TMK 5-6-7:01 owned by the James Campbell Estate. An area between 40 and 60 feet wide and 300 feet long previously has been cleared and graded for the exploratory wells. As a result, only a small amount of additional grading would be required for the well pumps, permanent structures, and other improvements. The site varies in elevation between 100 and 110 feet above sea level.

2.2.2 PRODUCTION WELL FACILITIES

Two exploratory wells have been constructed on the site. Both are approximately 300 feet deep.

- Well No. 1 (State Well No. 3957-08) was drilled, cased, and pump-tested in 1997. The existing ground elevation at the wellhead is approximately 108 feet above sea level. The well is comprised of 12-inch solid casing to a depth of 208 feet and 92 feet of 10-inch open hole below the bottom of the casing. On December 2, 1997, the static water level was measured at 15.04 feet above mean sea level (msl).
- Well No. 2 (State Well No. 3957-09) was drilled and cased in 1999. The existing ground elevation and other well characteristics are essentially the same as those of Well No. 1. The static water level measured on June 28, 1999 was 14.93 feet above msl.

Figure 2-1 shows the conceptual site layout of the proposed production facility. In order to convert each exploratory well into a production well, the BWS is proposing to install a water-lubricated vertical turbine pump with a 75 HP TEFC motor. For the first five to seven minutes of each startup, the pump blow-off units would discharge potable quality water into Mālaekahana Stream through the piping and discharge structure illustrated in Figure 2-1. The Department of Health has confirmed that an NPDES permit would not be required. Other significant design characteristics of the well are also shown in Figure 2-2.



Produced For:
City and County of Honolulu
Board of Water Supply

Produced By:
PLANNING SOLUTIONS

Source:
Control Point Survey, May 4, 1999
TNWRE, Inc., July 7, 1999

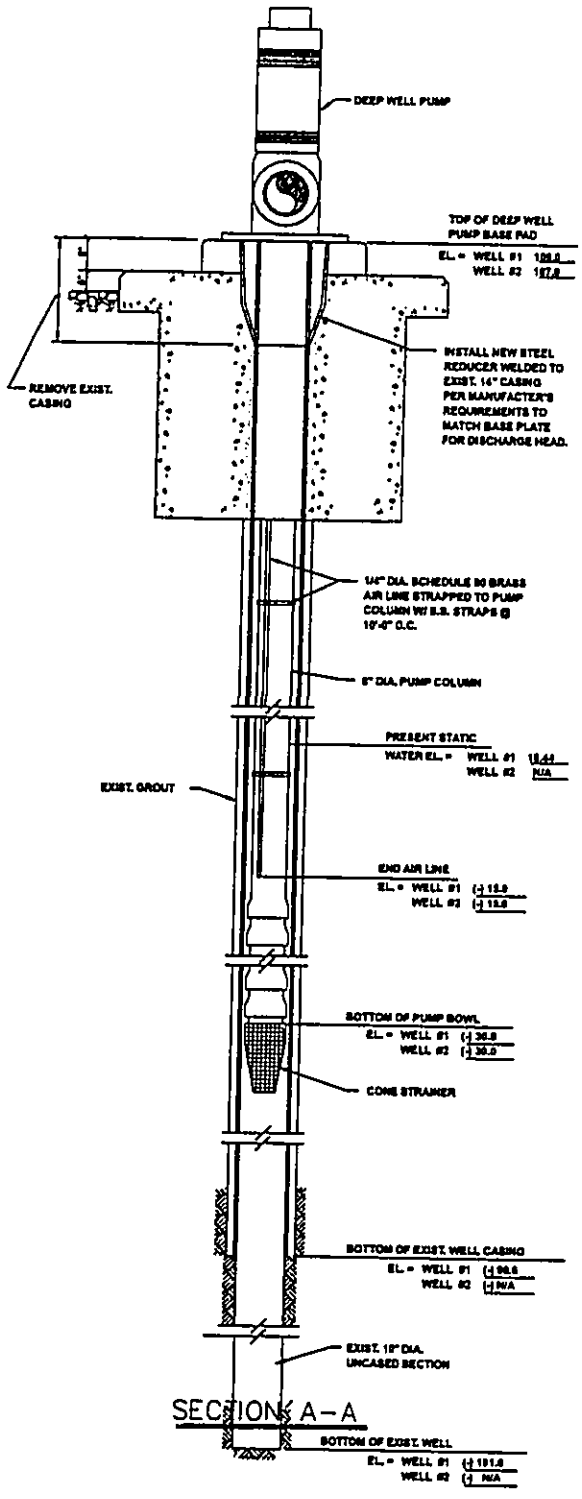
Legend:
- 16" Water Line
- 8" Water Line
- Blowoff Drain Line
- Existing Easement
- Fence
- New Structures
- Electrical Transmission Line Extension
- Well Pump
- Utility Cover
- Discharge Structure
- Pavement

0 40 80 Feet N

Figure 2-1:

Proposed Wells Site Improvements

Mālaekahana Production Wells



Produced For:
City and County of Honolulu
Board of Water Supply

Produced By:
PLANNING SOLUTIONS

Source:
TNWRE Inc., July 7, 1999

0 4 8 Feet

Figure 2-2:

Cross Section of Well

Malaekahana Production Wells

The proposed design includes a single-story control building between the two wells. This building would house the motor control center for the two pumps, telemetry, a SCADA system, the main electrical control panel, well level and flow recorders, and the automatic chlorination system (see Figure 2-3). This concrete-block structure would be approximately 49 feet by 19 feet, for a total enclosed area of approximately 931 square feet. It would be naturally vented.

The control building will house a potable water chlorination system, which will use a 12.5% sodium hypochlorite solution rather than the chlorine gas used in many of the BWS' existing facilities. Sodium hypochlorite is the basic ingredient in household bleach, and its use eliminates potential hazards associated with the use of chlorine gas.[7]

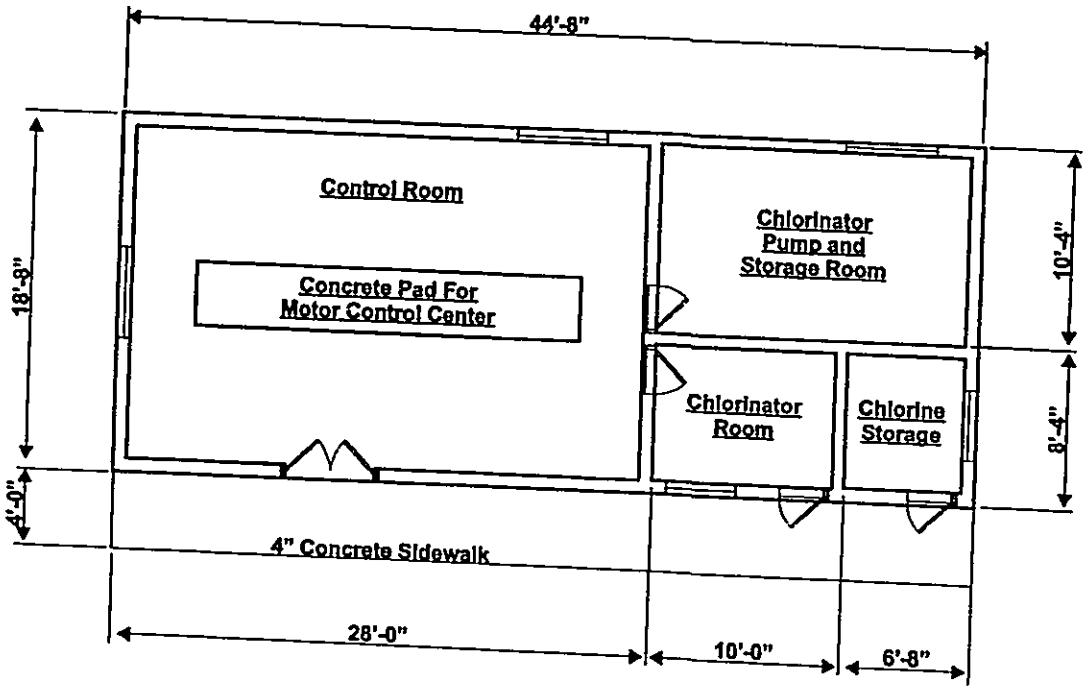
The sodium hypochlorite solution would be delivered to the well site in drums. The proposed system would consist of chlorine solution metering pumps, a pump control panel, pump stand, "no flow" monitoring device, tubing, valves, a chlorine solution injection assembly, and a polyethylene storage tank. The system would deliver a chlorine dose ranging from 0.1 to 1.0 mg/l to the discharge pipe downstream of the pump discharge piping. The chlorination system would operate whenever the wells are operating. The automatic control system for the well would deactivate the well pumps if there is any malfunction of the chlorine metering pumps.

Sodium hypochlorite in aqueous solution is a clear, green-yellow liquid with the odor of household bleach. The solution is not flammable and not explosive. However, fire-fighters are advised to wear self-contained breathing apparatus when fighting fires in the vicinity of the material. If the solution gets in workers eyes it can cause burning and/or irritation; contact with skin can cause burns and irritation. In addition to safety goggles, the control room would contain an eyewash system and shower that personnel could use in the event of inadvertent exposure to the sodium hypochlorite solution. It would also be ventilated to the outside. The U.S. Department of Transportation classifies sodium hypochlorite as a corrosive material, and containers over four gallons must be properly labeled to ensure safe handling. Transportation of hypochlorite solution is regulated by the Department of Transportation (DOT classification Class 8 (9.2) UN: 1791 PG: III).

2.2.3 ACCESS ROADWAY AND CONNECTING WATER MAIN

Access between Kamehameha Highway and the proposed production well facilities would follow Campbell Estate's preferred alignment along the existing roadway between Kamehameha Highway and the well site (see Figure 1-3). The road is within a 20-foot-wide easement, and the width of both the easement and the existing unimproved roadway are sufficient for a BWS access road. Key portions of the existing road would be improved for easier accessibility to the site. These improvements would include pavement on steep grades, specific drainage crossings, and at the well site. The road profile would follow the existing terrain for the entire length and would require only minor grading. Figure 2-4 contains a typical cross-section that illustrates the major design features of the roadway.

[7] It is possible for sodium hypochlorite solutions to generate chlorine gas if they are mixed with acids or acidic chemicals, and some accidents have occurred at facilities where this has been done. However, the absence of such chemicals at the well Malaekahana Well site eliminates this as a risk factor for the proposed project.



Produced For:
City and County of Honolulu
Board of Water Supply

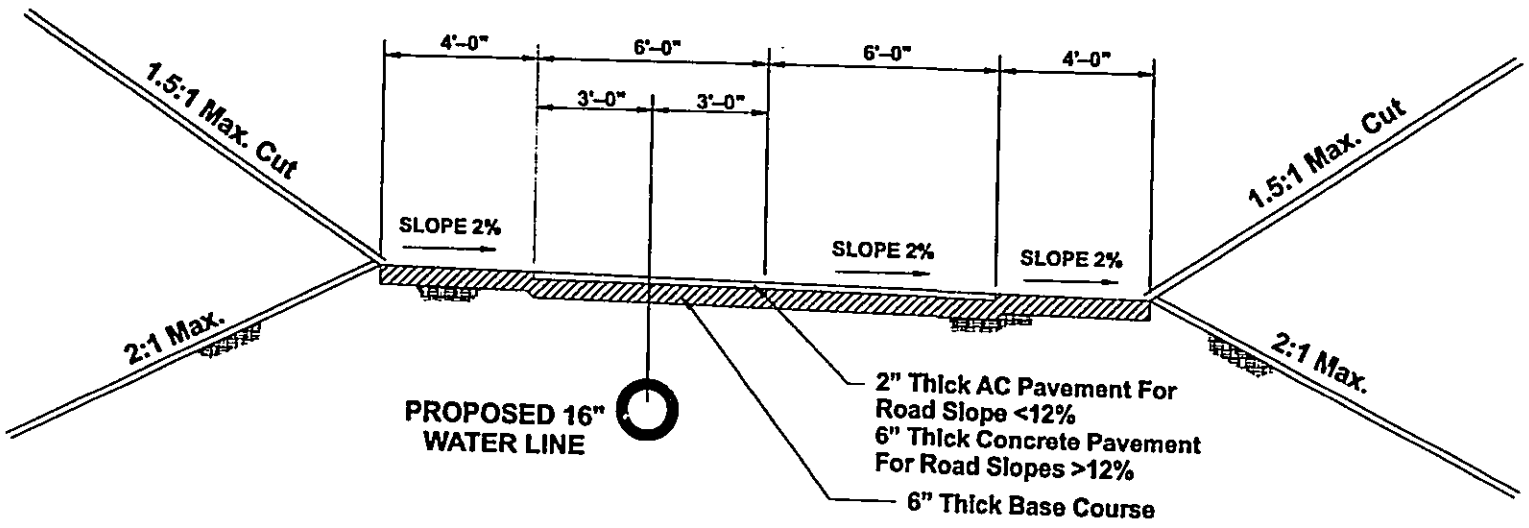
Produced By:
PLANNING SOLUTIONS

Source:
TNWRE Inc., July 7, 1999

Figure 2-3:

Pump Control Building

Mālaekahana Production Wells



Produced For:
City and County of Honolulu
Board of Water Supply

Produced By:
PLANNING SOLUTIONS

Source:
TNWRE, Inc., July 7, 1999

Figure 2-4:

Typical Access Road Cross Section With 16" Water Line

Mālaekahana Production Wells

Approximately 9,000 linear feet of new, 16-inch diameter pipeline would be installed to carry water from the well to a 12" water main within the Kamehameha Highway right-of-way; that water main is currently in the process of design and construction by the State to serve the Mālaekahana Beach Park. The new 16" pipeline would be buried within the access road right-of-way. Figure 2-4 contains a cross-section showing the pipeline and trench design. Plans for such construction work would be submitted to the State Department of Transportation Highways Division for review and approval, and all appropriate construction permits would be obtained prior to commencement of the work.

The roadway and pipeline cross two dry gulches.

- The first, Kea'aulu Gulch crossing, is less than 100 feet inland from Kamehameha Highway. Several improvements would be made at this crossing. These include installation of a new 36-inch drainpipe to replace the existing, partially collapsed 24-inch drain. The new, 16-inch main would be installed above or below the new culvert, and riprap protection would be provided on both sides of the roadway embankment to protect the pavement and pipeline.
- The second crossing occurs approximately 1.4 miles *mauka* of Kamehameha Highway where the roadway crosses a reach of Mālaekahana Stream that is normally dry (see Section 3.3 for further discussion). The existing concrete ford crossing would be left intact; additional protection for the roadway would be provided by extending concrete or adding pavement for a distance of 40 to 70 feet on either side of the ford. The 16-inch pipeline would be installed in a concrete jacket next to the ford.

The Commission on Water Resource Management staff has indicated that neither stream crossing would require a stream-channel alteration permit (see Appendix D). The proposed improvements can both be permitted under one of the Army Corps of Engineers' current Nationwide Permits.

2.2.4 ELECTRICAL POWER AND TELECOMMUNICATIONS

Electrical power for the permanent pump motor would be supplied by the Hawaiian Electric Company (HECO). The overhead power lines that currently run more than half way up the access road from the 46-kV transmission lines along Kamehameha Highway would be extended to the well site along the roadway. The poles would carry both electrical lines and telecommunication lines. HECO would provide a pad-mounted transformer at the well site.

GTE Hawaiian Tel would provide telephone service. As noted earlier, the telephone lines would extend along the same overhead alignment as the HECO electrical lines. Telemetering facilities would be provided via Verizon leased lines between the Kahuku 228' Reservoir and the well site, as well as between the well site and the BWS Beretania Control Station.

2.3 COST OF THE PROPOSED FACILITIES

Preliminary estimates of project costs are tabulated below:

Item	*Estimated Cost*
Access Road and Drainage	$ 168,440
Connecting 16-Inch Pipeline	$1,182,850
Well Pumps, Control Building, and Site Work	$ 504,490
Electrical Power and Telemetry	$ 652,500
GRAND TOTAL	**$2,508,280.00**

The BWS and the State each drilled one of the exploratory wells at the Mālaekahana site. The primary funding for the production facility would come from the BWS. The Hawai'i State Department of Land and Natural Resources would reimburse the remaining portion as part of its agreement with the BWS for service within the Kahuku Water System. The State would receive water allocation credits in proportion to the amount of its participation relative to the total cost of the facility. The exact amount of credits would be determined after the facility is completed and all costs are finalized.

2.4 IMPLEMENTATION SCHEDULE

The BWS anticipates the following schedule for the proposed project:

- Design: FY1999 - 2001
- Construction: FY2002 - 2003
- Begin Full-Scale Operation (Wells Online) by: FY2003

CHAPTER 3 - EXISTING CONDITIONS

3.1 TOPOGRAPHY

3.1.1 WELL SITE TOPOGRAPHY

As shown in Figure 3-1, the ground elevation near the Mālaekahana Production Well facility ranges from 100 to 110 feet above sea level. The average slope along the long axis of the site (southwest-northeast) is 3 percent. The slope across the site is even less except along its northwestern boundary, where the ground begins to drop more steeply as it descends into Mālaekahana Stream Gulch. The ground elevation in the gulch immediately adjacent to the site is approximately 70 feet above sea level.

3.1.2 ACCESS ROAD TOPOGRAPHY

The topography differs significantly along the length of the site access road.

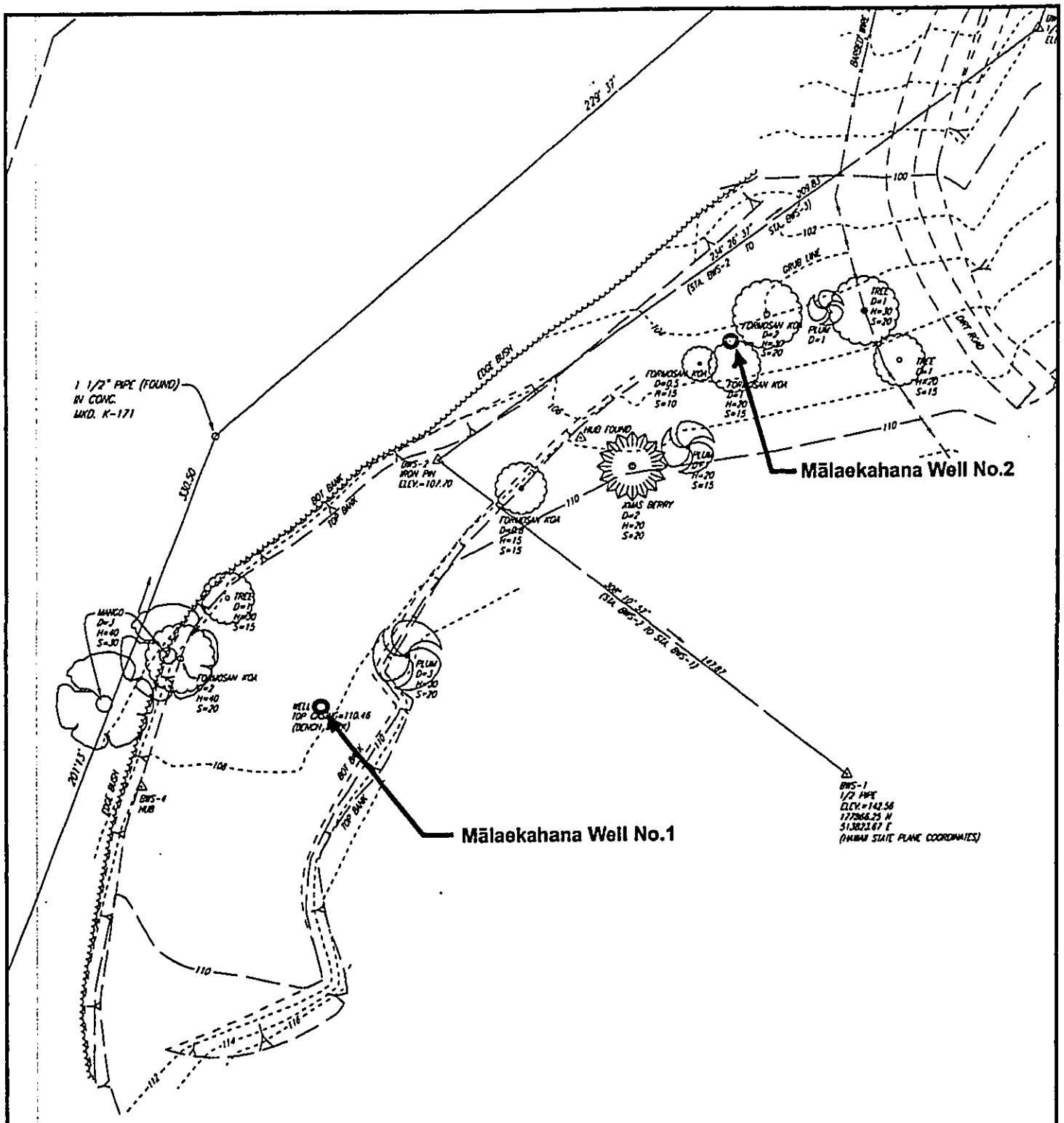
- The steepest portion is the 900-foot-long segment closest to the well site. It climbs from approximately 65 feet at the point where the road crosses Mālaekahana Stream to 100 feet at the boundary of the production well facility. The average slope over this distance is 4 percent. However, portions are steeper, with the 50-foot-long segment between 80 and 90 feet above sea level having a slope of approximately 15 percent.
- The 1,000-foot-long segment immediately below the Mālaekahana Stream crossing has an average slope of 1.5 percent. The terrain is slightly rolling through this segment.
- The third, and final segment is the longest and most nearly level. It extends approximately 7,100 feet inland from the access road's intersection with Kamehameha Highway and climbs from 15 to 50 feet above sea level. The average slope is 0.5 percent, and there is little variation from the average.

3.2 GEOLOGY AND SOILS

3.2.1 REGIONAL GEOLOGY

Windward O'ahu is composed of the deeply eroded remnants of the Ko'olau volcano. This unusually elongated shield volcano formed about 2.5 million years ago. It was built principally by thin-bedded, gently sloping, highly permeable basalt lava flow eruptions along a northwest trending rift zone that extended from Makapu'u northwestward to Waiale'e and Kawela on the northern shore of the island. The center of the rift zone near the proposed wells probably coincides with the existing crest of the Ko'olau range (Takasaki, 1969). Almost all of the Ko'olau rock consists of tholeiitic and olivine basalt.

This lava came to the surface through numerous, nearly vertical fissures. When the flow of magma feeding the eruptions ceased, the lava remaining within the fissures hardened to form dikes. The rock that forms these dikes is denser and much less permeable than the rock that



Prepared For:
City and County of Honolulu
Board of Water Supply

Prepared By:
PLANNING SOLUTIONS

Source:
Control Point Survey, May 4, 1999

0 40 80
Feet

N

Figure 3-1:

Topographic Survey of the Mālaekahana Wells Site

Mālaekahana Production Wells

was formed by lava flowing over the surface of the ground.[8] The dike zone ends well inland of the Mālaekahana Production Wells site.

A long period of erosion followed the cessation of volcanic activity. This resulted in Windward O'ahu's characteristic deep valleys and fluted ridges. During this period, terrestrial sediments washed from the mountains were deposited along the lowlands and near-shore areas. Fluctuations in sea level and other processes intermixed these terrestrial sediments with deposits of coral, limestone, and other marine sediments to form the present broad coastal plain.

The dike-free basaltic lavas that underlie the Mālaekahana well site dip downward towards the northeast at an angle of 5-10 degrees. They extend below the wedge-like sedimentary formation (often referred to as a "caprock") that forms the coastal plain. The relatively impermeable caprock inhibits the discharge of water from the basaltic aquifer into the ocean.

3.2.2 SOILS

The Soil Conservation Service (SCS) of the U.S. Department of Agriculture (Foote *et al.*, August 1972) has classified the soil on the Mālaekahana Well site as Kunia silty clay. These well-drained soils have developed on upland terraces and fans. Permeability is typically moderate and runoff slow. The erosion hazard is slight. They are generally well suited for the kinds of structures and improvements that are planned for the site.

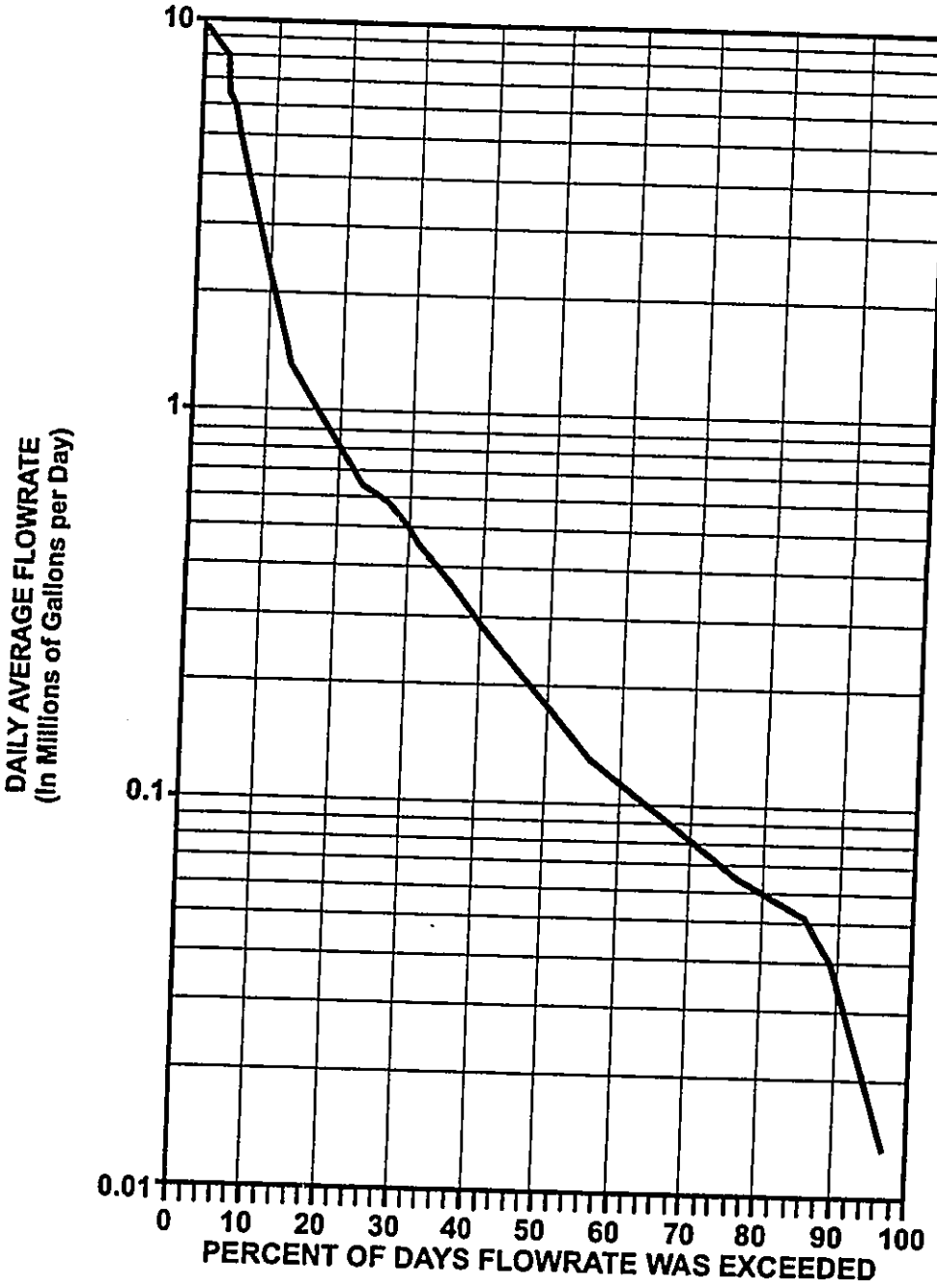
The SCS has classified the soils beneath the access road and water pipeline route as belonging to the Kawaihapai Series. This series consists of well-drained soils on alluvial fans. The soils are relatively deep, but the substratum can be gravelly or stony. These soils are typically neutral in pH. They do not present special construction problems for roadway or pipeline construction, and they are deemed a good source of road fill.

3.3 SURFACE WATER HYDROLOGY

The BWS' Mālaekahana Production Wells are situated 200 to 300 feet away from Mālaekahana Stream and are about 30 feet higher in elevation than the streambed. The stream channel extends inland toward the Ko'olau crest and is very steep in its upper reaches. At low elevations across the coastal plain, the stream's gradient is very flat and its existing channel section is actually a man-made ditch that was constructed during Kahuku's plantation era.

The U.S. Geological Survey (USGS) operated Gauging Station No. 3089.9 on Mālaekahana Stream from 1963 through 1971. The gauging station was located about 1.4 miles upstream from the site of the wells. It was within the relatively wet forest reserve lands at an elevation of approximately 450 feet above sea level. Figure 3-2 depicts the duration-discharge characteristics of stream flow over the 8-year period of record. The steep decline of the curve indicates that most of the stream flow at this location is surface runoff with only a small component of discharge from the soil mantle. There is no indication of a base flow sustained by the discharge of dike-confined groundwater at this location.

[8] As a result, the seaward movement of rainfall that percolates into the ground within the dike zone is retarded behind the dikes to form high-level groundwater.



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Source:
TNWRE Inc., July 13, 1999

Figure 3-2:

Duration and Discharge at USGS Gauge 3089.9 on Mālaekahana Stream

Mālaekahana Production Wells

Flow measurements made above and below the USGS gauging station and reported in Takasaki and Valenciano (1969) are reproduced in Figure 3-3. These measurements depict Mālaekahana as a losing stream.

At the 80-foot elevation of the streambed opposite the BWS wells, the stream channel is normally dry. In the lowest 2,300 feet of the stretching from Kamehameha Highway to the shoreline, the channel bed is below sea level. Water in that reach of the stream varies from only slightly brackish near the highway (conductivity of 1,000 to 1,500 µmhos, depending on the phase of tide) to about half seawater near the shoreline (18,000 to 25,000 µmhos). The channel discharges to the ocean through an opening in the lithified sand that forms the shoreline at the north end of Mālaekahana Bay. Conductivity measurements made along the shoreline indicate that wave-driven currents move the stream's brackish discharge south toward the center of the Bay.

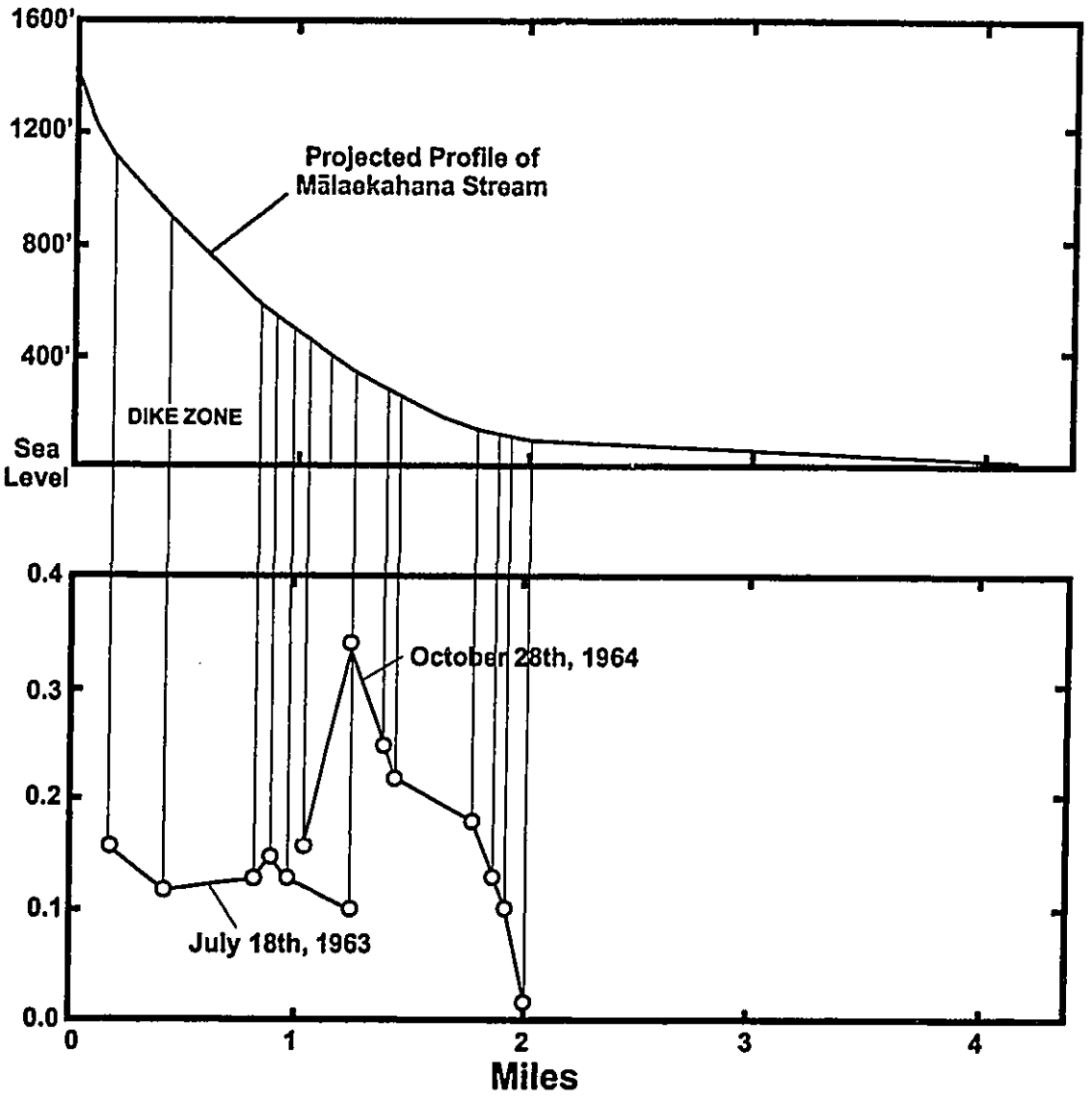
3.4 GROUND WATER HYDROLOGY

3.4.1 GROUNDWATER OCCURRENCE

Within the Mālaekahana basin, groundwater occurs in two distinctly different modes. In a band near to and parallel with the Ko'olau crest, it is impounded as high-level water by intrusive dikes. The groundwater seaward of the dike zone appears as unconfined and semi-confined basal groundwater in hydraulic contact with saline groundwater at depth and with seawater at some distance offshore. Unlike the caprock areas to the north of Kahuku Town, which are primarily of marine origin, the coastal sediments at Mālaekahana consist primarily of terrestrial alluvium. More permeable coral and beach sands occur only in small pockets at Mālaekahana and mostly near to the shoreline. As a result, the sediments of the coastal plain do not contain a shallow aquifer of significance.

No wells tap into the inland band of high-level groundwater in the Kahuku area. However, basal groundwater in Kahuku, Mālaekahana, and Lā'ie has been a continuous source of water supply for more than 100 years, either by pumping from wells at the inland margin of the coastal plain or from freely flowing wells at lower elevations of the coastal plain. A number of existing wells and well batteries are located within the Mālaekahana basin, all of which are down gradient of the two proposed BWS wells, which are the subject of this environmental assessment. The locations of these wells and well batteries are shown on Figure 3-4, and information on them is summarized in Table 3-1.

The peak use of the wells in Mālaekahana and elsewhere in Kahuku occurred from 1940 to 1970, coinciding with the last three decades of the operation of Kahuku Plantation. Pumpage during this 30-year plantation period is depicted on Figure 3-5. Draft of the wells in Mālaekahana averaged 6.4 MGD and reached a peak of 10 MGD in 1947. In addition to this pumpage, there was also an unknown amount of water which free-flowed into irrigation ditches from the lowest elevation wells. During this peak-use period, draft from Mālaekahana was 26 percent of the total pumpage in the Kahuku area and 22 percent of all the pumpage from Punalu'u to Kahuku. The area from Punalu'u to Kahuku is now known as the Ko'olauloa Aquifer System.



Prepared For:
City & County of Honolulu
Board of Water Supply

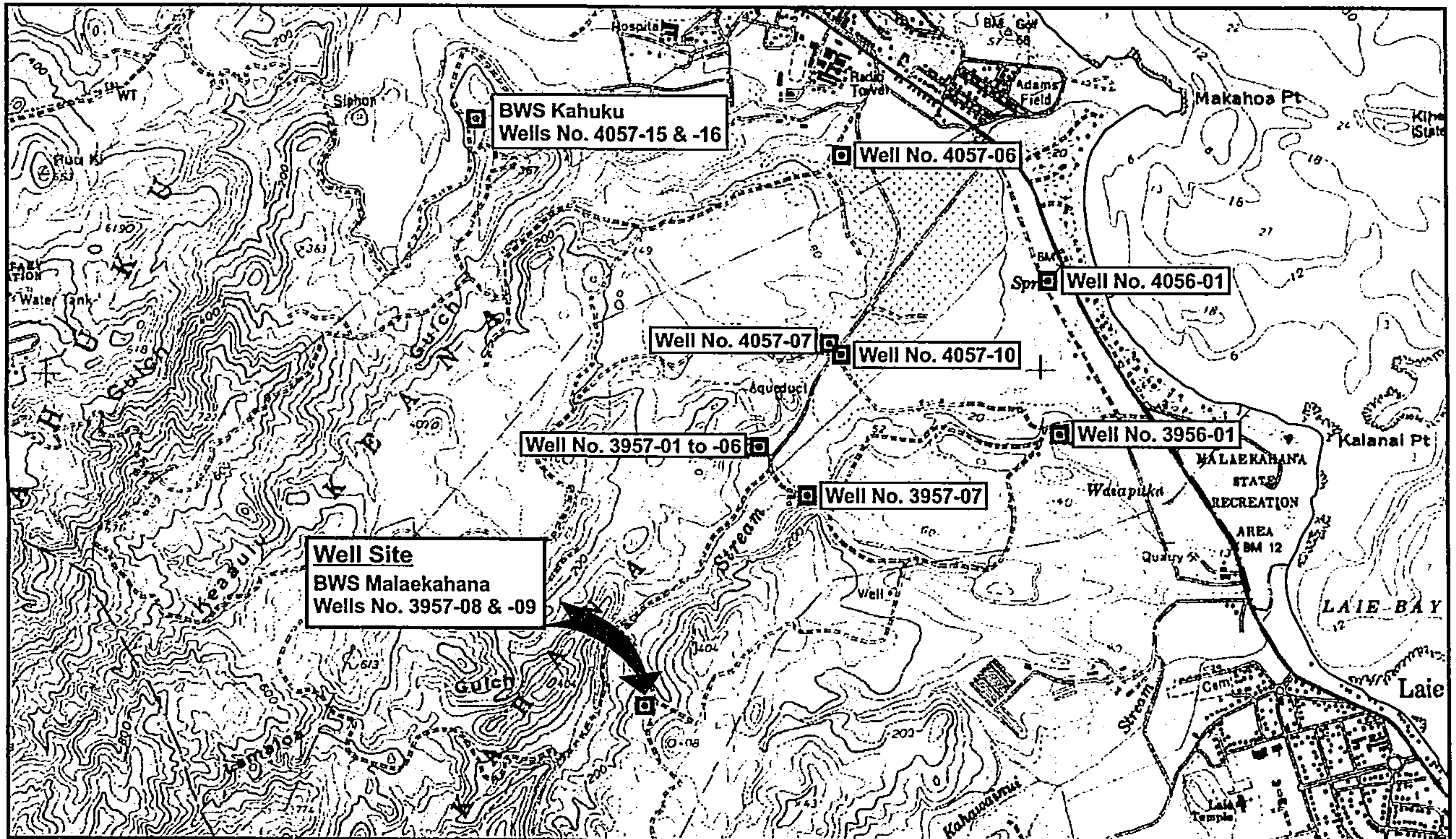
Source:
PLANNING SOLUTIONS

Prepared By:
TNWRE Inc., July 13, 1999

Figure 3-3:

Flow Measurements Along the Upper Reaches of Mālaekahana Stream

Mālaekahana Production Wells



Prepared For:
City & Countyof Honolulu
Board of Water Supply

Prepared By:
PLANNING SOLUTIONS

Source:
TNWRE Inc., July 13, 1999
USGS 7.5" Kahuku Quadrangle, 1983

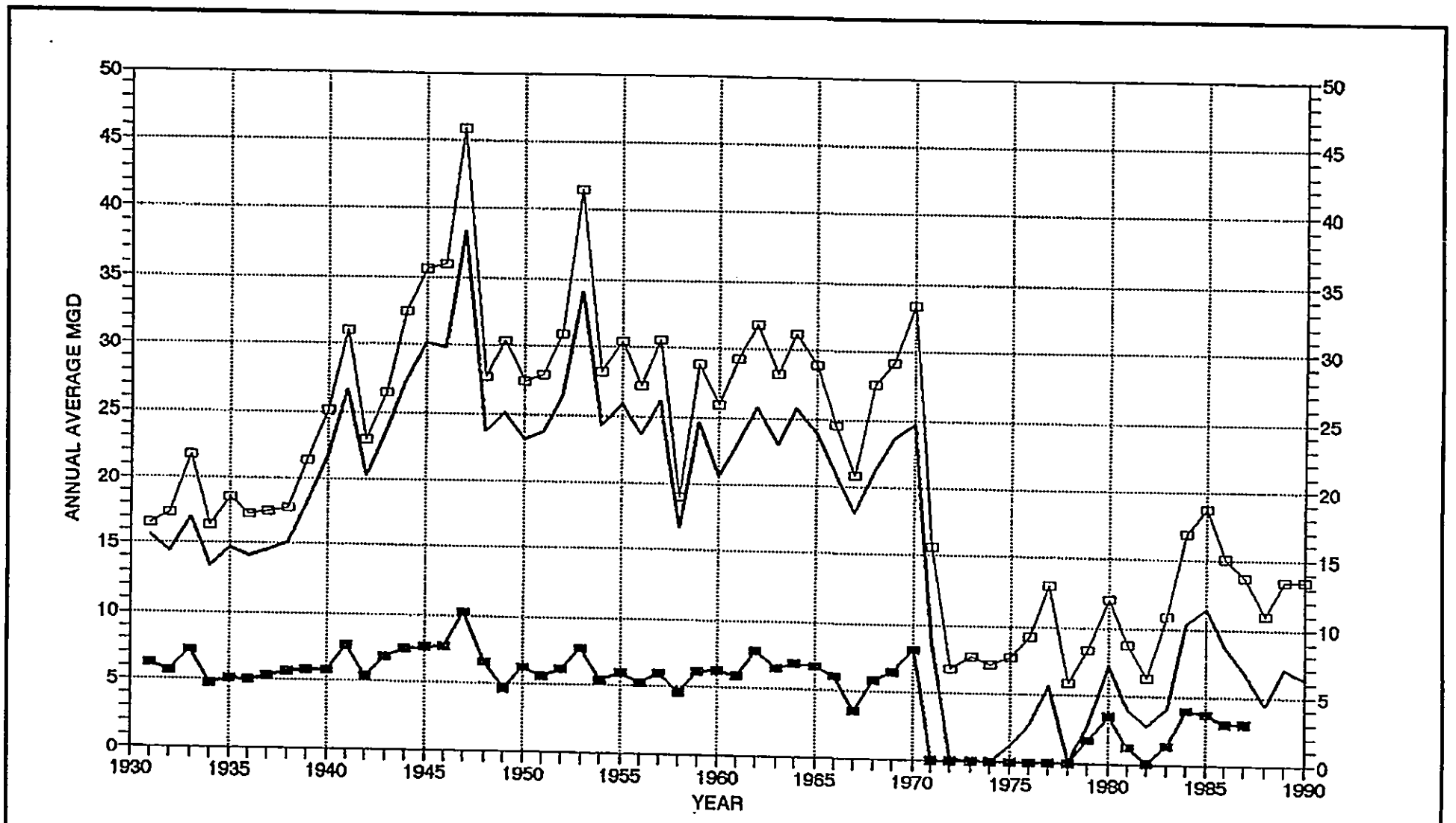
Legend:
Well Sites

200 400 Feet
Contour Interval 40 Feet
N

Figure 3-4:

Locations of the Wells in the Mālaekahana Basin

Mālaehana Production Wells



Prepared For:
City & County of Honolulu
Board of Water Supply

Source:
PLANNING SOLUTIONS

Prepared By:
TNWRE Inc., July 13, 1999.

Legend:

- Only Malaekahana
- Kahuku Sub-area
- Ko`olauloa Total

Figure 3-5:

Draft From Wells in the Ko`olau Aquifer System - 1930 to 1985

Mālaekahana Production Wells

Table 3-1. Summary of Available Information on Wells in the Mālaekahana Basin

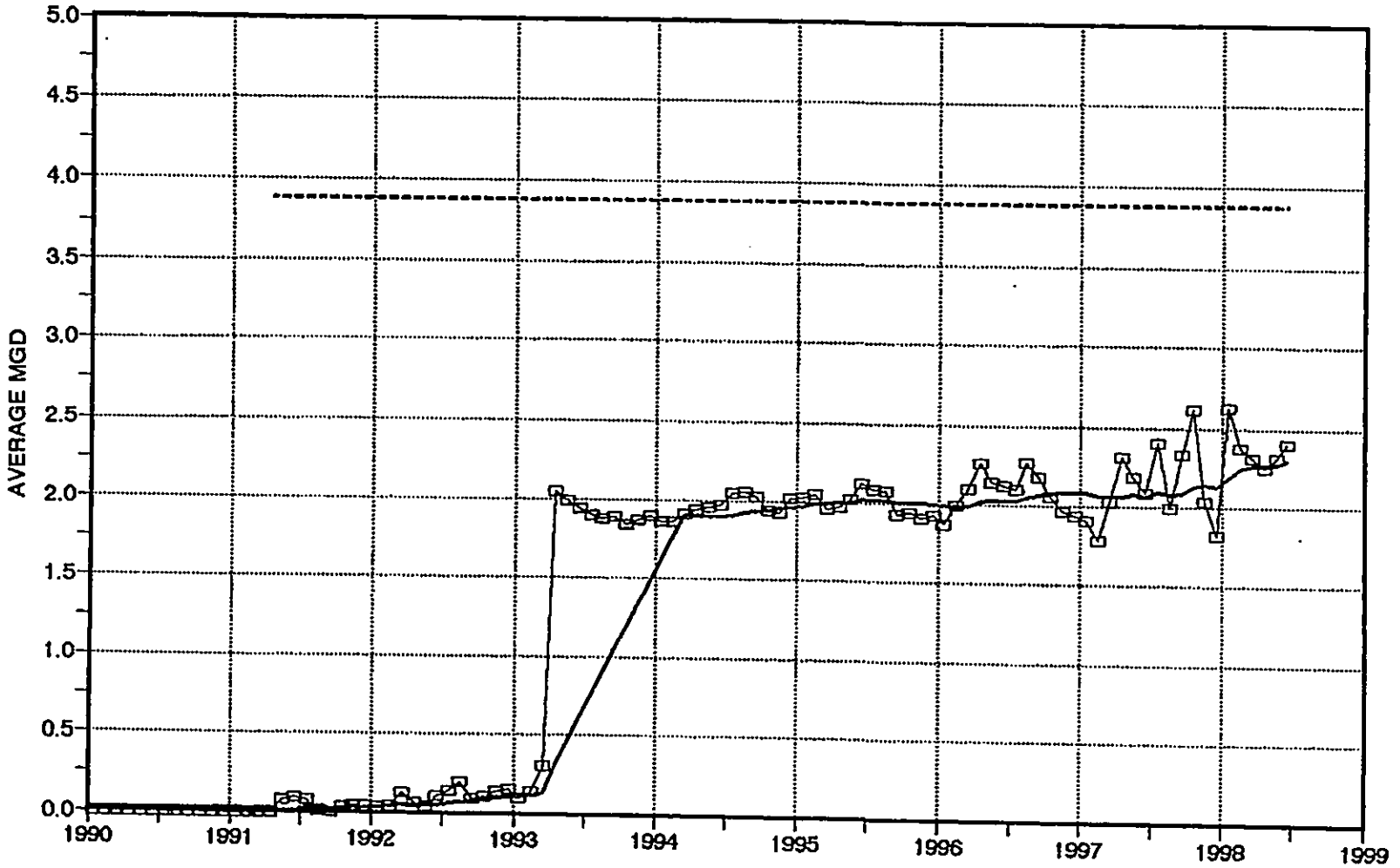
Well		*Year Drilled*	*Ground Elevation (ft MSL)*	*Elevation at Bottom of Solid Casing (ft MSL)*	*Total Depth (ft)*	*Elevation at Bottom (ft MSL)*	*Currently Permitted Use*	
State No.	*Old No.*						*Permit Holder*	*Amount (MGD)*
3956-01	363		18				Campbell	0.042
3957-01	362A		32	-91				0.095
3957-02	362B		32	-78				
3957-03	362C		32				Campbell	1.189
3957-04	362D		32					
3957-05	362E	1930	32	-86	373	-341		
3957-06	362F	1930	32	-83	384	-352		
3957-07	362-1	1937	29	-75	397	-368	Campbell	0.006
4056-01	358		11	-177	328	-317	Campbell	0.576
4057-06	357		15				Campbell	0.670
4057-07	361A		16	-52	306	-290	Campbell	0.109
4057-10	361B	1937	16	-102	378	-362	Campbell	1.200
3957-08	--	1997	108.4	-99.6	300	191.6		
3957-09	--	1999						
							Total of Currently Permitted Use	**3.887**
Source: Compiled by Tom Nance Water Resource Engineering, Inc.								

With the Kahuku Plantation's closing in 1970, pumpage in Mālaekahana and the rest of Kahuku was reduced substantially. As the landowner, Campbell Estate, has acquired agricultural lessees, use of the old plantation wells and well batteries has begun again. This usage in the 1990s is depicted on Figure 3-6. In recent years, water use has been in the range of 2.0 to 2.3 MGD, about one-third of the use rate from 1940 to 1970.

3.4.2 REGULATION OF GROUNDWATER USE

The State Commission on Water Resource Management (CWRM) regulates use of groundwater throughout the State. In 1992, it designated the Ko'olauloa and Ko'olaupoko Aquifer Systems as the Windward O'ahu Groundwater Management Area. The CWRM issues water use permits (WUPs) for wells in these aquifers to ensure that groundwater draft does not exceed the sustainable yield and to avoid conflicts among users of the same resource. BWS' Mālaekahana Production Wells are in the 32-square mile area from Punalu'u to Kahuku that comprises the Ko'olauloa Aquifer System (see Figure 3-7). As of May 1999, the CWRM had issued 55 WUPs totaling 19.593 MGD for this system. Since the CWRM has adopted a sustainable yield of 35 MGD for Ko'olauloa, 15.407 MGD is still available to allocate to new wells such as those the BWS has proposed at Mālaekahana.

Although the CWRM utilizes a single number to regulate uses throughout the entire aquifer system, its linear shape and the generally northward direction of groundwater flow suggest that differentiating between different sections of the aquifer may be appropriate to avoid local overdrafts. Using the sub-areas shown on Figure 3-7 and the distribution of the 35-MGD sustainable yield within these areas suggested in a report by George A. L. Yuen & Associates (1992), locations where the unallocated supply would most appropriately be developed can be identified.



Prepared For:
City & County of Honolulu
Board of Water Supply

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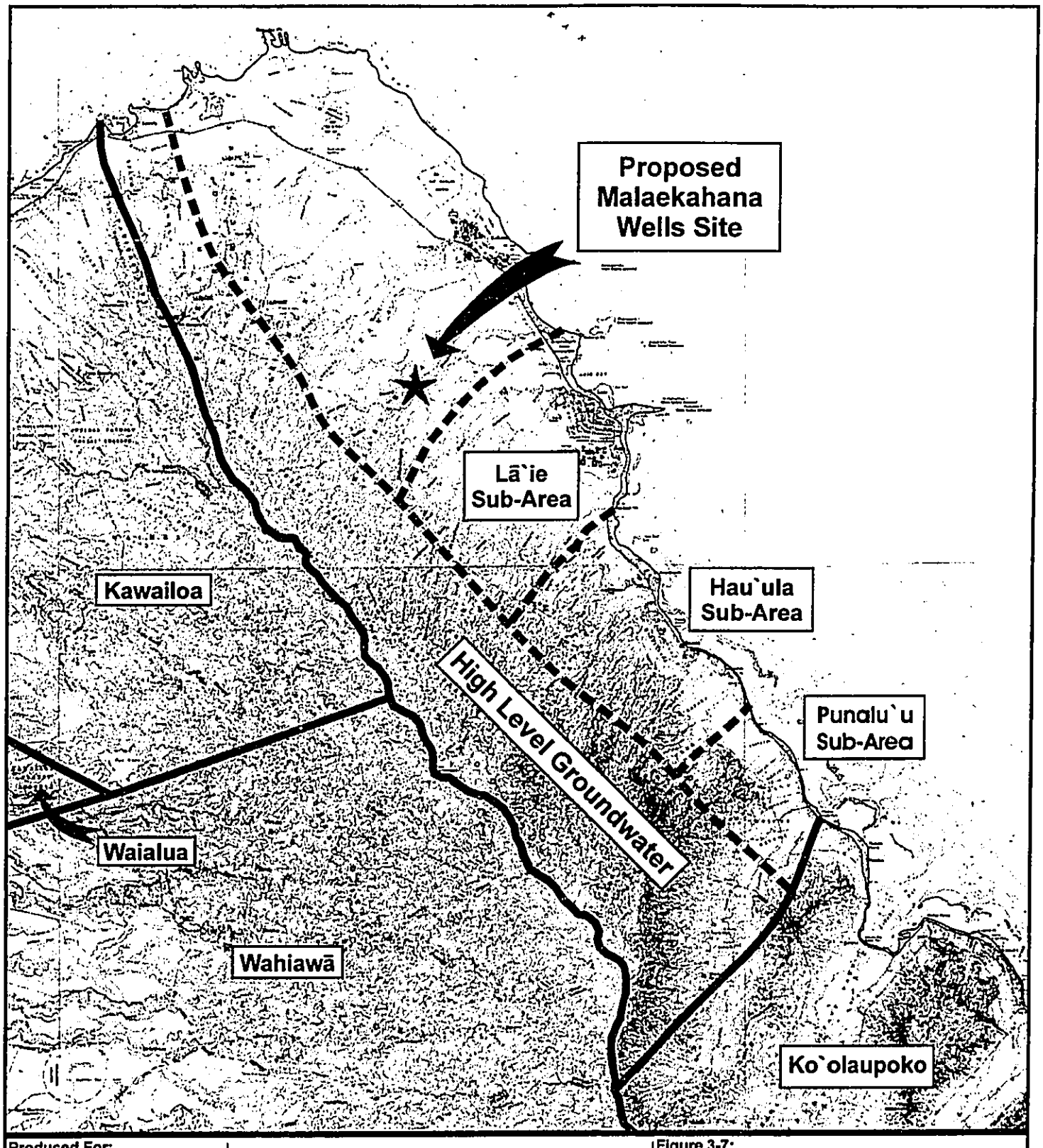
Source:
TNWRE Inc., July 13, 1999

Legend:
- Permitted Use
- 12-MAV
- Monthly Average

Figure 3-6:

Draft By Wells in the Mālaekahana Basin - 1990 to 1999

Mālaekahana Production Wells



Produced For:
City & County of Honolulu
Board of Water Supply

Produced By:
PLANNING SOLUTIONS

Source:
USGS 7.5' Kahuku Quad, 1983
USGS 7.5' Hauula Quad, 1983
USGS 7.5' Waimea Quad, 1983
USGS 7.5' Haleiwa Quad, 1983
TNWRE Inc., July 13, 1999

Feet

N

Figure 3-7:

Ko`olauloa Aquifer System

Mālaekahana Production Wells

As indicated in Table 3-2, this approach suggests that about 3.6 MGD of Ko'olauloa's 15.5 MGD unallocated supply might be developed in the Kahuku section.

Table 3-2. Summary of Water Use Permits and Unallocated Supply by Sub-Areas of the Ko'olauloa Aquifer System

Sub-Area	*No. of Permits*	*Permitted Use (MGD)*	*Sustainable Yield (MGD)*	*Unallocated Supply (MGD)*
Punalu'u	11	6.743	7	0.257
Hau'ula	6	2.031	8	5.969
Lā'ie	15	2.399	8	5.601
Kahuku	23	8.420	12	3.580
Totals	**55**	**19.593**	**35**	**15.407**

Notes: The number of permits and their permitted use are as of May 1999. Distribution of the sustainable yield in the four sub-areas is taken from George A. L. Yuen & Associates (1992).

Source: Compiled by Tom Nance Water Resource Engineering, Inc.

3.5 CLIMATE AND AIR QUALITY

3.5.1 CLIMATE

3.5.1.1 Temperature

The average annual temperature in Kahuku is approximately 75 degrees Fahrenheit (°F). Monthly average temperatures range from approximately 72°F in January, the coolest month, to 79°F in August and September, the warmest months. The highest monthly temperature of record is 90°F. The lowest monthly temperature of record is approximately 50°F.

3.5.1.2 Winds

The Kahuku area is exposed to strong northeast tradewinds, the dominant air circulation feature in Hawai'i. Because of this, it has been studied extensively by individuals and organizations interested in developing the wind energy resources of the State (see, for example, Daniels and Oshiro, September 1980). Average wind speeds from this study are shown in Table 3-3.

3.5.1.3 Rainfall

The average annual precipitation in Kahuku is approximately 42 inches per year. Rainfall increases as one moves inland from Kamehameha Highway towards the well site. The estimated average annual rainfall there is somewhat higher, probably about 50 inches per year. As shown in Figure 3-8, rainfall varies considerably from year-to-year. In 1926, for example, rainfall totaled over 80 inches, while in 1963 it was only 20 inches. Rainfall varies considerably by month as well (see Figure 3-9). On average, December through March is the wettest period, and May through September is the driest season.

Figure 3-8 Annual Rainfall at Kahuku Station 390: 1921 through 1962.

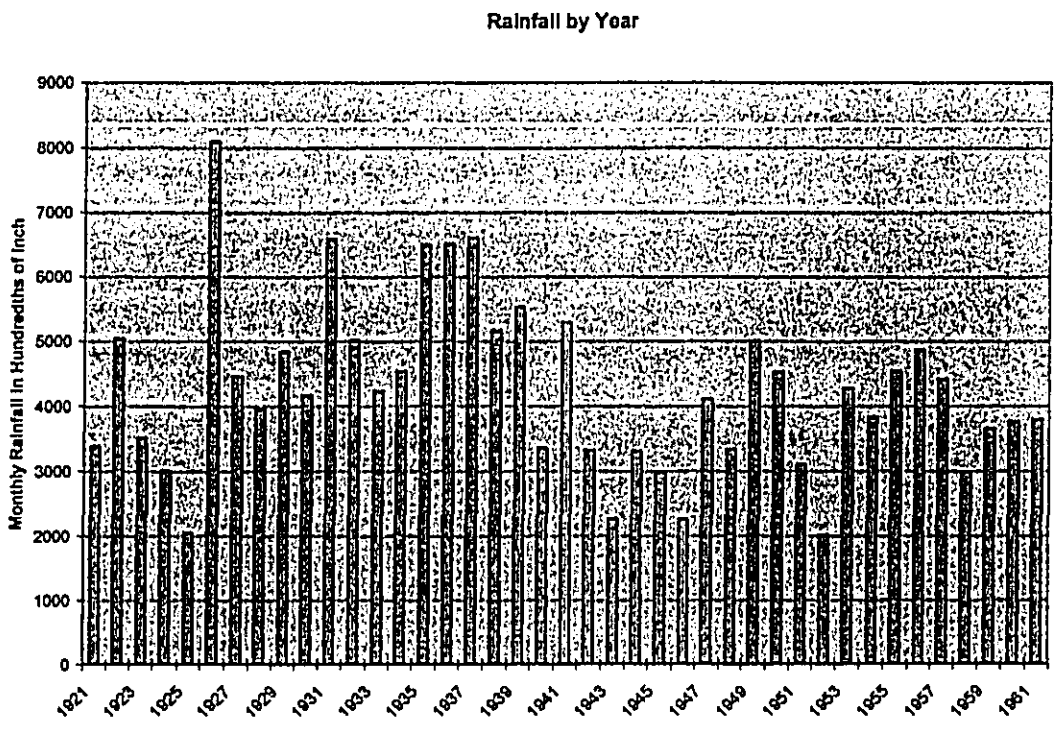


Figure 3-9 Mean, Median, and Extreme Monthly Rainfall: Kahuku Station 390: 1921 - 1962.

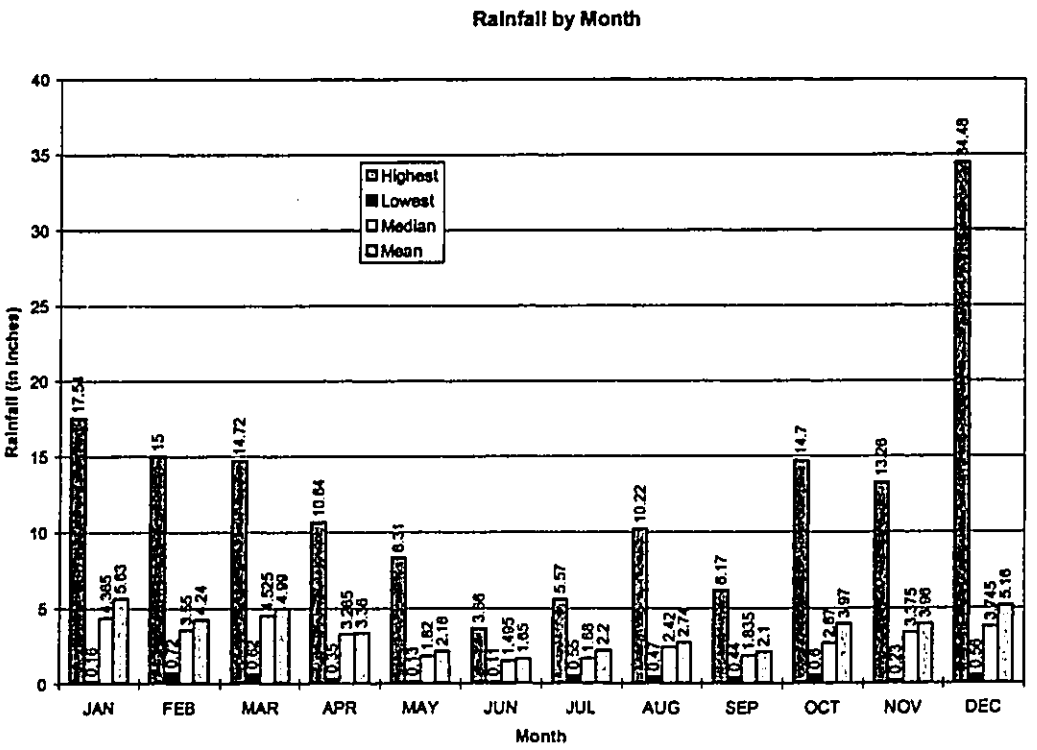


Table 3-3. Average Wind Speeds by Time of Day

	Average Wind Speed (in mph) by Hour of the Day								
Month	*0000 to 0259*	*0300 to 0559*	*0600 to 0859*	*0900 to 1159*	*1200 to 1459*	*1500 to 1759*	*1800 to 2059*	*2100 to 2359*	*24-Hour Average*
Jan	19.9	18.0	20.5	17.8	15.5	15.0	14.6	20.6	17.80
Feb	15.3	18.0	15.8	17.6	15.1	15.7	12.9	16.1	15.80
Mar	13.9	13.7	15.0	17.0	17.8	15.9	14.9	14.6	15.40
Apr	14.0	14.2	14.7	16.8	17.2	16.5	15.2	16.2	15.60
May	16.0	14.6	17.9	20.2	19.4	18.4	16.2	16.4	17.40
Jun	15.9	17.4	17.1	19.8	20.4	17.6	16.9	18.3	17.90
Jul	16.7	16.0	18.1	20.1	21.9	19.9	19.0	18.7	18.80
Aug	16.3	18.2	18.9	20.9	22.0	19.1	16.0	17.6	18.60
Sep	14.1	13.8	18.0	20.3	20.2	19.1	15.4	14.8	17.00
Oct	15.8	17.1	17.8	16.1	16.6	14.8	15.7	16.8	16.30
Nov	18.3	16.4	17.0	18.0	17.8	15.4	18.4	17.4	17.30
Dec	18.9	19.2	21.5	20.1	18.0	17.0	17.5	17.7	18.80
Annual	16.3	16.4	17.7	18.7	18.5	17.0	16.1	17.1	17.20

3.5.1.4 Air Quality

No air-quality data are available for the project area. However, the only manmade pollutant sources are vehicular traffic on Kamehameha Highway and agricultural activities in the fields adjacent to the access road. Consequently, existing air quality is believed to be good.

3.6 FLORA AND FAUNA

3.6.1 FLORA

Char & Associates (December 1995) conducted a walk-through reconnaissance survey of the well site and access road alignment on November 13, 1995. Its primary objectives were to identify the vegetation on and immediately around these areas and to search for rare, endangered, and vulnerable plant species. Where possible, plant identifications were made in the field. Plants that could not be positively identified were collected for later classification in the University of Hawaii at Mānoa herbarium.

Results of the survey showed that the vegetation on the well site, along the access road, and on the surrounding lands consists almost entirely of introduced or alien species. Java plum (*Syzygium cumini*) is the most common tree species. It, together with smaller stands of Formosan koa (*Acacia confusa*) forms a secondary forest approximately 18 to 25 feet tall. Occasional stands of old mango trees (*Mangifera indica*) stand above these, especially closer to Mālaekahana Stream. Koa-haole (*Leucaena leucocephala)* and guava *(Psidium guajava*) form a second, lower layer approximately 12 to 15 feet high. Other shrubs, which occur in lesser numbers, include Christmas berry (*Schinus terebinthifolius*), two species of pluchea (*Pluchea indica*, and *P. symphytifolia*), lantana (*Lantana camara*), and clidemia (*Clidemia hirta*). A few ti or ti leaf plants (*Cordyline fruiticosa*) are also scattered through the area.

Ground cover consists of smaller shrubs or subshrubs, grasses, and herbaceous species. Nettle-leaved vervain (*Stachytarpheta urticifolia*), a small shrub that is a native of tropical

Asia is locally abundant on the well site. Hilo grass (*Paspalum conjugatum*) is also abundant on the well site and along the access road. Spanish clover (*Desmodium incanum*) is common to abundant through the entire areas as well. Small patches of carpet grass (*Axonopus fissifolius*) are associated with the Formosan koa trees. Other plants found here in smaller numbers include sour grass (*Digitaria insularis*), Asiatic pennywort (*Centella asiatica*), niruri (*Phyllanthus debilis*), hairy horseweed (*Conyza bonariensis*), yellow woodsorrel (*Oxalis corniculata*), and Chinese violet (*Asystasia gangetica*).

None of the plants found during the field study is a listed, proposed, or candidate threatened or endangered species (U.S. Fish & Wildlife Service, March 28, 1994; December 15, 1994; and October 2, 1995). Neither are any of the plants considered rare and/or vulnerable (Wagner *et al.*, 1990). Finally, none of the vegetation types seen on the well site, the access road, or other nearby areas is dominated by native plants.

3.6.2 FAUNA

Phillip L. Bruner (December 6, 1995) conducted a two-day field survey of the proposed well site and access road alignment. Field observations were made using binoculars and by listening for vocalizations during the early morning hours (0630 to 0940 hours) on November 13 and 18, 1995. Weather on both days was partly cloudy, with winds from the east at 5 to 10 miles per hour. Heavy rain showers had occurred over a period of several days before the survey.

The primary objectives of the survey were to:

- Identify the bird and mammal species that occur in the area based on specific observations and the presence of suitable habitat.
- Determine the presence or likely occurrence of any native fauna, particularly species that are considered threatened or endangered.
- Evaluate the quality of the habitat with respect to its ability to support native wildlife and identify special or unique resources that might be adversely affected by the proposed use.

Resident Endemic (Native) Land Birds. No native resident land birds were observed during the survey period. Some of the habitat is suitable for the short-eared Owl or Pu'eo (*Asio flammeus sandwichensis*), but none were recorded during the survey Bruner (December 6, 1995:3).[9]

Resident Waterbirds. No waterbirds were recorded during the survey. Black-crowned night heron (*Nycticorax nycticorax*) is occasionally seen roosting along the streams in the general area (Bruner, personal observations). The night heron is the only Hawaiian waterbird that is not listed as rare or endangered.

Seabirds. No seabirds were observed during the survey. Moreover, the area is generally considered unsuitable for them because it is easily accessible to predators.

[9] The State of Hawaii Division of Forestry has listed the Pu'eo as an endangered species on O'ahu, and the number of individuals present on the island is believed to be low.

Migratory Indigenous (Native) Birds. No migratory native shorebirds were seen during the course of the survey. Moreover, the well site and most of the access road alignment do not contain habitat suitable for such birds. Wandering Tattlers (*Heteroscelus incanus*), which are most commonly seen along rocky shorelines, sometimes forage around streams, and it is possible they will occasionally be present along stretches of Mālaekahana Stream. These birds are not threatened or endangered.

Exotic (Introduced) Birds. Individuals representing twelve exotic bird species were observed during the field survey. These species, together with the average number recorded during each 6-minute count at each census station, are shown in Table 3-4. Based on the available habitat, it is likely that the Barn Owl (*Tycto alba*) and Ring-Necked Pheasant (*Phasianus colchius*) may also be present in the area.

Table 3-4. Birds Recorded At Mālaekahana Well Site

Common Name	*Scientific Name*	*Average Number*
Spotted Dove	*Streptopelia chinensis*	11
Zebra Dove	*Geopelia striata*	6
Common Myna	*Acridotheres tristis*	4
White-rumped Shama	*Copsychus malabaricus*	2
Red-Vented Bulbul	*Pycnonotus cafer*	10
Red-crested Cardinal	*Paroaria coronata*	5
Northern Cardinal	*Cardinalis cardinalis*	2
Japanese White-Eye	*Zosterops japonica*	9
Japanese Bush warbler	*Cettia diphone*	2
House Finch	*Carpodacus mexicanus mexicanus*	4
Common Waxbill	*Estrilda astrild*	7
Nutmeg Mannikin	*Lonchura punctulata*	3
Source: Bruner (December 6, 1995: 9).		

Feral Mammals. Two Small Indian Mongooses (*Herpestes auropunctatus*) were seen on the property during the survey. Rats, mice and feral cats are also likely to be present, although they were not seen during the course of the field survey. Feral pigs may also be present, particularly at elevations above the well site.

The endemic and endangered Hawaiian Hoary Bat (*Lasiurus cinerus semotus*) has been recorded on O'ahu (Tomich 1986, Kepler and Scott, 1990), but data on their distribution are extremely limited. They are known to roost in trees and to occur in both upland forests and lowland habitats. None were seen during the survey, and there is no published report that suggests that this endangered species is present near the well site or access road.

3.7 NOISE

The Mālaekahana well site and access road right-of-way are well away from existing residential areas and other noise-sensitive uses. Spot noise measurements made during a field visit in May, 1999 indicate that noise levels are typical of those in similar undeveloped

and agricultural areas. These spot recording are reproduced in Table 3-5. These data indicate that the sound of wind passing through vegetation and traffic noise from vehicles on Kamehameha Highway the principal sources of environmental noise in the vicinity of the proposed activities.

Table 3-5. Existing Noise Levels in the Project Area

Location/Condition	*Noise Level (dBA)*
WELL SITE:	
No wind	30-32
With gentle wind rustling in trees	35-40
ACCESS ROAD:	
Mālaekahana Stream Crossing:	
No wind/no water in stream/no other identifiable noises	32-34
Gentle breeze rustling in vegetation	35-38
Adjacent to Agricultural Fields:	
No wind or other identifiable noise sources	32-35
Gentle breeze only	34-37
Sound of distant motorized equipment	34-41
Approaching Kamehameha Highway:	
Gentle breeze with unidentifiable background noise	37-40
With passing vehicles on Kamehameha Highway	45-65
Note: Measurements made with B&K Type 2219 Sound Level Meter.	
Source: Planning Solutions, Inc. May 1999.	

3.8 AQUATIC RESOURCES

There are no standing or flowing bodies of water on the well site. The proposed access road alignment crosses Mālaekahana Stream using an existing concrete ford. As discussed in Section 3.3 above, there is no water in the stream at the ford except during brief periods of heavy rainfall. Consequently, it does not constitute a significant aquatic habitat.

3.9 ARCHAEOLOGICAL FEATURES AND CULTURAL RESOURCES

3.9.1 ARCHAEOLOGICAL INVESTIGATIONS

Dr. Hallett H. Hammatt of Cultural Surveys Hawai'i conducted an archaeological reconnaissance survey of the area affected by development of the Mālaekahana Exploratory Wells (Hammatt, February 1996). The work entailed a field survey of the area that would be directly affected by the proposed construction activities. Information obtained through the field survey and through documentary research was used to determine the presence and significance of cultural remains.

Fieldwork was conducted on November 13, 1995. The survey involved two north/south sweeps on foot covering the project area and at least 200-300 feet in all directions around the project area. No archaeological remains were encountered. Historical research consisted of a review of information on previously recorded sites within the Mālaekahana *ahupua'a*, inspection of some recent archaeological studies, limited research on Land Commission Awards (LCAs), and compilation of a brief history of ranching and sugarcane and pineapple production in the vicinity

3.9.2 PREVIOUSLY IDENTIFIED ARCHAEOLOGICAL SITES

McAllister (1930) reported four known sites in Mālaekahana. In addition, Yent and Ostioko-Griffin reported in 1980 on an extensive cultural layer existing in the sand layers of Mālaekahana State Park. As shown in Figure 3-10, however, all of these sites are along the shoreline near Kamehameha Highway, over 7,000 feet away from the well site. For the upland areas near the well site and along the proposed route of the transmission main, no archaeological sites have been recorded to date.

3.9.3 CULTURAL RESOURCES

As discussed below, the site is located on a small terrace of previously disturbed land. Site grading and preparation is already completed, and no change in public access to the site vicinity would occur with the development of the site. No historical or archaeological sites are known to exist near the well site or along the proposed transmission main route.

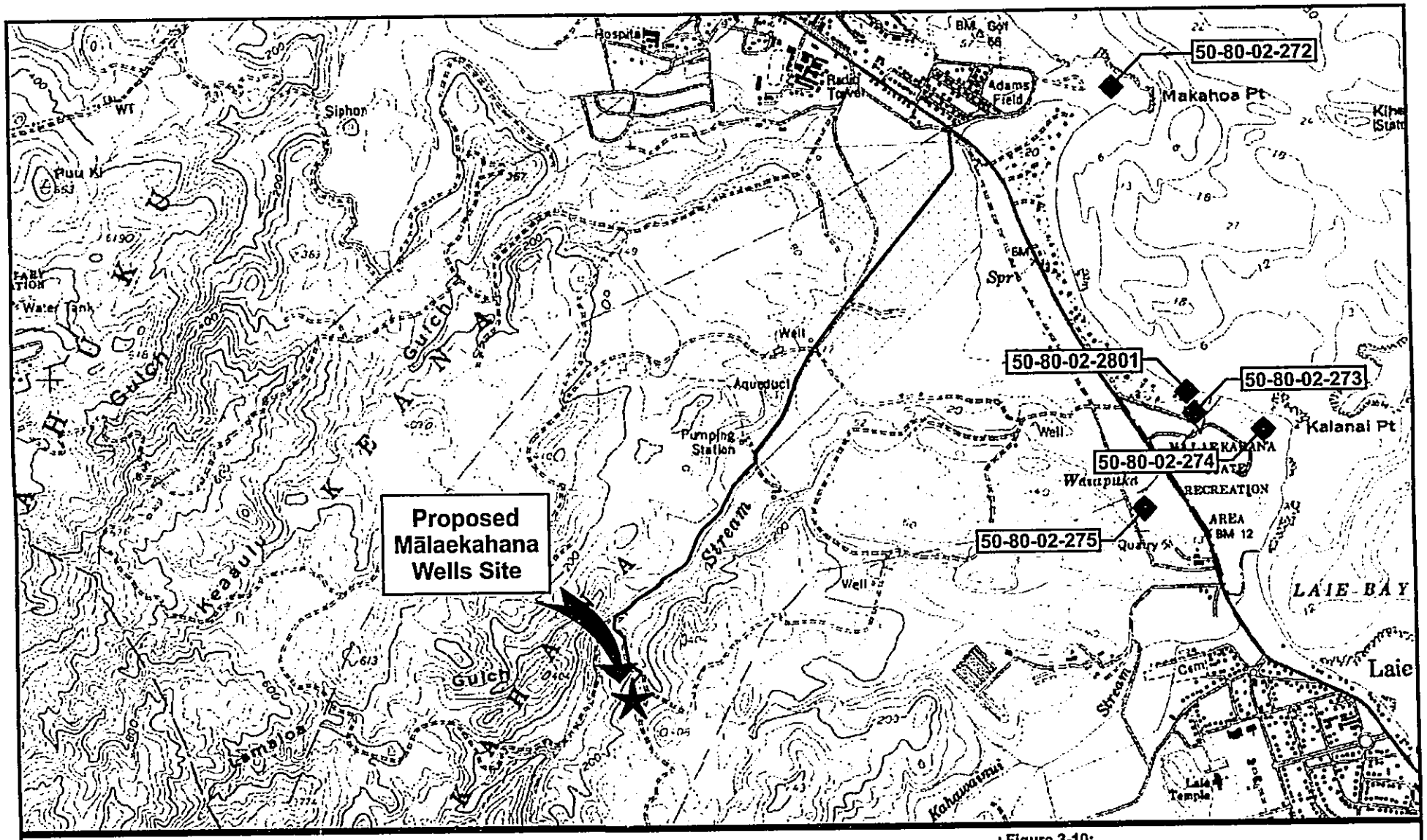
Because the Mālaekahana Stream is dry most of the time at the well site and downstream along the transmission main route, the aquatic species that are valued by native Hawaiians are not present in the area. In any case, potential gathering or other native Hawaiian cultural practices that could be associated with the nearby stream gulch would not be restricted by the proposed development. Because the proposed developments would involve only previously disturbed lands and would not impair public access, no formal cultural survey or program of ethnographic interviews is planned for the project.

3.10 SCENIC AND AESTHETIC RESOURCES

The Mālaekahana well site is surrounded by secondary forest growth. Mature trees ranging from 30 to 40 feet tall enclose the site. As a result, it is not visible from Kamehameha Highway or any of the surrounding areas. No visual or aesthetic impact is expected. Furthermore, the existing vegetation makes the installation of additional landscaping unnecessary.

3.11 EXISTING LAND USE

The site is situated on a small terrace of undeveloped but previously disturbed land above Mālaekahana Stream Gulch. Historically, the land in Mālaekahana has been used for dry land agricultural cultivation and ranching. Currently, secondary forest growth with grassy areas, low shrubs, and mature trees cover the area. Adjacent areas have been bulldozed and fenced. There is evidence of recent horse grazing in the area.



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Source:
USGS 7.5" Kahuku Quadrangle, 1983

Figure 3-10:

Known Archaeological Sites Within the Project Area

Mālaekahana Production Wells

The access road improvements and proposed pipeline are within the existing private roadway. That roadway and the smaller roads that connect to it provide vehicular access to the various agricultural uses in the area.

3.12 LAND USE CONTROLS AND OWNERSHIP

The site, located in a portion of the parcel TMK 5-6-07:01, is in the State Agriculture District. The County zoning is AG-2, General Agriculture. The proposed facilities are allowable uses in both these land use districts. Due to the size of the proposed lot, 0.35 acres, a variance for lot size would be required.

The James Campbell Trust Estate owns the parcel. Campbell Estate has indicated its willingness to convey the access easement and lot in fee. This easement consists of the 20-foot road easement from Kamehameha Highway to the point where access to the site departs from the easement. For the portion of the access road that departs from the existing easement, easement descriptions for both the roadway and the pipeline must be completed by BWS, but may be done after the grading plans have been completed and as a part of the final design.

CHAPTER 4 - PROBABLE IMPACTS

4.1 TOPOGRAPHIC IMPACTS

4.1.1 WELL SITE

As can be seen from the topography shown in Figure 3-1, the Mālaekahana Production Wells site was graded during construction of the exploratory wells. No additional mass grading would be required for the production well facilities. A limited amount of finished grading would be undertaken on the site to provide suitable pads for the small structures and other production well facilities and for the related driveways and parking areas. These would alter the existing grade by no more than 3 to 4 feet, and it will be possible to balance cut and fill within the area.

4.1.2 ACCESS ROAD AND PIPELINE

Except for the last 180 feet up to the proposed access gate to the site, the existing access road from the Kamehameha Highway would remain as is. From beyond that point to the wells, the access road would be paved with concrete or asphalt. The pavement would be 12 feet wide with 4-foot shoulders on both sides to conform to BWS standards. The road profile would generally follow the existing ground and would require only minor grading.

4.2 GEOLOGIC AND SOILS HAZARDS AND IMPACTS

The minor grading that is proposed would not alter the geology of the area or involve the removal of valuable minerals. Neither would construction of the access road, production well facilities, or other project-related activities involve the consumption of substantial amounts of minerals, rocks, or soil useful for construction or other purposes.

All of O'ahu is situated in Seismic Zone 2A (Foremost *et al.*, 1988). Therefore, the project area is no more or less likely to experience an earthquake than elsewhere on the island. The proposed facilities will be designed to withstand Seismic Zone 3 seismic forces in accordance with BWS policy. Consequently, it is unlikely that they would fail and harm users or surrounding areas.

4.3 HYDROLOGIC IMPACTS

Construction, operation, and maintenance of the proposed facilities have the potential to affect the area's water resources in several ways. These are discussed below.

4.3.1 SURFACE WATER IMPACTS

Site Drainage. The area of the lot for the two wells, control building, and other equipment would be about 0.35 acres. About 20 percent or 0.07 acres would have impermeable surfaces consisting of pavement and building roofs.

As discussed above, the site has already been graded to a nearly level condition to accommodate drilling equipment. Minor additional grading would be required for the

installation of the permanent well pumps, control building, and other site improvements. Grading at the site would provide adequate drainage to keep storm runoff from flowing through the site. Stormwater runoff would be collected at drain inlets, and this drainage system would be connected to the well pump blow-offs. The outlet pipe for this system would extend across the existing dirt road at the bottom of the slope, ending at the top bank of the Mālaekahana Stream. An easement for the route of this drainpipe will be required if the slope area is not purchased. These measures would ensure that no substantial impacts to the site drainage would occur. Best Management Practices (BMPs) will be used during all construction activities to ensure minimal impacts. Development of specific BMPs for site grading and road construction will be completed during final design in close cooperation with the State Department of Health, Clean Water Branch. Examples of the BMPs that may be used include berms, fabric filter fences, limiting work to dry periods, and immediate revegetation of cleared areas.

Crossing of Mālaekahana Stream. The existing access road crosses Mālaekahana Stream as a concrete ford across a normally dry streambed approximately 1.4 miles inland from Kamehameha Highway. This existing ford would be left intact, and a 16-inch water main would be installed in a concrete jacket next to it. Concrete would also be added on the sloping approaches to the existing ford for a distance of 40 to 70 feet in both directions. During final design, a detailed study of the limits of flooding would be made to determine the extent of additional pavement needed to avoid scouring of the ford and pipeline during major floods. The CWRM staff has indicated that a stream alteration permit would not be required for this work (see Appendix D). The Army Corps of Engineers has indicated that these improvements could be permitted under its current Nationwide permits with the associated Section 401 (Clean Water Act) Water Quality Certification or waiver. The stream crossing design for the transmission main will be completed during final design in close cooperation with the State Department of Health, Clean Water Branch. Examples of the BMPs that may be used include limiting work to dry periods, constructing pipeline crossings in phases so that construction areas can be isolated from portions of the drainage channel that continue to handle through flows, and limiting the overall duration of construction work. No substantial impacts to the stream from these improvements would be anticipated.

Crossing of Kea'aulu Gulch. The access road crosses Kea'aulu Gulch within 100 feet of Kamehameha Highway. At this point, the gulch is actually a man-made ditch, and the access road at the crossing now has a partially collapsed 24-inch CMP culvert. Improvements at this crossing would include replacing the collapsed pipe culvert with a 36-inch pipe and providing grouted riprap on the slopes of the access road. The new 16-inch water main would be placed above or under the improved culvert. The change would not substantially alter drainage patterns. Because it would increase the ability of stormwater to pass beneath the road, it would decrease upstream flooding. No detailed hydraulic analysis has been conducted for the portion of the channel below the roadway crossing. However, the cross-section of the dug channel below the crossing is larger than the cross-section of the culvert beneath the roadway. Consequently, the downstream channel would be able to accommodate increased flow through the culvert. No CWRM permit is required, but a Corps of Engineers Nationwide Permit [with the associated Section 401 (Clean Water Act) Water Quality Certification or waiver] is likely to be needed.

Periodic Discharge of Water. During each pump start-up, water would be discharged to waste for the first five to seven minutes. At 700 GPM, this would amount to 3,500 to 5,000 gallons. This blow-off water would be directed into a drain system that would outlet to Mālaekahana Stream. Except during significant rainstorms when the streambed is actually carrying water, the periodic discharge from the wells would be lost to seepage in several hundred feet or less.

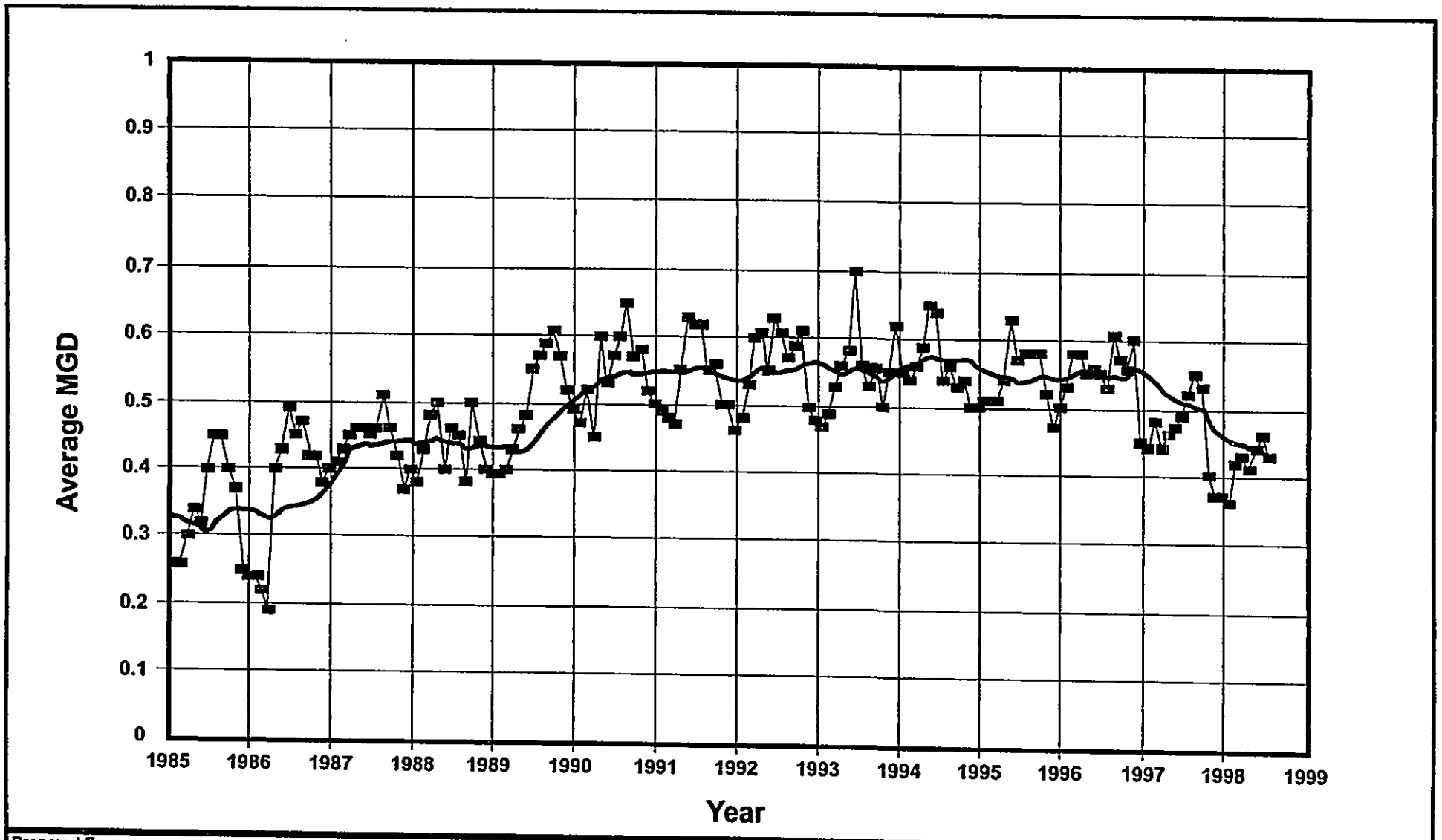
Effect on Flow in Mālaekahana Stream. All streams in the area, including Mālaekahana Stream, are intermittent, from low elevations to their upper reaches in the Ko'olau Mountains. Mālaekahana is a losing stream below an elevation of 400 feet. The water level in the basal aquifer that would supply the water for the Mālaekahana Production Wells is well below the level of stream, and the planned withdrawal of water is well below the rate that would be expected to lower the basal heads of the aquifer or impact its sustainable yield (Water Resources Associates 1997, p. 4-10 to 4-12). Consequently, operation of the proposed production well facility is not expected to decrease stream flow.

4.3.2 IMPACTS ON GROUNDWATER

Prospective Groundwater Use. Total pumpage by BWS to supply its Kahuku service area since 1985 is illustrated in Figure 4-1. It averaged about 0.55 MGD through most of the 1990s, although there was some decline below this rate in 1997-98. BWS intends to install 1.0-MGD capacity pumps in the two Mālaekahana wells as additional sources of supply for its Kahuku service area. Only one well pump would be operated at any one time, with the second acting as a standby back up system. These wells would increase the average-day supply capability of the entire Kahuku system from 0.44 to 0.88 MGD, assuming that one well at either site would always be on stand-by status.

Available Allocable Supply. As described previously in Section 3.4, approximately 15.4 MGD of the Ko'olauloa Aquifer System's sustainable yield of 35 MGD was unallocated as of May 1999. As such, a water use permit applicable for the Mālaekahana Production Wells can readily be accommodated from the unallocated supply. Even if the aquifer system were to be more closely regulated through the application of individual limits for the four sub-areas discussed in Section 3.4.2, there is sufficient unallocated supply within the Kahuku sub-area to accommodate the prospective use.

Impacts on Groundwater Use in the Mālaekahana Basin. As discussed previously, eight of the former Kahuku Plantation wells and well batteries in Mālaekahana are currently being used by lessees of Campbell Estate for various agricultural ventures. The total permitted use of these wells is 3.887 MGD (refer back to Table 3-1). Usage in the 1990s, as has been reported to the CWRM, has been in the range of 2.0 to 2.3 MGD (refer back to Figure 3-6). At the present rate of use, the quality of water pumped by the wells toward the inland margin of the coastal plain is better than it was during the peak plantation period.



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Source:
TNWRE Inc., July 13, 1999

Legend:
12-Month Moving Average
Monthly Average

Figure 4-1:

Board of Water Supply Pumpage of Wells 4057-15 & -16 in the Kahuku Service Area

Mālaekahana Production Wells

As the salinity profile on Figure 4-2 indicates, groundwater quality near the inland margin of the coastal plain is excellent. As one would expect, water from wells in the *makai* areas, which draw water from deeper beneath the coastal caprock, has higher salinity (see Table 4-1).

Table 4-1. Water Quality of Wells in the Mālaekahana Basin

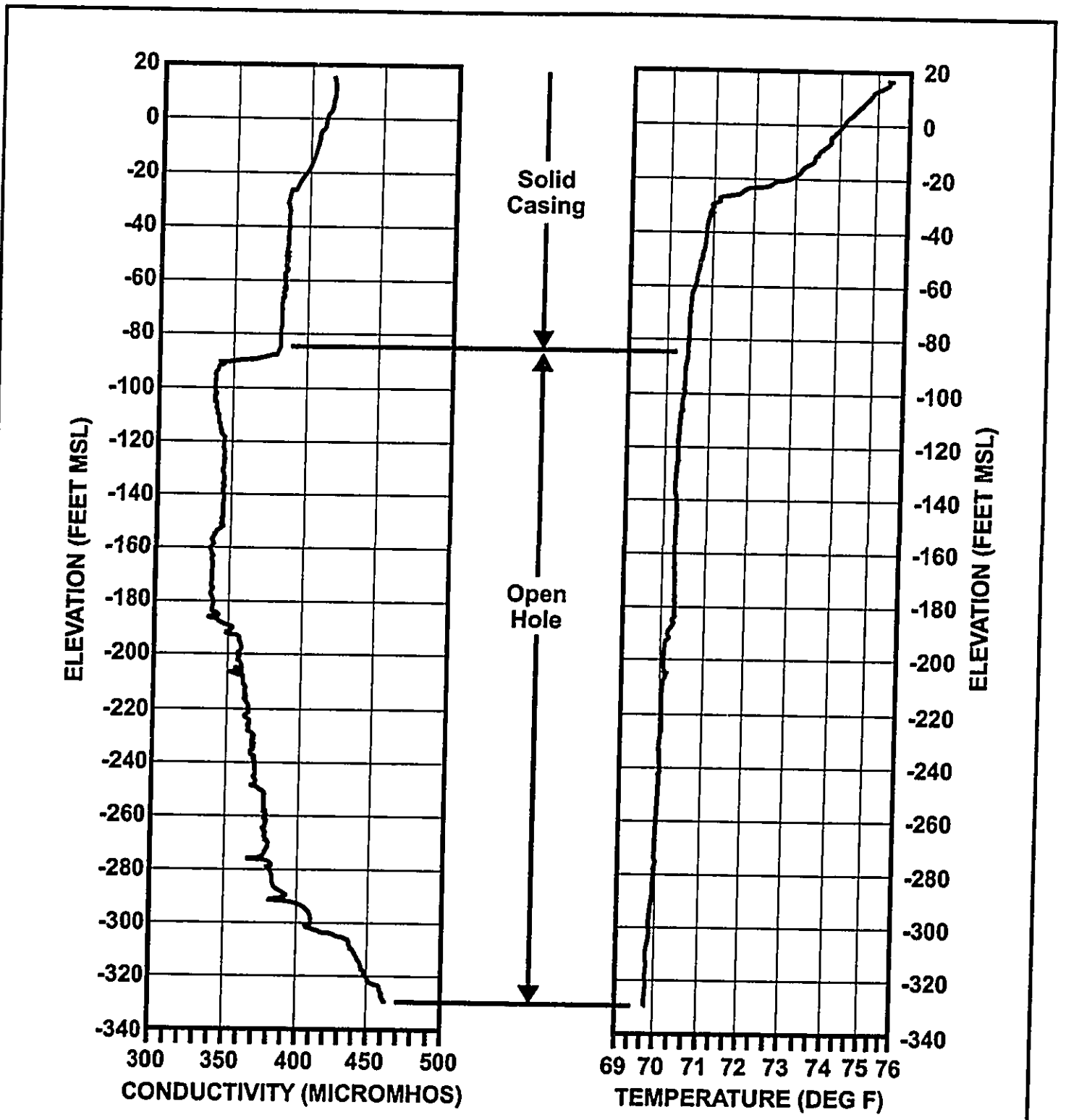
State Well No.	*Old Well No.*	*Current Chloride Level (MG/L)*	*Peak Chloride Level in the Plantation Era (MG/L)*
Inland Locations:			
3957-01	362-A	45	241
4057-07	361-A	70	133
4057-10	361-B	68	133
Makai Locations:			
3956-01	363	172	362
4057-06	357	550	1,283
BWS Mālaekahana Wells			
No. 1 (3957-08)	n.a.	30	n.a.
No. 2 (3957-09)	n.a.	28	n.a.

Notes:
1. Samples for the current levels in the "Inland" and "*Makai*" wells were taken on June 28, 1999 by TNWRE.
2. Peak chlorides in the plantation era were taken from the CWRM's *Hawaii Groundwater Index and Summary*.
3. Chlorides of the BWS wells are from their respective constant rate pump tests.

Source: Compiled by Tom Nance Water Resource Engineering.

Since all currently used wells in Mālaekahana are down gradient of the two BWS wells, the potential impact of BWS' pumpage on these makai wells must be considered. The historic record of pumpage and chlorides provides the best gage of this possible impact:

- In the three decades from 1940 to 1970, pumpage from wells in Mālaekahana averaged 6.4 MGD and reached a peak of 10 MGD in 1947. Total discharge by these wells was actually greater than this, since discharge from the free-flowing *makai* wells was not measured.
- Except for the lesser drafts from two wells closer to the shoreline (Nos. 3956-01 and 4057-06, Old Nos. 363 and 357), chlorides in this peak use period were generally in the range of 50 to 150 MG/L (Takasaki and Valenciano, 1969:39).
- In the latter part of the 1990s, usage has averaged 2.0 to 2.3 MGD or less than one-third of the peak period use. Chlorides today are generally lower because of this reduced use.



Prepared For:
City and County of Honolulu
Board of Water Supply

Prepared By:
PLANNING SOLUTIONS

Source:
TNWRE Inc., July 13, 1999

Figure 4-2:

Salinity and Temperature Profile Through Well 3957-04 in Mālaekahana

Mālaekahana Production Wells

- With the addition of BWS' Mālaekahana Production Wells, the total draft from this basin may ultimately be in the range of 3 to 4 MGD, less than one-half of the Kahuku Plantation's use in the 1940 to 1970 period. The quality of water from the wells that are down gradient from the proposed BWS can be expected to be at least as good, if not consistently better, than it was during the plantation period.

In summary, while there may be a very modest salinity increase in the down-gradient wells in Mālaekahana, water quality would still be more than adequate for the various agricultural uses.

4.4 CLIMATE AND AIR QUALITY IMPACTS

4.4.1 CONSTRUCTION PHASE

Only minor amounts of grading and excavation are contemplated as part of the project. This, and the fact that the work areas are a considerable distance from residential and other sensitive receptor sites, means that dust is unlikely to be a problem during construction.

4.4.2 OPERATIONAL PHASE

Normal operation of the proposed facilities would not produce on-site air emissions, would not alter airflow in the vicinity, and would not have other measurable effects on the area's microclimate. The electrical power consumed in the operation of the wells would require additional power generation (and, therefore, fuel consumption and gaseous emissions) by the Hawaiian Electric Company. The increase represents such a small portion of total power use that its effect would not be significant.

4.5 IMPACTS ON FLORA AND FAUNA

As discussed in Chapter 3, the vegetation on the well site, along the access road, and on the surrounding lands consists almost entirely of introduced or alien species. None of the plants is a listed, proposed, or candidate threatened or endangered species and none is considered rare and/or vulnerable. Consequently, construction and operation of the Mālaekahana Production Well Facility is not expected to have a significant adverse effect on flora.

Similarly, construction and operation of the facilities would not significantly affect fauna. This is due both to the limited extent of the land disturbance that would be required and to the absence of native land or water birds.

4.6 NOISE IMPACTS

4.6.1 CONSTRUCTION PHASE

Installation of the pumps, controls, driveways and parking areas, and other facilities on the well site would involve the operation of construction equipment such as trucks, backhoes, excavators, etc. Similar equipment would be used to make the specified improvements to the access road and to install the pipeline. Use of this equipment would be of short duration. Moreover, the facilities are located well away from existing and planned noise-sensitive uses.

For example, the well site is approximately 7,000 feet *mauka* of the nearest residential area, and the nearest part of the proposed electrical power line extension is approximately one mile from the closest home. Most of the access road improvements and pipeline are also removed from residential areas. Only at their *makai* end would the construction activities for the pipeline and roadway approach within a few hundred feet of the nearest residence.

Vehicular traffic along Kamehameha Highway is by far the most significant existing noise source affecting those residences. The noise that that would result from construction equipment installing the pipeline may exceed traffic noise for short periods.

Hawai'i Administrative Rules §11-46 (Community Noise Control) establishes noise limits for construction, agricultural, and industrial activities. The noise limits for "Class C Districts" [which §11-46-3(1) defines as "...all areas equivalent to lands zoned agriculture, country, industrial, or similar type], is 70 dBA between 7:00 a.m. and 10:00 p.m. and 70 dBA between 10:00 p.m. and 7:00 a.m. The comparable noise limits for "Class A Districts" (which would be relevant only for work on the pipeline close to the existing homes along Kamehameha Highway) are 55 and 45 dBA, respectively. The limits are applicable at the property line. Noise emissions in excess of this limit require a permit or variance from the Director of the Department of Health issued in accordance with HAR §11-46-7.

The BWS would require the contractor to limit construction work that has the potential to create noise levels in excess of 45 dBA in these residences to daytime hours. If the contractor finds it necessary to use equipment that creates noise levels in excess of the standard limits, the BWS would require it to obtain a permit from the Department of Health in accordance with the provisions of HAR §11-46-7. In view of the foregoing, no significant adverse construction noise impacts are anticipated.

4.6.2 OPERATIONAL PHASE

The permanent pumps and motors would operate quietly. Submersible pumps and motors would be used, limiting aboveground noise to the hum of the transformer. Consequently, the noise level at the well-site property boundary from this equipment is expected to be approximately 35 to 42 dBA when the well is in operation.[10]

4.7 IMPACT ON AQUATIC RESOURCES

As discussed in Section 3.3, the proposed water withdrawals would not alter flow in Mālaekahana Stream. Consequently, pumping does not have the potential to alter aquatic habitat.

The well access road crosses Mālaekahana Stream approximately 900 feet below the well site. The crossing is via an existing ford. Installation of the pipeline would involve excavation across the stream, the installation of the pipeline, and reconstruction of the ford. The area that would be affected is an artificial habitat that was extensively altered during construction of the ford and, before that by the construction of a railroad bridge over the

[10] This is based on an estimated 50 dBA at 50 feet less a minimum of 8-15 dBA attenuation from the walls of the structure within which the noisiest equipment is housed.

streambed. Consequently, the temporary disturbance that would occur during reconstruction of the ford is not likely to alter the stream habitat or water quality.

4.8 IMPACTS ON HISTORIC AND ARCHAEOLOGICAL FEATURES AND CULTURAL RESOURCES

The proposed facilities would be constructed on land that has been extensively disturbed by prior construction and by agricultural activities. As discussed in Chapter 3, there are no known historic or archaeological properties on the well site or within the access road right-of-way. Development of the wells would not change access to the site or to the nearby stream gulch. Consequently, the proposed project is not expected to adversely affect such resources.

Installation of the pipeline would entail excavation to a depth of approximately four feet. It is unlikely that such excavation will reveal previously unknown remains. Nonetheless, the BWS will require the contractor to suspend activities should this occur and notify the State Historic Preservation Division immediately.

4.9 IMPACTS ON SCENIC AND AESTHETIC RESOURCES

The planned production well facilities would not alter the existing visual character of the site. Topography and natural vegetation presently block views of the well facilities from Kamehameha Highway and from other vantage points open to the public. Access would be via an existing roadway, and the limited improvements that are planned to the upper portion of the roadway would not alter the overall appearance of the hillside. The additional utility poles and electrical conductor needed to extend power from its existing terminus to the well site would not be visible from areas accessible to the general public.

Installation of the pipeline between the well site and Kamehameha Highway would involve trenching and other construction activities. Work needed to install the portion of the pipeline closest to Kamehameha Highway and to connect the new line to the existing water main along the Highway would be visible to passing motorists for a period of one to two months. As discussed above, adequate measures would be included to mitigate noise, the generation of dust and traffic restrictions. Because the presence of work crews would be short-term and localized, no substantial impacts on scenic and aesthetic resources are anticipated.

4.10 IMPACTS ON LAND USE , POPULATION AND INFRASTRUCTURE

4.10.1 IMMEDIATELY ADJACENT LANDS

The proposed Mālaekahana production wells and the associated pipeline connecting them to the planned 12" water main presently under design and construction along Kamehameha Highway are intended to serve the needs of nearby Kahuku Town, including the high school and existing recreational and residential development around Mālaekahana Bay. The proposed facilities are compatible with the existing open space and agricultural uses of surrounding areas, and their installation and operation would not affect the viability of existing or planned land use on immediately adjacent areas. Neither would they affect the value of these lands.

4.10.2 REGIONAL LAND USE AND POPULATION

The availability of the water that the wells would provide would allow the BWS to meet the water demands of the Kahuku and Mālaekahana areas while still maintaining compliance with BWS standards for source capacity. These demands include water for the Mālaekahana State Recreation Area, planned school improvements in Kahuku, and residential units at Kahuku Villages.

The addition of the proposed wells to the Kahuku system would increase the overall capacity of the area's water system to meet planned future needs. This would remove water as a potential restraint on planned future development and population growth. The other constraints discussed below would remain, however. For reasons outlined in the following paragraphs, these would prevent the proposed infrastructure improvements from actually stimulating undesired growth.

The *O'ahu General Plan* designates the Ko'olauloa Development Plan Area as a rural area. It specifies that its natural resources and predominantly "country" character be maintained by allowing only limited development and by confining this growth to established communities. The *Draft Ko'olauloa Development Plan* forecasts that implementation of the *Draft Plan's* provisions would limit population growth within the entire Ko'olauloa Development Plan Area to 822 persons over the 25-year period from 1995 to 2020 (from 14,271 in 1995 to 15,093 in 2020). Less than 25 percent of these would be within the area that would be served by the Mālaekahana wells.[11]

Water from the Mālaekahana Production Wells would be priced in accordance with normal BWS rates. This is higher than the cost of the water presently available for agricultural users. Consequently, its availability would not stimulate growth in that sector of the economy.

4.10.3 ISLANDWIDE LAND USE AND POPULATION

The combined capacity of the BWS' existing Kahuku and proposed Mālaekahana Production Wells should accommodate the future needs of the BWS' Kahuku service area. However, BWS will only apply for permission to withdraw that amount of water that can be justified in a 4-year period.

The BWS wells in the Kahuku area are not presently connected to the remainder of the BWS system, and there are no plans to construct such connections. Water from these wells cannot be exported. Consequently, the availability of this water would not affect land use or population in other parts of the O'ahu. The IRP public participation process will evaluate the specific watershed needs and resources in the regional and islandwide perspective.

4.10.4 LOCAL INFRASTRUCTURE

As discussed above, the proposed development of the Mālaekahana wells as production wells would not lead to any development of the area that is not already envisioned in the

[11] The plan does not identify the exact geographic distribution of the growth. However, its discussion of rural residential development notes that: (*i*) 550 units have already been approved in Lā'ie (*ii*) 177 units have been approved in Kahuku, and (iii) other in-fill development is likely. If the population growth were distributed in line with these numbers (and if 100 in-fill units are assumed), the population of the area that would be served by the proposed wells would increase by approximately 175 persons over the 25-year period [(177+550+100)/827)*822 persons].

Ko'olauloa Sustainable Communities Plan. The wells would not cause, directly or indirectly, any substantial impacts on roads, electrical utilities, stormwater collection systems, and other infrastructure. The anticipated increase in municipal water use, described in the Plan and discussed above in Section 1.2.2, can easily be accommodated by the existing Kahuku Wastewater Treatment Plant, which was expanded in 1995-1996 to provide sufficient capacity for this anticipated growth through the year 2020.

4.11 IMPACTS ON ECONOMIC ACTIVITY

As described in Chapter 2 of this report, it is anticipated that construction of the proposed facilities would cost approximately $2.9 million (in 2000 dollars). It is estimated that between one-third and one-half of this (roughly $1. to $1.5 million) would be for labor, with equipment and materials purchases accounting for the remainder. Based on the average construction worker wages, this is equivalent to approximately 16 to 24 construction-worker years of employment.[12] Since the work force would be drawn from an islandwide labor pool, it would probably not have a substantial effect on the local economy. Local businesses may experience some increase in sales during the construction period as workers purchase goods and services in the area on their way to and from work.

[12] This is based on Average construction worker wages (in 1997) of $956/week, fringe benefits of 30%, and 49 weeks per year of work. These are reported in the *State of Hawai'i 1997 Data Book*, Table 12.26-- Hours and Earnings in Specified Industries: Annual Averages, 1992 To 1997.

CHAPTER 5 - ALTERNATIVES CONSIDERED

5.1 NO-ACTION ALTERNATIVE

"No Action" involves the Board of Water Supply (BWS) taking no action to increase the available water supply to meet the forecast demand. This is not a feasible alternative because it would not fulfill the mandate in the BWS Charter requiring it to provide the water needed by the people of the City & County of Honolulu. It could result in an unreliable system with the potential for water shortages that lead to restrictions on domestic water use, economic losses by businesses and industry, and adverse effects on crops and landscape plants that depend upon irrigation. For example, Kahuku Hospital recently dropped plans for a needed facility expansion, because it could not obtain the required water allocation when it was ready to begin construction. Since dropping the expansion plans, a poor local economy has led to an indefinite postponement for this needed improvement. For these reasons, the "No Action" alternative is not the preferred alternative.

5.2 ENHANCED WATER CONSERVATION ALTERNATIVE

The proposed new wells are intended to provide the water that the BWS needs to meet customer demand through the year 2020. The BWS has advocated conservation and efficient use of the island's water supply as the best means of balancing supply and demand since its establishment in 1929. It will continue these efforts. As discussed in several passages above, the BWS decision to develop the Mālaekahana Production Wells was made only after it determined that conservation measures alone would be insufficient to meet the needs of its customers.

The BWS' ongoing conservation program includes the following:

- Public Outreach & Education. The BWS assists schools with curriculum development, providing educational materials, arranging student tours, running an annual poster contest, providing a Teachers Water Conservation Calendar, arranging tours of the Fred Ohrt Water Museum, the Hālawa Shaft, and the Hālawa Xeriscape Garden.
- Water Conservation/Education & Publications. The BWS makes speakers available to community organizations and funds the Summer Conservation Media Program. It maintains an office of water conservation information/complaints and a water waste hotline. The BWS regularly provides the media with news releases and advisories on water emergencies and high water usage. It also operates landscape water conservation classes.
- Special Events. The BWS funds and staffs numerous special events. These include detect-a-leak week, water conservation week, booths at the Hawaii State Farm Fair and other trade shows, and exhibitions.
- Leak Detection and Water System Repair & Maintenance. The BWS constantly examines its system so that it can identify and repair leaks within its distribution system & storage facilities. It has standby crews who can begin immediate repairs of breaks in mains & fire hydrants.

- Maintenance and Repair of Aging Service Laterals. The BWS has a proactive program aimed at replacing aging system components (e.g., service laterals, fire hydrants, etc.) before they fail and wastewater.
- Meter-Reading/Billing Monitoring. The BWS monitor bills as a means of helping it identify unusually high water use that may be due to undetected leakage. It also reviews reports of seepage and other unusual occurrences that may indicate a malfunction in its system.
- Water Use Regulations. The BWS has also adopted (and enforces) rules designed to help it prevent wasteful water use practices. These rules empower BWS to discontinue water service to customers who waste the resource. It has similar rules governing use of non-potable water for irrigation of large landscaped areas, golf courses, parks, highways, and school playgrounds. The Board also has the power to impose restrictions on water use during periods of low rainfall and/or high consumption. It has supported State/County legislation requiring low-flush toilets and low-flow showerheads and fixtures.
- Alternate Source Development, Recycling, & Conservation. The BWS has encouraged the use of non-potable water sources for purposes that do not require water of potable quality. It has moved to develop non-potable sources (e.g., 'Ewa caprock aquifer) and recently purchased the Honouliuli Recycling Plant to re-use treated wastewater effluent and surface runoff. It has also installed and operated a pilot desalination facility.

The BWS will continue to fund, staff, and otherwise foster these conservation-related programs. However, it believes they will not eliminate the need for it to continue to develop additional water sources such as the Mālaekahana Wells.

5.3 OTHER WATER SOURCE DEVELOPMENT ALTERNATIVES

5.3.1 SOURCES IN OTHER AREAS

At present, no water mains exist that would allow water to be imported into the Kahuku/Mālaekahana area. Consequently, supplying it from sources in other areas would require the BWS to construct new water mains to import Hau'ula or Waiale'e water into Kahuku. The lengths of these new mains would be 4.2 and 3.0 miles, respectively.

In addition to the distance, other factors make connecting the systems impractical as well. The Hau'ula system's reservoir elevation of 180 feet is not compatible with the Kahuku system, with its supply located at 228'. Connecting the Kahuku/Mālaekahana area to the existing Waiale'e 228' water system serving the North Shore is impractical as well. Although the systems are compatible, the available sources are already fully committed and the transmission distances are substantial for such a relatively small demand.

5.3.2 SOURCES ELSEWHERE IN THE MĀLAEKAHANA AREA

It is likely that wells drilled in other parts of the Mālaekahana area would also be productive. However, the proposed project has several characteristics that make it unlikely that these alternatives would have substantially different environmental effects or be superior from an operational viewpoint. These include the fact that:

- The County already owns [has rights to] the proposed site, eliminating the need for additional property acquisition;
- The presence of the existing exploratory wells eliminates the need for additional drilling;
- There are no unique environmental characteristics of the site and access road alignment that make them particularly susceptible to adverse effects; and
- The wells' proximity to an existing access road minimizes the land disturbance and cost often associated with well development in Windward O'ahu.

5.3.3 INTEGRATED RESOURCE PLAN

As mentioned previously, the BWS is also preparing an *Integrated Resource Plan* (*IRP*). A comprehensive, balanced approach to water resource planning, the *IRP* process examines and evaluates the protection, conservation, and development of all water resources in the context of environmental and cultural issues. The *IRP* will also be used to update the next version of the *O'ahu Water Management Plan* (*OWMP*) as a comprehensive water plan that combines the various components of the *State of Hawai'i Water Plan.* Along these lines, the BWS is already developing and purveying different qualities of water for expanded uses, thereby conserving potable water where it is truly needed as a drinking source. Furthermore, a main *IRP* component to be utilized towards achieving this end is the public participation process. This consensus-building public participation process gives the community a say in their water future and is designed to foster support for the individual water projects that implement the overall umbrella plan.

As indicated previously, through the IRP process the BWS is looking at all potential water sources, including potable and non-potable groundwater, re-cycled wastewater, and desalinated water. However, alternate source projects are dependent not only on the availability of alternate sources to be developed, but also on the needs for these specific types of waters at acceptable costs to end users.

In examining the Mālaekahana/Kahuku area, there initially appear several likely candidates for alternate source projects. These include wastewater reuse from the Kahuku Sewage Treatment Plant for the nearby wetlands and irrigation at the Kahuku Golf Course, Kahuku High School, and the Kahuku District Park. There are also many acres of agricultural lands that could use non-potable water for irrigation. However, since the uses that could be served by the alternate source projects being considered are <u>not</u> presently drawing water from the BWS system and do <u>not</u> affect the forecast increase in demand, their implementation would not affect the need for the Mālaekahana Production Wells project.

Moreover, a closer examination of these alternate source projects reveals several problems that make their implementation difficult. Upgrading the sewage treatment plant to product acceptable water for these uses and construction of the required distribution system may be too expensive to be practical. Almost all of the existing agricultural lands are already using private, low-cost, on-site wells for irrigation (see Table 3-1 and Figure 3-4). BWS estimates that the maximum amount of potable water saved by using recycled water from an upgraded sewage treatment plant is only 35,000 gallons per day, less than 10 percent of the 400,000 gallons per day that BWS customers in the Kahuku are currently using for potable purposes.

Hence, the BWS believes that more study is needed and other options must be explored to make practical use of recycled water from the Kahuku Sewage Treatment Plant.

Meanwhile, the present demand for potable water continues to increase in the Kahuku Service Area, and the current supply remains a vulnerable, stand-alone system. While Integrated Resource Planning and conservation will provide for future savings of water on an islandwide basis, it appears unlikely that there will be any large direct savings within the Mālaekahana/Kahuku area. For these reasons, the alternate sources that are being investigated as part of the IRP process are not viable alternatives to the Mālaekahana Production Wells.

5.4 ALTERNATIVE TIME FRAMES

The BWS' present plans call for the wells and pipeline to be completed and brought into service by fiscal year 2003. Its decision to proceed on the present time schedule outlined in Chapter 2 is based on discussions with BWS staff.

The BWS is already moving with all due speed to bring the Mālaekahana Wells into production. In the absence of an emergency condition that would allow it to bypass normal budgeting and approval procedures, it is not possible to accelerate implementation of the proposed facilities. Consequently, developing the wells ahead of the present schedule is not practicable.

Delaying construction of the proposed facilities is possible. However, such a delay would leave the existing BWS system serving Kahuku and Mālaekahana below BWS design standards for capacity. This would leave the BWS unable to meet the needs of its customers in the event of unforeseeable problems with its present facilities.

CHAPTER 6 - CONSISTENCY WITH APPLICABLE PLANS & POLICIES

6.1 CONSISTENCY WITH EXISTING ZONING DESIGNATIONS

The wells, access road, pipeline, control building, and electrical and telecommunications service lines are located within the Hawai'i State Agricultural District. All are permitted uses within the State Agricultural District as defined in Hawai'i Administrative Rules (HAR) §205-4.5.

The City & County of Honolulu has zoned the project area AG-2 for general agricultural uses. Wells and appurtenant facilities are classified as Type A Utility Installations. Type A utility installations are permitted uses within the AG-2 District.

6.2 CONSISTENCY WITH THE O'AHU WATER MANAGEMENT PLAN (OWMP)

As discussed above (Section 1.1.3), the proposed developments are consistent with this plan and are specified in the January 1998, revision to the *OWMP* (Wilson Okamoto & Associates, Inc: January 1998) as one of the new water sources needed to provide sufficient potable water supplies for O'ahu's projected demand in the year 2020.

6.3 CONSISTENCY WITH THE KO'OLAULOA SUSTAINABLE COMMUNITY PLAN

As discussed above (Sections 1.1.2 and 0), the additional water supply that would be provided by the proposed developments is consistent with, and does not exceed the additional needs specified in, the latest draft of this plan. It is also consistent with the slow-growth policy espoused for the area in the *O'ahu General Plan*.

CHAPTER 7 - CONSISTENCY WITH APPLICABLE RULES

The proposed developments would be located outside the Special Management Area (SMA), and they do not involve the expenditure of Federal Funds. The wells themselves do not involve Federal permits or other approvals that would subject the project to the requirements of the Hawai'i Coastal Zone Management Program. However, the access road and pipeline involve a crossing of Mālaekahana Stream.

The crossing occurs in an area where there is normally no stream flow. The State Commission on Water Resource Management has indicated that the crossing does not require a stream-channel alteration permit. The U.S. Army Corps of Engineers (COE) has indicated that the crossing of the stream channel would require a Department of the Army permit. Based on the plans that were presented, the COE indicated that the pipeline could be installed and the existing roadway ford reconstructed under Nationwide Permit Nos. 3 (Maintenance), 12 (Utility Line Backfill & Bedding), and 14 (Road Crossing). These Nationwide Permits have the following associated approval requirements:

Table 7-1. US Army Corps of Engineers Nationwide Permits Approval Requirements

NWP No.	*Description*	*Approval Required*		
		Pre-Construction Notification	*Water Quality Certif.*	*CZM Consist. Certif.*
3	Maintenance	Y	C	Y
12	Utility Line Backfill & Bedding	Y	D	Y
14	Road Crossing	Y	C	D

Y = activities that require notification of the Corps before starting
D = individual review by State agencies required
C = 401 Water Quality Certification issued, but Best Management Practices and Water Quality Management Plan may be required.
N = Not Required

Source: Compiled by Planning Solutions, Inc. from Part 330 – Nationwide Permit Program Final Notice of Issuance and Modification of Nationwide Permits, *Federal Register* March 9, 2000. Note that these new regulations were adopted following completion of the *Preliminary Engineering Report* for the Mālaekahana Production Wells project.

In addition to these environmental permits, the construction of the proposed facilities would also require a number of ministerial permits. These include:

- Grubbing and grading and building permits from the City & County of Honolulu Department of Design & Construction;
- A variance for lot size from the City & County of Honolulu Department of Planning and Permitting;
- A Flood Determination review by the City & County of Honolulu Department of Planning & Permitting;

- A pump installation and water use permit from CWRM;
- A permit to perform work within a state highway (this assumes that the pipeline connection would be within the Kamehameha Highway right-of-way).

CHAPTER 8 - DETERMINATION

8.1 SIGNIFICANCE CRITERIA

Hawaii Administrative Rules (HAR) §11-200-11.2 establishes procedures for determining if an environmental impact statement (EIS) should be prepared or if a finding of no significant impact is warranted. HAR §11-200-11.2 (1) provides that proposing agencies should issue an environmental impact statement preparation notice (EISPN) for actions that it determines may have a significant effect on the environment. HAR §11-200-12 lists the following criteria to be used in making that determination:

> *In most instances, an action shall be determined to have a significant effect on the environment if it:*
>
> *(1) Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;*
>
> *(2) Curtails the range of beneficial uses of the environment;*
>
> *(3) Conflicts with the State's long-term environmental policies or goals as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders;*
>
> *(4) Substantially affects the economic or social welfare of the community or State;*
>
> *(5) Substantially affects public health;*
>
> *(6) Involves substantial secondary impacts, such as population changes or effects on public facilities;*
>
> *(7) Involves a substantial degradation of environmental quality;*
>
> *(8) Is individually limited but cumulatively has considerable effect on the environment or involves a commitment for larger actions;*
>
> *(9) Substantially affects a rare, threatened, or endangered species, or its habitat;*
>
> *(10) Detrimentally affects air or water quality or ambient noise levels;*
>
> *(11) Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters;*
>
> *(12) Substantially affects scenic vistas and viewplanes identified in county or state plans or studies; or,*
>
> *(13) Requires substantial energy consumption.*

8.2 FINDINGS

The potential effects of outfitting, testing, and operating the Mālaekahana Production Wells described earlier in this document were evaluated using these significance criteria. The findings with respect to each criterion are summarized below.

8.2.1 IRREVOCABLE LOSS OR DESTRUCTION OF VALUABLE RESOURCE

The proposed production well facilities would be constructed within the area that was graded during installation of the existing Mālaekahana exploratory wells. The proposed access road improvements are within the existing private road right-or-way, as is the water main that would connect the wells with the existing water line along Kamehameha Highway. None of these improvements involves the loss or destruction of any significant cultural or natural resources. The site would appear much the same following development as it does at present.

8.2.2 CURTAILS BENEFICIAL USES

Construction, testing, and operation of the proposed facilities would not curtail beneficial uses of the area. The water that would be withdrawn is a fraction of the developable yield of the aquifer. Its removal would not affect streamflow. While it would slightly reduce groundwater discharge into the ocean, this would not have a measurable effect on ocean or groundwater quality.

8.2.3 CONFLICTS WITH LONG-TERM ENVIRONMENTAL POLICIES OR GOALS

The proposed project is consistent with the State's long-term environmental policies and goals as expressed in Chapter 344, Hawaii Revised Statutes, and elsewhere in State law.

8.2.4 SUBSTANTIALLY AFFECTS ECONOMIC OR SOCIAL WELFARE

The proposed production well facilities are intended to provide a continuing supply of water to existing residents of the Kahuku and Mālaekahana areas. They would not have a substantial adverse effect on economic or social welfare except insofar as it allows the BWS to assure its customers that they will receive the potable water they need at the lowest price consistent with the maintenance of environmental quality.

8.2.5 PUBLIC HEALTH EFFECTS

The proposed project would not adversely affect air or water quality. Neither would it generate solid waste or produce other emissions that would have a significant adverse effect on public health.

8.2.6 PRODUCES SUBSTANTIAL SECONDARY IMPACTS

The proposed project would not produce significant secondary impacts. It is not designed to foster population growth or to promote economic development. The proposed facilities have the capacity to provide water in excess of the area's existing needs. The growth policies expressed in the *O'ahu General Plan* and in the *Draft Ko'olauloa Development* severely limit the amount of population growth that may occur in the area through the Year 2020. Consequently, the availability of this water is not expected to lead to substantial development within the BWS' Kahuku service area.

8.2.7 SUBSTANTIALLY DEGRADES ENVIRONMENTAL QUALITY

As discussed in Chapter 4 of this report, the proposed project would not have substantial long-term environmental effects.

8.2.8 CUMULATIVE EFFECTS OR COMMITMENT TO A LARGER ACTION

Construction and operation of the proposed facilities is not a commitment to a larger action and is not intended to promote population growth. While the facilities are part of a larger system, they are intended largely to increase the reliability of the system rather than to increase its overall capacity. The new wells would only provide for projected demands within the Kahuku Water Service System. BWS will apply for Water Use Permits only in response to clearly established needs in the community. The proposed development is not a commitment to any larger action

8.2.9 AFFECTS A RARE, THREATENED, OR ENDANGERED SPECIES

The proposed project would be constructed on land that has already been developed. It would not utilize a resource needed for the protection of rare, threatened, or endangered species.

8.2.10 AFFECTS AIR OR WATER QUALITY OR AMBIENT NOISE LEVELS

Construction and operation of the proposed well would not have a measurable effect on air or water quality. Neither would it have a long-term effect on noise levels. The project does have the potential to increase noise levels during the construction phase. Adequate mitigation measures would be taken to limit these to reasonable levels.

8.2.11 ENVIRONMENTALLY SENSITIVE AREAS

There are no environmentally sensitive areas or resources near the proposed project. The areas on which facilities would be developed are not subject to significant geologic hazards, such as earthquakes and lava flows. Portions of the access road pass through areas that are occasionally flooded. However, its construction would not affect the extent of the flooding or otherwise alter drainage.

8.2.12 AFFECTS SCENIC VISTAS AND VIEWPLANES

The proposed structures and equipment building are small and located far from areas to which the public has access. The site is not part of a designated scenic area. The proposed facilities would not significantly alter the visual character of the site or change views across it.

8.2.13 REQUIRES SUBSTANTIAL ENERGY CONSUMPTION

Operation of the wells would require electrical energy. The limited size of the electrical motors that drive the pumps means that they would not place a large peak load on the

electrical system. The relatively short distance that they must raise the water and the limited amount of water that they would produce mean that the regular pumping of water would not significantly alter energy use in the area.

8.3 DETERMINATION

This Final Environmental Assessment was prepared for review in accordance with the consultation process of Chapter 343, Hawai'i Revised Statutes. Based on the significance criteria set forth in Section 11-200-12 of Title 11, Chapter 200, Administrative Rules, the BWS has determined that the proposed project would not have a significant effect on the environment. A Finding of No Significant Impact (FONSI) has been filed with the State Office of Environmental Quality Control following the consultation period.

This determination is based on the absence of significant impacts associated with construction of the production facility. Short-term impacts resulting from construction activities would be minimized through the recommended mitigation measures and adherence to all government rules and regulations. No long-term impacts are anticipated from water withdrawal, as there is adequate sustainable yield available for the development. There are also no significant growth impacts, as the water would be used to support the planned development of the area as predicated by the City's development plans.

CHAPTER 9 - REFERENCES

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CHAPTER 10 - CONSULTATION

10.1 DRAFT ENVIRONMENTAL ASSESSMENT

The following agencies and organizations were consulted during the 30-day review period. Copies of comments received during the review period and the responses to them that have been developed by BWS are included in the following section. Agencies that provided responses are noted here with an asterisk after the agency's listing.

STATE AGENCIES

Office of Environmental Quality Control*
State Department of Agriculture*
Department of Defense
State Department of Health
State Department of Land and Natural Resources
State DLNR Historic Preservation Division*
State Department of Transportation*
Office of Hawaiian Affairs
UH Environmental Center*
UH Water Resources Research Center*

FEDERAL AGENCIES

US Fish and Wildlife Service
US Army Corps of Engineers

CITY AND COUNTY OF HONOLULU

Department of Design and Construction*
Fire Department*
Department of Planning & Permitting*
Department of Parks and Recreation
Department of Facility Maintenance
Department of Environmental Services

LIBRARIES AND DEPOSITORIES

Kahuku Public and School Library
State Main Library

NEWS MEDIA

Honolulu Advertiser
Honolulu Star Bulletin

ELECTED OFFICIALS

State Senator Bob Nakata
State Representative Colleen Meyer
State Representative Michael Magaoay
County Councilmember Steve Holmes
County Councilmember John Henry Felix, Chair, Committee on Planning and Public Safety
Maryanne Long, Chair, Ko'olauloa Neighborhood Board

10.2 FINAL ENVIRONMENTAL ASSESSMENT

Letters received commenting on this EA and the responses made to these letters are presented in the following section.

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

September 14, 2001

Dr. Charles L. Morgan
Planning Solutions Inc.
1210 Auahi St., Suite 221
Honolulu, Hawaii 96814

Dear Dr. Morgan:

RE: Malaekahana Production Wells Draft EA

Thank you for the opportunity to review the above Draft EA. At this time, the Department of Agriculture does not object to this project provided that there is no impact on the sustainable yield of our existing well (State Well Number 4057-01).

Sincerely,

James J. Nakatani
Chairperson, Board of Agriculture

c: BWS – Scot Muraoka
DLNR - CWRM

OCT-23-01 TUE 02:39 PM

FAX:

PAGE 1

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. AHI
HERBERT B.K. KAOPUA, SR.
BARBARA KIM STANTON

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

CLIFFORD S. JAMILE
Manager and Chief Engineer

October 16, 2001

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

Dear Mr. Nakatani:

Subject: Your Letter of September 14, 2001 Regarding the Malaekahana Production Wells Draft Environmental Assessment

Thank you for your letter regarding the Draft Environmental Assessment (DEA) for the Malaekahana Production Wells project.

We acknowledge that the Department of Agriculture does not object to this project provided that there is no impact on the sustainable yield of State Well 4057-01, which is located north of Kahuku Town. Sections 3.4.1 and 4.3.2 of the DEA discussed the use of the Malaekahana Wells which is not expected to have any substantial effects on this well due to the distance and direction of groundwater flow which generally moves perpendicular to the coast.

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

SM:ds
cc: S. Muraoka

(2)

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 11TH FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 523-4564 • Fax: (808) 523-4567
Web site: www.co.honolulu.hi.us

JEREMY HARRIS
MAYOR

RAE M. LOUI, P.E.
DIRECTOR

GEORGE T. TAMASHIRO, P.E.
DEPUTY DIRECTOR

ERIC G. CRISPIN, AIA
ASSISTANT DIRECTOR

WWDE.P 01-375

September 17, 2001

Mr. Charles Morgan
Planning Solutions, Inc.
1210 Auahi Street, Suite 221
Honolulu, Hawaii 96814

Dear Mr. Morgan:

Subject: Malaekahana Production Wells, DEA

We have reviewed the subject draft environmental assessment and have no comments. It is noted that there are no municipal wastewater facilities in the vicinity of the proposed production wells. The Laie Water Reclamation Facility, which is currently privately owned, may be taken over by the City. Some of the effluent from the facility is recycled for irrigation.

If there are any questions, please contact Richard Leong of our Wastewater Design and Engineering Division at 527-5863.

Very truly yours,

RAE M. LOUI, P.E.
Director

---

(2)

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

COPY

September 28, 2001

TO: MS. RAE M. LOUI, DIRECTOR
DEPARTMENT OF DESIGN AND CONSTRUCTION

FROM: CLIFFORD S. JAMILE, MANAGER AND CHIEF ENGINEER

SUBJECT: YOUR LETTER OF SEPTEMBER 17, 2001
REGARDING THE MALAEKAHANA PRODUCTION
WELLS DRAFT ENVIRONMENTAL ASSESSMENT

Thank you for your letter regarding the Draft Environmental Assessment for the Malaekahana Production Wells project.

We acknowledge that you have no comments to offer. We note that there are no municipal wastewater facilities in the vicinity of the proposed production wells and that the Laie Water Reclamation Facility, which is currently privately owned, may be taken over by the City.

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

cc: Charles Morgan, Planning Solutions

BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

BRIAN K. MINAAI
DIRECTOR

DEPUTY DIRECTORS
GLENN M. OKIMOTO
JADINE Y. URASAKI

IN REPLY REFER TO:

HWY-PS
2.4214

Mr. Charles L. Morgan
Planning Solutions
1210 Auahi Street, Suite 221
Honolulu, Hawaii 96814

Dear. Mr. Morgan

Subject: Draft Environmental Assessment, Malaekahana Productions Wells, Malaekahana, Oahu, TMK: 5-6-07: por. 01

Thank you for providing a copy of the subject Draft Environmental Assessment for our review.

We have the following comments:

1. The proposed conversion of exploratory wells to production wells and construction of appurtenant facilities will not impact Kamehameha Highway, our State facility.

2. Plans for construction work (i.e. connecting water mains) within the State highway right-of-way must be submitted for our review and approval. A permit will be required prior to commencing construction.

If there are any questions, please contact Ronald Tsuzuki, Head Planning Engineer, Highways Division, at 587-1830.

Very truly yours,

BRIAN K. MINAAI
Director of Transportation

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

October 19, 2001

JEREMY HARRIS, Mayor
EDDIE FLORES, JR.
CHARLES
JAN M.L.Y.
HERBERT S.K. KAOPUA, SR.
BARBARA KIM STANTON

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

CLIFFORD S. JAMILE
Manager and Chief Engineer

COPY

Mr. Brian K. Minaai, Director
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

Dear Mr. Minaai:

Subject: Your Letter (HWY-PS 2.4214) to Planning Solutions, Inc., Regarding Assessment for the Board of Water Supply's Proposed Malaekahana Production Wells Project

Thank you for your letter regarding the Draft Environmental Assessment for the proposed Malaekahana Production Wells project.

Construction plans for connecting the water main within the State highway right-of-way will be submitted for your review and approval. We understand a permit to work within the State right-of-way will be required prior to commencing construction.

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

Very truly yours,

for CLIFFORD S. JAMILE
Manager and Chief Engineer

cc: Charles Morgan, Planning Solutions, Inc.

(4)

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 10TH FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 523-4182 • FAX: 527-5725 • INTERNET: www.co.honolulu.hi.us

JEREMY HARRIS
MAYOR

WILLIAM D. BALFOUR, JR.
DIRECTOR

EDWARD T. "SKIPPA" DIAZ
DEPUTY DIRECTOR

September 24, 2001

Mr. Charles Morgan
Planning Solutions, Inc.
1210 Auahi Street
Honolulu, Hawaii 96814

Dear Mr. Morgan:

Subject: Malaekahana Production Wells
Draft Environmental Assessment/Anticipated Finding of No Significant Impact

Thank you for the opportunity to comment on the Board of Water Supply's proposal to convert the two existing exploratory wells at Malaekahana into productions wells.

The proposed project will not impact the Department of Parks and Recreation programs or facilities. We request that we be deleted as a consulted party to the environmental impact process.

Should you have any questions, please contact Mr. John Reid, Planner, at 547-7396.

Sincerely,

W. D. Balfour, Jr.

WILLIAM D. BALFOUR, JR.
Director

WDB:cu (3814)

cc: Mr. Don Griffin, Department of Design and Construction

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

December 12, 2001

JEREMY HARRIS, Mayor
EDDIE FLORES, JR., Chairman
CHARLES A. STEED, Vice Chair
JAN M.L.Y. AMI
HERBERT S.K. KAOPUA, SR.
BARBARA KIM STANTON

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

CLIFFORD S. JAMILE
Manager and Chief Engineer

COPY
(4)

TO: WILLIAM D. BALFOUR, JR., DIRECTOR
DEPARTMENT OF PARKS AND RECREATION

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

SUBJECT: YOUR MEMORANDUM OF SEPTEMBER 24, 2001 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE BOARD OF WATER SUPPLY'S PROPOSED MALAEKAHANA PRODUCTION WELLS

Thank you for reviewing the Draft Environmental Assessment for the proposed Malaekahana Production Wells project.

We acknowledge that the proposed project will not impact the Department of Parks and Recreation programs or facilities. As requested, your agency will be deleted as a consulted party to this environmental review process.

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

cc: Perry White, Planning Solutions, Inc.

FIRE DEPARTMENT
CITY AND COUNTY OF HONOLULU
3375 KOAPAKA STREET, SUITE H425 • HONOLULU, HAWAII 96819-1869
TELEPHONE: (808) 831-7761 • FAX: (808) 831-7750 • INTERNET: www.co.honolulu.hi.us

(5)

JEREMY HARRIS
MAYOR

ATTILIO K. LEONARDI
FIRE CHIEF

JOHN CLARK
DEPUTY FIRE CHIEF

September 26, 2001

Mr. Charles L. Morgan
Planning Solutions Inc.
1210 Auahi Street, Suite 221
Honolulu, Hawaii 96814

Dear Mr. Morgan:

Subject: Draft Environmental Assessment
Malaekahana Production Wells

We received your letter dated September 4, 2001, regarding the City and County of Honolulu Board of Water Supply's Malaekahana Production Wells. The Honolulu Fire Department has no objection to the proposal to convert the two existing exploratory wells into production wells.

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

Sincerely,

Attilio K. Leonardi

ATTILIO K. LEONARDI
Fire Chief

AKL/SK:jo

cc: Scot Muraoka, Board of Water Supply

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

October 11, 2001

(5)

COPY

TO: ATTILIO K. LEONARDI, FIRE CHIEF
FIRE DEPARTMENT

FROM: BJ SW CLIFFORD S. JAMILE, MANAGER AND CHIEF ENGINEER

SUBJECT: YOUR LETTER OF SEPTEMBER 26, 2001 TO PLANNING SOLUTIONS, INC. REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE BOARD OF WATER SUPPLY'S PROPOSED MALAEKAHANA WELLS

Thank you for your letter regarding the Draft Environmental Assessment for the proposed Malaekahana Wells project.

We acknowledge that the Honolulu Fire Department has no objections to the proposed project.

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

cc: ✓Charles Morgan, Planning Solutions, Inc.

(6)

UNIVERSITY OF HAWAI'I
ENVIRONMENTAL CENTER

A UNIT OF THE WATER RESOURCES RESEARCH CENTER

October 8, 2001
EA: 0273

Mr. Scot Muraoka
City and County Board of Water Supply
630 South Beretania Street
Honolulu, HI 96813

Draft Environmental Assessment
Malaekahana Production Wells
Ko'olauloa, Oahu

The City and County Board of Water Supply (BWS) proposes to convert two existing exploratory wells to production wells. One well would be availible at all times, and the other would be used as a stand-by well. In addition to the wells, the BWS proposes to construct access road improvements, pipeline connections, a control building, and other ancillary facilities needed to convert the exploratory wells into production wells. The two wells would increase the capability of the Kahuku system to .88MGD. The estimated cost of the project is $2.9 million. The purpose of the project is to enable the BWS to meet the forecasted domestic water needs for the area.

This review was conducted with the assistance of Roger Babcock, Civil Engineering; and Renee Thompson, Environmental Center.

General Comments

In general, we find the EA to be very well written and comprehensive in its approach to many issues. We concur that this project seems beneficial with minimal potential impacts, and that groundwater resources apparently will not be affected adversely. We do note that contrary to the statement on Page 1-1 that in-stream flow standards have not been set for Windward O'ahu streams, four streams in the Wai'ahole watershed have received such standards.

Wastewater

The project would not appear to affect wastewater. However, one of the stated objectives is to increase water system capacity for planned growth, and this will lead to production of more wastewater and perhaps to expansion of wastewater treatment facilities at the Kahuku WWTP. In this sense, there is a secondary impact on public facilities and/or a commitment to larger actions. The WWTP already may have adequate capacity for the planned growth described, but this is not discussed in the draft EA. Some consideration of this potential secondary effect should be included in the final EA.

KAHUKU ANNEX 18 • 2500 DOLE STREET • HONOLULU, HAWAII 96822 • (808) 956-7361 • FAX (808) 956-3980

Chlorination Facilities

The draft EA mentions on page 2-4 that there will be an automatic cholrination system, and Figure 2-3 depicts the pump control structure including three rooms dedicated to chlorination facilities. We were unable to find these facilities discussed anywhere else in the document, but in view of common issues regarding chlorination, some further discussion is warranted. Questions to be addressed include, but are not limited to the following:

- Will chlorine be added all the time? If so, then chlorine probably will be delivered monthly, raising issues of transportation safety, noise, etc. Chlorine usually is supplied in pressurized cylinders which require safe handling procedures to be followed to ensure protection of workers and the public.
- We have concerns related to the presence of pressurized chlorine systems in remote locations that are not visited often. Does the BWS intend to install alarms that will notify personnel of a leak? Will there be on-site self-contained breathing apparatus available for emergency repairs? What will be the expected response time to a detected leak?
- Many Hawaii facilities do not conform to Uniform Fire Code requirements for such facilities, which specify automatic systems for ventilation and chlorine gas detoxification (scrubbing). The plume from a catastrophic release of chlorine is heavier than air, and it could kill animals and/or humans if they came in contact with it.
- We assume that pump blow-off water (3500-5000 gallons generated each time pumps start that will be directed to dry Malaekahana stream) will not be chlorinated, otherwise there are potential impacts to be considered.

In view of the foregoing questions, our reviewers suggest that a fairly thorough discussion of the chlorine issues is needed (i.e., how much will be stored on site? Will it be used all the time? What safety equipment will be provided? Will the facility be open to the atmosphere? Will an approved chlorine scrubber be used? What types of alarms will be included and what emergency response time is expected?)

Thank you for the opportunity to review this draft Environmental Assessment.

Sincerely,

John T. Harrison, PhD.
Environmental Coordinator
Environmental Center

cc: OEQC
James Moncur, WRRC
Clifford Jamile, BWS
Charles Morgan, Planning Solutions, Inc.
Renee Thompson

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

November 19, 2001

COPY 6

John T. Harrison, Ph.D.
University of Hawaii
Environmental Center
Krauss Annex 19
2500 Dole Street
Honolulu, Hawaii 96822

Dear Dr. Harrison:

Subject: Your Letter of October 8, 2001 Regarding the Draft Environmental Assessment for the Board of Water Supply's Proposed Malaekahana Production Wells

Thank you for your letter regarding the Draft Environmental Assessment (EA) for the proposed Malaekahana Production Wells project.

We have the following response to your concerns:

1. General Comments

   The Final EA will indicate that four streams in the Wai'ahole and Kahana watersheds will be assigned interim in-stream flow standards upon approval of the Commission on Water Resource Management on page 1-1.

2. Wastewater

   The Final EA will indicate that the Kahuku Wastewater Treatment Plant has adequate capacity to accommodate the planned growth that the Malaekahana Wells will serve. The Koolauloa Sustainable Communities Plan indicates a population of 4,900 in Kahuku by the year 2020. The required wastewater system treatment and disposal capacity for this population will be an average of 400,000 gallons per day.

3. The following discussion of the chlorination system will be added to Section 2.2.2 of the Final EA:

   Chlorination System

   The control building will house a potable water chlorination system which will use a 12.5 percent sodium hypochlorite solution rather than the chlorine gas used in many of the Board of Water Supply's existing facilities. Sodium hypochlorite is the basic ingredient in household bleach, and its use eliminates potential hazards associated with the use of chlorine gas.

The sodium hypochlorite solution would be delivered to the well site in drums. The proposed system would consist of chlorine solution metering pumps, pump control panel, pump stand, "no flow" monitoring device, tubing, valves, a chlorine solution injection assembly, and a polyethylene storage tank. The system would deliver a chlorine dose ranging from 0.1 to 1.0 mg/l to the discharge pipe downstream of the pump discharge piping. Therefore, the pump blow-off water will not be chlorinated prior to discharge. The chlorination system would operate whenever the wells are operating. The automatic control system for the well would deactivate the well pumps if there is any malfunction of the chlorine metering pumps.

Sodium hypochlorite in aqueous solution is a clear, green-yellow liquid with the odor of household bleach. The solution is not flammable and not explosive. However, fire-fighters are advised to wear self-contained breathing apparatus when fighting fires in the vicinity of the material. If the solution gets in workers eyes, it can cause burning and/or irritation; contact with skin can cause burns and irritation. In addition to safety goggles, the control room would contain an eyewash system and shower that personnel could use in the event of inadvertent exposure to the sodium hypochlorite solution. It would also be ventilated to the outside. The U.S. Department of Transportation (DOT) classifies sodium hypochlorite as a corrosive material, and containers over four gallons must be properly labeled to ensure safe handling. Transportation of hypochlorite solution is regulated by DOT (Classification Class 8 (9.2) UN: 1791 PG: III).

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: Charles Morgan, Planning Solutions, Inc.

BENJAMIN J. CAYETANO
GOVERNOR

(7)

GENEVIEVE SALMONSON
DIRECTOR

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

October 5, 2001

Mr. Clifford 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: Draft EA for the Malaekahana Production Wells, Oahu

Thank you for the opportunity to review the subject document. We have the following comments.

1. Please include maps that show the points of known contamination and points of potential contamination (landfills, individual wastewater disposal systems) in relation to nearest or adjacent wells.

2. Please provide a record of contamination problems in the aquifer or hydrologic unit including but not limited to heavy metals, inorganic and organic chemicals, microbiological agents, and radioactivity. If contamination exists, the sources and duration of the contamination should be listed. Water quality data from nearby wells should be presented as well as any anticipated need for treatment or filtering systems. Discuss past and existing land uses within the likely wellhead protection area and the potential for future contamination from those uses.

   The potential for contamination should be assessed based on geologic and hydrologic considerations. Although sources of contamination might be presently absent, vulnerability to contamination might be great, if contamination sources occur in the future, due to factors such as high rates of infiltration or thin, protective soil horizons.

3. This environmental assessment is generally well prepared. We appreciate the good work.

Should you have any questions, please call Jeyan Thirugnanam at 586-4185.

Sincerely,

Genevieve Salmonson
Director

c: Planning Solutions

12/19/01 15:48 FAX 5276193 BWS ENGINEERING

@0:

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. AHU
HERBERT S.K. KAOPUA, SR.
BARBARA KIM STANTON

(7)

BRIAN K. MINAAI, Ex-Officio
NOBLE S. SASAKURA, Ex-Officio

CLIFFORD S. JAMILE
Manager and Chief Engineer

December 20, 2001

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

Dear Ms. Salmonson:

Subject: Your Letter of October 5, 2001 Regarding the Draft Environmental Assessment for the Board of Water Supply's Proposed Malaekahana Production Wells, Oahu

Thank you for your letter regarding the Draft Environmental Assessment for the proposed Malaekahana Production Wells project.

We have the following response to your concerns:

1. There are no points of known contamination near the proposed Malaekahana Wells site. The Malaekahana Wells site is located over 4,000 feet upgradient from the nearest agricultural fields, the closest potential source of contamination through the application of pesticides, herbicides and other agricultural chemicals. The nearest homes with individual wastewater treatment systems are located in Kahuku Town and around Malaekahana Bay, both of which are distant and seaward from the well site. The Kahuku Wastewater Treatment Facility is located makai of Kamehameha Highway. There are no landfills located in the area. In all cases, these potential sources of pollutants are downgradient with respect to groundwater flow from the Malaekahana Wells.

2. There is no record of contamination problems in the aquifer or hydrologic unit in which the wells are located. The water quality data from our adjacent Kahuku Wells which tap the same aquifer as the proposed Malaekahana Wells is enclosed for your use. We do not anticipate the need for treatment or filtering systems for the Malaekahana Wells. Historically, the land in Malaekahana has been used for dry land agricultural cultivation and ranching. Presently, secondary forest growth with grassy areas, low shrubs and mature trees cover the project area. The Malaekahana Wells were sited to avoid contamination.

The well will comply with the Department of Health Chapter 11-29-20, Engineering Reports for certifying water sources for public use.

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

Enclosures

cc: Charles Morgan, Planning Solutions, Inc.

SM:js
cc: S. Muraoka

WR-174/01
01-1660

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

2001/CLOG-3734 (TH)

October 10, 2001

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

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

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT FOR THE MALAEKAHANA PRODUCTION WELLS, KAHUKU, TAX MAP KEY 5-6-007:001 PORTION

We have reviewed the Draft Environmental Assessment (DEA) and offer the following comments.

1. The two proposed 1.0 million gallon per day (mgd) potable water wells would implement the long range land use and development policies of the General Plan and Koolauloa *Sustainable* Communities Plan.

   The proposed project addresses the need to develop and maintain an adequate supply of water for residents and visitors as cited in Chapter V Transportation and Utilities, Objective B, Policy 1 of the General Plan.

   Section 4.2 of the Koolauloa *Sustainable* Communities Plan stresses the protection, preservation and conservation of the region's ground and surface water resources. Further, the water needs of Koolauloa should be met first and the transmission of water out of the region should not be detrimental to Koolauloa.

   The proposed project will be part of the Kahuku Water system (which includes the Kahuku Wells 1 & 2 and 0.5 mg reservoir) that only serves Kahuku and Malaekahana. The Kahuku Water System is an isolated system that is not connected to other Board of Water Supply (BWS) water systems in adjacent communities. Groundwater pumped from the new wells will only serve Kahuku and Malaekahana and cannot be transported out of Koolauloa. The addition of two new potable water wells in Koolauloa should not adversely impact the region's ground or surface water resources.

   The Koolauloa Sustainable *Communities* Plan was adopted as Ordinance 99-72 and took effect on February 14, 2000. Therefore, Section 1.2.2 of the DEA should be revised by deleting the term "current draft."

2. In May 2001, the BWS submitted an application to revise the Koolauloa Public Infrastructure Map (PIM) for the proposed project. A revision to the Koolauloa PIM is necessary because publicly funded potable water wells are required to be shown on the PIM in accordance with Section 4-8.3 Revised Ordinances of Honolulu, 1993, as amended. The proposed revision and draft resolution have been forwarded to the City Council for review and action.

3. The proposed project is also included in the draft BWS July 1, 2001 to June 30, 2007 Six Year Capital Improvement Program (CIP) which we reviewed in June 2001. In our memorandum to the BWS of July 5, 2001 regarding the draft CIP, we noted that the proposed Malaekahana Wells project a PIM revision in progress. Once this PIM revision and other projects are approved, the proposed project will be consistent with the PIM.

4. The proposed project site is currently zoned AG-1 Restricted Agricultural District, AG-2 General Agricultural District, and R-5 Residential District. The well site is in the AG-2 General Agricultural District, and the access road is in the AG-1 Restricted Agricultural District and the R-5 Residential District. However, potable water wells are considered utility installations and are permitted uses in any zoning district. Therefore, a zone change will not be required.

Thank you for the opportunity to comment on this matter, should you have any questions, please contact Tim Hata of our staff at 527-6070.

RKF:lh

cc: Managing Director

g:/dlw/general/cpd/Eis/2001/mk/bmadea.doc

BOARD OF WATER SUPPLY

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

November 2, 2001

TO: RANDALL K. FUJIKI, AIA, DIRECTOR
DEPARTMENT OF PLANNING AND PERMITTING

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

SUBJECT: YOUR MEMORANDUM OF OCTOBER 10, 2001 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE BOARD OF WATER SUPPLY'S PROPOSED MALAEKAHANA PRODUCTION WELLS, KAHUKU, TMK: 5-6-007: PORTION 001

Thank you for your memorandum regarding the Draft Environmental Assessment (EA) for the proposed Malaekahana Production Wells project.

We have the following response to your comments:

1. We acknowledge the water resources language within the Koolauloa Sustainable Communities Plan and its adoption as Ordinance 99-72 effective on February 14, 2000. The term "current draft" will be deleted from Section 1.2.2 of the Final EA.

2. The Koolauloa Public Infrastructure Map (PIM) revision and draft resolution for the proposed project is still in the adoption process. Upon PIM approval, the proposed project will be consistent with the PIM.

3. We acknowledge that a zoning change will not be required since potable wells are considered utility installations and are permitted uses in any zoning district.

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

cc: Charles Morgan, Planning Solutions, Inc.

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

(9)

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

DEPUTIES
JANET E. KAWELO
LINNEL NISHIOKA

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

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

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND
STATE PARKS

October 25, 2001

Mr. Charles L. Morgan
Planning Solutions, Inc.
1210 Auahi Street, Suite 221
Honolulu, Hawaii 96814

LOG NO: 28421
DOC NO: 0110SC29

Dear Mr. Morgan:

SUBJECT: Chapter 6E-8 Historic Preservation Review of a Draft Environmental Assessment (DEA) for the Proposed Malaekahana Production Wells Project
Keana-Malaekahana, Ko`olauloa, O`ahu
TMK: (1)-5-6-007: 001

Thank you for the opportunity to review and comment on the DEA prepared for the proposed Malaekahana Production Wells Project, to be carried out the City and County of Honolulu's Board of Water Supply (BWS) near Kahuku, O`ahu. The BWS plans to install a 1.0 MGD pump in each of the two, existing exploratory wells. In addition, a control building, a driveway, and ancillary facilities will be constructed. Finally, the BWS plans to upgrade the existing access road and install a 16-inch transmission main within the existing access road to connect the existing wells to a 12-inch water main along Kamehameha Highway. Our review is based on historic maps, aerial photographs, records, and reports maintained at the State Historic Preservation Division; no field inspection was made of the proposed project area.

We previously determined that construction of the exploratory wells would have "no effect" because the well site was located on an old sugar cane field. As noted in the DEA, the reconnaissance survey further established that prior, extensive ground disturbance had taken place through bulldozing and grading. The existing access road extends through former sugar cane fields and appears to be within the corridor of a former cane road. Consequently, we believe that the proposed improvements will have "no effect" on significant historic sites.

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

Aloha,

DON HIBBARD, Administrator
State Historic Preservation Division

SC:jk

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

COPY
(9)

November 9, 2001

Mr. Don Hibbard, Administrator
State Historic Preservation Division
Department of Land and Natural Resources
State of Hawaii
Kekuhihewa Building, Room 566
601 Kamokila Boulevard
Kapolei, Hawaii 96707

Dear Mr. Hibbard:

Subject: Your Letter of October 25, 2001 to Planning Solutions, Inc. Regarding the Draft Environmental Assessment for the Board of Water Supply's Malaekahana Production Wells Project, Malaekahana, Koolauloa, Oahu, TMK: 5-6-07: 001

Thank you for reviewing the Draft Environmental Assessment for the proposed Malaekahana Production Wells project.

We acknowledge that the proposed project should have "no effect" on any significant historic sites. Based on the archaeological reconnaissance survey, extensive ground disturbance had previously taken place through bulldozing and grading and the existing access road extends through former sugar cane fields.

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

Very truly yours,

CLIFFORD S. JAMILE
Manager and Chief Engineer

cc: Charles Morgan, Planning Solutions, Inc.

APPENDIX A. FLORA SURVEY

CHAR & ASSOCIATES
Botanical / Environmental Consultants
4471 Puu Panini Ave.
Honolulu, Hawaii 96816
(808) 734-7822

December 1995

BOTANICAL RESOURCES ASSESSMENT
MALAEKAHANA WELL SITE
KO'OLAU LOA DISTRICT, ISLAND OF O'AHU

INTRODUCTION

At the request of the Honolulu Board of Water Supply and Water Resources Associates, a botanical assessment study was conducted for the proposed Malaekahana exploratory well site on 13 November 1995. The dimensions for the exploratory well site are roughly 100 ft. by 200 ft. An overgrown dirt road will be improved to provide access to the site. The well site is located at about 200 ft. elevation near the Malaekahana Stream in disturbed secondary forest composed largely of Java plum trees.

The primary objectives of the botanical assessment study were to describe the vegetation on and immediately surrounding the proposed well site and along the access road, and to search for threatened and endangered species as well as rare and vulnerable plants. A walk-through survey method was used. Notes were made on plant associations and distribution, substrate types, topography, past disturbances, etc. Plant identifications were made in the field; plants which could not be positively identified were collected for later determination in the herbarium (University of Hawai'i, Manoa - HAW), and for comparison with the most recent taxonomic

literature. The plant names used in the following discussion follow Wagner et al. (1990).

DESCRIPTION OF THE VEGETATION

The vegetation on the exploratory well site, along the access road, and on the surrounding lands is composed almost exclusively of introduced or alien species. Trees of Java plum (Syzygium cumini) along with smaller stands of Formosan koa (Acacia confusa) and Macaranga tanarius form a secondary forest, 18 to 25 ft. tall. Occasionally, stands of taller, old mango trees (Mangifera indica) can be found, especially closer to the stream area. Beneath the trees, shrubs of koa-haole (Leucaena leucocephala) and guava (Psidium guajava) form a second layer, 12 to 15 ft. tall. Other shrubs which occur here in lesser numbers include Christmas berry (Schinus terebinthifolius), two species of pluchea (Pluchea indica and P. symphytifolia), lantana (Lantana camara), and clidemia (Clidemia hirta). A few ti or ti leaf plants (Cordyline fruticosa) can be found scattered here and there.

Ground cover consists of smaller shrubs or subshrubs, grasses, and herbaceous species. Nettle-leaved vervain (Stachytarpheta urticifolia), a small shrub up to 3 ft. tall and a native of tropical Asia with rugose leaves and dark purple flowers, is locally abundant on the well site. Hilo grass (Paspalum conjugatum) is abundant throughout the well site and along the access road. Small patches of carpetgrass (Axonopus fissifolius) can be found associated with the Formosan koa trees. Spanish clover or ka'imi (Desmodium incanum) is common to abundant throughout the whole area. Other plants found here in smaller numbers include sour grass (Digitaria insularis), Asiatic pennywort (Centella asiatica), niruri (Phyllanthus debilis), hairy horseweed (Conyza bonariensis), yellow woodsorrel (Oxalis corniculata), Chinese violet (Asystasia gangetica), etc.

DISCUSSION AND RECOMMENDATIONS

The vegetation on the proposed exploratory well site, along the access road, and the surrounding area is dominated by introduced species such as Java plum, koa-haole, guava, Hilo grass, etc. Introduced or alien species 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. During the field survey, two native species were observed, but outside of the project site on a nearby hill. One plant of 'ulei (Osteomeles anthyllidifolia) and one plant of 'akia (Wikstroemia oahuensis) were found. Both species are fairly common, occuring in similar habitats throughout O'ahu and some of the other islands.

None of the plants found during the field study is a listed, proposed, or candidate threatened and endangered species (U.S. Fish and Wildlife Service 1994a, 1994b, 1995); nor is any plant considered rare and vulnerable (Wagner et al. 1990). There are no sensitive native plant-dominated vegetation types on the well site, access road, or immediately adjacent areas. This is not surprising as the heavily urbanized island of O'ahu has the lowest percentage of forest cover among the four largest Hawaiian Islands. Because of invasion by introduced plant species and the detrimental activities of feral pigs, most of the lowland wet zone does not support large areas dominated by undisturbed native forests, especially on the older, more dissected islands such as O'ahu (Cuddihy and Stone 1990). During the field study, we noted that many areas had been bulldozed and graded as well as fenced. There was evidence of horses grazing recently in the study area.

Given the findings above and the limited nature of the project, the proposed exploratory well site and improvements to the existing access road should not have a significant negative

impact on the botanical resources. There are no botanical reasons to impose any restrictions, conditions, or impediments to the proposed project. It is recommended, however, that areas disturbed by the project be grassed over as soon as possible to prevent soil erosion. Hilo grass which is already quite abundant on the site could be used for revegetation.

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APPENDIX B. FAUNA SURVEY

AVIFAUNAL AND FERAL MAMMAL SURVEY FOR A BOARD OF WATER SUPPLY EXPLORATORY WELL SITE AT MALAEKAHANA, OAHU

Prepared for

Water Resource Associates

by

Phillip L. Bruner
Assistant Professor of Biology
Director, Museum of Natural History
BYU-Hawaii
Environmental Consultant - faunal (Bird & Mammal) Surveys

6 December 1995

INTRODUCTION

The purpose of this report is to summarize the findings of a two day (13,18 November 1995) bird and mammal field survey of a proposed well site at Malaekahana, Oahu (Fig. 1). Also included are references to pertinent literature.

The objectives of the field survey were to:

1- Document what bird and mammal species occur on and near the property, or may likely be found there given the type of habitats available.

2- Determine the presence or likely occurrence of any native fauna, particularly any that are considered "Endangered" or "Threatened".

3- Evaluate the quality of the habitats for native wildlife and note any special or unique resources that might be adversely impacted by the proposed development.

GENERAL SITE DESCRIPTION

Figure One indicates the location of the area surveyed for birds and mammals. The habitat on and around the site proposed for the exploratory well contains second growth forest and open

grasslands. An intermitent small stream is located nearby. Weather during the survey was partly cloudy with winds 5-10 mph. from the east. Several days previous to the survey were marked with heavy rain showers.

STUDY METHODS

Field observations were made with binoculars and by listening for vocalizations. The survey was conducted during the early morning hours (06:30-09:40). Counts were made of all birds seen or heard (Table 1). Census stations were sampled to obtain relative abundance estimates (Fig. 2). Published accounts of birds known from similar habitat were also consulted in order to acquire a more complete picture of the possible species that might be expected in this area (Pratt et al. 1987; Hawaii Audubon Society 1993). Data on feral mammals were limited to visual observations.

Scientific names used in this report follow those given in Hawaii's Birds (Hawaii Audubon Society 1993); Field guide to the birds of Hawaii and the tropical Pacific (Pratt et al. 1987) and Mammal species of the World (Honacki et al. 1982).

RESULTS

Resident Endemic (Native) Land Birds:

No native resident land birds were observed on the survey. The only species in this category which may occasionally occur in this area and at this elevation is the Short-eared Owl or Pueo (Asio flammeus sandwichensis). Pueo are listed as an endangered species on Oahu by the State of Hawaii Division of Forestry and Wildlife. None were recorded on the survey. The number of Pueo on Oahu is probably quite low and their present abundance in the area covered by this survey is unknown.

Resident Waterbirds:

No waterbirds were recorded on the survey. Black-crowned Night Heron (Nycticorax nycticorax) is occasionally seen roosting along streams in this area (personal observations). This is the only native waterbird in Hawaii that is not listed as endangered. Habitat suitable for waterbirds does not occur on the proposed well site property. Nearby lands, however, do contain some wetland habitat in the form of stream drainages.

Seabirds:

No seabirds were observed on the survey. This site is unsuitable for seabirds due to predator access and human disturbance. There are only a few locations on Oahu where seabirds are nesting, however, this is not one of them.

Migratory Indigenous (Native) Birds:

No habitat suitable for migratory shorebirds exists on the project site. Wandering Tattler (Heteroscelus incanus) can be found foraging along streams as well as more commonly along rocky shorelines. This species might use the nearby stream. Wandering Tattler are not endangered or threatened.

Exotic (Introduced) Birds:

A total of 12 species of exotic birds were recorded during the field survey (Table 1). Pratt et al.(1987) Hawaii Audubon Society (1993) confirm that this assortment of introduced birds would be expected in this area. In addition the Barn Owl (Tyto alba) and Ring-necked Pheasant (Phasianus colchicus) may also occur in this area.

Feral Mammals:

Two introduced Small Indian Mongoose (Herpestes auropunctatus) were seen on the property. No trapping was conducted in order to assess the relative abundance of feral mammals. In addition rats, mice and feral cats are common in the Kahuku area (personal observations). Feral pigs are occasionally seen in this region particularly at higher elevation.

Oahu records of the endemic and endangered Hawaiian Hoary Bat (Lasiurus cinereus semotus) are limited (Tomich 1986; Kepler and

Scott 1990). Data on the bat's distribution and behavior are extremely limited. They are known to roost solitarily in trees and occur in upland forests as well as in coastal habitats. This species is insectivorous and forages at dusk. None were seen on this survey. There are no published data to show this endangered species occurs in this area.

DISCUSSION AND CONCLUSIONS

This brief field survey provides only a limited perspective of the wildlife which utilize the area. The number and relative abundance of each species may vary throughout the year due to available food resources and reproductive success. Exotic species sometimes prosper only to later disappear or become a less significant part of the ecosystem (Williams 1987; Moulton et al. 1990). Long term studies could provide a more comprehensive view of the bird and mammal populations in this particular area. Nevertheless, some general conclusions related to birds and mammals at this site are provided. The following comments summarize the findings of this survey.

1- The proposed well site and nearby lands (Fig. 1) were traversed on foot. Counts of birds were used to make conclusions about their estimated abundance at this location (Table 1).

2- No native birds or mammals were found on the survey. The Pueo (Hawaiian Owl), Black-crowned Night Heron and Wandering Tattler have all been seen in this region (personal observations).

3- Twelve introduced species of birds were tallied on the survey. No unexpected species were observed. These twelve species are typically found in the type of habitat present at this site.

4- The only mammal recorded was the Small Indian Mongoose. Rats, mice and feral cats and perhaps pigs also occur in the area. The endangered Hawaiian Hoary Bat was not found.

5- The proposed well should have no measurable effect on bird and mammal populations in this region of Oahu. No endangered or threatened species were recorded on the survey. No special or unique habitat essential to native birds was found on the property.

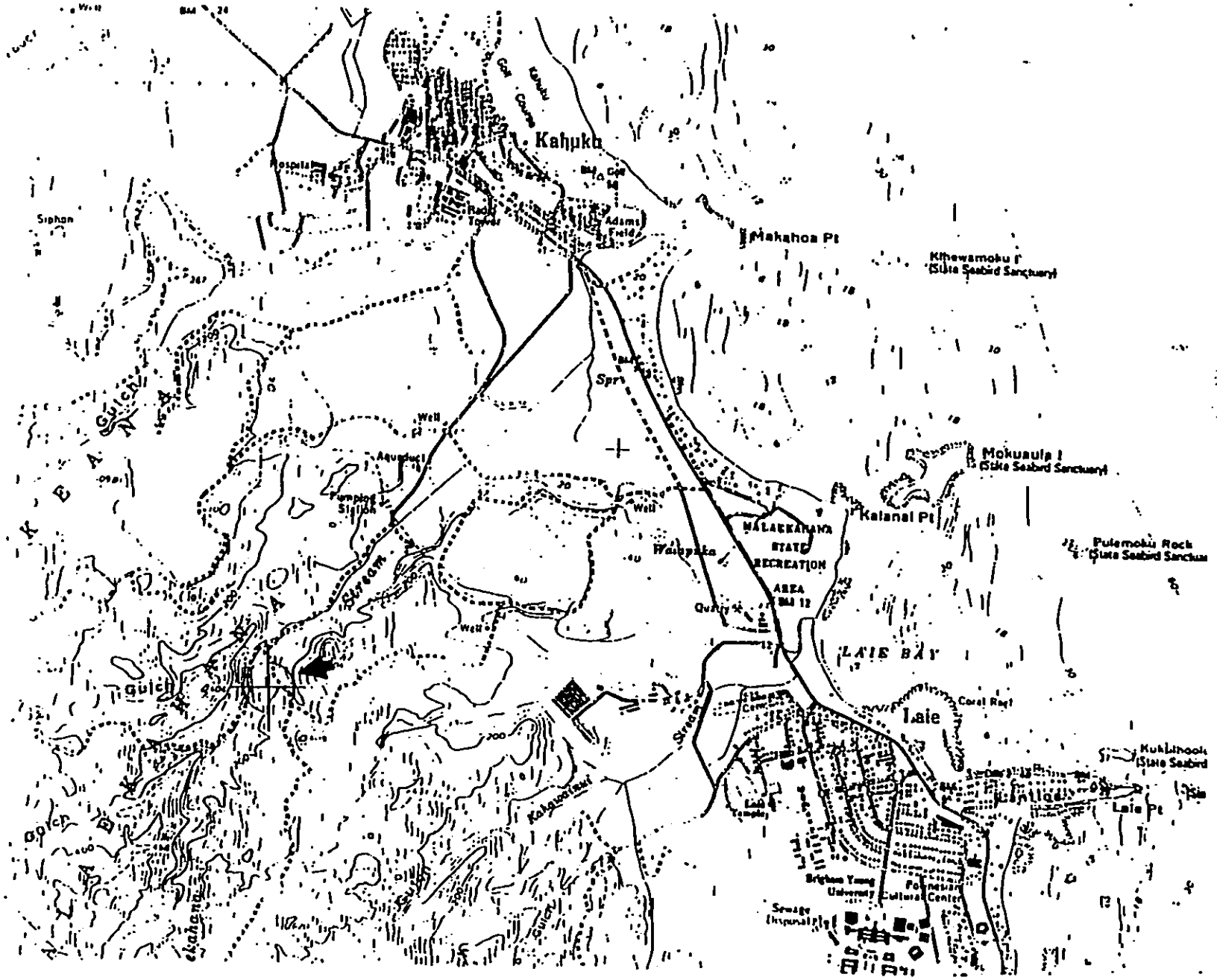

Fig. 1. Location of Malaekahana BWS proposed well site. (Arrow marks site).

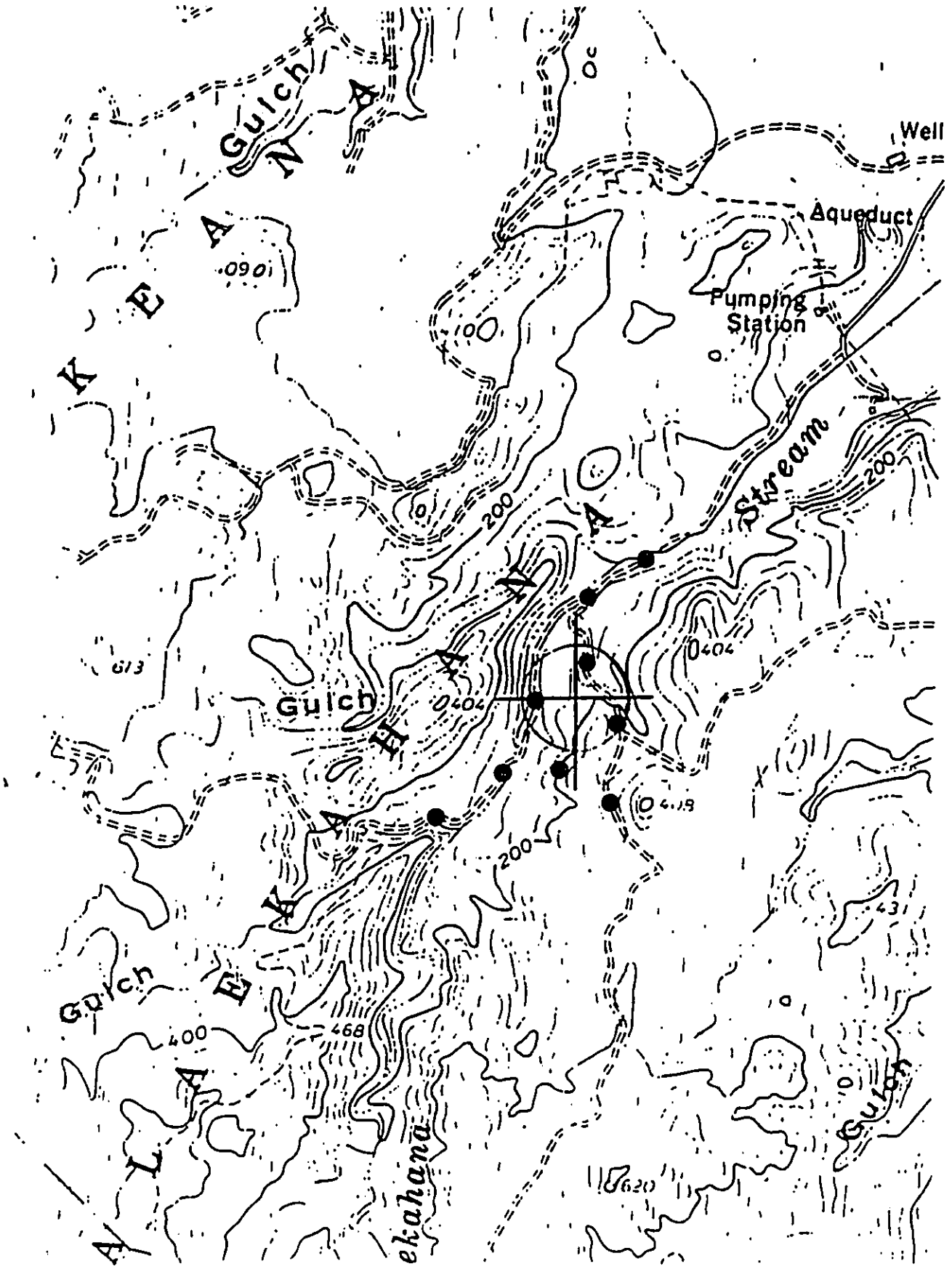

Fig. 2. Location of Malaekahana BWS proposed well site with faunal census stations marked with solid circles.

TABLE 1

Introduced birds recorded at a proposed well site at Malaekahana, Oahu. Number represents an average of the totals from each census station. These data provide an estimate of relative abundance.

COMMON NAME	SCIENTIFIC NAME	AVERAGE Number Recorded at each Census Station
Spotted Dove	Streptopelia Chinensis	11
Zebra Dove	Geopelia striata	6
Common Myna	Acridotheres tristis	4
White-rumped Shama	Copsychus malabaricus	2
Red-vented Bulbul	Pycnonotus cafer	10
Northern Cardinal	Cardinalis cardinalis	5
Red-crested Cardinal	Paroaria coronata	2
Japanese White-eye	Zosterops japonicus	9
Japanese Bush-warbler	Cettia diphone	2
House Finch	Carpodacus mexicanus	4
Common Waxbill	Estrilda astrild	7
Nutmeg Mannikin	Lonchura punctulata	3

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Honacki, J.H., K.E. Kinman and J.W. Koeppl ed. 1982. Mammal species of the World: A taxonomic and geographic reference. Allen Press, Inc. and the Association of Systematic Collections.

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Moulton, M.P., S.L. Pimm and N.W. Krissinger. 1990. Nutmeg Mannikin (Lonchura punctulata): a comparison of abundance in Oahu vs. Maui sugarcane fields: evidence for competitive exclusion? 'Elepaio 50(10):83-85.

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APPENDIX C. ARCHAEOLOGICAL SURVEY

ARCHAEOLOGICAL RECONNAISSANCE FOR PROPOSED MALAEKAHANA EXPLORATORY WELLS MALAEKAHANA, O'AHU

by

Hallett H. Hammatt, Ph.D.

Prepared for

Water Resource Associates

Cultural Surveys Hawaii
February 1996

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INTRODUCTION

This project was performed at the request of Water Resources Associates to provide an archaeological reconnaissance of a location of a proposed Board of Water Supply well in the *ahupua'a* of Malaekahana. The BWS proposes to drill, case, and test two exploratory wells (one operating and one standby) within an approximately 100 ft. X 200 ft. site to locate a new municipal source of supply to serve the Windward Oahu area extending from Laie to Kahuku. The project area is located an approximate elevation of 220 ft. on the Laie side of Malaekahana Stream approximately 7,000 ft. *mauka* of Kamehameha Highway (Figure 1). The project area is gently sloping land with grass, mature trees (Formosan Koa, Macaranga, Java Plum, guava, etc.) and low shrub vegetation. The well site itself consists of approximately 1/2 acre of land. The access road would be along existing ranch and farm roads. For this reason a specific access route did not need to be surveyed.

Scope of Work

The following is the scope of work for the Malaekahana Exploratory Wells Site:

1. Field survey of the study areas to locate and briefly describe archaeological site;
2. Preparation of a report detailing results of the field study with some limited background information on history and nearby archaeological sites. If archaeological sites are found in any of the study areas, an inventory survey with full recording of sites and complete background research well be recommended for that particular study area.

Methods

Fieldwork was performed by the author on Nov. 13, 1995 accompanied by Ms. Winona Char, a botanist. The survey of the well site itself was accomplished in two north/south sweeps. The access to the property was along a coral gravel covered road paralleling Malaekahana Stream, and then by a connected dirt road which led south directly to the proposed well site. The dirt road lies directly to the north and east of the well site.

Historical Research

Historical research consisted of investigation of previously recorded sites within the *ahupua'a*, inspection of some recent archaeological studies, limited research on Land Commission Awards (LCAs) and a brief history of ranching and cane and pineapple cultivation. The purpose of this work was to provide context and explanation for the lack of sites in the project area.

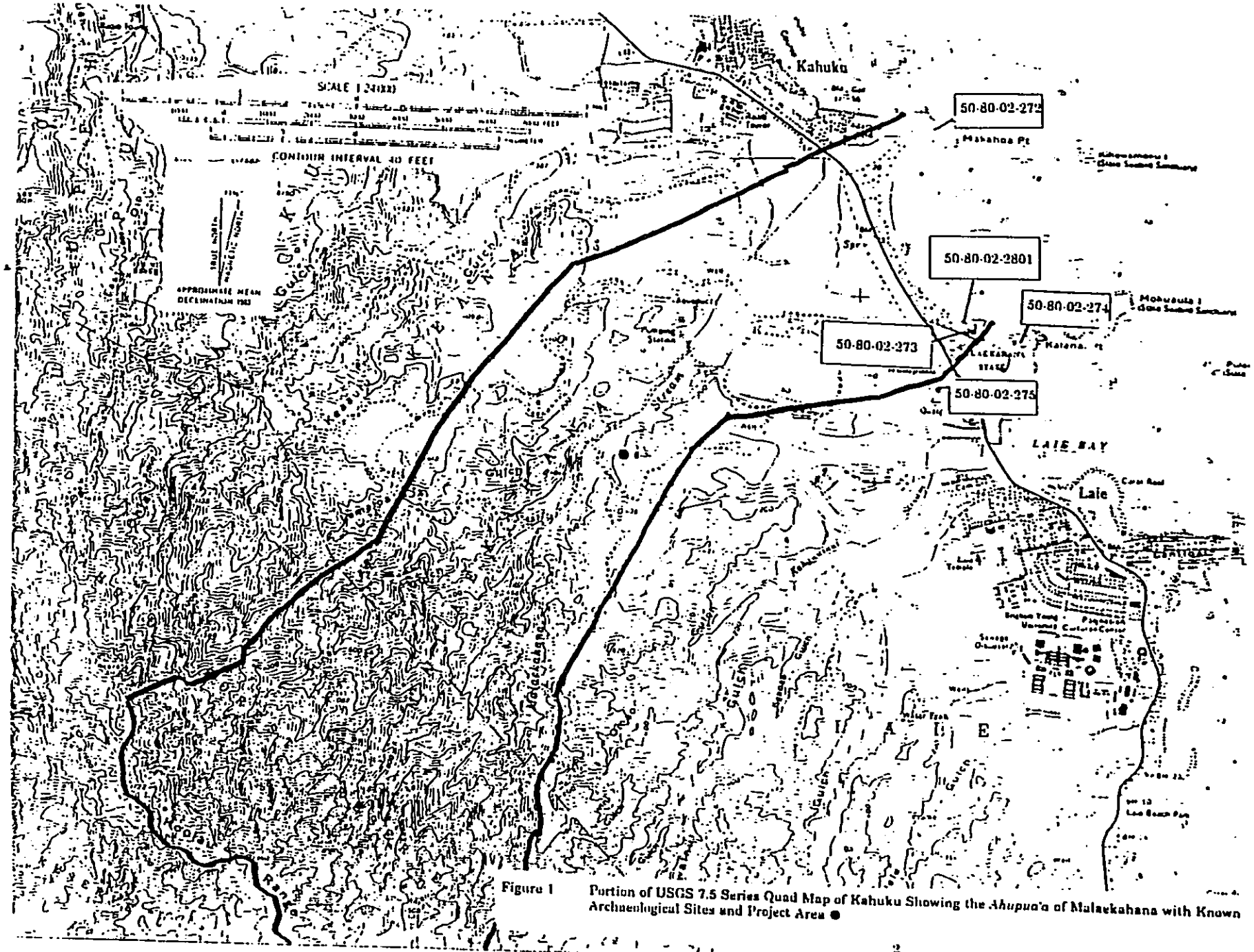

Figure 1 Portion of USGS 7.5 Series Quad Map of Kahuku Showing the *Ahupua'a* of Malaekahana with Known Archaeological Sites and Project Area ●

HISTORIC BACKGROUND

Archaeological Sites:

There are four sites (State sites 50-80-02-272 to 275) recorded by McAllister (1930) in Malaekahana. All of these sites occur along the shoreline and are shown in Figure 1. They are described as follows:

Site 272 A few rocks at Makahoa, all that remain of a fishing shrine which was on the point. The fish brought here were the oio.

> Formerly a fishpond was located near the point and was known as Waipunaea. There are traditions about the mullet coming to this point from Pearl Harbor. To this day schools of mullet come around the island to this northern point of Malaekahana. They go no farther, and their apparent disappearance still mystifies the Hawaiians.

Site 273 - Foundation of the house (kahuahale) of Manuwani, keeper of the god of Malaekahana.

> Only a few large rocks remain by the site of the railroad track, but the site has great importance in the eyes of the natives because of the prominence of the kahuna Manuwahi. About this area is said to have been a rather large Hawaiian settlement, which formerly was level land, but which owing to the removal of flora has formed into dunes The site was pointed out by a descendant of Manuwahi, Kaniona Apuakehau, a very old Hawaiian living in Laie. The Hawaiians are still proud that the distinct of Malaekahana was never conquered by Kamehameha I. This is not recorded in Hawaiian history so far as I know.
>
> The legend collect by Rice (Hawaiian Legends pg 113) tells the story of Kamehameha's sending out Kanalaiu, who was unable to subdue Manuwahi because this powerful kahuna was aided in battle by the gods. After the battle, Kanalaiu joined forces with Manuwahi and is still spoken of by the older natives as the chief who revolted against Kamehameha. Many skeletons were unearthed in plowing the cane fields of the region and in digging the foundations for the beach houses, indicative, some think, of many battles in the region.

Site 274 - Site known to Hawaiians as a fishing shrine on the land known as Kalanai, which is now included in the division of Laie but formerly belonged to Malaekahana.

> The fish brought to this shrine were the kala and enenue. Several flat rocks have been placed on end; one is placed flat. Innumerable remains of fish were found about the stones and on the west side of the rocks.
>
> Skeletal remains were found on the northwest side at an average depth of 2

feet. The body was partially flexed. The upper portion of the body was lying on its back, with the head thrown back so that the mandible was uppermost. The legs had been flexed. The entire length of the burial, from head to knee, was 4 feet. The maximum length of the right femur was 17 inches. The head was lying toward the south, and the lower portion was toward the sea.

Site 275 - Waiapuka, a pool on the Kahuku side of Laie in Malaekahana, inland from the road in the midst of a cane field.

Waiapuka is made famous by the legend of Laieikawai. Without guidance it is difficult to find, for it is hidden from sight even from the surrounding elevations or from the tops of the highest pines which line the road. The pool is oval in shape, measuring about 30 ft. by 60 ft. with the water about 10 ft. below the level of the surrounding plain. Tides are said to affect the pool On the Laie side is a small crevice in the rock, which is said to open into the cavern in which Laieikawai was hidden. Natives of the region remember when it was possible to swim through an underwater entrance, and it is said that the chamber could accommodate three or four people. Within the last 25 years silt has filled the pool, and it is no longer possible to enter the hidden chamber. The pool is significant in the minds of the Hawaiians because it was here that Waka hid Laieikawai until she reached maturity.

In 1980 Yent and Ostioko-Griffin reported on an extensive cultural layer (Site 50-80-02-2801) occurring in the sand layers of Malaekahana State Park. This cultural layer covers large portions of the eastern portion of the park and is divided into 6 distinct geographic areas.

For the upland area no archaeological sites have been recorded, except that Handy and Handy mention terraces in this *ahupua'a* irrigated by Kaukanalaau Stream. The exact location of the stream is not apparent on the USGS stream. It is assumed to be a tributary of Malaekahana Stream.

Land Use as Indicated in LCA Claims (1840-1854)

In 1850 the *ahupua'a* of Malaekahana (3280 Acres) is claimed by A. Keohokalole, mother of King Kalākaua, Queen Liliu'okalani, Miriam Likelike Cleghorn and Wm. Pitt Leleiohoku (II) and is awarded to her in 1854. Of 21 claims for land parcels (*apana*) in Malaekahana only four *kuleana* claims are awarded. There are no claims for *lo'i* in Malaekahana. The claims often state that the area jumps around and goes from sea to mountain and therefore boundaries can't be given. The claims for Malaekahana mention 15 *kula*, 6 *mala* ,and 1 *mo'o* with no crop given, 12 *wauke* patches, 7 house sites, 6 banana patches, 3 potato patches, 5 koa trees for canoe making, and 1 *mala* each for *hala*, *noni*, *ti*, *hau*, breadfruit and tobacco. Two mountain areas are also claimed. Two house sites, 1 banana and potato land, and 1 wauke land are awarded. However, no present maps show where these awards were located. The old Malaekahana maps at the State Survey office

are missing (as reported by the survey office to Dr. V. Creed on 2/2/96). Tax maps do not show the location of these few awards.

Ranching and Commercial Agriculture

In 1850 Kaikala Kapaakea (Keohokalole's husband) conveyed Malaekahana to Charles Hopkins for Malaekahana Ranch and at the same time Kahuku for Kahuku Ranch. James Campbell purchased Malaekahana Ranch before 1889 and the deed included about 3000 head of cattle, 90 horses, 1700 sheep, etc. In 1889 Campbell then leases several tracts of land to Oahu Railway and Land Co. (ORLC) for sugar cane and railway development and a few tracts for pineapple (between 1920 and 1930) Figure 2 shows pineapple and cane fields in the central *mauka* portion of Malaekahana near the proposed well site.

In 1866, the Kahuku Ranch was purchased from Hopkins by Robert Moffitt and by 1873, H.A. Widemann had gained control and ownership of the entire Kahuku Ranch, which included the *ahupua'a* of Kaunala, Pahipahialua, 'Opana 1 &2, Kawela, Hanakaoe, 'O'io 1 & 2, Ulupehupehu, Punalau, Kahuku, Malaekahana, Keana, and a part of Laie (*Ibid.*:138). On January 19, 1874, Widemann sold Kahuku Ranch to Julius L. Richardson who in turn sold the entire ranch to James Campbell.

> In 1889, George Bowser described the Kahuku Ranch as follows:
> Kahuku Ranch. Main Road, Kahuku: Proprietor, James Campbell, Esq., of Honouliuli: Manager, W.R. Buchanan: postoffice address, Kahuku, 38 miles from Honolulu, at the northern point of Oahu: 23,608 acres occupied as a cattle ranch: extends 14 miles along the coast, in close proximity to the sea. A valuable fishery is attached to this property [Bowser 1880:409].

Although the sugar plantation became the major industry at Kahuku and adjacent *ahupua'a*, the Kahuku Ranch continued operations until the mid-20th century.

The *mauka* acreage of Malaekahana remains under the Campbell Estate as pasture and ranch land.

Malaekahana Settlement Pattern

Yent and Griffin (1980) described the pattern of use of the shoreline as a seasonal one in which there was heavy use doing good fishing seasons. February to March was a planting period during which much time was spent in the more *mauka* agricultural lands (Yent and Estioko-Griffin 1980:18). As indicated by the Land Commission claims, wetland agriculture was not developed in Malaekahana. Claimants mention tending *lo'i* in adjacent *ahupua'a*, particularly Laie, and using Malaekahana for dryland cultivation and gathering purposes. Table 1 provides a list of the 21 land claims within the *ahupua'a* of Malaekahana showing land use.

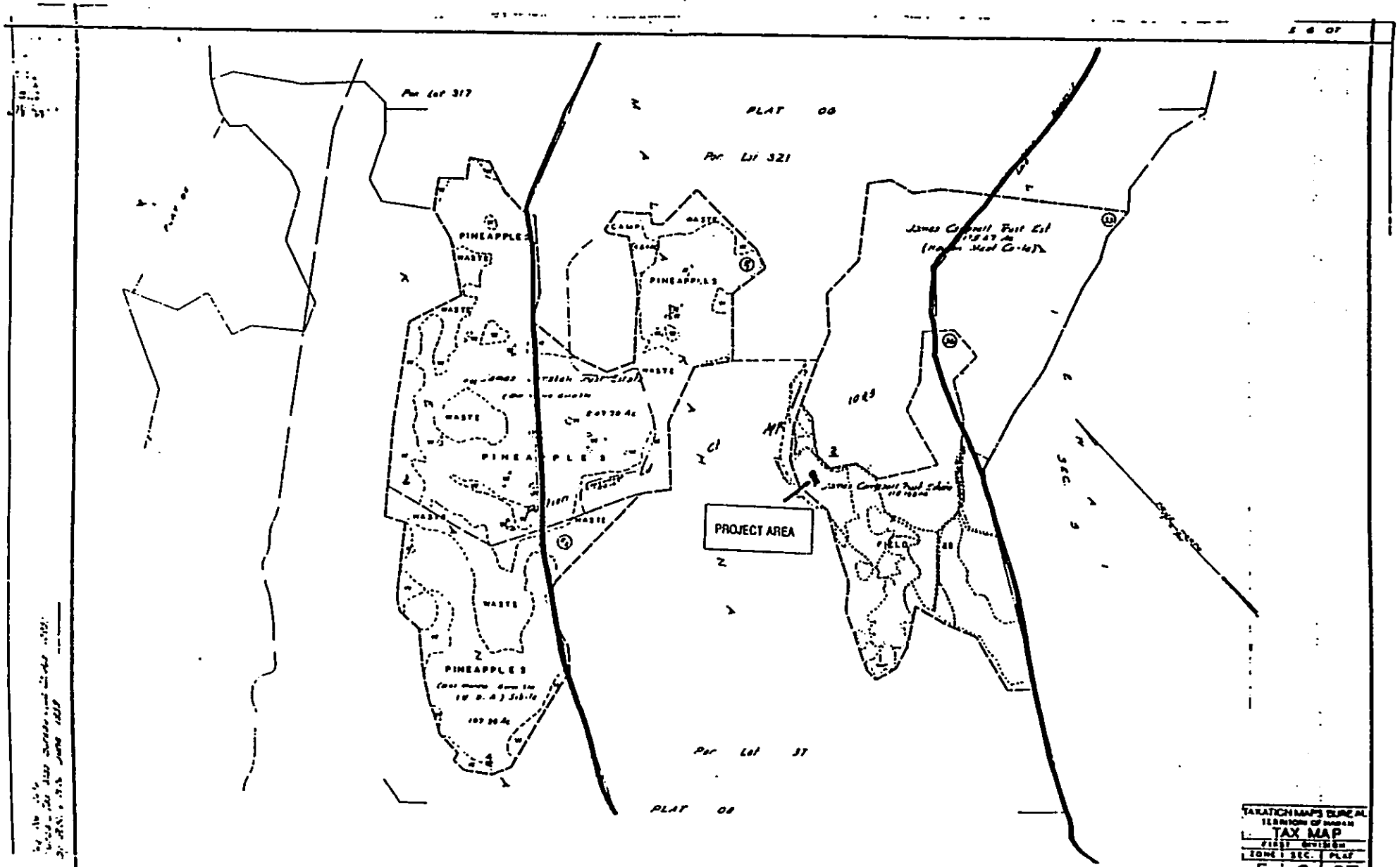

Figure 2 TMK 5-6-07 Showing Cane and Pineapple Lands in Malnekahana in Relation to Project Area

Table 1: Malaekahana Land Claims

LCA #	Claimant	Land use	Awarded or Not
2880	Kupau deceased	2 mala noni, 2 mala wauke, 2 koa canoe trees	Not awarded
3861	Pulehu	1 moo	not awarded
3870	Puu	Kula Kamapa, Mala Niu, Mala Kahakalokaha, mala Makanikeoloi, 2 mala Kalonainui, mala mt. land. (F.T. potatoes & bananas 1/2 acre)	Aw. 1 ap. .22 ac.
3999B	Kuahuia deceased	1 clump hala & house lot near seaside	?
4061	Kuku	1 kula	?
4291	Kapule deceased	kula wauke, partly in Malaekahana	?
4302	Kauaikaua	2 canoe trees	?
4329B	Kuapuhi	(See 4392)	Awarded
4336	Kekui	10 kula, 1 kula house, 1 koa tree	?
4342	KapuaoKahala deceased	kula land in 4 specific pieces, 1 wauke, other 3 in potatoes, noni, bananas, etc.	?
4346	Kawahinewiwi deceased	1 kula & 1 mountain area	not awarded
4392	Kuapuhi	mala wauke, ti, breadfruit, hau, & banana	Awarded as 4329B
6989	Kahuailua	10 kula fr. sea to mt. & house	?
7727	Paukoa deceased	wauke	Awarded

LCA #	Claimant	Land use	Awarded or Not
8355	Kakau	kula land fr. sea to far mt. bananas, wauke, house site makai	Award house site
8443	Kauhalekua	wauke	?
8452	A. Keohokalole		Awarded Ahupua'a
8537	Kahawaii deceased	mo'o kula from se to house site & to mountains, wauke	Award house site
9894	Nawai	1 moo from sea to mountain, wauke, bananas, house site	?
9895	Kekauanui	3 pieces kula land, 1 & 2 wauke & tobacco and wauke & bananas, and house site makai.	not awarded
10619	Poouahi	kula land	?

21 Claimants, 5 awards of which 1 is for the ahupua'a

RECONNAISSANCE RESULTS

The Nov. 13, 1995 fieldwork showed the project area to be fairly open with excellent ground visibility. Bulldozing was evident in the northeast corner of the project area as indicated by scarred boulders and moved piles of soil. No archaeological remains were encountered. The survey extended outward from the immediate project area in all directions at least 200-300 ft. and no archaeological sites were observed in any of these area.

Recommendations

Based on the reconnaissance results, it is recommended that no further archaeological research be conducted. It appears that construction of a well within the project area with access provided by existing roads would have no impact to archaeological resources. If, however, during ground disturbance activities archaeological findings are encountered work should stop in that area and the State Historic Preservation Division should be contacted at 587-0047.

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APPENDIX D. LETTERS FROM CWRM

Included in this appendix are copies of two letters from the State of Hawai'i Department of Land and Natural Resources Commission on Water Resource Management (CWRM). These letters confirm that stream channel alteration permits will not be required for the pipeline crossings planned in this project for the Mālaekahana and Kea'aulu drainageways.

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

JUN 22 1999

Mr. Todd Yonamine
Tom Nance Water Resource Engineering
680 Ala Moana Blvd., Suite 406
Honolulu, Hawaii 96813

Dear Mr. Yonamine:

This is in response to your inquiry as to whether a stream channel alteration permit would be required for the installation of a pipe crossing at Keaaulu Gulch near Malaekahana Stream, Kahuku, Oahu.

We previously visited the Keaaulu Gulch (also known as Dead Man's Gulch) in response to a request by the James Campbell Estate, who proposed to clear the watercourse for drainage purposes. We determined that the Keaaulu watercourse is not considered to be a stream due to a lack of sufficient flowing water to support instream uses. Therefore, the installation of the pipeline crossing under the watercourse will not require a stream channel alteration permit, pursuant to Hawaii Revised Statutes 174C-71.

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

Sincerely,

EDWIN T. SAKODA
Acting Deputy Director

DH:ss

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

JUN - 7 1999

Mr. Todd Yonamine
Tom Nance Water Resource Engineering
880 Ala Moana Blvd., Suite 406
Honolulu, Hawaii 96813

Dear Mr. Yonamine:

This is in response to your inquiry on whether a stream channel alteration permit would be required for the installation of a pipe crossing in the upper reaches of Malaekahana watercourse, Kahuku, Oahu.

We received your request via fax and internet memo on June 2, 1999. Based on the photos you submitted, it appears that there is insufficient water flow at the location of the proposed waterline crossing to support instream uses. Therefore, we do not consider this reach of the Malaekahana watercourse to be a stream and a stream channel alteration permit, pursuant to Hawaii Revised Statutes §174C-71, will not be required for the proposed pipeline crossing.

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

Sincerely,

Edwin T. Sakoda

EDWIN T. SAKODA
Acting Deputy Director

DH:ss

12/20/01 8:42 AM

INSTRUCTIONS TO HONBLUE

Mālaekahana Final EA Project

Printing and Delivery

1. GBC Bound
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3. Cardstock front and back sandstone
4. Spines burgundy (preferable) or black
5. Color figures marked with yellow tabs
6. Make a total of 16 bound copies of this document
7. Bill to Planning Solutions, Inc.

DELIVERY BEFORE 12:00 PM, FRIDAY, DECEMBER 21, 2001:

Deliver ten (10) copies and enclosed envelope addressed to Scot Muraoka to:

Mr. Scot Muraoka
Planning & Engineering Building (Ewa Side)
Board of Water Supply
630 South Beretania Street
Honolulu, HI 96813
Phone: 527-5221

Deliver three (3) copies to the Municipal Library at:

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558 S. King Street
Honolulu, HI 96813

Deliver 3 copies and original to Planning Solutions.

Contact person at Planning Solutions, Inc. is Charles Morgan 593-1786