

Kalihi Exploratory Well IV

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714



November 17, 1998

JEREMY HARRIS, Mayor

EDDIE FLORES, JR., Chairman
FORREST C. MURPHY, Vice Chairman
KAZU HAYASHIDA
JAN M.L.Y. AMII
JONATHAN K. SHIMADA, PhD
BARBARA KIM STANTON
CHARLES A. STED

CLIFFORD S. JAMILE
Manager and Chief Engineer

Mr. Gary Gill, Director
Office of Environmental Quality Control
235 South Beretania Street, #702
Honolulu, Hawaii 96813

Dear Mr. Gill:

Subject: Finding of No Significant Impact for the Board of Water Supply's Proposed
Kalihi Exploratory Well IV, Kalihi, Oahu, Hawaii, TMK: 1-4-18: 06

The Board of Water Supply has reviewed the comments received during the public comment period which began on May 8, 1998. We have determined that the environmental impacts of this project have been adequately addressed as discussed in the final environmental assessment (EA) and are therefore, issuing a finding of no significant impact. We request that the proposed well project be published as finding of no significant impact in the next Office of Environmental Quality Control (OEQC) Bulletin. ✓

Attached are the completed OEQC bulletin publication form and four (4) copies of the final EA for your review.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

CLIFFORD S. JAMILE
Manager and Chief Engineer

Attachments

cc: Bennett Mark, CH2M Hill

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1998-12-08-0A-*FEA-Kalihi Exploratory*
Well IV

DEC 8 1998

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FINAL ENVIRONMENTAL ASSESSMENT

KALIHI EXPLORATORY WELL IV

KALIHI, HONOLULU, OAHU, HAWAII
TAX MAP KEY: 1-4-18:06

PROPOSING AGENCY
CITY AND COUNTY OF HONOLULU
BOARD OF WATER SUPPLY



Submitted pursuant to Chapter 343, Hawaii Revised Statutes

OCTOBER 1998

CH2M HILL

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- A Archaeological Reconnaissance Survey of a Proposed Well Site in Upper Kalihi Valley, Kona District Island of O'ahu, TMK 4-4-18:06, Cultural Surveys of Hawaii, October 1994.
- B Botanical Resources Assessment, Kalihi IV Well Site, Honolulu District, Island of Oahu, Char and Associates, July 1994.
- C Avifaunal and Feral Mammal Survey for a Board of Water Supply Exploratory Well Site In Kalihi Valley, Oahu, Phillip L. Bruner, April 1994.
- D Agencies and Others Provided a Copy of the Draft Environmental Assessment
- E Comments and Responses to the Draft Environmental Assessment

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Chapter 1 Executive Summary

1.1 Proposing Agency and Proposed Action

The City and County of Honolulu Board of Water Supply (BWS) proposes to drill and case an exploratory water well in its Kalihi 614 Reservoir site in Kalihi Valley on the leeward side of the Koolau Mountains. This exploratory well will be drilled within the existing 1.3-acre BWS site located about 1 mile below the Wilson Tunnel portal. The proposed Kalihi Exploratory Well IV is expected to be capable of yielding 0.25 million gallons per day (mgd) of potable water.

The drilling and casing of this exploratory well is one step of a process that the BWS utilizes to obtain hydro-geological data on the potential of new groundwater resources. Following the drilling and casing of the exploratory well, test pumping of the well will be performed to determine if the quantity and quality of the water from this exploratory well are suitable for development. If the quantity and quality of the water are suitable for development, it may be possible to convert the exploratory well into a production well. However, if either the quantity or quality of the water prove to be unsuitable for a production well, the exploratory well will be sealed and abandoned.

This environmental assessment (EA) focuses only on the drilling, casing, and testing of this exploratory well. The proposed action will also include the temporary installation of a pump, piping, and appurtenances. All construction work will be within the BWS's existing 1.3-acre Kalihi 614 Reservoir site.

1.2 Purpose of this Environmental Assessment

This EA was prepared pursuant to Chapter 343, Hawaii Revised Statutes (HRS). Any project proposing the use of county lands or funds, or proposing any use within any land classified as conservation district by the state land use commission under Chapter 205, HRS, must comply with Chapter 343, HRS.

Environmental compliance pursuant to Chapter 343, HRS, is required because the exploratory well will be located within property under the jurisdiction and ownership of the BWS, will be constructed with BWS funds, and will be within the state conservation district.

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A final environmental assessment and an accompanying negative declaration by the BWS determining that the impacts of this project are not sufficient to require the preparation of an environmental impact statement (EIS) will satisfy the Chapter 343, HRS, requirements.

1.3 Subsequent Permits and Discretionary Approvals Required

A Conservation District Use Permit will be required from the Board of Land and Natural Resources (BLNR).

Well construction, pump installation, and water use permits will be required from the Commission on Water Resource Management (CWRM).

A noise permit will be required from the State of Hawaii, Department of Health, Noise and Radiation Branch.

According to the City and County of Honolulu Planning Department, exploratory wells are considered minor and are not required to be shown on the Development Plan Public Facilities Map. If the well is developed into a potable water production facility, an amendment to the City and County of Honolulu Development Plan Public Facilities Map to include the project area as a "site determined, well facility programmed for construction within 6 years" will first be required. The amendment would require an application to the City and County of Honolulu, Planning Department, and approval by the City and County of Honolulu, City Council.

1.4 Benefits of this Project

The proposed exploratory well will furnish valuable data that will be added to Oahu's islandwide hydro-geological information base. This data will be valuable in estimating the quantity and quality of the groundwater resources available at this site, and in combination with data from other wells, ultimately for the entire island. If the hydro-geological data shows that groundwater sources can be developed successfully at this site, this exploratory well may be converted to a permanent potable water well.

If the exploratory well is converted into a production well, it would be part of a major water development project that will integrate new groundwater sources in Honolulu into the islandwide water system. The development of additional water sources is necessary in order to accommodate the growing demand for water within the City and County of Honolulu.

1.5 Alternatives Considered

The no action alternative, the delayed action alternative, site alternatives, and source alternatives are discussed in this environmental assessment or were discussed in previous environmental analyses done by the BWS.

The no action alternative was not pursued because it would be contrary to the BWS's legal mandate to provide for the water needs of a growing population. This project is part of an overall potable groundwater development program intended to increase the water supply to meet growing municipal water demands. If the BWS's water source development program is curtailed, the BWS would be hampered in providing adequately for the water needs of the future population of the island, which may result in regional water shortages.

The delayed action alternative was not pursued because this alternative would delay the BWS's implementation schedule, and would have substantially similar environmental outcomes, and higher development costs because of inflation. Delay in the proposed well testing program would increase the risk that the growth in population will lead to water demands in excess of available supplies.

This environmental assessment analyzes a possible potable groundwater source site in the Honolulu Sector, where surplus sustainable yields occur in the high level source areas. This exploratory well project is a continuation of a BWS analysis of 21 potential sites within the Honolulu Sector for additional potable wells which was originally done in its *Regional Environmental Impact Assessment for Development of Wells, Reservoirs, Transmission Lines and Appurtenances at Honolulu, Hawaii* (1984). Two of the 21 well sites identified in this assessment for possible potable groundwater sources were located in upper Kalihi Valley. The proposed Kalihi Exploratory Well IV is located in the vicinity of the two sites, and is intended to determine if an additional well in this upper Kalihi Valley area is feasible.

Alternative source development was not pursued in this analysis since the BWS had also analyzed potential potable water source alternatives other than groundwater in its 1984 study, including desalinization, the development of surface and brackish water sources, and the recycling of treated wastewater. Typically these alternative sources have considerably higher costs and technical challenges. For instance, the use of surface water from Kalihi Stream has a high potential for health and safety problems, and would require costly water treatment works. The development of these alternatives was not considered as feasible as the development of groundwater resources.

1.6 Potential Impacts of this Project and Mitigation Measures

Construction work, primarily the drilling of the exploratory well, will cause minor short-term noise and air pollution impacts to the surrounding environment. Noise and air pollution impacts from this project will not be noticeable to any residences or schools since the area is located within the forest reserve at least 1/2 mile *mauka* from the edge of the urban boundary.

All government rules and regulations concerning noise and air pollution will be followed during construction to minimize minor short-term noise and air pollution impacts.

To mitigate the short-term noise impacts, contractors will comply with all of the conditions of the required noise permit. Mufflers will be required for all construction equipment. All noise attenuating equipment will be maintained in proper operating condition and will be repaired or replaced as needed. For the drilling operation, drilling operations will be restricted to the hours of 7:30 am to 4:30 pm on weekdays and will exclude state holidays. Mufflers will be used to reduce noise during the drilling. In order to reduce noise levels from the temporary pumps, a surface pump will be installed with mutes, or a submersible pump (which is considerably quieter) will be used. If the well is incorporated into the existing facilities as a permanent production well, noise levels from the permanent pump will be reduced to below regulatory levels by the use of a surface pump installed with mutes, or by the use of a submersible pump.

To mitigate the short-term air pollution effects of the construction activities, dust control measures, such as water sprinkling, may be implemented by the contractor to reduce dust levels, as necessary. Further, the contractor will properly maintain its internal combustion equipment to minimize exhaust emissions, and will comply with the Hawaii Department of Health Rules Title 11, Chapter 59 and 60 regarding Air Pollution Control.

Traffic impacts to Kalihi Street will be minimal. The contractor will schedule the movement of heavy trucks and vehicles to or from the site after 8:00 am and before 3:30 pm to avoid the morning and afternoon peak traffic periods.

Water from the test pumping will be discharged into the existing drainage system on the Kalihi 614 Reservoir site. It is expected that the water that will be discharged will be clean, and therefore will not introduce any pollutants into the environment. The existing underground pipe drainage system leads into Kalihi Stream. Care will be taken in disposing of the test water to preclude the possibility of flushing debris or resuspending sediments and other pollutants in Kalihi Stream.

If the test pumping results indicate that the quantity and quality of the water from the exploratory well is unsatisfactory for municipal use, the Kalihi Exploratory Well IV will be

capped and/or sealed to prevent malicious or accidental contamination of the underlying groundwater aquifers.

There is no potential for adverse impacts to the three wetland areas in the Honolulu Sector, which are Paiko Lagoon, Diamond Head Crater, and Kaau Crater. No significant impacts are anticipated because of the great distances separating the exploratory well site from Paiko Lagoon, Diamond Head Crater, and Kaau Crater, and because these wetlands are not located in the same aquifer system as the exploratory well site.

The identified minor adverse impacts can be appropriately mitigated. The purpose of the Kalihi Exploratory Well IV construction and its test pumping is to determine if there is water of sufficient quantity and quality for development as a potable source. There are substantial potential benefits that can be provided in terms of the potable water supplies from the Kalihi Exploratory Well IV if it is able to be developed as a production well.

1.7 Determination

In accordance with Chapter 343, Hawaii Revised Statutes (HRS), the BWS has determined that an Environmental Impact Statement (EIS) is not required for the Kalihi Exploratory Well IV construction and test pumping.

This determination has been made because of the short duration of the project, and whatever minor adverse impacts that result from the construction and test pumping of the Kalihi Exploratory Well IV will also be short-term and may be minimized to insignificant levels by the application of the recommended mitigation measures.

1.8 Agencies and Others Consulted in Making this Assessment

The following agencies were consulted during the preparation of the draft environmental assessment for this project:

State of Hawaii agencies

- Department of Land and Natural Resources
 - Commission on Water Resources Management
- Department of Health
 - Environmental Management Division
 - Office of Environmental Quality Control

City and County of Honolulu agencies

- Planning Department
- Land Utilization Department

Seventeen government agencies and three groups or other individuals were provided a copy of the draft environmental assessment for this project and requested to provide comments. The following is a list of those agencies and others who were provided a copy of the draft environmental assessment.

Federal agencies

- U.S. Department of Agriculture, Soil Conservation Service
- U.S. Army Corps of Engineers, Pacific Ocean Division
- U.S. Fish and Wildlife Service

State of Hawaii agencies

- Department of Agriculture
- Department of Business, Economic Development, and Tourism
- Department of Land and Natural Resources
 - Conservation and Environmental Affairs
 - Forestry and Wildlife Division
 - Historic Preservation Division
 - Commission on Water Resources Management
- Department of Transportation, Highways Division
- Department of Health
 - Environmental Management Division
- University of Hawaii
 - Environmental Center
 - Water Resources Research Center

City and County of Honolulu agencies

- Land Utilization Department
- Planning Department
- Public Works Department
- Transportation Services Department

Others

- City Council District VII representative Donna Kim
- Kalihi Valley, Neighborhood Board No. 16, Chair Mary Rose McClellan
- Sierra Club, Hawaii Chapter

Chapter 2 Purpose and Need for the Proposed Action

2.1 Project's Purpose and Need

In 1980, the average municipal water demand on the island of Oahu was 130 mgd. The BWS's 1982 *Oahu Water Plan* projected that the island-wide average municipal water demand would increase to 156 mgd in 1990, and to 181 mgd in the year 2000. Actual BWS water usage in 1990 averaged 158 mgd, of which 156 mgd was potable water. In 1992, the Commission on Water Resource Management (CWRM), Department of Land and Natural Resources (DLNR), in its 1992 review draft of the "*Hawaii Water Plan, Oahu Water Management Plan*," (OWMP) projected that municipal water demand would be between 204 to 213 mgd by the year 2010, depending on whether the upper limit of the City and County of Honolulu's General Plan population projection for Oahu is attained. Thus, additional water requirements for the year 2010 are projected to be between 48 and 57 mgd. To meet the growing islandwide demand for water, the BWS plans to develop new sources of potable groundwater on Oahu within Honolulu, within the Moanalua aquifer (see Figure 2-1).

The Kalihi Exploratory Well IV is a proposed BWS well project within the Honolulu Sector, Moanalua aquifer. If the tests for the quantity and quality of the groundwater from the Kalihi Exploratory Well IV prove to be successful, the BWS intends to convert the exploratory well to a production well and integrate it into the BWS's island-wide potable water source, storage, and transmission system. The Kalihi Exploratory Well IV, if converted to a production well, is expected to be able to yield 0.25 mgd of potable water.

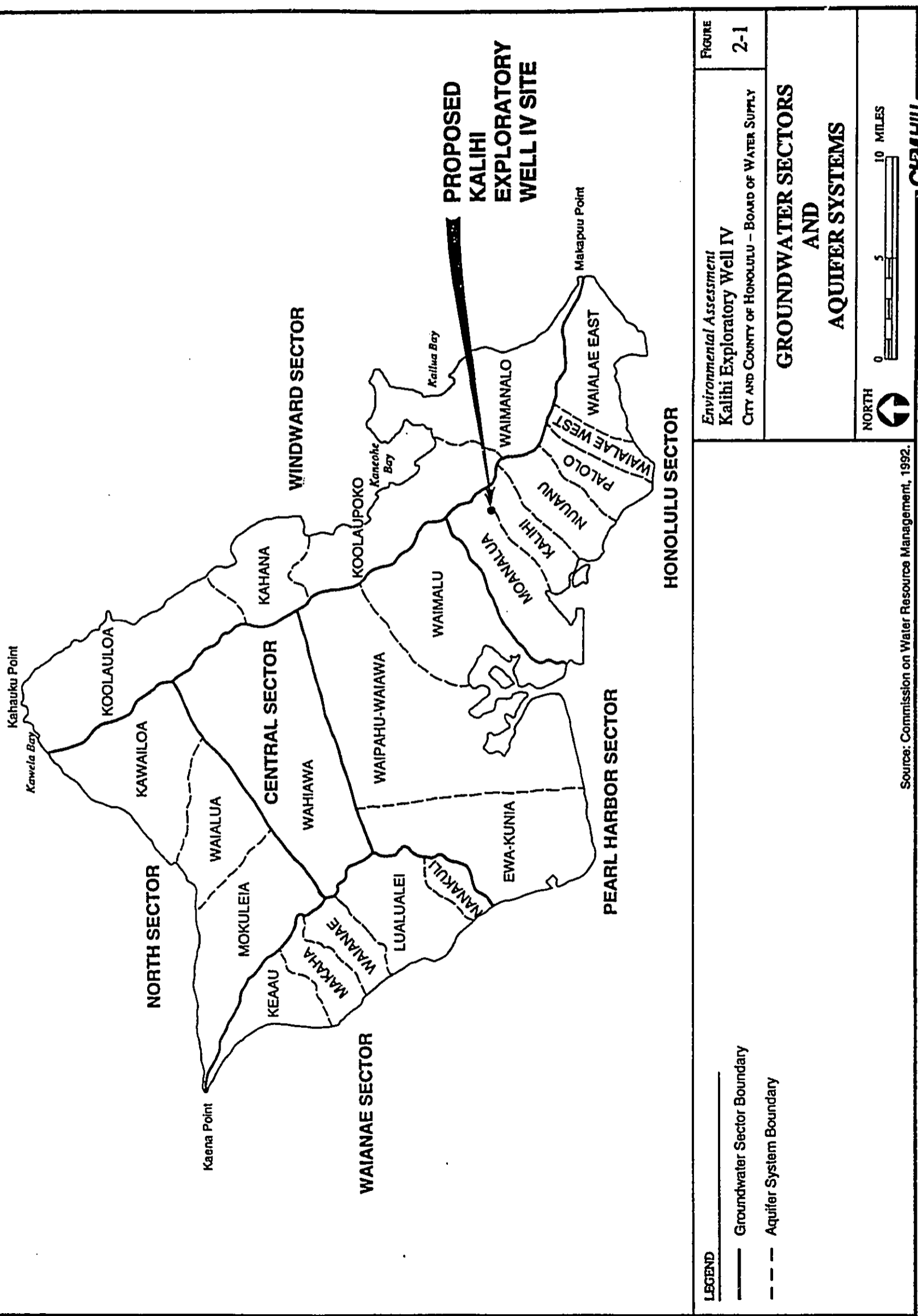
2.2 The State Water Code and the Commission on Water Resource Management

The State Water Code and a Commission on Water Resource Management (CWRM) was established in 1987 by the Hawaii State Legislature in Section 174-C of the Hawaii Revised Statutes (HRS). The CWRM was established to handle the administration of the new State Water code.

The State Water Code established a Hawaii Water Plan consisting of four parts:

- A water resource protection plan prepared by the CWRM
- Water use and development plans prepared by each county

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- A state water project plan prepared by state agencies
- A water quality plan prepared by the Department of Health

As part of the Hawaii Water Plan, a study was commissioned to determine the sustainable yields of surface and groundwater sources statewide.

Under the State Water Code, the CWRM created management boundaries for "water management areas." Water Management Areas were designated by the CWRM for those areas where it decided, after conducting scientific investigation and research, that management of ground or surface waters, or both, was necessary because the water resources for that area were threatened by existing or proposed withdrawals or diversions of water. The CWRM has administrative control over the withdrawals and diversions of ground and surface waters, respectively, within a Water Management Area and is responsible for ensuring reasonable beneficial uses of the resources in the public interest.

In designating an area for groundwater use regulation, the CWRM must consider the following:

- (1) *Whether an increase in water use of authorized planned use may cause the maximum rate of withdrawal from the groundwater source to reach 90 percent of the sustainable yield of the proposed water management area;*
- (2) *There is an actual or threatened water quality degradation as determined by the Department of Health;*
- (3) *Whether regulation is necessary to preserve the diminishing groundwater for future needs, as evidenced by excessively declining groundwater levels;*
- (4) *Whether the rates, times, spacial patterns, or depths of existing withdrawals of groundwater are endangering the stability or optimum development of the groundwater body due to upconing or encroachment of salt water;*
- (5) *Whether the chloride contents of existing wells are increasing to levels which materially reduce the value of their existing uses;*
- (6) *Whether excessive preventable waste of water is occurring;*

- (7) *Serious disputes respecting the use of the groundwater resources are occurring; or*
- (8) *Whether water development projects that have received any federal, state, or county approval may result, in the opinion of the commission, in one of the above conditions.*

Notwithstanding an imminent designation of a Water Management Area conditioned on a rise in the rate of groundwater withdrawal to a level of 90 percent of the area's sustainable yield, the CWRM, when such level reaches the 80 percent level of the sustainable yield, may invite the participation of water users in the affected area to an informational hearing for the purposes of assessing the groundwater situation and devising mitigative measures (Section 174C-44, HRS).

In designating an area for surface water use regulation, the CWRM must consider the following:

- (1) *Whether regulation is necessary to preserve the diminishing surface water for future needs, as evidenced by excessively declining surface water levels, not related to rainfall variations, or increasing or proposed diversions of surface waters to levels which may detrimentally affect existing instream uses or prior existing off stream uses;*
- (2) *Whether the diversions of stream waters are reducing the capacity of the stream to assimilate pollutants to an extent which adversely affects public health or existing instream uses; or*
- (3) *Serious disputes respecting the use of surface water resources are occurring. (Section 174C-45, HRS)*

2.3 Groundwater Sectors and Aquifers

The CWRM has established, for planning and administration purposes, six groundwater sectors that encompass the entire island of Oahu (see Figure 2-1). These sectors are: Honolulu, Pearl Harbor, Waianae, Central, North, and Windward. Presently, all sectors except the Waianae Sector have been designated as Water Management Areas. The Windward Sector, which became a Water Management Area in July 1992, is the last sector to be included (*CWRM, June 7, 1995*).

Each sector is divided into aquifers. The Honolulu Sector covers an approximately 84 square-mile region that extends from Makapuu Point northwestward about 18 miles to Moanalua. The Honolulu Sector is generally bounded at its northeast edge by the ridge of the Koolau Mountains, and extends in the southwestward direction for 2 to 8 miles down to the shoreline. From east to west, the Honolulu Sector is divided into the Waialae East, Waialae West, Palolo, Nuuanu, Kalihi, and Moanalua aquifers.

The Moanalua aquifer is the most western of the aquifers in the Honolulu Sector. The Moanalua aquifer is about 2 miles wide, and extends from the Koolau Mountain ridge down to the coastline near Hickam Air Force Base, Honolulu International Airport, and Keehi Lagoon, a distance of about 8 miles. The Kalihi Exploratory Well IV is proposed to be located in *mauka* portion of the Moanalua aquifer near the upper end of Kalihi Valley, near the west boundary of the Kalihi aquifer. The proposed site is located about 1 mile below the Likelike Highway's Wilson Tunnel through the Koolau Mountains.

2.4 Sustainable Yield and Water Management Areas

In order to evaluate the impacts of developing an additional permanent potable groundwater source on this site, it is necessary to take into account the sustainable yield of the underlying aquifer system as estimated by DLNR. Sustainable yield is the amount of groundwater that can be removed from an aquifer over a period of many years without developing serious adverse impacts to the aquifer.

Within the Hawaiian Islands, the sustainable yield of basal aquifers for each island is always less than the average annual rate of recharge to the groundwater aquifer, because a certain amount of the groundwater is lost through mixing with the underlying salt water. Estimating sustainable yield for the island of Oahu and for its individual aquifers is complex, because the amount of fresh groundwater that is mixed with salt water is dependent upon the degree of aquifer confinement, lens thickness, the degree of agricultural and urban development, and numerous other factors that are not constant.

The Honolulu Water Management Area (WMA) has the second highest estimated sustainable yield of all of the Oahu aquifer system sectors at 53 mgd. The highest estimated sustainable yield of 184 mgd occurs in the Pearl Harbor WMA. The Honolulu WMA is also the second most heavily utilized WMA for municipal water use. In 1990, the authorized use of 52.55 mgd, or more than one-third of BWS's total usage of 156 mgd, was allocated from the Honolulu WMA.

The OWMP notes that the Honolulu WMA's total estimated sustainable yield of 53 mgd is

distributed among the six aquifers that constitute the Honolulu sector as follows: Waialae East aquifer, 2 mgd; Waialae West aquifer, 4 mgd; Palolo aquifer, 5 mgd; Nuuanu aquifer, 15 mgd; Kalihi aquifer, 9 mgd; and Moanalua aquifer, 18 mgd.

In 1990, the groundwater withdrawals from the Honolulu WMA was reported by the CWRM to be 46.8 mgd, or about 88 percent of the sustainable yield of 53 mgd for this WMA. The 46.8 mgd of groundwater withdrawn in 1990 from the six aquifers in the Honolulu WMA was distributed as follows: Waialae East and Waialae West aquifers, 0.8 mgd; Palolo aquifer, 6.8 mgd; Nuuanu aquifer, 17.2 mgd; Kalihi aquifer, 9.9 mgd; and Moanalua aquifer, 12.1 mgd.

In 1990, the average water withdrawn from the Moanalua aquifer was roughly 12 mgd, which is about 6 mgd less than this aquifer's estimated sustainable yield of 18 mgd.

2.5 Potential Areas for Source Development

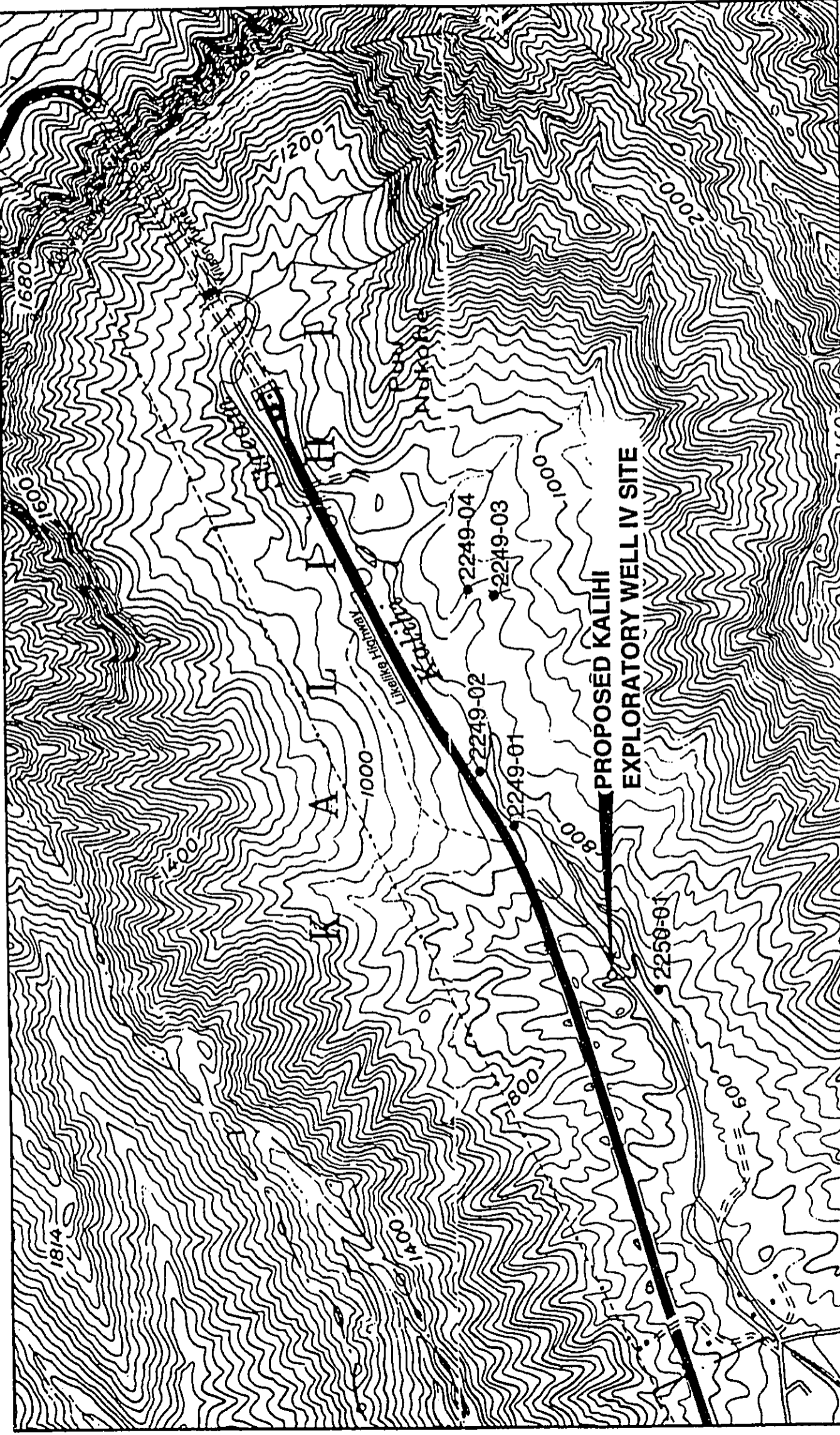
According to the OWMP report, there is a potential for developing potable water sources in the high level areas in Honolulu. The purpose of the Kalihi Exploratory Well IV is to determine if the development of an additional potable water source in the high level area of the Moanalua aquifer within the upper portion of Kalihi Valley is feasible.

The impact of development of additional sources of potable groundwater in Honolulu was done in a separate study entitled *Regional Environmental Impact Assessment for Development of Wells, Reservoirs, Transmission Lines and Appurtenances at Honolulu, Hawaii*, which was prepared for the BWS and published in 1984.

2.6 Existing Water Sources

According to the OWMP and DLNR records, the Moanalua Aquifer facilities consists of about 11 wells. One private well has been sealed. Two wells are operated by private entities, and four wells are operated by the U.S. Army. The remaining well facilities are under the jurisdiction of the BWS or operated by the BWS. Within the Moanalua Aquifer, the BWS operates the Kalihi Shaft (Well No. 2052-08) in lower Kalihi Valley. In the vicinity of the proposed well site in upper Kalihi Valley are located the Kalihi Aerator Well (Well No. 2250-01), and the inactive Kalihi Tunnels (Wells Nos. 2249-01, 02, 03, and 04) (see Figure 2-2). Further information on the BWS's water system in the Honolulu Sector and Moanalua Aquifer may be found in *Regional Environmental Impact Assessment for Development of Wells, Reservoirs, Transmission Lines and Appurtenances at Honolulu, Hawaii*, 1984.

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Well No. 2249-01 to 04 2250-01	Well Name Kalihi Tunnels (inactive) Kalihi Aerator Well (inactive)	FIGURE	2-2
Environmental Assessment Kalihi Exploratory Well IV CITY AND COUNTY OF HONOLULU - BOARD OF WATER SUPPLY		EXISTING WELLS AND PROPOSED EXPLORATORY WELL SITE	
NORTH 0 1000 2000 FEET		CH2M HILL	

Records for the Moanalua Aquifer for 1990 indicate that the BWS withdrew an average of about 10.5 mgd from its wells, while military and private users withdrew an average of 1.6 mgd, for a total of about 12.1 mgd. The CWRM has set the authorized water use for the Moanalua Aquifer System to 14.05 mgd, which is about 4 mgd less than the estimated sustainable yield for this aquifer.

2.7 Recommended Water System Improvements

The *Regional Environmental Impact Assessment for Development of Wells, Reservoirs, Transmission Lines and Appurtenances at Honolulu, Hawaii*, addressed the impacts of developing proposed new basal groundwater, alluvial groundwater, and spring water sources in the Honolulu sector of Oahu. In the 1984 study, the BWS evaluated 21 proposed water development projects (including conventional groundwater wells, springs, or spring diversions), two proposed reservoirs, and two proposals for additional transmission pipelines totaling 11,500 linear feet (about 2.3 miles).

Within the Moanalua aquifer, the BWS's *Regional Environmental Impact Assessment for Development of Wells, Reservoirs, Transmission Lines and Appurtenances at Honolulu, Hawaii*, proposed two possible potable groundwater sources in upper Kalihi Valley, an additional 4 groundwater well station sites, and an a transmission pipeline in Salt Lake Boulevard. The proposed Kalihi Exploratory Well IV is located in the vicinity of the two sites in upper Kalihi Valley, and is intended to determine if an additional potable well in this area is feasible. The four additional proposed groundwater well station sites were all located at lower portions of the Moanalua aquifer, and were proposed as nonpotable water sources.

Chapter 3 Project Description

3.1 Location and Site Characteristics

The proposed project is located in Kalihi Valley, on the leeward side of the Koolau Mountains, and is located about one mile *makai* of the Likelike Highway-Wilson Tunnel portal, at an elevation of about 592 feet above mean sea level (msl) (see Figure 3-1). The 1.3-acre site is located a few hundred feet down gradient and southeast of Likelike Highway within the forest reserve area, and about 200 feet upgradient from the banks of Kalihi Stream. The proposed exploratory well is to be located within the BWS's existing Kalihi 614 Reservoir site (see Figure 3-2).

Construction of the Kalihi 614 Reservoir site was completed in 1990. The site is a flat area that has been carved out of the hillside and contains an existing 1.0 million gallon concrete cylindrical reservoir, a 6-foot by 9-foot by 8-foot-high concrete hollow block instrument house, and a paved asphalt curbed driveway encircling the reservoir. The entire site is surrounded by a six-foot high chain link fence topped with barbed wire. The flat area around and directly in front of the reservoir is landscaped with pangola grass. The site is secured with a 14-foot-wide double-swing chain link entry gate, chain, and pad locks.

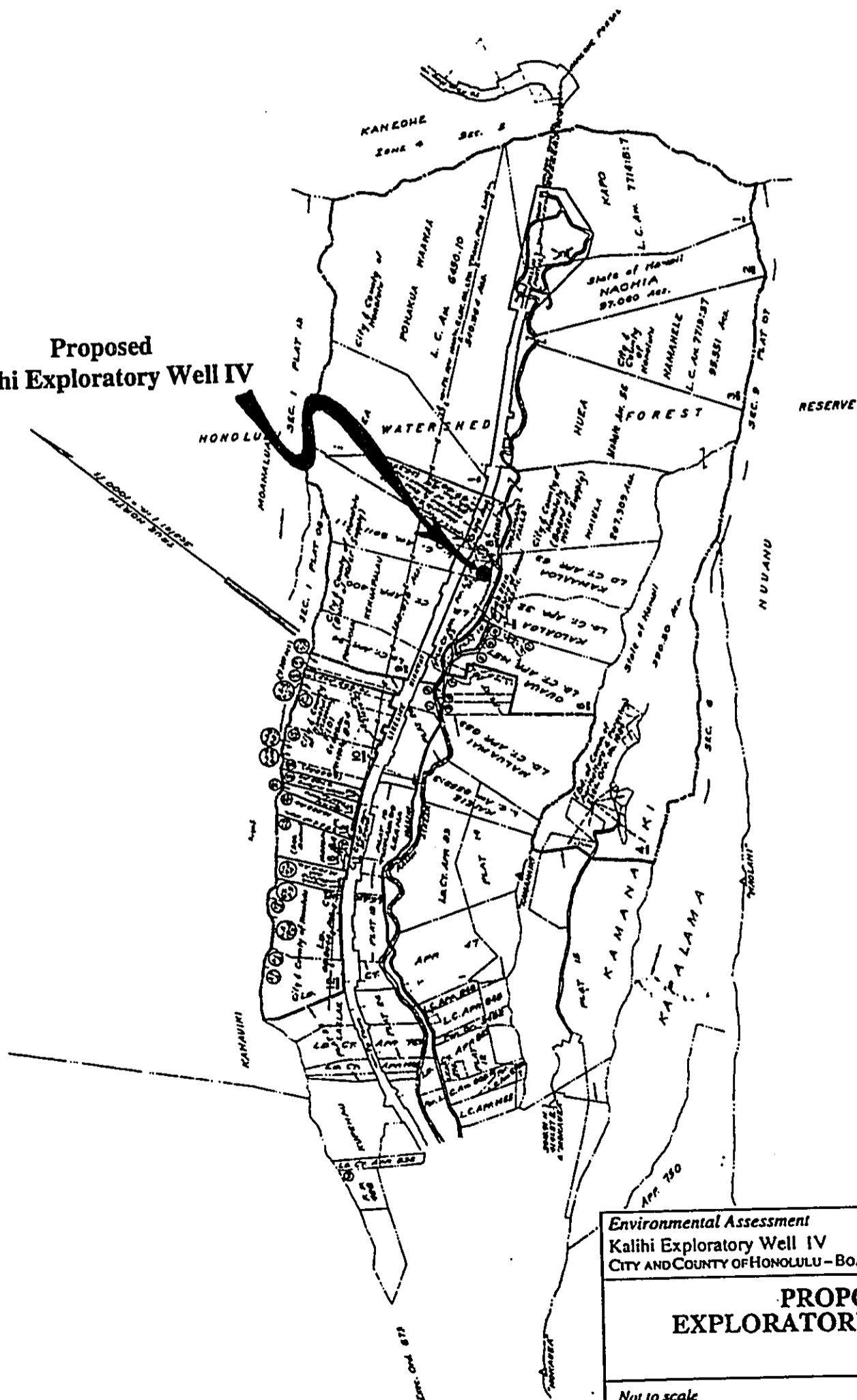
Access to the site is via Kalihi Street, which extends in the *mauka* direction from the existing residential area from the southwest to the northeast. Within the most *mauka* section of the Kalihi residential area, Kalihi Street is a winding 18-foot wide paved roadway that narrows to a 9-foot wide paved roadway about 800 feet *makai* of the forest reserve boundary. At the forest reserve boundary, a 6-foot high, locked chain link fence gate controls vehicular entry into the forest reserve. From the gate at the entrance to the forest reserve to the Kalihi 614 Reservoir site, Kalihi Street crosses over Kalihi Stream twice and is a winding 9-foot wide paved roadway with dense brush and trees on both sides.

The existing 1.0 million gallon Kalihi 614 Reservoir is connected to existing 16-inch and 8-inch diameter lines in Kalihi Street that are connected to BWS's municipal (Honolulu area) water system.

A surface drainage inlet covered with a steel grating is located in the asphalt driveway at the front of the reservoir site. The drain inlet is connected to a 24-inch underground pipe drainage system that is used to dispose of water drawn during the periodic testing and water sampling done at the reservoir and for surface drainage. This 24-inch underground drainage pipe goes under Kalihi Street and then into Kalihi Stream. Power for the instrument house and controls is via electric lines along Kalihi Street.

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**Proposed
Kalihi Exploratory Well IV**



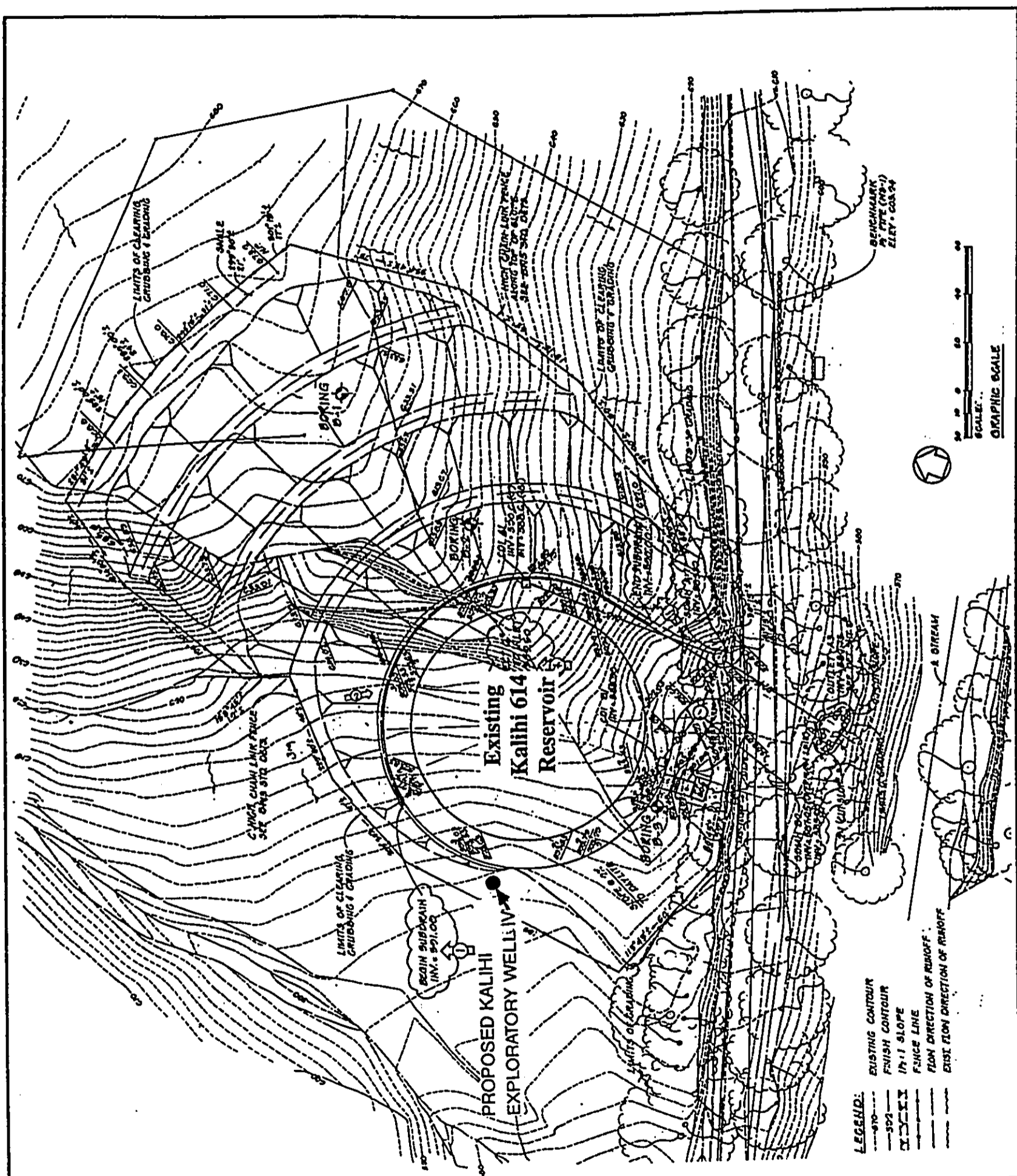
DEPARTMENT OF THE LAND COMMISSION	
TAXATION MAPS DIVISION	
STATE OF HAWAII	
TAX MAP	
DATE	FILE
1988	1988
1	4
18	18
SCALE 1 INCH = 1000 FEET	

SUBJECT TO CHANGE

18 existing number and
name of well
shown on map
is for reference
only

<p>Environmental Assessment Kalihi Exploratory Well IV CITY AND COUNTY OF HONOLULU - BOARD OF WATER SUPPLY</p>	<p>FIGURE 3-1</p>
<p>PROPOSED EXPLORATORY WELL SITE</p>	
<p>Not to scale</p>	
<p>CH2M HILL</p>	

0000 0001 0027



LEGEND:

- 970 --- EXISTING CONTOUR
- 992 --- FINISH CONTOUR
- 1/4\"/>



0 20 40 60 80
SCALE
GRAPHIC SCALE

Environmental Assessment
 Kalihi Exploratory Well IV
 CITY AND COUNTY OF HONOLULU - BOARD OF WATER SUPPLY

FIGURE
 3-2

PROPOSED SITE PLAN

3.2 Technical Characteristics

The Kalihi Exploratory Well IV is proposed to be approximately 500 feet deep and will attempt to extract perched water from the alluvium below the Kalihi basalt (see Figure 3-3). The proposed Kalihi Exploratory Well IV, if converted to a production well, is expected to be able to yield 0.25 mgd.

In the vicinity of the proposed Kalihi Exploratory Well IV, there are four inactive BWS Kalihi Tunnels (Well Nos. 2249-01 to 04) located to the northeast, and the BWS Kalihi Aerator Well site (Well No. 2250-01). The production at the four BWS Kalihi Tunnels in 1993 was 0.00 mgd, and 0.06 mgd of water was being extracted from the Kalihi Aerator Well site.

BWS Tunnels No. 2249-01 and No. 2249-02 are situated at a ground elevations of 791 feet and 801 feet above msl respectively, and are both located about 1,000 to 2,000 feet northeast of the Kalihi Exploratory Well IV site. BWS Tunnels No. 2249-03 and No. 2249-04 are situated at a ground elevations of 842 and 845 feet above msl respectively, and are located about 3,000 feet northeast of the Kalihi Exploratory Well IV site.

The existing deep well at the Kalihi Aerator site is designated No. 2250-01. DLNR records indicate that Well No. 2250-01, which was constructed in 1964, is located at a ground elevation of 614 feet msl, has a diameter of 12 inches, a depth of 464 feet above msl, and a solid well casing reaching a depth of 514 feet above msl. A former well, designated as No. 2250-02, which was constructed in 1991, is located at a ground elevation of 560 feet, and had a depth of 380 feet above msl. The initial static head of Well No. 2250-01 was 635 feet above msl, and the initial static head of Well No. 2250-02 was 535 feet above msl. Well No. 2250-02 did not produce sufficient water and was sealed in 1991.

It is expected that the proposed Kalihi Exploratory Well IV will be successful in yielding the necessary quantity and quality of groundwater because it will be extracting water at a depth below 200 feet from alluvium where the BWS hydrologists have predicted that there may adequate yields of ground water available.

3.3 Construction and Exploratory Well Testing

The proposed exploratory well will be approximately 500 feet deep with the upper 300 feet consisting of a 10-inch diameter steel casing. The lower 200 feet of the well will consist of a 10-inch diameter louvered casing surrounded by a 3-inch layer of silica pea and gravel. The ground elevation of the proposed exploratory well will be about 592 feet above mean sea level (see Figure 3-3).

Drainage from the existing reservoir for testing or flushing and for surface drainage is provided through the existing 24-inch diameter drain line that goes underground under Kalihi Street and empties into Kalihi Stream at an outlet with an invert elevation of about 583 feet above msl. Kalihi Stream's invert is at an elevation of about 540 feet above msl. This existing drainage system will be used to dispose of water extracted during the yield-drawdown test and the long term constant rate test.

The yield-drawdown test will be conducted after the exploratory well is drilled, and a temporary diesel or electric pump and pipelines are installed. The yield-drawdown test will be performed at a rate of 200 to 400 gallons per minute. Following the yield-drawdown test, a long-term constant rate test will be conducted for a period of several days at the rate determined from the yield-drawdown test. Water table drawdown rates will be measured and the quality of water will be tested.

Should the quantity and quality of the water prove to be satisfactory, the exploratory well will be temporarily capped. If the test pumping proves to be unsatisfactory, the exploratory well will be sealed and abandoned. In either case, when the yield-drawdown and long-term test pumpings are completed, the temporary pump and pipeline will be removed from the site, and all surplus excavation material and construction debris will be removed and disposed of off-site in compliance with applicable State and City and County regulations.

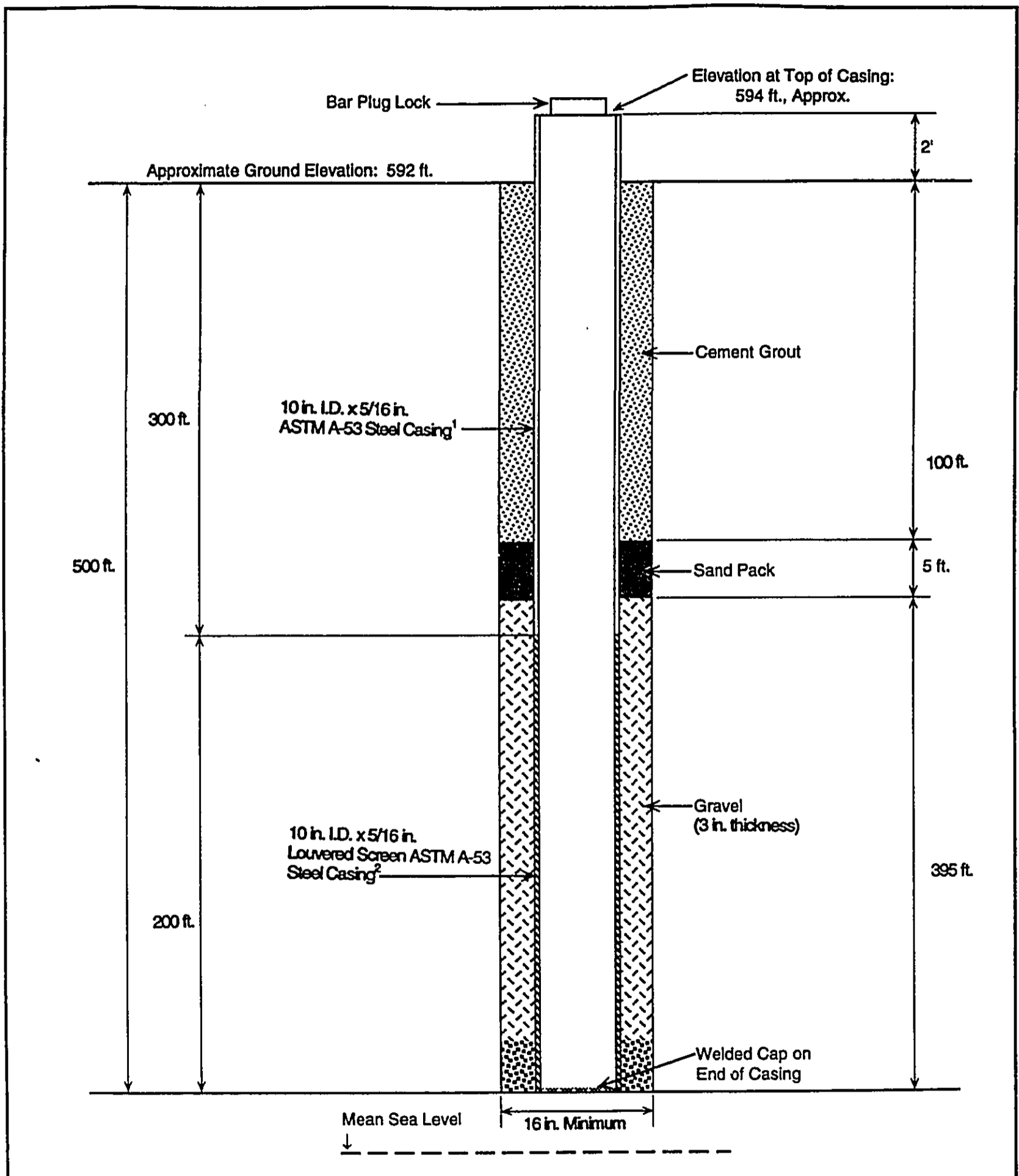
3.4 Project Schedule, Cost, and Work Force

The construction and testing of the proposed Kalihi Exploratory Well IV is on temporary hold. The capital cost for the exploratory well project is estimated at \$175,000.00 in 1995 dollars.

Drilling will be completed in about six months. Installation of the casing will take about a week and another two to three weeks will be required to install the pump and run the test pumping. Demobilization may take up to two weeks. Total project duration for the construction and testing of the exploratory well is therefore estimated to be about eight months.

If the well tests are successful, the Kalihi Exploratory Well IV will be integrated into the existing municipal potable water system. Installation of the permanent pump, pipelines, and necessary electrical and mechanical control devices is expected to take up to an additional 14 months, at an additional cost of \$750,000.00.

0000 000 0030



NOTES:

¹ Solid Casing:		² Louvered Casing:	
Material:	ASTM *A-53 Steel	Material:	ASTM A-53 Steel
Length:	300 ft.	Length:	200 ft.
Inside Diameter:	10 in.	Inside Diameter:	10 in.
Wall thickness:	5/16 in.	Wall thickness:	5/16 in.

Environmental Assessment
Kalihi Exploratory Well IV
 CITY AND COUNTY OF HONOLULU - BOARD OF WATER SUPPLY

FIGURE
3-3

WELL CROSS-SECTION

Not to scale

* ASTM=American Society for Testing and Materials

Chapter 4 Environmental Setting, Potential Impacts, and Mitigation

4.1 Land Use and Ownership

4.1.1 Land Use and Ownership

Land use in this area of upper Kalihi Valley is forest reserve and watershed, consisting predominantly of trees and brush. Likelike Highway is located a few hundred feet up gradient from the proposed exploratory well site and Kalihi Stream is located about 200 feet down gradient from the proposed exploratory well site, across Kalihi Street. The area is isolated from the Kalihi residential area and is far away from the most *mauka* of the residents in Kalihi Valley who are located next to the *makai* edge of the forest reserve. Access to this area is restricted, with vehicular entry controlled by a locked chain link fence across Kalihi Street at the edge of the forest reserve.

The Kalihi Exploratory Well IV is proposed to be located within the BWS's existing Kalihi 614 Reservoir site, which contains an existing 1.0 million gallon concrete cylindrical reservoir, an instrument house, and a paved asphalt curbed driveway encircling the reservoir. The flat area around the reservoir and instrument house is landscaped with pangola grass, and the steeper areas surrounding the reservoir within the site are covered with smaller trees and shrubs. A small *auwai* (ditch) is located outside of the site to the northwest, and leads into Kalihi Stream downstream of the site.

The Kalihi 614 Reservoir site is identified by Tax Map Key 1-4-18: portion of 06. The lands surrounding the Kalihi 614 Reservoir site are predominantly under City and County or State of Hawaii jurisdiction, except for Tax Map Key parcel 1-4-18:08, which is jointly owned by private parties and the State of Hawaii. The parcel on which the Kalihi 614 Reservoir is situated is under the ownership of the BWS.

4.1.2 Project Impacts

Installation of the Kalihi Exploratory Well IV will not change any of the surrounding land uses and ownership patterns.

4.1.3 Mitigation Measures

No mitigation measures are proposed or required.

4.2 Topography, Climate, and Rainfall

4.2.1 Topography, Climate, and Rainfall

The site is located at the upper portion of Kalihi Valley, about one mile *makai* of the Likelike Highway-Wilson Tunnel Portal. The project area is located on the flattened floor of Kalihi Valley, about 200 feet up gradient of the bank of Kalihi Stream, at about an elevation of about 592 feet above msl.

Temperature ranges from 74 to 75 degrees F in March and ranges from 79 to 80 degrees F in September. A northeasterly trade wind is prevalent throughout most of the year. In Hawaii, the term "windward" generally refers to the normal direction of this prevailing trade wind and not the direction of the wind at a specific time. The northeast or "windward" trade wind occurs with higher frequency in the summer, about 90 percent of the time, as compared to winter, when the northeast trade wind occurs only about 50 percent of the time.

Rainfall averages over 120 inches per year near the top of the Kalihi Valley at about the 2,700 foot elevation near the ridge line of the Koolau Mountain range. The rainfall at this elevation is the result of mountain-caused or "orographic" rains that form as the moist trade wind air moves in from the sea, predominantly from the northeast direction on the other side of the island, first along the lower flat lands of Kaneohe and Kailua, and then up the steep slopes of the Koolau Mountains. Rainfall distribution closely follows the topographic contours on both the windward and leeward sides of the Koolau Mountains, with higher rainfall at the upper slopes, and lower rainfall at lower elevations.

The BWS site is located at an elevation of about 592 feet above msl, but because it is near the head of Kalihi Valley, has an average rainfall of about 120 inches per year.

4.2.2 Project Impacts

Installation of the exploratory well will not have any significant effect on the topography, climate, or rainfall in the area.

4.2.3 Mitigation Measures

No mitigation measures are proposed or required.

4.3 Geology and Hydrology

4.3.1 Geology

The island of Oahu is result of the growth, connection, and erosion of two elongated shield volcanoes that are the foundation of the present Waianae and Koolau mountain ranges. The Waianae volcano, which is the older of the two volcanoes, formed what is now the Waianae mountain range. The Koolau volcano became active after the Waianae volcano had reached its maturity and continued its activity long after the Waianae volcano ceased its activity. The Koolau volcano continued to build and fill in the region between the two volcanoes creating one island as lava flows continued westward creating the Schofield plateau and the rest of the island.

Within the geological time known as the "great erosional period," the Koolau volcano was inactive for a long period of time, during which time erosion and the deposition of sediment continued to shape the ridges and deep valleys on the island of Oahu. Changes in sea level also shaped the island, as evidenced by the marine and terrestrial sediments deposited on the coastal plains. Reef limestone coral fossils are found miles inland from the present shoreline, and conspicuous submarine benches are found offshore. After the long period of volcanic quiet, eruptions broke out on the southwest and southeast slopes of the Koolau range and at the heads of the deeply eroded valleys, with lava from these eruptions running down the valleys, spreading out, and flattening the floor of many valleys including Kalihi Valley.

The walls and the deep geological structure below the floor of Kalihi Valley is older Koolau basalt. Chiefly older alluvium consisting of noncalcareous deposits overlies this older and deeper Koolau basalt, and is located near surface at the head and sides of Kalihi Valley. Near the head of Kalihi Valley, this chiefly older alluvium grades into coarse angular talus and landslide deposits which, in places, may carry considerable water. A dense vesicular jointed layer of *aa* and *pahoehoe* from the most recent volcanic eruptions from the Koolau range, from about 10 to 300 feet thick, overlies the alluvium along the floor of Kalihi Valley, from the middle of the valley *mauka* to nearly the head of the valley (Stearns and Vaksvik, 1935).

The soils at the surface of the proposed Kalihi Exploratory Well IV site is classified by the U.S. Soil Conservation Service as Lolekaa silty clay (LoE). Lolekaa silty clay is characterized as having medium to rapid runoff, moderate to severe erosion hazard, moderately rapid permeability, and low to moderate shrink-swell potential.

4.3.2 Groundwater Hydrology

The proposed BWS exploratory well site is located near the head of Kalihi Valley, about 1-1/2 miles below the Koolau ridge line within the Moanalua Aquifer System. The Moanalua aquifer consists of a thick basal lenses that is hydrologically confined along the coast by the caprock. Because rainfall is greater in the interior higher elevation mountain areas, recharge of the basal groundwater is also greatest in these higher elevation areas. Thus, basal groundwater generally flows from the higher interior areas to the lower coastal areas, through the caprock formation, and then out to sea. The highest yields of basal groundwater are expected in the *makai* areas of the Moanalua aquifer where there are unconfined or confined basaltic aquifers. In the areas closer to the shoreline where there are confined basalts, the caprock, which is formed of marine and alluvial deposits, is the barrier that retards the seaward flow of basal ground water.

Basal groundwater may also occur in significant quantities in the coastal plain and valley sedimentary deposits, although in much less abundance than found in the basaltic lava aquifers. However, since the storage capacity and the permeability of these sedimentary deposits is small as compared to that of the basaltic lava aquifers, and many of the coastal plain sedimentary aquifers sea tend to be brackish, it has always been easier to develop groundwater from the basaltic lava aquifers. Sedimentary aquifers along the stream valley may hold some promise for the development of groundwater (MacDonald, 1990).

According to the OWMP and DLNR records, the Moanalua Aquifer facilities consists of about 11 wells. One private well has been sealed. Two wells are operated by private entities, and four wells are operated by the U.S. Army. The remaining well facilities are under the jurisdiction of the BWS or operated by the BWS. Within the Moanalua Aquifer, the BWS operates the Kalihi Shaft (Well No. 2052-08) in lower Kalihi Valley. In the vicinity of the proposed well site in upper Kalihi Valley are located the Kalihi Aerator Well (Well No. 2250-01) and the inactive Kalihi Tunnels (Well Nos. 2249-01, 02, 03, and 04) (see Figure 2-2). Further information on the BWS's water system in the Honolulu Sector and Moanalua Aquifer may be found in *Regional Environmental Impact Assessment for Development of Wells, Reservoirs, Transmission Lines and Appurtenances at Honolulu, Hawaii*, 1984.

Records for the Moanalua Aquifer for 1990 indicate that the BWS withdrew an average of 10.5 mgd from its wells, while military and private users withdrew an average of 1.6 mgd, for a total of about 12.1 mgd. The CWRM has set the authorized water use for the Moanalua Aquifer System to 14.05 mgd, which is about 4 mgd less than the estimated sustainable yield for this aquifer.

The Kalihi Exploratory Well IV is proposed to be 500 feet deep and reach a depth of 92 feet above msl and will attempt to draw water from the alluvium below the Kalihi basalt.

If the test pumping results indicate that the quality or quantity of the water from the exploratory well is unsatisfactory, the well will be capped and/or sealed to prevent malicious or accidental contamination of the underlying groundwater aquifers.

4.3.3 Surface Water Hydrology

The Kalihi Valley drainage basin flows into two perennial streams, Kalihi Stream and Kapalama Stream. Kamaikai Stream, a tributary that feeds into Kalihi Stream, is located about 1/2 mile to the southeast of the proposed exploratory well site. From the proposed exploratory well site, Kamaikai Stream is located to the southeast, beyond an intervening ridge, and northwest of Kapalama Stream. Kalihi Stream is the closest stream to the proposed exploratory well site, and is located about 200 feet downgradient and to the southeast of the BWS site. Both Kalihi Stream and Kapalama Stream are lined at the lower reaches near the mouths of the streams.

Gauging information exists for Kalihi Stream but not for Kapalama Stream (CWRM, 1990). The U.S. Geological Survey stream flow gage in the lower reach of Kalihi Stream (No. 229300) is located about a mile upstream from the mouth of the stream. Another stream flow gage (No. 229000) is located about 4 miles upstream from the mouth of the stream, and downstream from the proposed exploratory well site. Kamaikai Stream feeds into Kalihi Stream about 2 miles upstream from the mouth of Kalihi Stream, between the two stream gages. The average flow for the Kalihi Stream at the lower gage (No. 229300) was 10.3 cfs (6.6 mgd) for the period since 1962 to 1991, and the average flow for the upper gage (No. 229000) was 6.59 cfs (4.3 mgd) for the period from 1913 to 1991.

Water from the test pumping of the exploratory well will be discharged into the existing drainage system in the Kalihi 614 Reservoir site that leads under Kalihi Street into Kalihi Stream. It is expected that the water that will be discharged will be clean, and therefore will not introduce any pollutants into the environment. Kalihi Stream eventually empties into Keehi Lagoon. Care will be taken in disposing of the test water to preclude the possibility of flushing debris or re-suspending sediments and other pollutants in the stream.

The U.S. Fish and Wildlife Service (USFWS) in 1977 classified perennial streams into four categories based upon the environmental quality and the appropriate use of the stream, using Hawaii State Department of Health (DOH) water quality standards (Timbol and Maciolek, 1978). The four stream categories were:

- **Pristine-Preservation Streams.** These streams have high environmental and biological quality.
- **Limited Consumptive Streams.** These streams have moderate to high quality water or natural values. Use of these streams is controlled to prevent excessive modification.
- **Exploitive-Consumptive Streams.** These streams have moderate to low natural (environmental-biological) quality and/or moderate to low water quality (because of exploitation, modification or degradation). These streams are intended for water related recreational activities.
- **Construct-Alter Streams.** These streams have low environmental and biological quality and may be restricted to the public for health or safety reasons.

The Kalihi and Kapalama Streams were both classified as Construct-Alter Streams. Kalihi Stream is a continuous perennial stream with a length of about 11.2 miles, of which about 3 miles of the channel has been modified with elevated culverts and revetments from 1927 to 1969. Kapalama Stream is an interrupted perennial stream with a length of about 5.6 miles. All 5.6 miles have been modified with linings; removal of vegetation and realignments; elevated culverts; revetments; blocked or filled-in sections; and extensions of culverts from 1938 to 1965.

In 1991, the CWRM published "*Hawaii Stream Assessment, A Preliminary Appraisal of Hawaii's Stream Resources*," in cooperation with the U.S. Department of Interior, National Park Service. The report represented the State of Hawaii's first attempt to identify streams that might be appropriate for protection. Four stream resource categories were used in the *Hawaii Stream Assessment*.

- **Aquatic Resources.** These resources are the unique aquatic fauna that have a life cycle involving both the stream and the sea, including freshwater fish, mollusks, crustaceans, and insects. Good aquatic resources were more likely for larger streams lacking stream modifications.
- **Riparian Resources.** These resources are the biological/ecological stream-associated resources such as: rare, threatened and endangered species and communities; protected areas; wetlands; and native forests. These resources give an indication of the status of the watershed that the stream is located within.

- **Cultural Resources.** These stream-related resources included archaeological resources, historic sites, and current taro cultivation areas. The criteria to be considered a stream-related was that, changes in stream management would affect the resource, or the resource was functionally dependent on the stream, or the resource was in close proximity to the stream.
- **Recreational Resources.** These resources include boating, camping, fishing, hunting, nature study areas, parks, scenic views, and swimming.

In the *Hawaii Stream Assessment*, resource categories were ranked as outstanding, substantial, moderate and limited. Kalihi Stream was identified as having moderate aquatic resources and moderate recreational resources. Kapalama Stream was identified as having moderate recreational resources.

Kalihi Stream's moderate aquatic resource ranking was due to the observance of *oopu nakea* (*Awaous stamineus*) a native fish; four other native species (which may have included two stream and two marine fishes, one shrimp, and one snail); and five introduced species (including noxious, non-native stream animals that may prey upon and/or out-compete with native species). Kalihi Stream's moderate recreational resources ranking was due to fishing, swimming, and hunting resources. Kalihi Stream was not ranked as one of the seven streams on Oahu that have outstanding aquatic resources, and was not ranked as one of the two streams on Oahu that have outstanding recreational resources. Kapalama Stream's moderate recreational resources ranking was due to fishing and nature study. Kapalama Stream was not ranked as one of the two streams on Oahu that have outstanding recreational resources.

4.3.4 Project Impacts

No adverse impacts to the geological formations underlying the drilling site for the exploratory well or to the soils at the surface of the site are expected. Impacts to the groundwater are expected to be insignificant.

There is no potential for adverse impacts to Kapalama Stream because of its distance from the exploratory well site. At its closest, Kapalama Stream is over a mile away from the proposed exploratory well site, and Kamaikai Stream is located between the proposed exploratory well site and Kapalama Stream. There is no potential for impacts on Kalihi Stream's riparian and cultural resources, because of the general absence of significant resources of these types at Kalihi Stream.

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In *Stream Modification in Hawaii, Part A: Statewide Inventory of Streams, Habitat Factors and Associated Biota* (CWRM, 1990), the Kalihi Stream was classified as a Construct-Alter Stream. Construct-Alter Streams have low environmental and biological qualities and may be restricted to the public for health or safety reasons. In the *Hawaii Stream Assessment*, Kalihi Stream was not ranked as one of the seven streams on Oahu that have outstanding aquatic resources, and was not ranked as one of the two streams on Oahu that have outstanding recreational resources. There will not be any significant impacts to Kalihi Stream's moderate aquatic resources and moderate recreational resources because of the short term and temporary nature of the exploratory well test pumping and disposal of the excess water into Kalihi Stream.

The well is not expected to affect Kalihi Stream which is perched upon the Kalihi Basalt, which is a thick, dense lava flow. The stream invert elevation is approximately 560 feet above msl compared to the approximate elevation of 290 feet above msl where water is expected to be found.

There is no potential for adverse impacts to the three wetland areas in the Honolulu Sector, which are Paiko Lagoon, Diamond Head Crater, and Kaau Crater. No significant impacts are anticipated because of the great distances separating the exploratory well site from Paiko Lagoon, Diamond Head Crater, and Kaau Crater, and because these wetlands are not located in the same aquifer system as the site for the exploratory well.

4.3.5 Mitigation Measures

During the test pumping, care will be taken in disposing of the test water to preclude the possibility of flushing debris or re-suspending sediments and other pollutants in Kalihi Stream.

If the test pumping results indicate that the quality or quantity of the water from the exploratory well is unsatisfactory, the well will be capped and/or sealed to prevent malicious or accidental contamination of the underlying groundwater aquifers.

4.4 Natural Hazards

4.4.1 Flood Zones

The proposed Kalihi Well site is located in a forest reserve in upper Kalihi Valley at an elevation of about 592 feet above msl. The site is about 200 feet upgradient from Kalihi Stream, in the Flood Insurance Rate Map (FIRM) Zone D. Zone D designates areas where

flood hazards are undetermined. The FIRM map does not show any flood-prone areas in the vicinity of the project site.

4.4.2 Seismic Activity

Under the Uniform Building Code (UBC), the island of Oahu is designated as Seismic Zone 2B. In a scale from 1 to 4, is Zone 1 has the lowest potential for ground motion created by seismic events. The UBC establishes minimum design criteria for structures to resist the effects of seismic ground motion, in accordance with the standards for the seismic zone in which the structure is to be built. In the interest of public health and safety, the BWS has adopted the standards for Seismic Zone 3 for all of its structures. All structures that will be built as part of this project will be designed and built in accordance with the UBC standards for Seismic Zone 3.

4.4.3 Project Impacts

The proposed project will not affect nor will be affected by flooding. Seismic risk at the project site is minimal. The proposed project will not affect seismic activity, and will not likely be affected by seismic activity.

4.4.4 Mitigation Measures

As a public health and safety measure, the BWS has adopted the standards for Seismic Zone 3 for the design and construction of all the structures that will be a part of this project.

No other mitigation measures are proposed or required.

4.5 Demographics

4.5.1 Population, Housing, and Employment

The project area where the Kalihi exploratory well is proposed is located in Census Tract 65, which generally comprises the area south of the crest of the Koolau mountains, west of the Kalihi-Kamanaiki Ridge, east of the Fort Shafter military reservation boundary, and north of Halina Street. The 1990 population for this tract was 4,077. In 1990, the U.S. Census reports showed that there were 974 households in this tract. There are very few employment activities in this basically residential community except for the administrative and teaching jobs at Kalihi Elementary School.

4.5.2 Project Impacts

The proposed Kalihi Exploratory Well IV project will involve a small amount of new construction work. However, this construction work will be temporary and will most likely be conducted by workers from outside of this census tract. Existing and future population, housing, and employment in this portion of Kalihi will not be affected by the construction activities related to this project.

The 0.25 mgd of potable water to be developed is intended to satisfy a very small portion of the existing municipal potable water usage for Oahu. In the Honolulu and Pearl Harbor Groundwater sectors, the Palolo, Nuuanu, Kalihi, and Waimalu aquifers have groundwater withdrawal rates that exceed that aquifer's sustainable yield. If it is determined that water can be developed from this well, that water would be used to make up the short fall of the potable water needed for those aquifers with sustainable yield deficits, and would thus not be available for future new developments.

4.5.3 Mitigation Measures

Since this project is intended to meet only existing potable water demands, the BWS will be seeking additional potable water sources elsewhere on the island of Oahu to satisfy potable water demands for future increases in population, housing, and employment.

4.6 Roadways and Traffic

4.6.1 Roadways and Traffic

Access to the site is via Kalihi Street, which extends in the *mauka* direction from the existing residential area from the southwest to the northeast. Kalihi Street is the main access through Kalihi Valley, and can be accessed by Likelike Highway. Within the *mauka* portion of the Kalihi residential area, Kalihi Street is a winding 18-foot wide paved roadway that narrows to a 9-foot wide paved roadway about 800 feet *makai* of the forest reserve boundary. At the forest reserve boundary, a six-foot high, locked chain link fence gate blocks vehicular entry into the forest reserve. From the gate at the entrance to the forest reserve to the Kalihi 614 Reservoir site, Kalihi Street crosses over Kalihi Stream twice and is a winding 9-foot wide paved roadway with dense brush and trees on both sides.

Because of the restricted access to this area within the forest reserve, there is very little vehicular and virtually no pedestrian traffic on the portion of Kalihi Street adjacent to the proposed exploratory well site except for occasional BWS or other government or service vehicles.

Likelike Highway, although located a few hundred feet northwest of the proposed exploratory well site, is completely separated from the site. Dense brush and trees separate the exploratory well site from Likelike Highway. Although noise from the vehicles on Likelike Highway can be heard, the highway cannot be seen from the site. According to the Hawaii Department of Transportation, average daily traffic on Likelike Highway in 1991 amounted to 58,788 in the section nearest the proposed exploratory well site.

4.6.2 Project Impacts

The project will create a slight and temporary rise in heavy truck traffic on Kalihi Street. There will be no adverse impacts to the traffic on Likelike Highway. No significant impacts to the traffic on Kalihi Street are expected with this project.

4.6.3 Mitigation Measures

To minimize traffic impacts to the residents along Kalihi Street, the contractor will schedule heavy truck activity between the hours of 8:00 am to 3:30 pm Monday through Friday and will exclude state holidays.

4.7 Visual and Recreational Resources

4.7.1 Visual Resources and Recreational Resources

Public access to this portion of Kalihi Street in the vicinity of the proposed exploratory well site is restricted because it is in a forest reserve area, and thus, there are no public views from this location.

The nearest public road is the Likelike Highway, which is located a few hundred feet northwest of the proposed exploratory well site. The site, including the existing reservoir, is not visible from Likelike Highway.

The closest public recreational area to the proposed project site is Kalihi Valley Park, which is located off Kalihi Street, near the *mauka* edge of the residential area, about 3/4 mile *makai* of the project site.

4.7.2 Project Impacts

No impacts to public visual resources will occur with this project. Since the project site and the Kalihi Valley Park are separated by a distance of about 3/4 mile, the Kalihi Valley Park will not be affected by this proposed project in any way.

4.7.3 Mitigation Measures

No mitigation measures are proposed or required.

4.8 Cultural Resources

4.8.1 Cultural Resources

An archaeological survey of the site was conducted by Cultural Surveys of Hawaii on April 21, 1994. The results of the archaeological reconnaissance survey and related research are found in Appendix A of this report.

Through its literature search, Cultural Surveys of Hawaii found documentation suggesting that there may have been taro cultivation within or near the present parcel during precontact times. In September 1988, the first archaeological reconnaissance survey of the proposed site was done prior to construction of the Kalihi 614 Reservoir. No prehistoric archaeological sites, feature, or artifacts were discovered during the 1988 survey.

In the 1988 survey, six structural features determined to be historic/modern in origin were found. These appeared to be dry masonry retaining or reinforcing walls, running parallel the contours along the eastern slope of a gulch cut by a small, unnamed tributary draining into Kalihi Stream. Four of these historic/modern features were adversely impacted by the construction of the reservoir, while two features were not adversely affected.

The proposed Kalihi Exploratory Well IV site is within the Kalihi 614 Reservoir site.

4.8.2 Project Impacts

The results of the field and investigative work show that this project area has been subject to considerable construction activity and is devoid of archaeological potential. The proposal for additional development of this site will not impact any archaeological resources.

4.8.3 Mitigation Measures

No mitigation measures are proposed or required.

4.9 Biological Resources

4.9.1 Botanical Resources

A botanical reconnaissance survey was conducted by Char and Associates on April 21, 1994. The results of the botanical reconnaissance survey and related research are found in Appendix B of this report.

The vegetation found at the site is composed almost exclusively of introduced or alien plants. Pangola grass was planted to plant soil erosion when the BWS reservoir was constructed. Since then, a number of other plants from the surrounding vegetation have spread onto the area. The most common of these include Florida beggarweed, red pualele and hairy sword fern. The level areas within the reservoir fence are maintained. Woody saplings, such as albizia and ironwood, are kept low, about 6 inches to under one foot.

None of the plants found on the site are candidates for threatened or endangered species status, and none are listed or proposed as threatened and endangered species (U.S. Fish and Wildlife Service, 1989, 1990, 1994.)

None of the plants are considered rare or vulnerable (Wagner et al., 1990). Two native species were observed on the site: a sedge (*Pycreus polystachyos*) and hau (*Hibiscus tiliacues*). Both are indigenous—that is, they are species native to the Hawaiian islands and elsewhere.

4.9.2 Faunal Resources

Faunal (bird and mammal) reconnaissance surveys were conducted by Philip L. Bruner, Environmental Consultant, on April 21, 1994. The results of this bird and mammal reconnaissance surveys and related research are found in Appendix C of this report.

No resident land birds were observed. Three species which may occasionally occur in this area are the short-eared Pueo (*Asio flammeus sandwichensis*), the Elepaio (*Chasiempis sandwichensis*), and the common Amakihi (*Hemignathus virens*). The Pueo is listed as an "endangered" species on Oahu by the Hawaii State Division of Forestry and Wildlife, and

forages in agricultural lands as well as forests. Elepaio is a small native insectivorous forest bird. The common *Amakihi* is not confined to native forests, and can often be seen in second growth exotic forest areas. The common *Amakihi* rarely descends to forage in the lower elevations similar to this site, preferring the higher elevations.

No waterbirds were observed at the site. It is possible that the black-crowned night heron (*Nycticorax nycticorax*), which is not listed as endangered, or the Koloa (Hawaiian duck, *Anas wyvilliana*), which is endangered, could frequent the mountains streams.

No seabirds or migratory shorebirds were observed. The site is unsuitable for seabirds and shorebirds due to predator access and human disturbance.

A total of 13 species of exotic bird were recorded. None of these exotic species are "endangered" or "threatened."

One non-native Small Indian Mongoose (*Herpestes auropunctatus*) was seen on the site. Rats, mice, and feral cats are undoubtedly numerous in this area.

It is not known whether the endemic and "endangered" Hawaiian Hoary Bat (*Lasiurus cinereus semotus*) utilize Kalihi Valley. This species are known to roost solitarily in trees and occur in upland forests as well as in coastal habitats; however, data on the bat's distribution and behavior are extremely limited. The bat is insectivorous and forages at dusk. No bats were encountered in the survey.

4.9.3 Project Impacts

There are no sensitive native plants communities on the project site. The proposed project will not have any affect on any significant biological resources. It is recommended, however, that the site be grassed over as soon as possible to prevent soil erosion due to the somewhat heavy rainfall in this area.

There were no sensitive bird or mammal resources observed on or nearby the project site. The proposed project should have no impact on any significant bird or mammal resources.

4.9.4 Mitigation Measures

For both botanical and faunal resources, no mitigation measures are proposed or required.

4.10 Air Quality and Noise

4.10.1 Air Quality and Noise

Air quality on Oahu is, in general, relatively clean and low in pollution, except where there are large numbers of motor vehicles or stationary sources. In the vicinity of the proposed exploratory well site at the upper end of Kalihi Street within the forest reserve, pollution contributed from vehicles traveling on Likelike Highway is minimal because of the distance separating Likelike Highway from the proposed exploratory well site, the predominance of the northeast trade winds, and because the trees and undergrowth provide a dense barrier against air currents from the highway. Air pollution resulting from the occasional vehicles on Kalihi Street in the area near the proposed exploratory well site is typically very low. There are no agricultural activities in the vicinity that may be a source of air pollutants. With the absence of stationary sources in this area, the air quality in this portion of Kalihi Valley near the proposed exploratory well site is low in pollution.

Ambient noise at and around the project site is also very low, and results mainly from the sounds of running water in the adjacent Kalihi Stream, and distant muffled sounds of the vehicular traffic on Likelike Highway. The trees and the brush between the proposed exploratory well site and the highway provides an effective noise barrier. Because this site is deep within the forest reserve, there are no nearby residents or others in the immediate area that may be sensitive to noise. The very low ambient noise levels is probably slightly higher in the morning and afternoon peak traffic periods, due to the increased number of cars and buses that travel on Likelike Highway.

4.10.2 Project Impacts

Construction will involve heavy vehicle and equipment operations that will create a small amount of fugitive dust and pollutant emissions. There will be no long-term air quality impacts once construction is completed.

On the island of Oahu, community noise controls have been set for analyzing noise impacts pursuant to Hawaii Department of Health Rules, Title 11, Chapter 46. Allowable daytime and nighttime noise level standards for sensitive receptors in residential, preservation, hotel, apartment, and business districts have been set under these rules. The project site is in a P-1, Restricted Preservation zone. For Preservation zones, the maximum allowable daytime noise level from 7:00 a.m. to 10:00 p.m. is 55 dBA, and the maximum allowable nighttime noise level from 10:00 p.m. to 7:00 a.m. is 45 dBA.

The project will not have any adverse noise impacts to any nearby sensitive noise receptors since there are none in the vicinity. Heavy equipment moving, construction, and the drilling of the exploratory well, will have noise. For the well drilling, if the cable tool drilling method is used, noise will result from the drill bit hitting rock, in a manner similar to a pile driver. Noise will also result from the operation of the diesel engine driving the drill.

A noise permit will be required from the Noise and Radiation Branch of the State of Hawaii Department of Health.

There will be no noise impacts after the construction is completed.

4.10.3 Mitigation Measures

To mitigate the effects of construction activities, dust control measures, such as water sprinkling, will be implemented by the contractor to reduce dust levels, as necessary. Further, the contractor will properly maintain its internal combustion equipment to minimize exhaust emissions, and will comply with the Hawaii Department of Health Rules Title 11, Chapter 59 and 60, regarding air pollution control.

Contractors will comply with all of the conditions of the required noise permit. Mufflers will be required for all construction equipment. All noise attenuating equipment will be maintained in proper operation condition and will be repaired or replaced as needed. For the drilling operation, drilling operations will be restricted to the hours of 7:30 a.m. to 4:30 p.m., on weekdays, and will exclude state holidays. Mufflers will be used to reduce noise during the drilling. In order to reduce noise levels from the temporary pumps, a surface pump will be installed with mutes, or a submersible pump (which is considerably quieter) will be used. If the well is incorporated into the existing facilities as a permanent production well, noise levels from the permanent pump will be reduced to below regulatory levels by the use of a surface pump installed with mutes, or by the use of a submersible pump.

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Chapter 5

Relationship to Land Use Designations and Controls

5.1 State Land Use Designations and Controls

The subject property is located within the State Land Use Conservation District, Protective Subzone. According to State law, Chapter 205, HRS, principal land use controls in the Conservation Districts on the island of Oahu are under the jurisdiction of the State Department of Land and Natural Resources (DLNR). Under Title 13, Chapter 2, regarding Conservation Districts, of the Hawaii Administrative Rules governing the DLNR, subchapter 2 section 11 states that permitted uses in the Protective Subzone include "monitoring, observing, and measuring natural resources," and "governmental use not enumerated herein where public benefit outweighs any impact on the conservation district."

A Conservation District Use Permit will be required from the Board of Land and Natural Resources (BLNR).

Well construction, pump installation, and water use permits will be required from the Commission on Water Resource Management (CWRM).

A noise permit will be required from the State of Hawaii, Department of Health, Noise and Radiation Branch.

5.2 City and County of Honolulu Land Use Designations and Controls

The subject parcel is designated Preservation on the City and County of Honolulu's Development Plan Land Use Map and is shown as P-1, Restricted Preservation Zone on the City and County of Honolulu's Zoning Map. According to the City and County of Honolulu's Land Use Ordinance (LUO), all land within the State designated Conservation District is zoned P-1, Restricted Preservation District by the City and County of Honolulu, and all uses, structures, and development standards in this P-1, Restricted Preservation District are governed by the appropriate State of Hawaii agencies.

Funding of projects with City and County of Honolulu funds requires consistency with the City and County of Honolulu's Development Plan Public Facilities Map. According to the City and County of Honolulu Planning Department, the construction of the exploratory wells

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is considered minor, and is not required to be shown on the Development Plan Public Facilities Map.

If the well is to be developed with BWS funds into a potable water production facility, an amendment to the City and County of Honolulu Development Plan Public Facilities Map to include the project area as a "site determined, well facility programmed for construction within 6 years" will first be required. The amendment would require an application to the City and County of Honolulu, Planning Department, and approval by the City and County of Honolulu, City Council.

Chapter 6 Possible Alternatives

The no action alternative, the delayed action alternative, alternative sites, and alternative sources were considered either in this environmental assessment or in previous environmental analyses done by the BWS.

6.1 No Action Alternative

The no action alternative was not pursued because it would be contrary to the BWS's legal mandate to provide for the water needs of a growing population within the existing developed areas. When development is proposed, the BWS requires developers to find new water sources for new large projects consuming over 250,000 gpd.

This project is part of an overall groundwater development program intended to increase the municipal water supply to meet growing demand from existing developed areas. If the BWS's new water source program is curtailed, the BWS would not be able to provide adequately for the water needs of the future population of the island. The no action alternative may result in regional water shortages within the existing developed areas.

6.2 Delayed Action

The delayed action alternative was considered but not pursued because this alternative would delay the BWS's implementation schedule and would have substantially similar environmental outcomes and higher development costs because of inflation.

Delay in the proposed well testing program would increase the risk that population growth will lead to water demands in excess of the available supplies.

6.3 Alternative Sites

This environmental assessment analyzes one of many possible potable ground water source sites in the Honolulu Sector, where surplus sustainable yields occur in the high level source areas.

This exploratory well project is a continuation of a BWS analysis of 21 potential sites within the Honolulu Sector for additional potable wells which was originally done in its *Regional*

Environmental Impact Assessment for Development of Wells, Reservoirs, Transmission Lines and Appurtenances at Honolulu, Hawaii (1984). Two of these 21 well sites identified in this assessment for possible potable groundwater sources were located in upper Kalihi Valley. The proposed Kalihi Exploratory Well IV is located in the vicinity of the two sites, and is intended to determine if an additional well in the upper Kalihi Valley is feasible.

6.4 Alternative Sources

Alternative source development was not pursued in this analysis since the BWS had also analyzed potential potable water source alternatives other than groundwater in its 1984 study, including desalinization, the development of surface and brackish water sources, and the recycling of treated wastewater. Typically these alternative sources have considerably higher costs and technical challenges. For instance, the use of surface water from Kalihi Stream has a high potential for health and safety problems, and would require costly water treatment works. The development of these alternatives was not considered as feasible as the development of groundwater resources.

Chapter 7
List of Preparers

CH2M HILL

Robert Chuck, P.E.

Clyde Kanehiro

Bennett Mark, P.E., A.I.C.P

Mara Soloway

Project Administrator and Senior Reviewer

Cartographer

Project Manager

Project Assistant

SUBCONSULTANTS

Phillip L. Bruner

Char and Associates

Cultural Surveys Hawaii

Faunal (Bird and Mammal) Resources

Botanical Resources

Archaeological and Cultural Resources

Chapter 8 Agencies Consulted in Making this Assessment

The following agencies were consulted during the preparation of the draft environmental assessment for this project:

State of Hawaii agencies

- Department of Land and Natural Resources
 - Commission on Water Resources Management
- Department of Health
 - Environmental Management Division
 - Office of Environmental Quality Control

City and County of Honolulu agencies

- Planning Department
- Land Utilization Department

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Appendix A

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ARCHAEOLOGICAL RECONNAISSANCE SURVEY
OF A PROPOSED WELL SITE
IN UPPER KALIHI VALLEY,
KONA DISTRICT, ISLAND OF O'AHU
(TMK 1-4-18:06)

by

Hallett H. Hammatt, Ph.D.
Rodney Chiogioji, B.A.

Prepared for
CH2M HILL

CULTURAL SURVEYS HAWAII
November 1994

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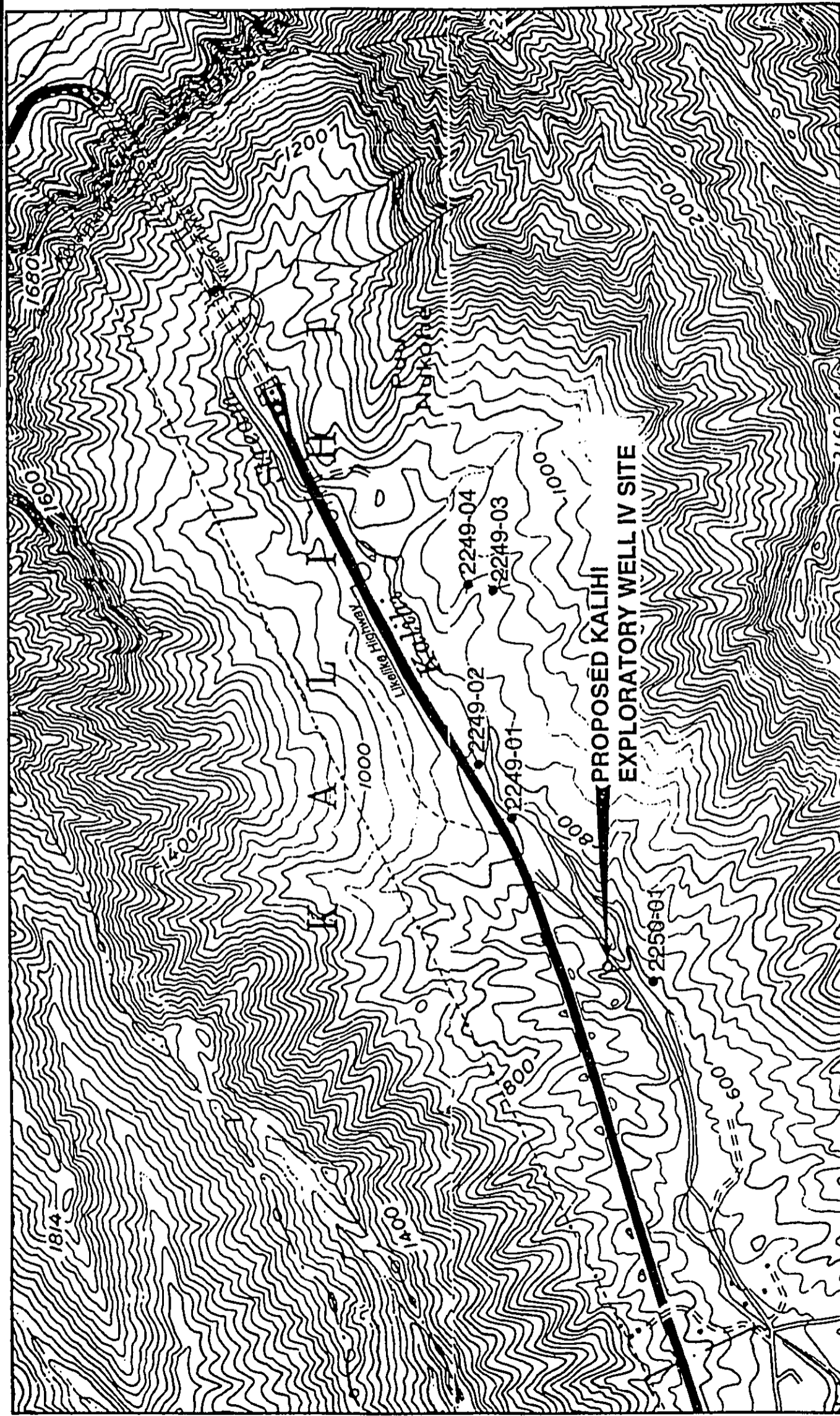
I. INTRODUCTION

At the request of CH2M Hill, Cultural Surveys Hawaii has completed an archaeological reconnaissance survey of a parcel proposed for development by the Honolulu Board of Water Supply of an exploratory well site in upper Kalihi Valley, Kona District, island of O'ahu (TMK 1-4-18:06).

II. PROJECT AREA DESCRIPTION

The project area (Figure 1) is located approximately 7.7 kilometers inland (northeast) of the present shoreline at Keehi Lagoon, at 600-ft. elevation above mean sea level. It is situated approximately one-half mile below the Wilson Tunnel portal, near the *mauka* end of Kalihi Street, on the west side of the street. The parcel is presently the site of a Honolulu Board of Water Supply reservoir and an adjacent concrete hollow block instrument house. Construction of the reservoir began in January 1990 and was completed in August 1994. The parcel was excavated and graded to accommodate the reservoir. A level grassed area extending *makai* of the reservoir is the proposed location for the well site (see Figures 3 & 4 below).

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Well No. 2249-01 to 04 2250-01	Well Name Kalihi Tunnels (inactive) Kalihi Aerator Well (inactive)	Figure I	Environmental Assessment Kalihi Exploratory Well IV CITY AND COUNTY OF HONOLULU - BOARD OF WATER SUPPLY
PROPOSED KALIHI WELL SITE PROJECT AREA			
<p style="text-align: center;">NORTH </p> <p style="text-align: center;">0 1000 2000 FEET</p> <p style="text-align: right;">CH2M HILL</p>			

III. LAND USE AND PREVIOUS ARCHAEOLOGY

Little can be known specifically about traditional Hawaiian land use within the present parcel during the centuries before western contact. E. F. Craighill and Elizabeth Handy present a general overview of Kalihi *ahupua'a* during pre-contact times:

Kalihi had a shallow seaside area, now the shore of Kalihi Basin, that was, like that of Moanalua, ideal for the building of fishponds...On the flatlands below the valley there were extensive terraces on both sides of the stream, while along the stream in the lower valley there were numerous areas with small terraces...The interior valley was rough and narrow and not suitable for *lo'i*, but it would have been good for sweet potatoes, yams, *wauke*, and bananas, which probably were planted there. (Handy and Handy 1972:475)

Although the Handys assert that the "rough and narrow" configuration of upper Kalihi Valley would have generally precluded construction of *lo'i* (*i.e.* irrigated terraces for planting taro), records documenting Land Commission Awards (LCAs) from the mid-nineteenth century suggest that there may have been taro cultivation within or near the present parcel. According to current tax maps, included within the present study parcel (TMK 1-4-18:06) are portions of two LCA *apana* (sections):

- 1) Apana 1 of LCA 5011 awarded to Kahaha, and
- 2) Apana 1 of LCA 3178 awarded to Keuwiwi.

Documents for LCA 5011 do not specify land usage but included in testimony for LCA 3178 to Keuwiwi - recorded 15 December 1851 - is the following description of Apana 1: "Section 1: 2 taro moo lands in Mahani" which was received "from Umi at the time before Poki's trip to Tahiti [*i.e.* before 1829]" (Native Testimony vol.10:86). If the area just described indeed corresponds to LCA 3178:1 located on the current tax map, then, by the 1850s, there had been active taro cultivation in or near the present study parcel extending at least over several decades. It is also probable that taro cultivation in the area would have extended well before Keuwiwi's receipt of the land at the "time before Poki's trip to Tahiti."

While upper Kalihi Valley would have been unsuitable for extensive taro *lo'i* fields, it is likely that areas of the upper valley - like the present study parcel - were amenable to construction of smaller patches during the pre-contact period. These smaller areas may have been focuses of settlement and habitation. A visitor to the valley in the 1830s noted:

The valley of Kalihi succeeds to that of Anuana [Nuuanu], but is less bold and diversified in its scenery. Human dwellings and cultivated lands are here very few, or scattered thinly over a great extent of, probably, the finest soil in the world. (Bennett 1840:202)

Archaeological investigations of Kalihi - which may provide clues to traditional land use patterns within the *ahupua'a* - have concentrated generally on *makai* areas at or below the valley mouth. The first archaeological study of the present study parcel occurred in 1988 when a reconnaissance survey (Sinoto 1988) was conducted prior to construction of the present reservoir facility. No prehistoric archaeological sites were observed. However, six wall features, described as "remains of historic/modern terrain alteration activities" which "parallel the contours along the eastern slope of a gulch cut by a small, unnamed, tributary draining into Kalihi Stream" (Sinoto 1988:2), were observed and recorded during the survey (Figure 2). The wall features, designated A to F, were assigned State Site Number 50-80-14-2004. The survey report enumerates the bases for determining a "non-Hawaiian and historic/modern" origin for the wall features:

- 1) Stream bank retaining or reinforcing walls like that of Feature B were observed at several of the major side drainages and were probably related to the old Kalihi Street construction.
- 2) Features C, D, and E are associated slope-cuts and appear to be mechanically excavated. The high faces are nearly vertical and the top surfaces are uniformly level. The stone facing is a superficial single layer embedded into the clay and do not appear to function as retaining wall structures.
- 3) Features A and F are lower than the other feature [*sic*], similar in construction and appear to function as retaining walls with a solid basal boulder course underlying the upper stone courses.

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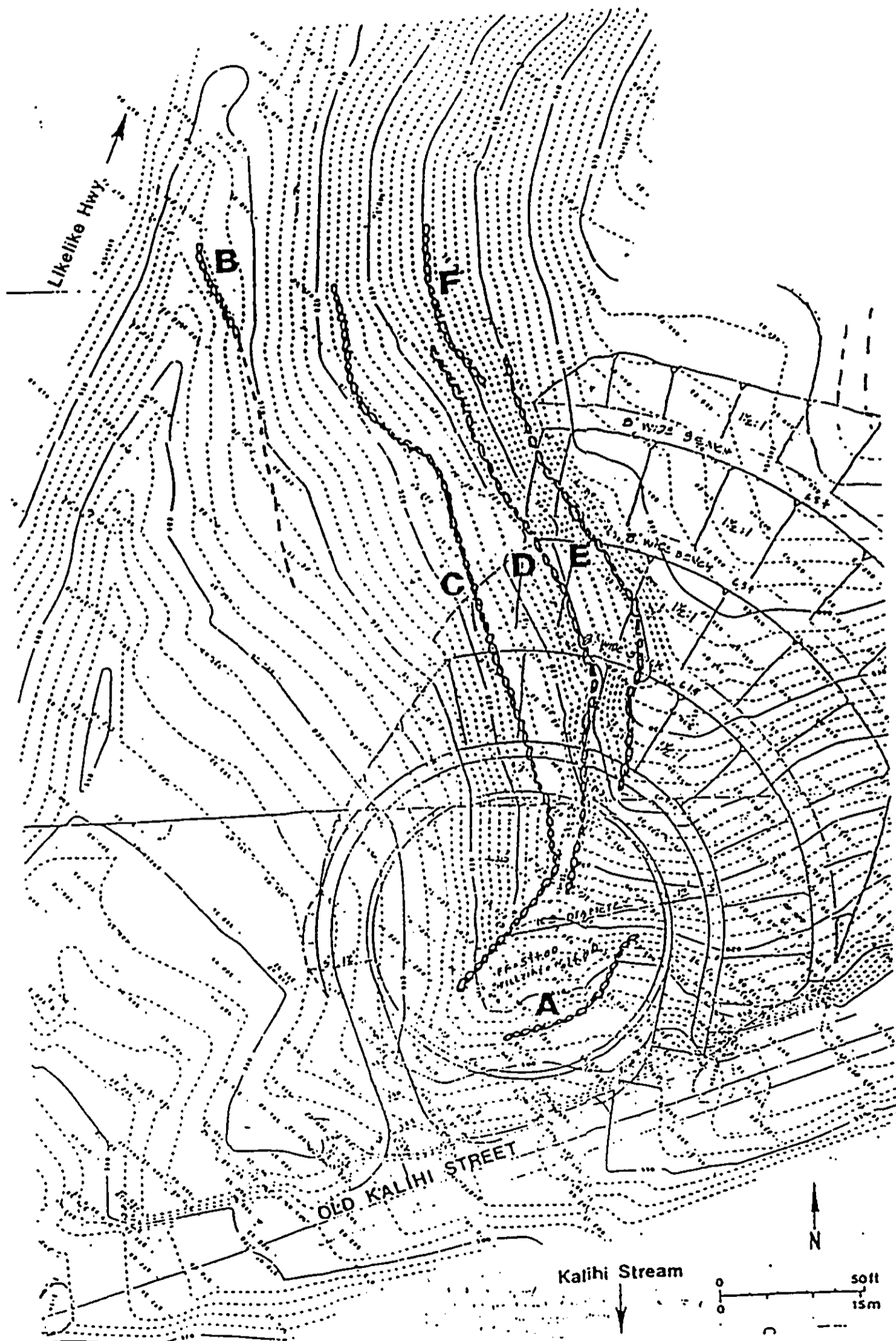


Figure 2 Map of study parcel showing location of State site 50-80-14-2004 Features A-F (from Sinoto 1988)

Feature A is most likely related to old Kalihi Street since similar features were observed beyond the project area.

- 4) Several areas of terrain alteration were observed beyond the project boundaries most frequently involving slope-cutting for probable roadways. (*Ibid:4-5*)

The report also noted:

Subsurface observations made at the time of trailblazer construction revealed a superficial humic layer overlying a homogeneous, culturally sterile clay with areas of exposed bedrock outcroppings. (*Ibid:5*)

The report concluded:

The current plans for the reservoir calls [*sic*] for extensive excavation and slope benching. Features A, C, D, and E will be adversely impacted although their northernmost segments may not be affected. Features B and F will not be directly impacted.

[State Site Number 50-80-14-2004] is comprised solely of late historic period, if not modern, terrain modification features with no subsurface components. Since the significance of this site is embodied in the location and description of these surface remains, the documentation procedures completed during the current project constitutes [*sic*] adequate mitigation of the adverse effects of the proposed development activities. Thus, no further archaeological work in conjunction with the proposed development is recommended. (*Ibid:5*)

In summary, the survey report indicates that no prehistoric archaeological sites were located on the parcel prior to construction of the present reservoir. The only features recorded were historic era walls, portions of which were likely to be "adversely impacted" by the reservoir's construction.

IV. SURVEY RESULTS

The Kalihi well site project area was inspected by Cultural Surveys Hawaii on April 21, 1994. The archaeological team consisted of Hallett H. Hammatt and Douglas Borthwick. They were accompanied by personnel from the Honolulu Board of Water Supply, CH2M Hill and other consultants.

The area inspected included the existing fenced reservoir site as well as the flat grassed terrain to the southwest of the reservoir between Kalihi Street and a present streambed (Figures 3 & 4). The streambed and banks were inspected up to three hundred feet *mauka* of Kalihi Street. No archaeological sites were observed within the fenced area of the reservoir which has been heavily graded for construction of the water tank. The level area between the fence and the stream was also graded during construction of the reservoir and no archaeological sites were encountered here.

Fill layers associated with the grading were observed along the stream cut bank defining the western end of this level area. Proceeding upstream, there were three separate localities which contained retaining walls on the east bank of the stream. Each of these localities is described briefly below:

- Locality 1: A section of retaining wall on the east bank of the stream, measuring 9m. long and averaging 1.2m. high. This locality is situated about 70m. upstream from the proposed well site.
- Locality 2: Situated downstream from Locality 1 is a 5m. long retaining wall section averaging 1.2m. high. The entire central portion of the retaining wall has collapsed due to stream flooding. Only the north and south sections at either end of the retaining wall remain.
- Locality 3: Situated 15 m. downstream from Locality 2 is a 3m. long section of retaining wall averaging 1.2m. high.

In all three localities these retaining walls appeared to have the same form of construction (Figures 5 & 6). They have a single-boulder thickness, with the boulders set into the clay of the stream bank at a slight angle off from vertical. Clearly these walls were not intended to

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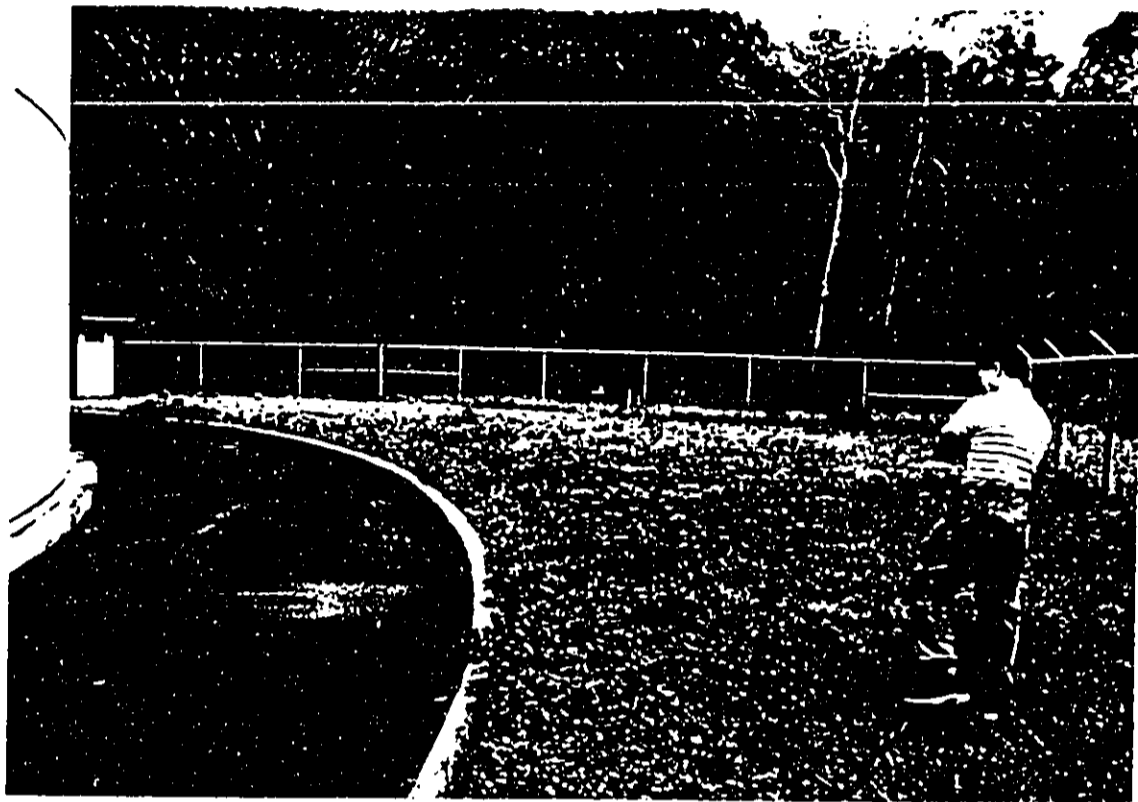


Figure 3 Study parcel: view southeast toward Kalihi Street showing reservoir (left) and level grass area enclosed by fence



Figure 4 Study parcel: view northwest showing level grass area outside fence

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Figure 5 Retaining wall section showing typical single-boulder thick construction



Figure 6 Close-up view of typical wall section

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be terrace retaining walls but appear to have been built to retard stream bank erosion along this tributary of Kalihi Stream.

The location of these three retaining wall sections corresponds to those recorded - and assigned State Site Number 50-80-14-2004 - during the earlier archaeological reconnaissance survey (Sinoto 1988) of the present parcel (see Figure 2 above) and specifically to Feature B which was described as a late historic era

stream bank retaining wall...constructed along a 50.0-m length of the east bank of the drainage. Comprised of four to eight courses of stone and boulders the wall ranges from 1.0 to 1.3m in height. (Sinoto 1988:2)

As was noted above, the 1988 survey located other wall features upslope of the stream bed - designated Features A and C through F - and assessed their origin as late historic, related to attempted drainage improvement for construction of old Kalihi Street. It appears that Features A and C through F were destroyed in the construction of the existing reservoir. No evidences of these features were observed during the present survey. In any event, all of these features, as located on the 1988 survey map, are not in the vicinity the proposed well site. The remaining portions of Feature B of State Site Number 50-80-14-2004 observed during the present survey appear to conform, in construction style and location, to the historic-era erosion control functions suggested in the 1988 survey report. These portions of Feature B are located well outside the area of the proposed well drilling.

V. SUMMARY AND RECOMMENDATIONS

Nineteenth century Land Commission Award documents suggest that the area in or near the present study parcel may have been the site of early historic and pre-contact traditional Hawaiian agriculture (wetland taro cultivation). However, the 1988 archaeological reconnaissance survey of the present parcel - conducted before construction of the reservoir now on the parcel - recorded no prehistoric archaeological sites within the parcel. The survey did record historic-era wall features - assigned State Site Number 50-80-14-2004 and probably associated with construction of Kalihi Road - located to the north and northeast of proposed well site. None of these wall features were situated in the portion of the parcel currently proposed for location of a well.

The present reconnaissance survey ascertained that most of the wall features noted during the 1988 survey have been eliminated by construction of the present reservoir, and by grading and landscaping of the grounds surrounding the reservoir. Portions of one wall feature - Feature B - noted by during the 1988 survey remain intact. This wall feature is clearly well-distanced from the portion proposed for the well site and would not be affected by construction activities.

It is further suggested that the already extensive grading and landscaping of the portion proposed for the well site have likely eliminated any subsurface cultural deposits.

Since the 1988 reconnaissance survey report has already documented the study parcel prior to construction of the present reservoir, Cultural Surveys Hawaii recommends no further archaeological study in conjunction with development of the proposed well within the parcel. However, if inadvertent discoveries of cultural remains are located during excavating and grading of the well site, work should be stopped in that area and the State Historic Preservation Division should be notified.

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Appendix B

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CHAR & ASSOCIATES

Botanical / Environmental Consultants

4471 Puu Panini Ave.
Honolulu, Hawaii 96816
(808) 734-7828

July 1994

**BOTANICAL RESOURCES ASSESSMENT
KALIHI IV WELL SITE
HONOLULU DISTRICT, ISLAND OF O'AHU**

INTRODUCTION

At the request of the Honolulu Board of Water Supply (BWS) and CH2M Hill, a botanical assessment study was conducted for the Kalihi IV well site on 21 April 1994. The work will include installation of one pump, control building, piping, transmission main, electrical equipment and appurtenances, etc. The proposed 0.25 MGD well is needed to meet future water demands of the district.

The primary objectives of the botanical assessment study were to describe the vegetation on and immediately surrounding the proposed well site, 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, drainage, topography, etc. Plant identifications were made in the field; plants which could not be positively identified were collected for later determination in the herbarium, and for comparison with the most recent taxonomic literature. The plant names used in the following

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discussion follow Wagner et al. (1990) for the flowering plants and Lamoureux (1988) for the ferns.

DESCRIPTION OF THE VEGETATION

The proposed well will either be placed within an existing fenced BWS reservoir facility, or outside the fenced area, immediately adjacent to the facility, on an already disturbed, more or less level area.

When the BWS reservoir was constructed, the site was leveled and pangola grass (Digitaria pentzii) was planted to prevent soil erosion. Since then a number of other plants, mostly weedy species, from the surrounding vegetation have quickly spread onto the reservoir area. The most common of these are Florida beggarweed (Desmodium tortuosum), Pycreus polystachyos, red pualele (Emilia fosbergii), hairy sword fern (Nephrolepis multiflora), ka'imi (Desmodium sandwicensis), and Hilo grass (Paspalum conjugatum). The level areas within the reservoir fence are periodically maintained and the grasses and other herbaceous species kept trimmed. Any woody saplings from the surrounding forests which happen to establish themselves on these areas, such as albizia (Paraserianthes falcataria) and ironwood (Casuarina equisetifolia), are kept low, about 6 inches to barely a foot tall.

The relatively flat and open, unfenced area outside of the reservoir site supports a ground cover of pangola grass and Hilo grass, in about equal abundance. A few small, scattered ironwood and albizia trees, 3 to 12 ft. tall, occur in this area. Locally common forming small mats are black medick (Medicago lupulina), and, near a small stream on the perimeter of the site, sweet potato (Ipomoea batatas) with purple tubers. Other species

observed occasionally are palm grass (Setaria palmifolia), wood fern (Christella parasitica), kili'o'opu (Kyllinga brevifolia), Asiatic pennywort or pohe kula (Centella asiatica), and wedelia (Wedelia trilobata).

The vegetation surrounding the BWS site is forested and composed of a number of introduced or alien species which include large stands of albizia and rose apple (Syzygium jambos), blocks of various Eucalyptus plantings, and a few small stands of common mango (Mangifera indica), ironwood, gunpowder tree (Trema orientalis), and Java plum (Syzygium cumini).

DISCUSSION AND RECOMMENDATIONS

The vegetation found on the sites proposed for the 0.25 MGD well is composed almost exclusively of introduced or alien plants, these are species which were introduced by humans, either intentionally or accidentally, after Cook's discovery of the Hawaiian Islands in 1778. Only two native species were observed during the field studies; these are Pycreus polystachyos, a sedge, and hau (Hibiscus tiliaceus). Both of these species are indigenous, that is, they are native to the Hawaiian Islands and also elsewhere throughout the Pacific.

None of the plants found during the study are listed, proposed, or candidate threatened and endangered species (U.S. Fish and Wildlife Service 1989, 1990, 1994a, 1994b); nor are any of them considered rare or vulnerable (Wagner et al. 1990). There are no sensitive native plant-dominated vegetation types on the sites proposed for the well (Hawai'i Heritage Program 1994).

Given the findings above and the limited nature of the proposed project, no significant negative impacts to the botanical

resources are expected. All of the plants found during the study occur in similar environmental habitats throughout the Hawaiian Islands. There are no botanical reasons to impose any restrictions, conditions, or impediments to the development of the new well site. It is recommended, however, that the site be grassed over as soon as possible to prevent soil erosion due to the somewhat heavy rainfall in this area.

References

- Lamoureux, C.H. 1988. Draft checklist of the Hawaiian pteridophytes, "Kupukupu O Hawai'i Ne'i". Lyon Arboretum, University of Hawai'i, Manoa.
- Hawai'i Heritage Program, The Nature Conservancy of Hawai'i. 1994. Summary listing of Hawaiian natural communities. Memorandum. February 1994.
- U.S. Fish and Wildlife Service. 1989. Endangered and threatened wildlife and plants. 50 CFR 17.11 & 17.12.
- _____. 1990. Endangered and threatened wildlife and plants; Review of plant taxa for listing as Endangered and Threatened Species; Notice of review. Federal Register 55(35): 6184-6229.
- _____. 1994a. Endangered and threatened wildlife and plants; Endangered status for 11 plant species from the Koolau Mountain Range, island of Oahu, HI. Federal Register 59(59): 14482-14493.
- _____. 1994b. Plants, Hawaiian Islands, Listed, proposed

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or candidate species under the U.S. Endangered Species Act,
Updated: March 28, 1994. Unpublished list, Pacific Islands
Office, Honolulu.

Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1990. Manual of
the flowering plants of Hawai'i. 2 vols. University of
Hawai'i Press and B.P. Bishop Museum Press, Honolulu. B.P.
Bishop Museum Special Publication No. 83.

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Appendix C

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AVIFAUNAL AND FERAL MAMMAL SURVEY FOR A BOARD OF WATER
SUPPLY EXPLORATORY WELL SITE IN KALIHI VALLEY, OAHU

Prepared for

CH2M Hill

by

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

29 April 1994

INTRODUCTION

The purpose of this report is to summarize the findings of a bird and mammal field survey of a proposed well site conducted on 21 April 1994 in Kalihi Valley, 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.

GENERAL SITE DESCRIPTION

Figure One indicates the location of the area proposed for the exploratory well. A fence surrounds an existing water storage tank. The topography around the site is steep. The habitat is forested with introduced species. Kalihi Stream is immediately down slope

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-2-

and across the service road fronting the property. Likelike Highway is up slope and traffic noise from this highway can be heard at the proposed well site.

Weather during the field survey was partly cloudy. Winds were from the east at 15-20 mph.

STUDY METHODS

Field observations were made with binoculars and by listening for vocalizations. Counts were made of all birds seen or heard (Table 1). Published data 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 region (Pratt et al. 1987); Hawaii Audubon Society 1993; Tanino 1994). 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.

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Three species which may occasionally occur in this area and at this elevation are the Short-eared Owl or Pueo (Asio flammeus sandwichensis), 'Elepaio (Chasiempis sandwichensis) and Common Amakihi (Hemignathus virens). The Pueo is listed as an endangered species on Oahu by the State of Hawaii Division of Forestry and Wildlife. 'Elepaio is a small native insectivorous forest bird. Their numbers on Oahu have declined over the last 20 years. Small relic populations occur in some leeward valleys (Tanino 1994). The Common Amakihi is one of the most abundant species of the endemic subfamily Drepanidinae. They feed on a variety of foods including nectar, insects and fruit. Common Amakihi are not confined to native forest but can often be seen in second growth exotic forest.

Resident Waterbirds:

Black-crowned Night Heron (Nycticorax nycticorax) occasionally are seen foraging along mountain streams. None were found on this survey. This is the only native waterbird in Hawaii that is not listed as endangered. The Koloa or Hawaiian Duck (Anas wyvilliana) is an endangered species that occurs in a wide variety of wetlands including mountain streams. It is possible this species may also utilize Kalihi Stream. No Koloa were recorded on this survey.

Seabirds and Migratory Shorebirds:

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 can safely nest.

No migratory shorebirds were recorded at this site. Wandering Tattler (Heteroscelus incanus) forage along mountain streams as well as in rocky intertidal habitats. Tattler may use Kalihi Stream. The present area around the proposed well site is not suitable shorebird habitat.

Exotic (Introduced) Birds:

A total of 13 species of exotic birds were recorded during the field survey (Table 1). Pratt et al. (1987); Hawaii Audubon Society (1993) and Tanino (1994) confirm that this array of introduced birds would be expected in this region.

Feral Mammals:

The introduced Small Indian Mongoose (Herpestes auropunctatus) was seen near the property. No trapping was conducted in order to assess the relative abundance of feral mammals. In addition rats, mice and feral cats undoubtedly also are common in this area.

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 forage at dusk. In Nuuanu during 1992 I saw two bats in habitat similar to Kalihi Valley. It is not known whether

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or not bats occur regularly in Kalihi Valley. Their occurrence on Oahu seems to be limited based on the few records for this species.

DISCUSSION AND CONCLUSIONS

This field survey was necessarily brief and thus can provide 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 a particular area. Nevertheless, some general conclusions related to birds and mammals at this site are provided. The following comments summarize the finding of this survey.

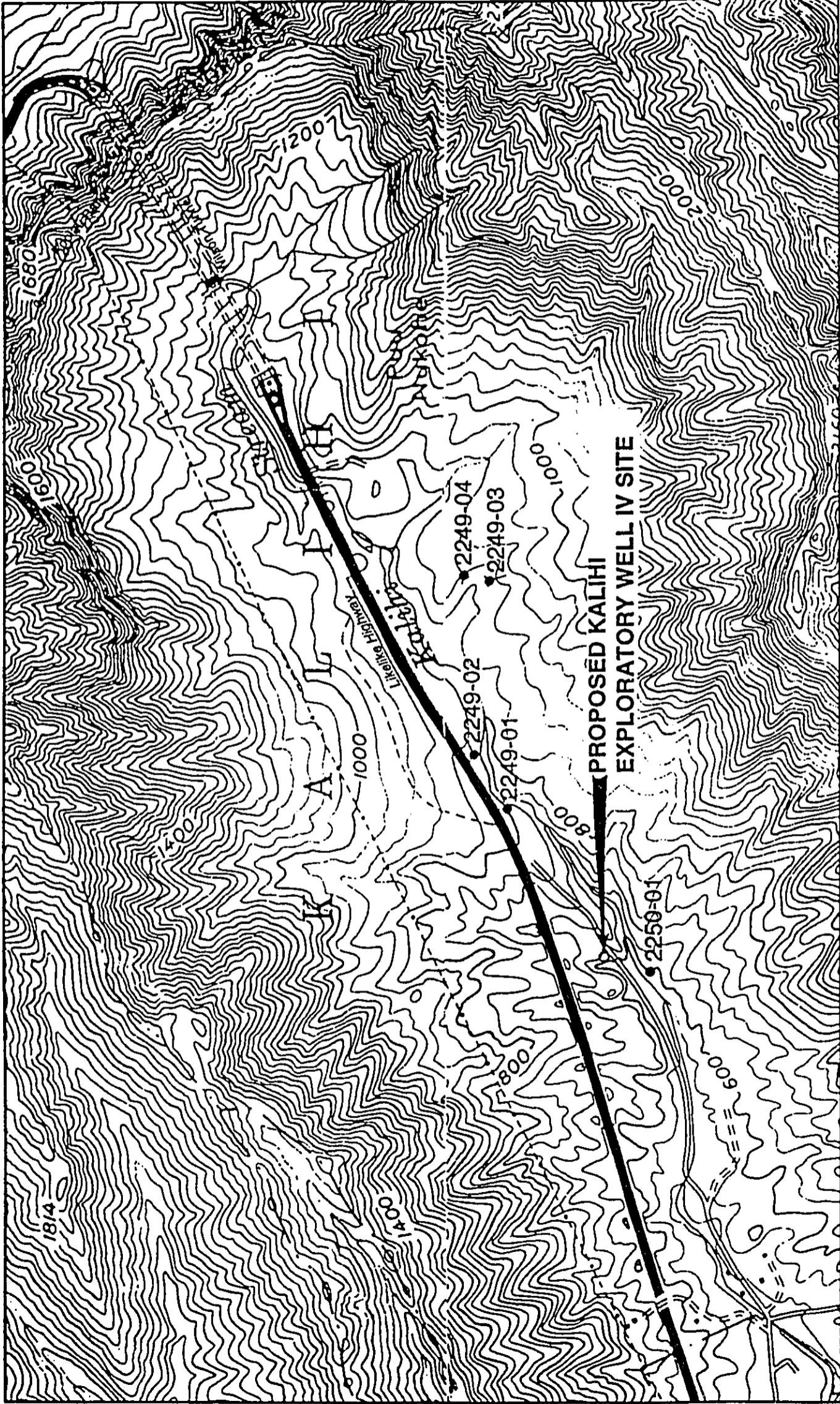
- 1- The proposed well site and nearby areas were covered on foot. At several locations counts of all birds seen and heard were made. These data are summarized in Table 1.
- 2- No native birds were recorded on the survey. Several species may, however, be found in this area at this elevation. No endangered or threatened species were found on the survey.

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- 3- This site consists of disturbed forest. Although some native birds may on occasion occur in this area I would not characterize this site as essential habitat for native wildlife. The proposed well project should have no measurable impact on the populations of native birds on Oahu.

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Environmental Assessment Kalihi Exploratory Well IV CITY AND COUNTY OF HONOLULU - BOARD OF WATER SUPPLY	Well No. 2249-01 to 04 2250-01
Figure 1	Well Name Kalihi Tunnels (inactive) Kalihi Aerator Well (inactive)
APPROXIMATE LOCATION OF FAUNAL SURVEY	
NORTH ↑ 0 1000 2000 FEET CH2M HILL	

Introduced birds recorded at a proposed well site in Kalihi Valley, Oahu. These data provide an estimate of relative abundance.

COMMON NAME	SCIENTIFIC NAME	Average Number Recorded at each Census Station
Spotted Dove	<u>Streptopelia chinensis</u>	2
Zebra Dove	<u>Geopelia striata</u>	1
Common Myna	<u>Acridotheres tristis</u>	2
Red-vented Bulbul	<u>Pycnonotus cafer</u>	8
Red-whiskered Bulbul	<u>Pycnonotus jocosus</u>	10
Northern Cardinal	<u>Cardinalis cardinalis</u>	2
Red-crested Cardinal	<u>Paroaria coronata</u>	2
Japanese White-eye	<u>Zosterops japonicus</u>	7
House Finch	<u>Carpodacus mexicanus</u>	10
White-rumped Shama	<u>Copsychus malabaricus</u>	4
Red-billed Leiothrix	<u>Leiothrix lutea</u>	3
Japanese Bush-warbler	<u>Cettia diphone</u>	2
Java Sparrow	<u>Padda oryzivora</u>	25 (one flock in grass near road)

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SOURCES CITED

- Hawaii Audubon Society. 1993. Hawaii's Birds. Fourth Edition. Hawaii Audubon Society, Honolulu.
- Honacki, J. H., K. E. Kinman and J. W. Koeppel ed. 1982. Mammal Species of the World: A taxonomic and geographic reference. Allen Press, Inc. and the Association of Systematic Collections.
- Kepler, C. B. and J. M. Scott. 1990. Notes on Distribution and Behavior of the endangered Hawaiian Hoary Bat (Lasiurus cinereus semotus) 1974-1983. 'Elepaio 50(7):59-64.
- 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.
- Pratt, H. D., P. L. Bruner and D. G. Berrett. 1987. A field guide to the birds of Hawaii and the Tropical Pacific. Princeton Univ. Press.
- Tanino, L. 1994. Honolulu Count: 50th annual Honolulu Christmas Count - 1993. 'Elepaio 54(3):13-15.
- Tomich, P. Q. 1986. Mammals in Hawaii. Bishop Museum Press.
- Williams, R. N. 1987. Alien Birds on Oahu. 1944-1985. 'Elepaio 47(9):87-92.

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Appendix D

Appendix D
Agencies and Others Provided a Copy of
the Draft Environmental Assessment

Seventeen governmental agencies and three other groups or individuals were provided a copy of the draft environmental assessment and were requested to provide comments. One copy was provided to the Kalihi-Palama Public Library. The following is a list of those agencies and others that were requested to provide comments:

Federal Agencies

- U.S. Department of Agriculture, Soil Conservation Service
- U.S. Army Corps of Engineers, Pacific Ocean Division
- U.S. Fish and Wildlife Service

State of Hawaii Agencies

- Department of Agriculture
- Department of Business, Economic Development, and Tourism
- Department of Land and Natural Resources
 - Conservation and Environmental Affairs
 - Forestry and Wildlife Division
 - Historic Preservation Division
 - Commission on Water Resources Management
- Department of Transportation, Highways Division
- Department of Health
 - Environmental Management Division
- University of Hawaii
 - Environmental Center
 - Water Resources Research Center

City and County of Honolulu Agencies

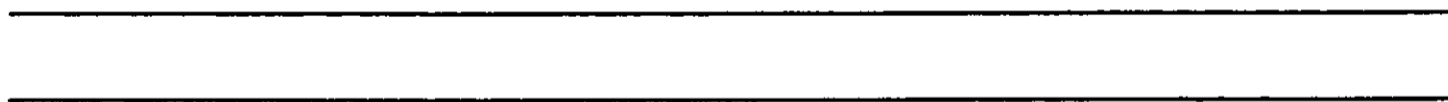
- Land Utilization Department
- Planning Department
- Public Works Department
- Transportation Services Department

Others

- City Council District VII representative Donna Kim
- Kalihi Valley, Neighborhood Board No. 16, Chair Mary Rose McClellan
- Sierra Club, Hawaii Chapter

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Appendix E



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Appendix E
Comments and Responses to the
Draft Environmental Assessment

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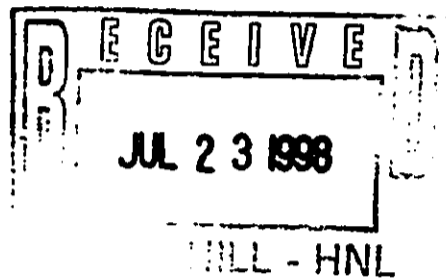
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Our People...Our Islands...In Harmony

July 21, 1998



Mr. Barry Usagawa
Board of Water Supply
City and County of Honolulu
630 south Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Usagawa:

Subject: Draft Environmental Assessment (DEA) - Kalihi Exploratory Well IV,
Kalihi, Oahu, Hawaii

We have reviewed the above document and have no comments to offer at this time.

Thank you for the opportunity to review this document.

Sincerely,

A handwritten signature in black ink, appearing to read "Ken Kaneshiro".

KENNETH M. KANESHIRO
State Conservationist

cc:

✓ Mr. Paul Luersen, CH2M Hill, 1585 Kapiolani Boulevard, Suite. 1420,
Honolulu, HI 96814-4530

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IRRA 1616

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

LETTIA N. UYEHARA
Deputy to the Chairperson

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

Fax: (808) 973-9613

May 8, 1998

Mr. Barry Usagawa
Board of Water Supply
City and County of Honolulu
630 So. Beretania Street
Honolulu, HI 96843

Dear ~~Mr.~~ ^{Barry} Usagawa:

The Department of Agriculture has no objections or comments on the environmental assessment for Kalihi Exploratory Well IV.

Sincerely,

PAUL T. MATSUO, P.E.
Administrator-Chief Engineer
Agricultural Resource Management
Division

✓ c: Paul Luersen, CH2M HILL



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COPY

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
1 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
(808) 533-2714



May 26, 1998

JEREMY HARRIS, Mayor

WALTER O. WATSON, JR., Chairman
EDDIE FLORES, JR.
KAZU HAYASHIDA
JAN M. L. Y. AMII
FORREST C. MURPHY
JONATHAN K. SHIMADA, PhD
BARBARA KIM STANTON

BROOKS H. M. YUEN, Acting
Manager and Chief Engineer

Mr. Paul T. Matsuo, P.E.
Department of Agriculture
State of Hawaii
1428 South King Street
Honolulu, Hawaii 96814-2512

Dear Mr. Matsuo:

Subject: Your Letter of May 8, 1998 Regarding the Draft Environmental Assessment for the Proposed Kalihi Exploratory Well IV, Honolulu, Oahu

Thank you for reviewing the Draft Environmental Assessment for the proposed Kalihi Exploratory Well IV.

We acknowledge that you have no comments or objections to the proposed project.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

BROOKS H. M. YUEN
Acting Manager and Chief Engineer

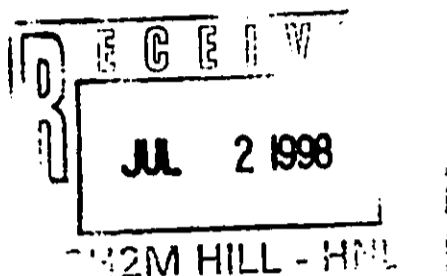
cc: Paul Luersen, CH2M Hill

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BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII



LAWRENCE MIKE
DIRECTOR OF HEALTH



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

In reply, please refer to:

June 24, 1998

98-104/epo

Mr. Barry Usagawa
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Usagawa:

Subject: Draft Environmental Assessment (DEA)
Kalihi Exploratory Well IV
Kalihi Valley, Oahu
TMK: 1-4-18: 06

Thank you for allowing us to review and comment on the subject document. We have the following comments to offer:

1. Federal and state regulations define a public water system as a system that serves 25 or more individuals at least 60 days per year or has at least 15 service connections. All public water system owners and operators are required to comply with Hawaii Administrative Rules, Title 11, Chapter 20, "Rules Relating to Potable Water Systems."
2. The report stated that the Kalihi Exploratory Well IV may be converted into a production well. Section 11-20-30 requires that new or substantially modified distribution systems for public water systems be approved by the Director. However, if the water system is under the jurisdiction of the County of Honolulu, the Board of Water Supply will be responsible for the review and approval of the plans.
3. Section 11-20-29 of Chapter 20 requires that all new sources of potable water serving a public water system be approved by the Director of Health prior to its use. Such an approval is based primarily upon the submission of a satisfactory engineering report which addresses the requirements set in Section 11-20-29.
4. The engineering report must identify all potential sources of contamination and evaluate alternative control measures

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Mr. Barry Usagawa
June 24, 1998
Page 2

98-104/epo

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

If you should have any questions, please contact Ms. Queenie Komori of the Safe Drinking Water Branch, Engineering Section, at 586-4258.

Sincerely,



BRUCE S. ANDERSON, Ph.D.
Deputy Director for
Environmental Health

c: SDWB
CH2M Hill

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BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
1 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714



July 15, 1998

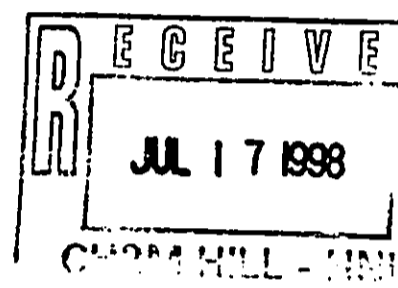
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JEREMY HARRIS, Mayor

EDDIE FLORES, JR., Chairman
FORREST C. MURPHY, Vice Chairman
KAZU HAYASHIDA
JAN M. L. Y. AMII
JONATHAN K. SHIMADA, PhD
BARBARA KIM STANTON

BROOKS H. M. YUEN
Acting Manager and Chief Engineer

Bruce S. Anderson, Ph.D.
Deputy Director for Environmental Health
Department of Health
State of Hawaii
P. O. Box 3378
Honolulu, Hawaii 96801



Dear Dr. Anderson:

Subject: Your Letter of June 24, 1998 Regarding the Draft Environmental Assessment for the Board of Water Supply's Proposed Kalihi IV Exploratory Well Project, Kalihi, Honolulu, Oahu

Thank you for reviewing the Draft Environmental Assessment for the proposed Kalihi IV Exploratory Well project.

We provide the following responses to your concerns:

1. An engineering report will be submitted to the Director of Health if the exploratory well is productive and will be placed into service.
2. We acknowledge that the engineering report must identify all potential sources of contamination and evaluate alternative control measures which could be implemented to reduce or eliminate the potential for contamination, including treatment of the water source.
3. The water quality analyses will be performed by a laboratory certified in the State of Hawaii and submitted as part of the report to demonstrate compliance with all drinking water standards.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

BROOKS H. M. YUEN
Acting Manager and Chief Engineer

cc: Peter Luersen, CH2M Hill

0000 000 1 0098

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
Land Division
Honolulu, Hawaii

May 13, 1998

Ref.: KALIHIEW.COM
Suspense Date: 5/26/98

MEMORANDUM:

TO: Aquatic Resources, Forestry & Wildlife, State Parks,
Historic Preservation, Water Commission, Natural Area
Reserves System, Land Division Branches of: Planning and
Technical Services, Engineering Branch, Oahu District
Land Office.

FROM: Dean Y. Uchida, Administrator
Land Division

Linda Manning

SUBJECT: Review : Draft Environmental Assessment
Project : Kalihi Exploratory Well IV
Applicant: CH2MILL on behalf of, Board of Water Supply,
City and County of Honolulu
Location: Kalihi, Honolulu, Island of Oahu, Hawaii
TMK : 1st/ 1-4-18: Parcel 06

Please review the attached:

(X) DRAFT ENVIRONMENTAL ASSESSMENT

and submit your comments on division letterhead within the time
requested above. Should you need more time and/or need to review
the complete document, please contact Nick Vaccaro at 7-0438.

RECEIVED
MAY 13 1998
6:19

Note:

Your division or branch may have received the DEA from CH2MILL
directly. Therefore, I'm transmitting to you the CH2MILL's cover
letter and first page of the DEA. Please send us a copy of your
comments (if any), for our records.

If this office does not receive your comments on or before the
suspense date, we will assume there are no comments.

() We have no comments.

() Comments attached.

Signed: _____

Date:

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BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII



COPY

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

June 3, 1998

STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

Mr. Barry Usagawa
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96813

MICHAEL D. WILSON, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES

GILBERT COLOMA-AGARAN

AQUACULTURE DEVELOPMENT
PROGRAM

AQUATIC RESOURCES
CONSERVATION AND

RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
DIVISION

LAND DIVISION
STATE PARKS
WATER AND LAND DEVELOPMENT

LOG NO: 21481 ✓
DOC NO: 9805EJ16

Dear Mr. Usagawa:

**SUBJECT: Chapter 6E-8 Historic Preservation Review -- Draft Environmental Assessment: Kalihi Exploratory Well IV
Kalihi, Kona, O'ahu
TMK: 1-4-18:6**

Thank you for the opportunity to review the draft Environmental Assessment for this project. The BWS plans to drill and case an exploratory water well at the existing Kalihi 614 Reservoir site. Archaeological survey conducted prior to the construction of the reservoir located modern/historic era walls (SIHP 50-80-14-2004) which were documented and subsequently partially destroyed during the construction of the existing reservoir between 1990 and 1994. Because the proposed well is located within the existing reservoir boundary, and this area was extensively graded during construction of the reservoir, it is highly unlikely that historic sites will be found. Therefore, we believe that this project will have "no effect" on historic sites.

This is our concurrence letter under Chapter 6E-8, Hawaii Revised Statutes.

If you have any questions please call Elaine Jourdane at 587-0014.

Aloha,

Don Hibbard, Administrator
Historic Preservation Division

EJ:jk

c: Mr. Paul Luersen, CH2M Hill, 1585 Kapiolani Boulevard, Suite 1420, Honolulu, Hawaii 96814-4530

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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

P.O. BOX 621
HONOLULU, HAWAII 96809
June 2, 1998

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND
RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND DIVISION
STATE PARKS
WATER RESOURCE MANAGEMENT

LD-NAV
Ref.: KALIHIEW.RCM

Mr. Paul Luersen
Project Manager
CH2M HILL
1585 Kapiolani, Suite 1420
Honolulu, Hawaii 96714-4530

REG
JUN - 5

Dear Mr. Luersen:

SUBJECT: Review : Draft Environmental Assessment
Project : Kalihi Exploratory Well IV
Applicant: CH2M HILL, on behalf of, Board of Water Supply,
City and County of Honolulu
Location : Kalihi, Honolulu, Island of Maui, Hawaii
TMK : 1st/ 1-4-18: Parcel 06

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

Please inform the Board of Water Supply that they need to file a Conservation District Use Permit. The proposed project parcel is in the resource and protective subzones.

Attached herewith is our Commission on Water Resource Management's comments related to water resources for the proposed project.

The Department of Land and Natural Resources has no other comments to offer on the subject matter at this time. Should you have any questions, please contact Nicholas Vaccaro of the Land Division Support Services Branch at 1-808-587-0438.

HAWAII: Earth's best!

Aloha,

MICHAEL D. WILSON, Chairperson
of the Board of Land And Natural Resources

c: Oahu Land Board Member
At Large Land Board Member
Oahu District Land Office

0000 000 1 0 10 1

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII



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

MICHAEL D. WILSON
CHAIRPERSON

ROBERT G. GIRALD
DAVID A. NOBRIGA
LAWRENCE H. MIKE
RICHARD H. COX
HERBERT M. RICHARDS, JR.

TIMOTHY E. JOHNS
DEPUTY DIRECTOR

May 18, 1998

Mr. Barry Usagawa
Board of Water Supply
City and County of Honolulu
630 S. Beretania Street
Honolulu, HI 96843

Dear Mr. ^{Barry} Usagawa:

SUBJECT: Draft Environmental Assessment, Kalihi Exploratory Well IV, TMK 1-4-18:06

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

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

- We recommend coordination with the county government to incorporate this project into the county's Water Use and Development Plan.
- We recommend coordination with the Land Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.
- We are concerned about the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.
- A Well Construction Permit and/or a Pump Installation Permit from the Commission would be required before ground water is developed as a source of supply for the project.
- The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit from the Commission would be required prior to use of this source.
- Groundwater withdrawals from this project may affect streamflows which may require an instream flow standard amendment.
- We recommend that no development take place affecting highly erodible slopes which drain into streams within or adjacent to the project.
- If the proposed project includes construction of a stream diversion, the project may require a stream diversion works permit and amend the instream flow standard for the affected stream(s).
- If the proposed project alters the bed and banks of a stream channel, the project may require a stream channel alteration permit.
- OTHER:

As indicated above and in the subject document, well construction and pump installation permits are required; should the well be converted to a production well, a water use permit is required.

If there are any questions, please contact Lenore Nakama at 587-0218.

Sincerely,

Timothy E. Johns
TIMOTHY E. JOHNS
Deputy Director

LN:ss

c: CH2M Hill
DLNR, Land Division

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DIVISION OF
LAND MANAGEMENT
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BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714



June 15, 1998

JEREMY HARRIS, Mayor

WALTER O. WATSON, JR., Chairman
EDDIE FLORES, JR.
KAZU HAYASHIDA
JAN M. L. Y. AMII
FORREST C. MURPHY
JONATHAN K. SHIMADA, PhD
BARBARA KIM STANTON

BROOKS H. M. YUEN, Acting
Manager and Chief Engineer

Mr. Timothy E. Johns, Deputy Director
Commission on Water Resource Management
Department of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Johns:

Subject: Your Letter of May 18, 1998 Regarding the Draft Environmental Assessment for the Board of Water Supply's Proposed Kalihi IV Exploratory Well Project, Kalihi, Honolulu, Oahu

Thank you for reviewing the Draft Environmental Assessment for the proposed Kalihi IV Exploratory Well project.

We provide the following responses to your concerns:

1. The proposed exploratory well project will be coordinated with the County's Planning Department to update the Water Use and Development Plan if it is determined to be suitable for production.
2. We acknowledge that a Well Construction Permit will be required prior to drilling the well.
3. We acknowledge that a Pump Installation and Water Use Permit will be required if the well is converted to a production well.
4. We note that an instream flow standard amendment will be required if a reduction in streamflow results; however, we do not anticipate effects to the Kalihi Stream due to the perched nature of the stream over the alluvial aquifer.
5. We acknowledge that a Stream Channel Alteration Permit will be required if the proposed project alters the bed and banks of a stream channel.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

BROOKS H. M. YUEN
Acting Manager and Chief Engineer

cc: Peter Luersen, CH2M Hill

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**DEPARTMENT OF BUSINESS,
ECONOMIC DEVELOPMENT & TOURISM**

P-351/98

BENJAMIN J. CAYETANO
GOVERNOR
SEIJI F. NAYA
DIRECTOR
BRADLEY J. MOSSMAN
DEPUTY DIRECTOR
RICK EGGED
DIRECTOR, OFFICE OF PLANNING

OFFICE OF PLANNING

235 South Beretania Street, 6th Flr., Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Tel.: (808) 587-2846
Fax: (808) 587-2824

Ref. No. P-7452

May 20, 1998

Mr. Brooks Yuen
Acting Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Attn: Mr. Barry Usagawa

Dear Mr. Yuen:

Subject: Draft Environmental Assessment for the Kalihi Exploratory Well IV,
Kalihi, Honolulu, Oahu

We do not have any comments to offer on the draft environmental assessment for
the Kalihi Exploratory Well IV project in Kalihi Valley, Oahu.

If there are any questions, please contact Howard Fujimoto of our Coastal Zone
Management Program at 587-2898.

Sincerely,

Rick Egged
Director
Office of Planning

cc: Seiji F. Naya, DBEDT
Paul Luersen, CH2M HILL

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MAY 29 3 58 PM '98

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BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714



June 9, 1998

JEREMY HARRIS Mayor **COPY**

WALTER O. WATSON, JR., Chairman
EDDIE FLORES, JR.
KAZU HAYASHIDA
JAN M. L. Y. AMII
FORREST C. MURPHY
JONATHAN K. SHIMADA, PhD
BARBARA KIM STANTON

BROOKS H. M. YUEN, Acting
Manager and Chief Engineer

Mr. Rick Egged, Director
Office of Planning
Department of Business,
Economic Development and Tourism
P. O. Box 2359
Honolulu, Hawaii 96804

Dear Mr. Egged:

Subject: Your Letter of May 20, 1998 Regarding the Draft Environmental Assessment for the Board of Water Supply's Proposed Kalihi IV Exploratory Well Project, Kalihi, Honolulu, Oahu

Thank you for reviewing the Draft Environmental Assessment for the proposed Kalihi IV Exploratory Well project.

We acknowledge that you have no comments to offer on the proposed project.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

BROOKS H. M. YUEN
Acting Manager and Chief Engineer

cc: Paul Luersen, CH2M Hill

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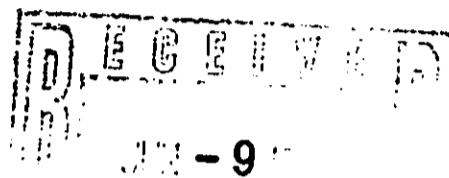
BENJAMIN J. CAYETANO
GOVERNOR



GARY GILL
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

235 SOUTH BERETANIA STREET
SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE (808) 686-4186
FACSIMILE (808) 686-4186



June 8, 1998

Mr. Brooks Yuen, Acting Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Yuen:

Subject: Draft Environmental Assessment for the Kalihi
Exploratory Well IV, Oahu

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

1. **Cost Effectiveness**

The Board proposes to drill approximately 500 feet deep to
test a well that is expected to yield only 0.25 million
gallons of water per day. Please show why developing this
new source is more cost efficient than water conservation
programs.

2. **Orientation Maps**

Please provide maps that show contamination information,
such as points or regions of known contamination, points of
potential contamination (landfills, individual wastewater
disposal systems, hazardous waste sites, dry wells and
injection wells), known or assumed chloride levels at
specified depths in relation to nearest or adjacent wells,
and the likely wellhead protection area for the proposed
well.

3. **Contamination Analysis**

Please provide a record of contamination problems in the
aquifer or hydrologic unit including but not limited to
saltwater intrusion, turbidity, heavy metals, inorganic and
organic chemicals, microbiological agents, water quality

Mr. Yuen
Page 2

parameters (such as pH, alkalinity, calcium, conductivity and temperature), 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.

Any hazardous materials used and/or produced during drilling and treatment should be described. The method of handling these hazardous materials should also be disclosed.

4. Financial and Institutional Arrangements

In some instances, a well is developed by private financing, the transfer of public lands to government or private developers, or in return for a water allocation credit to supply an urban development. The EA should include a full discussion of any institutional, financial or land use arrangements or commitments related to developing the well and delivering water to end users.

These arrangements may include the formation of public utility companies and subsequent rate-setting, the establishment of county water commitments, the co-funding of state or county water system development, an executive order or other set-aside of state lands, and purchase of land or easements by public entities.

Any or all of these arrangements and all permits or governmental approvals required to fulfill these commitments should be listed.

5. Watershed and Land Use Analysis

A discussion of how waters from the well will be used, and an analysis of how the proposed well development may affect land and water uses on the island and in the region. The analysis should include a discussion of the following (published materials may be referenced):

- * Plans for future water development within the aquifer
- * How the well may affect existing water sources
- * Any secondary or cumulative impacts caused by promoting land uses that alter the hydrology of the source and/or end-use area
- * An assessment of the well's impact on the land owners, water users including farmers and kuleana residents in the region and a declaration if ceded lands are involved.

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Mr. Yuen
Page 3

6. **Determination**

Please discuss the findings and reasons for supporting the determination based on the significant criteria listed in §11-200-12 of the EIS rules. Please see the enclosed example.

NOTE: A Finding of No Significant Impact (FONSI) determination can only be made after an agency has reviewed and responded to all comments made on the Draft EA. This Draft EA (page 1-5) prematurely made a FONSI determination. The correct determination should have been anticipated FONSI.

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

Sincerely,



Gary Gill
Director

c: ✓ CH2M Hill

8.0 DETERMINATION, FINDINGS AND REASONS FOR SUPPORTING DETERMINATION

8.1 SIGNIFICANCE CRITERIA

According to the Department of Health Rules (11-200-12), an applicant or agency must determine whether an action may have a significant impact on the environment, including all phases of the project, its expected consequences both primary and secondary, its cumulative impact with other projects, and its short and long-term effects. In making the determination, the Rules establish "Significance Criteria" to be used as a basis for identifying whether significant environmental impact will occur. According to the Rules, an action shall be determined to have a significant impact on the environment if it meets any one of the following criteria:

- (1) **Involves an irrevocable commitment to loss or destruction of any natural or cultural resources;**

The proposed project will not impact scenic views of the ocean or any ridge lines in the area. The visual character of the area will change from the current agricultural land to an improved 4-lane highway which is compatible with the surrounding land use plans and programs being implemented for the region. The highway corridor is comprised of "Prime" agricultural land which is an important resource. Development of drainage systems will follow established design standards to ensure the safe conveyance and discharge of storm runoff. In addition, the subject property is located outside of the Count's Special Management Area (SMA).

As previously noted, no significant archaeological or historical sites are known to exist within the corridor. Should any archaeologically significant artifacts, bones, or other indicators of previous on-site activity be uncovered during the construction phases of development, their treatment will be conducted in strict compliance with the requirements of the Department of Land and Natural Resources.

- (2) **Curtails the range of beneficial uses of the environment;**

Although the subject property is suitable for agricultural uses, the land area adjoining the Mokulele Highway is naturally suited for transportation purposes due to its location proximate to an existing highway system. To return the site to a natural environmental condition is not practical from both an environmental and economic perspective.

- (3) **Conflicts with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS; and any revisions thereof and amendments thereto, court decisions, or executive orders;**

The proposed development is consistent with the Environmental Policies established in Chapter 344, HRS, and the National Environmental Policy Act.

(4) Substantially affects the economic or social welfare of the community or state;

The proposed project will provide a significant contribution to Maui's future population by providing residents with the opportunity to "live and work in harmony" in a high quality living environment. The proposed project is designed to support surrounding land use patterns, will not negatively or significantly alter existing residential areas, nor will unplanned population growth or its distribution be stimulated. The project's development is responding to projected population growth rather than contributing to new population growth by stimulating in-migration.

(5) Substantially affects public health

Impacts to public health may be affected by air, noise, and water quality impacts, however, these will be insignificant or not detectable, especially when weighed against the positive economic, social, and quality of life implications associated with the project. Overall, air, noise, and traffic impacts will be significantly positive in terms of public health as compared to the "no action" alternative.

(6) Involves substantial secondary impacts, such as population changes or effects on public facilities

Existing and planned large-scale housing development projects within Wailuku-Kahului and Kihei will contribute to a future population growth rate that will require expansion of public and private facilities and services. These improvements will become necessary as the overall population of Maui grows and settlement patterns shift. However, the proposed project will not in itself generate new population growth, but provide needed infrastructure the area's present and future population.

In addition, new employment opportunities will generate new sources of direct and indirect revenue for individuals and the County of Maui by providing both temporary and long-term employment opportunities during the construction period. Indirect employment in a wide range of service related industries will also be created from construction during project development.

(7) Involves a substantial degradation of environmental quality;

The proposed development will utilize existing vacant agricultural land. With development of the proposed project, the addition of urban landscaping will significantly mitigate the visual impact of the development as viewed from outside the site while the overall design will complement background vistas.

Makai views from the subject property are available, however, they are not significant nor generally available to the public in the property's present restricted condition.

- (8) **Is individually limited but cumulatively has considerable effect on the environment, or involves a commitment for larger actions;**

By planning now to address the future needs of the community and the State, improvement of the transportation system is consistent with the long term plans for Maui. No views will be obstructed or be visually incompatible with the surrounding area.

- (9) **Substantially affects a rare, threatened or endangered species or its habitat;**

No endangered plant or animal species are located within the highway corridor.

- (10) **Detrimentially affects air or water quality or ambient noise levels;**

Any possible impact to near-shore ecosystems resulting from surface runoff, will be mitigated by the establishment of on-site retention basins during the construction phases of development. After development, retention areas within the highway right-of-way will serve the same function to encourage recharge of the groundwater.

- (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, freshwater, or coastal waters.**

Development of the property is compatible with the above criteria since there are not environmentally sensitive areas associated with the project and the physical character of the corridor has been previously disturbed by agricultural uses. As such, the property no longer reflects a "natural environment". Shoreline, valleys, or ridges will not be impacted by the development.

- (12) **Substantially affects scenic vistas and view planes identified in county or state plans or studies;**

Due to topographical characteristics of the property, views of the area to be developed are generally not significant although they are visible. The majority of the proposed project will not be visible, except from higher elevations by the general public or from persons traveling along the highway.

- (13) **Requires substantial energy consumption.**

The location of the proposed project is between Maui's major growth areas. This relationship will reduce travel times and energy consumption after project build out through efficiencies gained by the increased capacity of the highway. Construction of the proposed project will not require substantial energy consumption relative to other similar projects.

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COPY

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
235 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714



September 23, 1998

JEREMY HARRIS, Mayor
EDDIE FLORES, JR., Chairman
FORREST C. MURPHY, Vice Chairman
KAZU HAYASHIDA
JAN M.L.Y. AMII
JONATHAN K. SHIMADA, PhD
BARBARA KIM STANTON
CHARLES A. STED

CLIFFORD S. JAMILE
Manager and Chief Engineer

Mr. Gary Gill, Director
Office of Environmental Quality Control
State of Hawaii
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

RECEIVED
SEP 29 1998
CLIFFORD S. JAMILE - MNL

Dear Mr. Gill:

Subject: Draft Environmental Assessment for the Kalihi
Exploratory Well IV, TMK: 1-4-18: 06

Thank you for reviewing the Draft Environmental Assessment (EA) for the Kalihi Exploratory Well IV. We provide the following response to your comments:

1. Cost Effectiveness

In considering the cost efficiency of producing potable water from this source in comparison to the Board of Water Supply's (BWS) conservation efforts, we must also consider the critical state of the Honolulu area's water needs, how effective a conservation program would be in solving Oahu's total water shortage problems, and the comparative costs of the other alternatives for providing water to Honolulu.

Section 2.4 documents the sustainable yield deficits in the Palolo, Nuuanu and Kalihi Aquifers in the Honolulu System. The BWS recognizes that with future population increases the sustainable yield deficits in these aquifer areas will be exacerbated. The BWS also recognizes that potable well development in these areas will continue to become increasingly more difficult.

Conservation is a program that is actively being pursued by the BWS, with a stated objective of a reduction in per capita consumption by 10 percent by the year 2000. Conservation efforts currently in progress include public education programs on the limits of Oahu's resources and the benefits of conservation, the use of low flow residential and commercial water fixtures, use of xeriscaping, maintenance of home plumbing (e.g., repair of leaking faucets and hoses), and periodic adjustments of the water rate structure. Reclaimed water systems in Ewa



Mr. Gary Gill
Page 2
September 23, 1998

and around existing wastewater treatment plants are being planned and designed to further extend the potable water resource. However, although conservation efforts will continue to play an important role in helping to reduce the demand on existing groundwater resources, the BWS recognizes that conservation alone cannot be relied on to meet all of Oahu's and especially of Honolulu's future water demands.

The development of this exploratory well into a production well would be less costly than the development of water sources outside of Honolulu and conveying of that water into Honolulu. Further, all other alternatives have much higher development costs and major technological challenges. Desalination plants show the most promise, and as that technology becomes available, it is BWS's intent to implement desalination projects as groundwater withdrawals approach sustainable yields. However, although the capital cost of a large scale desalination plant per gallon is about the same as groundwater development in rural areas, the Operations and Maintenance (O & M) costs is about \$3.00 per thousand gallons, which is 10 times the O & M cost of pumping groundwater.

2. Orientation Maps

Maps of the project site were included as Figures 2-2 and 3-1. Figure 2-2 shows all wells in the vicinity that were registered with the Department of Land and Natural Resources. Except for the four tunnels and the well, there are no other reported or known wells in the vicinity of the proposed exploratory well.

The proposed exploratory well site is located within the forest reserve, inside the State Conservation District, Protective Subzone. As described in Section 3-1, access to this area is strictly controlled. Contamination in the forest reserve area is highly unlikely, and there are no reported or known points of potential contamination in the vicinity such as landfills, individual wastewater disposal systems, hazardous waste sites, dry wells and injection wells.

Chloride levels in the Kalihi Aerator Well, 2250-01 were reported to be 18 mg/l, which indicate natural occurring minerals in water bearing rock. Perched aquifers are separate from basal aquifers which displace underlying sea water.



Mr. Gary Gill
Page 3
September 23, 1998

3. Contamination Analysis

The proposed well is located in the Moanalua Aquifer, near the west boundary of the Kalihi Aquifer. The Department of Health (DOH) indicated that the closest sources in the vicinity of the proposed Kalihi Exploratory Well IV that had detection of any contamination were in the Kalihi Aquifer and were identified as Jonathan Springs and the Kamehameha School wells. These downgradient wells contain dieldrin and chlordane from the ground treatment of termites in the surrounding urban area. The proposed Kalihi Exploratory Well IV is located in a different aquifer sector and adjacent to the Kalihi watershed, a State Conservation District zone.

In accordance with the DOH, Hawaii Administrative Rules, Title 11, Chapter 20, Potable Water Systems, an engineering report will cover all aspects of the possible contamination concerns.

4. Financial and Institutional Arrangements

The BWS is responsible for the financing of this project. There are no other institutional, financial or land use arrangements or commitments related to the drilling or the development of this exploratory well.

5. Watershed and Land Use Analysis

Section 1.1 indicated that the water from this exploratory well will be tested to determine if the quantity and quality of this water will be suitable for development. If suitable for development, the exploratory well may be considered for conversion into a production well.

As indicated in Section 5-2, current City and County of Honolulu procedures do not require any amendment to the Development Plan public facilities map for the exploratory well. However, if the well is proposed to be developed into a water production well, the Development Plan public facilities map will be amended to include the site. Water from this well would support the land uses that are designated urban by the State and the City.

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Mr. Gary Gill
Page 4
September 23, 1998

If this exploratory well is developed into a production well, the anticipated withdrawal of 0.25 mgd would be from the perched alluvial aquifer, which is hydraulically distinct from the underlying basal aquifer. BWS will comply with all the Commission on Water Resource Management conditions for groundwater withdraw in accordance with Chapter 174C, HRS. Stream flow impacts are not expected, however, standard test pumping and stream flow gaging protocol will be followed.


As indicated in Chapter 3, the exploratory well site is located within the BWS's Kalihi 614' Reservoir site, within the State's Conservation District and forest reserve. Figure 3-1 is a map showing land ownership. There are no land owners or water users, such as farmers or kuleana residents, or ceded land in the vicinity of this exploratory well project.

5. Determination

The BWS utilized the "Significance Criteria" referred to in the HAR, Title 11, DOH, Chapter 200, Environmental Impact Statement Rules (EIS), to make its determination that no EIS would be required for this project. The BWS has determined that all significance criteria have been addressed and proper mitigative actions are proposed in the environmental assessment.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,


CLIFFORD S. JAMILE
Manager and Chief Engineer

cc: CH2M Hill

0000 0001 0115

BENJAMIN J. CAYETANO
GOVERNOR



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

MAY 19 1998

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
BRIAN K. MINAJI
GLENN M. OKIMOTO

IN REPLY REFER TO:
HWY-PS
2.9324

Mr. Paul Luerson
CH2M HILL
1585 Kapiolani Boulevard, Suite 1420
Honolulu, Hawaii 96814

Dear Mr. Luerson:

Subject: Draft Environmental Assessment, Kalihi Exploratory Well IV,
Kalihi, Honolulu, TMK: 104018:06

Thank you for transmitting the above subject document for our review and comments.

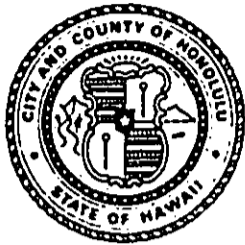
The City's proposed exploratory water well at the Kalihi 614 reservoir site in Kalihi Valley will not impact our State highway facilities.

Very truly yours,

A handwritten signature in cursive script, appearing to read "Kazu Hayashida".

KAZU HAYASHIDA
Director of Transportation

0000 0001 0116



CITY COUNCIL

CITY AND COUNTY OF HONOLULU
HONOLULU, HAWAII 96813-3065 / TELEPHONE 547-7000

DONNA MERCADO KIM
COUNCILMEMBER
(808) 547-7007
(808) 523-4220 (fax)
e-mail: dmk@co.honolulu.hi.us
Internet: <http://pr.hula.net/dmk/>

June 8, 1998

Mr. Brooks Yuen
Acting Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Yuen:

Re: Proposed Kalihi Exploratory Well IV

I am writing in response to a correspondence regarding the above-referenced matter soliciting my comments on the Draft Environmental Assessment (EA). I have conducted a cursory review of the EA and find no objections to the project. However, I request that your agency address any concerns that the Kalihi Valley Neighborhood Board No. 16 may have, especially any concerns regarding any potential impacts upon the surrounding community.

Thank you for bringing this matter to my attention. Should you have any questions, please contact my office.

Sincerely,

A handwritten signature in black ink, appearing to read "Donna", is written over a horizontal line.

DONNA MERCADO KIM
Councilmember
Council District VII

cc: CH2M Hill

0000 0001 0117

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714



June 24, 1998

JEREMY HARRIS, Mayor **COPY**

WALTER O. WATSON, JR., Chairman
EDDIE FLORES, JR.
KAZU HAYASHIDA
JAN M. L. Y. AMII
FORREST C. MURPHY
JONATHAN K. SHIMADA, PhD
BARBARA KIM STANTON

BROOKS H. M. YUEN, Acting
Manager and Chief Engineer

The Honorable Donna Mercado Kim
Councilmember
City Council
City and County of Honolulu
Honolulu, Hawaii 96813-3065

Dear Councilmember Kim:

Subject: Your Letter of June 8, 1998 Regarding the Draft Environmental Assessment for the Board of Water Supply's Proposed Kalihi IV Exploratory Well Project, Kalihi, Honolulu, Oahu

Thank you for reviewing the Draft Environmental Assessment for the proposed Kalihi IV Exploratory Well project.

We acknowledge that you have no objections to the proposed project. We will coordinate the proposed project with the Kalihi Valley Neighborhood Board to ensure that their concerns are addressed.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

FOR BROOKS H. M. YUEN
Acting Manager and Chief Engineer

RECEIVED

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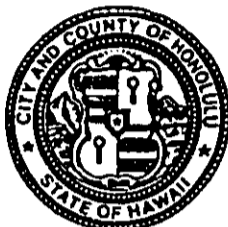
cc: Paul Luersen, CH2M Hill

0000 0001 0118

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 523-4414 • FAX: (808) 527-6743

JEREMY HARRIS
MAYOR



JAN NAOE SULLIVAN
DIRECTOR

LORETTA K.C. CHEE
DEPUTY DIRECTOR

98-03344 (DT)
98 EA Comments Zone 1

June 3, 1998

MEMORANDUM

TO: BROOKS H.M. YUEN, ACTING MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

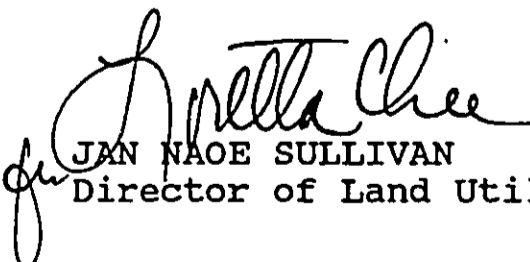
ATTN: BARRY USAGAWA

FROM: JAN NAOE SULLIVAN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR KALIHI
EXPLORATORY WELL IV, TAX MAP KEY: 1-4-18: 6

We have reviewed the above proposal to drill and case an exploratory water well in its Kalihi 614 Reservoir site in Kalihi Valley. The project is not within the Special Management Area. We have no other comments to offer at this time.

Thank you for the opportunity to comment on the EA. If you have any questions regarding this memo, please contact Ms. Dana Teramoto of our staff at Extension 4648.


JAN NAOE SULLIVAN
Director of Land Utilization

JNS:am

/cc: CH2M Hill (Paul Luersen)

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BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714



June 18, 1998

JEREMY HARRIS, Mayor **COPY**

WALTER O. WATSON, JR., Chairman
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JAN M. L. Y. AMII
FORREST C. MURPHY
JONATHAN K. SHIMADA, PhD
BARBARA KIM STANTON

BROOKS H. M. YUEN, Acting
Manager and Chief Engineer

TO: JAN NAOE SULLIVAN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: ^{BHMY} BROOKS H. M. YUEN, ACTING MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR MEMORANDUM OF JUNE 3, 1998 REGARDING THE DRAFT
ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED KALIHI IV,
EXPLORATORY WELL, KALIHI, OAHU

Thank you for reviewing the Draft Environmental for the proposed Kalihi IV Exploratory Well project.

We acknowledge that the proposed project is not within the Special Management Area.

If you have any questions, please contact Barry Usagawa at 527-5235.

cc: Peter Luersen, CH2M Hill

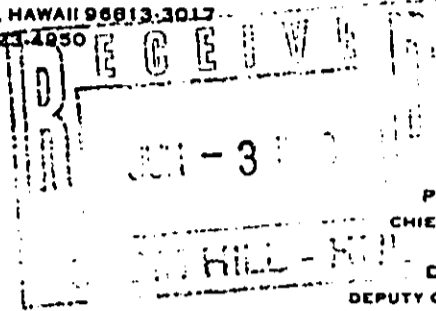
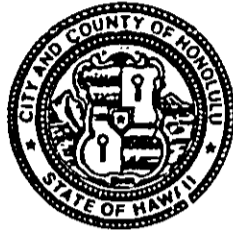
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PLANNING DEPARTMENT
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 8TH FLOOR • HONOLULU, HAWAII 96813-3017
PHONE: (808) 523-4533 • FAX: (808) 523-4950



PATRICK T. ONISHI
CHIEF PLANNING OFFICER

DONA L. HANAIKE
DEPUTY CHIEF PLANNING OFFICER

GW 5/98-0968

JEREMY HARRIS
MAYOR

June 1, 1998

Mr. Brooks Yuen, Acting Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

ATTN: Barry Usagawa

Dear Mr. Yuen:

Draft Environmental Assessment, Kalihi Exploratory Well IV,
Kalihi, Honolulu, Hawaii, TMK 1-4-18:06

We have reviewed the above referenced Draft Environmental Assessment (DEA), and have no objections to this project at this time. We offer the following items for you to consider during preparation of the Final Environmental Assessment (FEA) for this project.

- a. Section 1.3, 3rd paragraph and Section 5.2, 3rd paragraph correctly describe map amendment requirements under the provisions of the current Development Plan (DP) for the Primary Urban Center (PUC). The FEA should acknowledge that the DP for the PUC is currently being revised per the provisions of the 1992 Charter amendments and may eliminate those requirements or may propose other requirements.
- b. Section 3.2, 2nd paragraph: The FEA should state why 1993 data is being reported or, preferably, should report more recent data. Also, it is unclear why production of 0.00 mgd is reported for the four Kalihi Tunnels when it has already been stated that they are inactive; it would be more informative to state the production capacity of those facilities. Why are the tunnels inactive?
- c. Section 4.3.2: The third paragraph states that 11 wells are located in the Moanalua Aquifer, that one has been sealed, two are privately operated, four are operated by the US Army, and the remaining four

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Mr. Brooks Yuen, Acting Manager & Chief Engineer
Board of Water Supply
June 1, 1998
Page 2

are the responsibility of BWS. The fourth paragraph states that BWS withdrew an average of 10.5 mgd from its wells and that private users withdrew an average of 1.6 mgd for a total of 12.1 mgd. The FEA should clarify if the US Army's withdrawals are included in the "private" total; if not, the Army's withdrawals should also be noted. The FEA should also provide an explanation of the relationship between total authorized water uses permitted by CWRM and the estimated sustainable yield.

- d. Section 4.4.2 states that Oahu is designated as UBC Seismic Zone 1. Figure 16-2 of the 1994 UBC assigns Oahu to Seismic Zone 2A.
- e. Chapter 6, Possible Alternatives, should discuss two additional points regarding the economic and physical feasibility of this project:
 - 1. \$925,000 is expected to be spent to develop 0.25 mgd of potential water production. Is this comparable to costs for other BWS well projects?
 - 2. Approximately 4 mgd are available for allocation, and 6 mgd are available for withdrawal. Is it known where the potential sources are located? What are the problems in locating and developing these sources?

If you should have any questions or concerns regarding the above, please do not hesitate to contact Gordon Wood of the Planning Department staff at 527-6073.

Yours very truly,


PATRICK T. ONISHI
Chief Planning Officer

PTO:lh

c: / Paul Luersen, CH2M Hill

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BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
30 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714



September 23, 1998

JEREMY HARRIS, Mayor

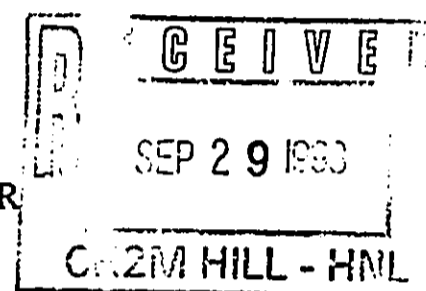
EDDIE FLORES, JR., Chairman
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KAZU HAYASHIDA
JAN M.L.Y. AMII
JONATHAN K. SHIMADA, PhD
BARBARA KIM STANTON
CHARLES A. STED

CLIFFORD S. JAMILE
Manager and Chief Engineer

TO: MR. PATRICK T. ONISHI, CHIEF PLANNING OFFICER
PLANNING DEPARTMENT

FROM: *Clifford S. Jamile*
CLIFFORD S. JAMILE

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED
KALIHI IV EXPLORATORY WELL, KALIHI, OAHU



Thank you for reviewing the Draft Environmental Assessment (EA) for the proposed Kalihi IV Exploratory Well project.

We provide the following response to your concerns:

1. We are aware that the Development Plan Public Facilities Map (DPPFM) amendment procedures may in the future be superseded with a new public facility approval process. The Primary Urban Center (PUC) Development Plan (DP) is currently being revised according to the requirements of the City Charter, and current procedures for DPPFM approvals may be revised when the new DP for the PUC is adopted.
2. The four Kalihi Tunnels were abandoned for potable production in 1987 due to a structural collapse and the costly improvements necessitated by the Safe Drinking Water Act's Surface Water Treatment Rule.
3. Section 4.3.2, the Board of Water Supply withdrew an average of 9.5 million gallons per day (mgd) in 1994, military withdrew 4.7 mgd and the private users withdrew 0.42 mgd for a total of about 14.62 mgd.

The Commission on Water Resource Management (CWRM) recently corrected the location of the Military's Red Hill shaft from the Waimalu to the Moanalua water management area. The sustainable yield of the Moanalua aquifer is 18 mgd, however, the average pumpage remains well below the sustainable yield.

4. Section 4.4.2 will be revised to indicate the appropriate seismic zone.

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Mr. Patrick T. Onishi

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September 23, 1998

5. The construction cost to develop 0.25 mgd of potable water is approximately \$2.8 million rather than \$925,000. The development cost per allocable gallon is comparable to Windward well development costs.
6. Due to the correction of the Red Hill shaft by CWRM, the Moanalua basal aquifer is permitted for 18.57 mgd. Although exceeding the 18 mgd basal sustainable yield, the proposed well project will not tap the basal aquifer. The proposed well will tap perched water which lies above the basal aquifer. We have asked CWRM to consider perched alluvial aquifers in their update of the Water Resources Protection Plan because these aquifers are a largely untapped resource.

If you have any questions, please contact Barry Usagawa at 527-5235.

cc: Bennett Mark, CH2M Hill

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DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 11TH FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 523-4341 • FAX: (808) 527-5857



AMY HARRIS
MAYOR

JONATHAN K. SHIMADA, PhD
DIRECTOR AND CHIEF ENGINEER


ROLAND D. LIBBY, JR.
DEPUTY DIRECTOR

ENV 98-116

May 22, 1998

MEMORANDUM:

TO: BROOKS YUEN, ACTING MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

FROM: JONATHAN K. SHIMADA, PhD 
DIRECTOR AND CHIEF ENGINEER

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (DEA)
KALIHI EXPLORATORY WELL IV
TMK: 1-4-18: 06

We have reviewed the subject DEA and have the following comments:

1. Please verify the truck load since the weight limit for the existing Kalihi Street Bridge #3 is ten (10) tons only.
2. The seismic zone for Island of Oahu is Zone IIB not I.
3. An effluent discharge permit from the Department of Public Works is required if non-storm water from yield drawdown tests and long-term constant rate tests enters the City drainage system.

If you have any questions, please contact Alex Ho at Local 4150.

cc: CH2M Hill (Paul Luersen)

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BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714



June 15, 1998

COPY

JEREMY HARRIS, Mayor

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EDDIE FLORES, JR.
KAZU HAYASHIDA
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FORREST C. MURPHY
JONATHAN K. SHIMADA, PhD
BARBARA KIM STANTON

BROOKS H. M. YUEN, Acting
Manager and Chief Engineer

TO: JONATHAN K. SHIMADA, Ph.D.
DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

FROM: *BH M Yuen*
BROOKS H. M. YUEN, ACTING MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR MEMORANDUM OF MAY 22, 1998 REGARDING THE DRAFT
ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED KALIHI IV
EXPLORATORY WELL, KALIHI, OAHU

Thank you for reviewing the Draft Environmental Assessment (EA) for the proposed Kalihi IV Exploratory Well project.

We provide the following responses to your concerns:

1. We shall indicate to our contractor that any construction vehicles crossing the Kalihi Street Bridge #3 shall be within the ten ton weight limit.
2. The Final EA will indicate that the seismic zone for the island of Oahu is Zone IIB instead of Zone I.
3. We have obtained a blanket National Pollutant Discharge Elimination System permit valid until March 5, 1999 for exploratory well discharges into the City drainage system.

If you have any questions, please contact Barry Usagawa at 527-5235.

cc: Peter Luersen, CH2M Hill

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