BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU

630 SOUTH BERETANIA STREET

HONOLULU, HAWAII 96843

November 9, 1993

Mr. Brian J. J. Choy, Director
Office of Environmental Quality Control
State of Hawaii
220 South King Street
Fourth Floor
Honolulu, Hawaii 96813

Dear Mr. Choy:

Subject: Final Environmental Assessment (EA) for an Exploratory Well and Access Road at Manoa Site IV, Manoa, Oahu, TMK: 2-7-36: 3

We request the subject Final EA be published in the November 23, 1993 OEQC Bulletin as a Negative Declaration. Please find the completed OEQC Bulletin Publication Form and four copies of the document attached for your use.

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

Very truly yours,

Kazu Hayashida

KAZU HAYASHIDA
Manager and Chief Engineer

Attachment

1993-11-23-OA-FEA-Manoa IV Exploratory Well Project

NOV 23 1993

ENVIRONMENTAL ASSESSMENT

FOR AN EXPLORATORY WELL AND ACCESS ROAD

AT MANOA SITE IV, OAHU, HAWAII

Proposing Agency

HONOLULU BOARD OF WATER SUPPLY
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Contact

Bert Kuioka, 527-5235

Prepared by:

MAGUIRE GROUP INC.
1600 Kapiolani Boulevard, Suite 601
Honolulu, Hawaii 96814

November 1993

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CHAPTER 1
INTRODUCTION AND SUMMARY

1.1 APPLICANT / PROPOSING AGENCY

Board of Water Supply, City and County of Honolulu

1.2 APPROVING AGENCY

Board of Water Supply, City and County of Honolulu

1.3 AGENCIES CONSULTED IN MAKING THE ASSESSMENT

Office of Environmental Control

1.4 PROJECT OBJECTIVES AND BACKGROUND

In the fiscal year ending June 30, 1991, the Honolulu Board of Water Supply (BWS) system served a population of over 830,000. Average daily water demand on the island during this period was 156 million gallons (mg). According to BWS projections, average daily water demand in the year 2010 will be 191 mg, an increase of 23 percent.

To meet growing demands for water, BWS has initiated a comprehensive groundwater development program. As part of this program, BWS proposes to drill an exploratory well in the Manoa Valley to determine the yield and quality of water supplies which may be withdrawn from this location.

1.5 PROJECT AND SITE DESCRIPTION

The proposed exploratory well will be located on the western edge of Manoa Valley field, east of the tennis courts at the end of Vista Place. The site is on property owned by the City Department of Parks and Recreation.

Access to the well site will be through Vista Place. The project will involve drilling a hole about 16 inches in diameter to a depth of about 500 feet. Once the drilling is completed, a 12 inch diameter steel casing will be grouted into place in the hole and a pump will be installed. A series of pumping tests will be conducted to determine the potential sustained yield and quality of water from the aquifer. Water from the pumping tests will be routed via conduit laid on the surface and discharged to a small tributary stream which will carry it into Manoa Stream.

Upon completion of the testing, the well driller will remove the pump, cap the well, and clean the area. The total project will require an estimated six to seven months to complete.

1.6 POTENTIAL IMPACTS, MITIGATION MEASURES, AND ALTERNATIVES

No significant adverse impacts are expected during the drilling and pump testing. Short-term impacts during construction of the well and testing will include localized soil disturbance and increases in noise resulting from site access and the operation of drilling equipment. No permanent impacts are anticipated. Mitigation measures will be carried out to minimize soil erosion and short-term impacts of equipment noise. The Contractor will be required to comply with all applicable noise regulations and to implement a "Best Management Practice Plan" to prevent erosion caused by the test pumping. Three alternatives to the project have been considered. These are: no action, development of alternative sources, delaying the project, while developing sources at other sites. None of these alternatives would enable the Board of Water Supply to successfully achieve its stated objectives.

1.7 GOVERNMENTAL PERMITS AND APPROVALS

The following permits and approvals will be required:

Well Construction Permit - Department of Land and Natural Resources
Water Use Permit - Department of Land and Natural Resources
Right of Entry Permit - Department of Parks & Recreation

CHAPTER 2
PROJECT DESCRIPTION

2.1 PROJECT SITE

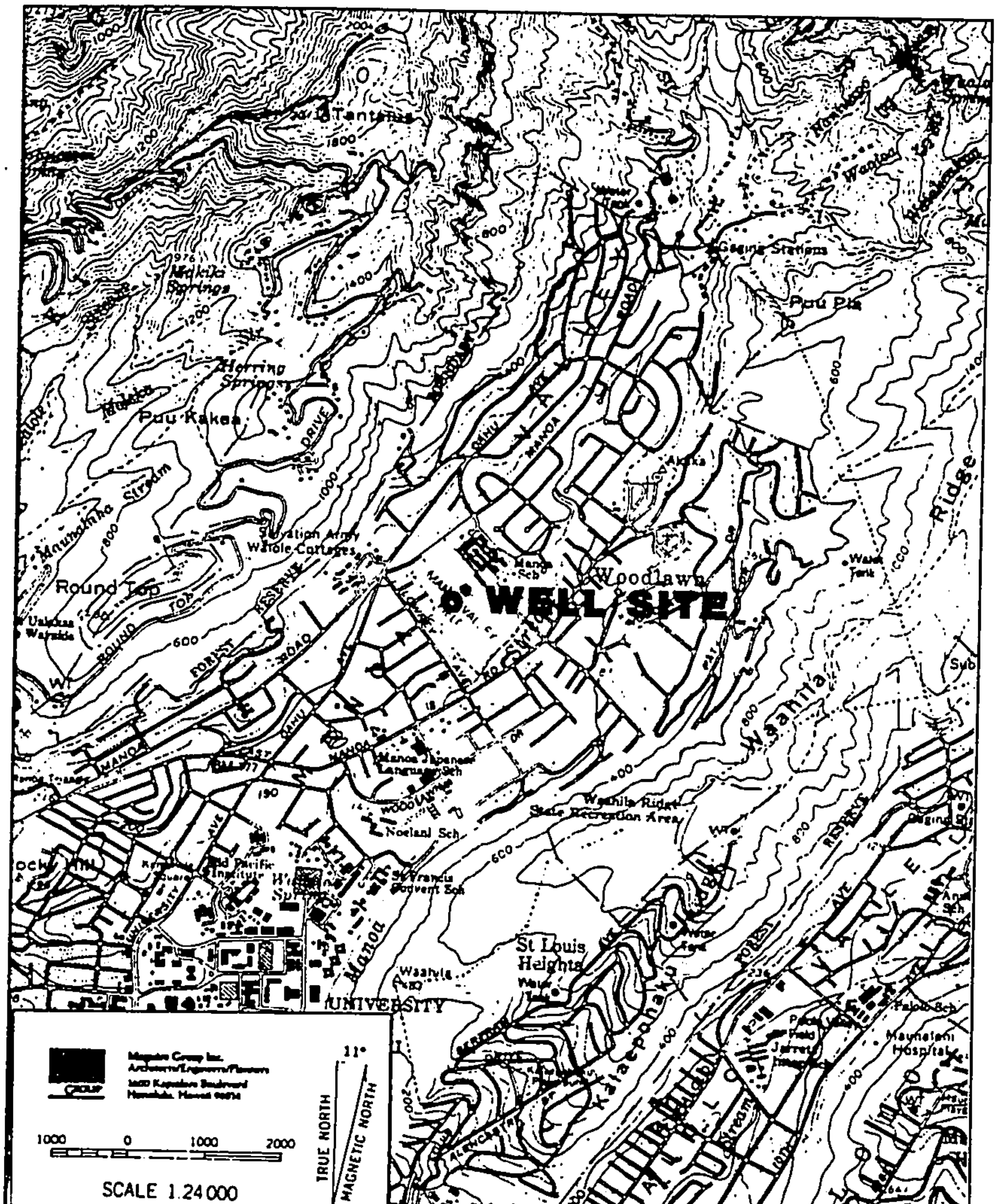
The site for the proposed exploratory well is in the Manoa Valley Field between Lowrey Avenue, Manoa Road, Kahaloa Drive and East Manoa Road. Figure 1 is a regional map indicating the general location of the proposed well. Located at an elevation of about 200 feet, the site is between the tennis and basketball courts adjacent to a drainage ditch running parallel to Lowrey Avenue. It slopes gently to the southeast, toward the Manoa Stream. It is accessible directly via the internal roads of the Manoa Park. Figure 2 provides photographs of the site location.

The well site [TMK 2-9-36:3] is owned by the City Department of Parks and Recreation. The site and surrounding area is designated on the City and County of Honolulu Development Plan Land Use Map as Park, land dedicated to park use. The City lists the planned use of the site as public park. Zoning is P-2 Preservation District. The Department of Parks & Recreation has developed the surrounding parts of the property intensively but has no immediate plans for the small area within which the test well would be installed.

2.2 PROPOSED FACILITIES AND ACTIVITIES

The project will involve well installation and pump testing. Well installation will require establishing a work area, covering about 2,500 square feet (50' x 50') for drilling and pumping equipment. Drilling equipment will be brought in to the site and used to drill a hole about 16 inches in diameter and approximately 500 feet deep. The depth will be determined by the depth necessary to develop groundwater in the alluviated portion of Manoa Valley.

Drilling may be accomplished by either of two methods; cable tool drilling or rotary drilling. Cable tool drilling, also known as percussion drilling, is a commonly used method for drilling to depths of 400 or 500'. Rotary drilling is generally more expensive and is used for drilling to



Location of the Proposed Manoa IV Test Well

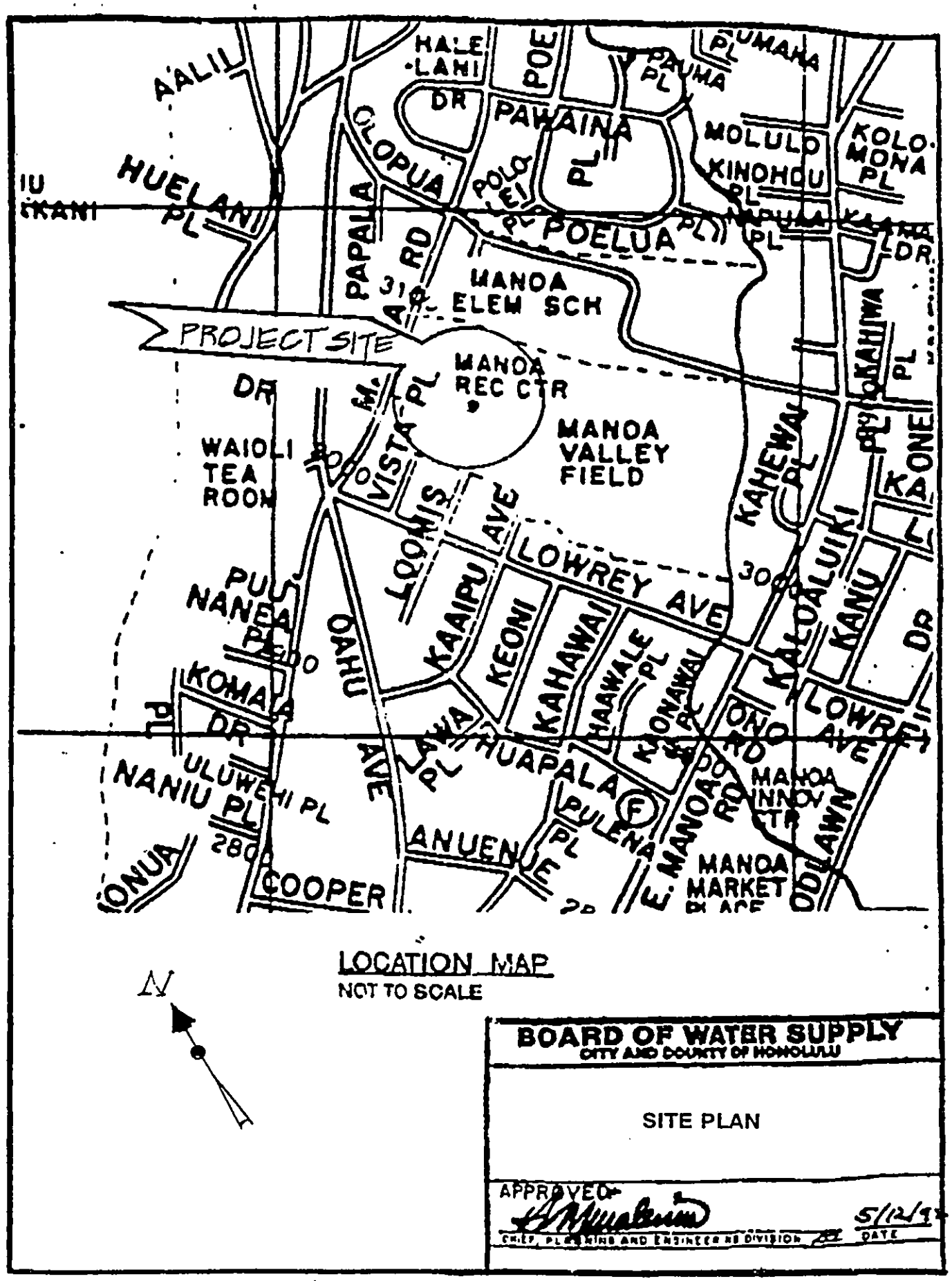
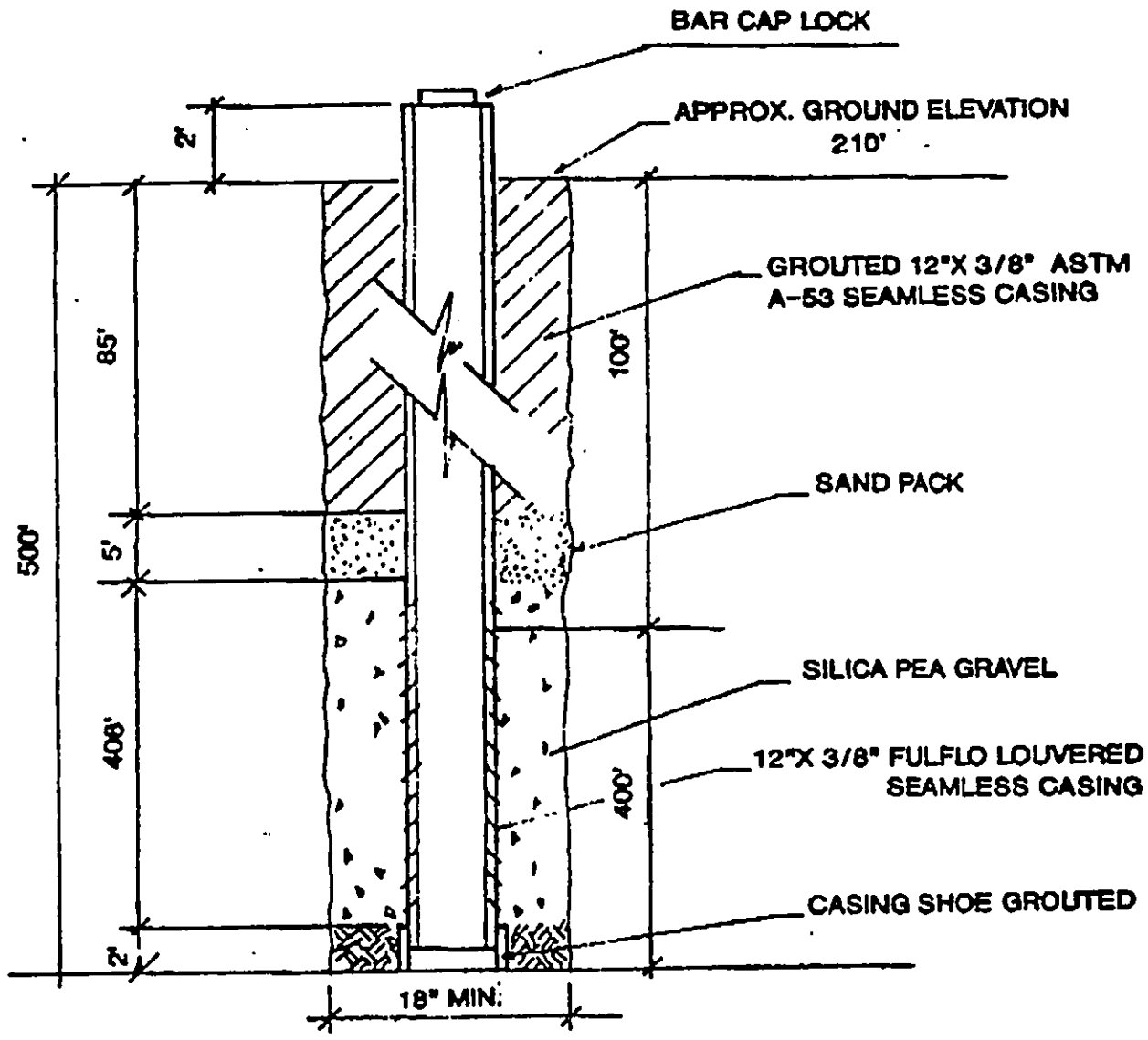


FIGURE NO. 2

MANOA IV EXPLORATORY WELL



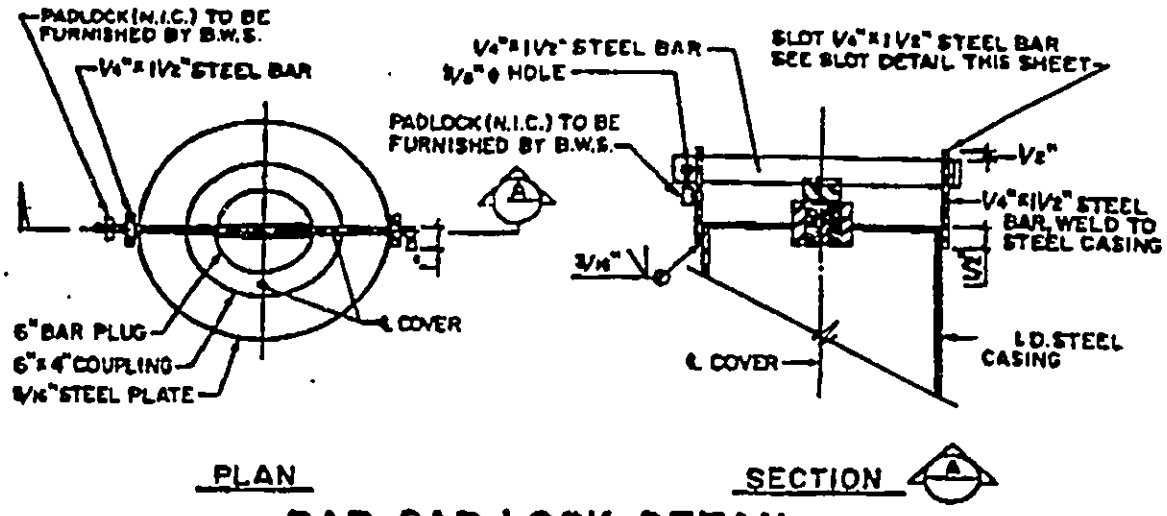
NOT TO SCALE

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

WELL DETAIL (1)

APPROVED:
CHIEF, PLANNING AND ENGINEERING DIVISION — DATE 5/12/92

FIGURE NO. 3



PLAN SECTION A

BAR CAP LOCK DETAIL

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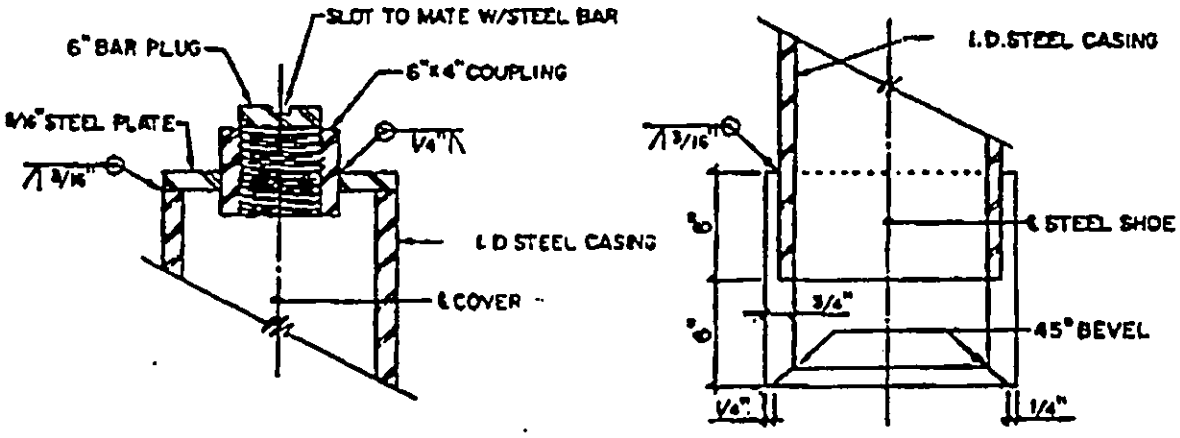

COVER DETAIL

STEEL SHOE DETAIL

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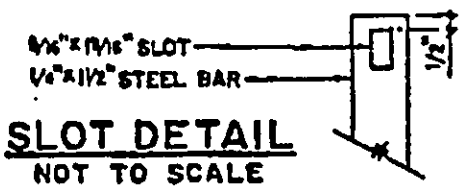


SLOT DETAIL

NOT TO SCALE

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

WELL DETAIL (2)

APPROVED:
CHIEF, PLANNING AND ENGINEERING DIVISION
5/12/92
DATE

FIGURE NO. 4

Photo 1: View Looking northwest toward Manoa IV Site

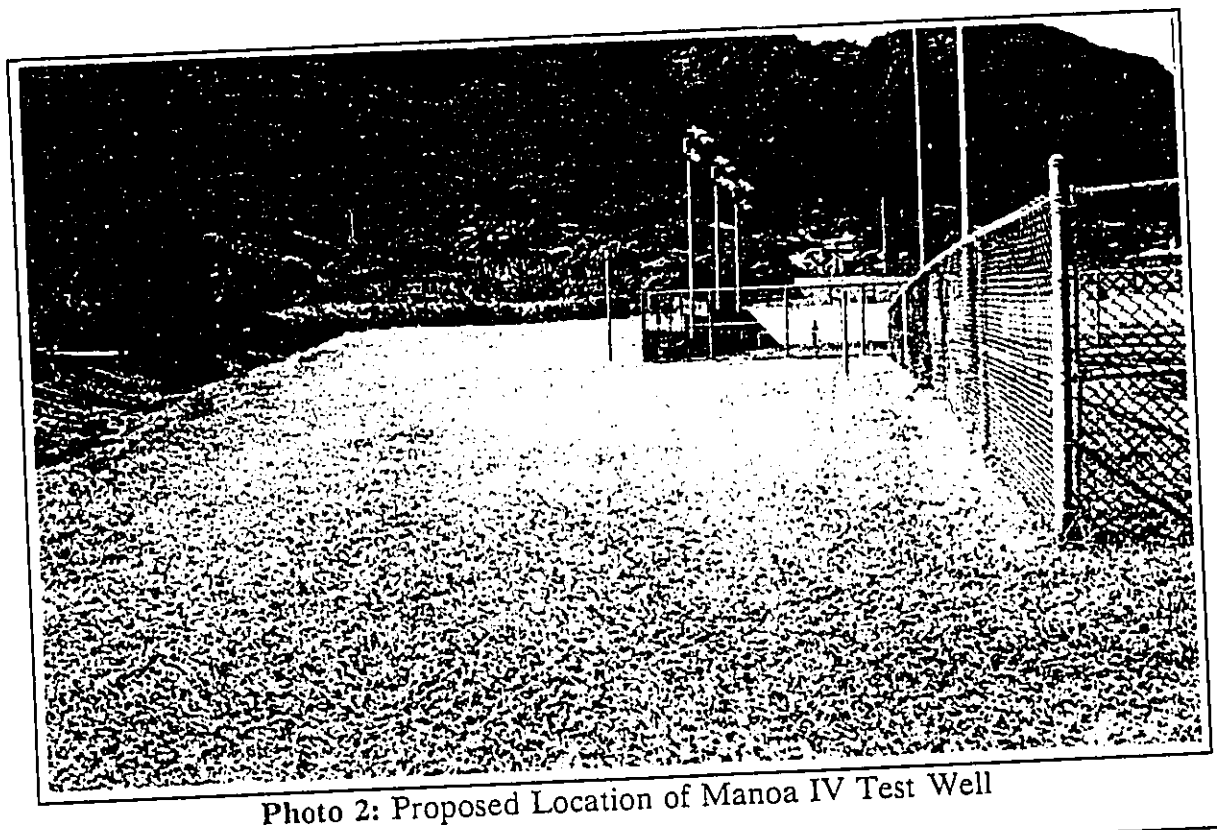


Photo 2: Proposed Location of Manoa IV Test Well

depths of 800-1000'. Given the projected depth of the Manoa well, the cable tool drilling method is the method most likely to be used. Site preparation and drilling will require about three to four months.

Once the drilling is completed, a 12" diameter steel casing will be grouted into place within the borehole to a depth about 50' below the water table. A test pump will be installed in the well and a discharge line will be routed from the well site down to the ditch tributary to the Manoa stream to carry the discharge from the pump test. The pump will be used to withdraw water from the well to test water quality and potential yield. Two pumping tests will be conducted to evaluate yield and drawdown. The first will be a short-term test conducted over a five hour period. The second will be a long-term test involving continuous pumping over a five day period. The Board of Water Supply has an agreement with the U.S. Geological Survey to jointly monitor any reduction in the Manoa stream flow during test pumping. Should the water level in the exploratory well approximate the level of the stream, stream gaging would be initiated. The potential yield for this well has been estimated to be 1.0 MGD. When the pump tests have been concluded, the drilling contractor will remove the pump and discharge line, cap the well, and clear all equipment and miscellaneous materials from the work area.

If the results show that development of the water source penetrated by the well is feasible, the Board of Water Supply expects to convert it for long-term production. This will require installation and operation of a production well. Production well development will be subject to the environmental review process as stipulated in Chapter 343, Hawaii Revised Statutes, and Chapter 200 of the State Department of Health Regulations.

2.3 PROJECT SCHEDULE AND COST

The project is expected to begin in early 1993. Drilling will begin after preparation of the well site, estimated to take less than a week. Drilling will be completed in two to three 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 pump tests. Demobilization will also take about two weeks. Total project duration is therefore estimated to be about four months time.

The project will cost an estimated $223,700. Funds for the project are available in the BWS budget for the fiscal year ending June 30, 1993.

2.4 NEED FOR THE PROJECT

The Board of Water Supply currently serves a population of more than 830,000 persons (Board of Water Supply 1982). Island-wide average daily water demand was about 156 million gallons per day (mgd). The Honolulu District, extending from Aliamanu to Hawaii Kai, is the most heavily populated of the water districts on Oahu and has the highest domestic water demand on the island. Water demand in the district is presently about 86 mgd. Over half of this amount was produced from sources within the district, while the remainder had to be imported from the Pearl Harbor District and the Windward District. Pumpage from the Pearl Harbor aquifer cannot be further increased without risking serious encroachment of sea water into the basal water lens. The Department of Land and Natural Resources, Commission on Water Resource Management, currently limits the Honolulu District's total allowed draft from the Pearl Harbor aquifer to 38.14 mgd.

Demand for water in the Honolulu District is projected to continue to increase to 92 mgd by the year 2010. During this period, island wide water demand is projected to rise by nearly 23 percent. To meet growing demand, the Board of Water Supply is seeking to identify, test, and develop new groundwater sources. Some of these new sources will be used to meet demand in the districts within which the sources are developed, some will be transferred to meet the growing demand in Honolulu. If the Manoa source is determined to be feasible for development, an estimated 1.0 mgd may be added to the BWS system.

The BWS has considered a number of alternatives for production of potable water. Water conservation programs are already in place to try and reduce per capita water demand. Alternatives to expanded use of groundwater sources include desalination, development of surface systems, use of brackish sources with dilution, and recycling of treated wastewater. At present, each of these alternatives is presently considered unacceptable for technical, health, and/or cost reasons.

CHAPTER 3
EXISTING CONDITIONS

3.1 PHYSICAL ENVIRONMENT

3.1.1 Geology

The Manoa valley is an erosional feature on the south western slopes of the Ko'olau Volcano. It is a deep valley carved into the southwestern slopes of the range. The eroded alluvial material was deposited upon the coastal plain. Subsequent volcanic eruptions deposited material within the valley, partially filling it and forming the broad flat base which is now found within it. During this same period, sediments of marine origin accumulated at the seaward portion of the valley as sea level rose and fell during glacial and inter-glacial periods.

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

Seaward of the dike zone a large body of basal groundwater as a freshwater lens floats on top of salt water. This basal lens is confined by sedimentary caprock or occasional dikes. It is recharged by leakage and overflow of dike-impounded groundwater from higher elevations and by infiltration of rainfall and stream flow.

The body of groundwater that will be developed by the exploratory well occurs in the thick sediments of Manoa Valley. The sediments emplaced by gravity and water are the sources for the existing Manoa Well II which produces 1.0 mgd. The alluvial water is perched above the basaltic aquifer.

3.1.2 Hydrology

The proposed well site is located in the watershed of the Manoa Stream. The Manoa stream is a small perennial stream which originates from a series of small tributaries high in the Ko'olau range in the Honolulu Watershed Forest Reserve. It flows generally southward through the Manoa Valley and into the Ala Wai Canal. It is fed by runoff, dike leakage and possibly dike overflow. The well site is located just south of the stream and is expected to tap into the water bearing alluvium of the valley. Flows in the Manoa stream have been gaged at a location near the proposed test well site and average about 5 cubic feet per second at the gaging location.

3.1.3 Topography

The proposed well site is located at an elevation of about 200' above sea level. It is located on the nearly level alluvial deposits on the floor of the Manoa Valley and slopes very gently to the southeast, toward Manoa Stream.

3.1.4 Climate

Average monthly temperature in the vicinity of the proposed well site is approximately 75°. It ranges from 72° in January to 78.5° in August (State of Hawaii Data Book, 1987). Exposed to the prevailing northeast tradewinds off the ocean, the windward coast of Oahu experiences very little variation in temperature between day and night. Rainfall in the area originates when tradewinds are intercepted and forced upward by the peaks of the Ko'olau range, dropping their moisture as they rise and cool. The proposed well site is in an area which receives a mean annual rainfall of about 50" (Atlas of Hawaii, 1973).

3.1.5 Soil

Soils in the vicinity of the proposed well site are classified by the U.S. Department of Agriculture Soil Conservation Service (SCS) as belonging to the Lualualei-Ewa association (SCS

1972). These are deep, nearly level to moderately sloping, well-drained soils that have a fine-textured subsoil. More specifically, the soils at the proposed site are classified as Hanalei silty clay.

The Hanalei soils developed in alluvium derived from basic igneous rock. The SCS describes a representative profile as follows:

> "...the surface layer, about 10 inches thick, is dark-gray and very dark gray silty clay that has dark-brown and reddish mottles. The subsurface layer is very dark gray and dark-gray silty clay about 3 inches thick. The subsoil, about 13 inches thick, is mottled, dark-gray and dark grayish-brown silty clay loam that has angular blocky structure. The substratum is stratified alluvium. The soil is strongly acid to very strongly acid in the surface layer and neutral in the subsoil."

Erosion hazard for the Hanalei soils is classified as "no more than slight". Given the relatively gentle slope and vegetative cover at the well site, the erosion potential at the site is negligible. The soil capability classification is rated IIw. Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices. Subclass IIw soils have moderate limitations because of excess water. These soils are poorly drained, and are subject to seasonal flooding. This problem has been overcome at the site of the proposed well by the installation of the adjacent drainage ditch to provide soil drainage and prevent seasonal flooding.

The proposed well site is on land which not in agricultural use and is not suited to agricultural use because of its development as public park. The U.S. Department of Agriculture Soil Conservation Service and the Hawaii Department of Agriculture do not consider the site or the Hanalei soils to be agriculturally important (Dept. of Agriculture, 1977).

3.1.6 Natural Hazards

According to the National Flood Insurance Program Flood Insurance Rate Map, the proposed well site is in zone X, an area in which flood hazards are undetermined (FEMA, 1987). This generally indicates that the risk of flooding within the area is not significant enough to warrant

detailed study by FEMA. Lands at the southeastern edge of Manoa Field, adjacent to Manoa Stream, are located in an AE flood zone and are subject to seasonal flooding. Although these lands are proximate to the proposed well site, given the site elevation and relationship to the drainage ditch and the stream, the risk of flooding of the site is slight.

Earthquake risk in the vicinity is also minimal. The island of Oahu is classified as a Seismic Zone 1 area, in which damage would be minor in the event of an earthquake (Uniform Building Code, 1988).

3.1.7 Flora and Fauna

The site is presently vegetated with grasses which are frequently mowed and maintained for park use. The site does not provide any significant habitat for indigenous or endemic plants or animals. None of the species found on this site are listed or proposed for listing on the federal list of threatened or endangered species (USFWS, 1990) and none are considered threatened, endangered or rare species at the state level (State of Hawaii, 1990).

3.1.8 Archaeology

Extensive alteration and grading of the Manoa Field to provide recreational facilities have resulted in removal of surface features and those strata within which any archaeological features might have occurred. As a result, the site does not contain archaeological resources which could potentially be disturbed by the proposed well testing program.

3.2 Socio-economic Environment

The Manoa Valley is the site of intensive residential development and the site of such cultural centers as the University of Hawaii, the Manoa Japanese Language School, and the Mid Pacific Institute. Manoa Field provides an important area of open space and a number of recreational opportunities in this densely developed area. It is an important focal point for the Manoa

Valley neighborhoods because of its location at a point which is nearly in the geographic center of the valley. It is also important because of its proximity to the Manoa School.

As a major population center on the island, and a part of the Honolulu water district, Manoa is also a major focus of the demand for water supplies. The population on the island of Oahu has been steadily increasing. The Honolulu district is one of the principal locations within which growth is forecasted to occur. City, County and State population projections indicate that the Honolulu district population will reach 464,389 by the year 2000, with a predicted daily water usage of 92.40 million gallons (BWS 1982). It is the Board of Water Supply's goal to integrate our sources to provide system flexibility and reliable, high quality water service to all customers. Because of the lack of sufficient water sources within the Honolulu District, this proposed source would be used to primarily meet the needs of this district.

CHAPTER 4
POTENTIAL IMPACTS AND MITIGATION MEASURES

4.1 TEMPORARY IMPACTS

The development of a test well at the Manoa IV site will result in short-term impacts on the environment in the immediate vicinity of the project area. No significant adverse impacts are expected during the drilling and pump testing. Short-term impacts during construction of the well and testing will include localized soil disturbance and temporary increases in noise resulting from the operation of drilling equipment.

Localized soil disturbance will result from staging of drilling equipment at the well head and establishment of a work area for installation of the well and pumping equipment. It is anticipated that the affected area will be about 50' x 50' (2500 sq. ft.). Although the potential for soil erosion is negligible in the Hanalei soils, every effort will be made to preserve existing soil cover around the work area and to re-establish grasses in the work area after project completion so as not to interfere with use of the park.

Noise will be produced by the drilling equipment and by the operation of the pumps. This minor increase in noise levels will not result in any significant adverse impacts because of the relatively low level of noise to be generated and because of the relatively short duration of the drilling program. Recreational use of the site should not be affected by noise levels. The active types of recreation for which the park is designed (basketball, tennis, field sports, etc.) are not normally sensitive to equipment noise. Local residential uses are sensitive to equipment noise however and it will be necessary to undertake mitigation for noise impacts on local residents.

The first of these mitigating actions is to operate drilling equipment only during normal working hours so as not to interfere with sleep cycles of local residents or their enjoyment of their properties in the early morning and late evening. The second action is to screen pumping equipment from the residences during the pump testing operations. A temporary noise barrier

of plywood or metal will be placed adjacent to the pump on the side facing the nearest homes during the pump testing. This will minimize the potential for adverse impacts of pump noise on the nearest residences and ensure compliance with applicable noise regulations.

4.2 IMPACTS ON STREAM FLOW AND STREAM ENVIRONMENT

The well testing will require that water be withdrawn from the aquifer penetrated by the well. This water will be discharged to the small tributary stream and conveyed thereby to the Manoa stream, resulting in a temporary increase in flow in the streambed. The increase in flow is expected to be within the range of peak flows normally experienced within the stream system and will not result in any flooding or adverse impacts in downstream areas. Water from the pump test will be routed to the tributary stream via conduit to prevent soil erosion and the introduction of excessive turbidity into the stream flow which might otherwise occur.

Flows in the Manoa stream are fed by runoff and by groundwater spilling over or leaking out of the dike system in the upper elevations of the Ko'olau range. To the extent that the pump tests lower the elevation of the groundwater table, they may reduce the hydraulic head and may affect the groundwater leakage into the stream. In practice, this effect is likely to be so small as to be undetectable. The existing Manoa Well has had only minor impacts on water table elevations and has not resulted in any significant reduction of flows in the Manoa stream. Long term impacts on flows in the Manoa stream are therefore also likely to be negligible. The Board of Water Supply has an agreement with the U.S. Geological Survey to monitor the stream flow in the Manoa Stream should the water level in the exploratory well approximate the stream level.

4.3 IMPACTS ON AGRICULTURAL SOILS

As noted in Chapter 3, the site is not in use for agricultural purposes and is not suitable for agricultural use. The proposed test will not result in any impacts on agricultural land.

4.4 IMPACT ON ARCHAEOLOGICAL RESOURCES

As noted in Chapter 3, there are no archaeological resources within the immediate vicinity of the site. The project will therefore not result in any adverse impacts to archaeological resources.

4.5 IMPACTS ON USE OF MANOA PARK

The proposed project will require temporary utilization of a small area of Manoa Park by drilling and pumping equipment. The well site was selected in consultation with the Parks Department to minimize the potential for interference with park use. The impact on park use will not be significant because of the relatively small area of land needed for the proposed project (approximately 50' x 50') and because of the careful selection of the site to avoid interference with any of the areas designed for active recreational use.

CHAPTER 5
ALTERNATIVES

5.1 NO ACTION

The no action alternative would not meet the objectives of the Board of Water Supply for this project. This project is part of an overall groundwater development program intended to increase the municipal water supply to meet growing demand. If the Board did not seek new water sources it would not be able to provide adequately for the water needs of the population of the island in the future.

5.2 ALTERNATIVE SOURCES

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

5.3 DELAYED PROJECT

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

5.4 ALTERNATIVE WELL SITES

In addition to evaluating alternative water sources, the Board of Water Supply has plans to test a number of other potential sites for development of groundwater resources. These alternative sites also offer opportunities as groundwater supply sources, but are to be considered in addition to, rather than as alternatives to, the proposed well testing program. The Manoa IV test location has been selected by geologic and hydrologic experts at the Board of Water Supply because it offers the potential to supply a relatively large quantity of high quality water which may not be obtainable at alternative sites. Developing and testing a well at the Manoa IV site is the most reasonable alternative given the potential yield of the site and the insignificant impacts associated with its development.

CHAPTER 6
DETERMINATION

In accordance with Chapter 343, Hawaii Revised Statutes, it has been determined that an Environmental Impact Statement is not required for the proposed Manoa III exploratory well and pump testing program. This determination has been made based primarily on the short duration of the project and its minimal impacts on the environment. The project will result in some negative impacts, but these can be minimized or alleviated by the suggested mitigation measures. The identified impacts have been determined to be insignificant in comparison to the potential benefits to be provided by the water supplies which may be obtainable from the Manoa IV well.

APPENDIX

References	**i**
Archaeological Report	**ii**
Botanist's Report	**iii**
Agencies' Reviews & Responses	**iv**

REFERENCES

Board of Water Supply, 1982 - Board of Water Supply, City and County of Honolulu, State of Hawaii, *Oahu Water Plan*, fourth edition, July, 1982

Department of Agriculture, 1977 - Hawaii Department of Agriculture, *Agricultural Lands of Importance to the State of Hawaii*, Map Series: January, 1977.

FEMA, 1987 - Federal Emergency Management Agency, National Flood Insurance Program. *Flood Insurance Rate Map, City and County of Honolulu*: September 4, 1987.

SCS, 1972 - U.S. Department of Agriculture, Soil Conservation Service in cooperation with The University of Hawaii Agricultural Experiment Station, *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii*, August 1972.

St. John, 1973 - St. John, H. *List of the Flowering Plants of Hawaii.* Pacific Tropical Botanical Gardens. Memoir 1. Lawai, Kauai; 1973

State of Hawaii, 1987 - Hawaii, State of, Department of Business and Economic Development, *The State of Hawaii Data Book, 1987; A Statistical Abstract*, Hawaii, November 1987.

State of Hawaii, 1990 - Hawaii, State of, Department of Land and Natural Resources. *Endangered and Threatened Species.*, 1990.

University of Hawaii, 1983 - University of Hawaii, Department of Geography, *Atlas of Hawaii, Second Edition.* Honolulu: University of Hawaii Press, 1983

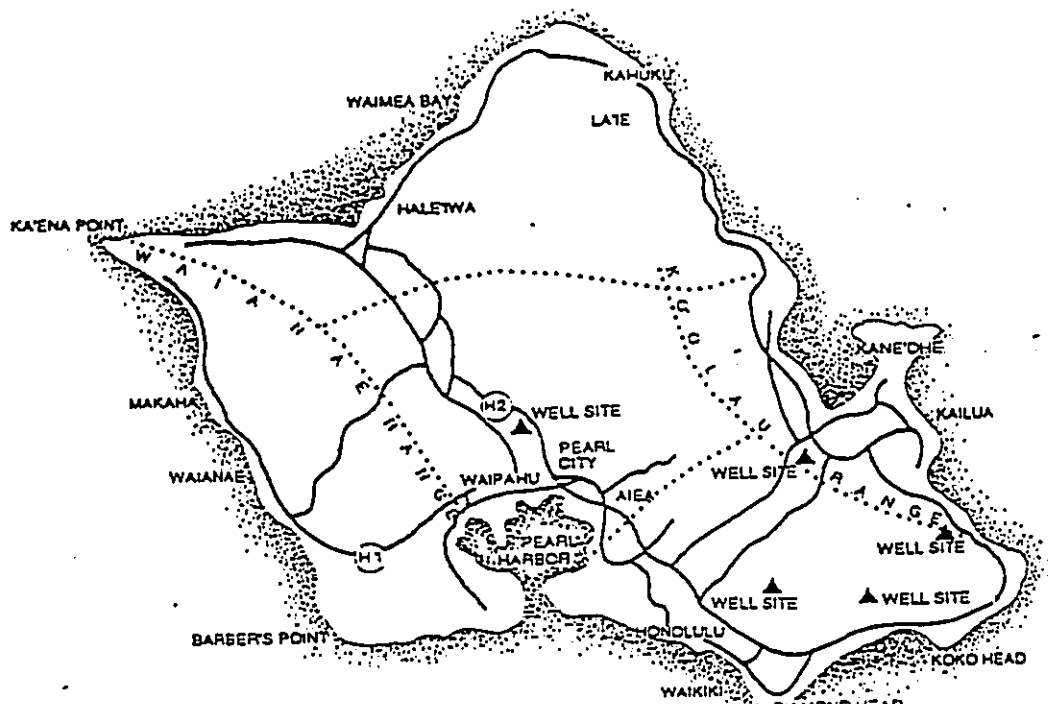
Uniform Building Code, 1988 - International Conference of Building Officials, *Uniform Building Code*, Whittier, California; 1988.

USF&WS, 1990 - U.S. Fish and Wildlife Service., *Endangered and Threatened Wildlife and Plants.*, 50 CFR 17.11 & 17.12. U.S. Government Printing Office., Washington, D.C. 1990.

Wagner et. al., 1990 - Wagner, W.L., Herbst, D.R., and Sohmer, S., *Manual of the Flowering Plants of Hawaii.*, Vols. 1 & 2. University of Hawaii Press, 1990.

ARCHAEOLOGICAL REPORT

AN ARCHAEOLOGICAL RECONNAISSANCE OF FIVE BOARD OF WATER SUPPLY WELLS ON O'AHU, HAWAI'I



Prepared by

Boyd Dixon, Ph.D.
Supervising Archaeologist

Prepared for

Maguire Group, Inc.
Architects/Engineers/Planners
1600 Kapi'olani Blvd.
Honolulu, HI 96814

October 27, 1992

Revised
October 15, 1993

Public Archaeology Section
Applied Research Group
Bishop Museum
Honolulu, Hawai'i

Project #503
MS #102792

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ABSTRACT

During October 1992, the Applied Research Group of the Bishop Museum conducted an Archaeological Reconnaissance as part of an Environmental Impact Assessment for five (5) exploratory water wells proposed by the Board of Water Supply for the City and County of Honolulu, under contract to the Maguire Group, Inc. Four of these locations-- Waipahu, Kāne'ohe, Waimānalo, and Mānoa failed to yield any cultural remains on the surface. The fifth location, in Kūpaua Valley, contained the remains of a culturally-modified bedrock terrace and one polished stone adze, on the surface, near the proposed well site on the east bank. Survey of the access road along the west bank also encountered possibly-modified bedrock terracing above the stream bed.

ACKNOWLEDGMENTS

The author would like to thank Mr. Ken Rappolt of the Maguire Group for the cooperation and patience he has shown in dealing with the sometimes alien profession of archaeology. In particular, his willingness to accompany Bishop Museum staff on a preliminary tour of the five water well locations greatly facilitated our work in the field from a logistical standpoint.

Within the Applied Research Group at the Bishop Museum, fieldwork was shared equally by Steve Clark, Maurice Major, and Angela Steiner-Horton, who also assisted with the cataloging of documents, photos, and artifacts. Hemantha Jayatilleke prepared the illustrations for this report, while Lana Pigao, Jinni Mitchell, and Chris Alper produced the final draft report. Peggy Chee and Marie Paresa coordinated our field needs, while Alan Haines was a rock of support in much more than just contracts.

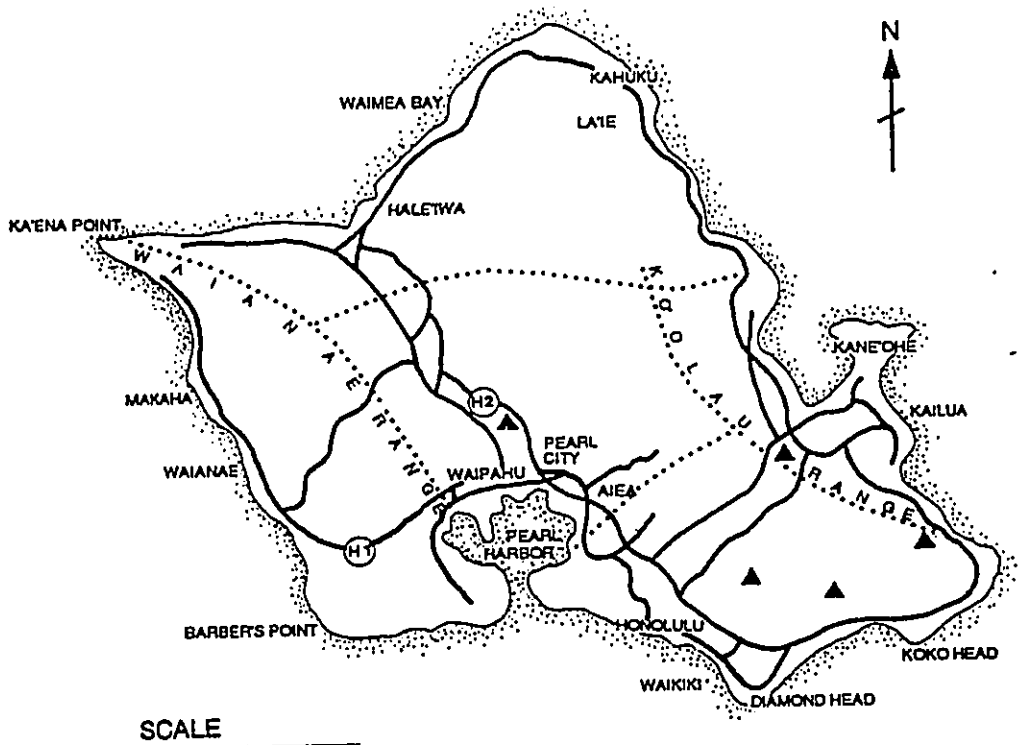

Figure 1. Location of the Five Water Wells on the Island of O'ahu.

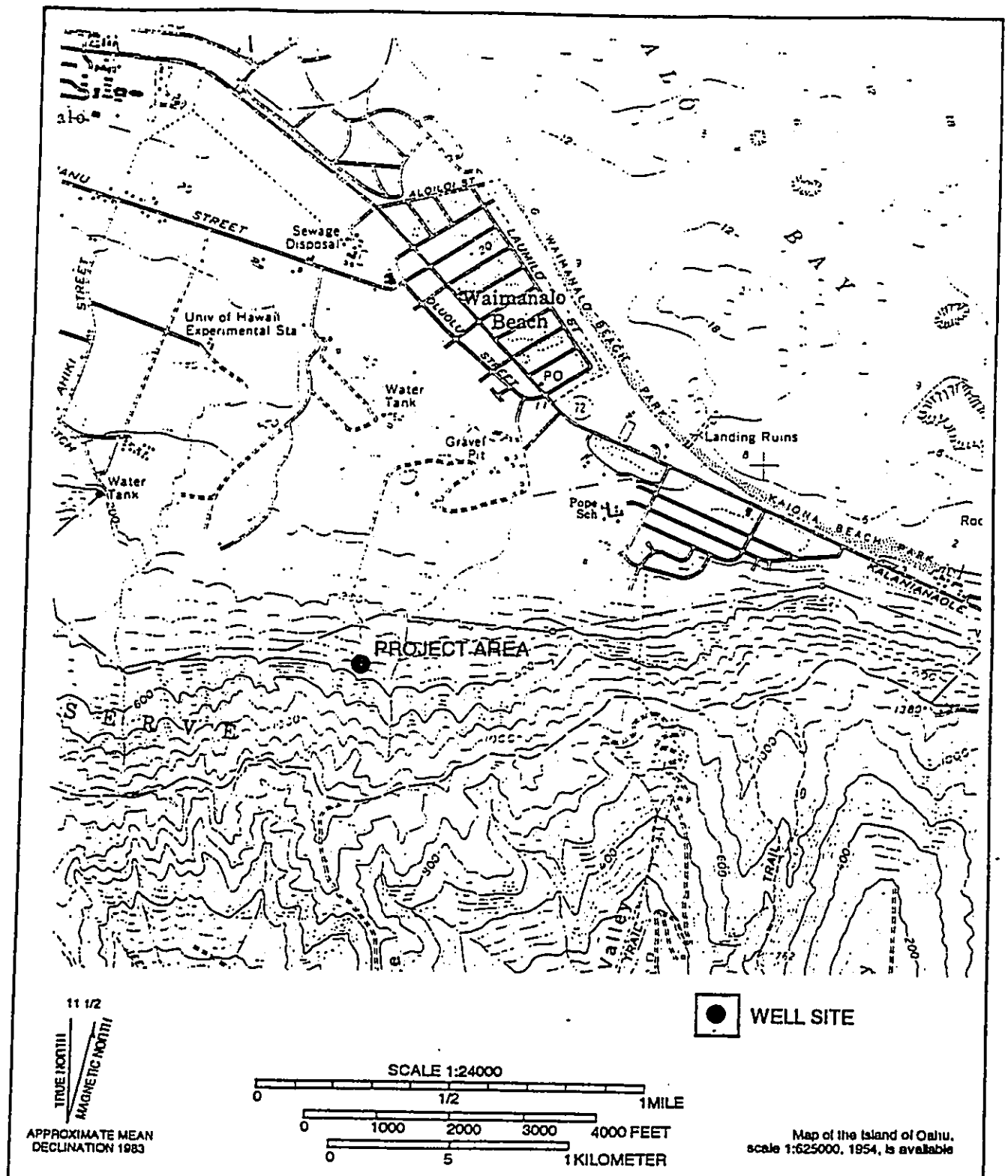

Figure 2. Location of the Waimānalo Well III.

Waipahu Well III

This well is located at approximately 280 famsl on Castle and Cooke, Ltd. land (TMK 9-4-5:74) in the *ahupua'a* of Waipio, 'Ewa District (Figure 3). Access to the well site, located in a fallow pineapple field, is provided by Kamehameha Highway, which runs immediately adjacent (east) to the project area.

Kuou Well III

This well is located at approximately 280 famsl within Ho'omaluhia Park (TMK 4-5-41) in the *ahupua'a* of Kāne'ohe, Ko'olau Poko District (Figure 4). Access to the well site is provided by a trail from the main park road, which is situated just *makai* of the H-3 Highway right-of-way and fenceline. The area is currently planted with banana trees that appears to have been there for some time.

Mānoa Well

This well is located at approximately 200 famsl within Mānoa Valley Park on City and County of Honolulu land (TMK 2-9-36) in the *ahupua'a* of Mānoa, Kona District (Figure 5). Access off Mānoa Road is provided on the lawn between the tennis courts *mauka* of Mānoa School and a small gulley bordering residential housing. The proposed location of the well is currently covered in low grasses.

Kūpaua Wells

These two alternate wells are located at approximately 300 famsl on land owned by Hawaiian Trust Co. Ltd. and the Hawaiian Humane Society (TMK 3-7-04:01) in the *ahupua'a* of Niu, Kona District (Figure 6). Access today is by a trail along the east bank of Kūpaua Stream although the route of a proposed access road up the opposite stream bank was surveyed in October. Two exploratory well locations were also surveyed, one on both sides of the stream. The entire project area is wooded with secondary regrowth of *koa haole, kiawe*, and various tall grasses although banyan, mango, and *wiliwili* trees were also observed.

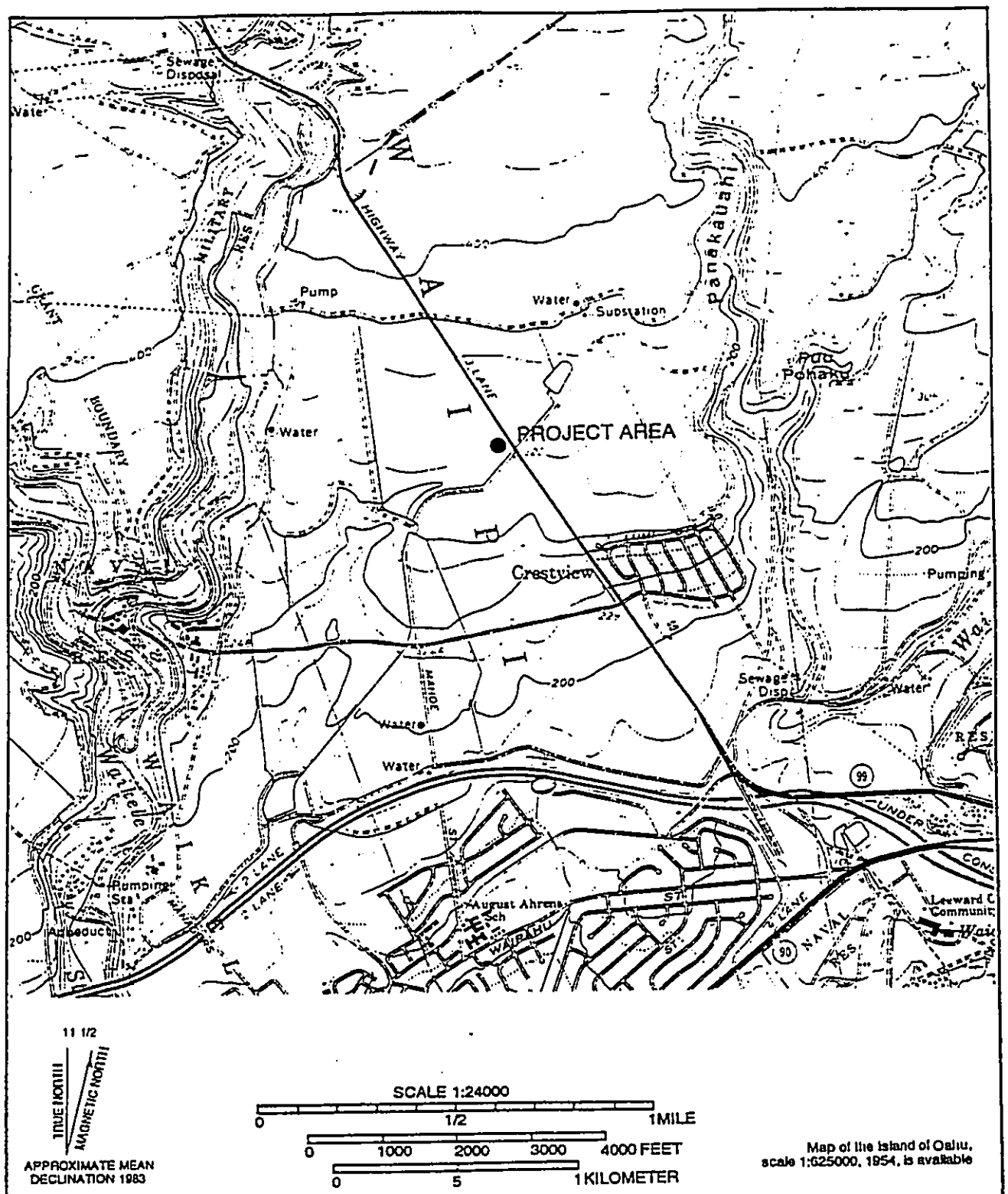

Figure 3. Location of the Waipahu Well III.

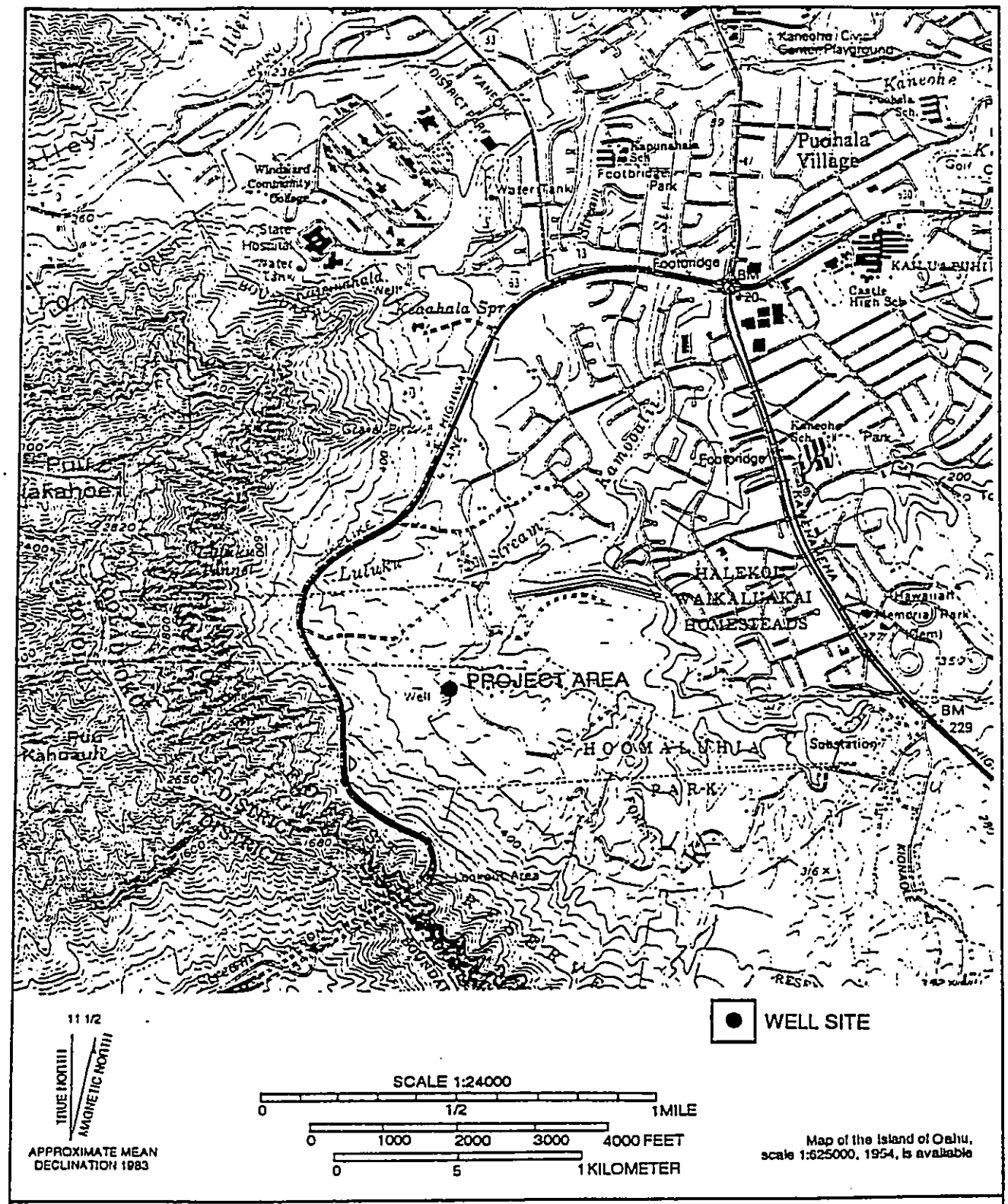

Figure 4. Location of the Kuou Well III.

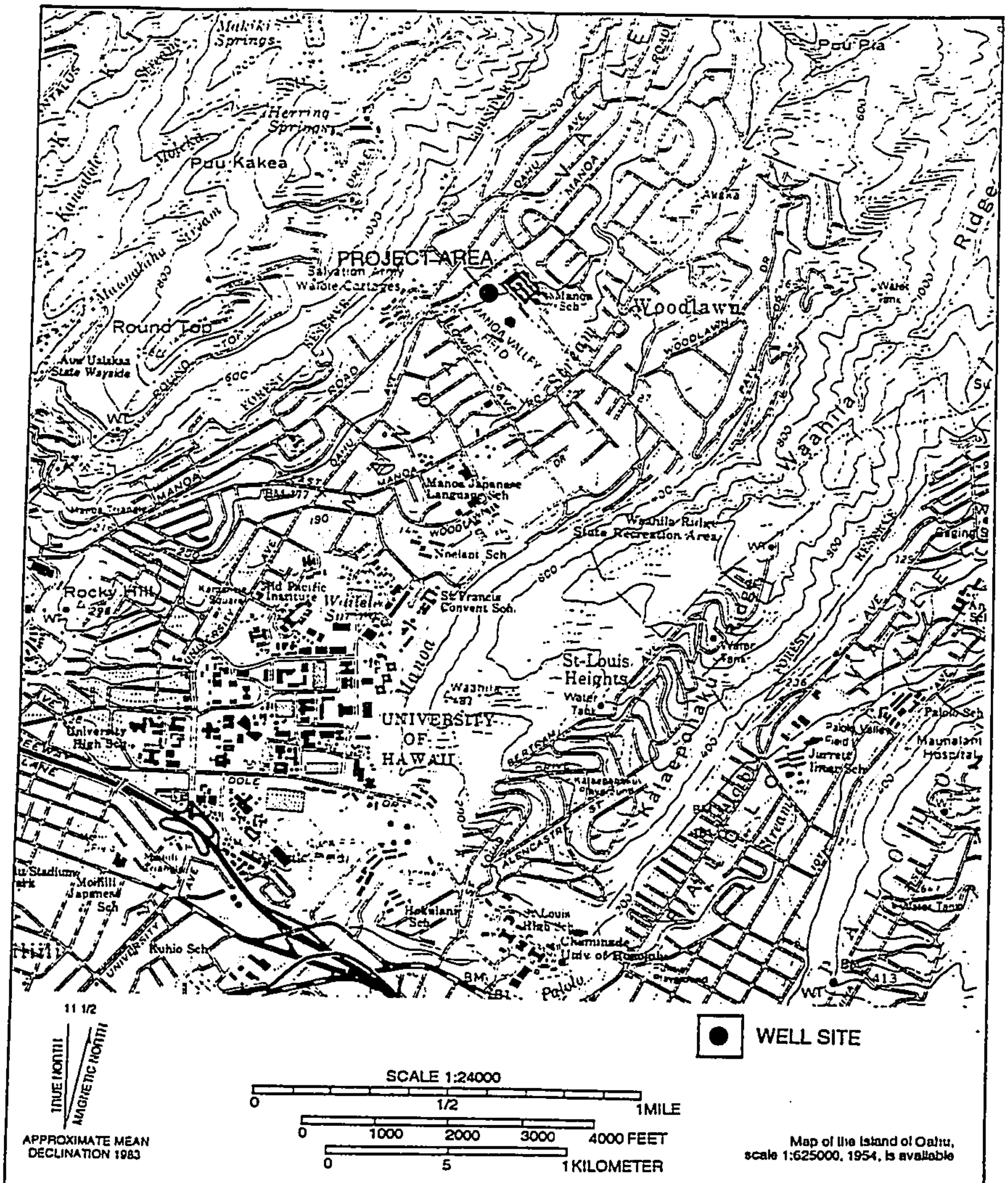

Figure 5. Location of the Mānoa Well.

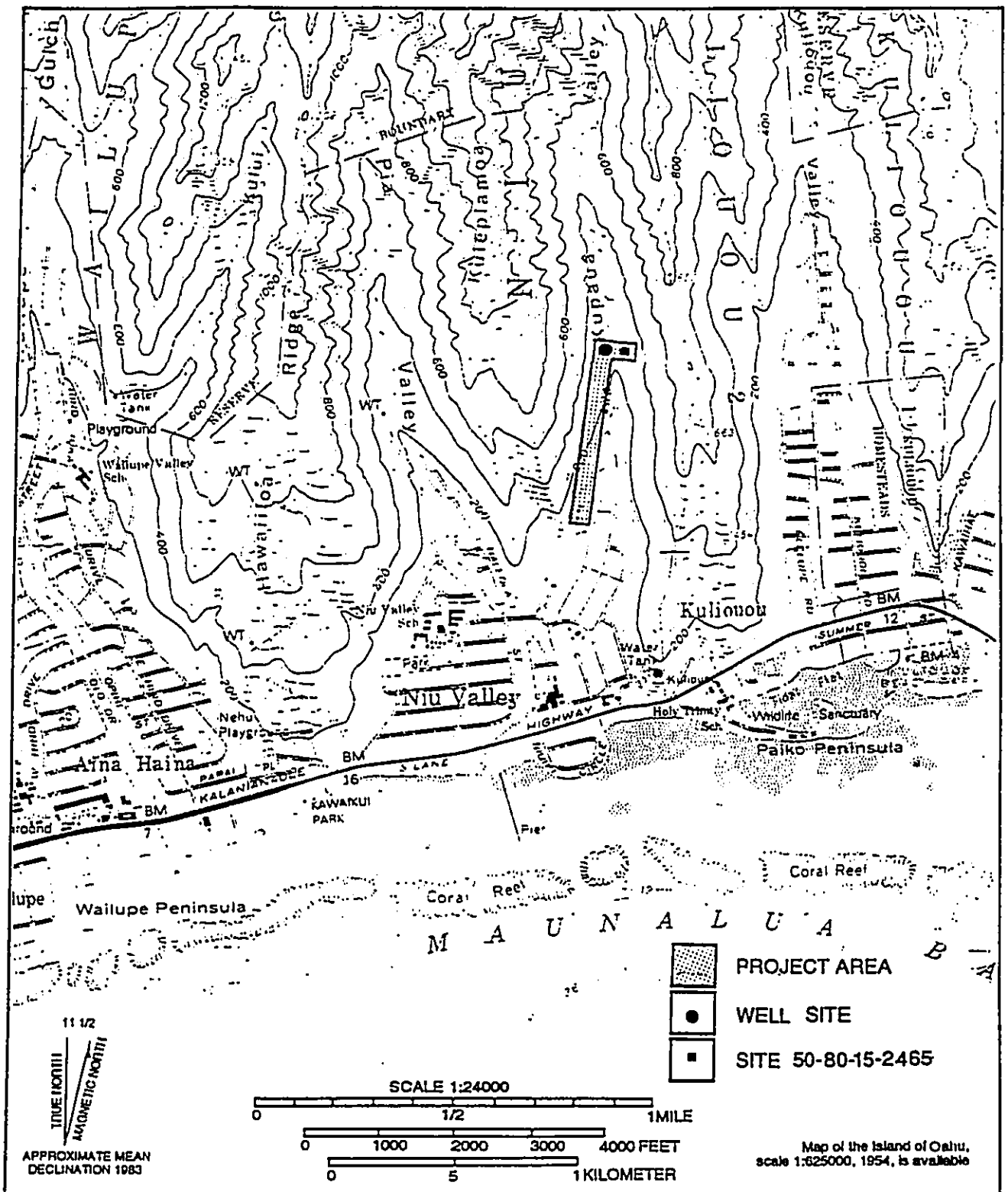

Figure 6. Location of the Kūpaua Wells and Access Road Survey.

PREVIOUS ARCHAEOLOGY

A thorough review of the previous archaeology for each *ahupua'a* containing a proposed exploratory water well location is not required for an Environmental Assessment reconnaissance prior to an Inventory level-survey (SHPD 1989). Nevertheless, a cursory search of traditional sources in the archaeological literature on the island of O'ahu (McAllister 1933; Sterling and Summers 1978; James 1992) was conducted in advance of the field survey of all five proposed well locations. In no instance was a known archaeological site located within the immediate vicinity of these project areas, although none of these areas has ever been subject to a systematic archaeological survey, according to a search of Bishop Museum Anthropology Department files. Future research in any of the five well sites should include a review of State Historic Preservation Division files as well.

Archaeological remains expected for the five areas varied with the setting, influenced as much by environmental factors as by proximity to larger coastal population centers in pre- and early post-Contact periods. On the slopes behind Waimānalo, terracing of the windward soils might be expected, as was the case *mauka* of the Kuou Well III site along Luluku Stream in Kāne'ohe (Allen 1987). In Waipahu, just above the 'Ewa Plain, leeward agricultural utilization of the slopes might have produced minimal modification of the landscape similar to that encountered *makai* of the project area (Davis 1988). But a recent survey just *mauka* of the well location revealed severe disturbances due to Historical Period agriculture (Goodman and Nees 1991). The upper valley of Mānoa was famed for its taro ponds and Historical Period royal residences (Sterling and Summers 1978:281-290; McAllister 1933:78-80) while the lower Niu Valley supported a more leeward agricultural regime (Handy 1940:155) with a *heiau* (temple) situated at the foot of the middle ridge between both streams (McMahon 1988:3).

FIELD METHODS

Methods employed during the archaeological reconnaissance varied with the degree of impact already found at each proposed water well location, but were restricted to pedestrian survey with no subsurface testing. At the Waipahu III and Mānoa well sites, only a cursory examination by the author was required, due to the extreme destruction of the previous landscape by agricultural and residential activities respectively. At the Kuou, Waimānalo, and Kūpaua well sites and access roads, a field crew of four ARG archaeologists conducted a pedestrian survey at 10-m-wide intervals across the entire length of the project areas. Bedrock outcrops were inspected for cultural modification and eroded gulleys, and surfaces were inspected to look for cultural materials.

RECONNAISSANCE RESULTS

Archaeological reconnaissance of the five exploratory water well locations on the island of O'ahu revealed four of these to have been impacted sufficiently in the Historic to recent past to effectively erase any traces of Native Hawaiian utilization of the landscape on the surface. Inspection of the exposed surfaces, moreover, failed to yield any evidence of subsurface features or activity areas. It therefore seems likely that these four well locations (Waimānalo III, Waipahu III, Kuou III, and Mānoa) were never subject to any intensive habitation or agricultural use that would have produced obvious archaeological residues, probably due to the somewhat peripheral setting of these locations in relation to water resources and traditional or historic population centers.

This assessment does not negate the possibility of subsurface remains (i.e. firepits, *imu*, or human burials) being present at all these locales, however. Downslope erosion in the case of Waimānalo and Kūpaua, agricultural soil modification at the Waipahu and Kuo locations, and urban landscaping in Mānoa may well have buried pre-Contact period deposits once visible.

KŪPAUA WELL ACCESS ROAD

Surface reconnaissance of the proposed access road alignment to the well site on the west bank of the Kūpaua Stream was conducted with four ARG archaeologists traversing dense underbrush over extremely rough exposed bedrock in many places. While these field methods were found adequate to cover the first four well locations, it was felt that a more intensive form of surface survey with clearing of vegetation and subsurface testing would be necessary along this access road to ascertain the true nature of several possibly modified bedrock outcrops encountered during the pedestrian reconnaissance.

Especially in the lower reaches of the project area just above the spillway (Figure 7), large boulder alignments paralleling the stream bed were found to contain many smaller cobbles creating a somewhat clear area immediately behind these probably natural terraces. The actual location of the proposed exploratory well on the west bank of the stream, however, appears to be free of this type of modification.

Given the setting of these potential features immediately above a permanent stream bed less than 1 km *mauka* of a substantial Native Hawaiian fishpond and *heiau* (McAllister 1933:70), the likelihood that the landscape was utilized in the past is quite high. The identification of more convincing cultural remains on the other side of the stream during this surface reconnaissance demonstrates the validity of this hypothesis.

STATE SITE 50-80-15-2465

This site consists of at least one modified cobble terrace wall located on the east bank of the Kūpaua Stream approximately 5 m *makai* of an alternate well location proposed to avoid crossing the stream drainage (Figure 7). The terrace itself is roughly 10 m long, and only stands some 30 cm tall, being a modification of a natural alignment of bedrock, probably to impede soil loss from downslope erosion.

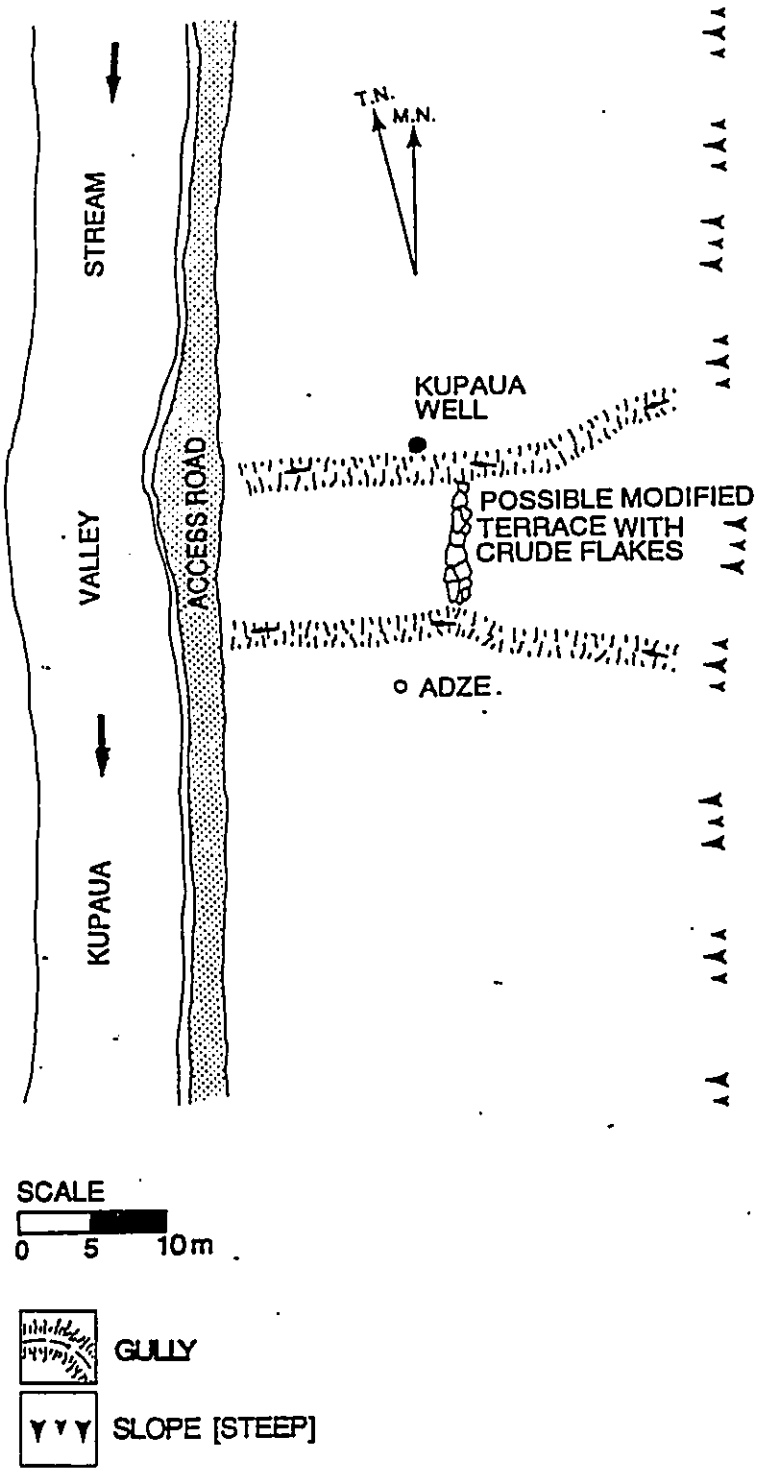

Figure 7. Sketch Map of State Site 50-80-15-2465.

Several large primary flakes of reasonable quality basalt are also located within and around the feature, although a cursory inspection of the surface (admittedly overgrown and covered with sheetwashed soil) failed to yield any smaller flakes to indicate traditional tool manufacture. This possibility was strengthened, however, by the recovery of a small polished stone adze (Figure 8) on the surface approximately 5 m *makai* of the terrace wall (Figure 7).

The issue of whether this artifact represents local use of a raw material resource would have to be resolved by basalt sourcing analysis, although the nature of the Kūpaua Valley lithic material has yet to be established (Kevin Johnson, personal communication 1992). Regardless of these analyses, however, the presence of a small polished adze, more commonly associated with wood-working, rather than forest clearing, is interesting, given its association with probable agricultural terracing. It appears likely therefore, that evidence of domestic habitation may be present in the vicinity, but more likely further up the slopes above seasonal flash floods for which the Niu Valley is known today.

CONCLUSIONS

Archaeological reconnaissance of five proposed exploratory water well locations on the island of O'ahu found four of these to contain no evidence of previous cultural remains or activities. The Waipahu III well site has been completely impacted by pineapple road construction and mechanized agriculture, as is the case for the Kuou III well site which is under banana production. The Mānoa well site, in turn, has been completely modified by landscaping associated with the construction of tennis courts adjacent to the Mānoa Elementary School. The Waimānalo III well site, on the other hand, has not been impacted by urban or commercial agricultural development, but does appear to have deforested and partially graded, both by historic ranching and more recent powerline construction.

The fifth location in the Kūpaua Valley, however, did contain artifactual and architectural evidence to suggest Native Hawaiian utilization of the area in the pre-

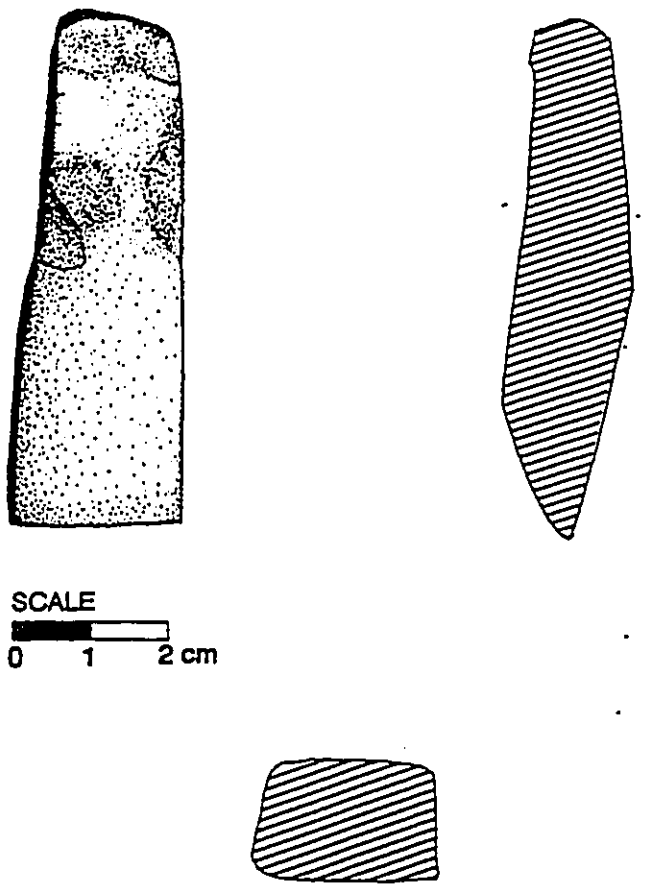

Figure 8. Stone Adze Recovered from State Site 50-80-15-2465.

or early post-Contact era. Recommended efforts to assess the nature of this occupation in Kūpaua Valley and the potential for subsurface deposits at the other four locations, are outlined below.

RECOMMENDATIONS

Given the absence of cultural remains in four of the proposed water well locations and access roads, it is recommended that an archaeological monitor be present during construction at the Waimānalo Well III, Waipahu Well III, Kuou Well III, and the Mānoa Well, if surface disturbances are minimal. This assessment can also be recommended for the well site located on the west bank of the Kūpaua Stream, if access is provided from the east bank.

The presence of positively identified cultural remains at the location of the proposed Kūpaua Well on the east bank of the stream, however, make archaeological Site 50-80-15-2465 potentially eligible to the National Register of Historic Places under Criterion D, due to its potential contribution to knowledge of past history and lifeways. The same assessment may also be the case for possible agricultural terracing located along the access road to the Kūpaua well location on the west bank of the stream. It is therefore recommended that two courses of action be undertaken to avoid negative impact to these cultural resources:

1 Access the west bank exploratory well location from across the stream bed, via the existing jeep trail.

2 Perform an Archaeological Inventory level survey of the west bank access road corridor before the route is more firmly established, to ascertain the true nature of the possible cultural remains located during the reconnaissance survey.

REFERENCES CITED

Allen, Jane
1987 *Five Upland 'Ili.* Departmental Report Series, Report 87-1, Department of Anthropology, Bishop Museum, Honolulu.

Davis, Bertell
1988 Archaeological Subsurface Survey of the Proposed Ewa Gentry Project Area, Honouliuli, O'ahu. MS on file, Department of Anthropology, Bishop Museum, Honolulu.

Goodman, Wendy, and Richard Nees
1991 Archaeological Reconnaissance and Inventory Surveys of 3,600 Acres in Waiawa Ahupua'a, 'Ewa, O'ahu. MS on file, Department of Anthropology, Bishop Museum, Honolulu.

Handy, E. Craighill
1940 *The Hawaiian Planter.* Honolulu: Bishop Museum Press.

James, Van
1992 *Ancient Sites of O'ahu.* Honolulu: Bishop Museum Press.

McAllister, J. Gilbert
1933 *The Archaeology of Oahu.* Honolulu: Bishop Museum Press.

McMahon, Nancy
1988 Archaeological Reconnaissance Survey of a Five-Acre Parcel in Niu Valley, O'ahu Island, Hawai'i, TMK 3-07-04:19 and Por. 1 and 12. MS on file, Anthropology Department, Bishop Museum, Honolulu.

State Historic Preservation Division
1989 Rules Governing Minimal Standards for Archaeological Inventory Surveys & Reports. Draft Guidelines - Title 13, Subtitle 6, Chapter 147. Honolulu: Department of Land and Natural Resources.

Sterling, Elspeth, and Catherine Summers
1978 *Sites of Oahu.* Honolulu: Bishop Museum Press.

BOTANIST'S REPORT

by

Dr. Loyal A. Mehrhoff
Department of Botany
Bishop Museum

Detailed Observations of Vegetation

Summary. Construction of water wells and attendant road systems does not appear to impact on any endangered or rare plant populations. The Hawaii Heritage Program's data base on the location of rare or endangered plants was searched in order to determine historical distributions of rare species. Only the Kupaua and Waimanalo Well Sites were located near know locations of rare plants. Field surveys of all sites were conducted to determine the present status of vegetation at the sites. None of the five proposed well sites have intact or high quality native ecosystems. In fact, the vegetation at four of the sites is composed entirely of alien plants. Only the Kupaua Well site has any native vegetation and this is composed entirely of scattered individual plants. Of the five native species found at this site, only two are endemic and neither of these are considered rare or endangered.

1. **Proposed Manoa Well [TMK 2-9-36]** is located entirely on a grassy lawn in a residential area of Manoa Valley. THERE ARE NO NATIVE PLANT COMMUNITIES WHICH COULD BE NEGATIVELY IMPACTED BY WELL CONSTRUCTION.

2. **Proposed Waimanalo Well III [TMK 4-1-11]** is located in a forest of alien weed trees. The dominant species are *Eucalyptus* sp., *Leucaena leucephala*, and *Rivina humilis*. Two species or rare plants are known from the vicinity or this well site; *Nesoluma polynesicum* and *Vigna o-wahuensis*. Neither species was observed in the area. THERE ARE NO NATIVE PLANT COMMUNITIES WHICH COULD BE NEGATIVELY IMPACTED BY WELL CONSTRUCTION.

3. **Proposed Waipahu Well III** is located in an existing agricultural field. No native plants were observed and there are no rare plants known from the area. THERE ARE NO NATIVE PLANT COMMUNITIES WHICH COULD BE NEGATIVELY IMPACTED BY WELL CONSTRUCTION.

4. **Proposed Kuou Well III [TMK 4-5-41]** is located in an existing banana plantation. No native plants were observed and there are no rare plants known from the area. THERE ARE NO NATIVE PLANT COMMUNITIES WHICH COULD BE NEGATIVELY IMPACTED BY WELL CONSTRUCTION.

5. **Proposed Kupaua Well [TMK 3-7-04:01]** is located in Niu Valley above existing residential areas. Niu Valley is one of the most famous collecting localities on Oahu. Many of the early Hawaiian botanists visited this valley so there is a good record of the vegetation present in the 1800's. The Hawaii Heritage Program data base has records from Niu Valley for 14 rare plants; *Bonamia menziesii, Cyanea grimesiana* ssp. *grimesiana, Eurya sandwicensis, Ctenitis squamigera, Tetraplasandra gymnocarpa, Delissea subcordata, Exocarpos gaudichaudii, Chamaesyce celastroides* var. *kaenana, Joinvillea ascendens* ssp. *ascendens, Lobelia monostachya, Phyllostegia parviflora* var. *parviflora, Rollandia lanceolata* ssp. *calycina, Melicope saint-johnii,* and *Schiedea nuttallii*. However, the current vegetation has only a few native plants, with the site dominated by alien weeds such as; *Leucaena leucephala, Schinus terebinthifolius, Asystasia gangetica,* and *Panicum maximum*. Four native species were observed; *Dodonaea viscosa* (a few scattered plants), *Sida fallax* (a small area with 20 to 30 plants), *Lipochaeta lobata* ssp. *lobata* (25 to 50 plants at the base of the cliffs), and *Erythrina sandwicensis* (several plants along the existing road on the east side of the creek). None of these species is considered rare or endangered and only the *Erythrina sandwicensis* should have special consideration (destruction of individual trees should be avoided). IT DOES NOT APPEAR THAT WELL CONSTRUCTION WOULD NEGATIVELY IMPACTED ON EITHER RARE PLANTS OR NATIVE PLANT COMMUNITIES.

AGENCIES' REVIEWS & RESPONSES

Agencies' Reviews and Responses

(Agency) State of Hawaii Dept. of Land & Natural Resources	August 4, 1993
(Agency) State of Hawaii Dept. of Land & Natural Resources	July 19, 1993
(Response) Board of Water Supply Dept. of Land & Natural Resources Mr. Keith W. Ahue, Chairperson	October 6, 1993
(Agency) State of Hawaii Dept. of Health	June 30, 1993
(Response) Board of Water Supply Dept. of Health John C. Lewin, M.D.	September 3, 1993
(Agency) City & County of Honolulu Dept. of Parks & Recreation	June 16, 1993
(Response) Board of Water Supply Dept. of Parks & Recreation Walter M. Ozawa, Director	October 5, 1993
(Agency) City & Count of Honolulu Planning Dept.	June 7, 1993
(Response) Board of Water Supply Planning Dept. Robin Foster, Chief Planning Officer	August 4, 1993
(Agency) State of Hawaii Office of Environmental Quality Control	May 20, 1993
(Response) Board of Water Supply Office of Environmental Quality Control Brian J. J. Choy, Director	October 4, 1993

Agencies' Reviews and Responses (cont'd)

(Agency) City & County of Honolulu Dept. of Public Works	May 21, 1993
(Response) Board of Water Supply Dept. of Public Works C. Michael Street, Director & Chief Engineer	October 4, 1993
Native Hawaiian Advisory Council	July 8, 1993
(Response) Board of Water Supply Native Hawaiian Advisory Council David L. Martin, Water Claims Manager	October 26, 1993

JOHN WAIHEE
GOVERNOR OF HAWAII

KEITH W. AHUE, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

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AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
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CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

REF:OCEA:SKB

AUG 4 1993

File No.: 93-656a
DOC. ID.: 3203

DGP RE
PE

The Honorable Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96813

Dear Mr. Hayashida:

Subject: Draft Environmental Assessment (DEA) for the Proposed Manoa IV Exploratory Well Project, Manoa, Oahu, TMK: 2-9-36: 3

The following are the Commission on Water Resource Management's (CWRM) comments on the subject project which supplement those forwarded in our previous letter dated July 19, 1993.

Commission on Water Resource Management

Though the present project contemplates the drilling of an exploratory well alone, with no intention of subsequently placing the well into production, the location of the well within a water management area requires that the Honolulu Board of Water Supply first apply for a Water Use Permit as well as a Well Construction Permit before proceeding with the project. This step would conform to the State CWRM's established procedures relating to the construction of wells within designated water management areas.

We have no other comments to offer at this time. Thank you for the opportunity to comment on this matter.

Please feel free to call Steve Tagawa at our Office of Conservation and Environmental Affairs, at 587-0377, should you have any questions.

Very truly yours,

John P. Keppeler II

KEITH W. AHUE

931969

JOHN WAIHEE
GOVERNOR OF HAWAII

Jul 22 9 28 AM '93

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
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Keith W. Ahue, Chairperson
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES
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HISTORIC PRESERVATION PROGRAM
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

REF:OCEA:KCK

File No.: 93-656
DOC. ID.: 3129

JUL 19 1993

The Honorable Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96813

Dear Mr. Hayashida:

Subject: Draft Environmental Assessment (DEA) for the Proposed Manoa IV Exploratory Well Project, Manoa, Oahu, TMK: 2-9-36: 3

We have reviewed the DEA information for the proposed exploratory well project transmitted by your letter dated May 14, 1993, and have the following comments:

Division of Aquatic Resources

The Division of Aquatic Resources (DAR) comments that according to the DEA, Manoa Stream is fed by runoff, dike leakage, and possibly dike overflow. The well is expected to tap into the water bearing alluvium of the valley. Any reduction in stream flows associated with the well are so small as to be undetectable, given the fact that the existing Manoa Well has had only minor impacts on water table elevations.

Despite severe downstream modifications and serious infestations of alien aquatic species, Manoa Stream has retained significant value as habitat for native fishes and invertebrates in its middle and upper reaches. Even minor reductions in stream flows from current conditions could shift the "balance" to favor the spread of alien species, at the expense of the surviving native species. Therefore, rather than accepting assurances that the well will not affect stream flows, DAR suggest that the Board of Water Supply (BWS) contract with the U.S. Geological Survey to jointly test whether any reduction in stream flows might be detected (as has been planned for the Kuou III exploratory well).

If the stream flows are in fact reduced, the BWS will have to petition the Commission on Water Resource Management (CWRM) to amend the instream flow standard for Manoa Stream. The BWS should also be prepared to conduct a thorough biological reconnaissance survey of the stream beforehand, because existing data on the occurrence, distribution, and abundance of aquatic biota are incomplete. If hydrological experts should suggest that an operational well could effect a long-term reduction in instream flow, extended flow monitoring might be required to assure compliance with the status quo of instream flow established by the CWRM for Manoa Stream.

Historic Preservation Division

Historic Preservation Division (HPD) comments that a review of their records shows that there are no historic sites at the proposed well location. This is a developed area, where surface historic sites are unlikely to be found. Subsurface sites, in particular the remains of prehistoric irrigated agriculture, might be present in the general area. If such sites are present, they are likely to be disturbed at the well location due to activities involved in the channelization of Manoa Stream.

Therefore, HPD believes that this project will have "no effect" on historic sites.

We have no other comments to offer at this time. Thank you for the opportunity to comment on this matter.

Please feel free to call Steve Tagawa at our Office of Conservation and Environmental Affairs, at 587-0377, should you have any questions.

Very truly yours,

KEITH W. AHUE

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

October 6, 1993

Mr. Keith W. Ahue, Chairperson
Department of Land and Natural
Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ahue:

Subject: Your Letters of July 19, 1993 and August 4, 1993 Regarding the Draft Environmental Assessment (EA) for the Proposed Manoa IV Exploratory Well, TMK: 2-9-36: 3

Thank you for reviewing the EA for the proposed exploratory well project in the Manoa District Park. We have the following response to your divisional comments:

Commission on Water Resource Management (CWRM)

1. Applications for Water Use and Well Construction Permits were filed on September 17, 1993 and are enclosed along with a site plan.

2. Should the exploratory well pumpage tests show a sustainable yield worth developing, the well will be converted to a production facility. We will then apply for all required permits and comply with applicable rules and regulations.

Division of Aquatic Resources

We recognize that if there is stream flow reduction, it could have an effect on the aquatic biota of the Manoa Stream. We have an agreement with the U.S. Geological Survey to gage streams that may be affected during test pumping of wells. Should the water level in the exploratory well approximate the level of the stream, we will then proceed with the stream gaging.

If stream flows are reduced, we will consider petitioning the CWRM to amend the interim instream flow standard. We will also be prepared to conduct the biological

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

reconnaissance survey necessary to identify any native species which may be adversely affected.

If water levels are substantially below Manoa Stream, then the stream is perched relative to the aquifers tapped by the well and no gaging or biological reconnaissance survey should be necessary.

Historic Preservation Division

We note that there are no known historic sites at the proposed well location. The park is a developed area that is unlikely to contain historic sites. If any historic remains are encountered, all work will stop and the Historic Preservation Division will be notified.

If you have any questions, please contact Roy Doi at 527-5235.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

cc: Maguire Group, Inc.

931757 PE

JOHN WAIHEE
GOVERNOR OF HAWAII

JOHN C. LEWIN, M.D.
DIRECTOR OF HEALTH

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

In reply, please refer to:

June 30, 1993

93-152/epo

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

Dear Mr. Hayashida:

Subject: Draft Environmental Assessment for the proposed Manoa IV Exploratory Well Project
Manoa, Oahu
TMK: 2-9-36: 03

Thank you for allowing us to review and comment on the subject project. We do not have any comments to offer at this time.

Very truly yours,

JOHN C. LEWIN, M.D.
Director of Health

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

September 3, 1993

John C. Lewin, M.D.
Director
State Department of Health
P. O. Box 3378
Honolulu, Hawaii 96801

Dear Dr. Lewin:

Subject: Your Letter of June 30, 1993 Regarding the Draft Environmental Assessments for our Proposed Kuou III, TMK: 4-5-41:11, and Manoa IV, TMK: 2-9-36: 3, Exploratory Well Projects

Thank you for reviewing and responding to our draft environmental assessments for our proposed exploratory well projects.

We note you have no comments at this time. If the test pump results are favorable to construct permanent well facilities, we will comply with all Department of Health requirements.

If you have any questions, please contact Roy Doi at 527-5235.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

cc: Maguire Group, Inc.

931554

DEPARTMENT OF PARKS AND RECREATION

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALTER M. OZAWA
DIRECTOR

ALVIN K.C. AU
DEPUTY DIRECTOR

June 16, 1993

TO: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

FROM: WALTER M. OZAWA, DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED MANOA IV EXPLORATORY WELL PROJECT, MANOA, OAHU TAX MAP KEY 2-9-36: 03

We have reviewed the draft environmental assessment for the subject project and have the following comments.

We have no objection to locating the proposed Manoa Exploratory Well site at Manoa District Park if the project is located east of the tennis courts at the end of Vista Place and accessed through Vista Place or located within the narrow grass area at the north end of the Kaaipu Avenue parking lot.

Please submit detailed plans of the well site and require the drill contractor to acquire a right-of-entry permit from our Permits Section located in the lobby of the Municipal Building.

Should you have any questions, please contact Lester Lai of our Advance Planning Branch at extension 4696.

For WALTER M. OZAWA, Director

WMO:ei

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

October 5, 1993

TO: WALTER M. OZAWA, DIRECTOR
DEPARTMENT OF PARKS AND RECREATION

FROM: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR MEMORANDUM DATED JUNE 16, 1993 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE MANOA IV EXPLORATORY WELL PROJECT, TMK: 2-9-36: 3

Thank you for your comments on the proposed exploratory well project within the Manoa District Park.

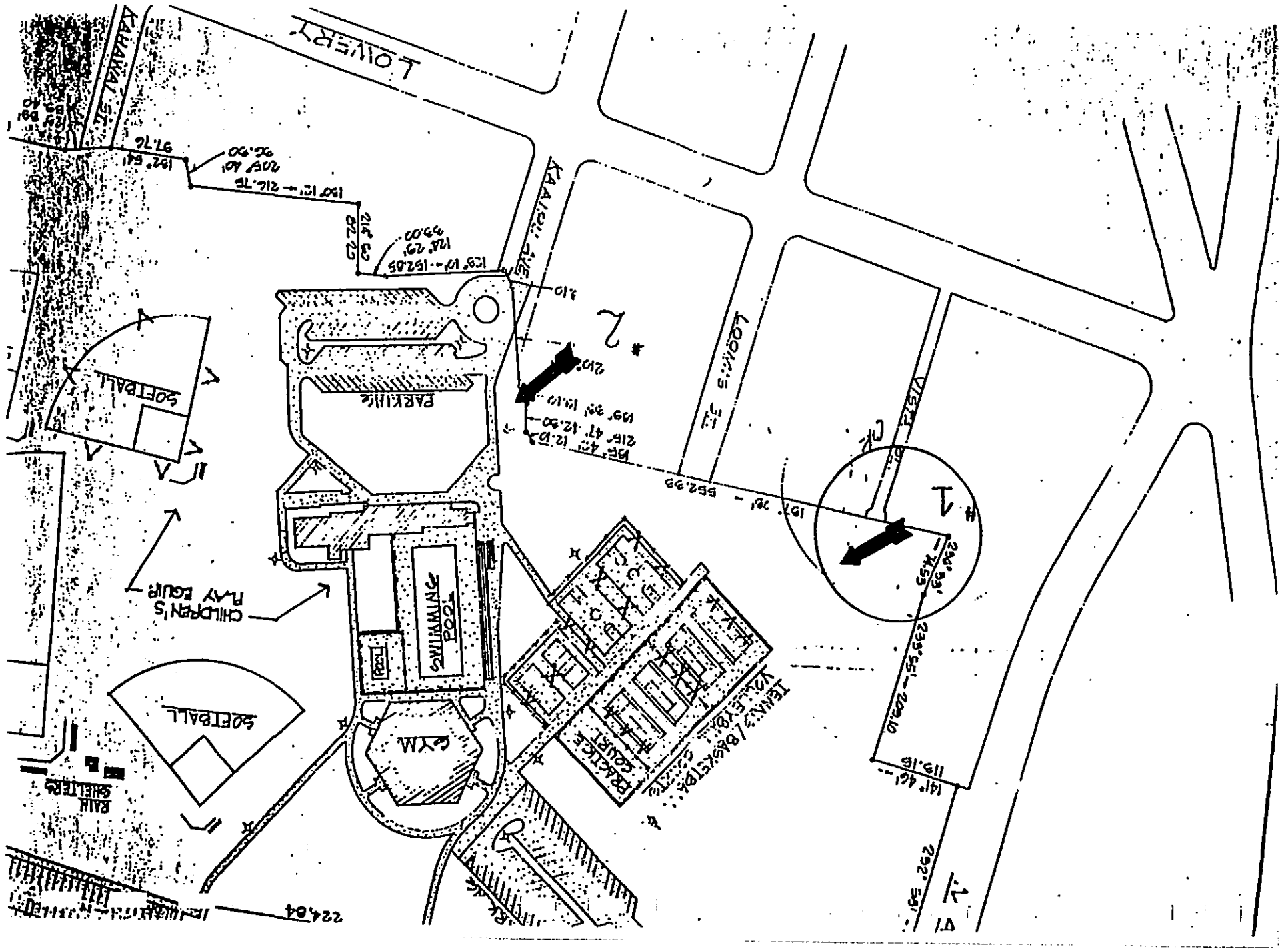
We note you have no objections to locating the well within the park. We have chosen your first alternative site which is located east of the tennis courts at the end of Vista Place and accessed through Vista Place, as shown on the attached site plan. We feel the closer we drill to the valley walls, the thicker the alluvial material will be which increases the probability of tapping a developable water source.

We will submit detailed well site plans for your review and the drilling contractor will acquire the right-of-entry permit from the Permits Section of your department.

If you have any questions, please contact Roy Doi at 527-5235.

Attachment

cc: Maguire Group, Inc.



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PLANNING DEPARTMENT
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

931484

FRANK F. FASI
MAYOR

ROBIN FOSTER
CHIEF PLANNING OFFICER

ROLAND D. LIBBY, JR.
DEPUTY CHIEF PLANNING OFFICER

MM 5/93-1253

June 7, 1993

MEMORANDUM

TO: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

FROM: ROBIN FOSTER, CHIEF PLANNING OFFICER
PLANNING DEPARTMENT

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR THE PROPOSED MANOA IV EXPLORATORY WELL PROJECT, TAX MAP KEY: 2-9-36: 03, MANOA, OAHU

We have reviewed the subject Draft EA for the Manoa IV Exploratory Well and have the following comments to offer:

1. The Project Description on page 3 states that the Development Plan Land Use Map designation for the subject site is P-2. This should be corrected to indicate that the Development Plan designation is Park and that the zoning is P-2 Preservation District.

2. The proposal is conceptually consistent with the Primary Urban Center Development Plan Public Facilities Map which shows a symbol for a Well, site undetermined, beyond six years, within the vicinity of the Park and Manoa Elementary School area.

Thank you for the opportunity to comment. Should you have any questions, please contact Mel Murakami of our staff at 527-6020.

ROBIN FOSTER
Chief Planning Officer

RF:js

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

August 4, 1993

TO: ROBIN FOSTER, CHIEF PLANNING OFFICER
PLANNING DEPARTMENT

FROM: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR MEMORANDUM OF JUNE 7, 1993 ON THE DRAFT ENVIRONMENTAL ASSESSMENT (DEA) FOR THE MANOA IV EXPLORATORY WELL PROJECT, MANOA, OAHU, TMK: 2-9-36: 03

Thank you for reviewing the DEA for our proposed project. We have the following responses to your comments:

p.3

1. We will amend the document to indicate the Development Plan Land Use Map designation is Park and the zoning is P-2 Preservation District.

2. We note that the project is consistent with the Primary Urban Center Development Plan Public Facilities Map which shows a well is planned for the project site.

If you have any questions, please contact Roy Doi at 527-5235.

cc: Maguire Group, Inc.

931344

JOHN WAIHEE
GOVERNOR

BRIAN J. J. CHOY
Director

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
220 SOUTH KING STREET
FOURTH FLOOR
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185

May 20, 1993

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

Attention: Mr. Roy Doi

Dear Mr. Hayashida:

Subject: Draft Environmental Assessment for the Proposed Manoa IV Exploratory Well Project, TMK: 2-9-36:03, Manoa, Oahu

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

Please consult with the agencies listed below:

1. Department of Health, Noise and Radiation Branch and the Department of Education regarding potential noise impacts to the Manoa Elementary School;

2. Department of Health, Clean Water Branch concerning the National Pollutant Discharge Elimination System Permit;

3. Department of Land and Natural Resources, Commission on Water Resource Management relating to the Well Drilling and Water Use Permits; and

4. City and County of Honolulu, Department of Public Works regarding the Effluent Discharge into City Storm Drain Permit.

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

Sincerely,

Brian J. J. Choy

Brian J. J. Choy
Director

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

October 4, 1993

Mr. Brian J. J. Choy, Director
Office of Environmental Quality Control
State of Hawaii
220 South King Street
Fourth Floor
Honolulu, Hawaii 96813

Dear Mr. Choy:

Subject: Your Letter of May 20, 1993 on the Draft Environmental Assessment (EA) for the Manoa IV Exploratory Well Project, Manoa, Oahu, TMK: 2-9-36: 03

Thank you for reviewing the Draft EA for our proposed project. We have the following responses to your comments:

1. We will comply with all applicable noise regulations as required by the State Department of Health (DOH), Noise and Radiation Branch regarding Chapter 43, Community Noise Control and Chapter 11-42, Vehicular Noise Control.

2. We have already consulted with the State DOH Clean Water Branch. A determination has been made that due to the nature and scope of the project, a State DOH National Pollutant Discharge Elimination System (NPDES) permit is not required. The contractor will implement a Best Management Practice Plan to prevent erosion caused by test pumping discharge.

3. Applications for well construction and water use permits have been submitted to the State Department of Land and Natural Resources.

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

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4. We have determined that the discharge effluent will not enter a storm drain system under the jurisdiction of the Department of Public Works prior to entering Manoa Stream. Therefore, a permit to discharge effluent into the municipal storm sewer is not applicable.

If you have any questions, please contact Roy Doi at 527-5235.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

cc: Maguire Group, Inc.

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

C. MICHAEL STREET
DIRECTOR AND CHIEF ENGINEER

FELIX B. LIMTIACO
DEPUTY DIRECTOR

ENV 93-121

May 21, 1993

MEMORANDUM

TO: MR. KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

FROM: C. MICHAEL STREET, DIRECTOR AND CHIEF ENGINEER

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (DEA)
MANOA IV EXPLORATORY WELL PROJECT
TMK:2-9-36:03

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

1. We have no objections to the proposed project.

2. The DEA should address the potential impact of storm water discharge associated with construction activities on water quality of the receiving waters.

Should you have any questions, please contact Mr. Alex Ho, Environmental Engineer, at 523-4150.

C. Michael Street

C. MICHAEL STREET
Director and Chief Engineer

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

October 4, 1993

TO: C. MICHAEL STREET, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

FROM: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR MEMORANDUM OF MAY 21, 1993 ON THE DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR THE MANOA IV EXPLORATORY WELL PROJECT, MANOA, OAHU, TMK: 2-9-36: 03

Thank you for reviewing the Draft EA for our proposed project. We have the following responses to your comments:

1. We note that you have no objections to the proposed project.

2. We anticipate no adverse impact to Manoa Stream from storm water runoff associated with the project due to the small area involved (2,500 sq. ft., 50' x 50'), the type of soil (Hanalei Clay), and the grass cover between the site and the drainage ditch. However, the contractor will utilize swales and berms to retain the runoff within the project site.

We also note that the State Department of Health Clean Water Branch has exempted the discharging of water from potable well pumping tests from the National Pollutant Discharge Elimination System permit on the basis that the test pump effluent is essentially free of pollutants and will not adversely impact the quality of receiving waters. Our construction contractors will be required to implement Best Management Practices to prevent erosion damage caused by the test pumping discharge by dissipating flow velocities.

If you have any questions, please contact Roy Doi at 527-5235.

cc: Maguire Group, Inc.

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NATIVE HAWAIIAN ADVISORY COUNCIL
A Nonprofit Corporation
1088 Bishop Street, Suite 1204, Honolulu, Hawaii 96813
Telephone (808) 523-1445
Facsimile (808) 599-4380

~~1993 July~~ 8

TO: Honolulu Board of Water Supply

RE: Draft Environmental Assessment [DEA] for an Exploratory Well and Access Road at Manoa Site IV, Oahu, Hawaii

GENERAL COMMENTS

Does BWS intend to prepare another EA for its Production Well at Manoa Well Site IV? Will this EA address a broad range of environmental impacts stemming from both the general allocation of water to BWS from the Honolulu Ground Water Management Area and the specifics of extracting that allocation from the aquifer at the proposed site? Has BWS already applied to the Commission on Water Resource Management (COWRM) for a Water Use Permit?

We object to this DEA because it fails to address the allocation and extraction impacts in the comprehensive manner required to inform COWRM water use permit decisionmaking. Also note that COWRM has recently taken a position that permit applications are not complete and cannot be taken up for decisionmaking until environmental review processes are completed.

There is huge confusion and problems with the current timing, sequence, and coordination of environmental review processes for both exploratory and production wells (including HRS 343 processes, Conservation district use permitting, and DOH processes) and COWRM permitting processes (water use, well construction, and pump installation). The DEA should explain the BWS view and those of other agencies concerning the timing, sequence, and coordination of these processes. This would provide a starting point for working with all parties to integrate the processes for the greatest mutual benefit.

SPECIFIC COMMENTS

Page 2. DLNR does not issue a "Well Drilling Permit." The correct terminology is "Well Construction Permit" and Pump Installation Permit."

The DEA should list the current status of required permits and approvals.

Page 4. This section should include an estimate of how much water BWS would extract from a production well, and should tabulate the sustainable yieled, exisitng uses, allocated uses, and pending allocations in the Ground Water Management Area.

Need for Project

Page 5. Alternatives to expanded use of potable groundwater also include:

1. Reduction of existing uses (consume less for the same purposes)

2. Reduction or stabilization of existing demands [eliminating use of potable water where brackish water or untreated wastewater (such as domestic grey water and stormwater) would suffice]

3. Conservation of existing uses (increasing system efficiencies)

We believe that the assessment and evaluation of alternatives is incomplete in both the range of alternatives examined and the sophistication of the analysis of cost/benefit and other trade-offs.

Page 7. What is the estimated developable capacity of the alluvial aquifer and the magnitude of its connections with the underlying basaltic aquifer? Do any other sources besides Manoa Well II tap this alluvium?

What is the > 150' shortest linear distance from the well site to the stream bed? 210 → 760 What is the change in elevation along this line? ~50 What is the estimated water table elevation at the well site? What is known about the gaining or losing nature of Kuou stream? What are the results of any seepage runs or other streamflow measurement conducted by USGS or others?

Page 10. Cam BWS guarantee that the proposed source would always be used to meet the needs of the Honolulu Water District rather than the needs of other districts?

Page 12. Please quantify the "minor impacts on water table elevations" and the insignificant "reduction of flows in the Manoa stream" and its triobutaries caused by the existng Manoa well.

Page 14. See previous comments on inadequacy of assessment of alternative sources (page 5).

Page iii. The biologist preparing the report should be identified.

Mahalo

David L. Martin

David L. Martin, Water Claims Manager

pc: Maguire Group Inc.
OEQC
Office of the Governor
Water Commission and Commissioners
Water Code Review Commission and Commissioners
DOH (Environmental Planning)
DLNR OCEA
UH Environmental Center
BLNR members
Sierra Club Legal Defense Fund
Native Hawaiian Legal Corp.
Ka Lahui Hawai'i
Office of Hawaiian Affairs

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

October 26, 1993

Mr. David L. Martin
Water Claims Manager
Native Hawaiian Advisory Council
1088 Bishop Street, Suite 1204
Honolulu, Hawaii 96813

Dear Mr. Martin:

Subject: Your Letter of July 8, 1993 Regarding the Draft Environmental Assessment (DEA) for the Proposed Manoa IV Exploratory Well Project, TMK: 2-9-36: 3, Manoa, Oahu

Thank you for reviewing the DEA for our proposed project. We have the following response to your comments:

1. If we decide to develop the exploratory well for the production of water, a separate EA will be prepared for the production well to address the related environmental impacts. We have applied for the Water Use Permit in September 1992.

2. We are not aware of the confusion and problems that you mention; however, we would support and welcome participation in any efforts to coordinate the permitting and environmental review processes for exploratory and production wells.

3. Page 2, Permits and Approvals

   The correct terminology, Well Construction Permit, will be incorporated into the final EA. We feel that the current status of the required permits and approvals is not necessary because it would only be current to the EA publication date. All the necessary permits will be obtained prior to construction.

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CITY AND COUNTY OF HONOLULU

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4. Page 4, Proposed Facilities and Activities

The potential yield of 1.0 million gallons per day (mgd) will be included in this section of the EA. Standard test pump protocol is presently being evaluated by the U.S. Geological Survey (USGS), the Commission on Water Resource Management (CWRM) and the Board of Water Supply (BWS). The information regarding the sustainable yield, existing uses and allocations of the Honolulu Groundwater Management Area is best obtained from the CWRM which controls all water withdrawals (public, private and military). Water is imported into the Honolulu area from the Pearl Harbor and Windward districts because of the lack of sufficient sources in the Honolulu Water Management Area. For your information, the 12-month moving average for BWS pumpages for the Honolulu district, from Halawa to Hawaii Kai, was 86.5 mgd as of June 1992. Our tabulation for the Honolulu District indicates a current commitment of 3.3 mgd.

5. Page 5, Need for Project and Page 14, Alternatives

We continue to pursue water conservation, water reclamation and best management practices for improvements in water system efficiencies as alternatives to the expanded use of potable groundwater. However, at the present time, these and the other alternative sources specified in the EA do not offer the potential to economically or cost-effectively produce water supplies of the quality which can be obtained through an effective groundwater development program. A more detailed analysis of alternatives to groundwater development in the area was presented in the Environmental Impact Statement for the Honolulu Regional Water System Improvements. An expanded range of alternatives will be presented in the Draft EA for the project to develop a full production facility at the Manoa IV site, if the exploratory well is successful.

6. Page 7, Geology and Hydrology

The sustainable capacity of the alluvial aquifer is undetermined at this time. Connection with the basal aquifer is expected to be unmeasurable because the layered and discontinuous structure of the alluvium hydraulically separate water flow. The Manoa Well II is the only production well

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

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presently tapping the alluvium. Although Manoa I and Manoa III are located in the same alluvial formation, the wells are presently capped and not intended for use in the foreseeable future.

The shortest linear distance from the well site to the stream bed is approximately 1,500 feet. The change in elevation along this line is approximately 50 feet. The water table elevation at the well site will be determined after the well is drilled and cased. Manoa Stream is perched upon the alluvium and does not gain groundwater flow nor lose flow into the ground in the vicinity of the proposed well site from the basal aquifer. Stream flow measurements were not conducted by the USGS for the BWS during the exploratory test pumping of the Manoa Well II and Manoa III again because Manoa stream is perched on the alluvium in this reach.

7. Page 10, Socio-Economics

This well project is being developed to meet the anticipated needs of various water users within our system. The BWS's goal is to integrate our sources to provide system flexibility and reliable, high quality water service to all customers. Because of the lack of sufficient water sources within the Honolulu district, the proposed source would be used primarily to meet the needs of this district.

8. Page 12, Impacts on Stream Flow

We have determined that pumpage of the existing Manoa Well II has only minor impacts on stream flows because this alluvial well taps deeper, specific horizons of water bearing formations surrounded by layers of impermeable alluvial material. The layered and discontinuous structure of the alluvium is expected to hydraulically separate water flow between layers. Therefore, if the water elevation in the well after casing is substantially below the stream bed elevation in the vicinity of the well site, we can conclude that well pumpages have unmeasurable effects on stream flow.

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

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9. Page iii

The biologist's report was prepared by Dr. Loyal A. Mehrhoff of the Bishop Museum's Department of Botany.

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

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

cc: Maguire Group, Inc.