BOARD OF WATER SUPPLY

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

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Manager and Chief Engineer

DONNA FAY K. KIYOSAKI
Deputy Manager and Chief Engineer

RECEIVED September 10, 2004

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OF... QUALITY CONT...

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

Dear Ms. Salmonson:

Subject: Finding of No Significant Impact (FONSI)
Expansion of the Ewa Nonpotable Water System
TMK: 9-1; 9-2-02; and 9-2-03, Ewa, Oahu, Hawaii

The Board of Water Supply has reviewed the comments for the subject environmental assessment received during the 30-day public comment period which began on July 23, 2004. The agency has determined that this project will not have significant environmental effects and has issued a FONSI. Please publish this notice in the September 23, 2004 OEQC *Environmental Notice*.

There are no changes to the project description, thus the same project summary that was provided with the Draft Environmental Assessment (EA) may be used again. The following are enclosed as requested:

- completed OEQC Publication Form
- four copies of the Final EA

Should there be any questions, please call Scot Muraoka at 748-5942.

Very truly yours,

FOR CLIFFORD S. JAMILE
Manager and Chief Engineer

Enclosures

2004-09-23 ~~FEA~~ FONSI
EWA NONPOTABLE WATER SYSTEM EXPANSION

SEP 23 2004

FILE COPY

Final
Environmental Assessment

Expansion of the
Ewa Nonpotable Water System

September 14, 2004

RECEIVED
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OFFICE OF
QUALITY CONTROL

Gray • Hong • Nojima & Associates, Inc.
CONSULTING ENGINEERS

841 Bishop Street, Suite 1100, Honolulu, Hawaii 96813 • Tel: (808) 521-0306 • Fax: (808) 531-8018

Final
Environmental Assessment

Expansion of the
Ewa Nonpotable Water System

September 14, 2004

Prepared For:

Board of Water Supply
City & County of Honolulu

Prepared By:

Gray • Hong • Nojima & Associates, Inc.
CONSULTING ENGINEERS

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Honolulu, HI 96813
Phone: (808) 521-0306
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INTRODUCTION

1.1 PROPOSED PROJECT SUMMARY

Oahu's Ewa district has undergone unprecedented growth via residential, commercial and industrial developments throughout the past decade. Based on the City and County of Honolulu's (CCH) *General Plan* (CCH, 1992) and the *Ewa Development Plan* (CCH, 1997), forecasts of continued growth in the district are expected through the year 2015 and beyond. These developments have and will continue to impact available water resources in terms of both reduced recharge of the existing caprock aquifer due to curtailing agricultural activity and increased demand for potable water.

Cutbacks in the region's agricultural operations have dramatically reduced recharge of the aquifer. As a result, the aquifer's salinity has been rising with ongoing withdrawal from existing wells. In addition, the State of Hawaii Department of Land and Natural Resources (DLNR) has limited new well permits and well permit renewals (R.M. Towill Corporation, 2004 and Analytical Planning, Consultants, 1999).

The City and County of Honolulu Board of Water Supply (BWS) presently owns and maintains the municipal nonpotable (or non-drinking) water system in the Ewa district (refer to Figure 1-1). The existing storage and distribution system currently has the capacity to provide 12.0 million gallons per day (MGD) of nonpotable Reverse Osmosis (RO) and R-1 water. R-1 water is regulated by the Department of Health (DOH) and is being used for irrigation of golf courses, parks, and greenbelts. Non-regulated RO water is being used for industrial processing and cooling at facilities in the region. In addition, the system includes the Honouliuli Water Recycling Facility (WRF), formerly known as the Ewa Water Reclamation Facility (EWRF). The Final Environmental Assessment/Findings of No Significant Impacts (FONSI) for the existing system was completed by the US Filter Corporation in October 1999.

Because of projected increasing demand for drinking water and the limited basal groundwater supply on Oahu, the BWS plans to expand the nonpotable storage and transmission system, which will facilitate the use of nonpotable water in greater amounts. In turn, this will relieve some of the potable supply that may be preserved for drinking water needs. The BWS estimates an ultimate nonpotable water demand of 26.2 MGD in the Ewa district (R.M. Towill Corporation, 2004). A master plan of the proposed expansion is also shown in Figure 1-1. It should be noted, however, that the proposed nonpotable waterline alignments and sizes, as well as reservoir sites and capacities, are based on projected user locations and demands. These are subject to change by the BWS during the preliminary engineering and design stages, pending actual nonpotable water user development schedules.

Basically, the proposed expansion is focused on increasing the delivery of DOH-regulated R-1 nonpotable water. The following are the anticipated infrastructure developments to be constructed in three phases over the next 15-plus years:

- 44 miles of distribution and transmission mains, 4 to 36 inches in diameter, located primarily within existing state and county rights-of-ways (roads, streets, and highways)

- 15 MG in additional reservoir capacity

Due to the fact that this expansion will require the use of state or county lands and county funds, environmental review is mandated under Chapter 343 of the Hawaii Revised Statutes; however, *separate environmental assessments (EAs) will be prepared for the various reservoir and booster pump station sites following the completion of site specific feasibility studies.*

1.2 GENERAL INFORMATION

Project Name:	Expansion of the Ewa Nonpotable Water System
Proposing Agency: (Applicant)	Board of Water Supply City and County of Honolulu 630 South Beretania Street Honolulu, Hawaii 96843 Contact: Mr. Scot Muraoka (ph. 748-5942)
Approving Agency:	Board of Water Supply City and County of Honolulu
Proposed Action:	Expansion of the Ewa nonpotable water storage and distribution system, including distribution and transmission mains, reservoirs, and booster pump stations (site specific environmental assessments will be prepared for reservoirs and booster pump stations)
Estimated Construction Cost:	$56,063,000 (distribution/transmission mains) $54,000,000 (reservoirs) $110,063,000 Total
Determination:	Finding of No Significant Impact (FONSI)
Project Location:	Ewa, Oahu, Hawaii

Tax Map Keys:	9-1; 9-2-02; and 9-2-03
Property Owners:	City and County of Honolulu rights-of-way State of Hawaii rights-of-way Various private owners (to be determined)
State Land Use:	Urban and Agricultural (Refer to Figure 1-2 for State Land Use Map)
County Zoning:	A-1 Apartment, Low-density A-2 Apartment, Medium-density AG-1 Agricultural, Restricted AG-2 Agricultural, General B-1 Business, Neighborhood B-2 Business, Community I-2 Industrial, Intensive P-2 Preservation, General R-5 Residential (Refer to Figure 1-3 for Zoning Map)
Flood Hazard Area:	Based on *Flood Insurance Rate Map (FIRM)*, November 20, 2000: - Majority in Zone D (areas in which flood hazard are undetermined) - Portion in Zone X (areas outside of 500-yr. flood plain) - Portion in Zone A (areas inundated by 100-yr. flood, no base flood elevations determined) - Portion in Zone AE (areas inundated by 100-yr. flood, base flood elevations determined)
Special Designations:	None (no Special Management Areas or Shoreline Setback)
Historic Sites:	Oahu Railway & Land Company (OR&L) right-of-way (National Registry of Historic Places) Onelua Archaeological District

1.3 LOCATION

The proposed project site is located on the Ewa Plain of Oahu's southwest coast line. The nonpotable water distribution system network will extend west to east, from Ko Olina to the Navy Blast Zone on the West Loch Naval Magazine, and makai to mauka, from the West Mamala Bay shoreline to lower Makakilo and mauka of the proposed University of Hawaii West Oahu campus site.

1.4 NEED FOR PROJECT

1.4.1 Consent Decree

In 1993, the U.S. Environmental Protection Agency (EPA) and the State of Hawaii brought enforcement action against the City and County of Honolulu alleging violations of the Clean Water Act stemming from pretreatment program deficiencies. The parties agreed to a settlement resulting in a Consent Decree without further litigation and trial. Pursuant to the terms of the Consent Decree, the City was required to pay a substantial initial fine with the possibility of additional fines that would be waived if the City agreed to implement Supplemental Environmental Projects (SEP). One of these projects involved the reuse of treated wastewater (or effluent) from the Honouliuli WWTP for beneficial uses such as irrigating parks and golf courses and cooling industrial processes.

To avoid the additional fines and to meet the need for additional water resources in the Ewa Plain, the City proceeded with the effluent reuse SEP. A proposal for this SEP submitted by US Filter Corporation was selected and awarded by the City. The contract included design, construction, and operation of a new wastewater reclamation facility that would treat wastewater effluent from the Honouliuli WWTP.

1.4.2 Consistency with Planning Documents

This section will examine the proposed project's consistency with three planning documents. The first two - the *General Plan* (CCH, 1992) and the *Ewa Development Plan* (CCH, 1997) - are the City and County of Honolulu's primary planning documents that provide overall guidance for the Ewa district. Because of the significance of the Barbers Point Naval Air Station (BPNAS) redevelopment in the future of the Ewa community, the *Kalaeloa Redevelopment Plan* (2000) will also be reviewed for relevance pertaining to nonpotable water usage.

❖ *General Plan*

The City and County of Honolulu's *General Plan* (CCH, 1992) serves as a planning guide which addresses eleven areas of concern. The following discussion explains the proposed project's consistency with five areas of concern.

- *Population - Policy 2 of Objective C calls for the "development of the secondary urban center at Kapolei and the Ewa and Central Oahu urban-fringe areas to relieve developmental pressures in the remaining urban-fringe and rural areas an to meet housing needs not readily provided in the primary urban center" ;*

- *Physical Development and Urban Design - Policies 1 to 6 of Objective C call for the development of "a secondary urban center in Ewa with its nucleus in the Kapolei area" and*

- *Economic Activity - Policy 2 of Objective A calls for the encouragement of "development of small businesses and larger industries, which will contribute to the economic and social well-being of Oahu residents."*

The Secondary Urban Center is expected be the focus of significant economic activity and major housing development, as well as a core location for government services. It will entail a myriad of developments: master planned residential developments, heavy and light industrial areas in the vicinity of the Barbers Point Deep Draft Harbor, offices and commercial/retail centers in the City of Kapolei, resort developments at Ko Olina and Ewa Marina, recreational facilities such as golf courses and park complexes, and the University of Hawaii West Oahu campus. The proposed expansion of the Ewa nonpotable water distribution network will continue to support ongoing development through increased water supply and service to various users in the Ewa district.

- *Transportation and Utilities - Objective B calls for "an adequate supply of water and for environmentally sound systems of waste disposal."*

The proposed project will support both aspects of water supply and waste disposal as stated in this objective. The ongoing development of the Secondary Urban Center will undoubtedly continue add to the existing water demand in the Ewa district. Nonpotable water provides an additional supply of water which will help to meet the needs of the residential and working population in the area, as well as irrigation and industrial users. Expanding the distribution network enables greater use of nonpotable water, which in turn will relieve some of the potable supply for drinking water purposes.

In addition, the reuse of treated wastewater effluent as a nonpotable source reduces the wastewater flow that is discharged through the Barbers Point Deep Ocean Outfall. Thus, the proposed action will result in both increased water supply and waste reduction.

- *Housing Activity - Policy 10 of Objective A calls for "the construction of affordable dwellings which take advantage of Oahu's year-round moderate climate" and*

- *Housing Activity - Policy 3 of Objective C calls for "residential development near employment centers."*

A network of master planned residential communities, such as Ewa Marina, the Villages of Kapolei and Ewa by Gentry, will provide a wide variety of housing and accommodate the need for affordable housing. These residential communities will be located in or near Kapolei, the major employment center, including government and business offices, retail areas, and Campbell Industrial Park. As mentioned previously, the proposed expansion of the nonpotable water distribution network will support housing developments by preserving potable supplies for drinking or clean water needs.

❖ *Ewa Development Plan*

The *Ewa Development Plan* (CCH, 1997) provides maps and policy statements to implement the objectives and policies of the *General Plan (CCH, 1992)*. The year 2020 is the initial phase planning horizon in which the vision for Ewa centers around the development of a Secondary Urban Center for Oahu. This phase is followed by full development of the Ewa district in the years beyond. According to the *Ewa Development Plan*, population is expected to almost triple from 43,000 in 1990 to 125,000 in 2020, requiring 28,000 new housing units through a series of master planned communities. The Secondary Urban Center will also generate a wide range of employment opportunities increasing the number of jobs from 17,000 to 64,000 in 2020.

The *Ewa Development Plan* (CCH, 1997) identifies key elements that are critical to the implementation of the vision for Ewa's future. The proposed expansion of the nonpotable water system is essential to one of the key elements - Conservation of Natural Resources. Specially, this element calls for the development of a dual water distribution system with potable water for drinking and other clean water uses and nonpotable water for irrigation and industrial uses. This system is necessary in order to allocate potable water to meet projected growth. The BWS forecasts an additional 35 MGD of potable water needed in Ewa by the year 2020. Long term demand for nonpotable water for irrigation is estimated at 26 MGD and as much as 10 MGD for agriculture.

The *Ewa Development Plan* (CCH, 1997) describes the vision for Ewa's future as a network of linked communities "within a garden." Another of the plan's key element, referred to as The Network of Open Space and Greenways, will include natural gulches and drainage ways, shoreline parks, regional and district parks, golf courses and greenway corridors along the major highways and roads. Among the planning principles and guidelines is the use of plantings and landscape treatments for

residential and commercial areas and utility and transportation corridors, as well as recreational areas such parks and golf courses. In order to conserve potable water, nonpotable water will be used for irrigation of the golf courses, parks, greenways and other landscaped or planted areas.

❖ *Kalaeloa Redevelopment Plan*

The *Kalaeloa Redevelopment Plan* (R.M. Towill Corporation, 2000) was prepared for the Barbers Point Naval Air Station (BPNAS) Redevelopment Commission as a Special Area Plan of the Ewa Development Plan. Essentially it presents the recommended reuse plan for BPNAS and provides a summary of the Barbers Point Community Redevelopment Plan approved by the BPNAS Redevelopment Commission and Governor Cayetano in 1996.

According to the *Kalaeloa Redevelopment Plan* (R.M. Towill Corporation, 2000), the overall goal for Kalaeloa is to integrate its redevelopment into the surrounding Ewa region such that land uses and urban design are compatible and complementary to the context of the region. The surplus land recommended for redevelopment includes over 2,000 acres, which will be used primarily for airport and aviation training, parks, recreation/sports facilities and light industrial developments. One of the design objectives calls for the enhancement of existing landscape patterns and preservation of existing trees by incorporating them into the design of public areas and development parcels.

Design guidelines for both public areas and site development indicate the reliance on nonpotable water for irrigation purposes:

(1) All public area landscaping are to be irrigated with an automatic controller and from a nonpotable water source.

(2) All development parcels are to use nonpotable water for irrigation where available.

1.4.3 Water Resources: Increasing Demand and Limited Supply

The unprecedented growth described above will bring an increased demand for both potable and nonpotable water in the Ewa district. According to the *Ewa Non-Potable Water Master Plan* (R.M. Towill Corporation, 2004), the decline in the sustainable yield in the Ewa caprock aquifer has limited the approval of new well permits and existing permit renewals by the Department of Land and Natural Resources (DLNR). Thus, there is warranted concern over the availability of water to accommodate projected demands of the Ewa district's urban developments. The proposed action will serve many purposes already discussed - the conservation of potable water, the development of the employment opportunities in the Secondary Urban Center with nearby affordable housing in planned communities, and the reduction of wastewater disposed through the Barbers Point Deep Ocean Outfall.

1.5 PUBLIC COMMENT AND REVIEW

A pre-assessment consultation was conducted for this project prior to preparation of the Draft Environmental Assessment (DEA). Various parties, including those listed below, were consulted by letter in March 2002. Responses and comments were taken into consideration in preparing the DEA and were also appended as part of the DEA.

Subsequently, the DEA was circulated to various agencies, organizations, utilities, and elected officials (see list below) during the public review period beginning July 23, 2004. Comments received from parties within the DEA 30-day review period are marked below with a asterisk (*). These comments were incorporated into the Final EA as appropriate. Copies of the comment letters and responses are included in Appendix A.

Federal Government
Naval Air Station Barbers Point
U.S. Army Corps of Engineers, Honolulu District*
U.S. Department of the Interior, Geological Survey
U.S. Fish and Wildlife, Pacific Islands Office Ecological Services

State of Hawaii
Department of Business and Economic Development and Tourism - Office of Planning
Department of Community Services
Department of Education*
Department of Hawaiian Home Lands
Department of Health*
Department of Land and Natural Resources*
Department of Transportation
Office of Environmental Quality Control*
Office of Hawaiian Affairs*
University of Hawaii Environmental Center

City and County of Honolulu
Department of Design and Construction
Department of Environmental Services*
Department of Facility Maintenance
Department of Parks and Recreation Services
Department of Planning and Permitting
Department of Transportation Services
Honolulu Fire Department*
Honolulu Police Department*

Golf Courses, Private Companies and Utilities
AES Hawaii Inc.Aina Nui Corporation
Barbers Point Golf Course
ChevronTexaco Hawaii
Coral Creek Golf Course
Ewa Villages Golf Course
Gentry Companies
Haseko (Ewa) Inc.
Hawaii Prince Golf Course
Hawaiian Electric Company, Environmental Department
Island Ready-Mix Concrete Inc.
Kahua Nursery & Landscape
Kapolei Golf Course
Ko Olina Resort Operators Assoc. Inc.
Oceanic Cable/Time Warner
St. Francis Medical Center - West
Tesoro Hawaii Corporation
The Estate of James Campbell
The Gas Company
US Filter Operating Services
Verizon Hawaii Inc.*

Community Organizations
Ewa Neighborhood Board No. 23
Historic Hawaii Foundation
Neighborhood Board No. 34

Elected Officials
Council Member, District 9
Senator, District 19
Senator, District 20
Representative, District 41
Representative, District 42
Representative, District 43

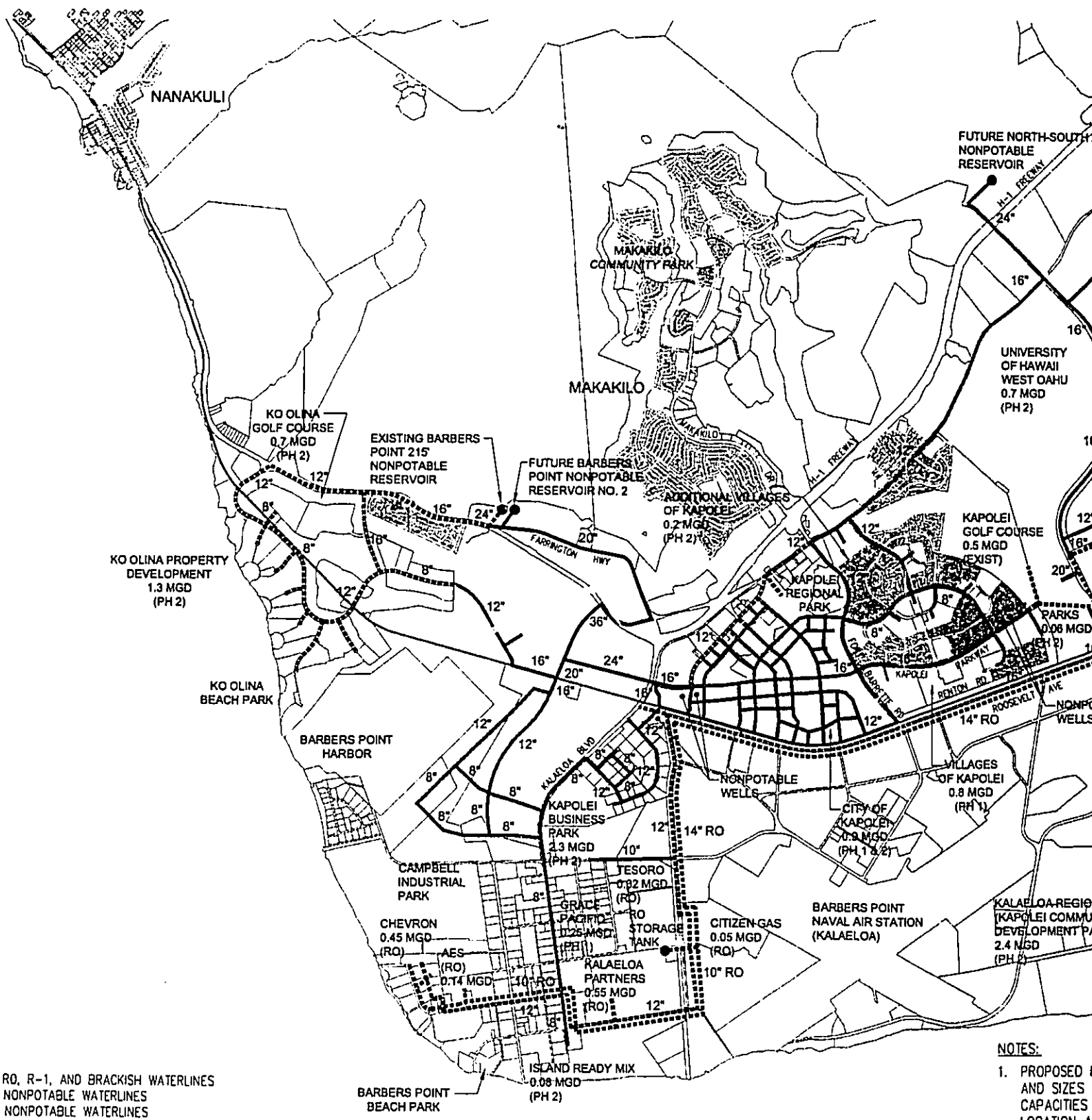
Libraries
Ewa Beach Public & School Library
Municipal Library

1.6 APPROVALS AND PERMITS

During the implementation stages of the proposed project, the applicant will be working with other utilities and agencies in the City and County of Honolulu for examination and approval of project construction plans and specifications. In addition, federal, state and city permits will be obtained as required.

U.S. Government	
Department of the Army Permit	Department of the Army, U.S. Army Engineer District, Honolulu
State of Hawaii	
Coastal Zone Management Consistency Determination	Department of Business, Economic Development and Tourism
Community Noise Control Permit	Department of Health
Section 401 Water Quality Certification	Department of Health
National Pollutant Discharge Elimination System General Permits - Discharge of Stormwater Associated with Construction Activity - Discharge of Hydrotesting Waters - Construction Dewatering	Department of Health
Stream Channel Alteration Permit	Department of Land and Natural Resources
City and County of Honolulu	
Grubbing, Grading and Stockpiling Permit	Department of Planning and Permitting
Trenching Permit	Department of Planning and Permitting
Street Usage Permit	Department of Transportation Services
Traffic Control Plans	Department of Planning and Permitting
Building Permit (if encroach in sidewalks)	Department of Planning and Permitting
Private Property Owners	
Easements for Nonpotable Water Lines	

SCALE: 1" = 4000'	PREPARED FOR:	EXPANSION OF THE EWA NONPOTABLE WATER SYSTEM E
CAD DRAWING: 2838WATER1	Board of Water Supply City and County of Honolulu	EXISTING AND PROPOSED INFRAS
DATE: SEPT 13, 2004		



LEGEND

- EXISTING RO, R-1, AND BRACKISH WATERLINES
- PHASE 1 NONPOTABLE WATERLINES
- PHASE 2 NONPOTABLE WATERLINES
- PHASE 3 NONPOTABLE WATERLINES
- RESERVOIR
- NONPOTABLE WELL

NOTES:

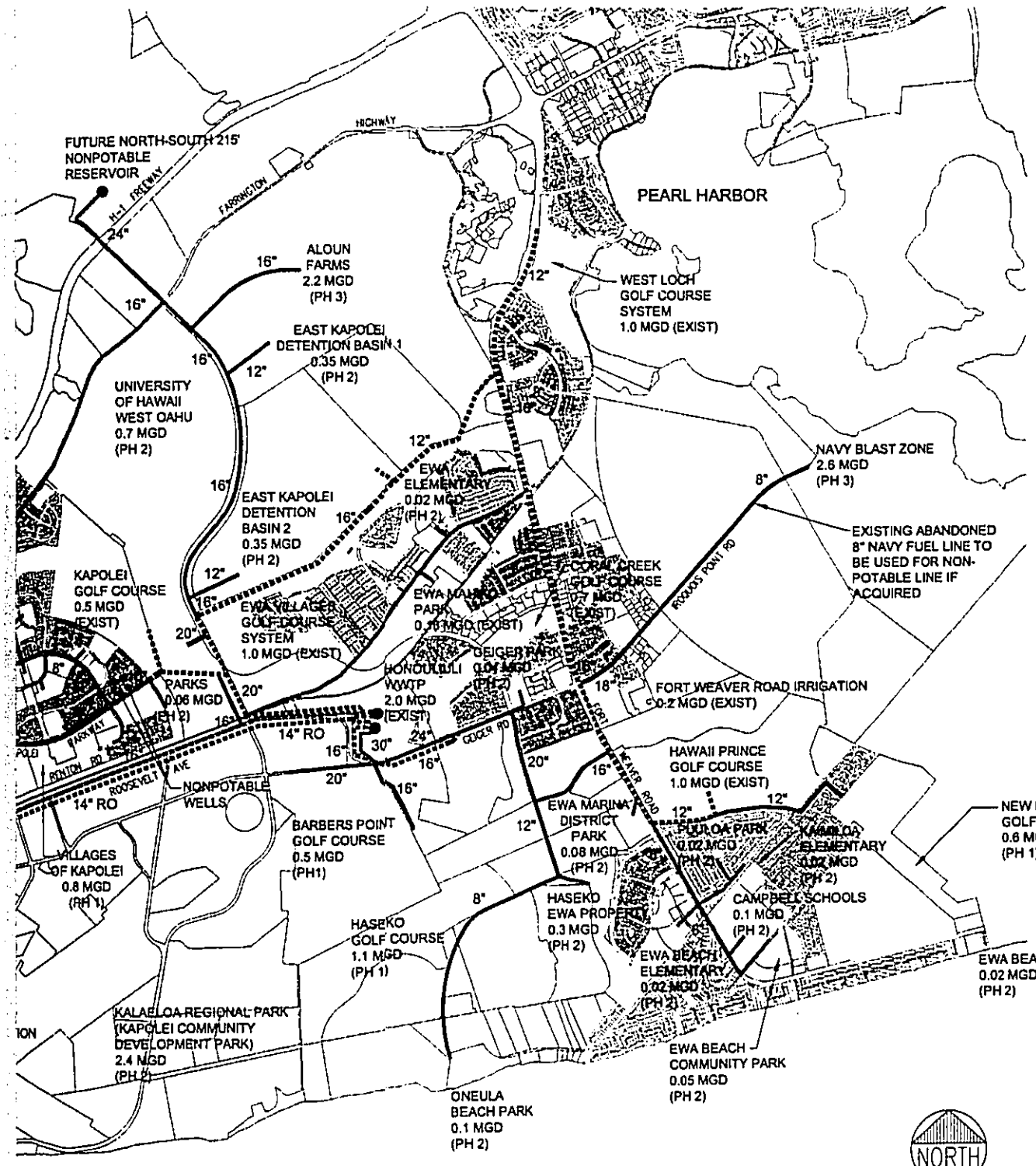
1. PROPOSED
   AND SIZES
   CAPACITIES
   LOCATION A
   BY BWS DU
   DESIGN STA
2. PHASE NUM

TER SYSTEM ENVIRONMENTAL ASSESSMENT

SED INFRASTRUCTURE

Gray • Hong • Nojima & Associates, Inc
CONSULTING ENGINEERS
841 Bishop Street Suite 1100

FIGURE
1-1

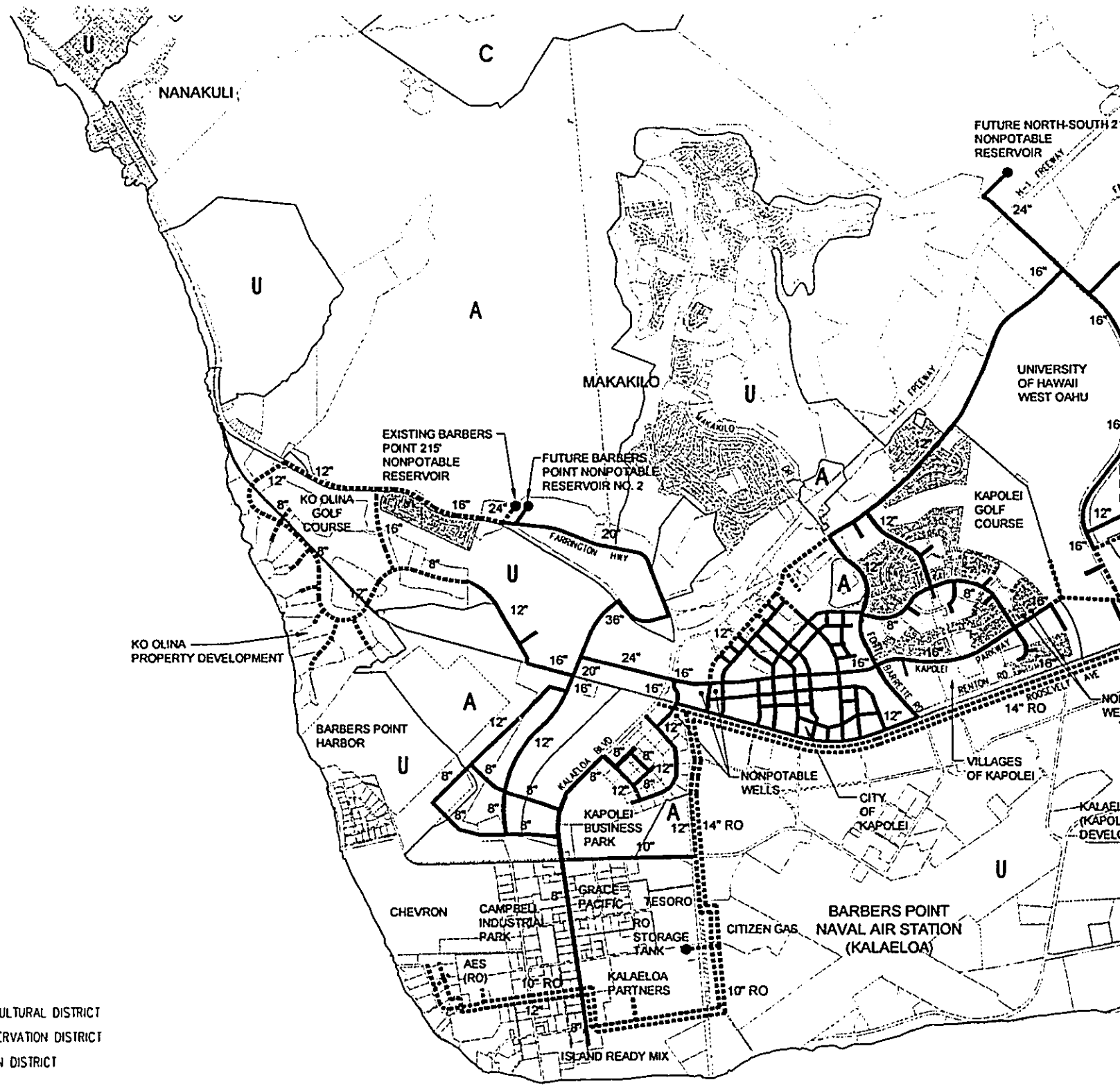


NOTES:

1. PROPOSED NONPOTABLE WATERLINE ALIGNMENTS AND SIZES AND FUTURE RESERVOIR SITES AND CAPACITIES ARE BASED ON PROJECTED USER LOCATION AND DEMAND, SUBJECT TO CHANGE BY BWS DURING PRELIMINARY ENGINEERING AND DESIGN STAGES.
2. PHASE NUMBER INDICATES START OF SERVICE.

SOURCE: R.M. TOWILL CORP. (2004)

SCALE: 1" = 4000'	PREPARED FOR:	EXPANSION OF THE EWA NONPOTABLE WATER SYSTEM EN
CAD DRAWING: 2838STATE	Board of Water Supply City and County of Honolulu	STATE LAND USE MAP
DATE: JULY 14, 2004		



LEGEND

A	AGRICULTURAL DISTRICT
C	CONSERVATION DISTRICT
U	URBAN DISTRICT
———	PROPOSED NONPOTABLE WATER (PHASES 1-3)
·····	EXISTING RO, R-1, AND NONPOTABLE WATER
———	ZONING BOUNDARY
●	RESERVOIR
•	NONPOTABLE WELL

ER SYSTEM ENVIRONMENTAL ASSESSMENT
) USE MAP

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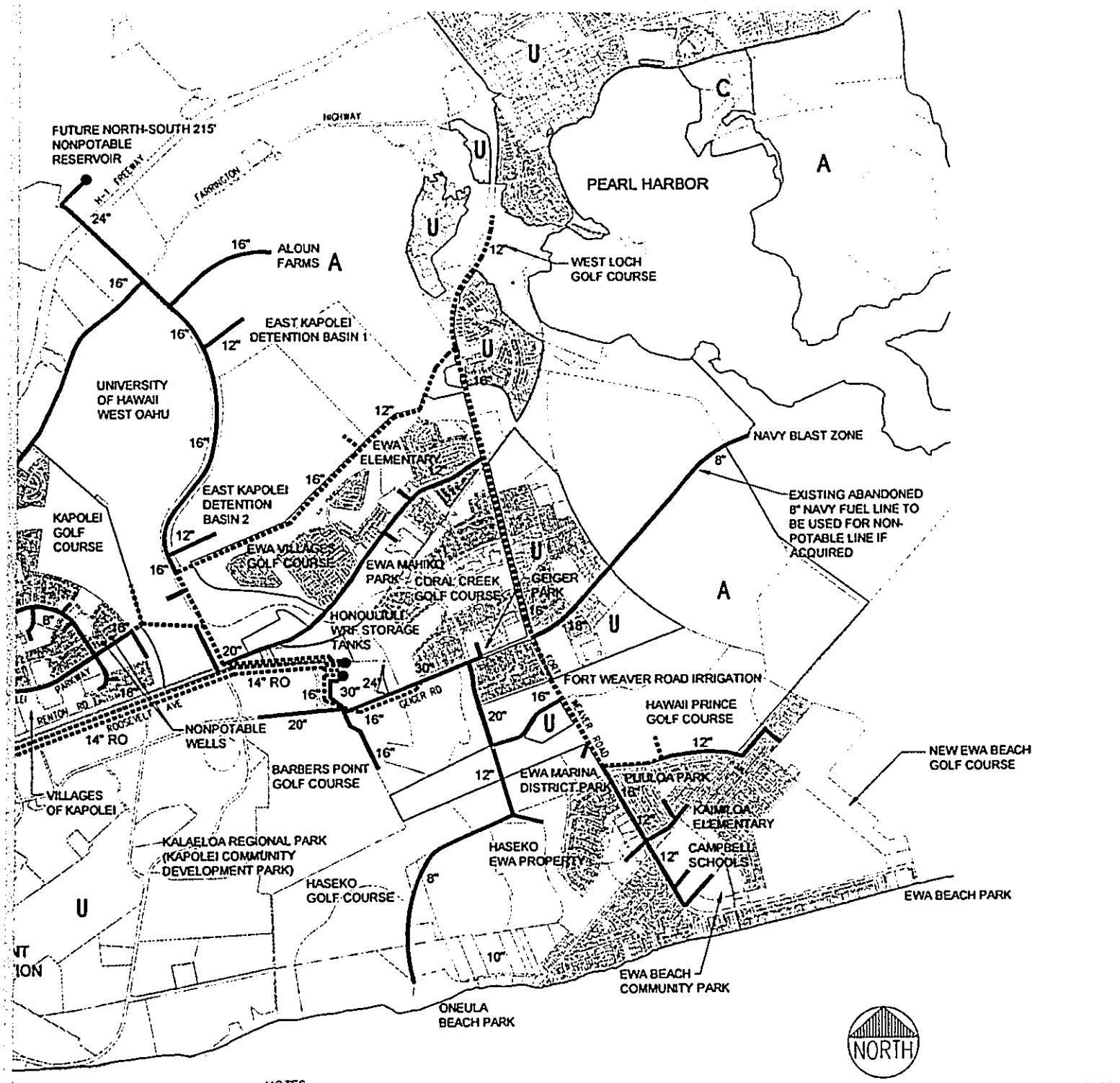
FIGURE
1-2

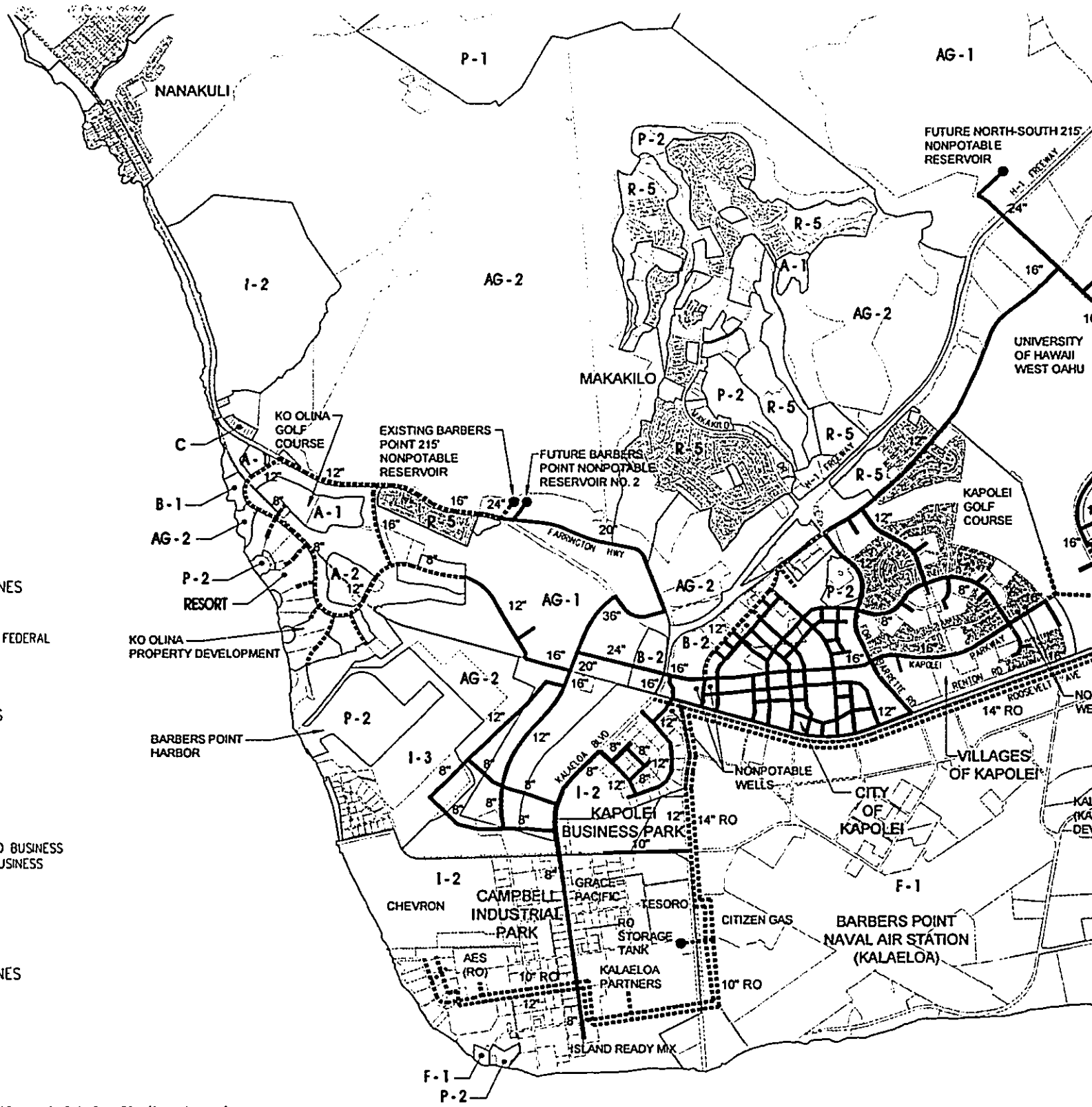


NOTES:

PROPOSED NONPOTABLE WATERLINE ALIGNMENTS AND SIZES AND FUTURE RESERVOIR SITES AND CAPACITIES ARE BASED ON PROJECTED USER LOCATION AND DEMAND, SUBJECT TO CHANGE BY BWS DURING PRELIMINARY ENGINEERING AND DESIGN STAGES.

SOURCE: CITY AND COUNTY OF HONOLULU GEOGRAPHIC INFORMATION SYSTEM (2002)

SCALE: 1" = 4000'	PREPARED FOR:	EXPANSION OF THE EWA NONPOTABLE WATER SYSTEM E
CAD DRAWING: 283BLAND	Board of Water Supply City and County of Honolulu	ZONING MAP AND DEVELOPME
DATE: JULY 14, 2004		



LEGEND

PRESERVATION ZONES
- P-1 RESTRICTED
- P-2 GENERAL
- F-1 MILITARY AND FEDERAL

RESIDENTIAL ZONE
- R-5 RESIDENTIAL

APARTMENT ZONES
- A-1 APARTMENT
- A-2 APARTMENT

RESORT ZONE
- RESORT

BUSINESS ZONES
- B-1 NEIGHBORHOOD BUSINESS
- B-2 COMMUNITY BUSINESS

INDUSTRIAL ZONES
- I-1 LIMITED
- I-2 GENERAL
- I-3 WATERFRONT

AGRICULTURAL ZONES
- AG-1 RESTRICTED
- AG-2 GENERAL

COUNTRY ZONE
- C COUNTRY

- PROPOSED NONPOTABLE WATER (PHASES 1-3)
- EXISTING RO, R-1, AND NONPOTABLE WATER
- ZONING BOUNDARY
- EXISTING RO, R-1, AND NONPOTABLE WATER
- ZONING BOUNDARY

ER SYSTEM ENVIRONMENTAL ASSESSMENT
EVELOPMENT PLAN

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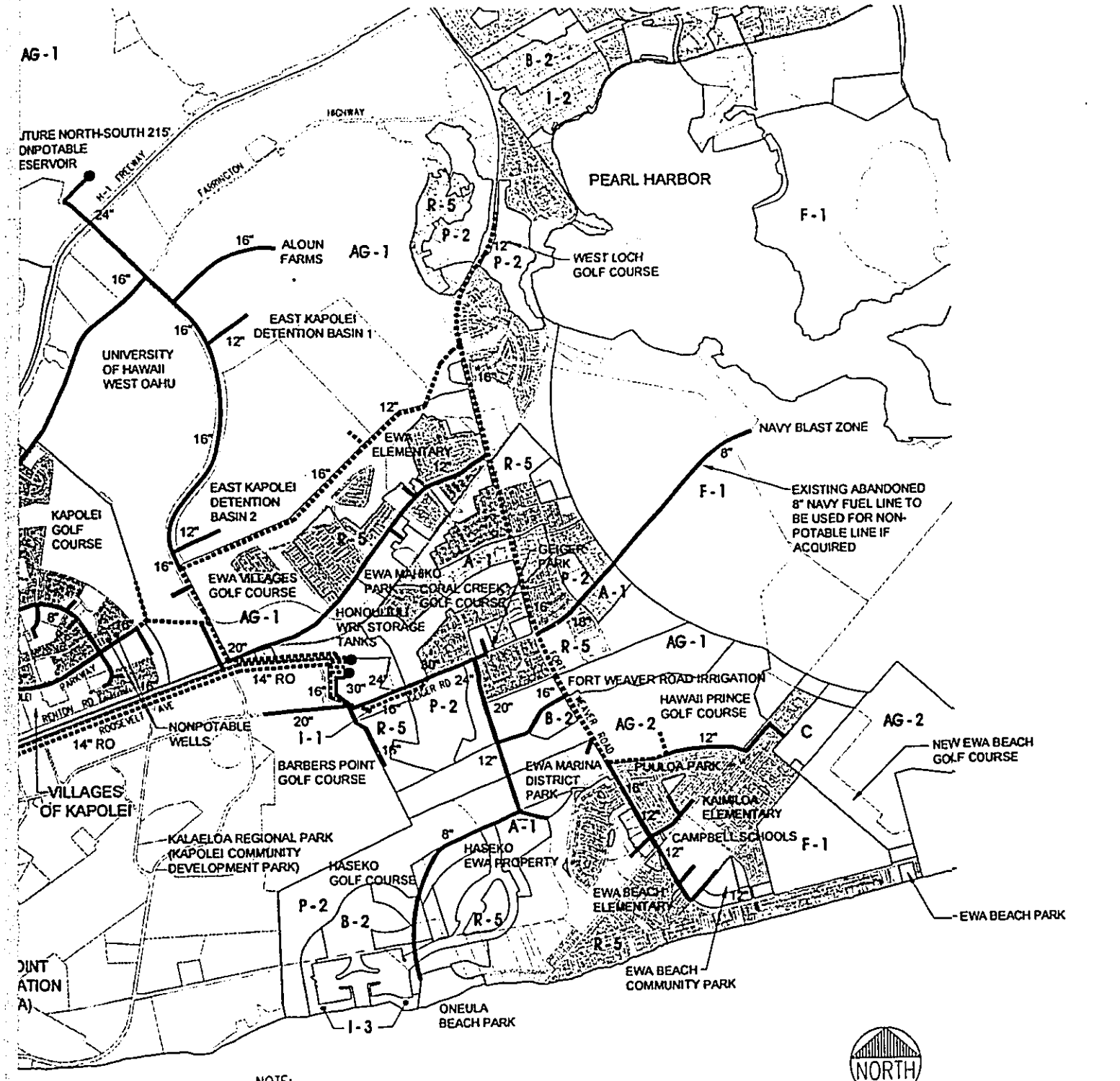
FIGURE
1-3



NOTE:

PROPOSED NONPOTABLE WATERLINE ALIGNMENTS AND SIZES AND FUTURE RESERVOIR SITES AND CAPACITIES ARE BASED ON PROJECTED USER LOCATION AND DEMAND, SUBJECT TO CHANGE BY BWS DURING PRELIMINARY ENGINEERING AND DESIGN STAGES.

SOURCE: CITY AND COUNTY OF HONOLULU GEOGRAPHIC INFORMATION SYSTEM (2002)

CHAPTER TWO

DESCRIPTION OF THE PROPOSED PROJECT

2.1 EXISTING NONPOTABLE WATER RESOURCES

The Ewa district is supplied by two major nonpotable water sources that are described in greater detail below - recycled water from the City and County of Honolulu Board of Water Supply (BWS) Honouliuli Water Recycling Facility (WRF) and brackish water from the Ewa Caprock Aquifer.

2.1.1 Recycled Water from the BWS Honouliuli Water Recycling Facility (WRF)

Nonpotable water that is recycled wastewater effluent begins as a by-product from the City and County of Honolulu's Honouliuli Wastewater Treatment Plant (WWTP). This effluent receives secondary treatment at the plant before it is piped to the WRF. Essentially, the secondary treated effluent from the WWTP is the WRF's influent. At the WRF the wastewater receives further treatment known as tertiary treatment so that it can be reused as nonpotable water for non-drinking uses such as irrigation and industrial processing. The wastewater effluent that is intended for recycling at the WRF must receive secondary treatment at the WWTP in order to remove solids and organic matter in the wastewater. The remainder of the effluent that is not treated at the WRF is discharged through the 78-inch diameter Barbers Point Deep Ocean Outfall. This wastewater effluent can be treated to a lower level of treatment known as primary treatment which is aimed at solids removal.

To meet the State of Hawaii Department of Health's (DOH) *Guidelines for the Treatment and Use of Recycled Water* (2002), the wastewater effluent undergoes a rigorous purification process. The Ewa WRF produces two grades of recycled water, R-1 for irrigation and RO (Reverse Osmosis) for industrial users. In either case, the recycled water will not be used for drinking or potable uses.

- **R-1** is the highest level of treatment as regulated by the Hawaii Department of Health. R-1 water is currently being used for irrigation of golf courses, schools, green spaces, and crops such as bananas, papayas, ornamental plants and seed corn.

- **RO** water is an ultra pure water suitable for industrial purposes, such as refineries and power plants. It is named after the Reverse Osmosis process, which is the method of treatment used for RO water production. RO water is not currently regulated by the DOH. It is being sold to power and petro-refining companies primarily at Campbell Industrial Park for boiler feed water, process water, and make up water for cooling towers.

Of the total production of nonpotable water produced by the Honouliuli WRF, an excess of 1 MGD will be allocated for RO use, 2 MGD for R-1 water to be used by the Honouliuli WWTP, and the remaining R-1 water will be delivered to various users in Ewa. The original distribution system was constructed as part of the construction of the Honouliuli WRF. These included separate R-1 and RO distribution lines to various users in the Ewa district (refer to Figure 2-1).

2.1.2 Brackish Water from the Ewa Caprock Aquifer

In a 1989 report prepared for the State of Hawaii Department of Land and Natural Resources (DLNR) Commission on Water Resource Management (CWRM), George A.L. Yuen and Associates (1996) divided the Ewa caprock resource into three management sectors based on geography, hydrogeology, and land use (refer to Figure 2-2). These three sectors and their estimated future yields were indicated as follows:

- Honouliuli/Puuloa - < 10 MGD
- Kapolei/Barbers Point Naval Air Station - < 5 MGD
- Malakole - < 1 MGD

As the entity that is delegated authority for administration of the State Water Code, CWRM has overseen groundwater management issues pertaining to land-based surface waters and groundwaters, such as the Ewa Caprock Groundwater Management Area. Consequently, the withdrawal of groundwater within the management area may be made only in accordance with permits issued by CWRM:

- Well Construction Permit - construction and testing of any well
- Pump Installation Permit - installation of a pump and pumping equipment in any well
- Water Use Permit - use of water in any Groundwater Management Area

Because of its moderate salinity, Ewa Caprock water had been a long-standing source of irrigation for sugarcane lands in the Ewa Plain from the late 1800s. The caprock aquifer was considered fully exploited in the 1930s when Ewa Plantation drilled approximately 70 artesian wells (Analytical Planning Consultants, 1999). Though it is effectively separated from contact with the basal aquifer, the Ewa Caprock Aquifer receives fresh groundwater from leakage of the underlying basal aquifer. It is recharged through infiltration of rainfall and/or excess irrigation water (Visher and Mink, 1964).

Based on the DLNR's groundwater database (obtained April 2002), major permit holders in the Ewa caprock region include the Estate of James Campbell, the U.S. Navy, Coral Creek Golf Course, Kalaeloa LP, Chevron USA, Seibu Hawaii (Prince Golf Course), and Gentry Properties (refer to Appendix B for listing of wells). The database indicates that primary uses of the 160 wells in this region are under the classifications of irrigation and industrial, although roughly one-third of the wells are reported as unused and sealed.

Cutbacks in the region's agricultural operations and the lack of new sources of irrigation recharge have relinquished the Ewa Caprock Aquifer as a significant future source of nonpotable water. Due to concerns about declining caprock and basal water quality, there has been a restriction in the number of well drilling permits and the amount of groundwater withdrawn from the caprock aquifer (Belt Collins Hawaii, 1999). In addition, since 1993, permits have been issued with limited duration as a result of looming uncertainties in the caprock's sustainable yield (Belt Collins Hawaii, 1999).

Thus, the BWS does not foresee the development new brackish wells or well fields in the Ewa-Kapolei area as a significant source of nonpotable water. Any additional supply will be developed in the form of R-1 water and is contingent on expansion of both the R-1 process at Honouliuli WRF and the secondary treatment process at Honouliuli Wastewater Treatment Plant (WWTP). Funding for expansion of both these facilities are still being programmed in the City and County of Honolulu's 6-year capital improvement program (CIP) budget and separate environmental assessments will be prepared for each of these projects.

Instead, existing brackish supplies may serve as backup nonpotable water sources, which can be blended with R-1 water on an as-needed basis during periods of high demand. Existing brackish wells are located at the following golf courses: West Loch Golf Course, Hawaii Prince, Kapolei, Coral Creek, and New Ewa Beach. Brackish wells are also located in Kapolei Villages and the City of Kapolei. Blended water will be classified and regulated as R-1 water if/when brackish water is mixed with R-1 water.

2.2 EXISTING AND PROJECTED NONPOTABLE WATER DEMANDS

Prior to projecting nonpotable water demands, potential users were identified and located. According to the *Ewa Non-Potable Water Master Plan* (R.M. Towill Corporation, 2004) the geographical areas under consideration for reuse were based on the following concerns raised by the Department of Wastewater Management (1995):

a. The proximity of the area to the Honouliuli Water Recycling Facility
b. The general scarcity of potable and/or non-potable water within the area
c. The determination that reclaimed effluent can be used to satisfy non-potable water demands in the area
d. The reuse site location in relation to the Ewa Caprock which overlays and protects the potable basal aquifer
e. The reuse site location in relation to the DOH Underground Injection Control and BWS No-Pass Lines

Irrigation for parks, golf courses and roadway landscaping, and other common area will have priority for effluent reuse. The BWS, however, will continue to explore other

non-irrigation uses, such as toilet flushing in new commercial projects approved by the DOH and at such time that the City and County of Honolulu has adopted provisions in the plumbing code pertaining to dual water plumbing in buildings.

The master plan also explains that CWRM well permittees in the Puuloa and Kapolei Sectors of the Ewa Caprock Groundwater Management Area are potential customers of R-1 water, because historically they have been allowed to pump only 6.0 MGD, but in fact have applied for 16.8 MGD in their permit applications (R.M Towill Corporation, 2004). Golf courses and parks are typical land uses in this area, which are suitable R-1 uses. Moreover, groundwater at the Ewa and Onelua Beach parks are too saline for landscape irrigation and can benefit from other nonpotable sources (George A.L. Yuen and Associates, 1996). Thus, R-1 water could satisfy future needs.

On the other hand, the permittees in the Malakole Sector, which are located primarily in the vicinity of Campbell Industrial Park, are presently using nonpotable water for different purposes. Since various permittees in this sector use groundwater for cooling towers, they would are more likely prefer RO water for specific industrial needs.

2.2.1 Existing Average Daily Demand

Current nonpotable water demand in the Ewa region have been furnished as follows in the *Ewa Non-Potable Water Master Plan* (R.M. Towill Corporation, 2004):

TABLE 2-1. EXISTING NONPOTABLE WATER DEMAND

User	Average Daily Demand (MGD)
R-1 Demand (Regulated)	
Coral Creek Golf Course	0.7000
Ewa Villages Golf Course	1.0000
Hawaii Prince Golf Course	1.0000
Kapolei Golf Course	0.5000
West Loch Golf Course	1.0000
Fort Weaver Road Irrigation	0.1661
Honouliuli WWTP	2.0000
Ewa Mahiko Community Park	0.1617
Subtotal - R-1 Demand	6.5278 MGD
RO Demand (Non-Regulated)	
AES Hawaii (Power Plant)	0.1446
Chevron	0.4494
Citizen Gas	0.0488
Kalaeloa Partners	0.5486
Tesoro Hawaii (Refinery)	0.3244
Subtotal - RO Demand	1.5158 MGD

User	Average Daily Demand (MGD)
*Brackish Demand**	
Villages of Kapolei	0.8096
Ko Olina Golf Course	0.6936
Ko Olina Property Development	1.2963
City of Kapolei	0.5000
Subtotal - Brackish Demand	3.2995 MGD
Total Existing Demand (R-1, RO, and Brackish)	11.3431 MGD

*Blended water will be regulated as R-1 water if/when brackish water is blended with R-1 water.

In addition to the R-1 and RO demands shown above, there are three interim brackish nonpotable water systems that are currently in use - Ko Olina, City of Kapolei and Villages of Kapolei (refer to Figure 2-1). These brackish systems will eventually be connected to the R-1 system, though they may still serve as backup sources during periods of high demand. Brackish water blended with R-1 water will be classified as R-1 water, and thus, will be regulated by DOH.

- Ko Olina is currently being serviced by the existing Barbers Point 215' Reservoir, which is supplied by two brackish wells. Ko Olina's nonpotable uses include irrigation of various landscaped areas and the golf course. The BWS will eventually connect this reservoir during Phase 1 - at that time the Ko Olina system will be part of the R-1 system.

- The City of Kapolei's nonpotable water system is partially completed, and brackish water is being delivered along Kamokila Boulevard in the vicinity of Haumea, Wakea and Manawai Streets (R.M. Towill Corporation, 2004).

- Similarly, part of the Villages of Kapolei is currently served by two 1.0 million gallon (MG) capacity reservoirs and two brackish wells. This separate system is presently maintained by the State of Hawaii. Both the City of Kapolei and the Villages of Kapolei systems will be converted to R-1 water service during Phase 1.

2.2.2 Projected Demands

The Board of Water Supply's *Ewa Non-Potable Water Master Plan* (R.M Towill Corporation, 2004) establishes three phases of nonpotable water system expansion which are dependent upon expansion of both Honouliuli WWTP and Honouliuli WRF:

- Phase 1 - Present to 2009
- Phase 2 - 2010 to 2014
- Phase 3 - 2015 and beyond

Increases in future nonpotable water demand will be exclusively R-1 water (refer to Table 2-2). Initially, this increase is projected at 3.7 MGD in Phase 1, while the largest boost is expected during Phase 2 adding 9.8 MGD. The additional demand during Phase 3 is contingent on whether the Navy Blast Zone is going to be serviced by the Honouliuli WWTP (R.M. Towill Corporation, 2004). Based on present figures, the projected use by the Navy Blast Zone would account for roughly one-half of the increase in demand during Phase 3.

The majority of the new demand over the three phases will be used for irrigation of golf courses, parks, schools (including UH West Oahu), and roadway landscaping. More detailed discussion on the proposed expansion of the nonpotable waterline network that will serve the new customers is provided in Section 2.3.2. Table 2-2 lists the new R-1 users and their projected demands that are expected to be added during the three phases of the project. In addition, Figure 2-1 indicates the potential water reuse areas associated with the existing nonpotable water system and the proposed expansion. It should be noted, however, that the proposed nonpotable water line alignments and sizes, as well as reservoir sites and capacities, are based on projected user locations and demands. These are subject to change by the BWS during the preliminary engineering and design stages, pending actual user development schedules.

TABLE 2-2. PROPOSED ADDITIONS OF R-1 NONPOTABLE WATER DEMAND

PHASE	USER	Average Daily R-1 Demand (MGD)
1	Barbers Point Golf Course	0.5000
1	*City of Kapolei	0.5000
1	Grace Pacific	0.2500
1	*Villages of Kapolei	0.8096
1	New Ewa Beach Golf Course	0.6000
1	Ocean Pointe Golf Course (260 acres)	1.0608
	Subtotal for Phase 1 Additions	**3.7204**
2	**Ko Olina Golf Course	0.6936
2	Campbell Schools (3)	0.1059
2	City of Kapolei	0.3780
2	East Kapolei Detention Basins 1 and 2	0.7000
2	Ewa Beach Community Park	0.0537
2	Ewa Beach Elementary School	0.0159
2	Ewa Beach Park	0.0199
2	Ewa Elementary (8 acres, 770 students)	0.0231
2	Ocean Pointe District Park (20 acres)	0.0816

Table 2.2 (Cont.)

PHASE	USER	Average Daily R-1 Demand (MGD)
2	Geiger Park	0.0408
2	Ocean Pointe Development (4,850 units)	0.3180
2	Island Ready Mix	0.0800
2	Kaimiloa Elementary School	0.0234
2	Kalaeloa Regional Park (Kapolei Community Development Park)	2.448
2	Kapolei Business Park	2.3400
2	**Ko Olina Property Development	1.2963
2	Oneula Beach Park	0.1224
2	Parks	0.0628
2	Puuloa Neighborhood Park	0.0177
2	UH West Oahu Campus (East Kapolei)	0.7344
2	Additional Villages of Kapolei	0.2030
	Subtotal for Phase 2 Additions	**9.7585**
3	Aloun Farms (Campbell East Kapolei)	2.2032
3	Navy Blast Zone Area	2.6125
	Subtotal for Phase 3 Additions	**4.8157**
	TOTAL ADDITIONS (Phases 1 - 3)	**18.2946**
	ULTIMATE R-1 DEMAND	**24.8224**
	ULTIMATE R0 DEMAND	**1.5158**
	ULTIMATE NONPOTABLE WATER (RO & R-1) DEMAND	**26.3382**

*City of Kapolei and Villages of Kapolei convert from brackish water to R-1 water in Phase 1.

**Ko Olina Golf Course and Property Development convert from brackish water to R-1 water in Phase 2.

Note: No additional RO and brackish demands in Phase 1, 2 and 3.

Source: *Ewa Non-Potable Water Master Plan* (R.M. Towill Corporation, 2004) and *Ocean Pointe Nonpotable Water Master Plan* (The Limtiaco Consulting Group, 2003)

2.3 INFRASTRUCTURAL COMPONENTS

2.3.1 Existing System Infrastructure

2.3.1.a Honouliuli Water Recycling Facility

The Honouliuli WRF receives secondary treated wastewater effluent supplied by the WWTP and processes up to 12.0 MGD for reuse. Two parallel liquid stream treatment process schemes are in operation at the Honouliuli WRF which produce the two grades of nonpotable water. Schematic diagrams for both processes are shown in Figure 2-3.

R-1 treatment consists of a direct filtration process in which polyaluminum chloride is used as a coagulant added to the rapid mix tanks and vigorously mixed using vertical shaft mixers. The wastewater then flows into flocculation tanks which brings particles into contact so that they will collide, stick together as floc and reach a size that will readily settle. The coagulated floc material is then removed in a sand filter. Filtrate from the clear will is then taken to the ultraviolet disinfection system, which inactivates potential disease-causing pathogenic bacteria. The disinfected water is then stored onsite in one of two 1 MG tanks before being pumped into the R-1 distribution system. R-1 treatment meets the Hawaii Department of Health's *Guidelines for the Treatment and Use of Recycled Water* (2002), also known as the "reuse guidelines" for R-1 water. R-1 water is being used primarily for irrigation.

RO treatment uses reverse osmosis (RO) with continuous micro-filtration (CMF) as the method of treatment. Upon entering the WRF, the wastewater is first pre-filtered through self-cleaning strainers (approximately 500 microns screens) to remove debris that could severely impact downstream processes. The pre-filtered wastewater is then run through the US Filter CMF system which uses a 0.2 micron hollow fiber membrane. Filtrate from the CMF is then fed into the RO units. Basically, reverse osmosis is a diffusion technique that uses a semipermeable membrane as a barrier to dissolved salts. Pressure is applied to the more concentrated solution on one side of the semipermeable membrane and forces pure water through leaving the salts behind. The pure RO water is then stored onsite in a separate RO storage tank before being pumped out through the RO distribution system. Currently there is no RO water classification in the DOH reuse guidelines. As such, RO water is not regulated by the DOH.

2.3.1.b Existing Distribution Systems

❖ *Existing RO and R-1 Distribution Systems*

The existing RO and R-1 distribution systems include separate lines for each grade of water. The systems were designed to operate within a pressure range of 40 to 80 PSI (Analytical Planning Consultants, 1999). RO and R-1 water are delivered to customers based upon water level in their storage tanks. As the water level drops, the WRF pumps begin pumping and a supply valve is electronically opened to fill the storage tank. Each customer has a flow control and meter at the point of delivery. The flow control valve is motorized and enables automatic start and stop of flow to the customer.

Valve position is controlled by the WRF's electronic supervisory control and data acquisition (SCADA) system.

All present and future RO users are located at the Campbell Industrial Park (CIP). The existing RO distribution system consists of approximately 5 miles of 14-inch and 3 miles of 10-inch polyvinyl chloride (PVC) pipe conveying approximately 1 MGD of industrial quality water to RO users at the CIP. The 14-inch PVC line exits the Honouliuli WRF towards the west and follows the Oahu Railway right-of-way (ROW) towards the Villages of Kapolei, past the City of Kapolei in the direction of the drainage ditch on the east boundary of CIP (refer to Figure 2-1). The 14-inch RO line then turns south and feeds a 0.7 MG storage tank in CIP. The RO tank allows for 70 PSI at peak flows (R.M. Towill Corporation, 2004). A 10-inch discharge line from the RO tank heads south and turns west on Olai Street. This line serves two RO users - the AES Power Plant and the Tesoro Refinery.

The existing R-1 distribution system spans both east and west of the Honouliuli WRF. There are presently two PVC R-1 lines exiting the WRF. Both head west in the same direction as the RO line. One of the R-1 lines is a 16-inch PVC line that is currently inactive. This inactive line follows the same alignment as the RO line. It continues towards the existing drainage ditch on the east boundary of CIP. There the line splits into a 16-inch stub at Kalaeloa Boulevard and a 12-inch pipe which turns south following the same alignment as the RO line described above.

A second R-1 line, 20-inch PVC, presently delivers R-1 water to the Villages of Kapolei, the Fort Weaver Road irrigation area, and the golf courses at Kapolei, Ewa Villages, West Loch, Coral Creek, and the Hawaii Prince. This line also runs west as it exits the WRF, however, it turns north within the City and County of Honolulu's easements along the future North-South Road (refer to Figure 2-1). The 20-inch line then makes another turn heading east at the makai boundary of the Ewa Villages golf course. There it is also reduced to a 16-inch line and continues towards the southeast boundary of the golf course. The line splits into two 12-inch lines, one serving the Ewa Villages Golf Course and another that continues towards Fort Weaver Road. The 12-inch line then heads north on Fort Weaver Road, continuing on towards the West Loch Golf Course. At this junction on Fort Weaver Road, an abandoned 16-inch water main in Fort Weaver Road was converted and connected to the 12-inch nonpotable R-1 line by the BWS. This has allowed service to the Hawaii Prince Golf Course. In addition, a 16-inch stub has been provided for the Ocean Pointe's (Ewa Marina) District Park.

The existing R-1 and RO distribution systems installed by US Filter were designed in accordance with the following standards and specifications (Analytical Planning Consultants, 1999):

- Design Standards of the Department of Wastewater Management, Volumes I and II, City and County of Honolulu, 1984 and 1993.

- Water Systems Standards, Volumes, I, II and III, City and County of Honolulu, 1985.
- American Water Works Association (AWWA) C900 - Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 in. through 12 in., for Water Distribution
- AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 14 in. through 48 in., for Water Transmission and Distribution.
- American Society for Testing Methods (ASTM) D1869 - Rubber Rings for Asbestos Cement Pipe.
- American National Standards Institute (ANSI) A21.10 - Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water.
- ANSI A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

❖ *Existing Nonpotable (Brackish) Water Distribution System*

As mentioned previously, even after they are converted to the R-1 system, existing brackish water supplies may serve as backup sources, which can be blended with R-1 water as needed during periods of high demand. Ko Olina is presently receiving brackish water for irrigation of their golf course and other roadway and common landscaped areas. This system is served by the existing Barbers Point (West Beach) 215' nonpotable reservoir (refer to Figure 2-1). Two brackish wells are supplying the reservoir during the interim period. A 24-inch transmission main is routed from the reservoir to Farrington Highway. At the highway, the main is reduced to a 16-inch line which travels west along Farrington Highway toward Ko Olina. The line is again reduced along Aliinui Drive to a 12-inch main which also provides 8-inch stub-outs at each of the connecting roads.

The Villages of Kapolei is also supplied by interim brackish wells. The 12-, 14- and 16-inch diameter transmission mains convey nonpotable water from the reservoirs in the northerly direction along the Navy boundary line. The 12- and 14-inch lines continue in the westerly direction along Kapolei Parkway before being reduced to an 8-inch line. Nonpotable brackish water is being used for irrigation of existing developments in the area on an interim basis. The reservoirs and transmission infrastructure have been designed to accommodate future nonpotable demands.

Twelve-inch mains of the partially completed nonpotable system in the City of Kapolei are also being supplied on an interim basis by brackish wells. The 12-inch lines along Kamikola Boulevard have been constructed with lateral connections along portions of Haumea, Wakea and Manawai Streets (R.M. Towill Corporation, 2004). The wells are located nearby at the intersection of Kapolei Parkway and Kamokila Boulevard.

2.3.2 Proposed Infrastructure

As mentioned previously, the Board of Water Supply's *Ewa Non-Potable Water Master Plan* (R.M. Towill Corporation, 2004) establishes three phases of nonpotable water system development which are dependent upon expansion of both Honouliuli WWTP and Honouliuli WRF. The following section described the work that is being planned for the distribution and storage systems under each of the three phases. However, it should be noted that the proposed nonpotable waterline alignments and sizes, as well as reservoir sites and capacities, are based on projected user locations and demands. These are subject to change by the BWS during the preliminary engineering and design stages, pending user development schedules.

2.3.2.a Proposed Expansion of Distribution System

Phase 1 - Present to 2009

Significant nonpotable water main construction will commence during Phase 1. The following are identified in the master plan:

- Existing Barbers Point 215' Reservoir (1.5 MG capacity) servicing Ko Olina and the City of Kapolei will be connected to an existing junction of a 20-inch slip lined waterline and a16-inch waterline on Farrington Highway.

- 36-inch waterline from Palailai Interchange along Old Farrington Highway and existing dirt road.

- 16-inch waterline from Kapolei Parkway to the Oahu Railway ROW servicing Campbell Industrial Park.

- 24-inch waterline along existing dirt road to intersection of Kalaeloa Boulevard and Kapolei Parkway.

- 10-inch waterline along Malakole Street off of the existing 12-inch main, which will connect Grace Pacific.

- 16-inch waterline off of an existing 16-inch main on Geiger Road, which will service the Barbers Point Golf Course.

- 16-inch waterline connecting to an existing 16-inch stub at Kalaeloa Boulevard to service the City of Kapolei (nonpotable wells may then be reserved for backup capacity).

- Upon transfer from the State of Hawaii, existing brackish waterlines serving the Villages of Kapolei will be converted to R-1 services through an existing connection at the Kapolei nonpotable reservoirs (nonpotable wells may then be reserved for backup capacity). At this time, the blended water will be classified and regulated as R-1 water by the DOH.

- 16-inch waterline from Renton Road to existing 16-inch main serving the Villages of Kapolei and the Kapolei Golf Course to allow flexibility in serving these users.

- 16-inch waterline from Fort Weaver Road to Kapolei Parkway.

- 30-inch and 24-inch waterline from Honouliuli WRF through Geiger Road to Kapolei Parkway.

- 20-inch and 12-inch waterlines from Geiger Road to Haseko Ocean Pointe.

- 12-inch waterline from Fort Weaver Road through Hawaii Prince Golf Course to serve the New Ewa Beach Golf Course.

Phase 2 - 2010 to 2014

The majority of the proposed nonpotable R-1 water system will be constructed by the Board of Water Supply during Phase 2 of the project. The following infrastructure are to be completed within the five-year period of the project's second of three phases (R.M. Towill Corporation, 2004):

- 30-inch waterline will run from the Honouliuli WRF through the WWTP site to Geiger Road, where it will split into a 24-inch and a 20-inch line. The 20-inch line will run west to service the Kalaeloa Regional Park. The other will run parallel with the existing 16-inch east on Geiger Road.

- 12-inch waterline will connect to the existing 20-inch line and run along Renton Road connecting to the existing 16-inch line in Fort Weaver Road. This new line will serve parks and schools.

- 16-inch waterline will connect to the existing 20-inch line and continue along the easement for the future North-South Road. This north bound 16-inch line will service the East Kapolei Detention Basins, Aloun Farms, and the Future UH West Oahu.

- Network of 8-inch and 12-inch waterlines will connect to the existing 16-inch line on Kapolei Parkway to service the City of Kapolei and Villages of Kapolei.

- Network of 8-inch through 24-inch waterlines in the Kapolei Business Park will connect to the existing 16-inch stub on Kalaeloa Boulevard. A 12-inch line will also run from the business park south through Campbell Industrial Park.

- Two reservoir sites - total capacity of 10.0 MG

The Barbers Point 215' Reservoir No. 2 will be constructed near the existing Barbers Point 215' Reservoir with an influent/effluent line connecting to the 20-inch slip-lined waterline (former 24-inch line) in Farrington Highway. The primary service areas of this reservoir will be the City of Kapolei.

The North-South 215' Reservoir will be located mauka of the H-1 Freeway at the former UHWO Campus site. A 24-inch influent/effluent line to the reservoir will connect to a 16-inch line constructed during Phase 2 along North-South Road. This reservoir will improve service at higher elevations, including mauka areas of East Kapolei.

Phase 3 - 2015 and Beyond

According to the *Ewa Non-Potable Water Master Plan* (R.M. Towill Corporation, 2004), Phase 3 represents the ultimate build-out for the nonpotable water system in Ewa. The following are the proposed developments scheduled for Phase 3:

- 16-inch waterline off of the 16-inch main on North-South Road, which will serve the Aloun Farms.
- If acquired, the U.S. Navy's existing 8-inch fuel line will be converted to a nonpotable line servicing the Navy Blast Zone.
- Additional reservoir capacity of 5.0 MG must be constructed to handle the expected increase in average day demand.

2.3.2.b Basis of Analysis and Design

Hydraulic analysis for the nonpotable system was done as part of the *Ewa Non-Potable Water Master Plan* by R.M. Towill Corporation (2004). All new waterlines were assumed to be of polyvinyl chloride (PVC) construction. It was also assumed that high density polyethylene (HDPE) would be the material used for slip-lining of existing lines. The CYBERNET program developed by Haestad Methods was used for the analysis with a C value of 150 for PVC and HDPE waterlines.

The *Ewa Non-Potable Water Master Plan*, R.M. Towill Corporation (2004) has generally followed average water average daily demand factors and peaking factors established in the preceding *Ewa Water Master Plan* (Belt Collins and Associates, 1987). The various criteria used for pipe sizing and storage requirements are summarized in the following table:

TABLE 2-3. PROPOSED NONPOTABLE WATER DESIGN CRITERIA

1. Average Day Demand Factor. For land uses to be served by a dual system, a 1.2 factor is applied to the AVERAGE WATER USE rates to derive the AVERAGE DAY DEMAND. For land uses served only by potable system, AVERAGE WATER USE and AVERAGE DAY DEMAND are identical.
2. Peak Hour Demand Factors
   a. PEAK HOUR RATE = 3.0 x AVERAGE DAY DEMAND for all other areas that will rely on BWS storage but can irrigate over a 12-hour period (MAX FACTOR =1.5)
   b. PEAK HOUR RATE = 2.0 x AVERAGE DAY DEMAND for golf courses and agricultural areas that will rely on BWS storage but can irrigate over a 16-hour period (MAX FACTOR =1.33)
   c. PEAK HOUR RATE = 1.5 x AVERAGE DEMAND for golf courses, urban areas and agricultural lands with storage or uses such as cooling towers that can receive reclaimed water over a 24-hour period (MAX FACTOR = 1.5)
3. Fire protection can be met in either the potable or non-potable system subject to meeting all present fire protection standards.
4. Reservoir Size
   a. The non-potable reservoir volume shall be equivalent to AVERAGE DAY DEMAND.
   b. Existing storage capacity at the Hawaii Prince, Kapolei, West Loch, Ewa Villages, Ko Olina, and Coral Creek Golf Courses will be considered as part of the system storage requirement in Phase 1.
5. Potable and nonpotable pipelines shall be sized for PEAK HOUR flow rates with a minimum residual pressure of 40 PSI or determined by the BWS Manager and Chief Engineer. Maximum velocity in the mains shall not exceed 8 feet per second. Hydraulic analyses will utilize tank spillway elevations as the initial hydraulic grade line elevations. Hydraulic analyses will use three-quarters full tank water surface elevations as initial hydraulic grade-line elevations. Maximum static pressure of 125 PSI.
6. Well pumps for potable & nonpotable systems shall provide MAXIMUM DAY in an operating time of 16 hrs.
7. For the Navy Blast Zone 5,000 GPD/acre is used for nonpotable water irrigation as stated in the *Water Systems Standards* for the island of Maui.
8. Nonpotable demands for industrial users are based on the US Filter water audit and current RO demands and current RO demands.

Source: *Ewa Non-Potable Water Master Plan* (R.M. Towill Corporation, 2004).

To the extent possible, the proposed distribution system will be identified designed in accordance with the *Water System Standards* (BWS, 2002). Although, it is recognized that the underlying premise of the master plan (R.M. Towill Corporation, 2004) was to permit deviations from the current standards, since they are intended for potable

water systems. In particular, the following exceptions have been identified in the master plan: (1) maximum velocity in water mains without fire flow was increased to 8 feet per second (FPS) instead of 6 FPS in order to reduce residence time in the nonpotable lines; (2) peak factors were also adjusted because nonpotable water is commonly drawn in set blocks of time as opposed to continuous draw in the case of potable water; (3) minimum residual pressure for peak hour flow may be reduced to below 40 PSI as determined by the BWS Manager and Chief Engineer, since some nonpotable users install a private booster pump to increase onsite water pressure as necessary.

2.3.2.c Storage Capacity of Nonpotable Reservoirs

When the Secondary Urban Center becomes fully developed, the total nonpotable water minimum storage requirement will be 26.2 MG. This requirement was determined based on the average daily water demand for the entire Ewa region (R.M. Towill Corporation, 2004). At present two nonpotable reservoirs are serving the Ewa system - a 1.5 MG reservoir at Barbers Point and a 5.0 MG tank at the Honouliuli WRF. As mentioned previously, the Phase 1 system storage requirement will be fulfilled by available storage capacities at existing golf courses in the region.

Additional reservoir storage capacity will have to be constructed as shown in Table 2-4 below; however, it should be noted that reservoir sites and capacities are subject to change by the BWS, pending actual nonpotable water user development schedules. Site specific feasibility studies will be conducted for each new nonpotable reservoir site along with the preparation of a separate environmental assessment based on the feasibility study.

TABLE 2-4. PROPOSED SYSTEM STORAGE REQUIREMENTS

Site	Existing Available Capacity (MG)	Required Additional Capacity (MG)	Status
Barbers Point 215'	1.5	—	Existing brackish/ R-1 connection in Phase 1
Honouliuli WRF	5.0	—	Existing/Phase 1
Existing golf courses	5.0	—	Existing/Phase 1
North-South 215' & Barbers Point 215' No. 2	—	10.0	Proposed Phase 2
To Be Determined	—	5.0	Proposed Phase 3
PROJECTED ULTIMATE BUILD-OUT = 26.5 MG			

2.4 PRELIMINARY COST ESTIMATE

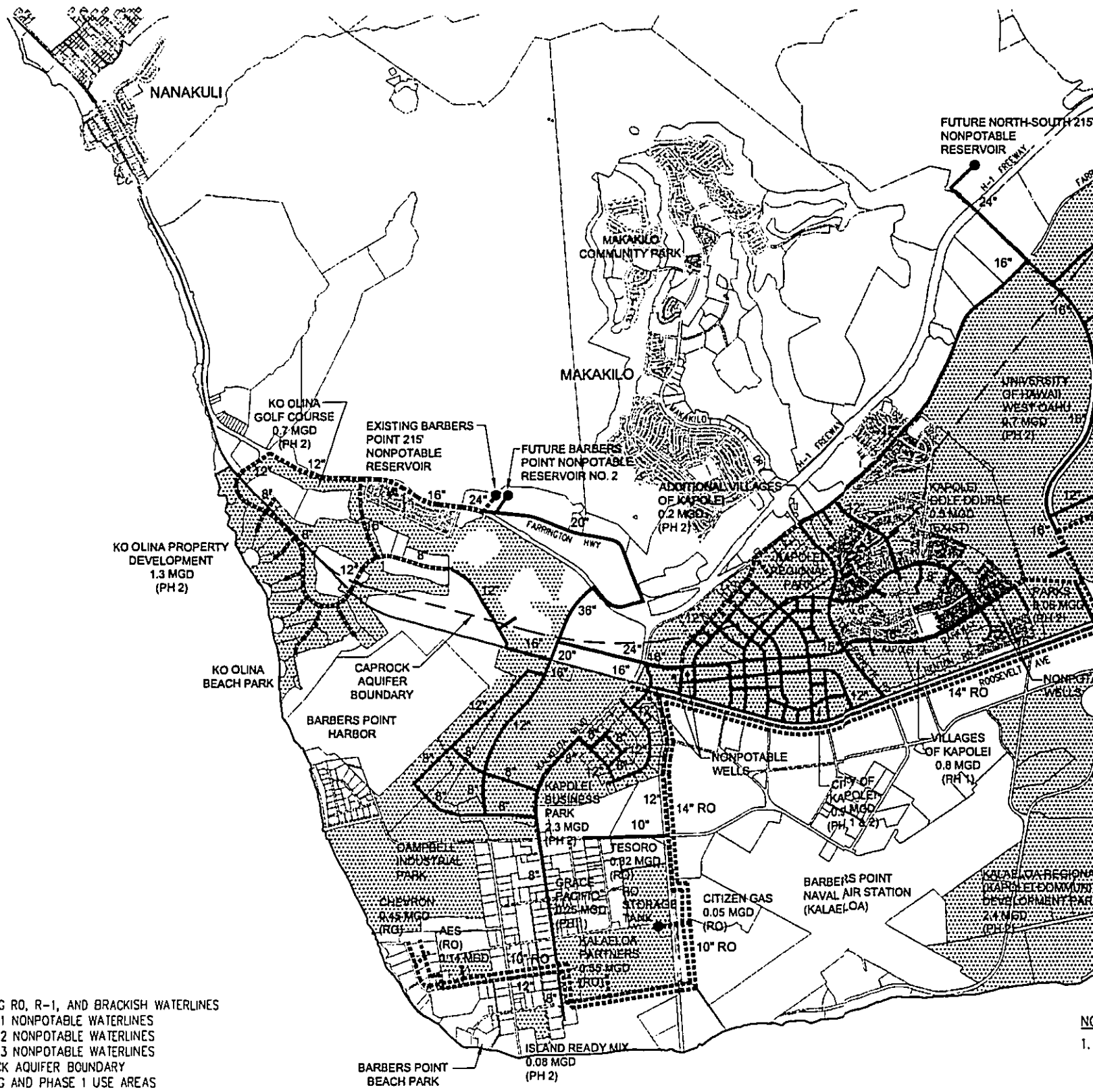
The preliminary estimated construction cost of the proposed Ewa nonpotable distribution system (not including pumping) is about $110 million over the three phases as summarized below (refer to Appendix C for Preliminary Construction Cost Estimate). These cost estimates, however, are subject to change should there be modifications in waterline alignments and sizes by the BWS during the preliminary engineering and design stages.

In the short-term, labor costs associated with a project of this magnitude will provide a positive economic impact on the construction industry. In the long run, the expansion of the nonpotable water system will support planned economic growth and development in the Ewa district, reserving potable water for drinking water requirements and allocating nonpotable water to irrigation and industrial needs.

TABLE 2-5. SUMMARY OF PRELIMINARY CONSTRUCTION COSTS

Phase 1	
Subtotal Phase 1	$9,855,000
Reservoirs	0
Subtotal Phase 1	$9,855,000
Phase 2	
Waterlines	$42,816,000
Reservoirs	36,000,000
Subtotal Phase 2	$78,816,000
Phase 3	
Waterlines	$3,392,000
Reservoirs	18,000,000
Subtotal Phase 3	$21,392,000
TOTAL	
Waterlines	$56,063,000
Reservoirs	54,000,000
Total Phases 1 through 3	$110,063,000

SCALE: 1" = 4000'	PREPARED FOR:	EXPANSION OF THE EWA NONPOTABLE WATER SYSTEM EN
CAD DRAWING: 2838WATER2	Board of Water Supply City and County of Honolulu	EXISTING AND POTENTIAL WATER R
DATE: SEPT 13, 2004		



LEGEND

- EXISTING RO, R-1, AND BRACKISH WATERLINES
- PHASE 1 NONPOTABLE WATERLINES
- PHASE 2 NONPOTABLE WATERLINES
- PHASE 3 NONPOTABLE WATERLINES
- CAPROCK AQUIFER BOUNDARY
- EXISTING AND PHASE 1 USE AREAS
- PHASE 2 USE AREAS
- PHASE 3 USE AREAS
- RESERVOIR
- NONPOTABLE WELL

NO
1.

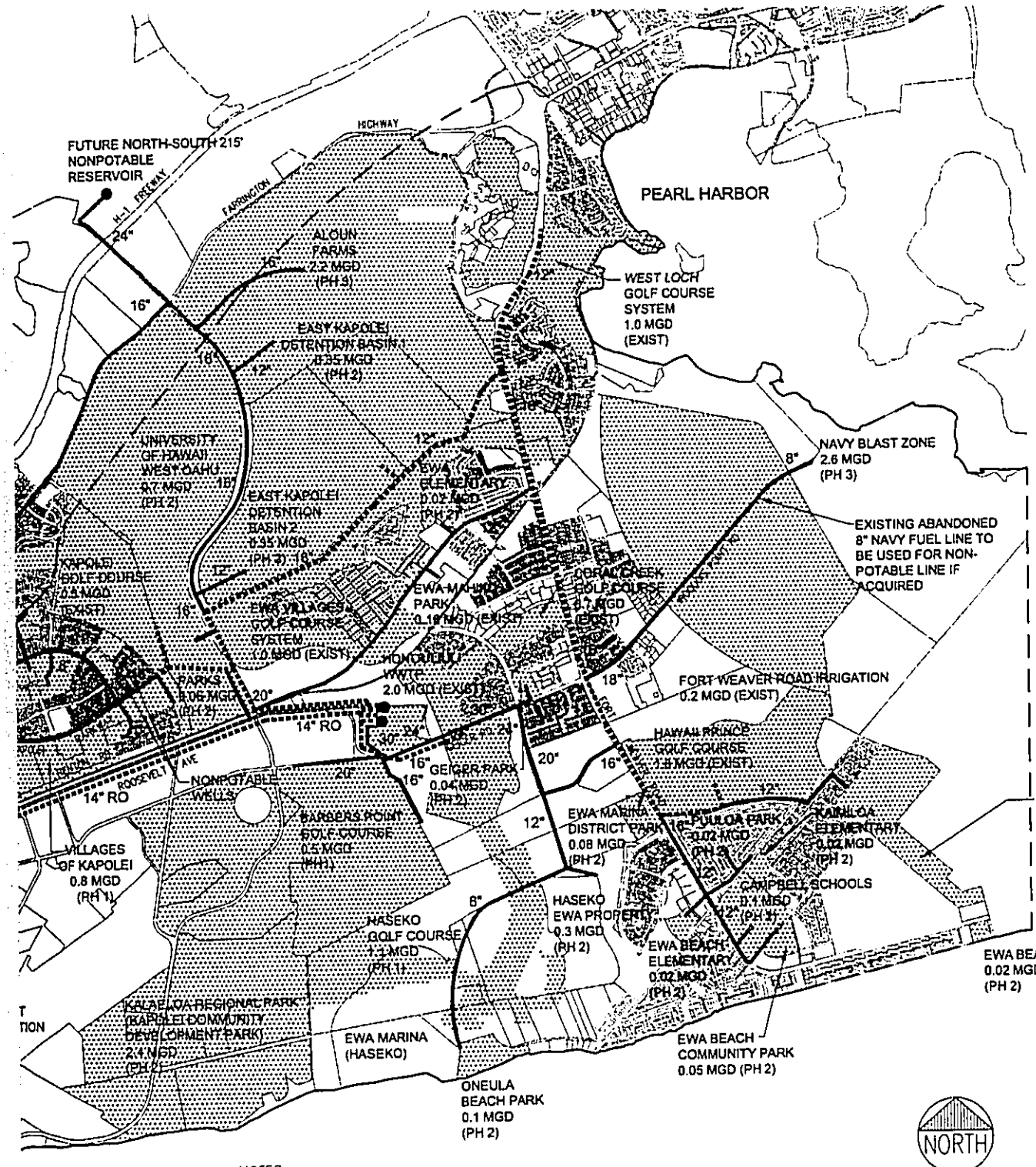
2.

.TER SYSTEM ENVIRONMENTAL ASSESSMENT

AL WATER REUSE AREAS

Gray·Hong·Nojima & Associates, Inc
CONSULTING ENGINEERS
841 Bishop Street Suite 1100

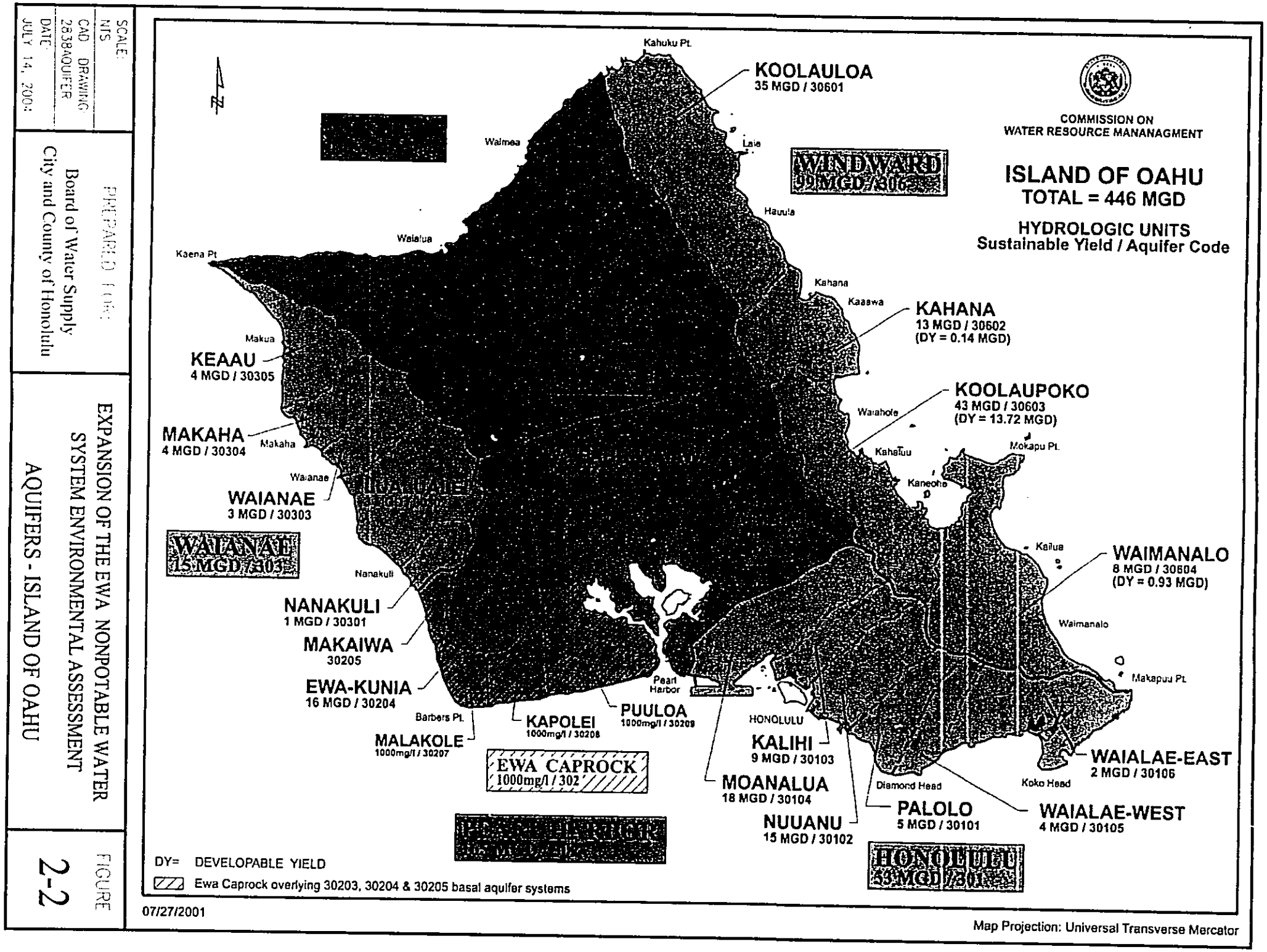
FIGURE
2-1



NOTES:

1. PROPOSED NONPOTABLE WATERLINE ALIGNMENTS AND SIZES AND FUTURE RESERVOIR SITES AND CAPACITIES ARE BASED ON PROJECTED USER LOCATION AND DEMAND, SUBJECT TO CHANGE BY BWS DURING PRELIMINARY ENGINEERING AND DESIGN STAGES.
2. PHASE NUMBER INDICATES START OF SERVICE.

SOURCE: R.M. TOWILL CORP. (2004)



SCALE: NTS
CAD DRAWING: 2838AQUIFER
DATE: JULY 14, 2003

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

EXPANSION OF THE EWA NONPOTABLE WATER SYSTEM ENVIRONMENTAL ASSESSMENT

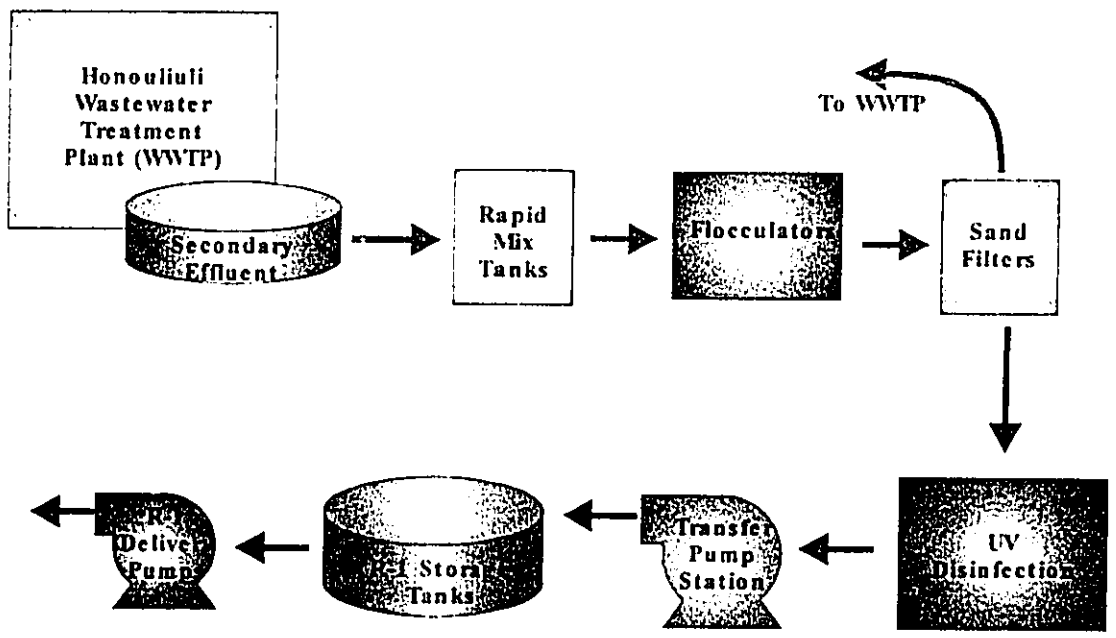
AQUIFERS - ISLAND OF OAHU

FIGURE 2-2

SCALE: NTS	PREPARED FOR:	EXPANSION OF THE EWA NONPOTABLE WATER SYSTEM ENVIRONMENTAL ASSESSMENT	FIGURE
CAD DRAWING: R1RO PROCESS	Board of Water Supply City and County of Honolulu	R-1 & RO PROCESSES AT HONOULIULI WATER RECYCLING FACILITY	2-3
DATE: SEPT 13, 2004			

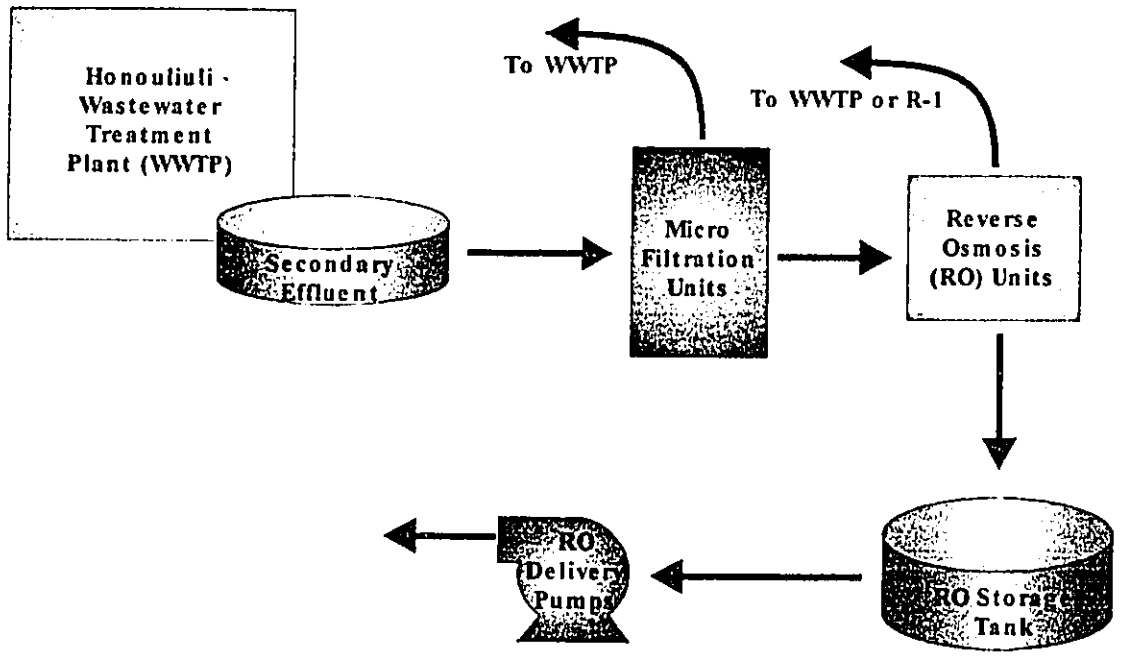
R-1 Process

High Quality Water for Irrigation (Regulated by Department of Health)



RO Process

High Quality Water for Industry (Not Regulated by Department of Health)



SOURCE: CITY AND COUNTY OF HONOLULU, BOARD OF WATER SUPPLY (2002)

CHAPTER THREE

DESCRIPTION OF THE AFFECTED ENVIRONMENT AND PROPOSED MITIGATIVE MEASURES

3.1 THE PHYSICAL ENVIRONMENT

3.1.1 Topography and Soils

Existing Conditions:

The proposed expansion of the Ewa nonpotable water system will traverse the entire Ewa Plain. Extending from Campbell Industrial Park to the Navy Blast Zone, the proposed project site is relatively flat with mild slopes up to 3 percent. The only areas in which the nonpotable water lines would encounter considerable slope are mauka of the H-1 Freeway in the vicinity of the proposed reservoir sites - the North-South 215' site and the Kapolei 215' site near Puu Palailai (west of Makakilo). The slopes in these two areas are likely to exceed 10 percent. As such, transmission and distribution lines mauka of the freeway toward the proposed the proposed reservoir sites are expected to reach the 200 feet elevation.

The *Soil Survey for the Islands of Kauai, Oahu, Maui, Molokai, and Lanai* (U.S. Department of Agriculture, 1972) identifies several soil classifications in the proposed project area which have been used in agricultural operations for sugarcane, truck crops, and pasture. In addition, the lowland areas include coral outcrop (CR), fill lands (Fd) filled with bagasse and slurry from sugar mills, and mixed filled lands (FL) filled with material dredged from the ocean or excavated from adjacent upland areas.

The areas in the vicinity of Campbell Industrial Park and Kapolei Business Park consists primarily of coral outcrop (refer to Figure 3-1 for Soil Classification Map). There are also pockets of Mamala stony silty clay loam (MnC, 0-2 percent slopes) and Ewa silty clay loam (EmA, 0-2 percent slopes). The Ewa and Mamala series are both well-drained soils with moderate permeability. Runoff tends to be slow and the erosion hazard ranges from slight (EmA) to moderate (MnC). The upper most reaches of the water system in this area will be in various clays and loams including Honouliuli clay (HxA, 0-2 percent slopes, and HxB, 2-6 percent slopes), Lualualei extremely stony clay (LPE, 3-35 percent slopes), Molokai silty clay loam (MuC, 7-15 percent slopes, and MuD, 15-25 percent slopes). The Honouliuli clay is also a well-drained soil with moderately slow permeability and slow runoff. The erosion hazard is no more than slight. As indicated, MuC and MuD are found in steeper areas where runoff is medium, and the erosion hazard is moderate to severe. Similarly, LPE is found on talus slopes, moderately sloping to steep. As the name implies, there are many stones in the surface layer, making this an impractical soil to cultivate. Runoff is medium to rapid, and the erosion hazard is also moderate to severe.

Soil types in the flat areas of the eastern half of the Ewa Plain below Farrington Highway (between West Loch and the Villages of Kapolei) is predominately Honouliuli clay (HxA and HxB), Mamala stony silty clay loam (MnC), and Ewa silty clay loam (EmA and EmB). The areas closer to the shoreline and military installations and shoreline, such as the Pearl Harbor and Barbers Point Naval Air Station, have been filled (FL and Fd) or remain as coral outcrop (CR).

The proposed waterline route along Farrington Highway between Fort Barrette Road and Palehua Road will encounter several soil types - Ewa silty clay loam (EaB, 3-6 percent slopes), Molokai silty clay loam (MuC), Honouliuli clay (HxA and HxB), and Ewa stony silty clay (EwA, 0-2 percent slopes). EwA and EaB are also part of the Ewa series described above. Permeability is moderate and the erosion hazard is light in the EaB type. The EwA also has very slow runoff, and the erosion hazard in no more than slight.

The Kawaihapai clay loam (KlB, 0-2 percent slopes), and Kawaihapai stony clay loam (KlaB, 2-6 percent slopes), Kawaihapai very stony clay loam (KlbC, 0-15 percent slopes), MuD, and HxA are found along the proposed nonpotable water pipeline route from Farrington Highway up to the proposed UHWO reservoir site. The Kawaihapai series consists of well-drained soils. Runoff is slow, and the erosion hazard is slight in both KlB and KlaB. KlbC can be found in steeper areas, with medium runoff and moderate erosion. Similarly the erosion hazard is slight along the lower slopes (KlA and KlB) and may become moderate at the higher slopes.

Environmental Impacts and Mitigation Measures:

The topography along the proposed waterline routes is relatively level except for the mauka most region above the H-1 Freeway where the nonpotable water mains would approach the proposed reservoir sites. For the most part, the Ewa Plain soil types identified above do not appear to be susceptible to erosion and runoff, except for the those mauka areas where soil types tend to be more stony with medium runoff and moderate erosion hazard.

According to the *Soil Survey* (U.S. Department of Agriculture, 1972), the Ewa, Molokai and Kawaihapai soils are generally suitable as a source of topsoil and road fill. However, significant concerns are not anticipated even with the remaining soil types that are considered poor sources. In all cases, trenching will be designed and constructed with the minimum 3-foot cover and appropriate backfill in accordance with the *Water System Standards* (2002).

3.1.2 Hydrology

Existing Conditions:

3.1.2.a Surface Water

There are no surface waters in the form of perennial stream flows throughout the proposed project site. In addition, the project area is not subject to contact with any

proposed or approved water body segments designated on the State of Hawaii 303(d) List of Water Quality Limited Waters.

The Ewa Plain does serve as a natural drainageway for runoff originating in the mountains of the Waianae Range during rainstorms. This runoff proceeds downgradient through normally dry gulches located mauka of the H-1 Freeway (refer to Figure 3-2). The following gulches traverse the proposed nonpotable water system and are designated as intermittent streams (USGS Ewa Quad Map for Oahu, 1983):

- Makaiwa Gulch
- Palailai Gulch
- Awanui Gulch
- Makakilo Gulch
- Makalapa Gulch
- Hunehune Gulch
- Kaloi Gulch

Environmental Impacts and Mitigation Measures:

The proposed project will not impact any perennial stream flows or channels. In addition, the proposed infrastructure will not come into contact with any 303(d) Water Quality Limited Waters, thus will not burden waters that are already impaired. The proposed nonpotable water line alignments, however, will cross natural and manmade drainageways, which are designated as intermittent streams (USGS Ewa Quad Map for Oahu, 1983).

Some of the proposed alignments will be located in areas that are already developed, while others in areas where developments are forthcoming. In either case, the proposed nonpotable waterlines will be designed within road rights-of-ways (ROW) to the extent possible, so as to confine the area of potential impact(s). Whether a particular alignment is located in an existing or future ROW, necessary approvals and permits will be obtained during planning and design phases covering federal, state, and county requirements for water quality and water resource issues. In addition, the contractor will be required to adhere to temporary erosion control best management practices during construction. Permits may include, but not be limited to, the following:

- NPDES General Permit Coverage
  - Construction Dewatering
  - Discharge of Stormwater Associated with Construction Activity (disturbed areas greater than or equal to one acre)
  - Discharge of Hydrotesting Waters
- Stream Channel Alteration Permit (SCAP)
- Department of the Army Permit
- Section 401 Water Quality Certification

Preliminary indications from the Department of Land and Natural Resources, Commission on Water Resource Management (CWRM) are that SCAPs will not be required based on the proposed alignments (correspondence of May 21, 2003). According to CWRM, the dry gulches at the proposed crossings are not considered streams because they are not natural watercourses and/or do not have sufficient flows to support instream uses.

In summary, compliance with current rules and regulations will ensure that the quality or quantity of surface water in the Ewa region is not compromised or diminished as a result of the proposed project. Applicable permits will be obtained by the BWS or contractor during the design or construction phase of the project. Construction activities are short-term and will be conducted in accordance with pertinent statutory and permit requirements. As such, significant impacts related to surface water courses are not anticipated.

3.1.2.b Groundwater

The Pearl Harbor Aquifer is one of three aquifer sectors in the Southern Oahu Aquifer as designated under the U.S. Environmental Protection Agency's Sole Source Aquifer Program (Analytical Planning Consultants, 1999). The proposed project area will be located in the lower coastal portion of the Waipahu-Waiawa and Ewa-Kunia systems in the western half of the Pearl Harbor Aquifer (refer to Figure 2-2). The two types of groundwater have been identified in the two systems as *basal* and *caprock* aquifers.

The basal aquifer which serves as the potable water source is formed where a thick layer or lens of fresh water floats on and displaces denser seawater within the pore spaces, fractures and voids of subsurface basalt rock. It is considered irreplaceable and highly vulnerable to contamination, ranging from 500 to 800 feet thick beneath the project area. According to Analytical Planning Consultants (1999, p. 4-12), "Recharge of the basal aquifer has been found to occur mainly in the high rainfall, highland area upgradient of the site via direct infiltration or temporary storage in dike compartments and subsequent percolation to the aquifer."

A second groundwater type also occurs in the coastal areas of the Ewa-Kunia and Waipahu-Waiawa systems known as the Ewa Caprock Aquifer (refer to Figure 2-2). The caprock aquifer consists of basal water that is confined by a wedge-like sediment barrier or caprock that has a highly permeable upper layer and relatively impermeable confining layer below. The caprock itself consists of a porous limestone strata and serves to restrict the seaward flow of the underlying basal groundwater. This allows the basal lens to be thicker than it would be without the caprock.

The caprock aquifer can be recharged by "fresh groundwater from leakage of the underlying basal aquifer and recharge from infiltration or irrigation water" (Visher and Mink, 1964). The quality of the caprock water in this area is dependent upon excess irrigation of the Ewa Plain because there is not enough natural recharge to sustain the existing and proposed demands. Unlike the basal aquifer, the caprock aquifer is

considered replaceable, though it is highly vulnerable to contamination (Analytical Planning Consultants, 1999).

Caprock water quality is generally brackish and not suitable for potable use (Kumagai, 1996). Over the years, the caprock salinity has been steadily rising from 500 to 900 mg/L chloride (George A.L. Yuen & Associates, 1989) and more recently up to 1,200 mg/l (Department of Wastewater Management, 1995). In their correspondence of July 25, 2000, it was confirmed that the Department of Health does not consider the Ewa Caprock to be a designated public drinking water aquifer.

Environmental Impacts and Mitigation Measures:

Impacts on the Ewa Caprock Aquifer may be considered in terms of outflows (pumping from wells) and returns (recharge). As for outflows, the BWS does not foresee the development new brackish wells or well fields in the Ewa-Kapolei area. The Ewa Caprock Aquifer cannot be regarded as a significant future source of nonpotable water, as all three sectors (Puuloa, Malakole, and Kapolei) are already committed for other uses. Thus, as mentioned previously, any additional nonpotable water supply will be developed in the form of R-1 water and is contingent on expansion of both the R-1 process at Honouliuli WRF and the secondary treatment process at Honouliuli Wastewater Treatment Plant (WWTP). Funding for expansion of both these facilities are still being programmed in the City's 6-year capital improvement program (CIP) budget and separate environmental assessments will be prepared for each of these projects.

In reality, recharge of the caprock aquifer is not expected to occur in any substantial amount. The major use of nonpotable water in this area will be for landscaping and golf course irrigation. According to the BWS, unlike the large return irrigation component of furrow irrigated sugar cane, it is expected that water reuse on landscaped areas, including golf courses would be at significantly reduced levels. Moreover, there would not be any economic advantage to over irrigate in any application. The irrigation or application rate is expected to be maintained at a level less than or equal to the vegetation's evapotranspiration rate. In addition, because of the Ewa Plain's predominately arid climate, it would be unusual to find gains from precipitation on a continuous basis.

The protection of the state's underground sources of drinking water and coastal waters is regulated via Title 11 of the Hawaii Administrative Rules (HAR). These regulations govern State of Hawaii Department of Health (DOH) programs and activities, including those associated with the location and operation of wastewater disposal systems. Chapter 11-62 Wastewater Systems offers the most extensive coverage of wastewater systems involving both wastewater treatment works and individual wastewater systems. The DOH's *Guidelines for the Treatment and Use of Recycled Water* (also referred to as the 'reuse guidelines') more specifically addresses the requirements for reuse of treated wastewater which are in the process of being incorporated into Chapter 11-62.

Groundwater recharge criteria and requirements are provided in the *Guidelines for the Treatment and Use of Recycled Water* (DOH, 2002, pp. 26-27) based on different classifications of recharge:

> "The classification is based on whether the recharge directly affects a non-potable or potable aquifer. For projects that are over an aquifer classified as potable, the application rates that exceed the consumptive evapotranspiration of the vegetative cover will be considered a recharge project. For projects that are over an aquifer classified as non-potable, where the design monthly (deep) percolation rate (DMPR) is greater than 20 percent of the maximum monthly application rate (MMAR) minus the DMPR, the project will be designated as a recharge project. In other words, when the design monthly application rate is greater than 1.2 times the vegetative consumption rate, then the project would be considered a recharge project."

As indicated in Figure 3-3, the majority of the distribution areas of the proposed nonpotable system will be located over the Ewa Caprock Aquifer. Since the DOH does not consider the Ewa Caprock as a designated public drinking water aquifer, groundwater monitoring requirements of the reuse guidelines will not will not be applicable, provided the monthly application rate does not exceed 1.2 times the vegetative consumption rate (non-recharge projects). However, the DOH will evaluate all proposed recharge projects (new and expansion) in which the 1.2:1 ratio is exceeded. The groundwater recharge criteria would also apply to those systems overlying public drinking water aquifers, such as the Pearl Harbor Aquifer, in which the monthly application is expected to exceed the consumptive rate (1:1 ratio). Evaluation of recharge project would be based on relevant aspects, including the following factors: treatment provided, effluent quality and quantity, effluent or application spreading area operation, soil characteristics, hydrogeology, resident time, and distance to withdrawal.

In certain circumstances, a disposal project may also be subject to DOH regulations governed by the underground injection control (UIC) program in Title 11 of HAR, Chapter 23 Underground Injection Control. Chapter 11-23 has jurisdiction over injection wells through which "subsurface disposal of fluid or fluids occurs or is intended to occur by means of injection." Injection can take place "either under pressure or by gravity flow into a subsurface formation or formations." The regulations stipulate that the construction of an injection well or wells cannot be started without first applying for a UIC permit. In addition, a well or wells cannot be operated, modified, or abandoned without obtaining a UIC permit from the DOH. In order to obtain a UIC permit, the DOH requires a substantive submission of engineering well data as well as a public notice of the proposed application prior to the issuance of a permit. During the public notice period, any interested person or groups may request the department for a public hearing with respect to the UIC application.

In summary, the DOH regulations and reuse guidelines provide significant safety considerations that must be approved prior to implementation of a recharge or a

underground disposal project. This will ensure that the use of R-1 water in the Ewa district will not pose serious threat to the potable basal aquifer.

3.1.3 Climate and Air Quality

Existing Conditions:

The project's distribution system will be situated on southwest Oahu's Ewa coastal plain where weather is normally warm and arid. Mean annual rainfall is 20 inches per year, with monthly averages ranging from 0.1 to 3.9 inches (Analytical Planning Consultants, 1999). Average temperatures range from 72 degrees Fahrenheit (°F) in winter to 79°F in the summer, with daily fluctuations of about 13°F (Analytical Planning Consultants, 1999). Northeasterly tradewinds prevail over Oahu and the surrounding waters throughout the year; however, the winds are typically less pronounced in the Ewa area. Humidity is moderate ranging from 75 to 85 percent.

Air quality is generally good due to the effects of the tradewinds and lack of stationary source of pollutants. The DOH currently monitors air quality at three stations located in the project area: West Beach (Ko Olina Golf Course), Makaiwa, and Kapolei. The West Beach and Kapolei stations monitor NO_2, PM_{10}, CO, and SO_2, while the Makaiwa station is monitoring only SO_2. According to the DOH's *Annual Summary Hawaii Air Quality Data* (2000), the State of Hawaii, including Oahu, was in attainment for all federal ambient air quality standards.

Environmental Impacts and Mitigation Measures:

Construction activities associated with the proposed project will produce emissions primarily from two sources: (1) fugitive dust from trenching operations and (2) exhaust from construction vehicles and equipment. These emissions are temporary or short-term and will cease upon the completion of construction. The key human receptors are the construction workers and residents along the pipeline route. Pedestrians and motorists temporarily using or commuting through the project area and immediate surroundings may also be exposed to short-term construction related emissions.

The contractor will be required to comply with Title 11 of HAR, Chapter 60.1 Air Pollution Control, and take the following precautions to the extent possible:

- Providing adequate water source and watering of exposed surfaces;
- Planting of vegetative cover as soon as final grades are established;
- Controlling dust from shoulders, project entrances, and access roads;
- Allowing for adequate control measures during off hours;
- Covering all moving, open-bodied trucks transporting material and debris which may result in fugitive dust;

- Wet-cutting (or dry-cutting with other dust control measures) of existing asphaltic concrete pavement along the waterline route in public streets and highways; and

The contractor will also be required to maintain and properly tune all equipment and engines, as well as minimize unnecessary idle time in order to control exhaust emissions. The suggested mitigative measures will alleviate the production of emissions and dust and should not result in significant impacts to air quality.

3.1.4 Natural Hazards

3.1.4.a Floods and Hurricanes

Existing Conditions:

According to the Central Pacific Hurricane Center, hurricane season in the Hawaiian Islands officially begins on June 1 and ends on November 30. However, tropical cyclones can occur at any time. The strong winds associated with hurricanes can also bring torrential rain that can lead to flash flooding and high waves.

The alignments of the proposed nonpotable water distribution system are located in the following Federal Emergency Management Agency Flood Insurance Rate Maps (FIRM) for the City and County of Honolulu (Effective Date November 20, 2000): 15003C0220 E, 15003C0305 E, 15003C0310 E, 15003C0315 E, 15003C0320 E, and 15003C0330 E.

The majority of the proposed nonpotable system is located in Zone D, or areas in which flood hazards are undetermined. There are few exceptions as described below:

- Kaloi Gulch along Renton Road and Kapolei Parkway. Some of the proposed waterlines will be located in Zone X, which are areas determined to be outside the 500-year flood plain.

- Fort Weaver Road at the bend towards Ewa Beach Community Park and New Ewa Beach Golf Course. The proposed 12-inch nonpotable waterline will be located in a Zone A area which would be inundated by the 100-year flood, though base flood elevations have not been determined (refer to Figure 3-4).

- Two short segments in the vicinity of Kaloi Gulch situated in Zone AE where base flood elevations have been determined for areas inundated by the 100-year flood (refer to Figure 3-5). The first is a 12-inch nonpotable line that is planned for Renton Road at the existing Kaloi Gulch bridge crossing. The base flood elevation at this location is 42 feet. The second location is about 0.9 mile upstream of the first location, where the base flood elevation is reported at 65 feet. A proposed 16-

inch nonpotable line will be connected to an existing 20-inch US Filter R–1 line.

Environmental Impacts and Mitigation Measures:

Except for booster pumping stations, above ground storage reservoirs, and the proposed crossing of Kaloi Gulch at Renton Road, the proposed distribution system is likely to be constructed underground in its entirety. While, the impacts on such a buried system related to flooding are improbable, all nonpotable water main project sites located in Zones A and AE will comply with applicable rules and regulations of the National Flood Insurance Program (NFIP) and the City and County of Honolulu.

Separate site specific environmental assessments will be prepared for each new reservoir and pumping station after feasibility studies have been conducted. The impacts of flooding on these facilities will be addressed accordingly.

The bridge on Renton Road crossing Kaloi Gulch is an existing structure under the jurisdiction of the City and County of Honolulu (CCH). The proposed 12-inch nonpotable water line will be strapped under the bridge deck, mitigating potential damage to the water main in the event of a flood.

3.1.4.b Tsunamis

Existing Conditions:

A tsunami is a series of destructive ocean waves that can affect coastal areas. The Oahu Civil Defense Agency's Evacuation Zone Maps indicate areas that are to be evacuated in such an event (CCH, 2003). Within the proposed project site, the entire shoreline from Fort Weaver Road to Barbers Point is identified as a tsunami evacuation area.

Environmental Impacts and Mitigation Meausres:

As mentioned above, except for booster pumping stations, above-ground storage reservoirs, and the proposed crossing of Kaloi Gulch at Renton Road, the proposed distribution system will be underground in its entirety. The impacts on such a buried system related to tsunamis are very unlikely. In addition, separate site specific environmental assessments will be prepared for each new reservoir and pumping station after feasibility studies have been conducted. The impacts of tsunamis on these facilities will be addressed accordingly.

3.1.4.c Earthquakes

Existing Conditions:

The entire island of Oahu is classified as Seismic Zone 2A under the *Uniform Building Code* (International Conference of Building Officials, 1997). These areas are considered low potential for ground motion created by seismic activity.

Environmental Impacts and Mitigation Measures:

Because of the low potential for ground motion, there are no special design considerations required for the proposed underground nonpotable waterlines. As mentioned previously, separate environmental assessments will be prepared for each above ground storage reservoir which will address the impacts of seismic activity and the necessary design considerations.

3.2 THE BIOLOGICAL ENVIRONMENT

3.2.1 Flora and Fauna

Existing Conditions:

The majority of the proposed nonpotable water line alignments will traverse through existing rights-of-ways. These areas have been previously cleared, excavated, and graded during prior construction activities.

According to the Final Environmental Assessment for the Honouliuli Wastewater Reclamation Plant (Analytical Planning Consultants, 1999), the dominant vegetation zone on the Ewa Plain is comprised of kiawe and lowland shrub. Endemic or native plant species found only in Hawaii occurring on the Ewa Plain include the sub-shrub *hinahina* (*Heliotropium anomalum var. argentum*) and the herb *nama* (*Nama sandwichensis*) in the coastal strand zone, and the small shrub-like sandalwood tree (*Santalum ellipticum*) in the kiawe and lowland shrub zone (Ogden Environmental and Energy Services, 1994). Indigenous or native plant species found in Hawaii and elsewhere in the coastal strand zone include the seaside heliotrope herb (*Heliotropium curravassavicum*) and the *ohelo kai* shrub (*Lycium sandwichensis*).

The most dominant form of wildlife are the birds, which include at least 17 introduced species and five indigenous species (Analytical Planning Consultants, 1999). Introduced birds such a cardinals, doves, mynas, ricebirds, sparrows and white-eyes are common to the low lying elevations, which provide a natural habitat and feeding areas (Wilson Okamoto & Associates and Brown and Caldwell Associates, 2001). Other wildlife consist of feral dogs, and cats, rodents and mongooses and introduced freshwater fish, including mosquito fish and tilapia (Analytical Planning Consultants, 1999).

Environmental Impacts and Mitigation Measures:

Since the majority of the construction will take place in areas that have been already been cleared and disturbed by prior excavation and grading, there will be no direct impacts on flora and fauna habitats. Existing vegetation along the waterline trenches may be temporarily damaged during construction, but will be restored to original or better condition by the contractor.

The proposed nonpotable water system will include underground pipelines, which will not directly affect terrestrial biota on a long-term basis. However, various plant and animal species could be exposed to the nonpotable water as direct spray or runoff from irrigated areas, or through waterline failures. The nonpotable water will be of R-1 quality, which is suitable for exposure to plants and animals (Department of Health, 2002). The dissolved nutrients in the recycled R-1 water may also stimulate plant growth in the area, and the irrigation water, itself, would generally benefit the existing wildlife in the warm and arid climate (Analytical Planning Consultants, 1999).

The use of corrosion-resistant pipe materials will also be considered during the design phase to minimize future failures resulting from pipe deterioration. Subsequently, nonpotable water main leaks or breaks will receive high priority consideration and will be repaired immediately by the BWS.

In summary, the proposed infrastructure expansion, itself, is not expected to result in significant impacts to region's wildlife and vegetation. The effects of irrigation spray, if any, could be beneficial.

3.2.2 Threatened and Endangered Species

The Final Environmental Assessment (FEA) for the Honouliuli Wastewater Reclamation Plant (Analytical Planning Consultants, 1999) provided a discussion on threatened and endangered plants and wildlife in the Ewa Plain, including Campbell Industrial Park (CIP) and Naval Air Station Barbers Point (BPNAS). Data and information for the FEA was obtained from the Hawaii Natural Heritage Program (HINHP) database. The two following sub-sections are taken from the FEA (pp. 4-29 to 4-31) and have been updated to reflect the HINHP database as of April 2002 (refer to Appendix D for listing of species and Figure 3-6 for rare species location map).

3.2.2.a Terrestrial Plants

Existing Conditions:

Location 8334, east *(mauka)* of Camp Malakole, harbors a population of the federally endangered *akoko* shrub *(Chamaesyce skottsbergii* var. *skottsbergii)*. Populations in the vicinity of the deep draft harbor have been destroyed, and additional populations will be lost as the harbor expands. A colony of this plant formerly grew within CIP, on the west side of Hanua Street (8336), but has been destroyed. Other colonies were reported from the east side of Saratoga Street in CIP (8339) and on BPNAS (8337, 8338).

The rare *Ophioglossum concinnum (pololei)* was recorded at location 12101, on an unimproved road about 200 feet north of the OR&L right-of-way north of the BPNAS boundary. It has not been observed since 1912.

The endemic round-leafed chaff-flower shrub *(Achyranthes splendens* var. *rotundata)*, a federally listed endangered species, occurs at low elevations in open, dry forest

CORRECTION

THE PRECEDING DOCUMENT(S) HAS BEEN REPHOTOGRAPHED TO ASSURE LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

The proposed nonpotable water system will include underground pipelines, which will not directly affect terrestrial biota on a long-term basis. However, various plant and animal species could be exposed to the nonpotable water as direct spray or runoff from irrigated areas, or through waterline failures. The nonpotable water will be of R-1 quality, which is suitable for exposure to plants and animals (Department of Health, 2002). The dissolved nutrients in the recycled R-1 water may also stimulate plant growth in the area, and the irrigation water, itself, would generally benefit the existing wildlife in the warm and arid climate (Analytical Planning Consultants, 1999).

The use of corrosion-resistant pipe materials will also be considered during the design phase to minimize future failures resulting from pipe deterioration. Subsequently, nonpotable water main leaks or breaks will receive high priority consideration and will be repaired immediately by the BWS.

In summary, the proposed infrastructure expansion, itself, is not expected to result in significant impacts to region's wildlife and vegetation. The effects of irrigation spray, if any, could be beneficial.

3.2.2 Threatened and Endangered Species

The Final Environmental Assessment (FEA) for the Honouliuli Wastewater Reclamation Plant (Analytical Planning Consultants, 1999) provided a discussion on threatened and endangered plants and wildlife in the Ewa Plain, including Campbell Industrial Park (CIP) and Naval Air Station Barbers Point (BPNAS). Data and information for the FEA was obtained from the Hawaii Natural Heritage Program (HINHP) database. The two following sub-sections are taken from the FEA (pp. 4-29 to 4-31) and have been updated to reflect the HINHP database as of April 2002 (refer to Appendix D for listing of species and Figure 3-6 for rare species location map).

3.2.2.a Terrestrial Plants

Existing Conditions:

Location 8334, east *(mauka)* of Camp Malakole, harbors a population of the federally endangered *akoko* shrub *(Chamaesyce skottsbergii* var. *skottsbergii)*. Populations in the vicinity of the deep draft harbor have been destroyed, and additional populations will be lost as the harbor expands. A colony of this plant formerly grew within CIP, on the west side of Hanua Street (8336), but has been destroyed. Other colonies were reported from the east side of Saratoga Street in CIP (8339) and on BPNAS (8337, 8338).

The rare *Ophioglossum concinnum (pololei)* was recorded at location 12101, on an unimproved road about 200 feet north of the OR&L right-of-way north of the BPNAS boundary. It has not been observed since 1912.

The endemic round-leafed chaff-flower shrub *(Achyranthes splendens* var. *rotundata)*, a federally listed endangered species, occurs at low elevations in open, dry forest

remnants, open thickets, on talus or rocky slopes, or on coralline plains (Wagner, Gerbst, and Sohmer, 1990). Several populations exist on the Ewa Plain; two are in CIP (5946, 5947), one in Camp Malakole (5948) and one is at BPNAS (5945). The *Achyranthes* at location 5947 occurs in *Myoporum sandwicense (naio)* coastal dry shrubland. In addition, *pua pilo (Capparis sandwichiana* var *zoharyi)*, an endemic shrub federally listed as a species of concern (8145, 12130), occurs in kiawe and lowland scrub zones (Ogden Environmental and Energy Services, 1994), and is known to exist in the same area as the *A. splendens.*

The federally endangered *naupaka (Scaevola coriacea)* was formerly seen near the site of Barbers Point Beach Park (8868), but the last siting was in 1919.

The federally endangered *ihi ihi* or *ihi la au (Marsilea villosa)* used to occur under kiawe trees just north of the Honouliuli Wastewater Treatment Plant site (12070). The plants have not been seen there since 1932, and the area has since been graded.

According to the Division of Forestry & Wildlife, Department of Land and Natural Resources (correspondence of March 14, 2002), the ongoing North-South Road project in Ewa was undergoing mitigative actions for the protection of *Abutilon menziesii*. A Habitat Conservation Plan for this project was approved by the State of Hawaii Board of Land and Natural Resources on April 8, 2004. Due to the fairly recent timing of this observation, the locations and detailed information had not been incorporated into the HINHP database as of April 2002. However, the general location of the *A. menziesii* is shown on Figure 3-6.

Impacts and Mitigation Measures:

Due to recent observations of *A. menziesii* and potential evidence of other endangered plants in Ewa, prudent planning practices are recommended to avoid needless mitigation later during the construction phase. As such, the planning phase for new waterline alignments in undisturbed areas will include an on-site reconnaissance survey by a trained botanist to determine whether endangered plants are present. Since the nonpotable water system is being proposed primarily within areas that are already developed, namely, existing right-of-ways, the impacts on endangered species are expected to be minimal, if any.

Other mitigative measures such as the use of corrosion resistant materials will also be considered during the design phase so as to retard pipeline deterioration. This will help to minimize future failures, including water main leaks and breaks.

In summary, necessary precautions will be followed during all phases of the project, from planning to design to operation. Thus, the proposed project is not expected to further endanger nor threaten rare plant species.

3.2.2.b Wildlife

Existing Conditions:

Three federally endangered waterbirds were observed in the CIP from the late 60s to the mid 70s: Hawaiian Gallinule *alae-ula* (1039), Hawaiian Coot *alae ke oke o* (1117), and the Hawaiian Stilt *ae o* (1378).

The federally endangered Oahu *elepaio (Chasiempis sandwichensis ibidis)* was last seen on the Ewa Plain in 1984 (1796) at a location which formerly harbored rare plants, including *Lipochaeta lobata* var. *loata* (6594) and *Portulaca villosa* (9676), as well as the endangered *Centaurium sebaeoides* (8613). It has been more than 60 years since any of these were seen there.

A pupillid land snail *(Lyropupa perlonga)*, a federal species of concern, was observed near Malakole Road (5867) in 1980. The obscure pentarthrum weevil *(Pentarthrum obsurum)*, another federal species of concern, was last seen northwest of Tenney Village (4804) in 1974.

There are several anchaline ponds on the Ewa Plain (4095, 4096, 4097), at least one of which (4767) contains the federal species of concern, *Metabetaeus lohena*.

Impacts and Mitigation Measures:

The proposed nonpotable water system will include underground pipelines, which will not directly affect endangered or threatened wildlife on a long-term basis. The use of corrosion resistant materials will be considered during the design phase so as to retard pipeline deterioration and minimize future failures, including water main leaks and breaks.

The DOH reuse guidelines (2002) prohibit ponding of recycled water, limiting the multiplication of residual microbial populations. In addition, the application of R-1 water and its dissolved nutrients to areas presently not irrigated could allow for consequent plant growth and provide habitat for prey and forage areas for owls and waterbirds (Analytical Planning Consultants, 1999).

Thus, the proposed infrastructure expansion, itself, is not expected to result in significant impacts to region's wildlife and will not further endanger/threaten rare species. The effects of irrigation spray, if any, should be beneficial.

3.2.2.c Marine Species

Existing Conditions:

The threatened and endangered green sea turtle *(Chelonia mydas)* is known to frequent the area immediately offshore (3988), which is known for an abundance of seaweed. The humpback whale *(Megaptera novaeangliae)*, a state and federally

listed endangered species, may be present in the vicinity from November to May; however, densities offshore of NASBP are among the lowest in Hawaii (Ogden Environmental and Energy Services, 1994). The Hawaiian Monk seal *(Monachus schauinslandi)* has been seen along the coast at Oneula Beach Park (3913), Barbers Point Beach Park (3928), Ko Olina Resort Lagoons (3930, 3931, 3954), Ewa Beach Park (3914), and Paradise Cove (3956).

Impacts and Mitigation Measures:

It is unlikely that reclaimed water will reach the ocean. There should be no impacts to turtles and other protected marine species.

3.3 THE HUMAN ENVIRONMENT

The region has been in transition from agricultural to urban uses, and is the location of Oahu's fastest growing residential communities.

3.3.1 Social and Economic Resources

3.3.1.a Demographics

Existing Conditions:

Ewa's population in 1990 was at 42,931 (1990 Census ST1 File; Planning Division, Department of Planning and Permitting, January 2002). This accounted for 5.1 percent of the City and County of Honolulu's population. Ewa's population increased to 68,718 in 2000 or 7.8 percent of the population of the City and County of Honolulu (2000 Census ST1 File; Planning Division, Department of Planning and Permitting, January 2002). Of Ewa's total population, 31.7 percent were children under the age of 18, 61.5 percent adults and 7.8 percent senior citizens 65 years and older in 2000. According to the 2000 Census, nearly three-fourths of the Ewa's 2000 population resided in three areas: (1) Ewa Gentry/West Loch, Ewa Beach/Iroquois Point and Makakilo/Makaiwa Hilles/Kunia. Overall there was a 60 percent population increase in Ewa over the 10-year period or 4.8% average annual growth.

Using forecasts by the City and County of Honolulu and the State of Hawaii Department of Business, Economic Development, and Tourism (DBEDT) projections, the *Transportation for Oahu Plan (TOP) 2025* has projected an increase in Ewa's population to 114,000 in the year 2025 (Carter & Burgess, 2001). This represents growth of more than 65 percent beyond the 2000 Census population.

Impacts and Mitigation Measures:

Construction of the proposed facilities will have no significant effects on population or demographics.

Operation and maintenance of the proposed distribution system will have indirect effects on population growth. It will allow planned development of the Ewa Plain to proceed with less of a burden on Oahu's potable aquifers.

3.3.1.b Employment

Existing Conditions:

Economic activity on Oahu is concentrated in the Primary Urban Center (Honolulu area), although the job share in Secondary Urban Center is expected to increase to more than 64,000 in 2020 (CCH, 1997). The majority of this growth will be located in the City of Kapolei, which will provide work sites for 25,000 private jobs and 5,000 City and State jobs. In addition, the development of the University of Hawaii West Oahu campus is expected to have 800 faculty and staff by 2020. Ongoing non-residential (commercial, industrial and resort) expansion at Campbell Industrial Park, Kapolei Business Park, Ko Olina Resort and Ewa Marina will provide employment opportunities in the Ewa district.

Impacts and Mitigation Measures:

The proposed project will have a direct impact on the construction industry over the 15 years of construction. While the construction workers will not necessarily be from the Ewa area, they are likely to be Oahu residents. This will be a boost to the construction industry in Hawaii.

There will also be indirect impacts as a result of the proposed project. The availability of an alternate water source will allow for overall growth and development that is envisioned for the Ewa area, providing more diverse job opportunities for present and potential Ewa residents. Living and working in Ewa will be an attractive option for these residents as they will be able to avoid a long daily commute. The Final Environmental Assessment for the Honouliuli Wastewater Reclamation Facility (Analytical Planning Consultants, 1999) indicated that more than one-fifth of the residents commuted for more than 45 minutes each way to and from work.

3.3.1.c Household Income

Existing Conditions:

Data from the U.S. Census Bureau's Census 1990 and Census 2000 pertaining to household income were available for six census designated places (CDPs) in Ewa: Barbers Point, Ewa Beach, Ewa Gentry, Ewa Villages, Iroquois Point and Makakilo City. The data is summarized below; however, it should be noted that the six areas represented 85 percent of the Ewa population in 1990 and 58 percent in the 2000 census.

TABLE 3-1. 1990 AND 2000 HOUSEHOLD INCOME DATA

CDP	1990 Median Household Income ($)	1990 Unemployment Rate (%)	2000 Median Household Income ($)	2000 Unemployment Rate (%)
Barbers Point	23,908	20.9	65,625	0
Ewa Beach	45,184	5.0	57,073	7.1
Ewa Gentry	45,824	1.0	61,462	3.6
Ewa Villages	40,924	1.8	51,451	7.1
Iroquois Point	29,593	8.0	44,200	16.2
Makakilo City	50,284	4.8	66,515	5.2
Weighted Average	42,595	5.3	59,777	6.1
Honolulu County	40,851	3.5	51,914	6.2

Source: U.S. Census Bureau (1990 and 2000).

The median household incomes and unemployment rates in Ewa appear to be following the same trend as the overall figures for the City and County of Honolulu. Median household income made a significant gain between 1990 and 2000, although both unemployment and poverty levels worsened in the same period. In 1990, 4.4 percent of the population was below poverty level and 6.7 percent in 2000.

Approximately one-fourth of the homeowners (of owner-occupied units) in the Ewa area were paying 35 percent or more of their household income on housing costs. A similar proportion of renters were also paying 35 percent or more of their household income on rent (U.S. Bureau of Census, 2002).

Impacts and Mitigation Measures:

Workers, during construction or operations, will not necessarily be from the Ewa area, but from Oahu in general. Construction activities will not have a direct significant impact on household income.

3.3.1.d Housing

Existing Conditions:

Housing in Ewa has expanded rapidly since the early 1990s as agricultural lands have been converted to residential developments such as Ewa Villages, Ewa Beach, Makakilo, Ewa by Gentry, West Loch, Iroquois Point (Navy Housing), and Kapolei. In

1990, Ewa had 11,722 housing units with a 2.6 percent vacancy rate (1990 Census ST1 File; Planning Division, Honolulu Department of Planning and Permitting, January 2002). A typical household size was 3.66. Owner-occupied homes comprised 53.5 percent of all occupied units. In comparison, the 2000 figures are as follows: 20,804 total housing units, 70.0 percent owner-occupied, 9.0 percent vacancy rate and typical household size of 3.61. Nearly three-fourths of the number of residential housing units in Ewa were found in the following three areas: (1) Ewa Gentry/West Loch, Ewa Beach/Iroquois Point and Makakilo/Makaiwa Hills/Kunia.

Changes over the 10-year period may be summarized as follows:

- 77.5% increase in housing units or approximately 6% average annual increase
- Number of owner-occupied housing units more than doubled
- No change in typical household size

Impacts and Mitigation Measures:

Operation and maintenance of the proposed distribution system will have indirect effects on population growth. It will allow planned development of the Ewa Plain to proceed with less of a burden on Oahu's potable aquifers.

3.3.1.e Economy

Existing Conditions:

The Department of Business, Economic Development and Tourism's (DBEDT) *State of the Economy* dated March 2004 has reported that investments in the construction and real estate sectors provide strong support for growth in Hawaii's economy. This positive outlook was backed by optimistic projections for the U.S. and Japanese economies.

DBEDT's *State of the Economy* (March 2004) also reported an increase of the number of wage and salary jobs of 9,000 or 1.6 percent for the fourth quarter of 2003. These jobs occurred in Food Services, Health Care, and Construction. Nominal personal income showed a gain of 4.8 percent in the same quarter of 2003 when compared to the second quarter of 2002. Tax revenues distributed to the State also rose 3.9 percent while the general excise and use tax increased 6.8 percent for the fourth quarter of 2003 compared to the fourth quarter of 2002. The number of visitors arriving by air increased 0.4 percent comparing the fourth quarter of 2003 to the same quarter in 2002.

According to the DBEDT's *County Economic Conditions* dated March 2004, during the fourth quarter of 2003, the City and County of Honolulu showed an increase of 5,050 wage and salary jobs or 1.2 percent from a year earlier. These jobs occurred in Health Care and Social Assistance; Natural Resources, Mining, and Construction; Food Service and Drinking Places; and Educational Services. Other economic activities, such as tax collections increased 11.9 percent while visitor days decreased 0.5 percent.

Future Conditions:

According to DBEDT's *Outlook of the Economy* (March 2004), the "forecast of Hawaii's economy continues to anticipate solid growth for tourism, personal income, and wage and salary employment for 2004." This is attributed to several factors, the partial recovery of our visitor sector, increased federal government spending, and ongoing construction spending. An increase of 5.2 percent in Hawaii's total visitor arrivals is anticipated in 2004. Similarly, visitor expenditures are forecasted to climb 6.5 percent. Total wage and salary jobs in Hawaii are likely to rise by 1.5 percent in 2004 and 1.3 percent in 2005.

DBEDT (March 2004) also indicates that "Hawaii's economic growth also depends on the conditions of the mainland U.S. economy as a whole." The 2004 Gross Domestic Product (GDP) is expected to increase 4.7 percent for the U.S. and 2.8 percent for Japan. Although the outlook for Japan's economy has shown definite growth, the uncertainty in non-performing debt held by Japanese banks continues to cloud the *country's economic future.*

3.3.2 Noise

Existing Conditions:

Current noise sources in the project vicinity include vehicular traffic and equipment. On a long-term basis, there is no noise that will be associated with the underground nonpotable water distribution system.

Environmental Impacts and Mitigation Measures:

The excavation for pipelines will result in unavoidable but temporary impacts during construction operations. The noise sources are vehicles and various construction equipment. These equipment include backhoes, compactors, and pavers, which will raise ambient noise levels along the pipeline route. Noise impacts may have direct and indirect effects on residential units adjacent to the construction areas. Motorists and pedestrians traveling through construction areas will also be exposed to increased noise levels.

Construction equipment and on-site vehicles or devices requiring an exhaust of gas or air will be equipped with mufflers. Within the residential areas, the allowable noise level is 55 dBA at the property line during the day (7 a.m. to 10 p.m.) and 45 dBA at night (10 p.m. to 7 a.m.). The contractor will be required to obtain a Community Noise Permit and comply with Title 11 of HAR, Chapter 46 Community Noise Control. Required permit conditions for construction activities, which the contractor must comply with include the following:

(1) No permit shall allow any construction activities creating excessive noise when measured at or beyond the property line of the

construction site for the house before 7:00 a.m. and after 6:00 p.m. on weekdays.

(2) No permit shall allow construction activities creating noise when measured at or beyond the property line of the construction site for the house before 9:00 a.m. and after 6:00 p.m. on Saturdays.

(3) No permit shall allow construction activities, which exceed the allowable noise levels on Sundays and holidays.

Nighttime work in residential areas will not be permitted for this project. The Department of Health will enforce the above conditions and violators will be penalized by the Director. As such, compliance with the proposed measures should not result in significant noise-related impacts.

3.3.3 Public Health and Safety

Existing Conditions:

Protection of the public health is the most important consideration in the distribution and use of recycled water. Human contact with recycled water may take place at the treatment plant and recycling facility, along the pipelines (in the event of a leak), or at the site of its reuse. This may include residents, commercial/industrial workers, recreational users of golf courses or other facilities where reclaimed water is applied, people transiting areas of reuse, or people consuming crops exposed to recycled water.

In 1993, the DOH drafted guidelines for the treatment and reuse of reclaimed water. These guidelines have recently been revised, entitled *Guidelines for the Treatment and Use of Recycled Water* (DOH, 2002), also referred to as the "reuse guidelines." These extensive and comprehensive guidelines were produced by various committees of scientists, engineers, public health specialists, water managers and others, who investigated the experiences, results and regulatory safeguards developed in water reuse projects elsewhere. The resulting guidelines have the following objectives:

- Protect public health and avoid public nuisances;
- Prevent environmental degradation of aquifers and/or surface waters;
- Delineate specific recycled water application with recycled water quality treatment;
- Facilitate the use of recycled water in greater amounts, by more readily available knowledge of the conditions under which DOH can attest to the safety of use of recycled water use; and

- Facilitate acceleration of planning, design, permitting, and implementation of water reclamation projects.

As mentioned in Chapter 2, the proposed project will involve the distribution of two recycled wastewater products: RO and R-1 water. **RO water is essentially sterile and does not present a public health risk; however, it is not regulated by the DOH.** Whereas R-1 water, the most highly treated class of recycled water, is regulated by the DOH. Wastewater typically undergoes a secondary treatment process where it is oxidized to decompose organics. Secondary treatment is followed by filtration to further remove particles and disinfection to deactivate or destroy potential pathogens in the wastewater. This advanced level of treatment is designed to produce water suitable for the maximum number of R-1 reuse applications approved by the DOH. The DOH's criteria defining R-1 water are expressed in terms of the concentrations of viruses and bacteria remaining in the product water (refer to Appendix E).

In comparison with drinking water, R-1 water is permitted to have a small number of coliform and viruses. For example, drinking water is not permitted to contain total or fecal coliform, whereas R-1 water can have an average of 2.2 fecal coliform per 100 milliliters. Even this, however, is a relatively small fraction compared to what might be expected in typical stream flows or storm water runoff.

R-1 water is not intended for private yard watering at this time. Instead, it will be used primarily for landscape irrigation in the following applications approved by the DOH (2002):

- Golf courses
- Roadsides and medians
- Parks, school yards and athletic fields
- Residential common areas when managed by an irrigation supervisor
- Ornamental plants for commercial use

While the current DOH reuse guidelines permit the use of R-1 water for toilet flushing, it is currently not common practice. R-1 water, however, may be considered for toilet flushing in new commercial facilities approved by the DOH at such time that the City and County of Honolulu has adopted provisions in the plumbing code pertaining to the use of dual water supply in buildings.

Environmental Impacts and Mitigation Measures:

The complete list of DOH-approved R-1 uses in the reuse guidelines includes irrigation for edible food crops and is contained in Appendix E. It can be seen from these uses that dermal exposure and the ingestion of food crops are safe. Public health and safety should not be compromised with increased usage of R-1 water.

3.3.3.a Best Management Practices

Prior to the construction of a reuse system, the reuse guidelines specify that an Engineering Design Report for a Water Reuse Project must be approved by the DOH for all projects involving areas greater than five acres (refer to Section VIII). The report must incorporate the following Best Management Practices plans:

1. Irrigation Plan
2. Management Reuse Plan
3. Public Education Plan
4. Employee Training Plan
5. Vector Control Plan

Applicants of smaller reuse projects (less than five acres) may submit a simplified application form; however, requirements set forth under Title 11 of HAR, Chapter 62 Wastewater Systems, and the provisions of the reuse guidelines must still be satisfied.

The *Irrigation Plan* will address methods and controls to be used in the irrigation system that will mitigate runoff or ponding. Specific information will be required by the DOH in order to assure that the distribution and use of the recycled water will not create a health hazard or nuisance:

- Boundaries of the irrigated area
- Amount and type of recycled water to be used for irrigation
- Transmission line from treatment facility to proposed area of use or impoundment
- Storage reservoir or impoundment
- Distribution network
- Method of irrigation (equipment)
- Location of exterior drinking fountains
- Method(s) to mitigate runoff

In addition, a *Management Reuse Plan* will be prepared as part of the Engineering Design Report, which will establish and delineate the responsibilities of operation and maintenance of the reuse system. The purpose of the plan is to assure prevention of discharge, runoff and overspray. The plan will address the following:

- Procedures, restrictions and other requirements to be followed by the user/distributor.
- Contact information on the User Supervisor appointed by the user, who will have overall operational responsibility for the system, including the prevention of potential hazards and implementation of the reuse guidelines.

In summary, while the proposed irrigation uses will not impact public health, the use of recycled R-1 water will be done in accordance with DOH's reuse guidelines. The

guidelines provide significant safety considerations that must be approved prior to implementation of a reuse project. This will ensure that the use of R-1 water in the Ewa district will not pose serious health threat to the public.

3.3.3.b Public Outreach and Education

Prior to the BWS purchase of the Honouliuli (Ewa) Water Recycling Facility, US Filter and the City and County of Honolulu initiated a communications program, which was designed to educate the general public, facility neighbors and businesses about the facility and water reuse in general. The BWS will expand on the initial program through the Water Recycling Program's Public Outreach Plan Update (BWS, 2003). The plan is a broad-based public outreach program designed to ensure that major issues continue to be addressed and to increase public awareness of recycled water as a viable and necessary supplemental water resource. Acting in the public interest at all times, the BWS will remain committed to maintaining open, two-way communication with its staff, the community, media, policymakers , civic and environmental groups, government agencies, schools, and other organizations.

Messages consisting of facts and declarative statements about the Water Recycling Program were developed through a collaborative process involving residents in focus groups and telephone surveys. The program messages were refined and classified into three tiers listed below, based on what residents felt were the most important issues. The tiers will also be associated with level support as identified through the iterative process.

Tier 1 Messages

- Recycled water is one of many ways that the Board of Water Supply is making sure we have water for the future.
- Recycled water ensures Oahu has water for generation to come.
- Recycled water helps keep Hawaii green without wasting limited drinking water supplies.
- Recycled water meets strict Department of Health requirements.

Tier 2 Messages

- Using recycled water is good for the environment.
- Using recycled water helps conserve good water for drinking.
- Recycled water has been used successfully on Oahu for more than 10 years.
- Recycled water costs less than other new water sources.

Tier 3 Messages

- Recycled water has been used successfully in other states for more than 40 years.

STRATEGIES

The BWS Water Recycling Program will oversee the implementation of the Public Outreach Plan in an organized, methodical way to ensure everyone has an opportunity to learn about water recycling and participate in educational programs. In coordination with its existing water resources management efforts, the BWS has developed and implemented the following strategies through a variety of tactics outlined in the plan:

Research

Completed Tasks

✓ Partnering session
✓ *Stakeholder interviews*
✓ Focus groups
✓ Telephone survey
✓ Key messages
✓ Members of the public outreach team and their roles
✓ Goals, objectives, and schedules
✓ Mailing list and audience database update

Ongoing Activites

❑ Develop procedures and methodologies necessary for timely communication and responses.
❑ Develop evaluation criteria and feedback loops.
❑ Develop knowledge and understanding of BWS policies and procedures to be incorporated.
❑ Update elected officials and customer contacts every six months.

Internal Communications

Completed Tasks

✓ Conduct employee tours
✓ Distribute information materials
✓ Employees' awareness about Water Recycling Program materials
✓ Team/Staff coordination meetings on regular basis

Ongoing Activities

Staff meetings

- ❑ Arrange for members of the Water Recycling Program outreach team to attend various BWS unit staff meetings to show the video and provide updates about the Program, status reports, marketing successes, technical problem resolution and tour opportunities.
- ❑ Prepare a memorandum from the BWS manager to inform all BWS supervisors that the water recycling team will attend staff meeting periodically to make presentations and respond to questions.

Materials

- ❑ Post information on the InfoNet and bulletin boards at various locations to provide Water Recycling Program updates, etc.
- ❑ Develop Water Recycling Program posters for each division within the BWS.
- ❑ Provide an article about the Water Recycling Program for each edition of the internal newsletter.

Water Recycling Team Meetings

- ❑ Hold quarterly meetings with entire Water Recycling Team and consultants to review progress and goals.

Community Relations

Completed Tasks

- ✓ Speakers training
- ✓ Presentations to groups
- ✓ Facility tours
- ✓ Community events
- ✓ Information lines
- ✓ Newsletter

Ongoing Activities

Speakers Bureau/Presentations

- ❑ Develop a list of organization – based on target audiences – and arrange an average of two presentations a month.
- ❑ Determine which organizations require senior level staff to attend.
- ❑ Determine most appropriate type of presentation for each group and key issues of interest.

Speakers Training

- ❑ Review key messages with project spokespeople prior to each presentation.

Project and Facility Tours

- ❑ Develop a list of organization appropriate for tours.
- ❑ Schedule and conduct an average of three tours a month.

Exhibits and Displays

- ❑ Identify community events where the BWS could have a booth to distribute and/or display information.

Special Events

- ❑ Identify opportunities such as co-sponsoring forums with community organizations, participating in already-scheduled events sponsored by other organizations, or participating in special events already hosted by the BWS.
- ❑ Showcase the progress of the Water Recycling Program and provide information at all events.
- ❑ Expand BWS participation in already-scheduled events that appeal to environmentally conscious audiences.

Neighborhood Board Meetings

- ❑ Provide an update to BWS Neighborhood Board representatives to ensure they are prepared to address questions about the Water Recycling Program.
- ❑ Follow up with representatives to ensure they report back any questions or concerns about the Water Recycling Program.

Interested Parties Communication

- ❑ Send project information, updates, media coverage and meeting announcements to the interested parties list periodically.

Third Party Spokespeople

- ❑ Identify independent, third parties who can speak about their experience with the Water Recycling Program. Independent spokespeople should be sought from academia, business, industry associations, health and safety interests, environmental organizations and others with water recycling project experience.
- ❑ Keep third parties updated about the Water Recycling Program or specific project progress.

School Programs

- ❑ Determine methods to integrate the Water Recycling Program into school curricula.
- ❑ Explore opportunities to make presentations, host tours and profile CD with students.

Customer Relations

Completed Tasks

- ✓ Provided informational posters to golf courses.
- ✓ Produced informational brochure for golfers and distributed to golf course customers.
- ✓ Provided employee training for customers.
- ✓ Follow-up with customers on product satisfaction/questions.
- ✓ Extended invitation to all current and prospective customers to tour the Honouliuli Water Recycling Facility.

Ongoing Activities

Testimonials

- ❑ Obtain recycled water customer testimonials – both from local customers and long-time users of recycled water on other islands of Hawaii – and post on Web site.
- ❑ Profile customers in the Water Recycling Program newsletter.

Educational Seminars

- ❑ Host educational seminars on a variety of topics, including how landscapers can work with recycled water, health and safety aspects of recycled water use for sports leagues, informational outreach for users of a facility irrigated with recycled water or neighbors who may have concerns about incidental contact with recycled water from the facility, etc.
- ❑ Develop specific information materials to address issues and frequently asked questions about recycled water use for these audineces.

Internal Meetings

- ❑ Meet with Program staff and consultants regarding status of new customers and needed support materials.

Media Relations

Completed Tasks

✓ Distributed news release and received coverage of facility purchase.

Governmental Relations

Completed Tasks

✓ Distributed first newsletter with cover letter to local elected officals.
✓ Held briefings with select elected officials.

Information Materials

Completed Tasks

✓ Interim information materials
✓ Program brochure
✓ Program information boards
✓ Program display
✓ Web site content
✓ PowerPoint presentation
✓ Program photography
✓ Complete updated brochure
✓ Complete Recycled Water Application Study (RWAS) fact sheet
✓ Update Q&A
✓ Update Web design and content
✓ Finalize CD and video

Ongoing Activities

❑ Create and install interpretive signage at plant.
❑ Create alternate versions of display for different audiences.
❑ Order additional give-away items for community events.

3.3.4 Traffic

Existing Conditions:

The nonpotable water mains will be constructed in various segments over the next 20 plus years. Projects will be scheduled by the BWS in conjunction with their capital improvement program. The majority of the proposed mains will be located within existing road or highway rights-of-way corridors, which is consistent with accepted practice. Final horizontal alignments will be determined in the design phase of each specific project.

Environmental Impacts and Mitigation Measures:

Construction of the various nonpotable water line projects will cause periodic disruptions to normal traffic flow along major thoroughfares such as Farrington Highway, Fort Weaver Road, Kalaeloa Blvd., Renton Road, Kapolei Parkway, and Fort Barrett Road. Construction vehicles will add to the traffic on streets adjacent to the proposed project areas. Construction may also require various lane closures and/or detours on a temporary basis. Depending on number of lanes, lane widths, and existing utility corridor configurations, vehicular and pedestrian traffic is likely to impacted by the closure of lanes and possible detours around construction areas. In addition, access to and from driveways and to adjoining roadways and usage of road frontage (mail, deliveries, parking, etc.) may be occasionally hampered by trenching, paving and construction materials deliveries.

Traffic control plans (TCP) will be prepared during the construction phase of each project by the contractor to minimize disruptions and inconveniences to the residents and the public. The TCP will be submitted to the Department of Planning and Permitting Traffic Review Branch for review and approval. The TCP will be prepared by a licensed civil engineer qualified to prepare TCP.

In addition, the contractor will be required to obtain a Street Usage Permit from DTS prior to commencement of any work that will temporarily obstruct any portion of the City roadway or sidewalk and comply with its requirements. Continuous access to and from all driveways and public streets shall be maintained. All walkways and intersections will be maintained in passable condition for pedestrian traffic. Appropriate signs and barriers will be required, and generally at least two lanes will remain open during normal working hours (8:30 a.m. to 3:30 p.m.). Construction during peak traffic hours and at night will be avoided. After working hours trenches will be covered with a non-skid bridging material and all lanes will be open to traffic. Off-duty police officers and/or trained construction flagmen will be provided for traffic control to improve traffic flow and to control two-way traffic on streets where only one lane is opened during construction.

The contractor will be required to coordinate work during construction with the affected community groups, businesses, schools, golf courses, government agencies, and other entities. At least two weeks prior to the start of construction, the contractor will notify all affected residents the waterline route, the school administrations, business establishments, golf courses, neighborhood boards, community association, emergency services (fire, police and ambulance), other property owners, the general public, the State Department of Transportation and the City Department of Transportation Services. The notification shall include the nature of the work, construction schedule, lane and street closures or detours, suggested alternate routes, the expected length of time of inconveniences, of any restrictions which may be imposed to complete the work and the contractor's phone number to be called to report traffic concerns.

In summary, the proposed mitigative measures will cover both design and construction phases of the proposed project. Early coordination with affected government agencies, community groups, schools, businesses, and golf courses as discussed above should alleviate impacts to traffic in the vicinity of the project area.

3.4 THE BUILT ENVIRONMENT

3.4.1 Archaeological Resources and Historic Sites

Existing Conditions:

An archaeological archival research of the proposed project area was conducted by Archaeological Consultants of the Pacific (ACP) in conjunction with preparation of the draft environmental assessment. A summary the history of archaeological investigations in the Honouliuli *ahupuaa* is provided below (ACP, 2002, pp. 9-11). The entire archaeological report, including figures and appendices, may be found in Appendix F of this environmental assessment.

> "Some of the earliest archaeological recordation in the *ahupuaa* was conducted by McAllister (1933). He listed the whole of the plain as a single site, Site 146, noting the presence of many features, including stone walls, probably dating to the ranching period, as well as coral sinkholes and pits which could have been used for cultivation by the indigenous Hawaiian population. Handy (1940) also mentions the cultivation of crops, particularly sugarcane and bananas, in the Ewa sinkholes. Two fishponds, one at Puuloa (Site 142) and one off Laulaunui Island in West Loch (Site 140), a fishing shrine near West Loch (Site 139) and a destroyed *heiau* on Puu o Kapolei (Site 138) were also mentioned by McAllister as being located on the Ewa Plain.
>
> In the northern portion of the *ahupuaa*, along the southeastern slopes of the Waianae Range, where much less archaeological work has been conducted, McAllister listed a number of sites. Two destroyed *heiau*, Sites 133 and 134, were located in gulches below Puu Kanehoa and Mauna Kapu, both peaks in the Waianae Range. Also in a gulch below Mauna Kapu were several leveled off enclosures, the largest measuring 25 meters by 30 meters (Site *135)*. On the Waianae Ridge separating Honouliuli from Waianae, McAllister notes a small coral and basalt platform, probably sacred, near Mauna Kapu (Site 136). He also notes another destroyed *heiau* on Puu Kuua in the eastern foothills of the Waianae Range (Site 137).
>
> Few archaeological investigations occurred between 1933 and the early 1970's. Those which did occur were summarized by Dunn *et al.* (1990). These included Emory's examination of a house site and possible *heiau* constructed of stacked limestone slabs and uprights located on the

western part of the Ewa Plain. Kikuchi's disinterment of 12 to 16 incomplete burials the Standard oil refinery. Soehren's documentation of a sinkhole burial, house sites and modified pits at the Naval Air Station. And finally, Soehren's excavation of a possible fishing shrine at the barge harbor which identified a cultural layer containing large amounts of fish scales, dog, fish and seashell remains and a one piece rotating fishhook.

In the 1970's, with increased development of the plain, investigations became more frequent and covered larger areas. The Barbers Point deep draft harbor, West Beach/Ko Olina, the Ewa Marina Community are among the larger of the projects which began around this time. Site types identified included house sites, cairns, *ahu,* walls, pits, unmodified limestone sinkholes, walled or modified sinkholes, enclosures, C-shaped enclosures as well as human burials. A variety of cultural remains were recovered from the many sites identified including fishhooks, sinkers, fish scales and fish bones providing evidence of a marine based economy. An early assessment of the probable settlement pattern for the area was described as 93 dispersed clusters of residences, surrounded by a relatively open and little inhabited area94 (Barrera,1975:18).

As investigations continued through the 1980's and 1990's, more sites were assessed for their age and function. Dating results indicated that most of the occupation likely dated to the latter centuries of the pre-Contact period. However, samples from some rock shelter sites suggested initial use or occupation as early as the period of initial Polynesian settlement on Oahu. The patterns of settlement were found to differ somewhat from the eastern portions of the plain near West Loch to the western portions of the plain.

Data recovery at the West Loch Estates Residential Increment I and Golf Course and Shoreline Park was conducted in 1988 and 1989 (Wolforth *et al.* 1998) while investigations of the lower and upper valley of Honouliuli Gulch above West Loch was undertaken in 1987 by PHRI (Dunn *et al.* 1990). Included among the recorded features were the remnants of a once extensive agricultural system which combined aquaculture in fishponds situated on the shores of West Loch, irrigated wet crop agriculture of the plain and dryland cultivation of the surrounding slopes and uplands. Along the shores of West Loch, radiocarbon dating results indicated use of a pondfield (Site 3324) and a habitation deposit (Site 3321) from the 10th to 17th centuries AD. The investigations within Honouliuli Gulch revealed that: (a) permanent occupation had occurred at most habitation features, (b) that upper valley occupation may have occurred as early as the mid-6th to mid-9th centuries and (c) that subsequent occupations appear to have been most intensive between the 1300's and 1600's and between the late 1700's to early 1800's (Dunn

et al. 1990).

Investigations conducted in the Barbers Point/Ko Olina area have revealed that the western Ewa Plain had a long initial settlement based on a high degree of marine-oriented task specialization (Dunn *et al.* 1990). Marine task specialization continued into latter settlements, but it seems that in the latter settlements, terrestrially oriented activities increased. This shift in activities suggests a concomitant shift from a dispersed temporary occupation to a loosely nucleated one involving extended periods of residence.

In order to assess areas through which the proposed waterlines of the Ewa Nonpotable Water System will pass which may contain potential historically significant properties, ACP has prepared figures depicting the route of the waterlines and the locations of known historic properties. The first of these figures was derived from the City and County of Honolulu's Ewa Development Plan, Exhibit 3.2 and depicts the locations of known archaeological sites, historic and archaeological districts, plantation villages and an historic railway (see Figure 3). The second was derived from a figure prepared by David Tuggle and depicts the locations of known pre-Contact settlement complexes and religious structures (see Figure 4).

An analysis of these overlays shows that there are three areas through which the proposed waterlines will be passing where potentially significant historic properties may be encountered. The first is located along the southeastern coastline of the Ewa Plain in the eastern portion of the Oneula Archaeological District (see Figures 3 & 4). The second is located across the central-eastern portion of the plain running along the route of an historic railway and the southern boundary of a group of plantation villages. The third and final area is located in the northwestern corner of the Ewa Plain. In this location, Figure 3 shows three segments of the waterlines passing through three areas of dispersed archaeological sites while Figure 4 depicts one waterline passing between two areas of pre-Contact settlement complexes."

Environmental Impacts and Mitigation Measures:

"Because it has been determined that the proposed waterlines will pass through three areas in which there is the potential to impact significant historic properties, ACP recommends that an archaeological monitor be on site when construction activities pass through these areas. During the remainder of the project, it is recommended that an archaeological monitor be on call in the event that significant historic properties are encountered during construction activities. The proper authorities with the DLNR-SHPD have been consulted and their comments regarding sites

to be avoided and proposed mitigation measures is included in Appendix A (correspondence dated April 12th, 2002; LOG NO: 29552, DOC NO: 0204EJ02)."

Furthermore, if iwi or Native Hawaiian cultural or traditional deposits are found during ground disturbance or excavation, work will cease, and the appropriate agencies will be contacted pursuant to applicable law.

3.4.2 Public Utilities

3.4.2.a Potable Water System

Existing Conditions:

The Board of Water of Water Supply operates and maintains the City and County of Honolulu's municipally-owned water system. The potable system consists of supply wells, storage reservoirs, booster pump stations, and transmission lines that convey water to distribution networks throughout the region. It serves present residential and non-residential customers in Kapolei, Ewa and Makakilo, and will also serve potential developments in the area.

Environmental Impacts and Mitigation Measures:

Contractors will be required to verify water infrastructure locations, especially underground waterlines, valves, and valve boxes prior to the start of construction. Water service should not be disrupted during construction activities, and the relocation or modification of any existing infrastructure is not expected. Access to fire apparatus will be maintained throughout the construction site and any interruption in the existing fire hydrant system during construction will be reported to the Fire Communication Center at 523-4111.

Since the nonpotable water system does and will continue to function as a dual system separate from the potable system, the two water systems must carefully be designed and operated to prevent cross-connections and backflow conditions. Cross-connection of potable and nonpotable water systems will not be normal practice; however, if connection between two water systems is necessary, an air gap approved by the BWS will be provided to protect the potable water system. Backflow prevention will be required for on-site distribution systems when a particular user operates both a nonpotable and a potable system within the same area. The method of backflow prevention will also require BWS or DOH approval.

In order to prevent a nonpotable main from mistakenly being connected to a potable water main, the proposed system will be appropriately painted and labels satisfying Section V.A. of the DOH reuse guidelines (2002), Design Parameters for the Distribution of Recycled Water:

- Buried and above ground transmission piping and appurtenances will follow consistent color coding (purple Pantone 522 for buried and 512 for above ground) to differentiate recycled water from potable water or wastewater.

- Service lines, valves and other appurtenances will be embossed or integrally stamped/marked "CAUTION: RECYCLED WATER - DO NOT DRINK," or be installed with proper identification indicated in the DOH reuse guidelines.

The significant long-term benefit of the proposed project will be the overall increase in water supply for the Ewa district. The 1:1 replacement allowed by substitution of nonpotable water for irrigation and industrial uses will permit direct consumption of potable water for other high priority clean water uses.

3.4.2.b Wastewater

Existing Conditions:

Ewa's wastewater collection, treatment and disposal systems are under the jurisdiction of the City and County of Honolulu. The collection system is comprised of associated sewer mains, trunk sewers, pump stations and force mains. Parts of the collection system have been identified with inadequate capacity to accommodate existing and projected flows. In addition, there are deficiencies in manholes and sewer lines due to structural deterioration and corrosion (Wilson Okamoto & Associates and Brown and Caldwell, 2001).

Collected wastewater is treated at the Honouliuli Wastewater Treatment Plant (WWTP), which is being operated under conditions of the 1991 National Pollutant Discharge Elimination System (NPDES) permit. The permit has been administratively extended pending issuance of a new permit by the U.S. Environmental Protection Agency. The current NPDES permit includes 7-day and 30-day effluent limits for total suspended solids and 5-day biochemical oxygen demand. The WWTP has a design liquid capacity of 38 MGD. The solid capacity is currently 26 to 28 MGD. A project to increase the WWTP's solids capacity is included in the FY04 and FY05 City Capital Improvement Program (CIP) budgets.

The NPDES permit authorizes the City to discharge treated wastewater to receiving waters of Mamala Bay through the Barbers Point Deep Ocean Outfall. Since the start-up of the WWTP, the outfall had been the exclusive means of effluent disposal. The outfall diffuser is located 1.7 miles offshore at a depth of approximately 200 feet. (Wilson Okamoto and Associates and Brown and Caldwell, 2001).

As described in Chapter 2, the Honouliuli Water Recycling Facility now takes treated wastewater effluent from the wastewater plant and further treats it to produce R-1 and RO water for specific reuse. This will also relieve the outfall during peak conditions.

Environmental Impacts and Mitigation Measures:

Prior to the start of construction, contractors will be required to verify wastewater and sewer infrastructure locations, especially underground sewer lines and manholes. In general, the relocation or modification of any existing wastewater infrastructure is not expected. During construction, contractors will also be required to protect existing infrastructure and ensure that services are not interrupted within the project area.

The new nonpotable distribution system, itself, will not generate additional wastewater flows to the Honouliuli WWTP.

3.4.2.c Drainage

Existing Conditions:

Although Ewa is known for its warm and arid climate most of the year, low-lying areas are subject to flooding during intense rainstorms. Flood control has been accomplished through various urban development projects consisting primarily of concrete-lined channels to convey stormwaters to the ocean. The drainage systems in the Ewa region is comprised of five sub-regional systems identified below.

- The Kaloi Gulch encompasses approximately 11 square miles extending from the crest of the Waianae Range to the shoreline. Developments in this watershed have included Ewa Villages and Laulani by the City and County of Honolulu, Ewa by Gentry, Ocean Pointe by Haseko, as well as others by the State of Hawaii and the Estate of James Campbell. Peak design flow is approximately 11,500 CFS which will run through Haseko's Ewa Marina (Ocean Pointe) property and ultimately discharge into the proposed marina.

- A major new system will drain Makaiwa Hills, Kapolei Business Park, and the industrial areas in the vicinity of the Kalaeloa Barbers Point Harbor.

- Drainage improvements in the West Loch Drainage Basin are serving the City's West Loch residential project, Phase I of Ewa by Gentry, and the East Kapolei community project.

- The Villages of Kapolei's drainage system will consist of golf course retention and disposal of stormwater into injection wells and a large ditch near the Barbers Point Naval Air Station boundary (BPNAS).

- Expansion of the channel at the western edge of the BPNAS will provide additional capacity to serve the City of Kapolei.

Environmental Impacts and Mitigation Measures:

Prior to the start of construction, contractors will be required to verify drainage infrastructure locations, especially underground drain lines, catch basins, and manholes prior to the start of construction. In general, the relocation or modification of any existing drainage infrastructure is not expected. During construction, contractors will also be required to protect existing drainage infrastructure and ensure that services are not interrupted within the project area.

The proposed construction of the nonpotable water distribution system will not alter existing or future drainage improvements in the Ewa region. Subsequently, drainage systems along the proposed alignments should not be impacted.

3.4.2.d Electricity

Existing Conditions:

The Hawaiian Electric Company (HECO) owns and operates three power plants on Oahu, which have a combined generating capability of 1,263 MW. This supplies the majority of Oahu's 275,000 customers. HECO's Kahe Power Plant is the largest of the three plants and is located approximately 6 miles from the Kapolei Business Park, mauka of Farrington Highway outside of Ko Olina Resort. The primary transmission line from Kahe is a 138 KV overhead line to the Waiau substation in Pearl City.

Independent power producers in the Campbell Industrial Park include: (1) HPOWER; (2) Kalaeloa Partners, L.P.; and (3) AES Hawaii. These independent producers are capable of generating approximately 400 MW.

Environmental Impacts and Mitigation Measures:

Contractors will be required to verify existing infrastructure locations prior to the start of construction. In general, the relocation or modification of any existing infrastructure is not expected. During construction, contractors will also be required to protect existing infrastructure and ensure against interruption of services within the project area.

Electrical demands during construction and operation of the proposed nonpotable water distribution system are not expected to exceed existing power generating capability. Essentially, the long-term operation of the nonpotable system will require the same power demand that would otherwise have been used in the potable water distribution system. There will be no significant impact on HECO or the other independent power producers.

3.4.2.e Gas

Existing Conditions:

The Gas Company maintains underground utility gas mains in the project vicinity, which serves commercial and residential customers in the area. This system is interconnected with the utility network in the Ewa District.

Environmental Impacts and Mitigation Measures:

Additional services will not be required for the proposed project. Contractors will be required to verify existing utilities prior to the start of construction. In general, the relocation or modification of any existing infrastructure is not expected. During construction, contractors will also be required to protect existing infrastructure and ensure against interruption of services within the project area. Overall, there are no anticipated impacts to the gas system.

3.4.2.f Communications

Existing Conditions:

Verizon Hawaii maintains land line telephone service in the Ewa region. Existing overhead lines are shared under the joint pole agreement established with other utility users. Oceanic Cable provides cable TV service in the region. The more recent installations of telephone and cable TV services have been exclusively underground.

Environmental Impacts and Mitigation Measures:

Additional services will not be required for the proposed project. Contractors will be required to verify existing utilities prior to the start of construction. In general, the relocation or modification of any existing infrastructure is not expected. During construction, contractors will also be required to protect existing infrastructure and ensure against interruption of services within the project area.

3.4.2.g Roads and Highways Rights-of-Ways

Existing Conditions:

Ewa's existing road and highway network consists of two major east-west arterials, Farrington Highway and the H-1 Freeway, connecting several roads in the north-south direction that distribute traffic on and off the arterials. The H-1 Freeway also connects Ewa with the Honolulu Primary Urban Center, and Farrington Highway connects Waipahu, Ewa and the Waianae Coast. The north-south distributor roads include: Fort Weaver Road, Kunia Road, Fort BarretteRoad, Makakilo Drive and Kalaeloa Boulevard.

The Secondary Urban Center in Ewa is expected to remain a focal point of significant economic growth and major housing development on Oahu. Traffic congestion has been a mounting concern strongly voiced by numerous community and business groups in the area. Various studies, including ongoing planning efforts by the Oahu Metropolitan Planning Organization (OMPO), have identified and prioritized the

necessary improvement projects required to support growth in this region. The *2020 Oahu Regional Transportation Plan (2020 ORTP)* was adopted by OMPO in 1995. Subsequently, the *Transportation for Oahu Plan 2025 (TOP 2025)* updates the *2020 ORTP*. Undoubtedly, the changing transportation needs of Oahu will require constant update of the ORTP and TOP throughout the multi-phased expansion of the Ewa Nonpotable Water System.

The *TOP 2025* (Carter & Burgess, 2001), approved by the OMPO Policy Committee on April 6, 2001, has recommended high priority consideration for 14 transportation projects in Ewa. These projects have been categorized on a need basis to provide congestion relief, support of community planning goals and improve operations and safety (refer to Table 3-2). It should be noted that this list will continue to be modified with future updates of the ORTP and TOP.

TABLE 3-2. HIGH PRIORITY TRANSPORTATION PROJECTS FOR THE EWA AREA

Project No.	Project Description	Estimated Cost ($M 2000)
E-1	H-1 Makakilo Interchange new WB on-ramp	$10.9
E-2	H-1Kapolei Interchange new interchange	$44.3
E-3	H-1 Palailai Interchange improvements	$8.5
E-5	Farrington Hwy. widening Kalaeloa to Kamokila	$4.9
E-6	Farrington Hwy. widening Kapolei Golf Course to Fort Weaver Rd.	$31.6
E-8	Fort Barrette Rd. widening Farrington Hwy. to F.D. Roosevelt Blvd.	$21.5
E-9	Fort Weaver Rd. widening Farrington Hwy. to Geiger Rd.	$38.6
E-10	Hanua St. new roadway Malakole St. to Farrington Hwy.	$13.1
E-11	Kalaeloa roadway improvements	$26.9
E-12	Kalaeloa Blvd. corridor improvements	$13.1
E-13	Kapolei Pkwy. completion (Kapolei to Ewa Beach)	$28.5
E-14	Makakilo Dr. extension (second access)	$8.5
E-15	Mauka Frontage Rd. Makakilo Dr. to Kalaeloa Blvd.	$6.4
E-17	North-South Road Kapolei Parkway to H-1 (includes new interchange with H-1)	$90.0

Source: *Transportation for Oahu Plan TOP 2025* (Carter & Burgess, 2001).

Environmental Impacts and Mitigation Measures:

As mentioned throughout this environmental assessment, every attempt will be made to locate proposed nonpotable distribution lines along existing or future road, street and highway rights-of-ways to prevent or minimize construction activities through undisturbed lands. This approach is being taken so as to mitigate potential impacts on the following environments:

- Archaeological
- Flora and Fauna

- Threatened and Endangered Species
- Open space (parks and golf courses)

In light of the various transportation projects that are planned for Ewa, appropriate coordination with the State Department of Transportation Highways Division and the City's Department of Transportation Services will not be overlooked. The following procedures will be observed to during planning and design of the proposed distribution system:

- Early coordination with government agencies to discuss and evaluate appropriate alignment and construction methods
- Coordination with ongoing and proposed projects in Kapolei, Ewa, Makakilo and Barbers Point (Kalaeloa)
- Submittal and approval of construction plans for all work done within State and City rights-of-ways

In summary, the proposed mitigative measures will cover both planning and design phases of the proposed project. Timely coordination with affected government agencies, community groups, schools, businesses, and golf courses as discussed above should alleviate significant impacts to overall transportation in the Ewa region.

3.4.3 Land Use and Zoning

Existing Conditions:

Oahu's Ewa district has undergone unprecedented growth via residential, commercial and industrial developments throughout the past decade. Based on the City and County of Honolulu's *General Plan* (CCH, 1992) and the *Ewa Development Plan* (CCH, 1997), forecasts of continued growth in the district are expected through the year 2020 and beyond.

The State Land Use Map classifies the project site within the Urban and Agricultural districts. City and County of Honolulu Land Use Zoning designations along the proposed waterline alignments and reservoir sites are shown on Figure 1-3 and include the following:

A-1	Apartment, Low-density
A-2	Apartment, Medium-density
AG-1	Agricultural, Restricted
AG-2	Agricultural, General
B-1	Business, Neighborhood
B-2	Business, Community
I-2	Industrial, Intensive
P-2	Preservation, General
R-5	Residential

Environmental Impacts and Mitigation Measures:

The proposed nonpotable waterline and reservoir projects will not require zoning changes from the City and County of Honolulu nor land use changes from the State of Hawaii. Easements in favor of the Board of Water Supply will need to be created for new waterlines constructed in private properties.

Land acquisition for reservoir and booster pumping station sites may be necessary once final locations are identified. Separate site-specific environmental assessments will be prepared for reservoirs and booster pumping station projects. At such time more detailed issues surrounding land ownership will be disclosed.

3.4.4 Commercial and Industrial Areas

Existing Conditions:

The major industrial and commercial areas in the Ewa Plain are the James Campbell Industrial Park and the Kapolei Business Park (refer to Figure 3-7). Both property developments are privately managed.

3.4.4.a Campbell Industrial Park

Since its opening in the early 1960s, the Campbell Industrial Park has been creating job opportunities in the Ewa and Leeward areas of Oahu, which previously had been dominated by the sugar plantations. The Campbell Industrial Park remains one of Kapolei's largest job centers accounting for more than 4,500 jobs (Estate of James Campbell Web site, 2004). It is Hawaii's largest industrial park (1,367 acres zoned I-2), with national and international companies like Ameron International, Chevron, Citizens Electric, Coca Cola, Reynolds Aluminum, Tesoro Petroleum and Ziegler Steel, representing various industries: manufacturing, recycling, import/export, power generation, construction, warehouse and distribution. The Campbell Industrial Park is also served by the adjacent deep-draft Kalaeloa Barbers Point Harbor.

3.4.4.b Kapolei Business Park

Kapolei Business Park is located just south of the City of Kapolei and is adjacent to Campbell Industrial Park and Kalaeloa Barbers Point Harbor. It includes 91 acres zoned I-2 with lots available for lease or sale. Uses include light industrial, processing, suppliers, wholesalers, warehousers and distribution centers, data processing, technology research and development, integrated systems networks, Internet exchanges, data centers, switching stations and telecom companies.

Environmental Impacts and Mitigation Measures:

Tesoro Refinery and AES Hawaii at the Campbell Industrial Park are already using RO water from the Honouliuli WRF. The activation of the existing 16-inch R-1 water line and proposed nonpotable waterlines in the City of Kapolei, Kapolei Business Park, and the Campbell Industrial Park will facilitate delivery to potential new business and industrial

customers. Future industrial users such as Island Ready Mix will benefit from the availability of nonpotable water in their manufacturing operations. Other entities in the Kapolei Business Park are also expected to use R-1 water for landscape irrigation. Overall, the proposed expansion of the nonpotable water system could indirectly benefit businesses and industries in the region by allowing potential growth of both sectors whereby water supply would not be a limiting factor.

3.4.5 Recreational and Open Spaces

3.4.5.a Golf Courses

Existing Conditions:

Presently there are eight private and public golf courses in the Ewa area (refer to Figure 3-8). The municipal courses include West Loch and Ewa Villages. According to the *Ewa Development Plan* (CCH, 1997) the Ewa Villages Golf Course also provides flood protection and storm water detention for Ewa Villages. Existing private courses include: Ko Olina, Hawaii Prince, Kapolei, and Coral Creek. The military operates the Barbers Point Golf Course. Additional private courses are planned for, Ewa Marina (Ocean Pointe)and Makakilo.

Environmental Impacts and Mitigation Measures:

In addition to their recreational value, golf courses also provide open space and help prevent flooding and reduce non-point pollution by retaining storm waters. As such, golf courses can offer positive social, environmental, and economic benefits to the community. As indicated in the DOH reuse guidelines (2002), R-1 water is a permissible use for golf course irrigation. Thus, the expansion of the R-1 nonpotable water system should serve to promote and facilitate golf development in the Ewa district.

3.4.5.b Resort Areas

Ko Olina Resort - The Ko Olina Resort property includes 640 acres located between Kahe Point Beach Park and the Kalaeloa Barbers Point Harbor. The fully developed resort will be a water-oriented residential and resort community with visitor units, resort condominiums, two golf courses, a small boat marina and four man-made swimming lagoons. The first phase of the resort development included the first hotel, swimming lagoons, the first golf course, roads and utilities.

Ewa Marina - The Ocean Pointe development in Ewa will encompass 1,100 acres of 4,850 residential units, a golf course, a major commercial area, 1,000 hotel rooms and a 70-acre regional recreational marina with a capacity of 1,400 wet slips.

3.4.5.c Parks

There are numerous park and beach facilities located throughout Ewa. The City and County of Honolulu Department of Parks and Recreation Services maintains 14 neighborhood and community parks and nine beach and shoreline parks along the coast and Pearl Harbor. In addition, there are three regional or district parks - Kapolei, Kalaeloa (Barbers Point) and Ewa.

The beach parks are well used by the public for diving, fishing, surfing, swimming, snorkeling, trapping, and netting. Because they are situated in residential areas, the community, neighborhood and regional/district parks are also well used for athletic activities, including baseball, soccer, and basketball.

Environmental Impacts and Mitigation Measures:

The primary benefit to existing and future parks in this region will be the availability of additional nonpotable water for irrigation of fields and landscaping. As indicated in Section 3.3.3, human contact is permitted for R-1 water. The use of R-1 water should not pose a health risk to park and beach users.

3.4.6 Residential Communities

Existing Conditions:

The *Ewa Development Plan* (CCH, 1997) envisions a network of master planned residential communities that will provide a wide variety of housing opportunities. Census 2000 reported 20,804 housing units in the Ewa DP area (2000 Census ST1 File; Planning Division, Honolulu Department of Planning and Permitting, January 2002). New developments are slated for the City of Kapolei, East Kapolei, Ewa by Gentry, Ewa Marina, Ko Olina, Lualani, Makaiwa Hills, Ewa Villages, and the Villages of Kapolei (refer to Figure 3-9). The projected number of housing units and phases of development as indicated in the *Ewa Development Plan* (CCH, 1997) is provided in Table 3-3.

Environmental Impacts and Mitigation Measures:

While the BWS does not intend on promoting the use of nonpotable water for private yard irrigation at the present time, the proposed system expansion will nevertheless enable delivery of nonpotable water to more areas in the Ewa district. This would free up potable water currently being used where nonpotable water is suitable, largely for non-residential uses. The potable water would then be available for residential housing projects such as those indicated in Table 3-3, consistent with the City's vision for Ewa.

TABLE 3-3. PHASING OF MASTER PLANNED RESIDENTIAL DEVELOPMENT

Project Area	Housing Units	Residential
Phase I (1997 - 2005)		
Previously Approved		
City of Kapolei	2,000	118
Ewa by Gentry	5,387	554
Ewa Marina	4,850	500
Ewa Villages	1,760	182
Kapolei Knolls	418	72
Kapolei Mauka	750	50
Ko'Olina	8,700	354
Makaiwa Hills	1,066	354
Makakilo	2,706	808
Villages of Kapolei	4,020	283
Total	31,657	3,275
Proposed Projects		
DHHL	1,600	200
East Kapolei (Schuler)	4,000	350
Fairways Residential	900	100
HFDC (State Land Bank)	4,000	750
Laulani Residential	1,100	150
Makakilo Extension	200	100
Cumulative Total	43,400	4,900
Phase II (2006 - 2015)		
East Kapolei (Schuler)	4,000	350
HFDC (State Land Bank)	3,700	300
Kapolei East (Campbell)	2,000	500
Kapolei LDA	500	50
Kapolei North	1,200	150
Makaiwa Hills	2,000	1,300
Cumulative Total	56,700	7,550
Phase III (2016 and Beyond)		
Kapolei East (Campbell)	6,300	300
Kapolei LDA	1,300	50
Cumulative Total	64,300	7,950

NOTES:

(1) For proposed projects in all phases, housing units are rounded to the nearest 100; residential and total acreage to the nearest 50; all other acreage to the nearest 10. Parts may not sum to totals shown due to rounding.

(2) Lands included in the first phase of development (1997 - 2005) would be eligible for processing zoning changes and other development applications starting with adoption of the Plan.

FOR PREVIOUSLY APPROVED PROJECTS, ACREAGES SHOWN REFER TO THE ENTIRE PROJECT AREA (INCLUDING AREAS ALREADY BUILT) WHEREAS HOUSING UNITS EXCLUDE UNITS BUILT BEFORE JULY 1994.

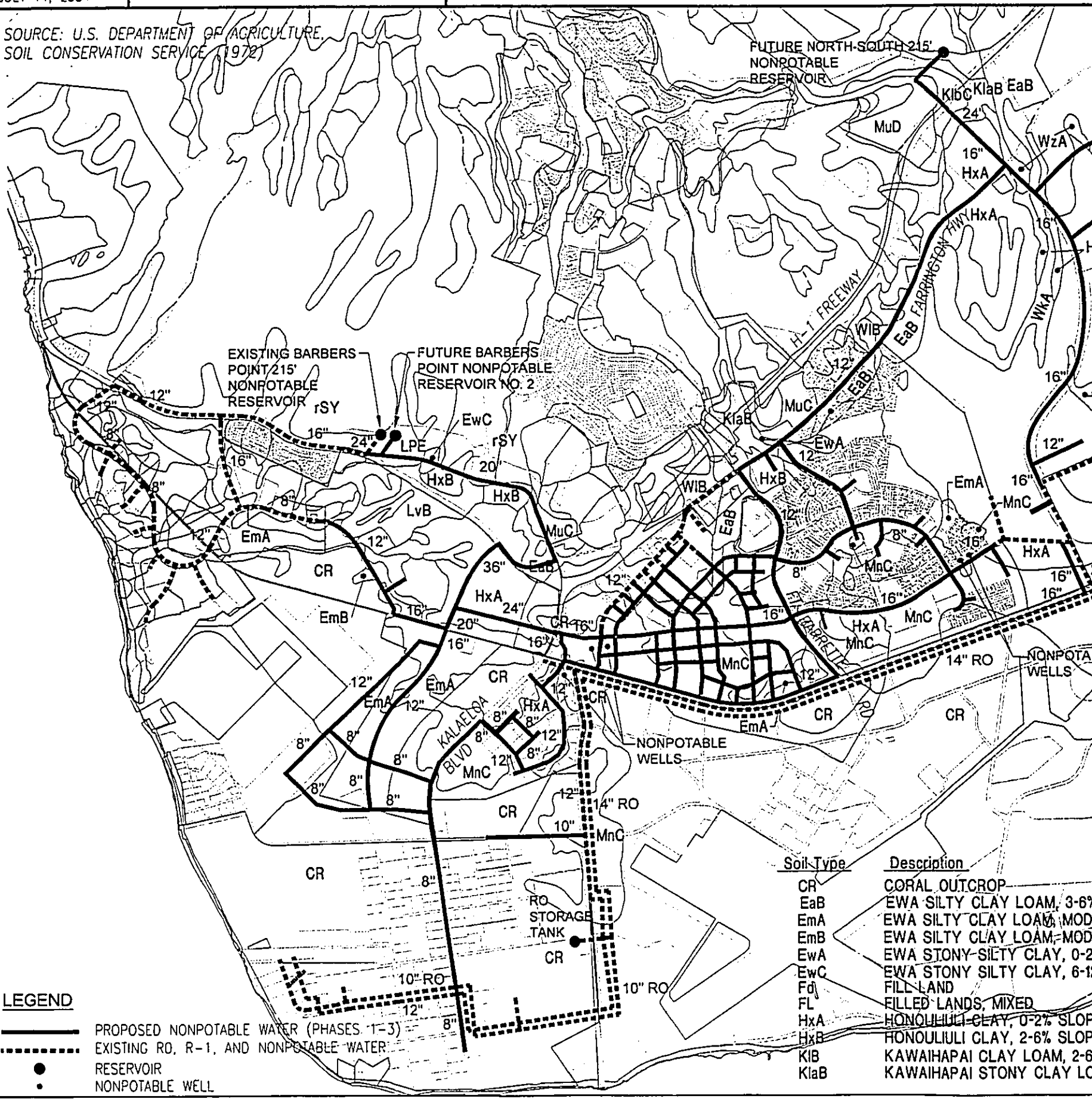
(3) LANDS IN THE SECOND PHASE OF DEVELOPMENT (2006 - 2015) WOULD BE ELIGIBLE FOR PROCESSING ZONING CHANGES AND OTHER DEVELOPMENT APPLICATIONS FAR ENOUGH IN ADVANCE SO THAT HOUSING CONSTRUCTION COULD BEGIN IN 2006.

(4) LANDS IN THE THIRD PHASE OF DEVELOPMENT (2016 AND BEYOND) WOULD BE ELIGIBLE FOR PROCESSING ZONING CHANGES AND OTHER DEVELOPMENT APPLICATIONS FAR ENOUGH IN ADVANCE SO THAT HOUSING CONSTRUCTION COULD BEGIN IN 2016.

SOURCE: *EWA DEVELOPMENT PLAN* (CCH, 1997).

SCALE: 1" = 4000'	PREPARED FOR:	EXPANSION OF THE EWA NONPOTABLE WATER SYSTEM ENV
CAD DRAWING: 2838-NCS-XZBIT	Board of Water Supply City and County of Honolulu	SOIL CLASSIFICATION MA
DATE: JULY 14, 2004		

SOURCE: U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE (1972)



Soil Type	Description
CR	CORAL OUTCROP
EaB	EWA SILTY CLAY LOAM, 3-6%
EmA	EWA SILTY CLAY LOAM, MOD
EmB	EWA SILTY CLAY LOAM, MOD
EwA	EWA STONY SILTY CLAY, 0-2
EwC	EWA STONY SILTY CLAY, 6-1
Fd	FILL LAND
FL	FILLED LANDS, MIXED
HxA	HONOULIULI CLAY, 0-2% SLOP
HxB	HONOULIULI CLAY, 2-6% SLOP
KlB	KAWAIHAPAI CLAY LOAM, 2-6
KlaB	KAWAIHAPAI STONY CLAY LO

LEGEND

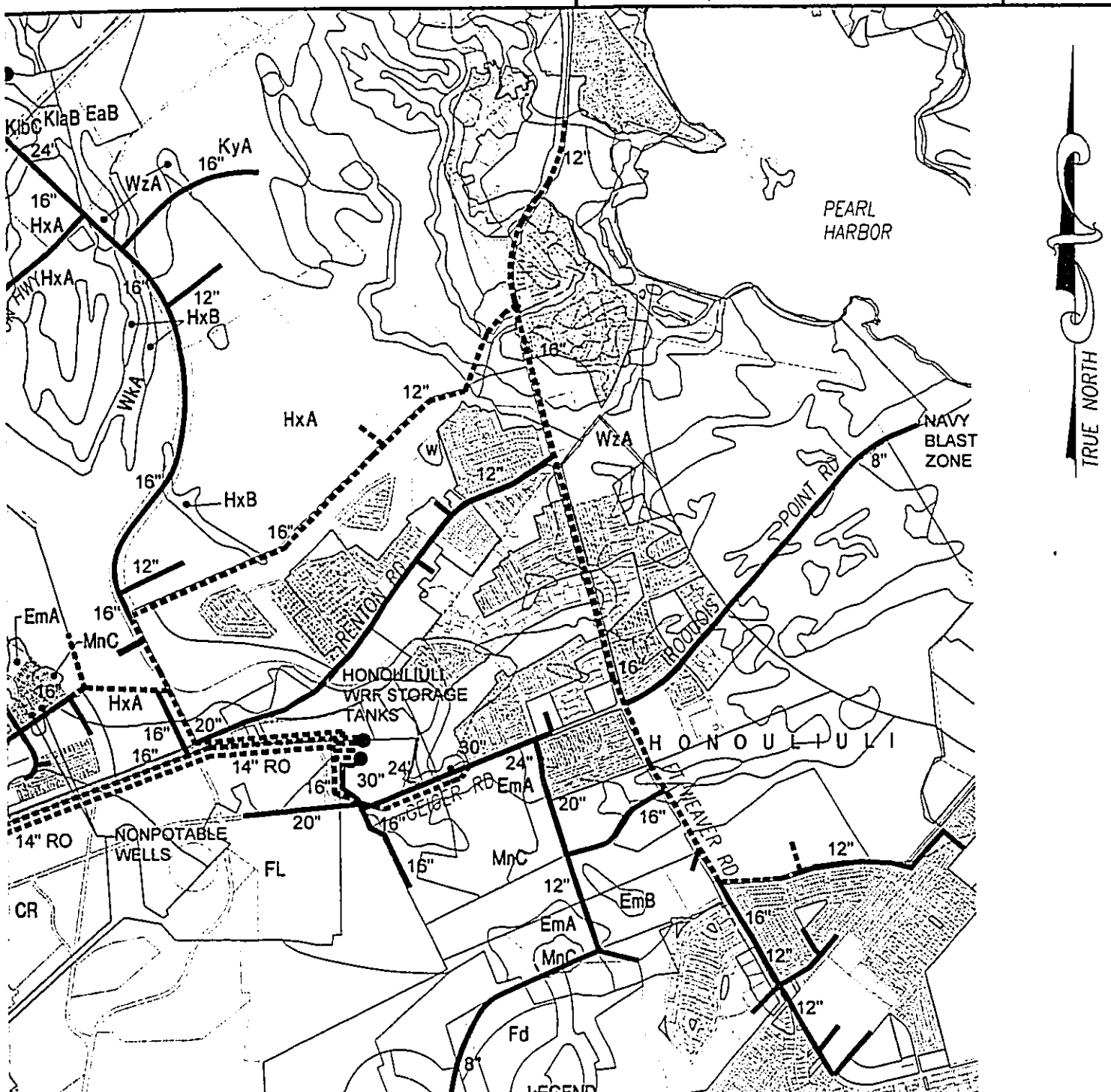
- PROPOSED NONPOTABLE WATER (PHASES 1-3)
- EXISTING RO, R-1, AND NONPOTABLE WATER
- RESERVOIR
- NONPOTABLE WELL

R SYSTEM ENVIRONMENTAL ASSESSMENT

CATION MAP

Gray · Hong · Nojima & Associates, Inc
CONSULTING ENGINEERS
841 Bishop Street Suite 1100

FIGURE
3-1



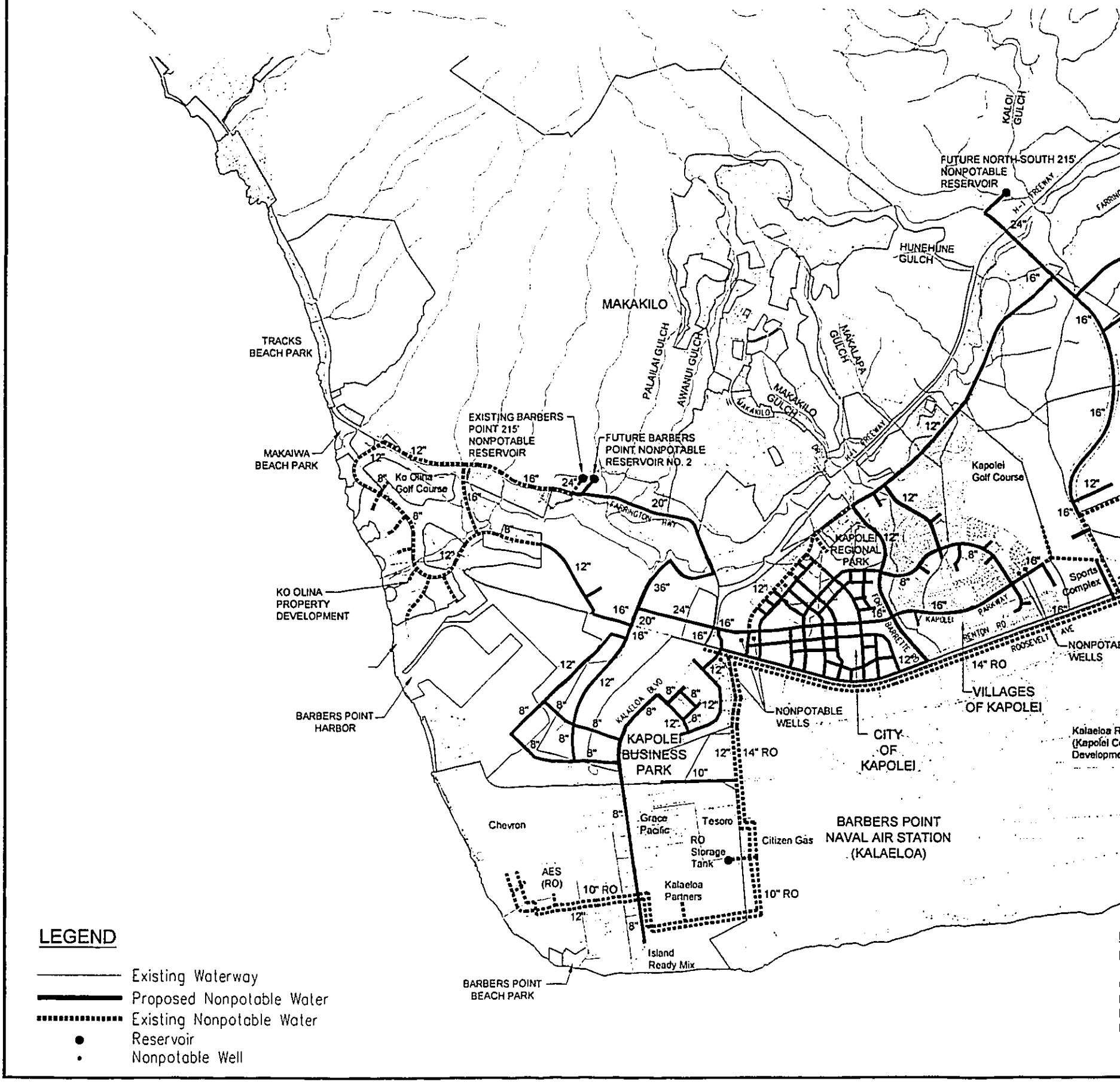
tion

OUTCROP
LTY CLAY LOAM, 3-6% SLOPES
.TY CLAY LOAM, MODERATELY SHALLOW, 0-2% SLOPES
.TY CLAY LOAM, MODERATELY SHALLOW, 2-6% SLOPES
'ONY SILTY CLAY, 0-2% SLOPES
'ONY SILTY CLAY, 6-12% SLOPES
ND
.ANDS, MIXED
IULI CLAY, 0-2% SLOPES
.IULI CLAY, 2-6% SLOPES
APAI CLAY LOAM, 2-6% SLOPES
APAI STONY CLAY LOAM, 2-6% SLOPES

LEGEND

KlbC	KAWAIHAPAI VERY STONY CLAY LOAM, 0-15% SLOPES
KYA	KUNIA SILTY CLAY, 0-3% SLOPES
LPE	LUALUALEI EXTREMELY STONY CLAY, 3-35% SLOPES
LyB	LUALUALEI STONY CLAY, 2-6% SLOPES
McD2	MANANA SILTY CLAY LOAM, 12-25% SLOPES, ERODED
MnC	MAMALA STONY SILTY CLAY LOAM, 0-2% SLOPES
MuC	MOLOKAI SILTY CLAY LOAM, 7-15% SLOPES
MuD	MOLOKAI SILTY CLAY LOAM, 15-25% SLOPES
rSY	STONY STEEP LAND
WlB	WAIALUA SILTY CLAY, 3-8% SLOPES
WkA	WAILUA SILTY CLAY, 0-3% SLOPES
WzA	WAIPAHU SILTY CLAY, 0-2% SLOPES

SCALE: 1" = 4000'	PREPARED FOR:	EXPANSION OF THE EWA NONPOTABLE WATER SYSTEM ENV
CAD DRAWING: 2838-QUADS	Board of Water Supply City and County of Honolulu	GULCHES AND DRAINAGEWA
DATE: JULY 14, 2004		



LEGEND

- Existing Waterway
- Proposed Nonpotable Water
- Existing Nonpotable Water
- Reservoir
- Nonpotable Well

ER SYSTEM ENVIRONMENTAL ASSESSMENT
RAINAGEWAYS

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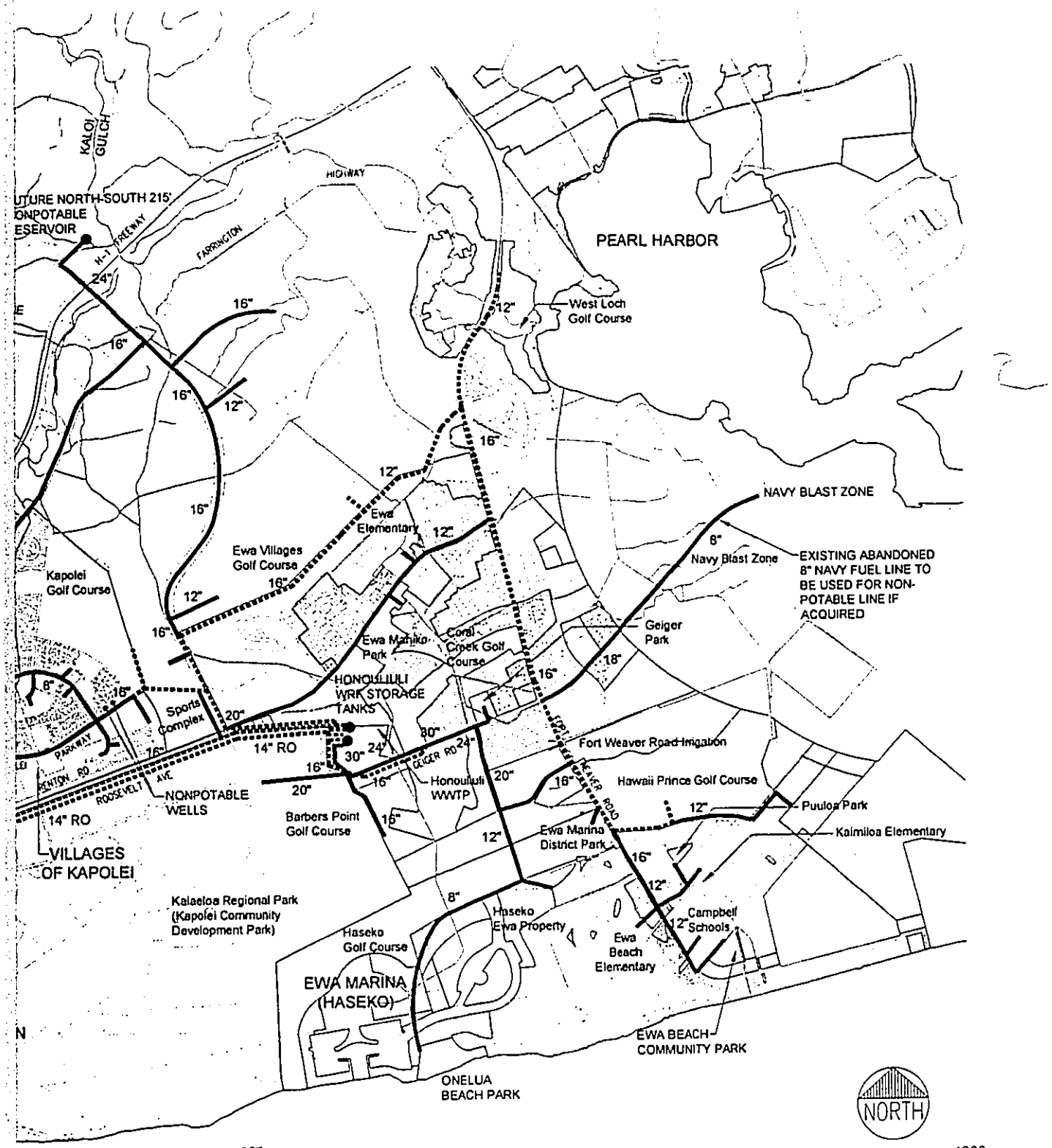
FIGURE
3-2

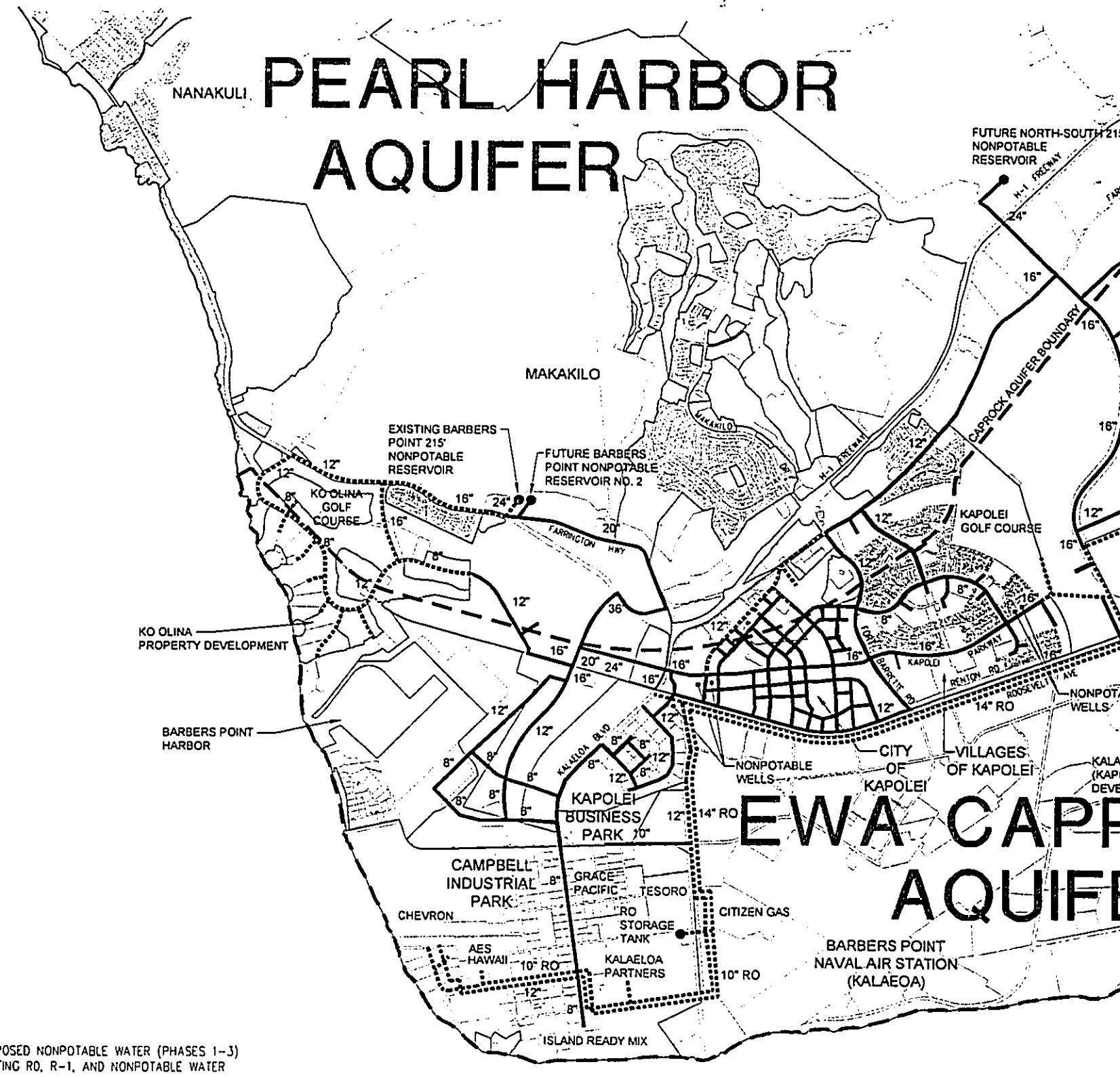


NOTE:

PROPOSED NONPOTABLE WATERLINE ALIGNMENTS AND SIZES AND FUTURE RESERVOIR SITES AND CAPACITIES ARE BASED ON PROJECTED USER LOCATION AND DEMAND, SUBJECT TO CHANGE BY BWS DURING PRELIMINARY ENGINEERING AND DESIGN STAGES.

SOURCE: CITY AND COUNTY OF HONOLULU GEOGRAPHIC INFORMATION SYSTEM (2002)

SCALE: 1" = 4000'	PREPARED FOR:	EXPANSION OF THE EWA NONPOTABLE WATER SYSTEM EN
CAD DRAWING: 2838ZONING	Board of Water Supply City and County of Honolulu	PEARL HARBOR & EWA CAPROCK
DATE: JULY 14, 2004		



LEGEND

- PROPOSED NONPOTABLE WATER (PHASES 1-3)
- EXISTING RO, R-1, AND NONPOTABLE WATER
- PEARL HARBOR AQUIFER
- EWA CAPROCK AQUIFER
- CAPROCK AQUIFER BOUNDARY
- RESERVOIR
- NONPOTABLE WELL

ER SYSTEM ENVIRONMENTAL ASSESSMENT

CAPROCK AQUIFERS

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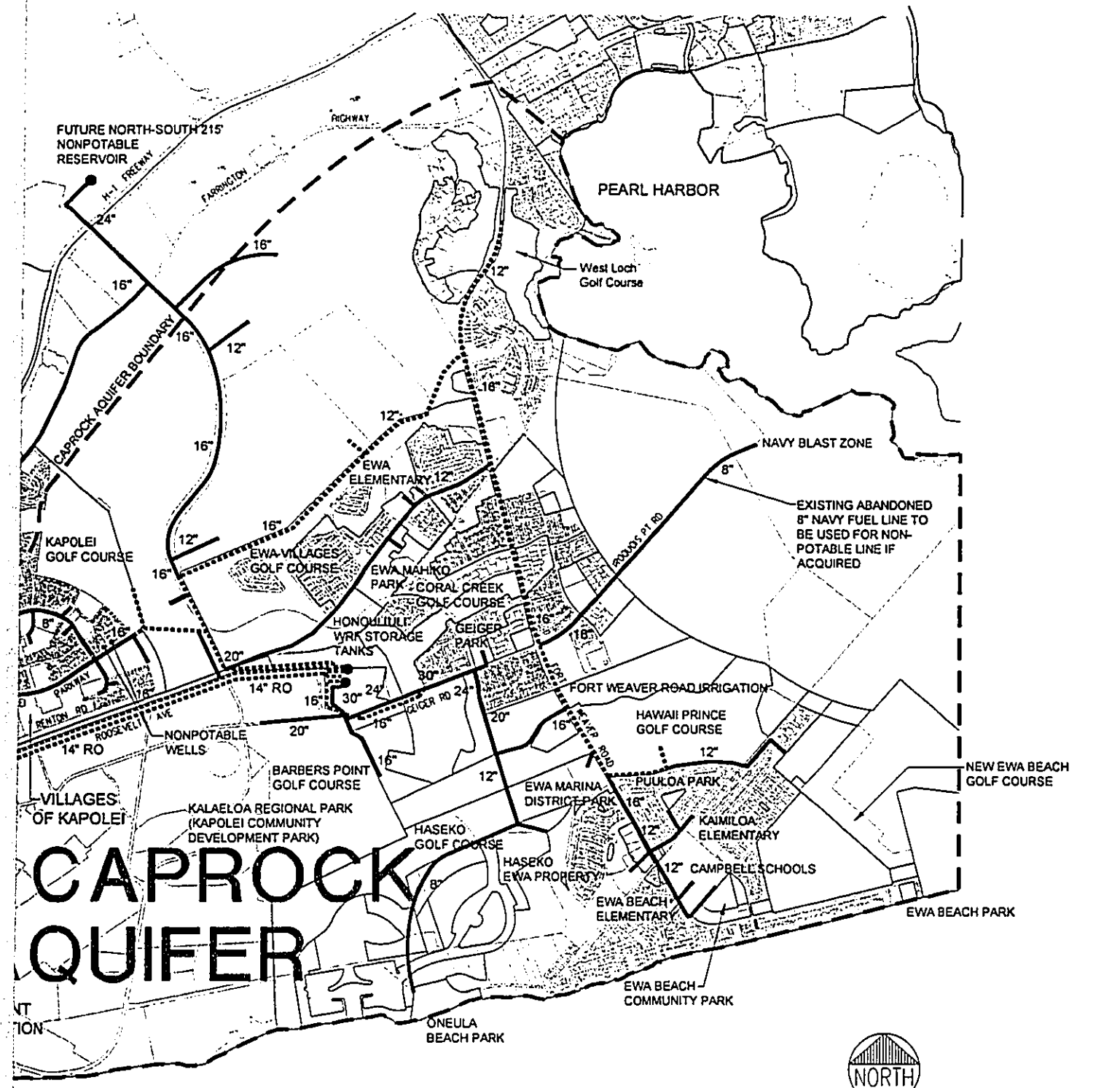
841 Bishop Street Suite 1100

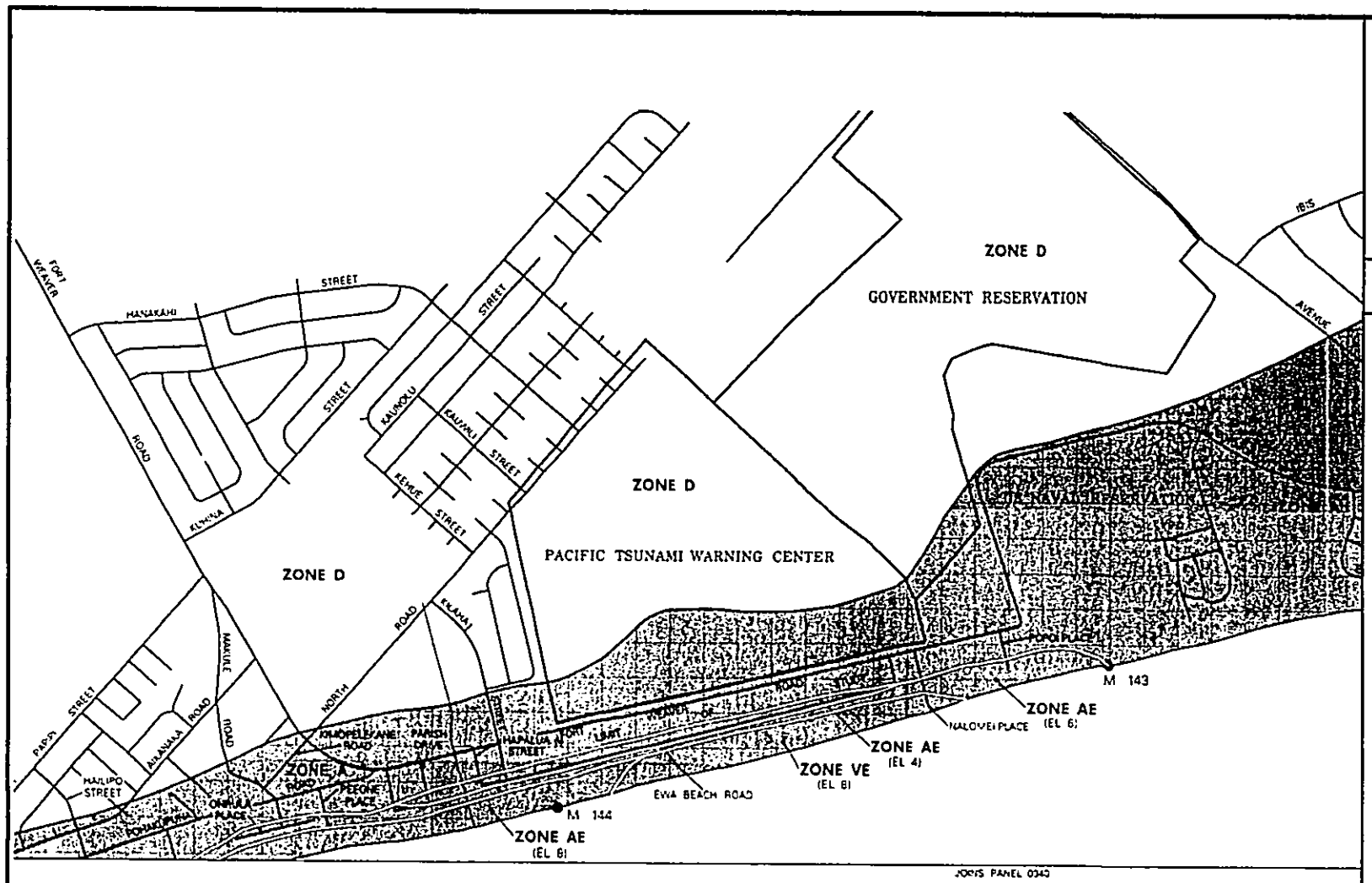
FIGURE
3-3



NOTE:

PROPOSED NONPOTABLE WATERLINE ALIGNMENTS AND SIZES AND FUTURE RESERVOIR SITES AND CAPACITIES ARE BASED ON PROJECTED USER LOCATION AND DEMAND, SUBJECT TO CHANGE BY BWS DURING PRELIMINARY ENGINEERING AND DESIGN STAGES.

SOURCE: R.M. TOWILL CORP. (2004) AND COMMISSION ON WATER RESOURCE MANAGEMENT, DEPARTMENT OF LAND AND NATURAL RESOURCES (2001)



LEGEND

ZONE A99 To be protected from 100-year flood by Federal flood protection system under construction ; no base flood elevations determined.

ZONE V Coastal flood with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

ZONE X Areas determined to be outside 500-year floodplain.

ZONE D Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain Boundary

Floodway Boundary

Zone D Boundary

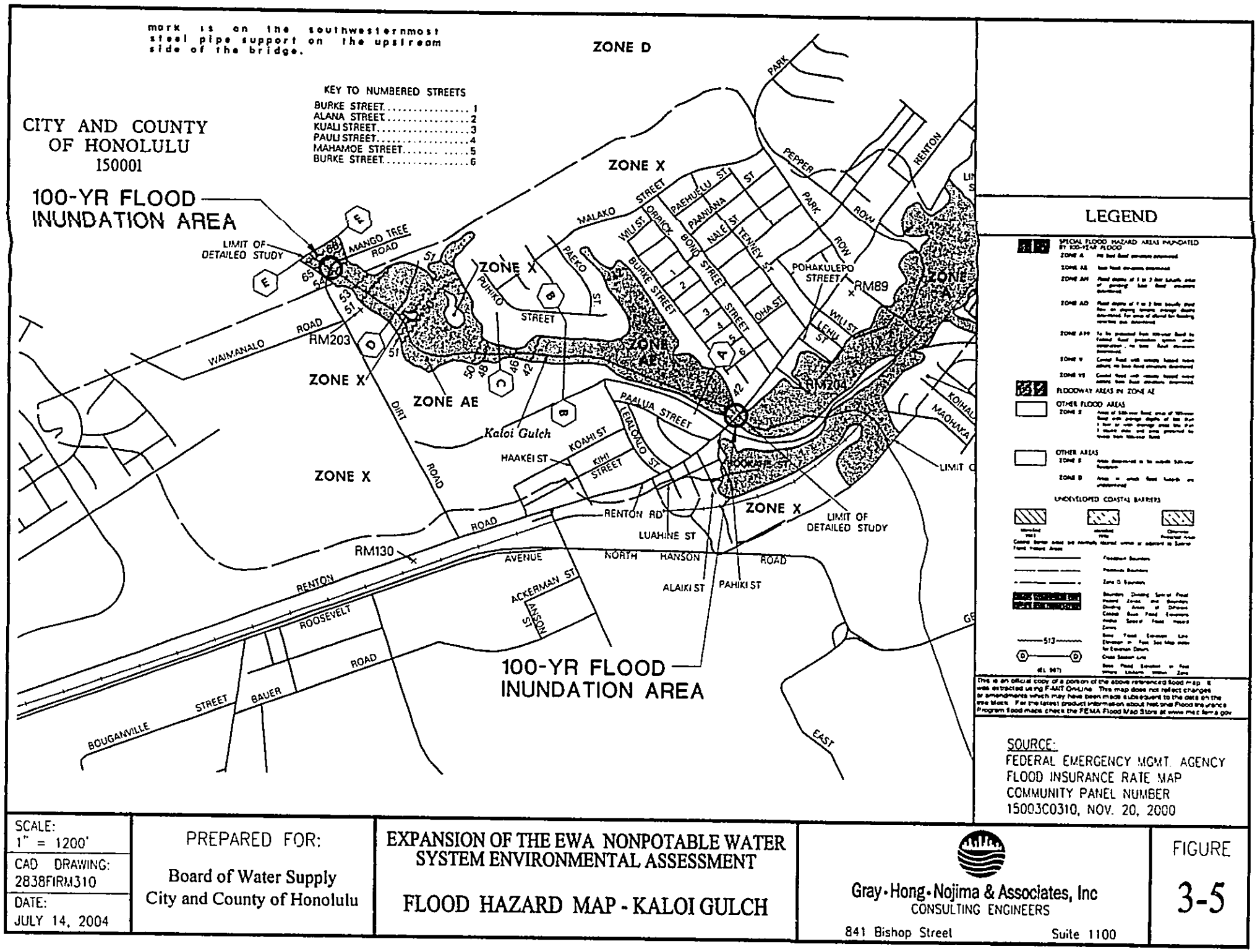
Boundary Dividing Special Flood Hazard Zones and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones

513 Base Flood Elevation Line Elevation in Feet. See Map Index for Elevation Datum.

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

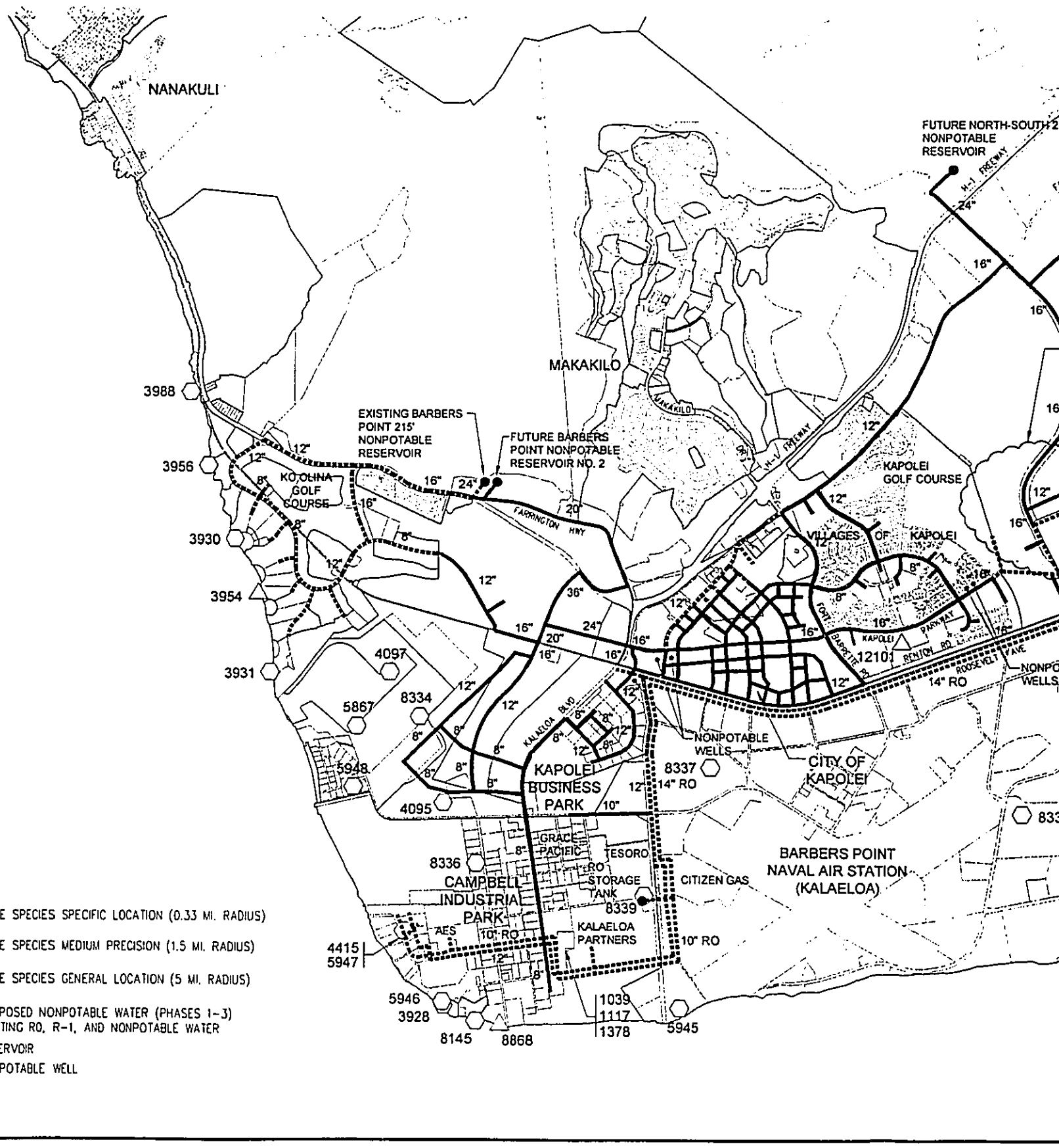
SOURCE:
FEDERAL EMERGENCY MGMT. AGENCY
FLOOD INSURANCE RATE MAP
COMMUNITY PANEL NUMBER
15003C0330, NOV. 20, 2000

SCALE: 1" = 1500' CAD DRAWING: 2838FIRM330 DATE: JULY 14, 2004	PREPARED FOR: Board of Water Supply City and County of Honolulu	EXPANSION OF THE EWA NONPOTABLE WATER SYSTEM ENVIRONMENTAL ASSESSMENT FLOOD HAZARD MAP - FORT WEAVER ROAD	Gray•Hong•Nojima & Associates, Inc CONSULTING ENGINEERS 841 Bishop Street Suite 1100	FIGURE 3-4



SCALE: 1" = 1200' CAD DRAWING: 2838FIRM310 DATE: JULY 14, 2004	PREPARED FOR: Board of Water Supply City and County of Honolulu	EXPANSION OF THE EWA NONPOTABLE WATER SYSTEM ENVIRONMENTAL ASSESSMENT FLOOD HAZARD MAP - KALOI GULCH	Gray·Hong·Nojima & Associates, Inc CONSULTING ENGINEERS 841 Bishop Street Suite 1100	FIGURE 3-5

SCALE: 1" = 4000'	PREPARED FOR:	EXPANSION OF THE EWA NONPOTABLE WATER SYSTEM EN
CAD DRAWING: 2838RARE	Board of Water Supply City and County of Honolulu	RARE SPECIES
DATE: JULY 14, 2004		



ER SYSTEM ENVIRONMENTAL ASSESSMENT
PECIES

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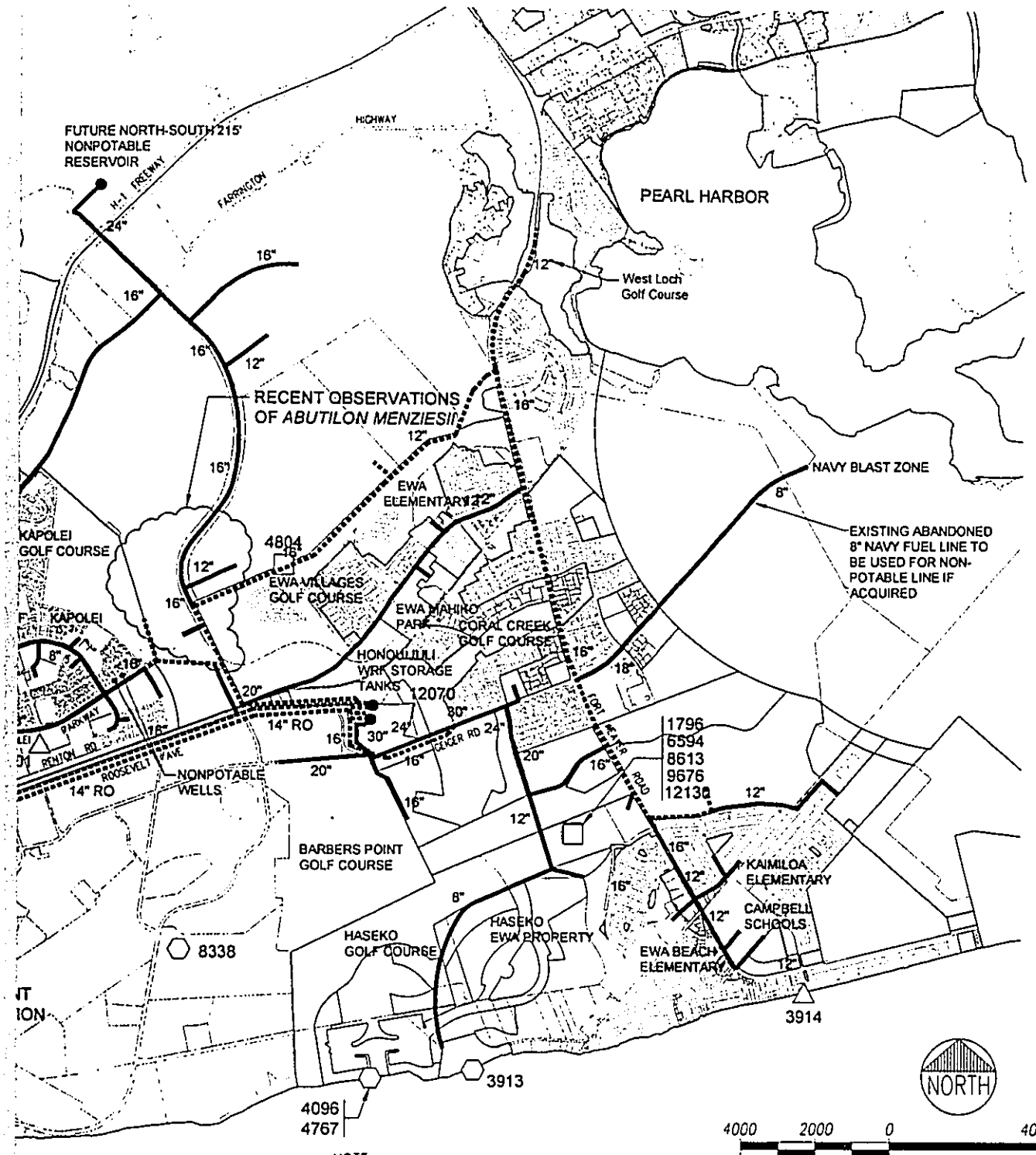
CONSULTING ENGINEERS
841 Bishop Street Suite 1100

FIGURE
3-6

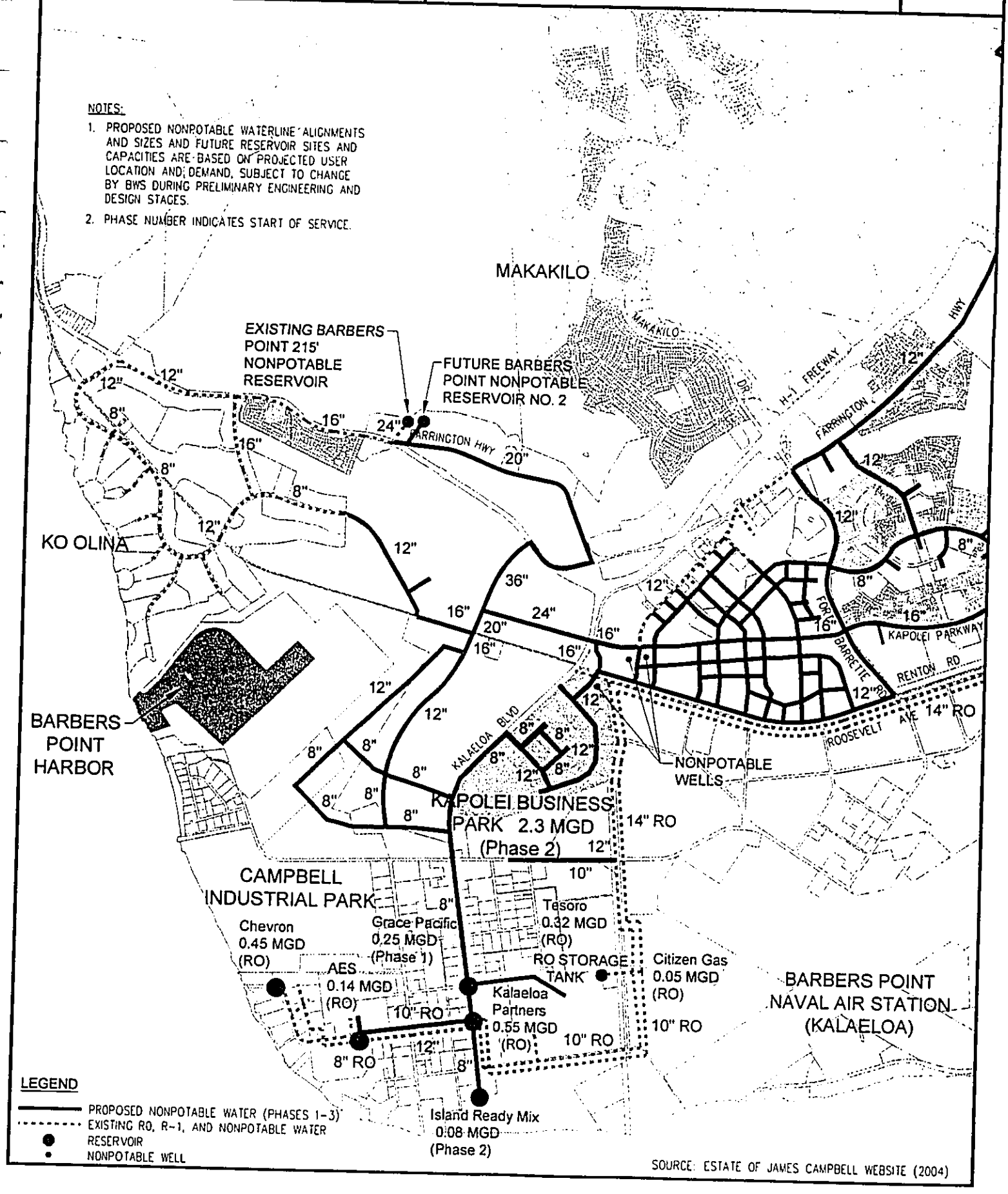


NOTE:

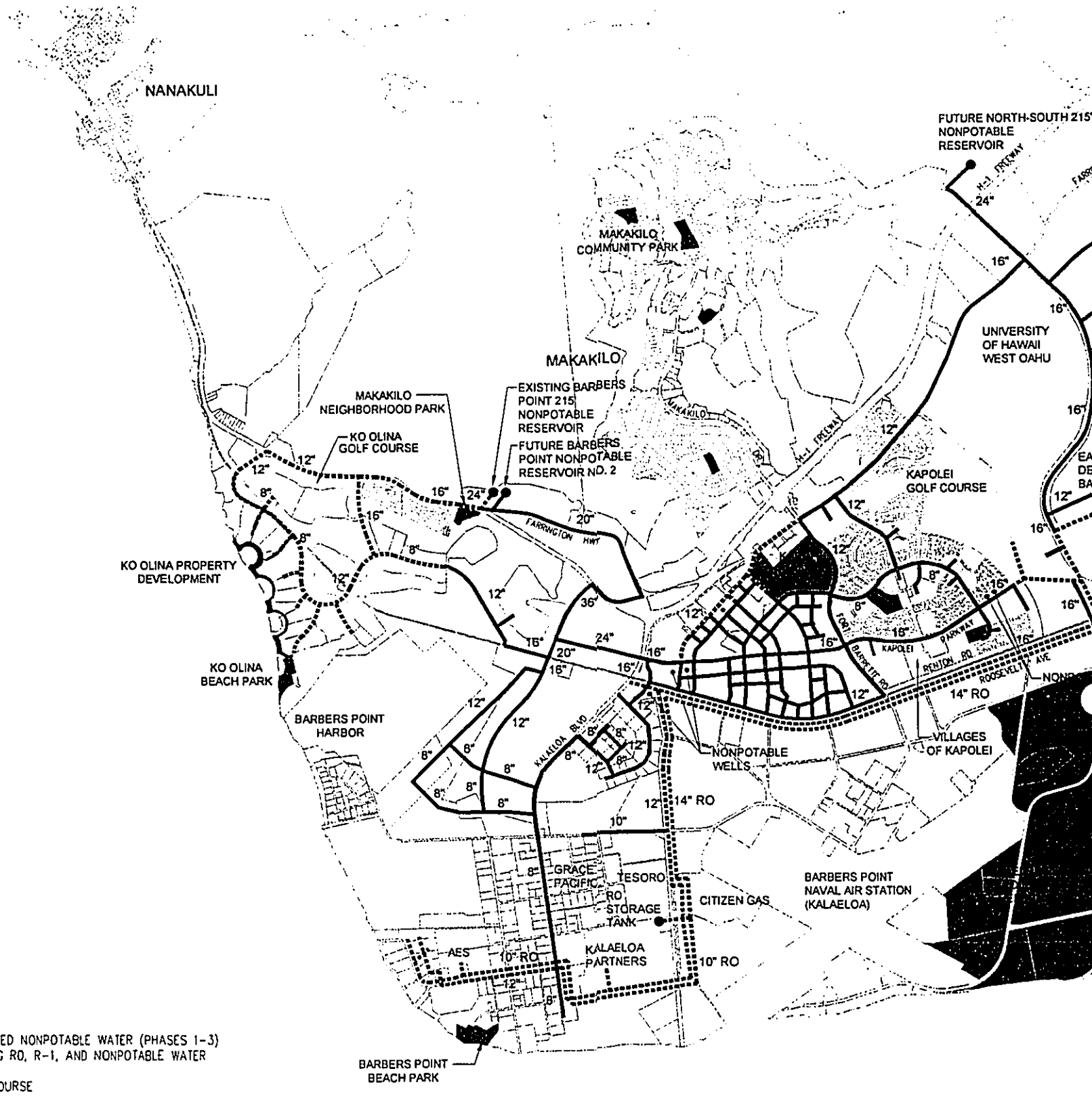
PROPOSED NONPOTABLE WATERLINE ALIGNMENTS AND SIZES AND FUTURE RESERVOIR SITES AND CAPACITIES ARE BASED ON PROJECTED USER LOCATION AND DEMAND, SUBJECT TO CHANGE BY BWS DURING PRELIMINARY ENGINEERING AND DESIGN STAGES.

SOURCE: R.M. TOWILL CORP. (2004), HAWAII NATURAL HERITAGE PROGRAM (HINHP) DATABASE (2002), AND ANALYTICAL PLANNING CONSULTANTS (1999).

SCALE: 1" = 3000'	PREPARED FOR:	EXPANSION OF THE EWA NONPOTABLE WATER SYSTEM ENVIRONMENTAL ASSESSMENT	FIGURE
CAD DRAWING: 2838COMM	Board of Water Supply City and County of Honolulu	MAJOR COMMERCIAL & INDUSTRIAL AREAS	3-7
DATE: JULY 14, 2004			



SCALE: 1" = 4000'	PREPARED FOR:	EXPANSION OF THE EWA NONPOTABLE WATER SYSTEM ENV
CAD DRAWING: 2838REC	Board of Water Supply City and County of Honolulu	RECREATIONAL & OPEN SPA
DATE: JULY 14, 2004		



LEGEND

- PROPOSED NONPOTABLE WATER (PHASES 1-3)
- EXISTING RO, R-1, AND NONPOTABLE WATER
- PARK
- GOLF COURSE
- RESERVOIR
- NONPOTABLE WELL

ER SYSTEM ENVIRONMENTAL ASSESSMENT
& OPEN SPACES

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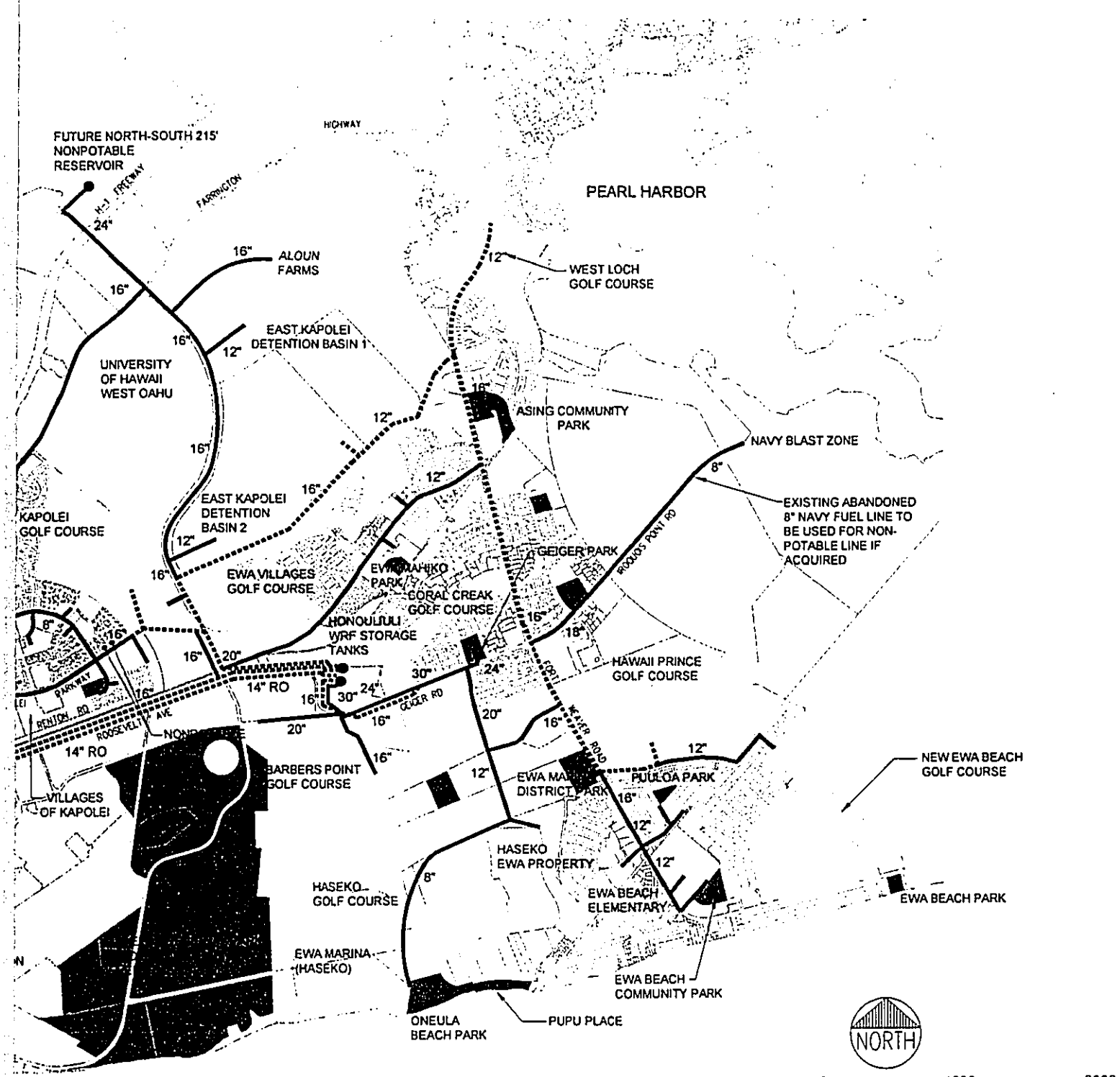
FIGURE
3-8



NOTE:

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SOURCE: CITY AND COUNTY OF HONOLULU GEOGRAPHIC INFORMATION SYSTEM (2002) AND R.M. TOWILL CORP. (2004)

SCALE: 1" = 4000'	PREPARED FOR:	EXPANSION OF THE EWA NONPOTABLE WATER SYSTEM E
CAD DRAWING: 2838ENMPC	Board of Water Supply City and County of Honolulu	EXISTING AND NEW MASTER PLANNE
DATE: JULY 14, 2004		

LEGEND

- Non-Urban Areas
- Existing Urban Areas
- Urban Expansion 1995-2005
- Urban Expansion 2006-2015
- Urban Expansion 2016 and Beyond
- Urban Growth Boundary

TER SYSTEM ENVIRONMENTAL ASSESSMENT
R PLANNED COMMUNITIES

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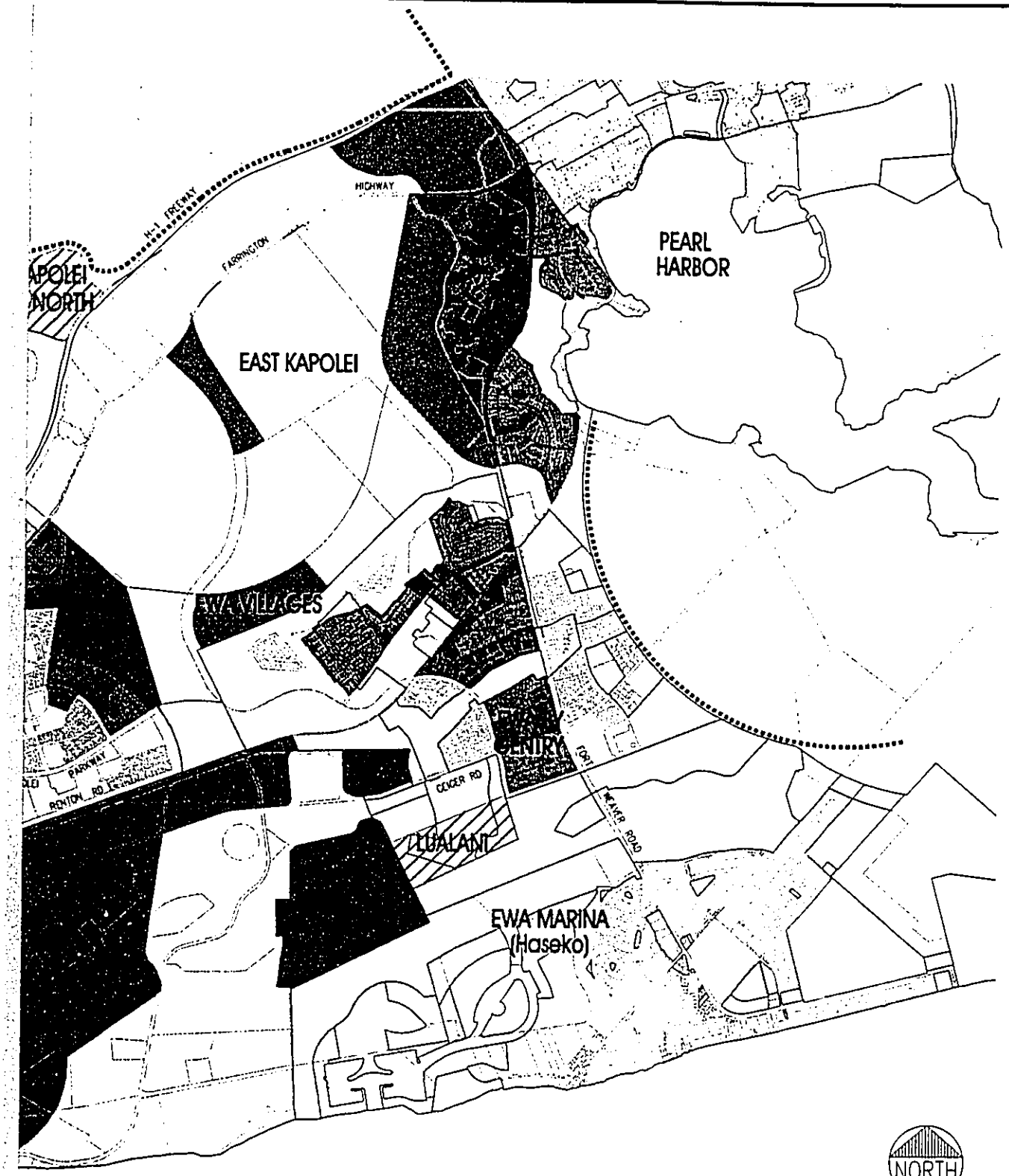
FIGURE
3-9



SOURCE: CITY AND COUNTY OF HONOLULU (1997)

CHAPTER FOUR

SUMMARY OF IMPACTS & MITIGATION MEASURES

Beneficial and detrimental effects related to the proposed project include short-term, long-term, and cumulative impacts. As defined by the *Environmental Impact Statement Law* (Hawaii Revised Statues, Chapter 343), *primary* impacts or effects are directly caused by the action and occur at the same time and place. *Secondary* impacts or effects are indirectly caused by the action and occur later in time or are farther removed in distance, but are still reasonably foreseeable. A *cumulative* impact may arise when an incremental impact of the action is added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such actions. Cumulative impacts can result from individually minor but collectively signification actions taking pace over a period of time.

Due to the intended siting of nonpotable infrastructure primarily within previously disturbed areas, environmental impacts are generally expected to be short-term in nature related to construction activities. The following is a summary of the anticipated environmental effects and proposed mitigation measures for the proposed Expansion of the Ewa Nonpotable Water System.

4.1 SHORT-TERM (DIRECT) IMPACTS

4.1.1 Air Quality

Impacts. During construction, fugitive dust and exhaust emissions from construction equipment may degrade the air quality in the project vicinity. This will result from vehicles traveling to and from the project site, as well as on-site construction equipment. Due to the prevailing tradewinds and the region's history of meeting air quality standards, increased emissions and dust are not expected to have a significant impact on existing air quality.

Mitigation Measures. Contractors will be required to minimize dust within the project site and surrounding areas by water sprinkling whenever feasible, wet cutting of existing asphaltic concrete pavement, and limiting the area being worked on at any one time. The work shall be in conformance with Title 11 of the Hawaii Administrative Rules (HAR), Chapter 60.1 Air Pollution Control. Contractors will also be required to provide proper tuning and maintenance of all construction equipment and vehicles to minimize pollutants from exhaust emissions.

4.1.2 Flora and Fauna/Threatened and Endangered Species

Impacts. Short-term impacts on vegetation along the waterline route are expected during the construction period. Since the nonpotable water system is being proposed

primarily within areas that are already developed, the impacts on endangered species are expected to be minimal, if any.

Mitigation Measures. The proposed infrastructure will be located primarily within existing and future rights-of-ways (ROWs) so as to confine the affected areas to those which are not known to sustain any habitats of threatened or endangered species. Any existing plants, grassed areas and surface improvements damaged by construction will be restored by contractors to original or better condition. Prior to the design of new waterline alignments in undeveloped areas, an onsite reconnaissance survey by a trained botanist will be conducted to determine whether endangered plants are present.

4.1.3 Economic Resources

Impacts. The proposed project will have a direct impact on the construction industry. Construction of the nonpotable system will add to the amount and number of government contract awards, as well as the number of construction and construction-related jobs. While these workers will not necessarily be from the Ewa area, they are likely to be Oahu residents.

4.1.4 Noise

Impacts. Periodic noise from construction equipment such as backhoes, trucks, compactors, and pavers will impact motorists and pedestrians traveling through construction areas, as well as residents living near the project vicinity.

Mitigation Measures. Noise impacts will be mitigated during construction by requiring contractors to apply current techniques and methods of sound attenuation and abatement such as noise reducing mufflers. Each contractor will be required to obtain a Community Noise Control Permit from the State of Hawaii Department of Health (DOH) and observe and comply with Title 11 of HAR, Chapter 46 Community Noise Control to protect the public from the effects of noise from vehicular and construction activities. Restrictions on noise levels and operational hours of the noisiest equipment will minimize the impacts on the adjoining community. Conditions of the Noise Permit shall be enforced and violators penalized by the Director of DOH. Nighttime work will not be permitted.

4.1.5 Traffic and Transportation

Impacts. Short-term effects include relatively minor visual distractions and changes to traffic patterns due to the close proximity of proposed waterline routes to road and highway ROWs. This is expected to result in periodic disruptions to normal traffic flow along major thoroughfares such as Farrington Highway, Fort Weaver Road, Kalaeloa Blvd., Renton Road, Kapolei Parkway, and Fort Barrett Road. Construction vehicles will add to the traffic on streets adjacent to the proposed project areas. Construction may also require various lane closures and/or detours on a temporary basis. Depending on

number of lanes, lane widths, and existing utility corridor configurations, vehicular and pedestrian traffic is likely to impacted by the closure of lanes and possible detours around construction areas.

Mitigation Measures. Mitigation measures will include: (1) preparing traffic control plans (TCP) during the construction phase of each project by the contractor to minimize disruptions and inconveniences to the residents and the public; (2) securing a Street Usage Permit prior to commencement of any work that will temporarily obstruct any portion of the City roadway or sidewalk; (3) avoiding construction during peak traffic hours and at night; and (4) requiring advance coordination of construction work with affected community groups, businesses, schools, golf courses, government agencies, and other entities. The various project contractors will be responsible for day-to-day construction operations and phasing of the work in order to satisfy the proposed mitigation measures.

4.1.6 Archaeological, Historical or Cultural Sites

Impacts. The majority of the site is fully developed and no significant natural or cultural resources are expected to be encountered. However, there are three areas through which the proposed waterlines will be passing where potentially significant historic properties may be encountered. The first is located along the southeastern coastline of the Ewa Plain in the eastern portion of the Oneula Archaeological District. The second is located across the central-eastern portion of the plain running along the route of an historic railway and the southern boundary of a group of plantation villages. The third and final area is located in the northwestern corner of the Ewa Plain.

Mitigation Measures. To mitigate potential loss or destruction of resources, an archaeological monitor will be on site when construction activities pass through these areas. During the remainder of the project, archaeological monitor will be on call in the event that significant historic properties are encountered during construction activities. The proper authorities with the State of Hawaii Department of Land and Natural Resources State Historic Preservation Division have been consulted and their comments regarding sites to be avoided. Furthermore, if iwi or Native Hawaiian cultural or traditional deposits are found during ground disturbance or excavation, work will cease, and the appropriate agencies will be contacted pursuant to applicable law.

4.1.7 Utilities

Impacts. Various utilities are located throughout the project area, including sewer, potable water, drainage, gas, cable TV, telephone, and electrical. Utility infrastructure should not be impacted, except for relocation and/or modification only under extenuating circumstances. In general, utility services should not be disrupted during construction activities.

Mitigation Measures. Contractors will be required to verify utility locations prior to the start of construction. Access to fire apparatus will be maintained throughout the construction site and any interruption in the existing fire hydrant system during construction will be reported to the Fire Communication Center at 523-4411 by the contractor. During construction, contractors will also be required to protect existing utilities and ensure that services are not interrupted or that interruptions are kept to a minimum.

4.2 LONG-TERM (INDIRECT) IMPACTS

The long-term (indirect) impacts of this project are all positive. Long-term benefits anticipated with the implementation of this project include the following:

4.2.1 Commercial and Industrial Areas

Overall, the proposed expansion of the Ewa nonpotable water system could indirectly benefit potential new business ventures, particularly in the Kapolei Business Park, the Campbell Industrial Park, and the City of Kapolei. The expansion will provide a much larger service area enabling delivery of R-1 water to more commercial and industrial customers.

4.2.2 Recreational and Open Spaces

The primary benefit to existing and future recreational and open spaces in the Ewa region will be the availability of additional nonpotable water for irrigation of fields and landscaping. The Department of Health reuse guidelines specify that human contact is permitted for R-1 quality (nonpotable) water, thus the use of R-1 water should not pose a health risk to park and beach users.

4.2.3 Residential Areas

The proposed expansion of the nonpotable water distribution system does allow for other development such as residential communities. Potable water demand will increase in the Ewa Plain as more homes are constructed consistent with the City's vision for Ewa. The indirect benefit will be the availability of potable water for residential housing that will become available when more nonpotable water can be used for non-residential (park, golf course, etc.) irrigation.

4.2.4 Social and Economic Resources

There will be indirect economic and social impacts of significant benefit as a result of the proposed project. As mentioned above, the system will facilitate the use of nonpotable water in greater amounts, allowing for irrigation of landscaped recreational areas such as neighborhood/district parks, golf courses, beach parks, and other open spaces, as well as commercial and business users throughout the area. By this, the proposed project may indirectly serve to enhance the lifestyle of those in the area.

The availability of an alternate water source will allow for overall growth and development that is envisioned for the Ewa area, providing more diverse job opportunities for present and potential Ewa residents. Living and working in Ewa will be an attractive option for these residents as they will be able to avoid a long daily commute.

Indirectly, the proposed project will also allow for continued economic activity and development on the Ewa Plain by reducing the demand for potable water. Overall, the project is consistent with the City and County of Honolulu's (CCH) vision per the *Ewa Development Plan* (CCH, 1997) and the *General Plan* (CCH,1992).

4.3 CUMULATIVE IMPACTS

Cumulative impacts are likely to arise due to concurrent construction activity throughout the Ewa region. These projects will include various private developments (Schuler Homes, Haseko, Gentry Homes, etc.) and the construction of highways, streets, and bikeways by the State of Hawaii and City and County of Honolulu.

In order to mitigate potential conflicts during construction, the following procedures will be observed to during planning and design of the proposed distribution system:

1. Early coordination with government agencies to discuss and evaluate appropriate alignment and construction methods

2. Coordination with ongoing and proposed projects in Kapolei, Ewa, Makakilo and Barbers Point (Kalaeloa)

3. Submittal and approval of construction plans for all work done within State and City right-of-ways

CHAPTER FIVE

ALTERNATIVES TO THE PROPOSED ACTION

The City and County of Honolulu Board of Water Supply (BWS) presently owns and maintains the nonpotable (or non-drinking) water system in the Ewa district. This system is supplied by two major nonpotable water sources – recycled water from the Board of Water Supply (BWS) Honouliuli Water Recycling Facility (WRF) and brackish water from the Ewa Caprock Aquifer. The storage and distribution system currently has the capacity to provide 12.0 million gallons per day (MGD) of nonpotable RO and R-1 water that is used for irrigation of golf courses, parks, and greenbelts, as well as industrial facilities in the region.

5.1 SUMMARY OF PROPOSED ACTION

Because of projected increasing demand for drinking water and the limited basal groundwater supply on Oahu, the BWS plans to expand the nonpotable storage and transmission system, which will facilitate the use of nonpotable water in greater amounts. The proposed system expansion is focused on increasing the delivery of nonpotable water known as R-1 water. Nonpotable R-1 water is not intended for private individual yard watering at this time. Instead, it will be used primarily for landscape irrigation in the following applications, which are approved by the Department of Health's *Guidelines for the Treatment and Use of Recycled Water* (2002):

- Golf courses
- Roadsides, medians and other common areas
- Parks, school yards and athletic fields
- Ornamental plants for commercial use

Specifically, the *Ewa Non-Potable Water Master Plan* (R.M. Towill Corporation, 2004) projects an ultimate nonpotable water demand of approximately 26.2 MGD for the Ewa district. The master plan provides discussion and analysis of the proposed expansion that is intended to relieve some of the island's potable supply. The project will entail the following infrastructure developments to be constructed in three phases over the next 15-plus years:

- 44 miles of distribution and transmission mains, 4 to 36 inches in diameter, located primarily within existing state and county rights-of-ways (roads, streets, and highways)

- 15 MG in additional reservoir capacity.

5.2 ALTERNATIVES TO THE PROPOSED ACTION

5.2.1 Distribution and Transmission System Alternatives

The various alignments being proposed by the BWS have been analyzed in the regional master plan prepared by R.M. Towill Corporation (2004). Booster pump stations may be located along the system to effectively transport water to various storage sites and meet system pressure requirements. The proposed alignments were established based on the existing nonpotable network and present RO, R-1, and nonpotable users, as well as the location and demand of future users. Construction phasing of the proposed system has also been developed on the basis of anticipated future user demand schedules.

It should be noted, however, that the proposed nonpotable waterline alignments and sizes, as well as reservoir sites and capacities, are subject to change during the preliminary engineering and design stages. The complexity of the multiple dependent factors involved (timing, quantity, location, actual user development schedules, etc.) may call for adjustments to the proposed master planned nonpotable system. Though, the overall conceptual plan is not likely to change significantly because of the intent to: (1) construct new lines within existing rights-of-ways and (2) connect to the nonpotable system that is already in place.

5.2.2 Reservoir Alternatives

Storage requirements and potential reservoir sites have been identified in the *Ewa Non-Potable Water Master Plan* (R.M. Towill Corporation, 2004). As mentioned previously, separate site-specific environmental assessments will be prepared for each reservoir site. The sites will be finalized by the BWS following appropriate site location and feasibility studies. At such time, various storage alternatives will be evaluated, including but not limited to the following: elevated reservoirs, underground reservoirs, and ground level reservoirs.

5.2.3 Expansion of Additional Nonpotable Water Uses

As the distribution system is expanded and greater supplies of nonpotable water supply become available, other DOH approved uses of R-1 water would be worth exploring. For example, the use of recycled water for the irrigation of private residential yards has been safely and successfully implemented elsewhere in the U.S., such as the Irvine Ranch Water District in California.

R-1 water should also be considered for toilet flushing in new commercial facilities approved by the DOH at such time that the City and County of Honolulu has adopted provisions in the plumbing code pertaining to the use of dual water supply in buildings. This practice has been demonstrated in California's Ventura County, City of San Jose, and the Irvine Ranch Water District, as well as the State of Washington Department of Health and Ecology.

5.3 NO ACTION ALTERNATIVE

The No Action Alternative preserves the status quo. In this scenario, development of the nonpotable water system will essentially be left to the discretion of developers. There would be no planned and coordinated effort to expand the existing nonpotable water system, further depleting the potable water resource. This would also result in the possibility of some users waiting indefinitely for nonpotable water to become available.

In the long run, the No Action Alternative would severely impact the Secondary Urban Center development plans as described in the City and County of Honolulu's *General Plan* (CCH, 1992) and the *Ewa Development Plan* (CCH, 1997). Forecasts of continued growth in the district through the year 2020 and beyond will be impacted and will continue to impact available water resources in terms of both reduced recharge of the existing caprock aquifer due to curtailing agricultural activity and increased demand for potable water.

The Secondary Urban Center is expected be the focus of significant economic activity and major housing development, as well as a core location for government services. It will entail a myriad of developments: master planned residential developments, heavy and light industrial areas in the vicinity of the Barbers Point Harbor, offices and commercial/retail centers in the City of Kapolei, resort developments at Ko Olina and Ewa Marina, recreational facilities such as golf courses and park complexes, and the University of Hawaii West Oahu campus. The proposed expansion of the Ewa nonpotable water distribution network will continue to support ongoing development through increased water supply and service to various users in the Ewa district.

CHAPTER SIX

DETERMINATION, FINDINGS AND JUSTIFICATION

It is anticipated that the proposed project will not significantly impact the environment, and therefore a Finding of No Significant Impact (FONSI) is issued. The preparation and processing of an Environmental Impact Statement will not be required for this project. This statement of findings is based on an evaluation of the significance criteria listed in Title 11 of the Hawaii Administrative Rules (HAR), Chapter 200 Environmental Impact Statement Rules, as described below:

1. ***The project will not involve an irrevocable commitment to loss or destruction of any natural or cultural resources.***

   The majority of the site is already fully developed and no significant natural or cultural resources are expected to be encountered. However, there are three areas through which the proposed waterlines will be passing where potentially significant historic properties may be encountered. The first is located along the southeastern coastline of the Ewa Plain in the eastern portion of the Oneula Archaeological District. The second is located across the central-eastern portion of the plain running along the route of an historic railway and the southern boundary of a group of plantation villages. The third and final area is located in the northwestern corner of the Ewa Plain. To mitigate potential loss or destruction of resources, an archaeological monitor will be on site when construction activities pass through these areas. During the remainder of the project, archaeological monitor will be on call in the event that significant historic properties are encountered during construction activities. Proper authorities of the State of Hawaii Department of Land and Natural Resources, State Historic Preservation Division (SHPD) have been consulted and their comments regarding sites to be avoided.

   In terms of natural resources, the proposed project will rely on reuse of treated wastewater. It is solely intended to supplement the existing supply of potable water from the limited basal aquifers.

2. ***The project will not curtail the range of beneficial uses of the environment.***

   To the extent possible, the proposed nonpotable infrastructure will be constructed in existing or future rights-of-ways, so as to preserve beneficial uses of the surrounding areas. A major benefit will be the availability of irrigation water for existing and future open spaces (parks, golf courses, etc.) in this region.

In addition to their recreational value, golf courses also provide open space and help prevent flooding and reduce non-point pollution by retaining storm waters. As such, golf courses can offer positive social, environmental, and economic benefits to the community.

3. ***The project will not conflict with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 344, Hawaii Revised Statutes, and any revisions thereof and amendments thereto, court decisions or executive orders.***

The project will not conflict with the environmental policies as set forth in the State Plan and Chapter 344 of the Hawaii Revised Statutes (HRS) in that the project will not damage sensitive natural resources nor emit contaminants.

4. ***The project will not substantially affect the economic or social welfare of the community or State.***

During the short-term, construction of the nonpotable system will add to the amount and number of government contract awards, as well as the number of construction and construction-related jobs. However, the construction workers, themselves, may not necessarily reside in the area. Lifestyle is not expected to be significantly altered during the short-term phase.

Instead, long-term social and economic benefits may be realized through the expansion of nonpotable storage and transmission. The proposed system will facilitate the use of nonpotable water in greater amounts, allowing for recreational areas such as neighborhood/district parks, golf courses, beach parks, and other open spaces. In turn, this will relieve some of the potable supply that may be preserved for development of the Secondary Urban Center. The proposed project may indirectly serve to enhance the lifestyle of those in the area. Overall, the project is consistent with the City and County of Honolulu's (CCH) vision per the *Ewa Development Plan* (CCH, 1997) and the *General Plan* (CCH, 1992).

5. ***The project will not substantially affect public health.***

There will be some negative short-term impacts as related to construction (traffic congestion, dust, blockage of street frontage and noise, etc.). However, construction will take place during normal working hours on weekdays.

The use of R-1 water for irrigation is not expected to cause any long-term or cumulative negative impacts to public health. R-1 water undergoes a typical secondary treatment process, designed to produce water suitable for the maximum number of reuse applications approved by the State of Hawaii Department of Health (DOH). Best Management Practices (BMPs), including Irrigation Plans and Management Reuse Plans will be subject to review and approval by the DOH. Furthermore, human contact is permitted for R-1 water, thus the use of R-1 water should not pose a health risk.

In order to allay public fears, prior to the Board of Water Supply (BWS) purchase of the Honouliuli (Ewa) Water Recycling Facility, US Filter and the City and County of Honolulu initiated a comprehensive public outreach program. This ongoing effort is designed to educate the general public, facility neighbors and businesses about the facility and water reuse in general.

6. ***The project will not involve substantial secondary impacts, such as population change or effects on public facilities.***

The proposed nonpotable water system will have somewhat of an indirect effect on population growth by allowing planned development of the Ewa Plain to proceed with far less of a burden on Oahu's potable aquifers and system infrastructure. However, this is viewed as a positive benefit in which growth will be appropriately managed and controlled and in a manner that is consistent with the City's long-term vision for Ewa.

7. ***The project will not involve a substantial degradation of environmental quality.***

Environmental quality will be essentially the same as that which exists prior to project implementation. The proposed infrastructure will be designed for construction within existing and future ROWs so as to confine the affected areas to the extent possible. It should be noted, however, that anticipated short-term impacts to air quality, noise, and traffic are anticipated resulting from construction activities are unavoidable.

8. ***The project is individually limited and will not cumulatively have a considerable effect upon the environment nor involves a commitment for larger actions.***

The proposed action is generally limited in terms of short- and long-term impacts. However, numerous other construction efforts are expected to occur concurrently due to growth of the region. Coordination with

various existing business and commercial entities, government agencies and private developers will help mitigate short-term effects related to construction. Long-term or cumulative impacts are not anticipated.

9. ***The project will not substantially affect a rare, threatened or endangered species, or its habitat.***

The proposed infrastructure will be designed within existing and future rights-of-ways (ROW) to the extent possible so as to confine the affected areas to those which are not known to sustain any habitats of threatened or endangered species. Any new waterline alignment in undeveloped areas will include on-site reconnaissance survey by a trained botanist to determine whether endangered plants are present. Since the nonpotable water system is being proposed primarily within areas that are already developed, primarily existing right-of-ways, the impacts on endangered species are expected to be minimal, if any.

10. ***The project will not detrimentally affect air quality, water quality or ambient noise levels.***

Short-term direct impacts on air, noise, and water quality will occur during the construction period. These will be mitigated by appropriate construction BMPs. Contractors will also be required to adhere to City and State rules, regulations and permit requirements, as well as project construction plans, specifications and BWS inspectors. There are no anticipated long-term impacts to these resources.

11. ***The project will not affect an environmentally sensitive area such as a flood plain, tsunami zone, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.***

The majority proposed waterlines will be buried, and thus is not be subject to tsunami, erosion, seismic or flood hazards. There may be a few above ground alignments that may be subject to inundation, requiring special design consideration in conditions (e.g. waterline constructed along a bridge). In addition, site-specific environmental assessments will subsequently be prepared for reservoirs and booster pump stations.

12. ***The project will not substantially affect scenic vistas or view lanes as identified in County or State plans or studies.***

Visual quality in construction areas will be impacted on a short-term basis. In general, however, the proposed infrastructure will be constructed on or under the ground, limiting any visual impacts. As mentioned previously, aboveground infrastructure such as reservoirs and

booster pump stations will undergo separate site-specific environmental review process, including an evaluation of scenic vistas and public view planes.

13. ***The proposed project will not require substantial energy consumption.***

The only energy consumption involved with this project is that related to construction activities. Essentially, the long-term operation of the nonpotable system will require the same power demand that would otherwise have been used in the potable water distribution system. There will be no significant burden on power producers such as Hawaiian Electric Company.

SUMMARY OF UNRESOLVED ISSUES

There are no known unresolved issues at this time. To the extent possible, the Board of Water Supply will respond to comment letters received after the 30-day Draft Environmental Assessment comment period deadline.

As mentioned previously, the proposed nonpotable waterline alignments and sizes and future reservoir sites and capacities were based on projected user location and demand. These are subject to change by the Board of Water Supply during preliminary engineering and design changes due to unforeseen circumstances and events.

LIST OF PREPARERS

The following list identifies the government agency, firms and individuals involved with the preparation of the environmental assessment for the Expansion of the Ewa Nonpotable Water System:

Board of Water Supply
Scot Muraoka, P.E. (BWS Point of Contact and Project Coordinator)

Gray, Hong, Nojima & Associates, Inc.
Sheryl E. Nojima, Ph.D., P.E. (Project Manager)

Archaeological Consultants of the Pacific, Inc.
James Moore, B.S. (Archaeologist)
Joseph Kennedy, M.A. (Archaeologist)

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CORRECTION

THE PRECEDING DOCUMENT(S) HAS BEEN REPHOTOGRAPHED TO ASSURE LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

REFERENCES

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APPENDIX A

Draft Environmental Assessment Public Comments

verizon

Verizon Hawaii Inc.
P.O. Box 2200
Honolulu, HI 96841

August 9, 2004

Attention: Mr. Scot Muraoka
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Muraoka:

Subject: **Draft Environmental Assessment, Expansion of the Ewa Nonpotable Water System**

Thank you for the opportunity to review and comment on the preliminary environmental assessment for Expansion of the Ewa Nonpotable Water System project.

Verizon Hawaii does not foresee any conflicts with the existing telecommunication facilities in the area. However, Verizon Hawaii requires further review during the design stages of the project.

If you have any questions or require assistance in the future on this project, please call Gary Sumida at 840-1442.

Sincerely,

Janet T Hayashi

for Jill Z. Lee
Section Manager
Outside Plant Engineering

Cc: Office of Environmental Quality Control
Sheryl Nojima (Gray, Hong, Nojima & Associates, Inc.)

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
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August 31, 2004

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DONNA FAY K. KIYOSAKI
Deputy Manager and Chief Engineer

Ms. Jill Z. Lee
Section Manager
Outside Plant Engineering
Verizon Hawaii, Inc.
P. O. Box 2200
Honolulu, Hawaii 96841

Attention: Gary Sumida

Dear Ms. Lee:

Subject: Your Letter of August 19, 2004 Regarding the Draft Environmental Assessment for the Expansion of the Ewa Nonpotable Water System, Ewa, Oahu, Hawaii, TMK: 9-1, 9-2-02 and 9-2-03

Thank you for your letter regarding the Draft Environmental Assessment for the Expansion of the Ewa Nonpotable Water System.

We acknowledge that Verizon Hawaii has no comments at this time. We will continue to consult with your staff during the design stages of the project.

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

Very truly yours,

Barry Usagawa

BARRY USAGAWA
Principal Executive
Water Resources Operating Unit

cc: Office of Environmental Quality Control
Sheryl Nojima (Gray, Hong, Nojima and Associates, Inc.)

LINDA LINGLE
GOVERNOR OF HAWAII

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

CHIYOME L. FUKINO, M.D.
DIRECTOR OF HEALTH

In reply, please refer to:
EMD / WB
O9 1 & O9 2 002.wpd
w11 wb040708

August 11, 2004

Ms. Sheryl E. Nojima
Gray, Hong, Nojima & Associates, Inc.
Consulting Engineers
841 Bishop Street Suite 1100
Honolulu, Hawaii 96813

Dear Ms. Nojima:

Subject: **Draft Environmental Assessment**
Expansion of the Ewa Nonpotable Water System
Ewa, Oahu, Hawaii
TMK: (1) 9-1, 9-2-002, and 9-2-003

Thank you for the opportunity to comment on the July 2004 Draft Environmental Assessment for the Expansion of the Ewa Nonpotable Water System. We have reviewed the document and offer the following comments and recommendations:

1. The Department of Health (DOH) has long been an advocate for wastewater reuse and fully supports this project;

2. There is no RO (Reverse Osmosis) water level classification for recycled water in the reuse guidelines. The effluent quality for the microfiltration-RO system was based on the R-2 classification due to the absence of a disinfection unit. All reference to RO water in the document not being regulated by the Department of Health should be revised accordingly; and

3. The report indicates that existing nonpotable (brackish) water distribution system will be converted to R-1 system. However, existing brackish water supplies may serve as backup sources, which can be blended with R-1 water during periods of high demand. Please be informed that it is the Department's policy that waters blended with recycled water will be regulated as recycled water. Thus, brackish well water blended with R-1 water will be classified as R-1 water.

All wastewater plans must conform to applicable provisions of the Department of Health's Administrative Rules, Chapter 11-62, "Wastewater Systems" and the Guidelines for the Treatment and Use of Recycled Water dated May 15, 2002. We do reserve the right to review the detailed wastewater plans for conformance to applicable rules.

Should you have any questions, please contact the Planning & Design Section of the Wastewater Branch at telephone (808)586-4294.

Sincerely,

HAROLD K. YEE, P.E., CHIEF
Wastewater Branch

BOARD OF WATER SUPPLY

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630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

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Manager and Chief Engineer

DONNA FAY K. KIYOSAKI
Deputy Manager and Chief Engineer

August 31, 2004

Mr. Harold K. Yee, P.E., Chief
Wastewater Branch
Environmental Management Division
Department of Health
State of Hawaii
P. O. Box 3378
Honolulu, Hawaii 96801

Attention: Planning & Design Section

Dear Mr. Yee:

Subject: Your Letter of August 11, 2004 Regarding the Draft Environmental Assessment for the Expansion of the Ewa Nonpotable Water System, Ewa, Oahu, Hawaii, TMK: 9-1, 9-2-02 and 9-2-03

Thank you for your letter to Sheryl Nojima of Gray, Hong, Nojima & Associates in support of expanding the Ewa Nonpotable Water System.

The following issues will be addressed accordingly in the Final Environmental Assessment (FEA):

1. The Department of Health's (DOH) present "Guidelines for the Treatment and Use of Recycled Water" (2002) do not include a water quality designation for recycled wastewater produced through reverse osmosis (RO). As such, the following sections will be revised to include further explanation and discussion regarding R-1 and R-O water with respect to the reuse guidelines:

   - Section 1.1 – Proposed Project Summary
   - Section 2.2.1 – Existing Average Daily Demand
   - Section 2.3.1 – Existing System Infrastructure
   - Section 3.3.3 – Public Health and Safety

2. The FEA will disclose that at such time brackish water is blended with R-1 water, the blended product will be regulated as R-1 water. This will be mentioned in Chapter 2 as follows:

   - Table 2-1 – Existing Nonpotable Demand
   - Section 2.3.2 – Proposed Expansion of the Distribution System

3. We acknowledge DOH's position requiring approval of reuse projects under Chapter 11-62, "Wastewater Systems" and the 2002 Reuse Guidelines. These requirements have been identified and are discussed as measures of mitigation in Section 3.3.3.a – Best Management Practices.

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

Very truly yours,

Barry Usagawa

BARRY USAGAWA
Principal Executive
Water Resources Operating Unit

cc: Office of Environmental Quality Control
Sheryl Nojima (Gray, Hong, Nojima and Associates, Inc.)

FIRE DEPARTMENT
CITY AND COUNTY OF HONOLULU
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JEREMY HARRIS
MAYOR

ATTILIO K. LEONARDI
FIRE CHIEF

JOHN CLARK
DEPUTY FIRE CHIEF

August 12, 2004

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

ATTENTION: SCOT MURAOKA, SECTION HEAD
LONG-RANGE PLANNING SECTION
WATER RESOURCES OPERATING UNIT

FROM: JOHN CLARK, ACTING FIRE CHIEF

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (DEA)
EXPANSION OF THE EWA NONPOTABLE WATER SYSTEM
EWA, OAHU, HAWAII
TAX MAP KEY: 9-1, 9-2-002, AND 9-2-003

We received a letter dated July 23, 2004, from Ms. Sheryl E. Nojima of Gray, Hong, Nojima & Associates, Inc. requesting our review and comments on the above-mentioned DEA.

The Honolulu Fire Department requires that the following be complied with for the duration of the project:

1. Maintain fire apparatus access throughout the construction site.

2. Notify the Fire Communication Center at 523-4411 regarding any interruption of the existing fire hydrant system.

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

JOHN CLARK
Acting Fire Chief

JC/SK:bh

cc: Genevieve Salmonson, Director, Office of Environmental Quality Control
Sheryl E. Nojima, Gray, Hong, Nojima & Associates, Inc.

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

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CLIFFORD S. JAMILE
Manager and Chief Engineer

DONNA FAY K. KIYOSAKI
Deputy Manager and Chief Engineer

August 31, 2004

TO: JOHN CLARK, ACTING FIRE CHIEF
FIRE DEPARTMENT

ATTN: LLOYD ROGERS, BATTALION CHIEF
FIRE PREVENTION BUREAU

FROM: CLIFFORD S. JAMILE, MANAGER AND CHIEF ENGINEER

SUBJECT: YOUR MEMORANDUM OF AUGUST 12, 2004 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE EXPANSION OF THE EWA NONPOTABLE WATER SYSTEM, EWA, OAHU, HAWAII, TMK: 9-1, 9-2-002 AND 9-2-003

Thank you for your memorandum regarding the subject project.

Sections 3.4.2 and 4.1.7 of the Draft Environmental Assessment specifies the following Honolulu Fire Department requirements:

1. The contractor will be required to maintain fire apparatus access throughout the construction period.

2. The Fire Communication Center at 523-4411 will be notified in the event of any interruption in the existing fire hydrant system.

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

cc: Office of Environmental Quality Control
Sheryl Nojima (Gray, Hong, Nojima and Associates, Inc.)

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

REPLY TO ATTENTION OF

WR-71/04

August 16, 2004

Regulatory Branch

Mr. Scot Muraoka
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, HI 96843

Dear Mr. Muraoka:

This letter is written in response to the Draft Environmental Assessment (EA) dated July, 2004, regarding the City and County of Honolulu, Board of Water Supply's proposal to expand the nonpotable water storage and transmission system in the Ewa district, Oahu, Hawaii, which currently provides approximately 12 million gallons per day (MGD). To meet the anticipated demand of 26 MGD, the proposed infrastructure will include approximately 44 miles of distribution mains, located primarily within state and county road rights-of-way, to be installed in three phases over a 15-year period. Increased storage facilities are also under consideration.

Aug 23 9 05 AM '04

According to Page 3-3 of the Draft EA, seven gulches traverse the proposed nonpotable water system. It is unclear, based on the information provided in the Draft EA, if the aforementioned gulches would be determined to be waters of the United States. Section 404 of the Clean Water Act requires that a DA permit be obtained prior to the placement or discharge of dredged and/or fill material into waters of the U.S., including wetlands (33 U.S.C. 1344). Future site visits, once specific plans identifying the extent of work in these areas are submitted, should be conducted to determine the presence of any waters of the U.S.

Should you have questions, please contact Ms. Connie Ramsey of my Regulatory staff at 438-9258 or by facsimile at 438-4060, or by email at connie.l.ramsey@usace.army.mil. Please reference File No. 200300419 on all future correspondence for this project.

Sincerely,

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

Copy furnish:
Genevieve Salmonson, Office of Environmental Quality Control, 235 South Beretania St # 702, Honolulu, HI 96813
Nelson Sagum, State Department of Transportation, Highways Division, 869 Punchbowl St, Honolulu, HI 96813

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

September 1, 2004

JEREMY HARRIS Mayor

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LARRY J. LEOPARDI, Ex-Officio

CLIFFORD S. JAMILE
Manager and Chief Engineer

DONNA FAY K. KIYOSAKI
Deputy Manager and Chief Engineer

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

Attention: Connie Ramsey

Dear Mr. Young:

Subject: Your Letter of August 16, 2004 Regarding the Draft Environmental Assessment for the Expansion of the Ewa Nonpotable Water System, File No. 2003000419, Ewa, Oahu, Hawaii

Thank you for your letter regarding the Draft Environmental Assessment for the Expansion of the Ewa Nonpotable Water System.

We note that it is unclear whether the gulches traversed by the nonpotable water system expansion are waters of the United States (U.S.). In the event the gulches are determined to be waters of the U.S., we acknowledge that a Department of the Army permit is required prior to the placement of discharge of dredged and/or fill material into its waters.

Future site visits will be coordinated with your department as the planning and design of the nonpotable water system expansion progresses.

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

Very truly yours,

CLIFFORD S. JAMILE
Manager and Chief Engineer

cc: Office of Environmental Quality Control
Sheryl Nojima (Gray, Hong, Nojima and Associates, Inc.)

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

YVONNE Y. IZU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

August 16, 2004

LD-NAV

BWSSEWANPWSDEA.RCH

Sheryl E. Nojima
Gray, Hong, Nojima
& Associates, Inc.
Consulting Engineers
841 Bishop Street, Suite 1100
Honolulu, Hawaii 96813

Dear Ms. Nojima:

SUBJECT: Draft Environmental Assessment for Ewa Non-Potable Water System
Ewa, Island of Oahu, Hawaii

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

A copy of your letter dated July 12, 2004 pertaining to the proposed project was transmitted or made available to the following Department of Land and Natural Resources' Divisions for their review and comment.

- Division of Forestry & Wildlife
- Engineering Division
- Commission on Water Resource Management
- Office of Conservation and Coastal Lands
- Land-Oahu District Land Office

Enclosed please find a copy of the Engineering Division comment.

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

Should you have any questions, please contact Nicholas A. Vaccaro of the Land Division Support Services Branch at 587-0384.

Very truly yours,

DIERDRE S. MAHIYA
Administrator

C: ODLO

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LA/NAV

Ref.: BWSEWANPWSDEA.COM2

COMMENTS

(X) We confirm that the project sites, according to the Flood Insurance Rate Maps (FIRM), are located in Flood Zones D, X, A and AE. The National Flood Insurance Program does not have any regulations for development within Zone D and X areas. However, for Zones A and AE, please see comments marked with X and bolded below.

( ) Please take note that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Zones ___.

( ) Please note that the correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is ___.

(X) Please note that project sites located in Zones A and AE must comply with the rules and regulations of the National Flood Insurance Program (NFIP) presented in Title 44 of the Code of Federal Regulations (44CFR), whenever development within a Special Flood Hazard Area is undertaken. If there are any questions, please contact the State NFIP Coordinator, Ms. Carol Tyau-Beam, of the Department of Land and Natural Resources, Engineering Division at (808) 587-0267.

Please be advised that 44CFR indicates the minimum standards set forth by the NFIP. Your Community's local flood ordinance may prove to be more restrictive and thus take precedence over the minimum NFIP standards. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

(X) Mr. Robert Sumimoto at (808) 523-4254 or Mr. Mario Siu Li at (808) 523-4247 of the City and County of Honolulu, Department of Planning and Permitting.

( ) Mr. Kelly Gomes at (808) 961-8327 (Hilo) or Mr. Kiran Emler at (808) 327-3530 (Kona) of the County of Hawaii, Department of Public Works.

( ) Mr. Francis Cerizo at (808) 270-7771 of the County of Maui, Department of Planning.

( ) Mr. Mario Antonio at (808) 241-6620 of the County of Kauai, Department of Public Works.

( ) The applicant should include project water demands and infrastructure required to meet water demands. Please note that the implementation of any State-sponsored projects requiring water service from the Honolulu Board of Water Supply system must first obtain water allocation credits from the Engineering Division before it can receive a building permit and/or water meter.

( ) The applicant should provide the water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update.

( ) Additional Comments: _____

( ) Other: _____

Should you have any questions, please call Mr. Andrew Monden of the Planning Branch at 587-0229.

Signed: Andrew M. Monden
for ERIC T. HIRANO, CHIEF ENGINEER

Date: 8/2/04

BOARD OF WATER SUPPLY

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

JEREMY HARRIS, Mayor

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LARRY J. LEOPARDI, Ex-Officio

CLIFFORD S. JAMILE
Manager and Chief Engineer

DONNA FAY K. KIYOSAKI
Deputy Manager and Chief Engineer

September 1, 2004

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

Attention: Andrew M. Monden, Engineering Division
Nicholas A. Vaccaro, Land Division Support Services

Dear Ms. Mamiya:

Subject: Your Letter of August 16, 2004 Regarding the Draft Environmental Assessment for the Expansion of the Ewa Nonpotable Water System, Ewa, Oahu, Hawaii

Thank you for your letter to Sheryl Nojima of Gray, Hong, Nojima & Associates regarding the subject project.

We understand the various divisions of the Department of Land and Natural Resources were given the opportunity to review the Draft Environmental Assessment (EA) for the subject project. Comments pertaining to flood zones furnished by the Engineering Division will be addressed in the Final EA as follows:

1. The Engineering Division has confirmed that the project sites are located in Flood Zones, D, X, A and AE based on current Flood Insurance Rate Maps (FIRM).

2. Section 3.1.4.a will indicate that the various nonpotable water main projects located in FIRM Zones A and AE will comply with applicable rules and regulations of the National Flood Insurance Program and City and County of Honolulu flood ordinances.

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

Very truly yours,

CLIFFORD S. JAMILE
Manager and Chief Engineer

cc: Office of Environmental Quality Control
Sheryl Nojima (Gray, Hong, Nojima and Associates, Inc.)

POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

801 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96813 · AREA CODE (808) 529-3111
http://www.honolulupd.org
www.co.honolulu.hi.us

JEREMY HARRIS
MAYOR

GLEN R. KAJIYAMA
ACTING CHIEF

PAUL D. PUTZULU
DEPUTY CHIEF

OUR REFERENCE CS-DK

August 16, 2004

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

ATTENTION: SCOT MURAOKA, CIVIL ENGINEER

FROM: GLEN R. KAJIYAMA, ACTING CHIEF OF POLICE
HONOLULU POLICE DEPARTMENT

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT, EXPANSION OF THE EWA NON-POTABLE WATER SYSTEM, TMK: 9-1; 9-2-02; AND 9-2-03

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

We have noted that there will be major roadwork through the already overly congested thoroughfares in Ewa. We have also noted that nighttime work in residential areas will not be permitted. However, we would like to recommend that, as much as possible, work on Fort Weaver Road, Kalaeloa Boulevard, and Fort Barrett Road be conducted at night to alleviate the situation.

The mitigation measures cited on pages 4-1, 4-2, and 4-3 may help to minimize some of the problems. However, in spite of these measures, calls for police service regarding construction-related dust, noise, odors, and traffic are inevitable.

If there are any questions, please call Captain Gregory Lefcourt of District 8 at 692-4253 or Ms. Carol Sodetani of the Support Services Bureau at 529-3858.

GLEN R. KAJIYAMA
Acting Chief of Police

By
KARL GODSEY
Assistant Chief of Police
Support Services Bureau

cc: Ms. Sheryl Nojima
Gray, Hong, Nojima and Associates, Inc.
OEQC

Serving and Protecting with Aloha

BOARD OF WATER SUPPLY

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

August 31, 2004

JEREMY HARRIS, Mayor

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CLIFFORD S. JAMILE
Manager and Chief Engineer

DONNA FAY K. KIYOSAKI
Deputy Manager and Chief Engineer

TO: BOISSE CORREA, CHIEF OF POLICE
POLICE DEPARTMENT

ATTN: CAPT. GREGORY LEFCOURT, DISTRICT 8
CAROL SODETANI, SUPPORT SERVICES BUREAU

FROM: CLIFFORD S. JAMILE, MANAGER AND CHIEF ENGINEER

SUBJECT: YOUR MEMORANDUM OF AUGUST 16, 2004 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE EXPANSION OF THE EWA NONPOTABLE WATER SYSTEM, EWA, OAHU, HAWAII, TMK: 9-1, 9-2-002 AND 9-2-003

Thank you for your memorandum regarding the subject project.

We share in your concern regarding impacts on traffic flow during construction. The Final Environmental Assessment will indicate that the Board of Water Supply will consider night work to alleviate construction in major thoroughfares that are already congested, such as Fort Weaver Road, Kalaeloa Boulevard and Fort Barrett Road.

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

cc: Office of Environmental Quality Control
Sheryl Nojima (Gray, Hong, Nojima and Associates, Inc.)

LINDA LINGLE
GOVERNOR

PATRICIA HAMAMOTO
SUPERINTENDENT

STATE OF HAWAI'I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

OFFICE OF THE SUPERINTENDENT

August 18, 2004

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

Dear Mr. Muraoka:

Subject: Draft Environmental Assessment (DEA) for
Expansion of the Ewa Nonpotable Water System
TMK 9-1; 9-2-02; and 9-2-03 Ewa, Oahu, Hawaii

The Department of Education (DOE) has reviewed the Draft Environmental Assessment for the expansion of the non-potable water system in the Ewa district for increased reservoir capacity and 44 miles of distribution and transmission mains. When completed, the expanded system will serve from the Navy Blast Zone on the West Loch of Pearl Harbor to Ko Olina and from lower Makakilo and Farrington Highway down to the Ewa coastline.

The DOE hopes that the completed system will correct the difficulties encountered by Kapolei High and Kapolei Middle schools that are using the current brackish water system. Both schools were required to replace the valves on their school grounds watering systems because of the clogging caused by the brackish water. The windows at Kapolei Middle that are exposed to the brackish water have been permanently etched. Finally, the system is often erratic in its supply and water pressure.

The DOE has no other comment at this time. If you have any questions, please call Rae M. Loui, Assistant Superintendent of the Office of Business Services, at 586-3444 or Heidi Meeker of the Facilities and Support Services Branch at 733-4862.

Very truly yours,

Patricia Hamamoto
Superintendent

PH:jmb

c: Rae M. Loui, OBS
Mamo Carreira, CAS, Campbell/Kapolei/Waianae Complex Area
Office of Environmental Quality Control
√Sheryl Nojima, Gray, Hong, Nojima & Assoc., Inc.

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

BOARD OF WATER SUPPLY

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

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LARRY J. LEOPARDI, Ex-Officio

CLIFFORD S. JAMILE
Manager and Chief Engineer

DONNA FAY K. KIYOSAKI
Deputy Manager and Chief Engineer

September 8, 2004

Ms. Patricia Hamamoto
Superintendent
Department of Education
State of Hawaii
P.O. Box 2360
Honolulu, Hawaii 96804

Dear Ms. Hamamoto:

Subject: Your Letter of August 18, 2004 Regarding the Draft Environmental
Assessment for the Expansion of the Ewa Nonpotable Water
System, TMK 9-1, 9-2-02 and 9-2-03, Ewa, Oahu, Hawaii

Thank you for your letter regarding the Draft Environmental Assessment for the Expansion of the Ewa Nonpotable Water System.

We note your concerns regarding the level of nonpotable water service experienced by Kapolei High and Kapolei Middle Schools using the State's brackish water system. The Board of Water Supply (BWS) has had discussions with the State Housing Community Development Corporation of Hawaii on the transfer of its brackish water system. Those discussions have not been successful to date, but we remain receptive to resuming those discussions. The Department of Education has the option to connect the schools separately to our recycled water system. Construction drawings would need to be submitted to the BWS for review and approval. In addition, service agreements would need to be executed for the new customers.

If there are any questions, please contact Scot Muraoka at 748-5942.

Very truly yours,

CLIFFORD S. JAMILE
Manager and Chief Engineer

cc: Rae M. Loui, Assistant Superintendent
Momi Carreira, CAS, Campbell/Kapolei/Waianae Complex Area
Office of Environmental Quality Control
Sheryl Nojima (Gray, Hong, Nojima and Associates)

SM:JS
cc: J. Myers
S. Muraoka
WR-70/04

LINDA LINGLE
GOVERNOR OF HAWAII

GENEVIEVE SALMONSON
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
235 SOUTH BERETANIA STREET
SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186
E-mail: oeqc@mail.health.state.hi.us

August 23, 2004

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

Ms. Sheryl Nojima
Gray Hong Nojima & Associates, Inc.
841 Bishop Street, Suite 1100
Honolulu, Hawai'i 96813

Dear Mr. Jamile and Ms. Nojima:

The Office of Environmental Quality Control (OEQC) has reviewed the draft environmental assessment (DEA) entitled "Expansion of the 'Ewa Nonpotable Water System," Tax Map Keys No. 9-1, 9-2-02, and 9-2-03, situtated in the judicial district of 'Ewa. OEQC offers the following comments for your consideration and response.

1. **R-1 water use plan:** The DEA notes that R-1 water is not intended for private yard watering at this time. While we understand the concerns of possible coliform and virus exposure to homeowners, does the City plan to allow R-1 water use for yard watering at a time when human exposure is minimal, say, at night using drip irrigation lines when the majority of homes are asleep? We support any dialogue with the community and appropriate agencies on this subject.

Thank you for the opportunity to comment. If there are any questions, please call Mr. Leslie Segundo, Environmental Health Specialist, at (808) 586-4185.

Sincerely,

Genevieve Salmonson

GENEVIEVE SALMONSON
Director

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

JEREMY HARRIS, Mayor

EDDIE FLORES, JR., Chairman
CHARLES A. STED, Vice-Chairman
JAN M.L.Y. AKAU
HERBERT E.K. KAOPUA, SR.
CAROLYN H. LENDIO

LARRY J. LEOPARDI, Ex-Officio

CLIFFORD S. JAMILE
Manager and Chief Engineer

DONNA FAY K. KIYOSAKI
Deputy Manager and Chief Engineer

August 31, 2004

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

Attention: Leslie Segundo

Dear Ms. Salmonson:

Subject: Your Letter of August 23, 2004 Regarding the Draft Environmental Assessment for the Expansion of the Ewa Nonpotable Water System, Ewa, Oahu, Hawaii, TMK: 9-1, 9-2-02 and 9-2-03

Thank you for your letter regarding the subject project.

The Draft Environmental Assessment (EA) indicates that R-1 water is not intended for private yard watering at this time. However, we are hopeful that with the proposed expansion of the distribution system, private yard watering may well become common practice in the future. The Draft EA also discusses the potential use of R-1 water for toilet flushing in new commercial facilities approved by the Department of Health at such time that the City and County of Honolulu has adopted provisions in the plumbing code pertaining to the use of dual water in buildings.

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

Very truly yours,

FOR CLIFFORD S. JAMILE
Manager and Chief Engineer

cc: Sheryl Nojima (Gray, Hong, Nojima and Associates, Inc.)

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HI 96707
(808) 692-5156, fax (808) 692-5113

Jeremy Harris
Mayor

Frank J. Doyle, P.E.
Director

Timothy A. Houghton
Deputy Director

PRO 04-046

August 23, 2004

via fax: 531-8018

Gray, Hong, Nojima & Associates, Inc.
841 Bishop St., Suite 1100
Honolulu, Hawaii 96813

Attention: Ms. Sheryl E. Nojima

SUBJECT: Draft Environmental Assessment (EA)
Expansion of the Ewa Nonpotable Water System
TMK 9-1; 9-2-02; and 9-2-03, Ewa, Oahu, Hawaii

We reviewed the subject Draft EA for the Board of Water Supply's project, Expansion of the Ewa Nonpotable Water System, as requested in your letter of July 22, 2004, and have the following comments:

1. Page 1-1, 1.1 Proposed Project Summary: The Secondary Treatment Plant was originally called the Ewa Water Reclamation Facility (EWRF). The secondary treatment plant was specifically constructed for effluent reuse.

2. Page 1-4, 1.4.1 Consent Decree: The correct information on the consent decree is as follows: The 1993 enforcement action was for spills and pretreatment program deficiencies. It was not specific to Honouliuli WWTP, but applied to the City's Oahu operations. One of the Supplemental Environmental Projects in the consent decree is for wastewater effluent reuse.

3. Figure 2-1: Existing and Potential Water Reuse Areas: The figure does not show all the existing landscaped areas currently being irrigated with recycled water. Include the various landscaped areas in the subdivisions, along Ft. Weaver Rd. and Renton Rd., and Ewa Mahiko Park.

4. Page 3-33, 3.4.2.b Wastewater, Existing Conditions: Regarding the existing capacity of the Honouliuli Wastewater Treatment Plant, the liquid capacity is currently 38 mgd. The solids capacity is currently 26 to 28 mgd. A project to increase the solids handling capacity is included in the FY04 and FY05 City CIP budgets. Describe what "near" means in terms of numbers, in "It (outfall) is already near its peak wet weather flow capacity."

Should you have any questions, please call me at 692-5159, or Jack Pobuk, Program Coordinator, at 692-5727.

Sincerely,

FRANK J. DOYLE, P.E.
Director

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

September 8, 2004

JEREMY HARRIS, Mayor

EDDIE FLORES, JR., Chairman
CHARLES A. STED, Vice-Chairman
HERBERT S. K. KAOPUA, SR.
CAROLYN H. LENCIO

ROCHEY K. HARADA, Ex-Officio
LARRY J. LEOPARDI, Ex-Officio

CLIFFORD S. JAMILE
Manager and Chief Engineer

DONNA FAY K. KIYOSAKI
Deputy Manager and Chief Engineer

TO: FRANK D. DOYLE, DIRECTOR
DEPARTMENT OF ENVIRONMENTAL SERVICES

ATTN: JACK POBUK, PROGRAM COORDINATOR

FROM: FOR CLIFFORD S. JAMILE, MANAGER AND CHIEF ENGINEER

SUBJECT: YOUR FACSIMILE OF AUGUST 23, 2004 TO GRAY, HONG, NOJIMA AND ASSOCIATES REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE EXPANSION OF THE EWA NONPOTABLE WATER SYSTEM, TMK 9-1, 9-2-02 AND 9-2-03, EWA, OAHU, HAWAII

Thank you for your facsimile to Ms. Sheryl Nojima of Gray, Hong, Nojima & Associates regarding the subject project. The Final Environmental Assessment (EA) will address your concerns as follows:

1. The project summary will be revised stating that the facility was formerly known as the Ewa Water Reclamation Facility.

2. Section 1.4.1 will be revised stating that the enforcement action resulted from alleged violations of the Clean Water Act stemming from pretreatment program deficiencies.

3. Figure 2-1 will be revised to show additional common irrigation areas and parks being served via the following golf course nonpotable water systems:

   - Ewa Villages Golf Course - Fernandez Village, Lincoln Village, Tenney Village, Lokahi Greens, and Ewa Mahiko District Park.

   - West Loch Golf Course - West Loch Estate Homes, West Loch Fairway Homes, West Loch Fairways Town Homes, West Loch Elderly Housing, West Loch Shoreline Park, and Asing Community Park.

4. The existing conditions of the wastewater system described in Section 3.4.2.b will be updated with the liquid and solids capacities you have furnished. The statement regarding the Barbers Point Deep Ocean Outfall capacity was based on the needs assessment discussed in the Department of Design and Construction's *West Mamala Bay Facilities Plan* (December 2001); however, it will be omitted from the Final EA.

If there are any questions, please contact Scot Muraoka at 748-5942.

cc: Office of Environmental Quality Control
Sheryl Nojima (Gray, Hong Nojima & Associates)

PHONE (808) 594-1888

FAX (808) 594-1865

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

HRD04/1490

August 23, 2004

Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawai'i 96843
Attn: Scott Muraoka Phone: (808) 748-5942

RE: Request for review and comment on the Draft Environmental Assessment, Expansion of the Ewa Nonpotable Water System, TMK: 9-1; 9-2-02; and 9-2-03

Aloha,

The Office of Hawaiian Affairs (OHA) is in receipt of your July 22, 2004 letter and appreciates the opportunity to again offer comments on the above project. OHA is supportive of efforts to reuse water and thereby make water available for other uses, including the fulfillment of Native Hawaiian Water Rights.

Besides offering general support for the project, we would like to reiterate a comment we made in our letter of March 28, 2002: "Procedures for handling inadvertent discoveries of human burials and cultural artifacts should also be included."

Your reply letter of June 5, 2002 indicated that you believe there is only a significant likelihood of finding iwi or other cultural materials in areas that are "undisturbed." We would like to note that recent redevelopment of the long "disturbed" urban core of Honolulu has resulted in repeated discovery of remains, as in the well-publicized Wal-Mart case. Therefore, we repeat our request that the document be amended to indicate that if iwi or Native Hawaiian cultural or traditional deposits be found during ground disturbance or excavation, work will cease, and the appropriate agencies will be contacted pursuant to applicable law.

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Thank you for the opportunity to comment. If you have further questions or concerns, please contact Dr. Jonathan Likeke Scheuer at 594-1946 or e-mail him at jonathans@oha.org.

Sincerely,

Clyde W. Nāmu'o
Administrator

CC: Office of Environmental Quality Control
State Office Tower
235 South Beretania Street, Suite 702
Honolulu, Hawai'i 96813

Gray, Hong, Nojima & Associates, Inc.
841 Bishop Street Suite 1100
Honolulu, Hawai'i 96813
Attn: Sheryl Nojima Phone: (808) 521-0306

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

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Manager and Chief Engineer

DONNA FAY K. KIYOSAKI
Deputy Manager and Chief Engineer

September 10, 2004

Mr. Clyde W. Namuo, Administrator
Office of Hawaiian Affairs
State of Hawaii
711 Kapiolani Blvd., Suite 500
Honolulu, Hawaii 96813

Attn: Jonathan Likeke Scheur, M.D.

Dear Mr. Namuo:

Subject: Your Letter of August 23, 2004 Regarding the Draft Environmental Assessment for the Expansion of the Ewa Nonpotable Water System, TMK 9-1, 9-2-02 and 9-2-03, Ewa, Oahu, Hawaii

Thank you for your letter regarding the subject project.

The Final Environmental Assessment will be revised to include the following statement in Sections 3.4.1 and 4.1.6:

> "If iwi or Native Hawaiian cultural or traditional deposits are found during ground disturbance or excavation, work will cease, and the appropriate agencies will be contacted pursuant to applicable law."

If there are any questions, please contact Scot Muraoka at 748-5942.

Very truly yours,

Barry Usagawa

BARRY USAGAWA
Water Resources Principal Executive

cc: Office of Environmental Quality Control
~Sheryl Nojima (Gray, Hong, Nojima & Associates)

Ewa Water ... our greatest need - use it wisely

APPENDIX B

DLNR CWRM Well Listing

APPENDIX B - Well Permits Issued by Department of Land and Natural Resources

Well ID #	WELL NAME	YR DRILLED	LATITUDE	LONGITUDE	OWNER/USER	WELL DEPTH (Feet)	USE	USE YR	CASING DIA (Inches)
3-1806-011	AES Prod 1	1989	211824	1580630	AES Haw Inc	115	IND	90	20
3-1806-012	AES 1B	1990	211822	1580632	AES Haw Inc	124	IND	90	20
3-1806-013	AES 1C	1990	211822	1580629	AES Haw Inc	124	IND	90	20
3-1806-014	AES 1D	1990	211821	1580631	AES Haw Inc	125	IND	90	20
3-2001-007	Arbors GV 1	1991	212034	1580149	Arbors Assoc	50	IRR	92	12
3-1805-003	BHP Firewell	1985	211819	1580525	BHP Petroleum	50	OTH	85	20
3-1805-002	Barbers Point	1978	211837	1580526	BHP Petroleum	100	UNU	83	20
3-1902-003	Honouliuli STP 1	1991	211959	1580231	C&C Envir Serv	51	UNU	98	12
3-1902-004	Honouliuli STP 2	1991	211959	1580231	C&C Envir Serv	51	UNU	98	12
3-1806-009	Facility Maint 1	1986	211830	1580629	C&C Faci Maint	103	IND	86	18
3-1806-010	Facility Maint 2	1986	211830	1580629	C&C Faci Maint	105	IND	86	18
3-2002-013	West Loch Cap 1	1993	212014	1580235	C&C Honolulu	70	UNU	93	11
3-2002-014	West Loch Cap 2	1993	212041	1580214	C&C Honolulu	70	UNU	93	11
3-2001-003	Geiger Park	1989	212013	1580148	C&C Parks&Rec	56	IRR	92	8
3-1905-008	Kapolei Irr 1	1991	211949	1580502	Campbell Estate	84	IRR	94	12
3-1905-010	Kapolei Irr 2	1993	211949	1580504	Campbell Estate	94	IRR	94	14
3-2006-002	Ep 10 C	1908	212016	1580636	Campbell Estate	282	IRR	96	12
3-2006-004	Ep 10 E	1908	212016	1580636	Campbell Estate	155	IRR	96	12
3-2006-006	Ep 10 G	1908	212016	1580636	Campbell Estate	165	IRR	96	12
3-2006-016	Makaiwa Mon TH	1990	212048	1580647	Campbell Estate	200	OBS	90	12
3-1905-002	Campbell Ind Pk	1957	211944	1580545	Campbell Estate	90	OTH	74	10
3-1906-007	Haw Raceway Park	1957	211901	1580605	Campbell Estate	50	OTH	74	7
3-2004-002	Makakilo City	1937	212053	1580452	Campbell Estate	200	OTH	88	6
3-1805-001	Barbers Point	1957	211859	1580527	Campbell Estate	50	UNU	74	7
3-1806-001	Barbers Point	1957	211809	1580617	Campbell Estate	50	UNU	74	7
3-1904-001	Ep 31&32	1965	211945	1580422	Campbell Estate	8	UNU		
3-1906-001	Ewa Beach	1957	211928	1580621	Campbell Estate	50	UNU	74	6
3-1906-002	Ewa Beach	1957	211946	1580618	Campbell Estate	75	UNU	74	10
3-2000-001	Ep 21	1930	212003	1580044	Campbell Estate	30	UNU	94	12
3-2006-001	Ep 10 A	1908	212016	1580636	Campbell Estate		UNU	95	12
3-2006-003	Ep 10 D	1908	212016	1580636	Campbell Estate		UNU	95	12
3-2006-005	Ep 10 F	1908	212016	1580636	Campbell Estate	165	UNU	95	12
3-2006-007	Ep 10 H	1908	212016	1580636	Campbell Estate		UNU	95	12
3-2006-008	Ep 10 J	1913	212016	1580636	Campbell Estate		UNU	95	12
3-2006-009	Ep 10 K	1913	212016	1580636	Campbell Estate		UNU	95	12

Well ID #	WELL NAME	YR DRILLED	LATITUDE	LONGITUDE	OWNER/USER	WELL DEPTH (Feet)	USE	USE YR	CASING DIA (Inches)
3-2006-010	Ep 10 B	1923	212016	1580636	Campbell Estate	160	UNU	95	12
3-2006-011	Ep 10 I	1923	212016	1580636	Campbell Estate	160	UNU	95	12
3-1806-020	Acid Plant	1959	211839	1580659	Chevron USA		IND	61	16
3-1806-021	Acid Plant	1959	211839	1580659	Chevron USA		IND	61	16
3-1807-001	Lpg Storage Area	1959	211859	1580712	Chevron USA		IND	61	14
3-1807-002	Lpg Storage Area	1959	211859	1580712	Chevron USA		IND	61	14
3-1807-003	Mauka-Makai St	1959	211853	1580709	Chevron USA		IND	60	20
3-1807-004	Mauka-Makai St	1959	211853	1580709	Chevron USA		IND	60	20
3-1806-006	Acid Plt P-2083	1959	211838	1580658	Chevron USA	50	OTH	60	18
3-1907-002	Chevron Fire	1991	211901	1580706	Chevron USA	41	OTH	91	36
3-1806-002	Barbers Point	1957	211858	1580656	Chevron USA	50	SLD	81	7
3-2004-003	Ft. Barrette	1941	212053	1580453	Chiyoda Pac	190	UNU	94	12
3-2001-013	Coral Creek 4	1998	212003	1580156	Coral Creek	48	IRR	98	12
3-2002-015	Coral Creek 1	1997	212015	1580220	Coral Creek	55	IRR	98	12
3-2002-017	Coral Creek 2	1998	212021	1580216	Coral Creek	48	IRR	98	12
3-2002-019	Lake A	1998	212002	1580211	Coral Creek	5	IRR	99	
3-2002-018	Coral Creek 3	1998	212019	1580202	Coral Creek	47	OBS	99	12
3-1902-005	Coral Creek 5	1998	211955	1580218	Coral Creek	68	OTH	98	12
3-1902-006	Holes 12,13,14	1998	211937	1580203	Coral Creek	6	OTH	99	
3-1902-007	Holes 15,16 Mau	1998	211953	1580207	Coral Creek	3	OTH	99	
3-1902-008	Holes 15, 16 Mak	1998	211944	1580206	Coral Creek	2	OTH	99	
3-2001-015	Holes 5,6,7	1998	212030	1580145	Coral Creek	5	OTH	99	
3-2002-020	Hole 2	1998	212015	1580225	Coral Creek	5	OTH	99	
3-2001-014	Lake 10	1998	212001	1580159	Coral Creek	5	UNU	99	
3-1806-007	Conaco Ref Obs 2	1972	211820	1580642	Dill-Conoco	300	OBS	74	6
3-1806-008	Conaco Ref Obs 1	1972	211820	1580642	Dill-Conocc	215	OBS	74	
3-2002-001	Ewa	1891	212032	1580222	Ewa Plantn	507	SLD	66	12
3-2002-002	Ewa	1891	212032	1580222	Ewa Plantn	523	SLD	46	8
3-2002-003	Ewa	1899	212032	1580222	Ewa Plantn	551	SLD	46	10
3-2002-004	Ewa	1899	212032	1580222	Ewa Plantn	550	SLD	46	12
3-2002-005	Ewa	1900	212032	1580222	Ewa Plantn	522	SLD	46	10
3-2002-006	Ewa	1900	212032	1580222	Ewa Plantn	518	SLD	46	10
3-2002-007	Ewa	1908	212032	1580222	Ewa Plantn	498	SLD	42	12
3-2002-008	Ewa	1908	212032	1580222	Ewa Plantn	497	SLD	42	12
3-2001-002	Gentry Entry Irr	1987	212038	1580152	Gentry Dev Co	38	IRR	87	8
3-2001-010	Gentry Area 24	1996	212034	1580116	Gentry Dev Co	52	IRR	97	11
3-1901-005	Gentry Area 13	1999	211955	1580119	Gentry Homes	43	IRR	00	20

Well ID #	WELL NAME	YR DRILLED	LATITUDE	LONGITUDE	OWNER/USER	WELL DEPTH (Feet)	USE	USE YR	CASING DIA (Inches)
3-2001-012	Keaunui Area 30	1999	212033	1580137	Gentry Invest	39	IRR	00	30
3-2001-004	Sunrise	1994	212013	1580142	Gentry Pacific	61	IRR	94	11
3-2001-005	Sun Terra	1994	212006	1580135	Gentry Pacific	65	IRR	94	11
3-2001-009	Ft Weaver Apt.	1994	212021	1580138	Gentry Pacific	56	IRR	95	11
3-1906-003	Grace Pac C-3	1988	211939	1580628	Grace Pacific	120	IND	88	16
3-1906-004	Grace Pac C-2	1988	211941	1580629	Grace Pacific	120	IND	88	16
3-1906-005	Grace Pac B-1	1988	211943	1580632	Grace Pacific	250	IND	88	12
3-1906-006	Grace Pac C-1	1987	211946	1580634	Grace Pacific	118	IND	88	16
3-1902-001	Ep 27A&B, 28&29	1964	211903	1580233	Haseko Ewa Inc	8	IRR	97	
3-2000-003	Honouliuli	1957	212012	1580018	Haw Meat Co	50	IRR	74	12
3-2000-004	Honouliuli	1957	212018	1580014	Haw Meat Co	55	IRR	74	12
3-1806-003	Barbers Point	1959	211820	1580628	Haw Westrn St	100	SLD	96	16
3-1806-004	Barbers Point	1959	211820	1580628	Haw Westrn St	50	SLD	96	16
3-2000-005	Honouliuli	1957	212015	1580022	Hawaii Meat Co., LTD	63	IRR	74	12
3-1905-003	Barbers Point	1966	211939	1580508	Hawn Tel Co	70	OTH	74	8
3-1806-015	*Heco Tank Farm*	*1993*	*211835*	*1580629*	*Heco*	121	IND	93	24
3-1900-021	New Ewa Intl G C	1991	211938	1580019	Hon Kosaido	30	IRR	91	12
3-2006-014	BP Non-Potable 1	1988	212047	1580619	Honolulu BWS	285	IRR	90	16
3-2006-015	BP Non-Potable 2	1988	212046	1580618	Honolulu BWS	300	IRR	90	16
3-2004-004	Makakilo	1981	212043	1580446	Honolulu BWS	268	MUN	85	14
3-2006-012	Kahe Point	1938	212038	1580615	Honolulu BWS	150	OBS	74	6
3-1905-006	Caprock 1	1990	211937	1580530	Honolulu BWS	72	SLD	92	12
3-2007-001	Barbers Point	1938	212050	1580712	Honolulu BWS	100	SLD	67	6
3-1905-007	Caprock 2	1991	211938	1580530	Honolulu BWS	78	UNU	91	12
3-1806-019	Ewa Island Comm		211802	1580602	Island Com Cor	25	IND	89	
3-1805-004	Kalaeloa PW-1	1990	211820	1580558	Kalaeloa L P	25	IND	90	11
3-1805-005	Kalaeloa PW-2	1990	211820	1580556	Kalaeloa L P	25	IND	90	11
3-1805-006	Kalaeloa PW-3	1990	211821	1580554	Kalaeloa L P	25	IND	90	11
3-1805-007	Kalaeloa PW-4	1990	211820	1580557	Kalaeloa L P	25	IND	90	11
3-1805-008	Kalaeloa PW-5	1990	211821	1580555	Kalaeloa L P	25	IND	90	11
3-1805-009	Kalaeloa PW-6	1990	211821	1580553	Kalaeloa L P	40	IND	90	14
3-1805-010	Kalaeloa PW-7	1993	211813	1580559	Kalaeloa L P	45	IND	94	11
3-1805-011	Kalaeloa PW-8	1994	211813	1580558	Kalaeloa L P	45	IND	94	11
3-1805-012	Kalaeloa PW-9	1994	211813	1580557	Kalaeloa L P	45	IND	94	11
3-2003-001	Kapolei Irr A	1991	212020	1580333	Kpi	85	IRR	91	12
3-2003-002	Kapolei Irr B	1991	212024	1580333	Kpi	82	IRR	93	12
3-2003-005	Kapolei Irr E	1991	212031	1580341	Kpi	100	IRR	92	12

Well ID #	WELL NAME	YR DRILLED	LATITUDE	LONGITUDE	OWNER/USER	WELL DEPTH (Feet)	USE	USE YR	CASING DIA (Inches)
3-1800-001	Ewa Beach B	1972	211858	1580020	N O A A	106	OBS	74	4
3-1900-014	Ewa Beach C	1972	211917	1580024	N O A A	106	OBS	74	4
3-1900-015	Ewa Beach D	1972	211929	1580012	N O A A	126	OBS	74	4
3-1900-023	Pac Tsunami Cntr	1999	211906	1580007	Nat Weather Service	9	IRR	99	8
3-2005-001	Honouliuli	1971	212023	1580516	Pac Conc Quar	142	SLD	77	12
3-2002-012	Palm Court 3	1989	212031	1580208	Palm Court Ass	60	IRR	92	12
3-2001-006	Palm Villa I	1990	212051	1580153	Palm Vil 1 Ass	60	IRR	90	12
3-2001-008	Palm Villa 2	1991	212030	1580157	Palm Vil 2 Ass	61	IRR	93	12
3-1901-002	Ewa Beach	1962	211942	1580156	Podmore & Sons	30	DOM	74	8
3-1904-002	Makakilo G C 1	1991	211952	1580429	Puu Makakilo	77	SLD	99	12
3-1904-003	Makakilo G C 2	1992	211952	1580429	Puu Makakilo	70	SLD	99	12
3-1900-002	Ep 22	1930	211952	1580040	Seibu Haw Inc	29	IRR	92	12
3-1900-017	Haw Prince Irr 2	1990	211938	1580056	Seibu Haw Inc	26	IRR	92	15
3-1900-018	Haw Prince Irr 3	1990	211940	1580047	Seibu Haw Inc	25	IRR	92	15
3-1900-019	Haw Prince Irr 4	1990	211941	1580035	Seibu Haw Inc	25	IRR	92	15
3-1900-020	Haw Prince Irr 5	1990	211948	1580025	Seibu Haw Inc	25	IRR	92	15
3-1901-003	Haw Prince Irr 1	1990	211937	1580104	Seibu Haw Inc	26	IRR	92	15
3-1900-001	Ep 20	1930	211958	1580058	Seibu Haw Inc	30	UNU	95	12
3-1901-001	Ep 24	1932	211947	1580117	Seibu Haw Inc	29	UNU	94	12
3-1806-005	Barbers Point	1959	211836	1580624	So Pipe&Casg	40	IND	74	8
3-1900-022	Dug C	1988	211937	1580001	Sogo Haw Inc	12	IRR	92	
3-1900-016	New Ewa Intl G C	1988	211931	1580008	Sogo Haw Inc	33	OTH	94	8
3-1906-008	Barbers Pt. MW-1	1997	211919	1580651	State Dot-Harb	115	OBS	97	2
3-1906-010	Barbers Pt. MW-3	1997	211949	1580622	State Dot-Harb	140	OBS	97	2
3-2006-018	Barbers Pt. MW-4	1997	212049	1580622	State Dot-Harb	125	OBS	97	2
3-1906-009	Barbers Pt. MW-2	1997	211937	1580630	State Dot-Harb	135	OTH	00	2
3-1905-004	Ewa Desalt Basal	1988	211945	1580534	State Dowald	380	UNU	95	12
3-1905-005	Caprock 1	1988	211945	1580536	State Dowald	80	UNU	91	14
3-1905-009	Caprock 3	1992	211940	1580530	State Dowald	80	UNU	92	12
3-2003-008	East Kapolei	1999	212013	1580310	State Hcdch	70	UNU	99	14
3-2003-004	Kapolei Irr D	1991	212006	1580352	State Hfdc	73	IRR	92	12
3-2003-007	Kapolei Irr C-1	1994	212014	1580341	State Hfdc	81	IRR	96	11
3-2003-003	Kapolei Irr C	1991	212012	1580343	State Hfdc	77	SLD	94	12
3-1900-012	Ewa Beach	1962	211906	1580008	U S G S	25	UNU	74	20
3-1900-003	Barbers Point	1939	211959	1580010	U S Navy	37	LOS	00	6
3-1900-004	Barbers Point	1939	211954	1580002	U S Navy	37	LOS	00	6
3-1900-005	Barbers Point	1941	211952	1580002	U S Navy	35	LOS	00	6

Well ID #	WELL NAME	YR DRILLED	LATITUDE	LONGITUDE	OWNER/USER	WELL DEPTH (Feet)	USE	USE YR	CASING DIA (Inches)
3-1900-006	Barbers Point	1941	211952	1580000	U S Navy	37	LOS	00	6
3-1900-010	Barbers Point	1941	211955	1580010	U S Navy	32	LOS	00	6
3-2000-002	Honouliuli	1939	212006	1580003	U S Navy	30	LOS	00	6
3-2004-001	Puu Kapolei	1933	212019	1580432	U S Navy	147	OTH	88	12
3-1900-007	Barbers Point	1941	211937	1580013	U S Navy	31	UNU	74	6
3-1900-008	Barbers Point	1941	211942	1580000	U S Navy	28	UNU		6
3-1900-009	Barbers Point	1941	211936	1580014	U S Navy	31	UNU	74	6
3-1900-011	Barbers Point	1941	211916	1580032	U S Navy	50	UNU	74	6
3-1900-013	EP 30	1965	211959	1580022	U S Navy	8	UNU	94	
3-2001-001	Ep 23	1931	212054	1580109	U S Navy	47	UNU	99	12
3-2002-009	Barbers Point	1941	212003	1580253	U S Navy	105	UNU	74	12
3-1907-001	Barbers Point	1951	211940	1580710	U S State Dpt	30	UNU	81	8
3-2006-013	W Beach Estates	1986	212025	1580631	W Beach Est	120	OTH	87	12
3-2002-010	Ewa	1944	212032	1580222		213	IND	74	12

SUMMARY

MUN	1	CAMPBELL	23	IRR
IRR	41	US NAVY	14	LOS, UNU
IND	29	SEIBU	8	IRR
OBS	11	KALAELOA LP	9	IND
SLD	17	CHEVRON	9	IND
UNU	37	GENTRY	7	IRR
LOST	6	CORAL CREEK	12	IRR, OTH
DOM	1			
OTHER	17			
TOTAL	160			

LEGEND

CASING DIA = Casing diameter in inches
WELL DEPTH = Total depth of well in feet
USE = Major use of well

Symbols listed:

MUN = Municipal	OBS = Observation
IRR = Industrial	DIS = Disposal
IND = Industrail	LOS = Lost
DOM = Domestic	RCH = Recharge
UNU = Unused	OTH = Other
SLD = Sealed	

SOURCE: Department of Land and Natural Resources (2002).

APPENDIX C

Preliminary Construction Cost Estimates

EXPANSION OF THE EWA NONPOTABLE WATER SYSTEM
PRELIMINARY CONSTRUCTION COST ESTIMATE

8-Jul-04

PHASE 1

Waterlines (LF)		
10"	2,619	615,465
12"	10,126	2,531,500
16"	8,064	2,096,640
20"	7,863	2,162,325
24"	5,016	1,504,800
36"	2,609	944,458
	36,297	$9,855,188
Additional Reservoir Capacity		
(MG)	0.0	$0
SUBTOTAL Phase 1:		**$9,855,188**

PHASE 2

Waterlines (LF)		
4"	460	80,500
6"	9,418	1,742,330
8"	64,232	12,846,400
12"	74,478	18,619,500
16"	25,867	6,725,420
20"	2,780	764,500
24"	5,451	1,635,300
30"	1,237	402,025
	183,923	$42,815,975
Additional Reservoir Capacity		
(MG)	10.0	$36,000,000
SUBTOTAL Phase 2:		**$78,815,975**

PHASE 3

Waterlines (LF)		
16"	8,190	2,129,400
18"	4,674	1,261,980
	12,864	$3,391,380
Reservoir Capacity		
(MG)	5.0	$18,000,000
SUBTOTAL Phase 3:		**$21,391,380**

TOTAL Phases 1-3:		**$110,062,543**
Waterlines (miles)	44	**$56,062,543**
Reservoirs (MG)	15.0	**$54,000,000**

Estimated Waterline Cost/LF

4"	$175
6"	$185
8"	$200
10"	$235
12"	$250
16"	$260
18"	$270
20"	$275
24"	$300
30"	$325
36"	$362

Assumptions:

1. Estimated pipe cost/LF includes PVC pipe, fittings, valves, trenching, cushion, backfill, and pavement restoration.

2. Assumed reservoir cost of $3.6 M/MG capacity.

3. 'System' reservoir storage requirements in Phase 1 to be fulfilled by existing 'project' storage at golf courses.

APPENDIX D

Recorded Rare Species

APPENDIX D - Recorded Rare Species

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	ID NUMBER	ACCURACY	DATE LAST OBSERVED	DIRECTION
GALLINULA CHLOROPUS SANDVICENSIS	HAWAIIAN GALLINULE, 'ALAE-'ULA	LE	1039	G	1970-08-07	Barber's Point
FULICA ALAI	'ALAE KE'OKE'O, HAWAIIAN COOT	LE	1117	G	1975-01-23	Barber's Point
HIMANTOPUS MEXICANUS KNUDSENI	HAWAIIAN STILT, AE'O	LE	1378	G	1968-07-24	Barber's Point
CHASIEMPIS SANDWICHENSIS IBIDIS	OAHU 'ELEPAIO	LE	1796	G	1984-09-29	Ewa Coral Plain
MONACHUS SCHAUINSLANDI	HAWAIIAN MONK SEAL	LE	3913	S	1990-04-24	Ewa Beach, Oneawa Park [Oneula Beach Park]
MONACHUS SCHAUINSLANDI	HAWAIIAN MONK SEAL	LE	3914	M	1990-01-18	Ewa Beach
MONACHUS SCHAUINSLANDI	HAWAIIAN MONK SEAL	LE	3928	S	1990-03-07	Campbell (Barbers Point) Beach Park
MONACHUS SCHAUINSLANDI	HAWAIIAN MONK SEAL	LE	3930	S	1995-01-02	West Beach Estates, Ko Olina Resort, lagoons 1 & 2
MONACHUS SCHAUINSLANDI	HAWAIIAN MONK SEAL	LE	3931	S	1990-03-09	West Beach Estates, Ko Olina condominiums [resort], lagoon 4
MONACHUS SCHAUINSLANDI	HAWAIIAN MONK SEAL	LE	3954	M	1996-09-21	West Beach Estates, Ko Olina Resort
MONACHUS SCHAUINSLANDI	HAWAIIAN MONK SEAL	LE	3956	S	1998-04-24	Paradise Cove
CHELONIA MYDAS	HONU, GREEN TURTLE	LELT	3988	S	1992-??-??	Kahe Point to Deep Draft Harbor
LOW SALINITY LIMESTONE ANCHIALINE POOL	LOW SALINITY LIMESTONE ANCHIALINE POOL		4095	S	1987	Ewa Plain, CA 1.2 mi north of Barber's Point Beach Park, CA 15 ft
LOW SALINITY LIMESTONE ANCHIALINE POOL	LOW SALINITY LIMESTONE ANCHIALINE POOL		4096	S	1986	Ewa Plain, CA 0.4 mi west of Oneula Beach Park, CA 2 ft
LOW SALINITY LIMESTONE ANCHIALINE POOL	LOW SALINITY LIMESTONE ANCHIALINE POOL		4097	S	1975-12-??	Ewa Plain, CA 0.25 mi north east of Camp Malakole MIL RES, CA 30 ft
MYOPORUM SANDWICENSE COASTAL DRY SHRUBLAND	NAIO COASTAL DRY SHRUBLAND		4415	SC	19779-07-??	Ka'aeloa, Barber's Point, ca 10 ft
METABETAEUS LOHENA	ANCHIALINE POOL SHRIMP	C	4767	S	1992-06-??	Ewa Plain, CA 0.4 mi west of Oneula Beach Park
PENTARTHRUM OBSCURUM	OBSCURE PENTARTHRUM WEEVIL	SOC	4804	G	1974-09-??	Ewa Cane Field
LYROPUPA PERLONGA	PUPILLID LAND SNAIL	SOC	5867	SC	1980-04-07	Honouliuli, Barbers Point, NR Makakole Rd
ACHYRANTHES SPLENDENS VAR ROTUNDATA		LE	5945	SC	199110??	Barber's Point Naval Air Station, west end of Ewa airstrip, 10-15 ft
ACHYRANTHES SPLENDENS VAR ROTUNDATA		LE	5946	S	1994-02-15	Barber's Point, behind lighthouse, 3-5 feet
ACHYRANTHES SPLENDENS VAR ROTUNDATA		LE	5947	SC	1993-05-19	Barbers Point, Campbell Industrial Park between C.Brewer Chemical Plant & HI Cement Corp Plant, near sea level
ACHYRANTHES SPLENDENS VAR ROTUNDATA		LE	5948	SC	1993-05-19	Barbers Point, Camp Malakole Military Reserve
LIPOCHAETA LOBATA VAR LOBATA	NEHE		6594	G	1936-04-10	Ewa Coral Plain
CAPPARIS SANDWICHIANA	PUA PILO, MAIAPILO	SOC	8145	S	1987-01-27	Barbers Point
CAPPARIS SANDWICHIANA	PUA PILO, MAIAPILO	SOC	12130	G	1956-07-04	Ewa Plain

APPENDIX D - Recorded Rare Species

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	ID NUMBER	ACCURACY	DATE LAST OBSERVED	DIRECTION
CHAMAESYCE SKOTTSBERGII VAR SKOTTSBERGII	'AKOKO, KOKO, KOKOMALEI	LE	8334	SC	1989-11-11	Ewa plain, area on south, east, & north sides of deep draft harbor, 10-40 ft
CHAMAESYCE SKOTTSBERGII VAR SKOTTSBERGII	'AKOKO, KOKO, KOKOMALEI	LE	8336	SC	1984-??-??	Ewa Plain, west side of Hanua St, next to Standard Oil Refinery, 10-20 ft
CHAMAESYCE SKOTTSBERGII VAR SKOTTSBERGII	'AKOKO, KOKO, KOKOMALEI	LE	8337	SC	1993-??-??	Barber's Point Naval Air Station, northwest corner, vicinity of Attu Street, 40 feet
CHAMAESYCE SKOTTSBERGII VAR SKOTTSBERGII	'AKOKO, KOKO, KOKOMALEI	LE	8338	SC	1993-11-26	Barber's Point Naval Air Station, area bounded by Coral Sea Rd, S Hanson Rd, Lamalle St & Long Island St, 30 ft
CHAMAESYCE SKOTTSBERGII VAR SKOTTSBERGII	'AKOKO, KOKO, KOKOMALEI	LE	8339	SC	1980-??-??	Ewa Plain, east side of Saratoga St, about midway between intersections W
CENTAURIUM SEBAEOIDES	'AWIWI	LE	8613	G	1916-03-14	Ewa Plains & Pearl Harbor
SCAEVOLA CORIACEA	NAUPAKA	LE	8868	M	1919-11-??	Barber's Point
PORTULACA VILLOSA	'IHI		9676	G	1916-03-14	Coral Plain below Ewa Mill & Sioal (Sisal)
MARSILEA VILLOSA	'IHI 'IHI, 'IHI LA'AU	LE	12070	M	1932-04-22	Ewa, below Ewa plantation
OPHIOGLOSSUM CONCINNUM	POLOLEI		12101	M	1912-02-16	Ewa near Sisal

Federal Status	Accuracy
LE = Listed Endangered	SC = Specific with exact location confimmed by source.
SOC = Species of Concern	S = Specific - reported within a 1.5 mile radius of mapped symbol
C = Canidate	G = General - reported within approximately 5 mile radius of mapped symbol
	M = Medium - reported within a 1.5 mile radius of mapped symbol

Source: Hawaii Natural Heritage Program Database (2002)

APPENDIX E

DOH Definitions of RO and R-1/Approved Uses

GUIDELINES

FOR THE TREATMENT AND

USE OF RECYCLED WATER

Prepared by
Hawaii State Department of Health
Wastewater Branch

May 15, 2002
(Replaces November 22, 1993 Version)

the recycled water who is responsible for operation and maintenance of the treatment and distribution facilities of recycled water, prevention of cross-connection, and surveillance of all recycled water users.

"Recycled water" means treated wastewater that by design is intended or used for a beneficial purpose."

"Recycled water system" means a facility which conveys to users or applies or otherwise uses recycled water. Recycled water systems are subdivided into distribution and use systems. Recycled water systems include all piping, storage, and repressurization facilities to deliver recycled water to users, but exclude treatment works.

"R-1 Water (Significant reduction in viral and bacterial pathogens)" means recycled water that is at all times oxidized, then filtered, and then exposed, after the filtration process, to:

A. A disinfection process that, when combined with the filtration process, has been demonstrated to inactivate and/or remove 99.999 percent of the plaque-forming units of F-specific bacteriophage MS2, or polio virus in the wastewater. A virus that is at least resistant to disinfection as polio virus may be used for purposes of demonstration; and

B. A disinfection process that limits the concentration of fecal coliform bacteria to the following criteria:

(1) The median density measure in the disinfected effluent does not exceed 2.2 per 100 milliliters utilizing the bacteriological results of the last seven days for which analyses have been completed; and

(2) The density does exceed 23 per 100 milliliters in more than one sample in any 30-day period; and

(3) No sample shall exceed 200 per 100 milliliters.

"R-2 Water (Disinfected Secondary-23 Recycled Water)" means recycled water that has been oxidized, and disinfected to meet the following criteria:

A. Fecal coliform bacteria densities as follows:

(1) The median density measured in the disinfected effluent does not exceed 23 per 100 milliliters utilizing the bacteriological results of the last seven days for which analyses have been completed; and

(2) The density does not exceed 200 per 100 milliliters in more than one sample in any 30-day period.

State of Hawaii
Department of Health
Wastewater Branch
919 Ala Moana Blvd.
Honolulu, HI 96814

"Water Reuse" means the treatment of wastewater to a quality that makes it suitable for one or more beneficial uses and the subsequent use of the treated water.

III USES AND SPECIFIC REQUIREMENTS FOR RECYCLED WATER

There are three categories of recycled water:

R-1 Water (Significant reduction in viral and bacterial pathogens);

R-2 Water (Disinfected secondary-23 recycled water, which means secondary treatment with disinfection to achieve a median fecal coliform limit of 23 per 100 ml based on the last seven days for which analyses have been completed); and

R-3 Water (Undisinfected secondary recycled water).

A. USES FOR R-3 WATER

1. Recycled water used for the purposes cited below in paragraph 2 of this section shall be at all times R-3 Water or recycled water with concentrations of potentially pathogenic organisms lower than those of R-3, such as R-2 and R-1 Waters.

2. R-3 Water is suitable for, from a public health standpoint, and shall be restricted to, the following purposes:

   a. Surface, drip, subsurface irrigation of feed, fodder and fiber crops, and pasture for animals not producing milk for human consumption;

   b. Surface, drip or subsurface irrigation of non-food bearing tree, provided no irrigation with recycled water occurs for a period of

14 days prior to harvesting or allowing access by the general public;

c. Surface, drip or subsurface irrigation of seed crops that are not eaten by humans;

d. Surface, drip or subsurface irrigation of orchards and vineyards where the recycled water does not come into contact with the edible portion of the crop;

e. Surface irrigation or drip irrigation of ornamental nursery stock and sod farms provided no irrigation with recycled water occurs for a period of 14 days prior to harvesting, retail sale, or allowing access by the general public;

f. Surface, drip or subsurface irrigation of a food crop which must undergo extensive commercial, physical or chemical processing determined by DOH to be sufficient to destroy pathogens, before it is suitable for human consumption. This is allowed no later than 30 days before harvest;

g. Application within a reclamation facility for the following:

(1) Non-spray irrigation of landscape not contacted by the general public;

(2) Polymer dilution water;

(3) Mechanical seal water for gas compressors;

(4) Cooling water for gas compressors and internal combustion engines;

(5) Dilution water for chlorination;

(6) Mechanical seal water and cooling water for sludge pumps;

(7) Heat exchangers: air, water and oil cooling;

(8) Odor and gas absorption;

(9) Centrifuge flushing; and

(10) Flushing grit and sludge pipes; or

h. Such other uses as approved by DOH.

for water purposes cited in the following items "a" through "c" of this paragraph:

a. It may be used until no later than 10 days before harvest for any form of irrigation to ornamental plants to be sold potted;

b. It may be used until no later than 10 days before harvest for surface drip irrigation of a food crop. This is allowed if the edible portion is never eaten raw without peeling, and is at least two feet above the height reached by drip irrigation and at least two feet above the ground surface, and no food crop is harvested that has contacted irrigation water or the ground; and

c. It may be used until no later than 10 days before harvest for surface or drip irrigation of a food crop. This is allowed if the crop will only be cooked at a commercial cannery or subjected to chemicals that kill microorganisms (e.g., canned pineapple, and roasted coffee beans).

C. USES FOR R-1 WATER

1. Recycled water used for the purposes cited below in paragraph "2" of this section shall be at all times R-1 Water.

2. R-1 Water is suitable for, from a public health standpoint, the purposes cited under R-2 Water, and R-3 Water in these guidelines and shall be restricted to the following purposes:

   a. Any form of irrigation for food crops, including all edible root crops, where the recycled water comes into contact with the edible portion of the crop;

   b. Any form of irrigation served by fixed irrigation system supplied by buried piping for turf and landscape irrigation of:

      (1) Golf courses;

      (2) Parks, playgrounds, school yards, athletic fields;

      (3) Residential property where managed by an irrigation supervisor; and

      (4) Roads sides and medians;

   c. Any form of irrigation for pasture where milking animals, and other

animals graze;

d. Any form of fire fighting from outdoor hydrants, fire trucks, or aircraft;

e. Cooling saws while cutting pavement;

f. Spray washing of electric insulators on utility poles;

g. High pressure water blasting to clean surfaces;

h. Drinking water for animals may be accepted if it will not be given to dairy animals, and the applicant demonstrates to the satisfaction of DOH there will be no unreasonable risk of occurrence of adverse effects on the animal related to chemical constituents or radioactivity;

i. Supply for commercial and public laundries for clothing and other linens;

j. Industrial cooling in a system that does not have a cooling tower, evaporative condenser, or other feature that emits vapor or droplets to the *open atmosphere* or to air to be passed into a building or other enclosure occupied by person;

k. Supply for addition to a cooling system or air conditioning system with a cooling tower, evaporative condenser, or other feature that emits vapor or droplets to the open atmosphere or to air to be passed into a building or other enclosure occupied by a person, when all of the following shall occur:

(1) A high efficiency drift reducer is used and the system is maintained to avoid greater rate of generation of drift than that with which a high efficiency drift reducer is associated;

(2) A continuous biocide residual, sufficient to prevent bacterial population from exceeding 10,000 per milliliter, is maintained in circulating water; and

(3) The system is inspected by an operator, capable of determining compliance with this subdivision, at least once per day;

l. In the absence of one or more of the three conditions in paragraph "k" above, it is suitable for addition to such a cooling or air conditioning system when the purveyor of R-2 Water uses has demonstrated to the satisfaction of DOH that the probability of intestinal infection with virus will not exceed 1 in 10,000 under

the specific conditions of use and that growth of Legionella will be controlled to avoid a concentration that could pose a significant hazard to health;

m. Industrial process that does not generate mist or facial contact with recycled water unless personal protective equipment is worn;

n. Water jetting for consolidation of backfill material around potable pipelines and for compaction of soil backfill above such pipelines. When there is a shortage of potable water and such use had been approved for a specific project by the public water system agency that owns the pipeline, and by DOH and conforms with the following conditions:

(1) The public water system that owns the pipeline shall have access and opportunity to have its inspector on the job site while recycled water is being used;

(2) Recycled water shall be used in the pipeline trench only when the pipeline is filled with the highly chlorinated water for new main disinfection and is used under pressure;

(3) The new main disinfection procedure, including checking chlorine residual and collecting bacteriological samples, shall be completed after the use of recycled water in the pipeline trench has ceased;

(4) Precautions shall be taken to minimize opportunities for any recycled water to enter a pipeline under construction (e.g., keeping ends of pipe lengths covered, etc.); and

(5) For other than "hot taps," an appropriate buffer zone of at least 50-foot radius, shall be established to reduce the risk of contamination to the existing water supply line;

o. Flushing toilets and urinals in types of buildings and institutions approved by DOH and where counties have adopted a provision in their plumbing code pertaining to the use of a dual water supply within a building;

p. A source of supply for a decorative fountain if the recirculating water does not support growth of microorganisms from the surrounding environment that could infect either the respiratory or digestive system of mammals;

q. A source of supply for:

(1) A restricted recreation impoundment; and

(2) Basins at fish hatcheries;

r. Washing of hard surfaces e.g., parking lots and sidewalks; or

s. A use other than those cited in this section may be accepted if DOH is satisfied that there will be no unreasonable risk of occurrence of events wherein humans would not take appropriate sanitary precaution when coming in contact with recycled water.

3. There may be recycled water uses where additional level of pathogen reduction is warranted.

D. PRECAUTIONS FOR ALL USES OF RECYCLED WATER

1. The provisions of this section shall be complied with when any recycled water is used on an approved use area. Use of recycled water without an approval from DOH is prohibited;

2. The purveyor of recycled water shall provide a copy of these guidelines to the users (i.e. property managers) to whom it provides recycled water, and shall obtain their agreement in writing to comply with all applicable provisions of these guidelines;

3. Signs shall be posted where recycled water is used pursuant to the PUBLIC EDUCATION and EMPLOYEE TRAINING PLAN specified in Chapter VIII;

4. Best Management Practices shall be taken to prevent ponding of recycled water;

5. Recycled water shall always be managed to avoid conditions conducive to proliferation of mosquitoes and other vectors, and to avoid creation of a public nuisance or health hazard;

6. Best Management Practices shall be used to mitigate discharge, runoff, or overspray beyond the approved use area boundaries;

7. Spray of recycled water shall not be allowed to contact an external drinking water fountain;

8. The following precautions pertain to the use of R-1 Water only:

   a. There shall be no irrigation within a minimum of 50 feet of any drinking water supply well;

   b. The outer edge of an impoundment shall be located at least 100 feet

APPENDIX F

Archaeological Archival Research Report

AN ARCHAEOLOGICAL ARCHIVAL RESEARCH REPORT FOR THE 'EWA NONPOTABLE WATER SYSTEM, HONOULIULI AHUPUA'A, 'EWA DISTRICT, ISLAND OF O'AHU

MAY 2002

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JOSEPH KENNEDY
Archaeologist

Inventory Reports Data Recovery Reports Research Design Documents Monitoring Due Diligence Work Historical Studies Cultural Studies Burial Treatment Plans Preservation Plans Interpretive Reconstructions Restorations Qualified Expert Witness Testimony

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An Archaeological Archival Research Report for the 'Ewa Nonpotable Water System, Honouliuli Ahupua'a, 'Ewa District, Island of O'ahu

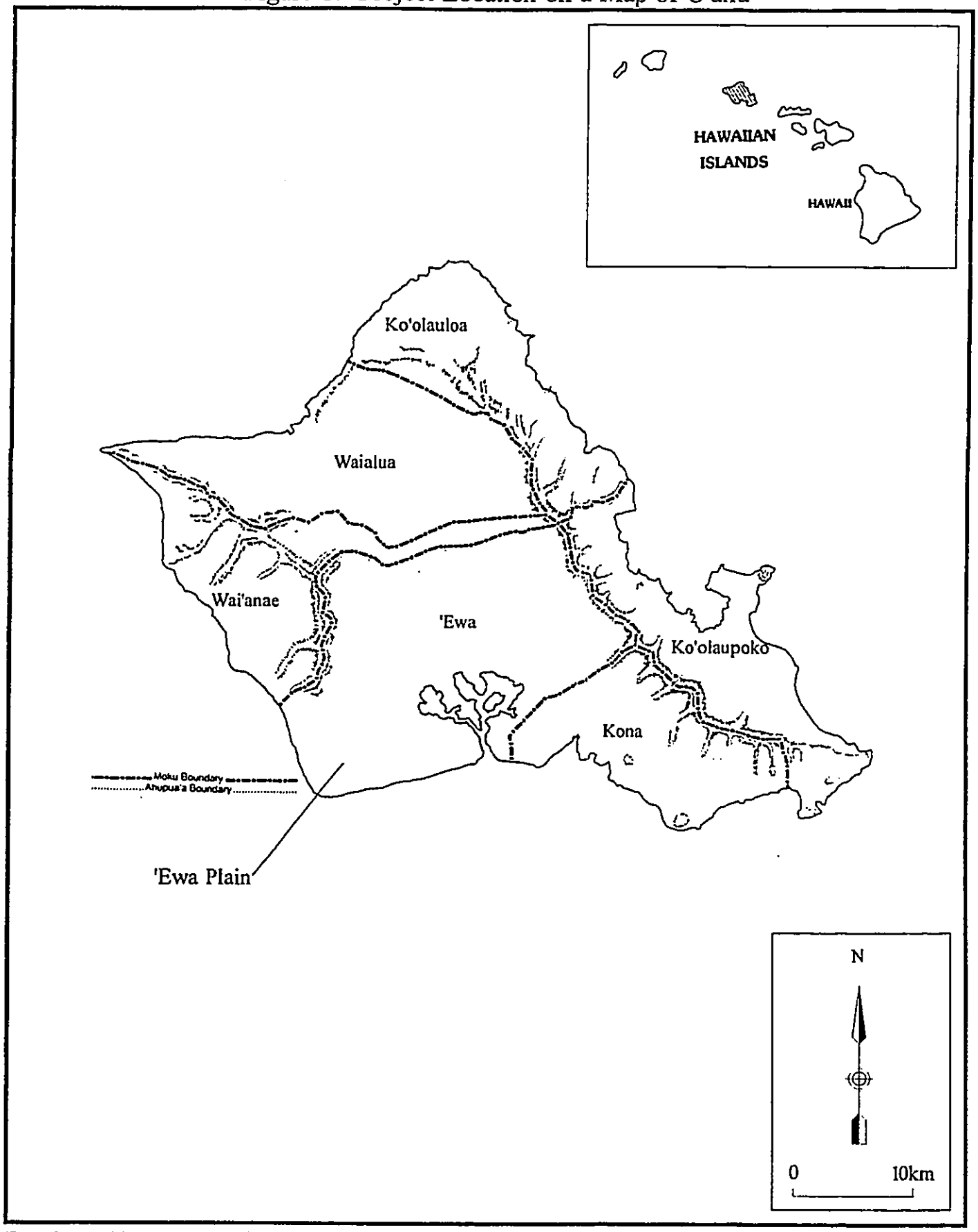
Section 1: Introduction

At the request of Ms. Sheryl Nojima of Gray, Hong, Bills, Nojima and Associates, Inc., Archaeological Consultants of the Pacific, Inc. (ACP) has conducted archaeological archival research concerning the *ahupua'a* of Honouliuli in 'Ewa District on the Island of O'ahu (see Figure 1). The current investigations were conducted in association with the preparation of an environmental assessment for the distribution/transmission mains of the 'Ewa Nonpotable Water System. Prior to the preparation of the environmental assessment the proper authorities with the Department of Land and Natural Resources, State Historic Preservation Office (DLNR-SHPD) were consulted and have provided comments regarding their concerns (correspondence dated April 12th, 2002; LOG NO: 29552, DOC NO: 0204EJ02; refer to Appendix B).

The purpose of the current investigations was to collect sufficient information through an archival and archaeological literature search to determine the locations of known significant historic properties and to assess the likelihood of those potential resources being impacted by the proposed project. These investigations also allow for the making of recommendations concerning the mitigation of the potential impact of proposed developments upon significant historic resources.

The current research has identified three areas through which the proposed waterlines will pass which have the potential to impact significant historic properties. Therefore, ACP recommends that an archaeological monitor be on site when construction activities pass through these areas. During the remainder of the project, it is recommended that an archaeological monitor be on call in the event that significant historic properties are encountered during construction activities.

Figure 1: Project Location on a Map of O'ahu



Ewa Nonpotable Waterline Project

Source: Adapted from Nogelmeier in Snakenberg 1990

Section 2: Physical Setting

The area in which the 'Ewa Nonpotable Water System is to be installed is limited to the 'Ewa Plain and extreme lower slopes of the southeastern end of the Wai'anae Range in Honouliuli Ahupua'a, 'Ewa District, Island of O'ahu (see Figure 2). Therefore, the discussion in this section will be limited to the 'Ewa Plain.

The 'Ewa Plain consists of an emergent coral limestone reef partially covered with alluvium eroded from the nearby mountains. The terrain gradually rises from the coastline until reaching the base of the mountains at an elevation of between 120 and 160 feet (ft) above mean sea level (AMSL). One significant physical landmark breaks the gently sloping landscape, Pu'u o Kapolei located along the *mauka* (inland) edge of the plain standing 166ft AMSL.

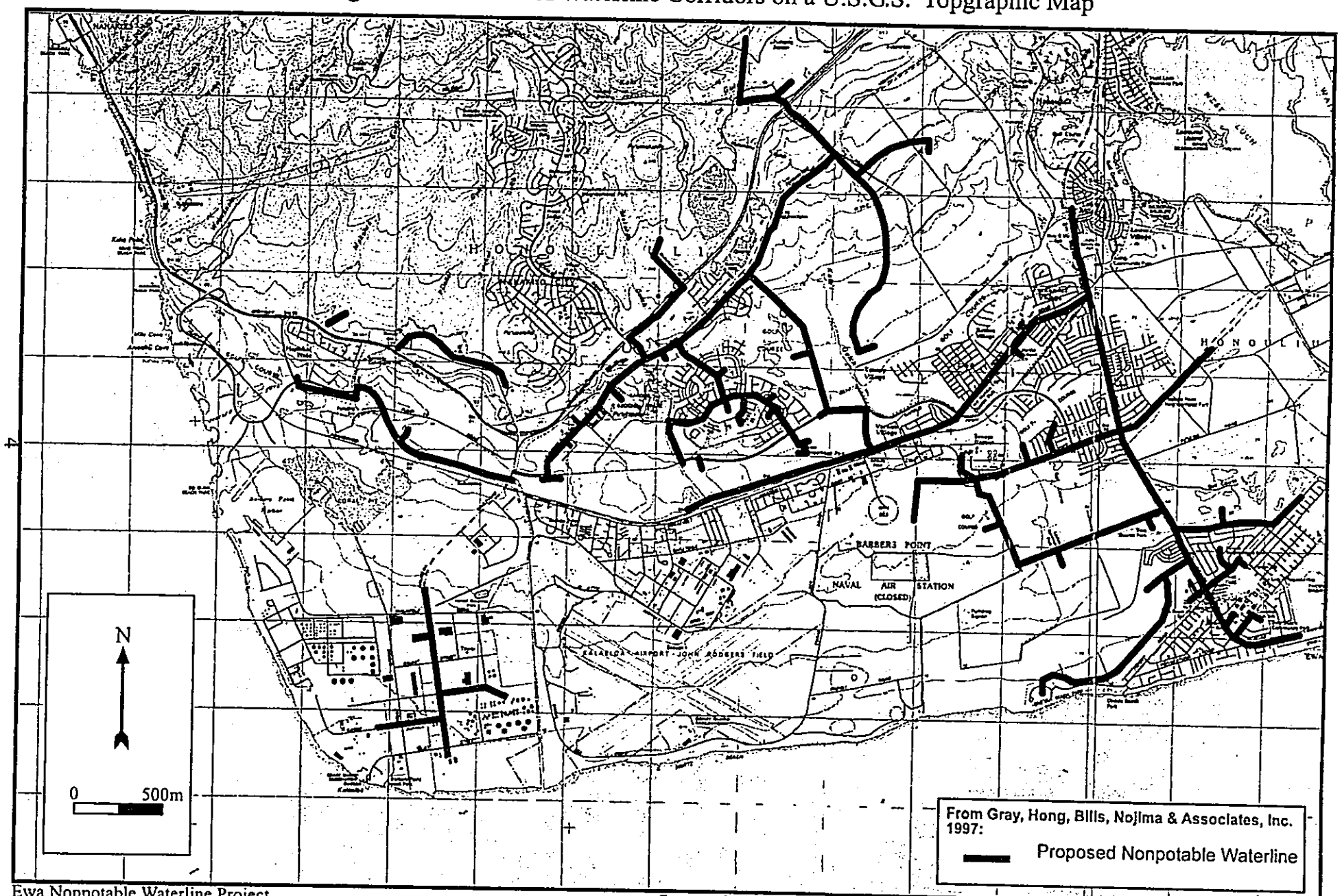
Rainfall on the plain averages approximately 19 inches per year, although wide fluctuations are known to occur from year to year (Tuggle & Tomonari-Tuggle 1997:13). Temperatures range between 60° and 90°F with the highest occurring in August and September (Armstrong 1973).

As mentioned above, alluvial soils only partially cover the emergent coral reef forming a relatively thin mantle of soils over the inland portions of the plain. Soil classifications identified on the 'Ewa Plain include a variety of soil series' and land form categories including the 'Ewa Series, Haleiwa Series, Helemano Series, Honouliuli Series, Kaloko Series, Kunia Series Mamala Series, Molokai Series, Waialua Series, Waipahu Series, Coral Outcrop, Fill Land and Beach Sands (Foote, Hill, Nakamura & Stevens 1972). Coral Outcrop is the dominant land form classification in areas closer to the coast with Beach Sands found at the shoreline. As one travels north (inland) from the southern coast, areas of Honouliuli, Ewa and Mamala Series soils are most common on the flat, gently sloping plain. Along stream channels and in gulches smaller areas are present which contain soils of the less common soil Series found on the plain and listed above. As the slope increases at the southeastern foot of the Wai'anae Range, soils increase in diversity.

The vegetation of this area prior to Western contact would probably have been an arid scrub dominated by such species as *wiliwili* (*Erythina sandwicensis*), *lama* (*Diospyros ferrea*), sandalwood (*Santalum* sp.), *'a'ali'i* (*Dodonea eriocarpa*) scrub *ohia* (*Metrosideros collina*) and *pili* grass (*Heteropogon contortus*). Since the time of Western contact, however, vegetation on the 'Ewa Plain has been extensively altered through the introduction of exotic species.

The present vegetation can be characterized as a low open *kiawe* (*Prosopis pallida*) forest. *Haole koa* (*Leucaena leucocephala*) is also common as a sub-dominant member of the floral community. Ground cover is dominated by a number of introduced grasses, with *'ilima ku kula* (*Sida cordifola*), cayenne vervain (*Stachytarpheta urticaefolia*), *Koko'olau* (*Bidens pilosa*) and morning glory (*Ipomoea indica*) present. It should be noted that IARII reports the presence of one relatively large stand and several smaller stands of healthy *wiliwili* within the grounds of the former Barbers Point Naval Air Station which are believed to represent remnants of the native dry land forest which formerly covered much of the plain (Tuggle & Tomonari-Tuggle 1997).

Figure 2: Location of Waterline Corridors on a U.S.G.S. Topgraphic Map



Ewa Nonpotable Waterline Project

Source: U.S.G.S. 7.5-Minute Series (Topographic) Map of the Ewa Quadrangle 1998 and Pearl Harbor Quadrangle 1999

Section 3: Historic Background

Section 3.1: Traditional Accounts of the 'Ewa Plain

The 'Ewa Plain is known to have been the home to a well established population in the pre-Contact period. A number of the traditions of those who resided there were recorded by early ethnographers. In the past few years, several researchers (including but not limited to: Tuggle 1997; Tuggle & Tomonari-Tuggle 1997; and McIntosh & Cleghorn 1999) have prepared documents providing information concerning the 'Ewa Plain and reviewing some of the traditional accounts of the area. The reader is referred to those documents for additional information.

Concerning the entire district, a legend associated with the naming of 'Ewa recounts:

> When Kane and Kanaloa were surveying the islands they came to Oahu and when they reached Red Hill saw below them the broad plains of what is now Ewa. To mark boundaries of land they would throw a stone and where the stone fell would be the boundary line. When they saw the beautiful land lying below them, it was their thought to include as much of the flat level land as possible. They hurled the stone as far as the Waianae range and it landed somewhere in the Waimanalo section. When they went to find it, they could not locate the spot where it fell. So Ewa (strayed) became known by that name. The stone that strayed (Sterling & Summers 1978:1).

Several locations on the 'Ewa Plain are related to significant traditional legendary accounts; Kalaeloa, Kualaka'i, the Plain of Kaupe'a, Pu'uloa and Pu'u o Kapolei. Traditional accounts associated with each of these areas will be summarized below.

The arrival of breadfruit in Hawaii is said to have taken place at 'Ewa. Both Kalaeloa and Pu'uloa are traditionally associated with this event. Tuggle and Tomonari-Tuggle (1997) state that the most commonly quoted version of breadfruit's arrival in Hawaii comes from Kamakau who describes Kaha'i-a-Ho'okamali'i as bringing the plant from Kahiki following a round trip originating at Kalaeloa and returning to Pu'uloa where it was planted. A second story comes from Fornander (1916-20). In it, a pair of fisherman from Pu'uloa are blown to Kanehunamoku, one of the hidden lands of the gods, where they find breadfruit. They then return to Pu'uloa with the breadfruit and plant it in what is described as a "large excavation".

Breadfruit is also associated with Kualaka'i in the story of Namakaokapao'o (Fornander 1916-20). Namakaokapao'o was a son of Ka'uluakaha'i, a chief/god from Kahiki. Ka'uluakaha'i abandons Namakaokapao'o at Ho'ae'ae, just to the east of Honouliuli. Ka'uluakaha'i, however, leaves royal garments for his son in a gourd which Namakaokapao'o finds at Kualaka'i beneath a breadfruit tree said to represent his father.

Kualaka'i is also the location of a spring named Hoaka-lei (*lei* reflection). The spring received its name because Hi'iaka stopped there to pick *lehua* flowers to make a *lei* and saw her reflection in the waters. Tuggle and Tomonari-Tuggle report that the 1928 USGS map depicts a "waterhole" at Kualaka'i suggesting that it may in fact be Hoaka-lei.

Another locale associated with traditional accounts of the region is the Plain of Kaupe'a. The Plain of Kaupe'a was the *ao kuewa* of Oahu, a place of homeless, wandering souls or ghosts (Kamakau 1964). According to Sterling and Summers, "The plain of Kaupea on the plain of Puuloa was where ghosts wandered to catch night moths and spiders for food. It extended from the *wiliwili* trees of Kaupea to Kanehili" (1978:44). The exact location and extent of the Plain of Kaupe'a is unclear. Tuggle and Tomonari-Tuggle (1997), however, have assessed the location of the area. They cite Kamakau as describing Kaupe'a as a *wiliwili* grove next to Pu'uloa. They go on to note that:

> Kaupe'a has been taken to refer to a rather restricted location on the 'Ewa Plain (Kelly 1991) or as the traditional term for the Ewa Plain as a whole (Johnson 1988). Kamakau uses the name, Plain of Pu'u-o-Kapolei, in a manner that indicates it is synonymous to Kaupe'a, by implication supporting Johnson's position (Tuggle & Tomonari-Tuggle 1997:20).

Perhaps the most culturally significant locale on the 'Ewa Plain is Pu'u o Kapolei, a hill formed by a volcanic cinder cone located at the foot of the Wai'anae Range. Pu'u o Kapolei has been described as "the spiritual vortex of the 'Ewa Plain" (Tuggle 1997). It has also been called "one of the most famous hills in the olden days. The chant composed for games in the olden days began with the name of this hill and went on [with the place names] all around the island" (Sterling & Summers 1978:33).

Pu'u o Kapolei is listed in the Hawaii Register of Historic Places as Site 138. McAllister reported that a *heiau* once stood on Pu'u o Kapolei but was destroyed when the stones were used to supply a rock crusher in the 1890's (1933:108). McAllister also indicated that there had previously been a large rock shelter on the "sea side" of the hill which was the traditional home of the pig god Kamapua'a and his grandmother, Kamaunuaniho.

Pu'u o Kapolei had a special significance for Hawaiians as evidenced in the legends and traditional accounts associated with the hill. Legends relate that, following his conquest of O'ahu, Kamapua'a made his grandmother queen and installed her court at Pu'u o Kapolei. This was to compel those who were to pay tribute to bring all the necessities of life from a distance; evidence of Kamapua'a's absolute power over all (Nakuina 1904). Nakuina relates that Pu'u o Kapolei was as desolate a place as any on the island and was equally distant from the nearest productive areas: the taro and sweet potato patches of 'Ewa, the coastal fishing areas and the banana and sugar cane plantations of the mountain ravines. Nakuina also states that until "a very short time" before 1904, the foundations of Kamaunuaniho's house and a stone wall surrounding it could still be seen and that it was said that her grave could at one time be identified. The only explanation for the disappearance of these structures was that the rocks were removed and used for other purposes.

The Ka Loea Kalaiana newspaper in 1900 also mentions the legend of Kamapua'a and refers to the road to Wai'anae passing Pu'u o Kapolei (Sterling and Summers 1978: 33-34). I'i (1959) describes the trail via Pu'u o Kapolei as one of three ways to get to Wai'anae.

Another significant aspect of Pu'u o Kapolei is its association with astronomical observations. One of the earliest references to its association with astronomical events comes from Kamakau who discusses the use of Pu'u o Kapolei as a reference point for the setting sun.

The people of O'ahu were said to determine the changing of the seasons based upon the point on the horizon at which the sun set in relation to the location of the *pu'u* (Kamakau 1976:14). Tuggle has prepared an in depth analysis of the *pu'u*'s role in astronomical observations in an unpublished paper entitled "Search for the Observation Point of O'ahu's *Po'e Kilo Hoku* (Astronomers)" (Tuggle 1996). He summarized his own work for the journal *Hawaiian Archaeology*:

> The association of the hill with solar movement immediately illuminates the meaning of the hill's name and the possible significance of its temple. The name Pu'uokapolei refers to the hill of "beloved Kapo" (Pukui et al. 1974), or to the wreath of Kapo created by the setting sun (Johnson 1988). Kapo (particularly as Kapo'ulakīna'u) can be interpreted as the female element of the sun, a counterpart of Kāne. Kapo is directly referenced in the chants and hulas that celebrate the rising sun (e.g., Barrere et al. 1980:8; Emerson 1978:41, 45). Thus, it is proposed that Pu'uokapolei was a temple and place of the sun, dedicated to the deity Kapo, and that it was a sacred setting for ceremonies and hula dedicated to solar events (Tuggle 1997).

Tuggle goes on to summarize the cultural order of the 'Ewa Plain in pre-Contact times well:

> For the common people who struggled for survival in this land, the 'Ewa Plain was a place of small villages, One'ula and Kualaka'i and Kalaeloa, and their deities were Kūulakai and Lono. For the royalty of Ewa, their priests and priest-astronomers, this was the plain of Kaupe'a and of Pu'uokapolei; this was the plain of the sun, and their gods were Kāne and Kapo'ulakīna'u (Tuggle 1997:21).

Section 3.2: The 'Ewa Plain in the Early Post-Contact Period

Early ethnographic accounts (e.g. Nakuina 1904) concerning Honouliuli generally depict the 'Ewa plain as being a marginal area of minimal value to the Hawaiian population. The plain was reported to be sparsely populated, with no villages west of Pu'uloa and little agricultural use of the inland portions. The coast was known to contain abundant marine resources but the inland area of the plain supported only minimal plantings of banana, taro, sweet potato and *ti* in scattered depressions and sinkholes.

Vancouver (quoted in Handy 1940 Vol. 1, p. 83) described the 'Ewa Plain in the 1790's as follows:

> ...from the commencement of the high land to the westward of Opooroah [Pu'uloa] was .... one barren rocky waste, nearly destitute of verdure, cultivation or inhabitants, with little variation all the way to the west point of the island. Not far from the southwest point is a small grove of shabby cocoanut trees, and along those shores are a few straggling fishermen's huts...

He goes on to say that there were no villages between Pu'uloa and Wai'anae. Ellis (1969:11) gives a similar account of the 'Ewa Plain: "Though capable of a high state of improvement, only a small portion is enclosed, or under any kind of culture; and in traveling across it, scarce a habitation is to be seen."

In early historic times, like much of Hawai'i, Honouliuli appears to have suffered a major population decline due to the introduction of new infectious diseases following Western Contact. The missionary census in 1831-32 recorded 1026 people in the *ahupua'a* while the 1835-36 census showed only 870 inhabitants (Welch 1987). There has been speculation that during these times the lowland forests on the foothills of the Wai'anae Range were decimated by logging and burning linked to the sandalwood trade.

The first historic land records place the lands of Honouliuli under the control of Kekau'onoihi, a granddaughter of Kamehameha I. With the exception of the *'ili* of Pu'uloa (which was sold to Isaac Montgomery in 1849) Kekau'onoihi's widower, Levi Ha'alele'a, inherited the lands of Honouliuli in 1851 and they were passed to his second wife, Anadelia Amoe, when he died in 1864. She deeded the lands to John Coney, her sister's husband, who sold them to James Campbell in 1877 (Welch 1987). Campbell turned the lower portion of these lands, the 'Ewa coral plain, into a large cattle ranch. At this stage, *kiawe*, which has since become the dominant plant species in the area, was planted as cattle forage.

In 1889, Campbell leased Honouliuli to Benjamin Dillingham for 50 years. Much of the area was subsequently planted in sugar cane. A railway line was built and used for hauling cane and cattle. Areas to the east of Pu'u o Kapolei were planted in sisal, while cattle were raised in the area closer to the coast where there is little soil (Welch 1987).

A search of a representative sample of the tax maps covering all the ecological zones of the *ahupua'a* showed no Land Commission Awards. However, a 1910 map of the lower portions of the Honouliuli Stream show rice lands and numerous *kuleana* extending over a mile inland in a belt up to a mile wide on both sides of the stream (State Survey Office Map, unnumbered)(Kennedy 1991). The 1917 USGS map of O'ahu shows large terrace areas bordering West Loch, indicating that taro was still being grown there. These were evidently what was referred to by McAllister as the "Ewa taro lands" (Sterling & Summers 1978). A 1928 map of the same area shows the same *kuleana* as in the 1910 map but refers to the area as "taro land" (State Survey Office Map CS. 16-34).

In the twentieth century, the coastal areas of the *ahupua'a*, which had been used to raise cattle, were taken over by several military bases and an industrial estate. The areas of the plain further inland have continued to be used for raising sugar cane. The upper slopes of the Wai'anae Range within the *ahupua'a* which had previously been used for cattle grazing are now reserved as the Honouliuli Forest Reserve. In the northern portion of the *ahupua'a*, the lower slopes are used for growing pineapple.

Section 3.3: Previous Archaeological Research

Numerous archaeological investigations have been conducted in Honouliuli Ahupua'a. Rather than individually reviewing all of these investigations in this text, ACP has compiled a complete list of all archaeological reports and plans on file at the DLNR-SHPD library, a total of 141 documents (refer to Table 1 in Appendix A). A thorough summary of many of these works may be found in PHRI's report "Archaeological Data Recovery at West Loch Estates Residential

Increment I, and Golf Course and Shoreline Park" (Wolforth *et al.* 1998). Following is a brief summary of the history of archaeological investigations in the *ahupua'a*.

Some of the earliest archaeological recordation in the *ahupua'a* was conducted by McAllister (1933). He listed the whole of the plain as a single site, Site 146, noting the presence of many features, including stone walls, probably dating to the ranching period, as well as coral sinkholes and pits which could have been used for cultivation by the indigenous Hawaiian population. Handy (1940) also mentions the cultivation of crops, particularly sugar cane and bananas, in the 'Ewa sinkholes. Two fishponds, one at Pu'uloa (Site 142) and one off Laulaunui Island in West Loch (Site 140), a fishing shrine near West Loch (Site 139) and a destroyed *heiau* on Pu'u o Kapolei (Site 138) were also mentioned by McAllister as being located on the 'Ewa Plain.

In the northern portion of the *ahupua'a*, along the southeastern slopes of the Wai'anae Range, where much less archaeological work has been conducted, McAllister listed a number of sites.. Two destroyed *heiau*, Sites 133 and 134, were located in gulches below Pu'u Kanehoa and Mauna Kapu, both peaks in the Wai'anae Range. Also in a gulch below Mauna Kapu were several leveled off enclosures, the largest measuring 25 meters by 30 meters (Site 135). On the Wai'anae Ridge separating Honouliuli from Wai'anae, McAllister notes a small coral and basalt platform, probably sacred, near Mauna Kapu (Site 136). He also notes another destroyed *heiau* on Pu'u Ku'ua in the eastern foothills of the Wai'anae Range (Site 137).

Few archaeological investigations occurred between 1933 and the early 1970's. Those which did occur were summarized by Dunn *et al.* (1990). These included Emory's examination of a house site and possible *heiau* constructed of stacked limestone slabs and uprights located on the western part of the 'Ewa Plain. Kikuchi's disinterment of 12 to 16 incomplete burials from a limestone sinkhole on the southwestern portion of the plain prior to the construction of the Standard oil refinery. Soehren's documentation of a sinkhole burial, house sites and modified pits at the Naval Air Station. And finally, Soehren's excavation of a possible fishing shrine at the barge harbor which identified a cultural layer containing large amounts of fish scales, dog, fish and seashell remains and a one piece rotating fishhook.

In the 1970's, with increased development of the plain, investigations became more frequent and covered larger areas. The Barbers Point deep draft harbor, West Beach/Ko Olina, the Ewa Marina Community are among the larger of the projects which began around this time. Site types identified included house sites, cairns, *ahu*, walls, pits, unmodified limestone sinkholes, walled or modified sinkholes, enclosures, C-shaped enclosures as well as human burials. A variety of cultural remains were recovered from the many sites identified including fishhooks, sinkers, fish scales and fish bones providing evidence of a marine based economy. An early assessment of the probable settlement pattern for the area was described as "dispersed clusters of residences, surrounded by a relatively open and little inhabited area" (Barrera 1975:18).

As investigations continued through the 1980's and 1990's, more sites were assessed for their age and function. Dating results indicated that most of the occupation likely dated to the latter centuries of the pre-Contact period. However, samples from some rock shelter sites

suggested initial use or occupation as early as the period of initial Polynesian settlement on O'ahu. The patterns of settlement were found to differ somewhat from the eastern portions of the plain near West Loch to the western portions of the plain.

Data Recovery at the West Loch Estates Residential Increment I and Golf Course and Shoreline Park was conducted in 1988 and 1989 (Wolforth *et al.* 1998) while investigations of the lower and upper valley of Honouliuli Gulch above West Loch was undertaken in 1987 by PHRI (Dunn *et al.* 1990). Included among the recorded features were the remnants of a once extensive agricultural system which combined aquaculture in fishponds situated on the shores of West Loch, irrigated wet crop agriculture of the plain and dryland cultivation of the surrounding slopes and uplands. Along the shores of West Loch, radiocarbon dating results indicated use of a pondfield (Site 3324) and a habitation deposit (Site 3321) from the 10th to 17th centuries AD. The investigations within Honouliuli Gulch revealed that: (a) permanent occupation had occurred at most habitation features, (b) that upper valley occupation may have occurred as early as the mid-6th to mid-9th centuries and (c) that subsequent occupations appear to have been most intensive between the 1300's and 1600's and between the late 1700's to early 1800's (Dunn *et al.* 1990).

Investigations conducted in the Barbers Point/Ko Olina area have revealed that the western 'Ewa Plain had a long initial settlement based on a high degree of marine-oriented task specialization (Dunn *et al.* 1990). Marine task specialization continued into latter settlements, but it seems that in the latter settlements, terrestrially oriented activities increased. This shift in activities suggests a concomitant shift from a dispersed temporary occupation to a loosely nucleated one involving extended periods of residence.

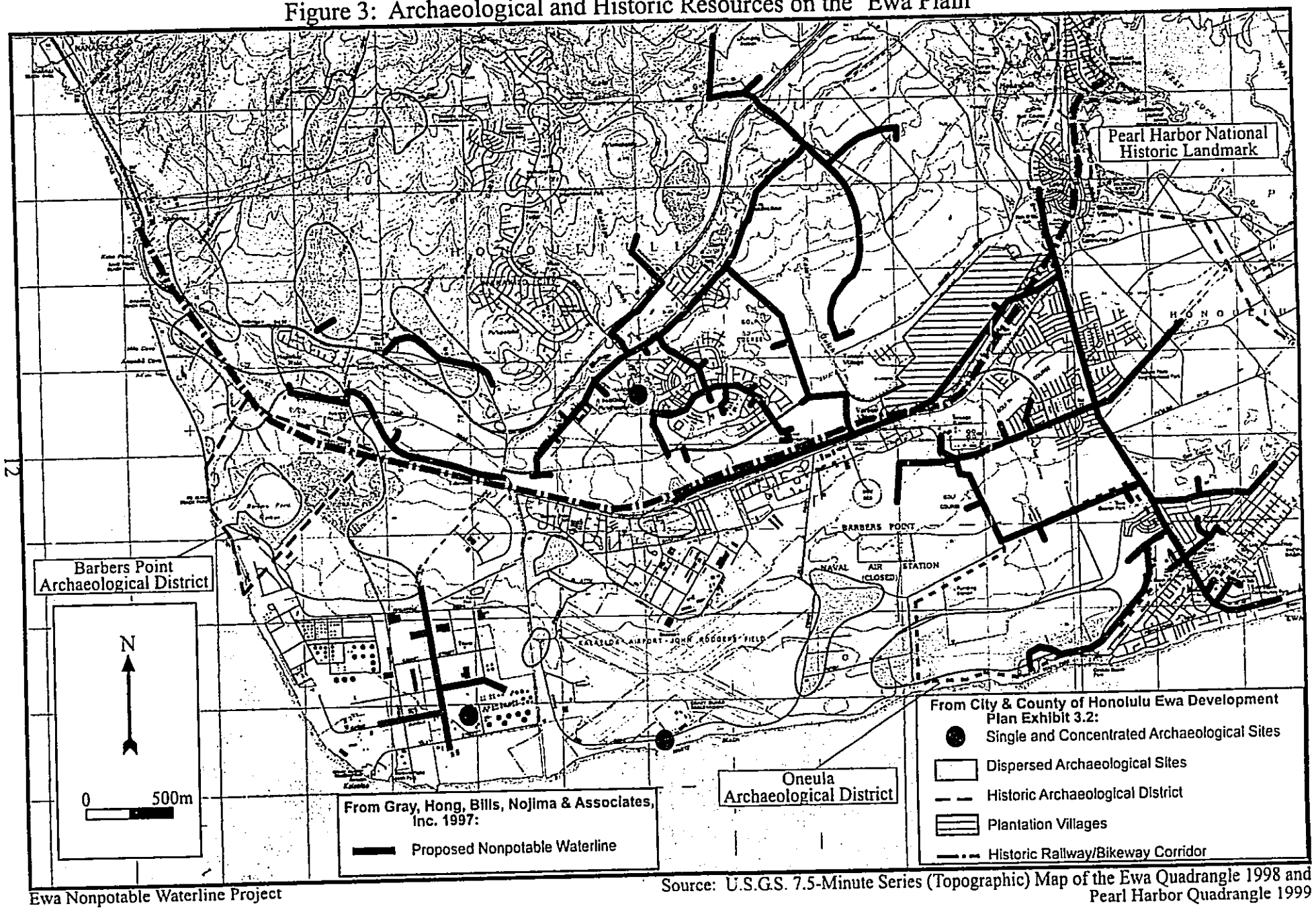
Section 4: An Assessment of Archaeological Resources Along the Proposed Waterline

In order to assess areas through which the proposed waterlines of the 'Ewa Nonpotable Water System will pass which may contain potential historically significant properties, ACP has prepared figures depicting the route of the waterlines and the locations of known historic properties. The first of these figures was derived from the City and County of Honolulu's 'Ewa Development Plan, Exhibit 3.2 and depicts the locations of known archaeological sites, historic and archaeological districts, plantation villages and an historic railway (see Figure 3). The second was derived from a figure prepared by David Tuggle and depicts the locations of known pre-Contact settlement complexes and religious structures (see Figure 4).

An analysis of these overlays shows that there are three areas through which the proposed waterlines will be passing where potentially significant historic properties may be encountered. The first is located along the southeastern coastline of the 'Ewa Plain in the eastern portion of the One'ula Archaeological District (see Figures 3 & 4). The second is located across the central-eastern portion of the plain running along the route of an historic railway and the southern boundary of a group of plantation villages. The third and final area is located in the northwestern corner of the 'Ewa Plain. In this location, Figure 3 shows three segments of the waterlines passing through three areas of dispersed archaeological sites while Figure 4 depicts one waterline passing between two areas of pre-Contact settlement complexes.

Because it has been determined that the proposed waterlines will pass through three areas in which there is the potential to impact significant historic properties, ACP recommends that an archaeological monitor be on site when construction activities pass through these areas. During the remainder of the project, it is recommended that an archaeological monitor be on call in the event that significant historic properties are encountered during construction activities. The proper authorities with the DLNR-SHPD have been consulted and their comments regarding sites to be avoided and proposed mitigation measures is included in Appendix B (correspondence dated April 12th, 2002; LOG NO: 29552, DOC NO: 0204EJ02).

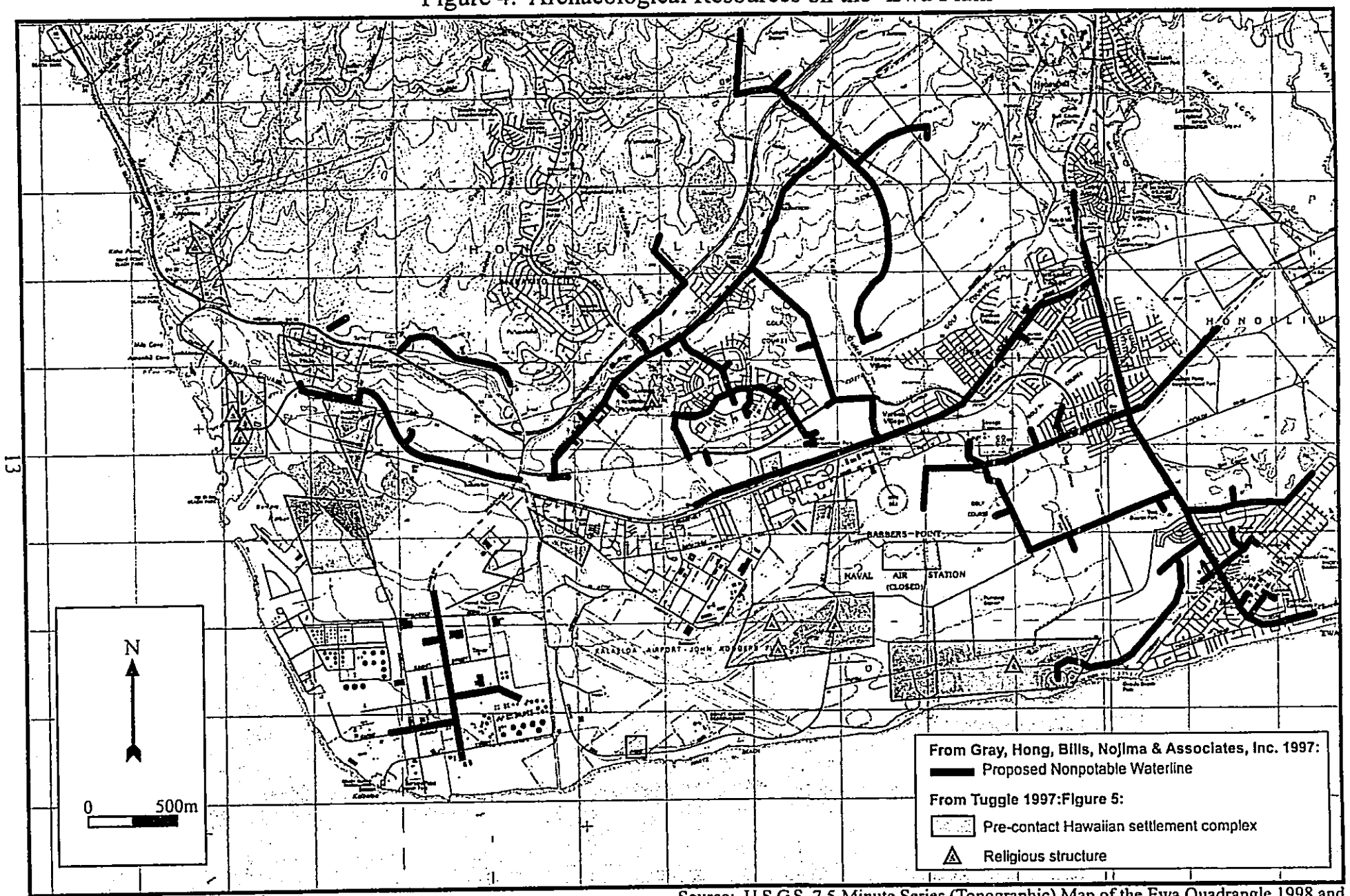
Figure 3: Archaeological and Historic Resources on the 'Ewa Plain



Ewa Nonpotable Waterline Project

Source: U.S.G.S. 7.5-Minute Series (Topographic) Map of the Ewa Quadrangle 1998 and Pearl Harbor Quadrangle 1999

Figure 4: Archaeological Resources on the 'Ewa Plain



Ewa Nonpotable Waterline Project

Source: U.S.G.S. 7.5-Minute Series (Topographic) Map of the Ewa Quadrangle 1998 and Pearl Harbor Quadrangle 1999

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Appendix A

Table 1: Previous Archaeology in Honouliuli Ahupua'a

Table 1: Previous Archaeology in Honouliuli Ahupua'a

Date	Authors				Title	Affiliation	General Location	Study Type	State Library Report
1983	Ahlo, H.	Hommon, R.			An Archaeological Reconnaissance Survey of the Site of the Proposed Solid Waste Processing and Resource Recovery Facility, Honouliuli, Ewa, Oahu.	SMI	Solid Waste Prossesing Site	RS	0-212
1987	Athens, J.				Human Burial Removal, Iroquois Point, Oahu (TMK 9-1-01: por 1).	IARII	Iroquois Point	ID	0-954
1975	Barrera, W.				A Report on the Archaeological Reconnaissance Survey of the Proposed Barbers Point Harbor Area.	BPBM	Barbers Point Harbor	RS	0-289
1979	Barrera, W.				West Beach, Oahu: An Archaeological Survey.	CI	West Beach/Ko Olina	IS	0-69
1984	Barrera, W.				West Beach, Oahu: Archaeological Status Report.	CI	West Beach/Ko Olina	Status Report	0-254
1986	Barrera, W.				West Beach Oahu: Archaeological Investigations.	CI	West Beach/Ko Olina	IS/RS	0-349
1989	Bath, J.				Waimanalo Gulch Petroglyphs - 80-12-4110 Waimanalo Gulch, Honouliuli, Ewa, Oahu.	CCH/ HPS	Waimanalo Gulch	RS	0-561
1977	Bordner, R. M.				Archaeological Reconnaissance of the Proposed Kalo'i Gulch Landfill Site, Ewa, Oahu.	ARCH	Kalo'i Gulch	RS	0-125
1977	Bordner, R. M.				Archaeological Reconnaissance of the Proposed Makaiwa Gulch Landfill Site, Ewa, Oahu.	ARCH	Makaiwa Gulch	RS	0-49
1983	Bordner, R. M.	Silva, C.			Archaeological Reconnaissance and Historical Documentation: Waimanalo Gulch, Oahu.	Unknown	Waimanalo Gulch	RS	0-218
1990	Carlson, A.	Rosendahl, P.			Archaeological Inventory Survey Campbell Industrial Park Kaomi Loop Subdivision Land of Honouliuli Ewa District Island of Oahu.	PHRI	Campbell Industrial Park	IS	0-690
1975	Clark, S.	Connolly			Archaeological Reconnaisance Survey for Honoulululi Sewage Treatment Plant and Barbers Point Ocean Outfall.	CCH	Honouliuli Sewage Treatment Plant	RS	0-90

Table 1: Previous Archaeology in Honouliuli Ahupua'a

Date	Authors				Title	Author	General location	Study Type	State Library Report
1977	Clark, S.				An Archaeological Reconnaissance Survey at Puu O Kapolei, Honouliuli, Oahu.	KARP	Puu o Kapolei	RS	0-472
1979	Clark, S.				Archaeological Reconnaissance Survey for Barbers Point Beach Park Improvements, Ewa, Island of Oahu.	CCH	Barbers Point	RS	0-189
1992	Cleghorn, P.	Anderson, L.			Archaeological Inventory Survey of the Proposed Kahe Point "Tracks" Beach Park, Honouliuli, Ewa, Oahu.	PCC	Kahe Point	IS	0-943
2000	Cleghorn, P.				Letter Report. PL, Inc. Conducted a walk through survey for the proposed 20-inch irrigation line for the Waipio Penninsula Soccer Park at Waipio Peninsula, Island of Oahu, Waikele, Waipio Ahupua'a, District of Ewa.	PLI	Waipio Peninsula	RS	0-1822
1996	Corbin, J.	Dye, T.	Jourdane, E.		Field Recon Laulaunui Island and Fishpond.	SHPD	West Loch - Laulaunui Island	RS	0-1692
1996	Cultural Surveys Hawaii				End of Field Work Report for Data Recovery at the Proposed Barbers Point Harbor Expansion.	CSH	Barbers Point Harbor	DR (end of field summary)	0-1681
n.d.	Davis, B.				Archaeological and Historical Information Regarding Ewa Beach, Oahu.		Ewa Beach	overview	0-100
n.d.	Davis, B.				A Proposal for Archaeological Survey and Subsurface Testing of the Proposed Ewa-Puuloa Golf Course in the Pu'uloa Section of Honouliuli, Southwestern Oahu. (Date is 1988 or later).	BPBM	Ewa-Puuloa Golf Course	Proposal for IS	0-974
1978	Davis, B.				Report on Archaeological Survey of the Proposed Ewa Marina Community Development, Ewa Beach, Oahu Island, Hawaii.	HMRI	Ewa Marina		0-118
1978	Davis, B.	Griffin			Interim Report I: Present Environment and Archaeological Survey of the Proposed Deep-Draft Harbor Area, Barbers Point, Ewa, Oahu.	ARCH	Barbers Point Harbor	IS	0-46

Table 1: Previous Archaeology in Honouliuli Ahupua'a

Date	Authors				Title	Publication	General Location	Study Type	State Library Report
1978	Davis, B.				Human Settlement and Environmental Change at Barbers Point, Oahu.	UHDA	Barbers Point	overview	0-118
1979	Davis, B.				Report on Archaeological Survey of the Proposed Ewa-Marina Community Development, Ewa Beach, Oahu.	HMRI	Ewa-Marina	IS	0-148
1981	Davis, B.				A Research Design for the Study of Human Settlement and Environmental Change in Southwestern Oahu: Re-evaluation of the Strategy Based on New Work.	UHDA	Southwestern Oahu	Research Design	0-117
1986	Davis, B.	Haun, A.	Rosendahl, P.		Phase 3 - Data Recovery Plan for Archaeological and Paleontological Excavations West Beach Resort, Honouliuli, Ewa, Island of Oahu.	PHRI	West Beach/Ko Olina	DRP	0-587
1986	Davis, B.	Haun, A.	Rosendahl, P.		Phase I - Research Design for Intensive Survey and Test Excavations, West Beach Data Recovery Program, West Beach Resort, Honouliuli, Ewa, Island of Oahu.	PHRI	West Beach/Ko Olina	DRP	0-1030
1986	Davis, B.	Haun			Preliminary Report upon Completion of Field Work: Phase 2 - Intensive Survey and Test Excavations West Beach Data Recovery Program, West Beach Resort, Honouliuli, Ewa, Island of Oahu.	PHRI	West Beach/Ko Olina	DR	0-343
1987	Davis, B.	Haun, A.			Interim Report: Phase 2 Intensive Survey and Test Excavations, West Beach Data Recovery Program, West Beach Resort, Honouliuli, Ewa, Island of Oahu.	PHRI	West Beach/Ko Olina Resort	DR	0-438
1988	Davis, B.				Report on Archaeological Reconnaissance of the Proposed HECO Generating Station at Barbers Point Honouliuli, Ewa, Oahu.	IARII	Barbers Point	RS	0-636
1988	Davis, B.				Archaeological Subsurface Survey of the Proposed Ewa Gentry Project Area, Honouliuli, Ewa, Oahu.	BPBM	Ewa Gentry	IS	0-507

Table 1: Previous Archaeology in Honouliuli Ahupua'a

Date	Authors				Title	Affiliation	General Location	Study Type	State Library Report
1988	Davis, B.				Report on Preliminary Reconnaissance of the Proposed Ewa-Puuloa Golf Course in the Pu'uloa Section of Honouliuli, Southwestern Oahu.	BPBM	Puuloa	RS	0-714
1989	Davis, B.				Interim Report on Archaeological and Paleontological Excavations at the Proposed HECO Barbers Point, Honouliuli, Ewa, Oahu.		Barbers Point	IS	0-542
1989	Davis, B.				Report on Archaeological Investigations at the Proposed HECO Generating Station, Barbers Point, Honouliuli, Ewa, Oahu.	IARII	Barbers Point	RS	0-637
1990	Davis, B.				Archaeological and Palaeontological Investigations at the Proposed HECO Barbers Point Generating Station, Honouliuli, Ewa, Oahu.	IARII	Barbers Point	IS	0-650
1991	Davis, B.	Burtchard, G.			Archaeological Inventory Survey of the Proposed PPV Housing Area, West Loch Unit of the Laulaulei Naval Ammunition Depot, Pu'uloa, Ewa, Oahu, Hawaii.	IARII	West Loch	IS	0-804
2000	Davis, B.				Volume 1: Archaeology and Palaeoecology at Ko Olina, Barbers Point, Land of Honouliuli, Ewa District, Island of Oahu: Summary and Synthesis. West Beach Data Recovery Program. Phase IV - Archaeological and Palaeontological Excavations, Ko Olina Resort.	PHRI	West Beach/Ko Olina	DR	0-869 (1)
2000	Davis, B.				Volume II: Palaeontological Site Reports. West Beach Data Recovery Program. Phase IV - Archaeological and Palaeontological Excavations Ko Olina Resort. Land of Honouliuli, Ewa District, Island of Oahu.	PHRI	West Beach/Ko Olina	DR	0-869 (2)

Table 1: Previous Archaeology in Honouliuli Ahupua'a

Date	Authors				Title	Affiliation	General Location	Study Type	State Library Report
2000	Davis, B.				Volume III: Archaeological Site Reports. West Beach Data Recovery Program. Phase IV - Archaeological and Palaeontological Excavations. Ko Olina Resort. Land of Honouliuli, Ewa District, Island of Oahu.	PHRI	West Beach/Ko Olina	DR	0-869 (3)
2000	Davis, B.				Volume IV: Technical Reports. West Beach Data Recovery Program. Phase IV - Archaeological and Palaeontological Excavations Ko Olina Resort. Land of Honouliuli, Ewa District, Island of Oahu.	PHRI	West Beach/Ko Olina	DR	0-869 (4)
1998	Dega, M.	Ogg, R.	Carson, M.	Benson, L.	An Archaeological Inventory Survey of the University of Hawaii West Oahu Campus, District of Ewa, Island of Oahu, Hawaii.	SCS	UH West Oahu Campus	IS	0-1752
1987	Dicks, A.	Haun, A.	Rosendahl, P.		Archaeological Reconnaissance Survey for EIS, West Loch Estates - Golf Course and Parks, Honouliuli, Ewa, Oahu.	PHRI	West Loch	RS	0-437
1991	Dunn, A.	Haun, A.			Intensive Archaeological Survey and Test Excavations Ewa Marina Community Project - Phase II, Land of Honouliuli, Ewa District, Island of Oahu.	PHRI	Ewa Marina	DR	0-1293
1991	Dunn, A.	Haun, A.	Goodfellow, S.		Intensive Archaeological Survey and Test Excavations Ewa Marina Community Project - Phase I, Land of Honouliuli, Ewa District, Island of Oahu.	PHRI	Ewa Marina	DR	0-675
1995	Dye, T.				Burial Report: Inadvertent Discovery of Human Remains at Barbers Point Naval Air Station Nimitz Beach Site 50-80-12-2220.	SHPD	Nimitz Beach, Barbers Point	ID	0-1360
1992	Erkelens, C.				Interpretive Trail Development Study NAS Barbers Point, Archaeological Survey of Site 1719.	IARII	Barbers Point	IS	0-1311

Table 1: Previous Archaeology in Honouliuli Ahupua'a

Date	Author				Title	Affiliation	General Location	Study Type	State Library Report
1991	Folk, W.				Archaeological Reconnaissance of a Proposed Drainage Channel: Supplement to an Archaeological Assessment for the Proposed Kapolei Bus./Industrial Park, Honouliuli, Ewa, Oahu.	CSH	Kapolei Business/Industrial Park	RS	0-1237
1992	Folk, W.	Hammatt, H.			Archaeological Subsurface Testing of a Beach Berm within the Proposed Barbers Point Drainage Channel.	CSH	Barbers Point	IS	0-929
1994	Franklin, L.				Archaeological Mitigation Program Ewa Marina Community Project Interim Report Phase II(a) - Data Recovery Field Work and Interim Report, Land of Honouliuli, Ewa District, Island of Oahu.	PHRI	Ewa Marina	DR	0-1275
1995	Franklin, L.	Goodfellow, S.	Wulzen, W.		Final Report Phase II - Data Recovery Archaeological Mitigation Program Ewa Marina Community Project. Volumes I, II (Tables), & III (Illus.). Land of Honouliuli, Ewa District, Island of Oahu. (TMK: 9-1-011-001,2,3,4,5,6,7; 9-1-012-008,9,11,12,13,16,17).	PHRI	Ewa Marina	DR	0-1413
1993	Glidden, C.	Major, M.	Dixon, B.		Results of Subsurface Data Recovery in Selected Areas of Paradise Cove, Honouliuli, Ewa, Oahu.	BPBM	Paradise Cove	DR	0-1133
1991	Goodman, W.	Cleghorn, P.			Historical Documents and Literature Search, and Archaeological Surface Survey of the Proposed Lauiani City Housing Project at Pu'uloa, Ewa, Ohau Island. (TMK 9-1-10:por. 7 and 9-1-12:por. 5?).	BPBM	Puuloa	RS/Document Search	0-1314
1993	Goodman, W.	Jayatilaka, H.	Patolo, T.	Nakamura, B., R. Nees, B. Dixon	An Archaeological Reconnaissance of a Proposed 20-Acre Commercial Project, Honouliuli, Ewa, Oahu Island (TMK 9-1-69: por. 5).	BPBM	Pu'uloa	RS	0-1255
1981	Hammatt, H.	Folk			Archaeological and Paleontological Investigation at Kalaeloa (Barbers Point), Honouliuli, Ewa, Oahu.	ARCH	Barbers Point	IS	0-543

Table 1: Previous Archaeology in Honouliuli Ahupua'a

Date	Authors				Title	Affiliation	General Location	Study Type	State Library Report
1984	Hammatt, H.				Reconnaissance and Evaluation of Archaeological Sites in the Proposed Ewa Marina Community, Ewa, Oahu.	CSH	Ewa Marina	RS	0-301
1989	Hammatt, H.	Shideler, D.			Archaeological Reconnaissance of the Six-Acre Proposed HECO Kahe Training Facility, Honouliuli, Ewa, Oahu.	CSH	Kahe Point	RS	0-613
1989	Hammatt, H.	Shideler, D.			An Archaeological Assessment for the Proposed Kapolei Business/Industrial Park Honouliuli, Ewa, Oahu.	CSH	Kapolei Business/Industrial Park	IS	0-1289
1990	Hammatt, H.	Shideler, D.	Folk, W.		Archaeological Reconnaissance of the Ewa Villages Project Site Honouliuli, Ewa, Oahu.	CSH	Ewa Villages	RS	0-683
1991	Hammatt, H.	Shideler, D.			Archaeological Inventory Survey for a Proposed Expansion of Saint Francis Medical Center West (TMK 9-1-17: por. 56), Honouliuli, Ewa, Oahu.	CSH	Saint Francis Medical Center West	IS	0-862
1991	Hammatt, H.	Robins, J.	Stride, M.	McDermott, M.	An Archaeological Inventory Survey for the Makaiwa Hills Project Site, Honouliuli, Ewa, Oahu.	CSH	Makaiwa Hills	IS	0-749
1992	Hammatt, H.				Archaeological Inventory Survey of Proposed K-A-I-M Radio Tower, Palikea, Honouliuli, Ewa, Oahu.	CSH	Palikea	IS	0-1025
1994	Hammatt, H.	Shideler, D.	Heidel, M.	Stride, M.	Archaeological Inventory Survey of the Proposed Barbers Point Harbor Expansion (TMK 9-1-14:02).	CSH	Barbers Point Harbor	IS	0-1323
1994	Hammatt, H.				Burial Treatment Plan Hawaiian Burial Cave Situated at Estate of James Cambell Lands, Honouliuli, Ewa, Oahu.	CSH	Barbers Point	BTP	0-1500
1994	Hammatt, H.	Shideler, D.			An Archaeological Assessment for the Proposed Barbers Point Harbor Expansion (84 Acres), Honouliuli, Ewa, Oahu.	CSH	Barbers Point Harbor	RS	0-1526
1997	Hammatt, H.	Chiogioji, R.			Archaeological Reconnaissance Survey of a 4.5 Kilometer (14,730 ft.) Long Land Cooridor within Honouliuli Ahupua'a, Ewa District, Oahu Island.	CSH	North-South Road	RS	0-1728

Table 1: Previous Archaeology in Honouliuli Ahupua'a

Date	Authors				Title	Affiliation	General Location	Study Type	State Library Report
1997	Hammatt, H.	Borthwick, D.			Archaeological Inventory Survey of a 0.8 Acre Study Area within the Ewa High Frequency Transmitter Station Site at Pu'uloa, Honouliuli Ahupua'a, Oahu (TMK 9-1-01:1 por).	CSH	Pu'uloa	IS	0-1666
1999	Hammatt, H.	Shideler, D.			An Archaeological Inventory Survey for the Waimanalo Gulch Sanitary Landfill Project Site, Honouliuli, Ewa, Oahu.	CSH	Waimanalo Gulch	IS	0-1563
1986	Haun, A.				Preliminary Archaeological Reconnaissance Survey for Environmental Assessment, Ewa Town Center/Secondary Urban Center.	PHRI	Ewa Town Center	RS	0-397
1986	Haun, A.				Preliminary Archaeological Reconnaissance Survey for Environmental Assessment, Ewa Town Center/Secondary Urban Center. TMK 9-1-15 & 16.	PHRI	Ewa Town Center	RS	0-396
1991	Haun, A.	Rosendahl, P.	Goodfellow, S.		Archaeological Mitigation Plan Ewa Marina Community Project - Phase I, Mitigation Plan for Data Recovery, Interim Site Preservation, and Monitoring, Land of Honouliuli, Ewa District, Island of Oahu.	PHRI	Ewa Marina	DRP	0-671
1983	Hommon, R.	Ahlo, H.			Archaeological Test Excavations at the Proposed Ewa Marina Community Development Area, Ewa, Oahu.	SMI	Ewa-Marina	IS	0-228
1983	Hommon, R.	Ahlo, H.			An Archaeological Reconnaissance Survey of the Proposed Hawaii High Technology Park, Ewa, Oahu.	SMI	Hawaii High Technology Park	RS	0-196
1984	Hommon, R.	Ahlo, H.			Archaeological Test Excavations at the Site of the Proposed Solid Waste Processing and Resource Recovery Facility, Honouliuli, Ewa, Oahu.	SMI	Solid Waste Prossesing Site	IS	0-230

Table 1: Previous Archaeology in Honouliuli Ahupua'a

Date	Authors				Title		General Location	Study Type	State Library Report
1992	Jayatilaka, H.	Patolo, T.	Nakamura, B.	Nees, R.	Archaeological Survey and Subsurface Testing of the Proposed Hawaii Prince Golf Course, Ahupua'a Honouliuli, Ewa District, Island of Oahu.	BPBM	Hawaii Prince Golf Course	IS	0-921
1988	Jensen, P.	Haun, A.	Rosendahl, P.		Phase I - Mitigation Plan for Archaeological Data Recovery Excavations, West Loch Estates Mitigation Program, Residential Increment I and Golf Course and Shoreline Park, Land of Honouliuli, Ewa District, Island of Oahu.	PHRI	West Loch Estates	DR	0-990
1993	Jones, B.				Letter Report for the Phase I Archaeological Inventory Survey at Barbers Point Naval Air Station. Family Housing Project, Aviation Maintenance Training Building and PATSWINGPAC Addition.	IARII	Barbers Point	IS	0-1042
1993	Jones, B.				Letter Report for the Phase I Archaeological Inventory Survey at Barbers Point Naval Air Station, Family Housing Project, Aviation Maintenance Training Building, and PATSWINGPAC Addition.	IARII	Barbers Point	IS	0-1298
1979	Jourdane, E.				Archaeological Reconnaissance Survey of Proposed Ewa Marina Community, Campbell Estate Properties, One'ula, Honouliuli, Oahu.	BPBM	Ewa-Marina/One'ula	RS	0-88
1995	Jourdane, E.				Inadvertent Discovery of Human Remains at Paradise Cove, Honouliuli, Ewa, Oahu, State Site No. 50-80-12-4968. SHPD No. 762.	SHPD	Paradise Cove	ID	0-1358
1994	Kaneshiro, R.				Summary of Archaeological Inventory Survey for Base Realignment and Closure (BRAC) and Comprehensive Long-Term Environmental Action Navy (Clean) Program at 13 Sites within the Naval Air Station, Barbers Point.	ERCE	Barbers Point	IS	0-1345

Table 1: Previous Archaeology in Honouliuli Ahupua'a

Date	Authors				Title	Affiliation	General Location	Study Type	State Library Report
1990	Kawachi, C.				Recordation of Campbell Industrial Park Burial, Honouliuli, Ewa, Oahu, State Site No. 80-12-4209, ME No. 90-0117.	HPP	Campbell Industrial Park	ID	0-609
1959	Kelly, M.				Palehua Kuula Stone, Honouliuli, Ewa, Oahu. Archaeological Site Survey Record.	BPBM	Palehua Waianae Range	Archaeological Site Survey Record	0-772
1988	Kennedy, J.				Archaeological Reconnaissance Report Concerning the Proposed Ewa Gentry Project in Honouliuli, Oahu.	ACH	Ewa Gentry	RS	0-484
1988	Kennedy, J.				A Preliminary Archaeological Reconnaissance Conducted at TMK: 9-1 01: 06, 27.	ACH	Ewa-Marina/One'ula	RS	0-713
1988	Kennedy, J.				Phase I: Cultural Resources Technical Report and Phase II: Field Survey Report Concerning the Waiau-Campbell Industrial Park Transmission Line.	ACH	Campbell Industrial Park	Archival Research/ RS	0-877
1991	Kennedy, J.				Subsurface Testing at the Proposed Kapolei Park/Fort Barrette, Puu Kapolei, Island of Oahu, TMK: 9-1-16:2.	ACH	Puu o Kapolei	IS	0-718
1992	Kennedy, J.	Berlin, J.	Denham, T.		Archaeological Inventory Survey Report for the Puuloa Golf Course Site TMK 9-1 01: 27 & 6, Located at Ewa, Island of Oahu.	ACH	Puuloa	IS	0-843
1992	Kennedy, J.	Denham, J.			Archaeological Data Recovery Report for the Puuloa Golf Course Located at Ewa, Island of Oahu, TMK 9-1-01: 27 & 6.	ACH	Puuloa	DR	0-844
1979	Komori, E.	Dye, T.			Archaeological Testing at Lanikuhonua, West Beach, Ewa, Oahu, Hawaii.	BPBM	West Beach/Ko Olina	IS	0-75
1992	Landrum, J.				Letter Report Post-Field Summary of Archaeological Reconnaissance and Limited Testing at Naval Air Station Barbers Point.	ERCE	Barbers Point	RS	0-882

Table 1: Previous Archaeology in Honouliuli Ahupua'a

Date	Author1	Author2	Author3	Author4	Title	Affiliation	General Location	Study Type	State Library Report
1993	Landrum, J.				Draft. Archaeological Reconnaissance and Limited Subsurface Testing at the Proposed Family Housing Construction Area, Project No. 34863, Barbers Point Naval Air Station, Honouliuli Ahupua'a, Ewa District, Oahu Island.	ERCE	Barbers Point	RS	0-1076
1970	Lewis, E.				The Campbell Project: A Preliminary Report.	UHDA	Campbell Industrial Park	RS (Prelim IS)	0-54
1997	Maly, K.				Phase III - Archaeological Site Preservation Plan, Phased Mitigation Program Ewa Marina Community Project, Land of Honouliuli, Ewa District, Island of Oahu.	PHRI	Ewa Marina Community Project	PP	0-1725
1933	McAllister				Archaeology of Oahu	BPBM	Oahu	RS	
1972	McCoy, P.				Archaeological Survey of the Proposed Puuloa Elementary School Site, Ewa Beach, Oahu.	BPBM	Ewa Beach	IS	0-128
2000	McDermott	Schideler	Winieski	Hammatt	Archaeological Data Recovery Report for the Archaeological Sites in the Proposed Barbers Point Harbor Expansion Area, Kalaeloa, Ahuhua'a of Honouliuli, District of Ewa, Island of Oahu (TMK 9-1-14:2).	CSH	Barbers Point Harbor	DR	0-1832
1999	McIntosh, J.	Cleghorn, P.			Report of Archaeological Archival Research for the Honouliuli Wastewater Treatment Plant Water Reclamation Project, Island of Oahu.	PLI	Honouliuli Wastewater Treatment Plant	Archival Research	0-1570
1993	Miller, L.				Archaeological Data Recovery of State Sites 50-80-12-2710 and 50-80-12-2711 at Barbers Point, Honouliuli Ahuphua'a, Ewa District, Oahu Island.	BPBM	Barbers Point	DR	0-1176
1993	Nakamura, B.	Pantaleo, J.	Sinoto, A.		Archaeological Inventory Survey of Proposed Development Parcels D and D 1 Makakilo, Honouliuli, Ewa, Oahu Island.	ASC	Makakilo	IS	0-1744

Table 1: Previous Archaeology in Honouliuli Ahupua'a

Date	Authors				Title	Affiliation	General Location	Study Type	State Library Report
1985	Neller, E.				A Preliminary Review and Evaluation of Archaeological Studies and Recommendations for the Proposed West Beach Estates at Ewa, Oahu.	SHPD	West Beach/Ko Olina Estates	Review of Studies	0-410
1987	None				Skeletal Remains Found at Kahe Beach Park, Waianae, Oahu.		Kahe Beach Park	ID (police report)	0-514
1975	Oshima, N.				Archaeological Reconnaissance Survey of Proposed Drainage Channal at the Campbell Industrial Park Complex, Ewa, Oahu.	BPBM	Campbell Industrial Park	RS	0-283
2001	Ostroff, B.	Elmore, M.	Kennedy, J.		Draft. An Inventory Survey at Pu'u Kapolei/Fort Barrette TMK: 9-1-16:02, 21 and 22, Honouliuli Ahupua'a, Ewa District, Island of Oahu.	ACP	Pu'u Kapolei	IS	0-1968
1991	Palesh, C.				Field Report: Replacement of Anchialine Pond, Ewa Marina, Island of Oahu.	BCA	Ewa Marina	Field Report	0-1029
1993	Pantaleo, J.	Sinoto, A.			Archaeological Inventory Survey for the Proposed Off-Site Drainage System, Ewa Gentry East, Honouliuli, Ewa, Oahu Island (TMK 9-1-10:15).	ASC	Ewa Gentry East	IS	0-1210
n.d.	PHRI				*Interim Report: Background, Summary* of Findings, and General Significance *Assessments and Recommended* General Treatments, Intensive Archaeological Survey and Testing Excavations Ewa Marina Community Project - Phase I, Land of Honouliuli, Ewa, Oahu.	PHRI	Ewa Marina	IS	0-670
1995	Pua-Kiapo, W.				Prefinal Report: Implementation of the Native American Graves Protection and Repatriation Act (NAGRPA) Inventory.	PHRI	Barbers Point, Pearl Harbor, West Loch, Iroquois Point	NAGPRA	0-1498

Table 1: Previous Archaeology in Honouliuli Ahupua'a

Date	Author				Title	Affiliation	General Location	Study Type	State Library Report
1998	Rechtman, R.				Final Report Boundary Assessment and Limited Data Collection at the Nimitz Beach Site (SIHP Site 50-80-12-2220) Naval Air Station Barbers Point.	PHRI	Nimitz Beach, Barbers Point	Boundary Assessment/Data Collection	0-1478
1980	Riley, T.				Archaeological Reconnaissance Survey: Palehua Road, Ewa District, Oahu.	BPBM	Palehua Road	RS	0-309
1986	Rosendahl, P.	Haun, A.			Phased Data Recovery Program and Memorandum of Agreement and Detailed Content Outline for Data Recovery Program Research Design, West Beach Estates Project Area, Honouliuli, Ewa, Island West Beach, Oahu: Archaeological Investigations.	PHRI	West Beach/Ko Olina Estates	DR	0-576
1987	Rosendahl, P.				Archaeological Reconnaissance Survey, Ko Olina Resort Phase II Development Site, Honouliuli, Ewa District, Island of Oahu.	PHRI	Ko Olina Phase II	RS	0-531
1987	Rosendahl, P.				Archaeological Reconnaissance Survey for Environmental Impact Statement: Kapolei Village Master Plan Project, Honouliuli, Ewa District, Island of Oahu.	PHRI	Kapolei Village	RS	0-893
1987	Rosendahl, P.				Archaeological Reconnaissance Survey for Environmental Impact Statement, West Loch Estates - Residential Increments I and II, Land of Honouliuli, Ewa District, Island of Oahu.	PHRI	West Loch Estates	RS	0-895
1988	Rosendahl, P.				A Proposal for: West Loch Estates Mitigation Program Residential Increments I and II and Golf Course and Shoreline Park.	PHRI	West Loch Estates	Proposal for Mitigation	0-1688
1990	Rosendahl, P.				Archaeological Survey, Kapolei Golf Course Addition, Honouliuli, Ewa, Oahu.	PHRI	Kapolei Golf Course Addition	IS	0-661

Table 1: Previous Archaeology in Honouliuli Ahupua'a

Date	Authors				Title	Affiliation	General Location	Study Type	State Library Report
1997	Rosendahl, P.				Ewa Marina Community Project, Monitoring of Grubbing and Grading for Fence in Area of Wetlands, and Flagging of Specified Preservation Sites, Honouliuli, Ewa, Oahu.	PHRI	Ewa Marina	MR	0-1714
1998	Rosendahl, P.				Archaeological Monitoring Plan - Borrow Site Fencing and Beach Access Road Realignment Ocean Point Project - Formerly Ewa Marina Community Project.	PHRI	Ewa Marina	MP	0-1762
1996	Schilz, A.	Landrum, J.			Archaeological Monitoring of Construction Excavation at Nimitz Beach, Naval Air Station, Barbers Point, Oahu, Hawaii. TMK 9:1:13.	ERCE	Nimitz Beach, Barbers Point	MR	0-1682
1996	Schilz, A.	Landrum, J.			Archaeological Test Excavations at the Shipboard Electronic Systems Evaluation Facility (SESEF) Shorebased Site, MILCON P-369 U.S. Coast Guard Station Barbers Point, Ewa District, Oahu, Hawaii (TMK 9-1-26-2).	ERCE	Barbers Point	IS	0-1540
1988	Shapiro	Rosendahl, P.			Interim Report: Summary of Findings, Sinkhole Test Excavations, Camp Malakole Industrial Subdivision Site, Land of Honouliuli, Ewa District, Oahu.	PHRI	Malakole Industrial Subdivision	IS	0-506
1992	Shideler, D.	Hammatt, H.	Borthwick, D.	Pfeffer, M.	Archaeological Assessment of the Proposed Fiber Optic Cable Landing for West Oahu, Kahe Point, Honouliuli, Oahu.	CSH	Kahe Point	IS	0-935
1976	Sinoto, A.				A Report of Cultural Resources Survey at Barbers Point, Oahu.		Barbers Point	CRS	0-48
1978	Sinoto, A.				Archaeological and Paleontological Salvage at Barbers Point, Oahu.		Barbers Point	DR (salvage)	0-572
1978	Sinoto, A.				Archaeological Reconnaissance Survey and Salvage of Burial at NAVMAG Lualualei, West Loch Branch, Oahu, Hawaii.	BPBM	West Loch	RS/ID	0-771

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Date	Authors				Title	Affiliation	General Location	Study Type	State Library Report
1979	Sinoto, A.				Cultural Resources Survey of New Dredged Material Disposal Sites at Barbers Point, Oahu.		Barbers Point	CRS	0-92
1988	Sinoto, A.				Surface Survey of Proposed Makakilo Golf Course, Ewa, Oahu.	BPBM	Makakilo Golf Course	RS	0-447
1988	Sinoto, A.				Surface Survey of Proposed Ewa Golf Course, Honouliuli, Ewa, Oahu.	BPBM	Ewa Golf Course	RS	0-445
1964	Soehren, L.				Waimanalo Gulch House Site. Archaeological Site Survey Record.	BPBM	Waimanalo Gulch	Archaeological Site Survey Record	0-734
1996	Spear, R.				No Title. Letter Report of a Cultural Resources Review of Properties Under Consideration for Development at Kapolei (TMK 9-1-16:17).	SCS	Kapolei	Cultural Resources Review	0-1541
1996	Spear, R. L.				Archaeological Reconnaissance and Assessment of the H.F.D.C. - East Kapolei Development Project.	SCS	East Kapolei	RS	0-1734
1995	Trembly, D.				Osteological Report on Human Skeletal Remains at Site 2220 Naval Air Station, Barbers Point, Island of Oahu, Hawaii.	PHRI	Barbers Point	ID	0-1553
1995	Tuggle, H. D.				Prefinal Report. Archaeological Inventory Survey for Construction Projects at Naval Air Station Barbers Point, Oahu, Hawaii.	IARII	Barbers Point	IS	0-1299
1996	Tuggle, H. D.				Search for the observation point of Oahu's po'e kilo hoku (astronomers). Typescript.	IARII	Puu o Kapolei	CRS	
1997	Tuggle, H. D.				The Ewa Plain. In Hawaiian Archaeology Vol. 6	IARII	Ewa Plain	CRS	

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Date	Authors				Title	Affiliation	General Location	Study Type	State Library Report
1997	Tuggle, H. D.	Tomonari-Tuggle			A Sythesis of Cultural Resourse Studies of the Ewa Plain. Task 1A.	IARII	Ewa Plain	CRS	
1997	Tuggle, H. D.	Tomonari-Tuggle			A Cultural Resource Inventory of Naval Air Station, Barbers Point, Oahu, Hawaii; Part I: Phase I Survey and Inventory Summary.	IARII	Barbers Point	IS	0-1460
2001	Tulchin, T.	Shideler, D.	Hammatt, H.		Archaeological Inventory Survey in Support of the Proposed Ewa Shaft Renovation Project, Honouliuli Ahupua'a, Ewa District, Island of Oahu.	CSH	Honouliuli Gulch	IS	0-1997
1987	Welch, D.				Archaeological Reconnaissance of the former Ewa Marine Corps Station, Barbers Point Naval Air Station, Oahu, Hawaii.	IARII	Barbers Point	RS	0-623
1998	Wolforth, T.	Wulzen, W.			Archaeological Data Recovery at West Loch Estates Residential Increment I, and Golf Course and Shoreline Park, Land of Honouliuli, Ewa District, Island of Oahu.	PHRI	West Loch	DR	0-1317
1995	Wulzen, W.	Rosendahl, P.			Pre-Final Report Archaeological Assessment of Seven BRAC 93 Project Areas at Lualualei Naval Weapons Magazine West Loch Station, NAS. Barbers Point, and Marine Corps Base HI, K. Bay. Honouliuli, Ewa & Lands of Kaneohe, He'ela, Ko'olau Poko District, Island of Oahu.	PHRI	West Loch/Barbers Point	IS	0-1448

Table 1: Previous Archaeology in Honouliuli Ahupua'a

Date	Authors				Title	Affiliation	General Location	Study Type	State Library Report
1990	Ziegler, A.				Identification of Faunal Material From PHRI Project 90-795, Campbell Industrial Park, Oahu.	PHRI	Campbell Industrial Park	ID of Faunal Material	0-624

Affiliation Key	
SMI	Science Management, Inc.
IARII	International Archaeological Research Institute, Inc.
BPBM	B.P. Bishop Museum
CI	Chinlago, Inc.
CCH	City and County of Honolulu
HPS	Hawaii Petroglyph Society
ARCH	Archaeological Research Center Hawaii, Inc.
PHRI	Paul H. Rosendahl, Inc.
KARP	Kualoa Archaeological Research Project
PCC	Paul Cleghorn Consulting
PLI	Pacific Legacy, Inc.
SHPD	State Historic Preservation Division
CSH	Cultural Surveys Hawaii
HMRI	Hawaii Marine Research, Inc.
UHDA	University of Hawaii Department of Anthropology
SCS	Scientific Consulting Services
ERCE	Ogden Environmental and Energy Services
HPP	Historic Preservation Program
ACH	Archaeological Consultants of Hawaii
ASC	Aki Sinoto Consulting
ACP	Archaeological Consultants of the Pacific
BCA	Belt Collins & Assoc.

Study Type Key	
RS	Reconnaissance Survey
ID	Inadvertent Discovery
IS	Inventory Survey
DR	Data Recovery
DRP	Data Recovery Plan
BTP	Burial Treatment Plan
PP	Preservation Plan
NAGPRA	Native American Graves Protection and Repatriation Act
MR	Monitoring Report
MP	Monitoring Plan
CRS	Cultural Resources Survey

Appendix B

Correspondence

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

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

DEPUTIES
ERIC T. HIRANO
LINNEL NISHIOKA

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DEPARTMENT OF LAND AND NATURAL RESOURCES

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

April 12, 2002

David Bills
Gray, Hong, Bills, Nojima & Associates, Inc.
841 Bishop Street, Suite 1100
Honolulu, HI 96813-3908

LOG NO: 29552
DOC NO: 0204EJ02

Dear Mr. Bills:

SUBJECT: Chapter 6E-8 Historic Preservation Review – Comments on Preparation of Draft Environmental Assessment Ewa Non-potable Water System
Honouliuli, `Ewa, O`ahu
TMK: 9-1, 9-2 various

Thank you for the opportunity to provide comment for the draft EA on the Ewa Non potable water system. The proposed expansion of the non-potable water system is planned to facilitate the use of non-potable water and relieve the potable water supply. The expansion includes development of new distribution and transmission mains (located primarily within existing state and county right-of ways), reservoirs and booster pumping stations.

Gray Hong, Bills Nojima & Associates have provided a general map showing the proposed infrastructure developments. Consequently we can only provide general comments on the effect that this project may have on historic sites. A review of our records indicates that there are no known historic sites within the existing right of ways. In general, all proposed development of transmission mains within existing roadways, streets, golf courses and parks where terrigineous soils are not underlain by Jaucus sand substrates, will have "no effect" on historic sites. These areas include those land parcels that were formerly cultivated in sugar cane, and areas where the historic preservation review process has been completed (i.e. Ewa by Gentry Residential areas, Coral Creek and Hawaii Prince Golf Course).

A segment of the OR&L Railroad is present within portions of the project area extending from the Ko Olina resort area to West Loch. The OR&L Railroad is a significant historic site listed on the National Register of Historic Places, and should be completely avoided by all water main construction activities, including equipment and materials storage, and vehicle turnarounds.

Construction, including transmission mains, may have the potential for an "adverse effect" on historic sites in areas that are underlain with Jaucus sand deposits (along beach parks and coastal roads). In these cases, we may recommend measures to identify historic sites and mitigate any "adverse effects" on them. Such measures may include survey with subsurface testing or having a qualified archaeologist conduct on-site monitoring during all ground disturbance. In order to better advise you on what historic preservation measures, if any, will be required, we request that we be provided with copies of detailed plans as they are finalized. Our review of the plans will focus on the effects, if any, the proposed water system improvements will have on significant historic sites.

Should you have any questions about archaeology, please feel free to call Sara Collins at 692-8026 or Elaine Jourdane at 692-8027. Should you have any questions regarding the OR&L, please feel free to contact Nathan Napoka at 587-0040. Should you have any questions about burial matters, please feel free to contact Kai Markell at 587-0008.

Aloha,

Don Hibbard, Administrator
State Historic Preservation Division

EJ:jk

c: Mr. A. Van Horn Diamond, Chair, O`ahu Island Burial Council
Mr. Kai Markell, Burial Sites Program
Nathan Napoka

Gray • Hong • Bills • Nojima & Associates, Inc.
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May 30, 2002

Mr. Don Hibbard, Administrator
State Historic Preservation Division
Department of Land and Natural Resources
601 Kamokila Blvd, Room 555
Kapolei, Hawaii 96707

Subject: Pre-Assessment Consultation
Ewa Nonpotable Water System
TMK 9-1 and 9-2; Ewa, Oahu, Hawaii

Dear Mr. Hibbard:

Thank you for your correspondence of April 12, 2002 (LOG NO. 29552/DOC NO. 0204EJ02) regarding the subject project. We acknowledge that the following comments that have been provided to assist in our preparation of the Draft Environmental Assessment (DEA):

1. There are no known historic sites within the existing right-of-ways, and in general, the construction of facilities in terrigineous soils that are not underlain by Jaucus sand substrates will not "no effect" on historic sites.

2. The OR&L Railroad is a significant historic site listed on the National Register of Historic Places and should be completely avoided by all construction activities, including equipment and materials storage and vehicle turnarounds.

3. The DEA will state that the Historic Preservation Division be consulted during the design phase to allow for more definitive preservation measures, such as onsite archaeological monitoring during ground disturbance, if required.

Please feel free to contact our office should there be any questions. Again, thank you for your participation in the environmental review process.

Very truly yours,

GRAY, HONG, BILLS, NOJIMA & ASSOCIATES, INC.

David B. Bills

SN:DBB:fle
cc: Mr. Scot Muraoka, Board of Water Supply
Mr. A. Van Horn Diamond, Chair, Oahu Island Burial Council
Mr. Kai Markell, Burial Sites Program
Mr. Joseph Kennedy, Archaeological Consultants of the Pacific
Mr. Nathan Napoka
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