BOARD OF WATER SUPPLY

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

February 15, 2008

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The Honorable Barbara Marshall, Chair
and Members
Honolulu City Council
530 South King Street, Room 202
Honolulu, Hawaii 96813

CITY CLERK
HONOLULU, HAWAII
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Dear Chair Marshall and Councilmembers:

Subject: Final Report Submittal in Response to City Council Resolution 03-36, Oahu Inactive Landfills Relative Risk Investigation

Pursuant to City Council Resolution 03-36, the Board of Water Supply, City and County of Honolulu ("BWS") procured the services of URS Corporation to perform a study to evaluate human health risks associated with groundwater sources potentially impacted by closed, unlined landfills (the "Study"). A multi-agency study team comprised of the State Department of Health Solid and Hazardous Waste Branch, City Department of Environmental Services Refuse Division and the BWS Water Resources Division guided the scoping and review of this Study. A Final Report of Oahu Inactive Landfills Relative Risk Investigation, Honolulu, Oahu, Hawaii has been completed (the "Report").

In summary, the Report states that there are currently no indications that the studied inactive Oahu landfill and dump sites are a threat to human health. Furthermore, the Report also states that there is no indication at this time that a more detailed calculation of risk is warranted at any of the studied sites.

Enclosed please find a copy of the Report. If you have any questions, please contact Barry Usagawa at 748-5900.

Very truly yours,

CLIFFORD P. LUM
Manager and Chief Engineer

APPROVED:

Wayne M. Hashiro, P.E.
Managing Director

Enclosure

cc: Thomas Arizumi, State Department of Health
Dr. Eric Takamura, Department of Environmental Services
Water Resources Research Center, University of Hawaii

DEPT. COM. 106

December 2006

Oahu Inactive Landfills Relative Risk Evaluation

Final Report

Prepared by:

URS

615 Piikoi Street, Ninth Floor
Honolulu, HI 96814-3141

March 2, 2007

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

Subject: Final Report
Oahu Inactive Landfills Relative Risk Investigation
Honolulu, Oahu, Hawaii
URS Project No. 26536686

Dear Mr. Usagawa:

As requested by the Board of Water Supply on February 23, 2007, URS Corporation is pleased to submit this Final Report on the relative risk posed by Oahu's Inactive Landfills.

If you require additional information, please contact Nate Adams at 593-1116 ext. 22. Correspondence can be sent by e-mail to nate_adams@urscorp.com.

Sincerely,

URS Corporation

Michael S. Welch, C.P.G.
Project Geologist

c: Mr. James Louise, City and County of Honolulu, Department of Environmental Services
Mr. John Valero, Hawaii Department of Health, Solid and Hazardous Waste Branch
Hawaii Department of Health, Safe Drinking Water Branch
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LIST OF ACRONYMS AND ABBREVIATIONS

AASHO	American Association of State Highway Officials
AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
AFS	Air Force Station
amsl	above mean sea level
ASTM	American Society of Testing and Materials
ATSDR	Agency For Toxic Substances And Disease Registry
BAT	best available technology
bgs	below ground surface
BRAC	base realignment and closure
BWS	Board of Water Supply
C&C	City and County of Honolulu
C&D	construction and demolition
CEPOD	Corps of Engineers Pacific Ocean Division
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
Cl^-	chloride
cm	centimeters
cm/sec	centimeters per second
COC	constituent of concern
COPC	constituent of potential concern
CSM	Conceptual Site Model
CTG	Composite Theme Grid
CWRM	Commission of Water Resource Management
DAGS	Department of Accounting and General Services
DBCP	1,2-Dibromo-3-chloropropane
DBEDT	Department of Business, Economic Development, and Tourism
DEM	Digital Elevation Model
DERP	Defense Environmental Restoration Program
DLG	Digital Line Graph
DLNR	Department of Land and Natural Resources

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

DOA	Department of Agriculture
DoD	Department of Defense
DOFAW	Department of Fish and Wildlife
DOH	Department of Health
DOT	Department of Transportation
DOWALD	Division of Water and Land Development
DSMOA	Defense/State Memorandum of Agreement
EA	Environmental Assessment
EE/CA	Engineering Evaluation/Cost Analysis
EDB	Ethylene dibromide
EKNA	Edward K. Noda and Associates
EMD	Environmental Management Division
ENV	Department of Environmental Services
EPA	Environmental Protection Agency
EPAR	Enhanced Preliminary Assessment Report
EPC	Ewa Plantation Company
ER	environmental restoration
ERA	Ecological Risk Assessment
ES	Engineering-Science
ESA	Environmental Site Assessment
ESD	Emergency Services Department, State of Hawaii - Department of Health
ESRI	Environmental Systems Research Institute, Inc.
FRAMES	Framework for Risk Analysis in Multimedia Environmental Systems
FRTR	Federal Remediation Technologies Roundtable
FS	Feasibility Study
ft	feet
FUDS	formerly used defense sites
GDSI	Geographical Decision Systems International
GIRAS	Geographic Information Retrieval and Analysis
GIS	Geographic Information System
gm/cc	grams per cubic centimeter
gpd	gallons per day
GNIS	Geographic Names Information System

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

GPS	Global Positioning System
GW	groundwater
HAR	Hawaii Administrative Rules
HEER	Hazard Evaluation and Emergency Response
HISWAP	Hawaii Source Water Assessment Program
HLA	Harding Lawson Associates
HoLIS	Honolulu Land Information System
HRS	Hazard Ranking System
HSA	Hawaii Stream Assessment
HWHPP	Hawaii Wellhead Protection Program
IAS	Initial Assessment Study
in	inches
in/hr	inches per hour
IRP	Installation Restoration Program
ISST	Initial Site Screening Team
JPEG	Joint Photographic Experts Group
K_d	equilibrium constant
KMR	Kapalama Military Reservation
LF	Landfill
LTM	long-term monitoring
LTM	Long-Term Management
LUC	Land Use Commission
LULC	Land Use and Land Cover
LUST	leaking underground storage tank
m	meters
MCBH	Marine Corps Base Hawaii
MEPAS	Multimedia Environmental Pollutant Exposure Assessment System
mg/l	milligrams per liter
Mgd	million gallons per day
MSW	municipal solid waste
MtBE	Methyl tertiary butyl ether
NAD 83	North American Datum of 1983
NCTAMS	Naval Computer and Telecommunication Area Master Station

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

NFA	No Further Action
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NRTF	Naval Radio Transmitting Facility
OP	Office of Planning
OR&L	Oahu Railway and Land Company
OSC	Oahu Sugar Company
OSP	Office of State Planning
OSRTI	Office of Superfund Remediation and Technology Innovation
OSWER	Office of Solid Waste and Emergency Response
OU	Operable unit
O&M	Operation and Maintenance
PA	Preliminary Assessment
PAC	Pacific Air Command
PA/SI	Preliminary Assessment/Site Inspection
PCA	potential contaminating activities
PDC	Pacific Disaster Center
PHNC	Pearl Harbor Naval Complex
PRG	Preliminary Remediation Goal
PVT	PVT Nanakuli Landfill
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
RA	Remedial Action
RA-C	Remedial Action Construction
RA-O	Remedial Action Operation
RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
SARA	Superfund Amendments and Reauthorization Act
SDAR	Site Discovery, Assessment and Remediation
SDWB	Safe Drinking Water Branch, State of Hawaii - Department of Health

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

SFI	Sanborn Fire Insurance
SHWB	Solid and Hazardous Waste Branch
SI	Site Inspection
SSURGO	Soil Survey Geographic
STATSGO	State Soil Geographic Information System database
SWAP	Source Water Assessment Program
TCE	trichloroethene
TCLP	Toxicity Characteristics Leaching Procedure
TCP	trichloropropane
TIGER	Topographically Integrated Geographic Encoding and Referencing
TMK	tax map key
TPH	total petroleum hydrocarbons
UEC	Unitek Environmental Consultants
UIC	Underground Injection Control
URS	URS Corporation, Inc.
U.S.	United States
USAF	United States Air Force
USDA	United States Department of Agriculture
USDW	underground sources of drinking water
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	underground storage tank
UTM	Universal Transverse Mercator
VOCs	volatile organic compounds
WHPA	wellhead protection area
WRRC	Water Resources Research Center
°F	degrees Fahrenheit
%	percent
2,4-D	2,4-Dichlorophenoxyacetic acid

LIMITATIONS

This report was prepared in accordance with the Project Scope of Work described in the contract between URS Corporation, Inc. (URS) and the Board of Water Supply (BWS). The work conducted by URS is limited to the services agreed to with the BWS, and no other services beyond those explicitly stated should be inferred or are implied.

The conclusions presented in this report are professional opinions based solely upon data described in this report and URS' interpretation of the available historical information and documents reviewed. They are intended exclusively for the purposes outlined herein and the subject property locations and project indicated.

It should be recognized that this study was not intended to be a definitive investigation of contamination at the subject properties and the conclusions provided are not necessarily inclusive of all the possible conditions. Given that the Scope of Work for this investigation was limited and that exploratory borings, soil and/or groundwater sampling were not undertaken, it is possible that currently unrecognized subsurface contamination may exist at the subject properties. URS makes no representations regarding the value or marketability of the subject properties or the suitability for any particular use, and none should be inferred based on this report.

Opinions and recommendations presented herein apply to the subject property conditions existing at the time of our investigation and cannot necessarily apply to subject property changes of which URS is not aware and has not had the opportunity to evaluate. Changes in the conditions of these properties may occur with time due to natural processes or the works of man on the subject property or adjacent properties. Changes in applicable standards may also occur as a result of legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated, wholly or in part, by changes beyond our control.

URS has exercised due and customary care in the conduct of this investigation but has not independently verified information provided by others. Therefore, URS assumes no liability for any loss resulting from errors or omissions arising from the use of inaccurate/incomplete information or misrepresentations made by others.

EXECUTIVE SUMMARY

Landfills and unmanaged refuse dumps pose a potential threat to the groundwater resources of Oahu because the refuse at these sites is subjected to percolating rainwater (less so when capped), which eventually flows out of the bottom of the landfill (if unlined) and moves into the local groundwater system. These percolating waters, known as leachate, can contain both inorganic and organic contaminants. The contaminant plume can subsequently be drawn into public drinking water supply wells.

Purpose

The purpose of this screening-level investigation was to evaluate human health risks associated with exposure to this potentially impacted groundwater. Collecting and analyzing site-specific data related to the type, volume, and age of waste and the hydrogeologic environment of each site helped accomplish this purpose.

This report is also intended to act as an active reference document for future mitigative and regulatory actions should such actions become necessary. Although, there are currently no indications that Oahu landfill sites are a threat to human health, an overview of potential mitigative measures is included in this report. In addition, an individual landfill report for each site is included in Appendix A.

Background

The words “landfill” and “dump” are often used interchangeably; however, there is a distinction between the two. Landfill is a general term for a disposal site in which refuse is buried beneath layers of earth. The bottoms of landfills are often lined with a layer of impermeable material, whereas a dump is a site where refuse is placed directly on the ground surface. Most of the sites in the inventory of Oahu inactive landfills are actually dumps.

Qualitative vs. Quantitative

Most of the landfills being considered during this investigation were operational prior to the 1970s. Most of these landfills predate state waste laws and federal regulations and in turn were not adequately monitored. Subsequently, very little analytical data are available. Due to the lack of quantitative data, this investigation is mostly qualitative in nature.

Key Points

- Seventy-six inactive Oahu landfills are included in this investigation.
- Of the seventy-six inactive Oahu landfills, only one is lined (Fort Shafter) and twenty-five are considered to be "capped."
- Of the seventy-six inactive Oahu landfills, twenty-two are agricultural, fifteen are military, thirty-two are municipal, one is residential (Nanakuli B), and six are private landfills.
- Emphasis was not placed on landfills currently being investigated under a separate project (i.e., Waipahu Ash Landfill) or military landfills, as most have been evaluated and mitigated.
- Thirty-seven of the landfills are located mauka (landward) of the No-Pass Line. Landfills located mauka of the No-Pass Line were visited, with the exception of military landfills and sites with unresponsive property owners. A total of twenty-four sites were visited.
- Of those thirty-seven landfills located mauka of the No-Pass Line, twenty-seven landfills are located within the Schofield Plateau physiographic province. Many of Oahu's largest unconfined potable aquifers are located within the Schofield Plateau. These unconfined aquifers have a high vulnerability to contamination.
- The Schofield Plateau has historically been used for the cultivation of sugarcane and pineapple, and most of the landfills in question are related to the sugarcane and pineapple industry. Of twenty-seven landfills located within the Schofield Plateau, nineteen were formerly agricultural landfills.
- Very little information was available for the agricultural landfills. This is due to the age of the landfills, poor record keeping, and rotation of agricultural disposal fields or dumps, which may also be the reason that little evidence of former dumping activities was noted during site visits to suspected agricultural dump sites (based on historic maps).
- Twenty-three landfills were determined to lie within one mile of a municipal or domestic drinking water well. Of those twenty-three landfills, twelve landfills are also located mauka of the No-Pass Line. Relative risk modeling was performed on these twelve landfills, which were designated as Category 1 landfills.
  - Seven of the twelve Category 1 landfills are associated with a BWS well that had at least one constituent detected above the method detection limit and/or the reporting limit (according to the Hawaii Source Water Assessment Program [HISWAP] report).
  - Thirty-seven BWS wells were found to lie within one-mile of Category 1 landfills. Some wells lie within one mile of multiple landfills. According to the HISWAP report, of those thirty-seven wells, twenty-four wells had at least one constituent detected above the method detection limit and/or the reporting limit.
- Fifteen landfills were determined to lay within BWS well capture zones predicted by the HISWAP report.

- Eleven of the fifteen landfills determined to lay within the BWS well capture zones are associated with a BWS well that had at least one constituent detected above the method detection limit and/or the reporting limit (according to the HISWAP report).
- Forty-three BWS wells have a landfill that lies within their capture zone. Some landfills fall within the capture zone of several wells. According to the HISWAP report, of those forty-three wells, twenty-three wells had at least one constituent detected above the method detection limit and/or the reporting limit.

- Seventeen impacted BWS wells lie within one-mile of Category 1 landfills and have landfills within their capture zones.
- Risk modeling was performed on the twelve Category 1 landfills, that is, landfills located over potable aquifers (e.g., mauka of No-Pass Line) and in close proximity (i.e., one mile) to drinking water wells. The landfills were subsequently ranked relative to each other based on the modeled risk posed to drinking water receptors.
- The United States Environmental Protection Agency (U.S. EPA) Comprehensive Environmental Response, Compensation and Liability Act program defines an acceptable risk of developing cancer from hazardous waste sites as a probability of "1 in 1,000,000" or 10-6. None of the landfills modeled has an Excess Cancer Risk Hazard Index greater than 1 in 1,000,000.
- There is no indication at this time that a more detailed calculation of risk is warranted at any of these sites. Even if contamination at the level of the Preliminary Remediation Goals were to be found at these landfills, the risk to off-site users of BWS or other municipal wells is significantly below the remediation goals calculated by the U.S. EPA (in many cases up to 10 times lower). If, on the other hand, much higher contaminant concentrations are found on or adjacent to these sites, risk modeling should be reconsidered and site-specific contaminant transport data should be collected.

1.0 INTRODUCTION

The Honolulu City Council adopted Resolution 03-36 to perform a study of inactive landfills on the island of Oahu. Resolution 03-36 requested that the Board of Water Supply (BWS) direct the study in partnership with the City and County of Honolulu (C&C) Department of Environmental Services (ENV) and the Hawaii State Department of Health (DOH) (**the Study Team**). After a preliminary scoping study of the problem (BWS, 2003), this multi-agency Study Team contracted URS to perform a screening-level investigation to evaluate human health risks associated with exposure to potentially impacted groundwater at known inactive Oahu landfills and to perform a preliminary mitigation analysis.

Although several of the landfills mentioned in the BWS scoping report are currently active, because this study is intended to be a reference document for landfill related data, all the landfills mentioned in the BWS scoping report were considered (Table 1-1, Figure 1-1). For simplicity, and because the vast majority of the landfills are inactive, the inventory of landfills investigated during this study is hereafter referred to as the "inactive landfills" inventory.

The information gathered during this investigation is important in understanding the potential nature, magnitude, and extent of contamination, as well as assisting in identifying potentially exposed target receptors (drinking water consumers).

This report includes the purpose of the investigation, background information, applicable regulations, the conceptual site model (CSM), the environmental setting, Geographic Information System (GIS) development, the database, landfill prioritization, desktop audit, site reconnaissance, data analysis, risk modeling, and remedial action alternatives, and conclusions are detailed herein.

2.0 PURPOSE

Landfills and unmanaged refuse dumps pose a potential threat to the groundwater resources of Oahu[1] because the refuse at these sites is subjected to percolating rainwater (less so when capped). This rainwater eventually flows out of the bottom of the landfill (if unlined) and moves into the local groundwater system. These percolating waters, known as leachate, can contain both inorganic and organic contaminants. The contaminant plume can subsequently be drawn into public drinking water supply wells. The hydrogeologic setting plays a role in determining the degree to which a landfill can impact water quality in local aquifer systems. The ability of the soils underlying a landfill to absorb contaminants, how far the landfill is situated above the water table, and the hydraulic properties of the aquifer affect the ultimate concentration of contaminants that reach groundwater and how far the contaminant plume migrates. Therefore, the degree of threat to groundwater from landfills depends on several factors: toxicity, volume, and age of contaminants generated at each site, the nature of the geologic medium underlying the site, and the hydrologic conditions dominant in the area (Driscoll, 1986).

The purpose of this investigation was to assess, categorize, and prioritize the potential risk to human health, via ingestion from drinking water wells, posed by impacted groundwater at known inactive Oahu landfills. Collecting and analyzing site-specific data related to the type and volume of waste and the hydrogeologic environment of each site helped accomplish this purpose. Additionally, two goals of this project were to (1) develop effective and economical remedial action alternatives to interrupt and/or eliminate the exposure pathway between the source (landfill) and the receptor (drinking water consumers) and (2) develop cost estimate ranges for the various remedial actions, where unacceptable risks were noted to exist.

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[1] According to the Hawaii Source Water Assessment Program (HISWAP), the potential for contamination associated with landfills, dumps, and historic dumps is very high. This determination was based on the nature of the activities, contaminants associated with those activities, and past record of groundwater and/or surface water contamination regardless of whether any environmental standards were exceeded. This ranking did not take into account any site-specific practices such as pollution prevention or protection measures (e.g., liners or caps) (State of Hawaii-DOH- Safe Drinking Water Branch [SDWB], 2004).

3.0 PROJECT COMPONENTS

Project related meetings and deliverables are described in this section. Figure 3-1 is a project flow chart.

3.1 Meeting with Study Team

URS met with the Study Team to:

- Develop a CSM for the release of landfill contaminants and their flow path to drinking water supply wells.
- Determine what information should be collected to avoid data gaps that could potentially present stumbling blocks for the project.
- Establish the specific risk screening process.

3.2 Quality Assurance Project Plan

A Quality Assurance Project Plan (QAPP) was developed to help assure sufficient data were collected during the desktop audit and site reconnaissance visits. The QAPP was developed prior to site visits and generally followed the guidelines specified in American Society of Testing and Materials (ASTM) Designation E 1527-00 (ASTM, 2001). The tasks of the desktop audit and the site visits were similar to a Phase I Environmental Site Assessment (ESA). Having a clear quality assurance/quality control (QA/QC) protocol helped assure sufficient data were collected during the investigation. No environmental samples were collected as part of this investigation.

3.3 Desktop Audit

Details regarding the desktop audit are included in Section 10 of this report.

3.4 Preparatory Efforts Letter Report

URS prepared a letter report to the Study Team for comment and review that summarized preparatory efforts, the initial database, current GIS development, literature search results, and a description of the CSM.

3.5 Final Report

The results of the desktop audit (Section 10), site reconnaissance (Section 11), risk modeling (Section 13), and mitigation analysis (Section 14) are detailed herein.

4.0 BACKGROUND

The words "landfill" and "dump" are often used interchangeably; however, there is a distinction between the two. Landfill is a general term for a disposal site in which refuse is buried beneath layers of earth. The bottoms of landfills are often lined with a layer of impermeable material, whereas a dump is a site where refuse is placed directly on the ground surface. Most of the sites in the inventory of Oahu inactive landfills are actually dumps. There are generally four different types of landfills in the inventory, which are municipal, agricultural, military, and private (Figure 4-1).

URS collected data for the landfills listed in the BWS (2003) preliminary scoping report (Table 1-1, Figure 1-1). Table 4-1 tabulates the landfills and potential landfill sites that were considered during this investigation. The list of landfills included in Table 4-1 was generated from landfills cited in the following reference material:

- A 1942 map from the Honolulu Advertiser titled "Refuse-Disposal Facilities" from Young (1993)
- A 1963 map titled "A Summary of the Present Solid Waste Disposal Sites" from Young (1993)
- *Inventory of Potential Sanitary and Demolition Landfill Sites on the Island of Oahu,* 1977, by Shimabukuro and Associates
- *Supplement to Inventory of Potential Sanitary and Demolition Landfill Sites on the Island of Oahu,* 1979, by Shimabukuro and Associates
- *Garbage in Paradise, A History of Honolulu's Refuse Division*, 1993, by Robert Young
- *Evaluation of Closed Landfills on Oahu*, DOH 1997, by Apolla Bagaoisan

The 1942 map, titled "Refuse-Disposal Facilities", accompanied a July 14, 1942 Honolulu Advertiser article. According to that article, tons of refuse accumulated at various points throughout the island following the December 7, 1941 attack on Pearl Harbor. Subsequently, refuse disposal centers were established across the island. The refuse disposal centers were divided into four classes, City-County sites, navy sites, army sites, and plantation sites. According to the plan adopted by the United States (U.S.) Department Surgeon's Office, the Corp of Engineers, and the City-County Public Works Department, this refuse was to be burned at these specially designated dumps. It appears, from the lack of information found on many of the sites depicted on the 1942 map, that many of these special rubbish disposal centers were not used after the accumulated refuse was burned.

It should also be noted that many of the sites included in the 1977 and 1979 Shimabukuro and Associates reports were considered, but never developed. In addition, the exact location of several dumps could not be determined because the only information found regarding their locations was in the form of unsuitably scaled historic maps. Spatial analyses and the subsequent conclusions drawn from them are unreliable if the subject site cannot be or is not considered to be accurately located. For these reasons, several landfills were removed from the inventory of Oahu inactive landfills considered during this investigation. Table 4-1 highlights the 76 landfills that were included in the investigation.

5.0 REGULATORY OVERVIEW

Most of the landfills in question operated prior to the establishment of many Federal regulations (e.g., Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)) and of State solid and hazardous waste regulations (e.g., Hawaii Administrative Rules (HAR) Title 11, Chapters 58.1 and 260 through 270), and were therefore not subjected to adequate post-closure care or monitoring. Subsequently, with the exception of the military landfills, very little analytical data related to groundwater quality in the vicinity of these landfills are available.

5.1 Federal Regulations

5.1.1 RCRA

In 1976, Congress passed an environmental statute known as RCRA. The RCRA statute directed the United States Environmental Protection Agency (U.S. EPA or EPA) to develop regulations around hazardous and non-hazardous wastes. These regulations appear in Title 40 of the Code of Federal Regulations (CFR). Solid Waste Regulations specifically appear in CFR Parts 239 through 259, which cover open dumping, landfill daily cover requirements, and established landfill lining and leachate control systems.

RCRA Subtitle D, and its implementing regulation, Title 40 CFR, Part 258 (40 CFR 258), specifies requirements for municipal solid waste (MSW) landfills, including siting, design, construction, operating conditions, monitoring and maintenance, closure/post-closure, restrictions of liquids and hazardous waste, legal liability for environmental contamination, and financial assurance. The various requirements of Subtitle D within RCRA were promulgated as federal law in phases between 1991 and 1996 (State of Hawaii-DOH, 2000).

On October 9, 1991, the U.S. EPA promulgated Solid Waste Disposal Facility Criteria in Parts 257 and 258 of 40 CFR, based on RCRA Subtitle D. The federal government required that states either adopt similar regulations or let EPA enforce the Subtitle D regulations. If a state wanted to enforce its own regulations, it had to develop criteria for sanitary landfills equal to or more stringent than the federal guidelines by October 9, 1993.

5.1.2 CERCLA

In 1980, in response to growing public concern over the state of the environment, Congress passed CERCLA, also known as Superfund. This law requires all responsible parties to clean up releases of hazardous substances to the environment. The 1986 Superfund Amendments and Reauthorization Act (SARA) refined and expanded CERCLA (U.S. Department of Defense [DoD], 2005).

5.2 State Regulations

The pertinent regulations that pertain to a landfill depend upon the effective date of the regulation in comparison to the last year of landfill operation. The following solid waste regulations have been used to regulate landfills in Hawaii.

- Chapter 46 of the Public Health Regulations, which was effective from July 1974 until November 1981.
- HAR, Title 11, Chapter 58, which was effective from November 27, 1981until October 9, 1993.
- Chapter 58 was repealed and Chapter 58.1 became effective October 1993 to present.

As mentioned above, if the state wanted to enforce its own regulations, it had to develop criteria for sanitary landfills equal to or more stringent than the federal guidelines by October 9, 1993. The State of Hawaii received the "determination of adequacy" for the State MSW permit program on January 13, 1994. HAR-58.1 is the current version of the Solid Waste Administration Rule, which repealed HAR 11-58 on January 13, 1994. HAR 11-58.1 incorporates the provisions of 40 CFR 258 and also regulates other waste handling facilities including construction and demolition (C&D) landfills, transfer stations, and recycling and materials recovery facilities (State of Hawaii-DOH, 2000).

5.3 Participating Agencies and Their Processes

In Hawaii, the EPA, the State of Hawaii DOH, and the Army, Navy, and Air Force (environmental restoration divisions) are participants in protecting human health and the environment from property impacted by past operations (e.g. landfills). Each organization has its own process for investigating, characterizing, and cleaning-up impacted sites. Private industry, states, and the military often incorporate provisions from the "tried-and-true" U.S. EPA

investigation process when addressing former landfills. An example of this is demonstrated in Figure 5-1, which shows how the Air Force's Engineering Evaluation/Cost Analysis (EE/CA) process parallels the U.S. EPA's Remedial Investigation/Feasibility Study (RI/FS) process. Much of the available information that was gathered for this investigation was generated as a result of these organizations' environmental regulations, programs, and investigations.

U.S. EPA often delegates the responsibility for monitoring and enforcing compliance to the State. Where national standards are not met, U.S. EPA can issue sanctions and take other steps to assist the state in reaching the desired levels of environmental quality. Because there are references to components of the U.S. EPA's investigation, monitoring, and characterization programs within many of the individual landfill reports (Appendix A), a brief review of the EPA's investigation and characterization program is presented below. U.S. EPA's investigation process is depicted in Figure 5-2.

5.3.1 U.S. EPA

The mission of the U.S. EPA is to protect human health and the environment. U.S. EPA works to develop and enforce regulations that implement environmental laws enacted by Congress. Twenty-three of the sites included in this investigation have an EPA identification number associated with them (Table 5-1).

5.3.1.1 CERCLIS

Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) contains information on hazardous waste sites, potential hazardous waste sites, and remedial activities across the nation, including sites that are on the National Priorities List (NPL) or being considered for the NPL. Eleven landfills included in this investigation are also included in the CERCLIS database (Table 5-1).

5.3.1.2 Discovery

Discovery is the process by which a potential hazardous waste site is brought to the attention of the EPA. The process can occur through the use of several mechanisms such as a phone call or referral by another government agency.

5.3.1.3 Preliminary Assessment

The EPA uses the Preliminary Assessment (PA) to evaluate the potential for a release of hazardous substances from a site. The PA is a limited-scope investigation performed on every CERCLIS site.

Readily available information about a site and its surrounding area are collected during PA investigations. The PA is designed to distinguish, based on limited data, between sites that pose little or no threat to human health and the environment and sites that may pose a threat and require further investigation. The PA also identifies sites requiring assessment for possible emergency response actions. If the PA results in a recommendation for further investigation, a Site Inspection (SI) is performed. PAs were performed on thirteen landfills considered during this investigation (Table 5-2).

5.3.1.4 Site Inspection

The U.S. EPA uses the SI as a more robust evaluation of the potential for a release of hazardous substances from a site. The SI identifies sites that enter the NPL Site Listing Process and provides the data needed for Hazard Ranking System (HRS) scoring and documentation. SI investigators typically collect environmental and waste samples to determine what hazardous substances are present at a site. They determine if these substances are being released to the environment and assess if they have reached nearby receptors. The SI can be conducted in one stage or two. The first stage, or focused SI, tests hypotheses developed during the PA and can yield information sufficient to prepare an HRS scoring package. If further information is necessary to document an HRS score, an expanded SI is conducted. Information collected during the PA and SI is used to calculate an HRS score. SIs were performed on eight landfills considered during this investigation (Table 5-3).

5.3.1.5 Hazard Ranking System

The HRS is the scoring system used by U.S. EPA's Superfund program to assess the relative threat associated with actual or potential releases of hazardous substances. The HRS is the primary screening tool for determining whether a site is to be included on the NPL.

5.3.1.6 National Priorities List

The NPL is U.S. EPA's list of sites that are priorities for further investigation. Sites with an HRS score of 28.50 or greater are eligible for listing on the NPL and require the preparation of an HRS scoring package. If a site is listed on the NPL, U.S. EPA may conduct remedial response actions.

There are currently three sites in Hawaii listed on U.S. EPA's NPL for cleanup. Schofield Barracks, the fourth site, was de-listed on August 10, 2000. The three sites are:

1. Del Monte, Kunia
2. Naval Computer and Telecommunication Area Master Station (NCTAMS)
3. Pearl Harbor Naval Complex (PHNC; Waipahu Incinerator Ash Landfill is part of this site)

Although the landfills themselves were not the reason for NCTAMS and PHNC being listed on the NPL, the Old Wahiawa Landfill is located at the NCTAMS and Pearl City Peninsula, Ford Island, and Ewa/Oahu Sugar Company - Waipio Peninsula Dumps are part of the PHNC.

5.3.1.7 Archived Site

An archived site is one at which U.S. EPA has determined that assessment has been completed and no further remedial action is planned under the Superfund program.

A value of "NFA" or No Further Action indicates that a site has no further Federal Superfund interest (assessment, cleanup, or enforcement), and that no further activities will be performed by Superfund at the site. When this code is assigned, it indicates that the site is archived (removed) from CERCLIS. Nine landfills included in this investigation are also included in EPA's Archived Site database (Table 5-1).

5.3.2 State of Hawaii Department of Health

The DOH consists of three administrations, which include the Health Resources Administration, Behavioral Health Administration, and the Environmental Health Administration. The Environmental Health Administration oversees the following divisions and offices:

- Environmental Planning Office
- Environmental Management Division
- Hazard Evaluation and Emergency Response Office
- Environmental Health Services Division
- Environmental Resources Office
- Compliance Assistance Office

For the purposes of this report, the three most important divisions and offices of the Environmental Health Administration are explained in the following sections.

5.3.2.1 Environmental Planning Office

The Environmental Planning Office develops strategic plans, supports land use reviews and helps to get new programs underway. This office is developing the polluted runoff control program and is involved in coordinating watershed management projects.

5.3.2.2 Environmental Management Division

The Environmental Management Division (EMD) is responsible for implementing and maintaining statewide programs for controlling air and water pollution, for assuring safe drinking water, and for the proper management of solid and hazardous waste. The division also regulates the state's wastewater. The following branches and programs are under the EMD: Clean Air Branch, Clean Water Branch, Safe Drinking Water Branch, Solid and Hazardous Waste Branch, Solid Waste Management Program, Hazardous Waste Management Program, and the Wastewater Branch.

5.3.2.3 Hazard Evaluation and Emergency Response Office

The Hazard Evaluation and Emergency Response (HEER) Office provides risk assessments, responds to the release of hazardous substances and oversees the cleanup of contaminated sites. The HEER Office also implements and maintains the environmental response programs for planning for, responding to, and preventing releases of hazardous substances into the environment, and protecting the natural resources of the State of Hawaii.

In general, the function of the HEER Office is to provide state leadership in addressing all aspects of releases of hazardous substances and/or petroleum into the environment. The office evaluates the actual or potential impacts such releases may have on the public, environment, and natural resources, and mitigates them as needed. The office is comprised of three operating sections, each addressing an important aspect of its mission: 1) Emergency Preparedness and Response; 2) Site Discovery, Assessment and Remediation (SDAR); and 3) Hazard Evaluation.

Site Discovery, Assessment and Remediation

The SDAR Section is responsible for assessing the relative near-term or long-term threat from sites contaminated with hazardous substances, and for the oversight and implementation of response actions at sites with suspected and confirmed releases of hazardous substances.

The Initial Site Screening Team (ISST), composed of members of the HEER SDAR Section, has been screening suspected contaminated sites since 1999. The ISST screening is one tool used by staff in the HEER Office to determine the potential risk to public health, and welfare, and environment, including natural resource damages, which may be posed by contamination or associated with exposure to the contamination. Every site that comes to the ISST is screened and assigned a priority of high, medium, or low. A determination that NFA is necessary may also be a decision made by the ISST. ISST screenings were performed on eight landfills considered during this investigation (Table 5-4).

Potential responsible parties connected with contaminated sites are notified by a letter reporting the priority ranking of their sites. Sites eligible for further investigation under the CERCLA are assigned to personnel in the Preliminary Assessment/Site Inspection (PA/SI) group. Sites that are ranked medium or high priority by the ISST may be assigned to a State Remedial Project Manager. Low priority sites generally do not have site managers assigned to them. However, sites that are ineligible under CERCLA may still be eligible for assessment under the State program.

State Priority Cleanup Sites

The majority of cleanup sites are identified through the spill/release "notification system" required by the Hawaii State Contingency Plan. Spills and releases, both CERCLA and non-CERCLA (i.e. oil contaminated) eligible, are reported to the DOH. The remainder of sites identified are from referrals by other programs and the HEER Office's site discovery process.

The Hawaii State Priority Site List contains all of the sites that have been determined by the HEER Office to need further assessment and possible removal or remedial action. These sites have gone through the ISST prioritization process based upon the criteria in the Hawaii State Contingency Plan, Chapter 11-451, HAR. These sites have been determined to be high, medium, or low priority and are actively being worked on or will be addressed in the future.

Two landfills/dumps from this investigation are included on the Hawaii State Priority Site List:

1. Ewa/Oahu Sugar Company - Waipio Peninsula (part of the Pearl Harbor NPL site)
2. Kapaa Landfill

As mentioned previously, once a site has been identified as a CERCLA site, it may be added to the NPL and the U.S. EPA may manage the cleanup. The HEER Office PA/SI Program portion of the SDAR Section is currently managing cleanup for the two listed sites.

Defense/State Memorandum of Agreement Site List

The HEER Office provides oversight to all military site cleanups through the Department of Defense/State Memorandum of Agreement (DSMOA). The military installations listed below are covered by the agreement. The installations with an asterisk have a landfill that is part of this investigation.

Army Installations

1. Kunia Military Reservation
2. Fort Shafter*
3. Schofield Barracks*
4. Tripler Army Medical Center

Navy Installations

1. Barbers Point Naval Air Station

2. Camp Smith
3. Pacific Missile Range Facility, Kauai
4. Pearl Harbor Fleet Industrial Supply Center
5. Lualualei Naval Magazine
6. Pearl Harbor Naval Public Works Center *
7. Pearl Harbor Naval Shipyard
8. Pearl Harbor Naval Station*

Air Force Installations

1. Bellows Air Force Station*
2. Hickam Air Force Base*
3. Hickam POL Pipeline and Fuel Storage Annexes
4. Kaala Air Force Station
5. Kaena Point Satellite Tracking Station
6. Kokee Air Force Station
7. Wheeler Army Airfield*

5.3.3 Department of Defense

DoD began environmental restoration activities in 1975 under its Installation Restoration Program (IRP). At that time, DoD was not legally required to address property impacted by past operations. This situation changed in 1980, however, when Congress passed CERCLA, also known as Superfund. This law requires all responsible parties to clean up releases of hazardous substances to the environment. The 1986 SARA refined and expanded CERCLA, and formally established the Defense Environmental Restoration Program (DERP) and its funding mechanism, the Defense Environmental Restoration Account.

Also during the 1980s, Congress recognized that DoD no longer needed some of its installations, and that realigning missions and workload at other installations could improve DoD's efficiency. This realization prompted Congress to authorize four rounds of base realignment and closure (BRAC) in 1988, 1991, 1993, and 1995. DoD is cleaning up both installations intended for transfer to non-DoD parties for other uses and realigned installations that remain DoD property.

After Congress approves the budget and appropriates the funding, DoD's environmental restoration (ER) funds for activities at active installations and formerly used defense sites (FUDS) properties are transferred to the Defense-wide, FUDS, Army, Navy, and Air Force ER accounts. The Army, Navy, and Air Force each manage their own ER accounts. The Army also oversees the U.S. Army Corps of Engineers execution of the ER account for the FUDS program. Environmental restoration at closing and realigning installations is funded through the BRAC account, but is managed as part of the DERP.

CERCLA and U.S. Code Title 10, Section 2701 are the primary legal authorities governing environmental restoration activities at DoD installations and FUDS properties. All DoD installations and FUDS properties follow requirements consistent with CERCLA. The CERCLA response process consists of several phases. Although some of these phases may overlap, DoD generally conducts activities in this order when addressing a site.

6.0 CONCEPTUAL SITE MODEL

A CSM is a visual aid showing how receptors may or may not be exposed to site-related contaminants. The CSM for this project was developed by integrating the individual characteristics of prototypical-closed landfills, and was used to develop a generalized understanding of each site. A CSM is the basis from which relative risk was determined. It is mimicked in the computer model, which follows an exposure "pathway" format.

6.1 Graphic Conceptual Site Model

The CSM (Figure 6-1) is a graphical depiction of the conceptual understanding of a lined/capped, lined, and an unlined site that includes a release of landfill contaminants to groundwater and subsequently to a public drinking water supply well.

Precipitation, infiltration, and the subsequent leaching of constituents from refuse into groundwater is the release mechanism. The amount, rate, and intensity of rainfall are factors in how much runs off to surface water bodies and how much ponds locally and ultimately infiltrates downward. Infiltration of rainwater is the release and migration driving mechanism because of the leachate created as water passes through landfilled materials (i.e. waste, refuse) and beyond. The infiltration rate is dependent on several factors that include landfill capping, soil types, and topography.

Upon reaching the basal aquifer, constituents migrate laterally with groundwater. If drinking water supply wells are downgradient of the source (or within a well's capture zone) and screened within the impacted aquifer, human receptors can potentially be exposed to the constituents in the groundwater mainly via ingestion.

6.2 Diagrammatic Conceptual Site Model

The CSM diagram (Figure 6-2) represents the relationships among contaminant sources, release mechanisms, exposure pathways and routes, and receptors. The diagram serves to summarize how potentially contaminated groundwater at these sites may impact drinking water receptors. The following section describes the CSM based on the typical site characteristics of landfills being considered in this investigation.

6.2.1 Sources

For the purpose of this discussion, the source of contaminants in groundwater, which is the primary focus of this investigation, is landfilled refuse and the subsequent leachate. Note that (1) the constituents being released from the source area will vary depending on the type of wastes present at the individual landfill (Table 6-1) and (2) that the concentration of constituents being released from the source area is dependant on a number of variables such as quantity of refuse, if the landfill is capped (Figure 6-3), if the landfill is lined (Figure 6-4), soil type, chemical conditions (reducing or oxidizing environment), geography, and the length of time the source has existed.

According to the HISWAP, the potential for contamination associated with landfills, dumps, and historic dumps is very high. This determination was based on the nature of the activities, contaminants associated with those activities, and past record of groundwater and/or surface water contamination regardless of whether any environmental standards were exceeded. This ranking did not take into account any site-specific practices such as pollution prevention or protection measures (e.g., liners or caps) (State of Hawaii-DOH-SDWB, 2004).

6.2.2 Release Mechanism

Precipitation, infiltration, and the subsequent leaching of constituents from refuse into groundwater is the release mechanism.

6.2.2.1 Precipitation

The amount, rate, and intensity of rainfall are factors in (1) how much runs off to surface water bodies and (2) how much ponds locally and ultimately infiltrates downward.

6.2.2.2 Infiltration

Infiltration of rainwater is the release and migration driving mechanism because of the leachate created as water passes through landfilled materials and beyond. The infiltration rate is dependent on several factors that include landfill capping, soil types, and topography.

- Uncapped portions of a landfill allow precipitation to infiltrate and leach the refuse (which is the constituent source). Landfills with unlined and/or un-compacted bottoms allow constituents in the leachate to migrate downward into the basal aquifer.
- Soil characteristics such as drainage traits and thickness can retard the infiltration rate.

6.2.2.3 Leaching

Contact between refuse and water (via infiltration of precipitation) produces leachate. Landfill leachate is a polluted liquid characterized by elevated constituent concentrations, elevated chemical and biological oxygen demand, and hardness. Leachate composition is a function of the composition of the refuse and the volume of infiltrating water (Born, 1987).

6.2.2.4 Migration

Upon reaching the basal aquifer, constituents migrate laterally with groundwater. The local geology determines whether the prevailing groundwater flow regime is (1) via fracture flow, which allows comparatively large quantities of groundwater to pass relatively unencumbered, or (2) via Darcy flow, which is slower and dependent on the interconnectedness of the pore spaces (permeability) in the subsurface.

An example of the release mechanism process is (1) precipitation infiltrating the uncapped landfill, (2) the subsequent leachate created as rainwater passes through landfilled material, and (3) constituents in the leachate being carried downward through the unlined bottom of the landfill into the basal aquifer.

6.2.3 Potential Exposure Pathway, Exposure Routes, and Receptors

An exposure pathway consists of a contaminant source, a receptor, and an exposure route that transports the contaminant to the receptor. Because the primary focus of this investigation is to assess the potential for individual landfills to contaminate the underlying drinking water

aquifer(s), the only media being considered is groundwater. Subsequently, the exposure scenario being considered is limited to drinking water consumers coming in contact with impacted groundwater via ingestion, dermal contact, and inhalation.

7.0 ENVIRONMENTAL SETTING

Oahu is the third largest of the eight major islands in the Hawaiian Archipelago and has a land area of approximately 596 square miles (Shade and Nichols, 1996; Figure 7-1). Oahu consists of the eroded remnants of two elongated shield volcanoes (Waianae and Koolau Ranges) with broad, low profiles that were built during the Pliocene and Pleistocene epochs (Stearns and Vaksvik, 1935 and 1938; Hunt 1996).

Weathering and erosion have altered the original shield-shaped surfaces of the volcanoes. Much of the original subaerial mass has been removed, especially in the windward regions, leaving the interior highlands with deep valleys and steep ridges (Hunt, 1996).

7.1 Land Use and Demographic Characterization

Land use on Oahu has changed dramatically in historical times, particularly in central Oahu. At one time, much of Oahu was natural, riparian, or used for agricultural purposes. During the past several decades, the plantation agriculture that dominated for 100 years has seen an incursion of commercial and suburban development. The resident population of Oahu has more than doubled from 353,006 in 1950 to 876,151 in 2000 (Department of Business, Economic Development, and Tourism [DBEDT], 2001a). Currently, land use on Oahu is classified as approximately 40 percent conservation (mostly forest reserves), 30 percent agricultural, and 30 percent urban The principal industry is tourism, followed by military and agricultural (United States Geological Survey [USGS], 1998). The City Development Plan District Map is included as Figure 7-2.

7.2 Climate and Meteorology

The Hawaiian Islands have a wide range of climatological areas that vary in accordance with geomorphology, elevation range, and geographic position of each individual island (Pierce, 2000). These factors are relevant in understanding the hydrology of an area.

7.2.1 Temperature

The average yearly temperature is approximately 76 degrees Fahrenheit (°F) below altitudes of 550 feet, with monthly average highs between 76°F and 88°F and average lows between 65°F and 72°F (DBEDT, 1999). There is a decrease in temperature with increasing altitude of

approximately 3°F per thousand feet. Temperatures are highest in August and September and lowest in January and February.

7.2.2 Wind

Oahu is within the belt of the northeast trade winds, which dominate its climate as well as that of the other Hawaiian Islands. The mean wind speed is approximately 11 miles per hour and the prevailing wind direction is east-northeast, the direction of the trade winds. The windward section of the island generally has a consistent year-round supply of trade winds that bring precipitation, which recharges the island's aquifers.

7.2.3 Rain

The distribution of rainfall differs markedly from the wet interiors to the dryer coastal and leeward areas (Figure 7-3). The pronounced pattern of "orographic rainfall" is associated with the persistent trade winds, which force moist oceanic air up and over the mountainous terrain of Oahu (Hunt, 1996). The warm moisture-laden air cools as it rises over the Koolau and Waianae Ranges. As the warm air cools, the moisture in the air changes from vapor to liquid and is released as precipitation. Subsequently, rainfall varies widely with the higher slopes of the windward areas receiving enough rainfall to support rainforest vegetation while the leeward sides of the island are more arid due to the "rain-shadow" effect.

The average annual rainfall ranges from greater than 700 centimeters (cm) in the higher elevations of the Koolau Range, 125 cm at Mililani (central Oahu), 75 cm at Waipio (south central Oahu), to less than 60 cm at Waianae (western Oahu) and Honolulu (southeastern Oahu) (State of Hawaii-Department of Land and Natural Resources [DLNR], 1986). During the winter months there are occasional cold front storms and often-related southwesterly "Kona" winds that bring rain to the entire Hawaiian Island chain. There are generally three pairs of high rainfall months: March through April, July through August, and November through December (Takasaki et al., 1969).

The Hawaiian Islands experience periods of drought about every 3.3 years. These events generally do not exceed six months in duration (Giambelluca et al., 1991). Seasonal droughts are often associated with the El Nino weather phenomenon in Hawaii, as El Nino is found to be associated with drier than normal winters. Most drought events are associated with higher than

normal temperatures, and groundwater levels in many areas are observed to decline during droughts.

7.3 Physiographic Provinces

Oahu is composed of four physiographic provinces, which are the Schofield Plateau, Waianae Range, Koolau Range, and the coastal plain (Figure 7-4).

7.3.1 Schofield Plateau

Erosion has been less severe on the Schofield Plateau in central Oahu, which forms the saddle between the Waianae and Koolau Ranges. The Schofield Plateau was formed by the burial of the older Waianae lavas by the younger lavas of the Koolau volcano. The surface topography of the plateau ranges from nearly flat to deeply dissected terrain rising up to the mountain ranges east and west of the plateau. The crest of the plateau forms a natural drainage divide for the island. The soils of the plateau are well suited for cultivation and a large acreage was once used for sugarcane and pineapple (Foote et al., 1972).

7.3.2 Waianae Range

The Waianae Range, on the western part of the island, is approximately 22 miles long. It is rough and mountainous with low ridges and very steep slopes (Foote et al., 1972).

7.3.3 Koolau Range

The Koolau Range, on the eastern portion of the island, is approximately 37 miles long. It is deeply dissected by numerous drainage ways. Along the northern side the Koolau Range is a sheer cliff that rises from the ocean's edge to more than 2,500 feet (Foote et al., 1972).

7.3.4 Coastal Plain

A broad coastal plain, underlain by sedimentary deposits and varying greatly in width, surrounds much of Oahu. The coastal plains adjacent to the ocean formed from coral reefs and alluvial sediments. They have smooth gentle slopes and are mostly used for farming, ranching, and urban development. The coastal plain along southern Oahu is the largest in the Hawaiian

Islands. It reaches its maximum width of nearly six miles at Pearl Harbor in the re-entrant between the Koolau and Waianae ranges (Foote et al., 1972).

7.4 Soil

Soil may be defined as the unconsolidated material occurring from the ground surface to five feet below ground surface (bgs). Soil on Oahu consists primarily of the weathered remnants of the original basaltic surface and is typically clayey or silty. It is typically deep red, lateritic, soil lithosol having a loose and generally porous structure (U.S. EPA, 2003a). Surface soil type and its corresponding properties are relevant to this investigation because these properties dictate the soil's attenuation capacity and can prove to be key in determining the fate and transport of constituents of potential concern (COPCs). The significance of soil attenuation considerations can be attributed to the fact that soil is the first material through which infiltrating water and associated contaminants pass prior to reaching groundwater. Soil's attenuation capacity is attributable to several factors including drainage characteristics, pH, and organic carbon content.

The *August 1972 United States Department of Agriculture (USDA) Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii* and the USDA Natural Resources Conservation Service' update information (http://www.ctahr.hawaii.edu/soilsurvey/soils.htm.) were utilized to identify and evaluate soil conditions at each of the inactive landfills. In the 1972 USDA soil survey, soil types are established by their characteristics; therefore, each soil type has a description and corresponding parameter information. Each soil type is also assigned a soil map symbol. These map symbols (e.g., AeE) are assigned to land parcels that are covered by a particular soil type. Thirteen key parameters for each soil type were selected. The parameters were selected based on their hydrogeologic properties in connection with drinking water contamination susceptibility (Table 7-1).

7.5 Geology

The first published studies concerning the geology and groundwater resources of Oahu were by Stearns and Vaksvik (1935; 1938) and Stearns (1939; 1940). These studies describe the general stratigraphy and structure of Oahu. Stearns' *Geologic and Topographic Map of the Island of Oahu* (1938) was used to identify the geologic unit that each landfill is situated upon.

Volcanic rocks on Oahu exist in four major forms: lava flows, dikes, pyroclastic deposits, and heavily weathered volcanic rock known as saprolite (Oki et al., 1998)

7.5.1 Waianae and Koolau Volcanoes

The island of Oahu is formed primarily from the lavas of two late Tertiary shield volcanoes: Waianae Volcano (approximately 3 million years old) forming the western part, and Koolau Volcano forming the eastern part (approximately 2 million years old) (Stearns, 1946). Following the initial mountain building phase, there was a period of quiescence during which both volcanoes were deeply eroded. This is referred to as the post-shield volcanism and mass wasting period (Presley et al., 1997). The Waianae Volcano became dormant first, as evidenced by the overlapping of the westward-dipping flows of the Koolau Volcanic Series, particularly in the Schofield Plateau area.

The Koolau dome and the lower portion of the Waianae dome consist mainly of thin basaltic flows (generally less than 10 feet in thickness). The Schofield Plateau, which lies between the two volcanoes, consists of lavas from the younger Koolau Volcano ponded against the eroded lower slopes of the Waianae Volcano.

The shield-building rocks vary widely in origin, chemical composition, and texture. The shield-building stage rocks of the Waianae and Koolau Volcanoes are known as the Waianae Volcanics and the Koolau Basalt, respectively (Stearns and Vaksvik, 1935, Macdonald et al., 1990). The Koolau Basalt is wholly of basaltic composition, whereas the Waianae Volcanics are lithologically diverse. These rocks form the uplands and mountains of western and eastern Oahu. The Waianae and Koolau Volcanoes have collapsed calderas near their summits. A common trilinear pattern of rift zones results from upward thrusting from beneath each volcano, and the caldera results from the relaxing of this same upward thrust (Macdonald et al., 1990). These features are now mostly eroded away.

In the post-eruption stage, the volcanoes have undergone substantial modification by secondary geologic processes, including subsidence due to gravitational loading, weathering, and sedimentation. Fluvial and marine erosion proceeded contemporaneously with subsidence and continue to the present. Fluvial erosion has incised relatively broad deep stream valleys on the steeper western slopes of the Waianae Range and eastern slopes of the Koolau Range. In contrast, gentler slopes such as those found on the Schofield Plateau in central Oahu have inhibited stream incision and resulted in shallower and narrower gulches separated by broad and little-dissected plateaus or interfluves (Hunt, 1996).

7.5.2 Dikes

The rift zones, mentioned earlier, are now marked by swarms of closely spaced, nearly vertical and parallel dikes (Takasaki and Mink, 1984), and figure importantly in groundwater reservoirs. Dikes are thin, near-vertical sheets of massive, low-permeability rock that intrude existing rocks. Dikes can extend vertically and laterally for long distances and impede the flow of groundwater. Within a dike complex, dikes intersect at various angles and compartmentalize the more permeable rock in which groundwater can be impounded.

7.5.3 Pyroclastic Rocks

Pyroclastic rocks include ash, cinder, spatter, and larger blocks.

7.5.4 Saprolite

Saprolite on Oahu is a clay-rich thoroughly decomposed rock formed by in-situ weathering of basalt. Saprolite is generally found beneath the soil and subsoil. Saprolite retains some textural and structural features of the parent rock, such as vesicles, fractures, and relict minerals. Saprolite generally has a thickness of about 50 to 150 feet but in areas of high precipitation, saprolite may be as much as 300 feet thick. Rocks with a high proportion of pore space and surface area, such as ash, cinder, and aa clinker, weather preferentially; weathering of massive rock proceeds more slowly (Hunt, 1996). Beneath the saprolite lies basalt. In places, the basalt immediately beneath the saprolite exhibits some moderate weathering. This zone of weathered basalt is a transition zone between the highly weathered saprolite and fresh basalt.

7.5.5 Coastal Plains

On the coastal plains, most materials are comprised of sedimentary rocks, calcareous reef material, and windblown calcareous beach sand. The sequences of coastal plain deposits locally form aquifers, but these aquifers are of minor importance because of the small volume of water contained in them (Hunt, 1996).

Terrestrial and marine sedimentary deposits created coastal plains during the quiescent period following the formation of the two volcanoes. The present broad coastal plain in southern Oahu is the culmination of a succession of marine sedimentary deposits composed of chemical precipitates of calcium carbonate (i.e., reef limestone, lagoon mud, and marl) interspersed with

layers of terrestrial alluvium (i.e., poorly sorted basaltic sediments from sand to boulder size) and volcanic material.

The coastal plain contains a wedge of sediments known in Oahu as caprock, named because of the relatively low permeability of its lower layers and its ability to act as a partially confining layer which restrains the upward and seaward movement of fresh groundwater from the volcanic basal aquifer. Rainfall, surface water, and runoff discharge are prevented from percolating into the underlying aquifer. Caprock overlies volcanic sequences and fills valleys along the coastal plains. It also forms a cover overlying the volcanics along much of the Oahu coastline, and is generally only about 1/500th as permeable as the main island volcanic aquifers (Hufen et al., 1980).

7.5.6 Depositional Shelves

Depositional shelves, built by coral reefs and sediment, were submerged and are now found at various depths around Oahu. Valleys formed very early during the erosional period were filled by marine, estuarine, and terrestrial sediments as island subsidence raised the base level of streams and drowned their lower coastal reaches (Hunt, 1996). Ancient reefs and other marine deposits interbedded with terrestrial sediments underlie much of Oahu's coastal plain. The interbedded nature of these deposits was caused by glacio-eustatic fluctuations in sea level on the order of hundreds of feet during the Pleistocene (Stearns, 1978).

7.6 Hydrogeology

Groundwater on Oahu occurs in two principal hydrogeologic units: the basal aquifer and the caprock aquifer. The basal aquifer exists as a confined lens of freshwater that floats on and displaces saltwater within the pore spaces, voids, and fractures in the basalt lava flows that form the underlying mass of Oahu. The caprock aquifer consists of various unconfined or semi-confined aquifer units within the series of marine and terrigenous sediments overlying the basalt lavas. The low permeability of the sediments at the base of the caprock and the artesian nature of the underlying basal aquifer inhibit the downward migration of groundwater from the caprock aquifer to the basal aquifer (Wentworth, 1951).

The main water-bearing rocks on Oahu consist of permeable basaltic lava flows, dikes, volcanic breccia, pyroclastic deposits of cinders or tuff, saprolite and weathered basalt, and volcanically derived sedimentary rocks (Takasaki et al. 1969; Hunt 1996).

The principal groundwater reservoirs in Oahu are located in subaerial, rather than submarine, formed basaltic lava flows. These subaerial flows now reach well below sea level because of extensive island subsidence that has progressed over time. Much of the groundwater apparently occurs in interconnected reservoirs that are impounded by dikes in the rift-zone areas or in reservoirs that are dike free in the flank areas of the volcanoes. Because dikes retard the flow of water, they impound and store water behind them (Takasaki and Mink, 1984).

The most extensive and productive basal aquifers on Oahu are in permeable (highly vesicular) basaltic igneous rocks. Similar vesicular basaltic lava flows make up the highly productive basal aquifers of Central Oahu.

Aquifer nomenclature for Oahu evolved historically without a consistent approach, resulting in a mixture of named and unnamed aquifer references. Examples of unnamed references are "the highly permeable volcanic-rock aquifer" and "the basal aquifers of the Honolulu area." References to named aquifers have implied correspondence with rock-stratigraphic units, such as the "Waianae aquifer" and "Koolau aquifer", or have invoked other locality names, such as "the Pearl Harbor aquifer." Mink and Sumida (1984), noting the lack of an orderly procedure for naming aquifers in Hawaii, proposed a systematic aquifer classification for the major islands of Hawaii (later revised for Oahu by Mink and Lau (1990)) (Hunt, 1996).

7.6.1 Principal Regional Aquifers

The Koolau aquifer in the Koolau Basalts (lava from the Koolau Volcano) and the Waianae aquifer in the Waianae Volcanics are the principal volcanic-rock aquifers of Oahu. These two principal volcanic-rock aquifers are composed mainly of thick sequences of permeable, thin-bedded lava flows. The aquifers combine to form a layered aquifer system throughout central Oahu where the Koolau aquifer overlies the Waianae aquifer. They are separated by a regional confining unit formed by weathering along the Waianae-Koolau unconformity, which marks the eroded and weathered surface of the Waianae Volcano buried by younger Koolau lava flows (Hunt, 1996).

7.6.2 Hydrologic Properties

Hydrologic properties of these aquifers are quite variable from place to place as a consequence of the factors below.

7.6.2.1 Porosity

Porosity is that fraction of the total rock volume that is void space. Estimates of the porosity of Hawaiian lavas range from less than 0.05 to 0.50 (Peterson and Seghal, 1974; Nichols et al., 1996). Vesicles, which make up a large part of the total volume of the lavas and contribute greatly to the porosity, are seldom interconnected and have little effect on permeability. Connected porosity (through which water may flow) is believed to be generally less than 10% (U.S. EPA, 2003a).

7.6.2.2 Permeability

The permeability of the unweathered rock that makes up basal aquifers is generally high. The principal flow structures contributing the high permeability are clinker layers associated with aa, lava tubes in pahoehoe, irregular openings between the thin flows, and contraction joints. Because most of the features that contribute to permeability lie parallel to flow surfaces, the stack of tabular units may be several orders of magnitude less conductive vertically than horizontally (U.S. EPA, 2003a).

7.6.2.3 Hydraulic Conductivity

The water transmission properties of aquifers are expressed in terms of their hydraulic conductivity. Higher hydraulic conductivity results in a more transmissive aquifer. Since volcanic rock aquifers are composed primarily of laterally spreading lava flows, the hydraulic conductivities are expected to be greatest along the direction of lava flows and least perpendicular to sequences of lava flows. Although volcanic rock aquifers are generally very permeable, the hydraulic conductivity values vary greatly due to the mode of emplacement of these rocks. The general hydraulic conductivity ranges of the volcanic rock aquifers are as follows:

- The hydraulic conductivity of the Koolau lava flows is on the order of 670 to 2,670 feet per day (Wentworth, 1951).
- The hydraulic conductivity of a dike complex can be as low as 0.01 feet per day (State of Hawaii-DOH-SDWB, 2004).
- Pyroclastic deposits have hydraulic conductivity values of between 1 and 1,000 feet per day. Compaction and weathering can reduce the permeability; weathered ash beds

commonly act as thin confining units within lava sequences (State of Hawaii-DOH-SDWB, 2004).

- The hydraulic conductivity of saprolite is generally less than 1 foot per day (State of Hawaii-DOH, 2004). As basalt weathers to saprolite, its pore structure is altered and, generally, permeability is decreased as secondary clay minerals fill in pore spaces. In some areas, the permeabilities are low enough to create locally perched water tables within the saprolite zone (U.S. EPA, 2003b).

As previously mentioned in Section 7.5, Stearns' 1938 geologic map was used to identify the geologic unit that each landfill is situated upon. Subsequently, Hunt's "rock types" were correlated to Stearns' geologic units (Table 7-2) to identify the appropriate hydraulic conductivity to use for each landfill when no site-specific hydraulic conductivity values were available. The median of the regional hydraulic conductivity range for a specific "rock type" (Hunt, 1996) was used in the numerical model (Table 7-3).

7.6.3 Hydraulic Gradient

Hydraulic gradient is the driving force behind groundwater movement. Hydraulic gradient is determined by dividing the change of hydraulic head by the flow distance. Values of hydraulic gradient are unitless. Where vertical gradients are negligible in an unconfined aquifer, hydraulic gradient is the slope of the water table. Generalized groundwater flow directions on Oahu are depicted in Figure 7-5.

7.6.4 Aquifer Identification and Classification

As previously mentioned, in response to the need to identify and describe aquifers of Oahu to serve as a framework for groundwater protection strategy, a program was initiated to classify and assign codes to the principal aquifers of Oahu. DOH contracted the Water Resources Research Center (WRRC) from the University of Hawaii for this project. Aquifers in Oahu were identified and classified from 1990 to 1993. Data from this program are presented in the *Aquifer Identification and Classification for the Island of Oahu: Groundwater Protection Strategy for Hawaii* (Mink and Lau, 1990).

The WRRC identified general aquifer sectors and smaller aquifer systems. Each aquifer system was divided into aquifer types characterized by hydrologic factors such as basal, high level, unconfined, confined, and confined/unconfined conditions, and geologic factors such as flank, dike, perched, sedimentary, or combination aquifer types. They also identified the status of the

aquifer types through identification of their development stages, potability/salinity, utility, uniqueness, and vulnerability to contamination. This information provides insight into how the aquifers were formed and the natural conditions that may or may not protect them from anthropogenic impacts such as leachate from landfills.

This report provides Aquifer Codes and Status Codes for the island of Oahu. The Oahu classification includes 6 Aquifer Sectors, 24 Aquifer Systems, and 90 Aquifer Codes (Figure 7-6).

7.6.4.1 Aquifer Codes

The Aquifer Codes incorporate locational and descriptive indices. Each Aquifer Type within an Aquifer System is assigned an Aquifer Code consisting of an eight-digit number. An Aquifer Code is unique and non-repeatable in the State.

7.6.4.2 Status Codes

The Status Codes indicate the developability, utility, quality, uniqueness and vulnerability to contamination of the groundwater resources. Accompanying the Aquifer Code is a Status Code of five digits. A Status Code is specific to an Aquifer Code.

The Status Code portion of this classification system, particularly the vulnerability to contamination of the groundwater resources, was utilized to quantify and ultimately prioritize sites by potential threat to drinking water.

7.6.5 Vulnerability

U.S. EPA defines vulnerability as: “the relative ease with which a contaminant applied on or near the land surface can migrate to the aquifer of interest...”

Aquifer types have varying levels of vulnerability to contamination. Aquifers contained or confined by caprock are less prone to contamination whereas unconfined aquifers have a higher vulnerablity to contamination (State of Hawaii, 1998).

The vulnerability determination applied in Mink and Lau’s WRRC study was based upon the geographical limits of the resource, interconnection among groundwater sources, relatively rapid

time of groundwater travel, and familiarity with environmental conditions. Vulnerability was ranked as high, moderate, or low. Sixty-six of Oahu's aquifers are unconfined and therefore "highly vulnerable to contamination." Aquifers that have landfills situated over them and have a high vulnerability to contamination are tabulated in Table 7-4.

Vulnerability to contamination has been confirmed by the widespread detection of pesticides and herbicides in the aquifers beneath agricultural fields (USGS, 1998). For example, pesticides that were used by the pineapple industry have leached through thick layers of soil, saprolite, and unsaturated (vadose zone) basalt and have entered into portions of the Pearl Harbor aquifer, with the natural recharge of water by rainfall and by irrigation recharge. The estimated time for agricultural pesticides to travel through the unsaturated zone in the Mililani area, where the groundwater table lies several hundred feet below the ground surface was approximately 17 years (Orr and Lau 1987).

In addition, vulnerability to contamination has been confirmed by the more localized presence of volatile organic compounds (VOCs) beneath sites of known use or spillage (USGS, 1998).

7.7 Groundwater Supply

Of the total freshwater used on Oahu, approximately 90% is from groundwater and 10% is from surface water. Groundwater provides essentially all municipal and domestic water on Oahu. Irrigation and public supply are roughly equal as the two largest freshwater uses but a major shift in water use continues as sugarcane cultivation is replaced with diversified agriculture and urban development. Most of the water is derived from the extensive volcanic aquifers of thin-bedded basalts in central and southern Oahu. Although the depth to water is as great as 600 to 1,000 feet in the island's interior, the aquifers are unconfined and essentially "surficial" aquifers (USGS, 1998).

Groundwater pumpage from all sources averaged about 394 million gallons per day (gpd) in 1980. Of this, about 81 percent, or 318 million gpd, was pumped from the volcanic-rock aquifers of the island, with 238 million gpd being pumped from the southern Oahu area alone. About 19 percent, or 76 million gpd, of the total from all sources was derived from water-development tunnels, flowing wells, and pumpage from aquifers in the caprock (Nichols et al., 1996).

7.7.1 Freshwater and Saltwater

The aquifers of Oahu contain two flow regimes: shallow fresh water and deep salt water (Figure 6-1). These extensive bodies of freshwater are known as basal groundwater. Basal groundwater occurs when fresh water percolates into the saturated zone and displaces the underlying seawater. Essentially, the freshwater floats on the saltwater in a condition of buoyant displacement. The accumulating freshwater forms a lens-shaped body with a surface that extends above the surface of the saltwater due to the contrast in densities of freshwater and seawater. The water table or potentiometric surface of a basal-water body is typically very flat and no more than several feet to several tens of feet above sea level. The predominant volume of the freshwater body lies below sea level (U.S. EPA, 2003a).

7.7.2 Recharge

The amount of recharge available to enter aquifers is equal to the volume of rainfall, fog drip, and irrigation water that is not lost to evapotranspiration (defined below) or stored in the soil. Rainfall is spatially variable because of the island's topography and persistent northeasterly trade winds. Recharge is typically 10 to 50 percent of the rainfall, fog drip, and irrigation water. Runoff is typically about 10 to 40 percent of rainfall, but is higher where rainfall is high and slopes are steep and where rain falls on poorly permeable land surfaces. Evapotranspiration is the loss of water to the atmosphere by the combination of transpiration of plants and direct evaporation from land and water surfaces and can exceed 50 percent of rainfall. Water stored in the soil is available for plants or can eventually flow downward to recharge the aquifer (USGS, 2000).

Five regional fresh groundwater flow systems: the eastern, western, southeastern, northern, and southern Oahu, are sustained by precipitation (Figure 7.5). Groundwater divides within the Waianae and Koolau Ranges divert water into the interior flow system in central Oahu and exterior flow systems in western, eastern, and southeastern Oahu. Total predevelopment recharge to the freshwater flow systems has been estimated at 792 million gpd (40% of mean annual precipitation) of which 542 million gpd was recharge to the central Oahu flow system, the most heavily developed flow system on Oahu (Hunt, 1996).

Of the 521 million gpd of groundwater recharge to the non-caprock areas of southern and northern Oahu, about 199 million gpd derives from the Schofield groundwater area and those parts of the Koolau and Waianae rift zone adjacent to the Schofield area. About 103 million gpd

is estimated to move as underflow from the southern Schofield area into the Pearl Harbor and Ewa groundwater areas; while about 96 million gpd moves as underflow from the Schofield area into Waialua groundwater area (Nichols et al., 1996).

7.7.3 Groundwater Quality

The high quality of Oahu's groundwater has been the principal reason for its extraordinary development and utilization as a potable water source. Virtually all of Oahu's population is served by groundwater sources. Safeguarding water sources against contamination has been of paramount concern to water consumers and agencies in Hawaii.

In the 1920's the City and County of Honolulu's BWS designated, with foresight, the principal natural groundwater recharge areas as watersheds within the forest reserves and thus, restricted these areas from public entry and development. At the same time, the BWS instituted a monitoring program of physical, chemical, and microbiological water quality parameters. These combined actions virtually assured maintaining the potable quality of groundwater (Lau, 1987).

Since 1966 numerous research studies have investigated potential sources of groundwater contamination to the less protected portions of aquifers. None of these studies uncovered "real threats" to the groundwater quality (Lau and Mink, 1987). Sources investigated include cesspools, sugarcane irrigation return flow, and sanitary landfill leachate (Chun and Dugan, 1981; Lau, 1987).

Groundwater quality is governed by several natural parameters: the quality of water that recharges into the ground; the hydrologic, mineralogic, and chemical properties and the thickness of the soil and rock formations through which the water passes; the residence time and the flux of the water in aquifer formations; and the quality of the resident waters with which the recharge water may mix.

The land management strategy of zoning the high rainfall Koolau Range into conservation districts has kept these areas in their natural undeveloped state and as prime groundwater recharges areas. Their conservation designation has also protected the purity of rainwater percolating to and replenishing the aquifers (Lau, 1987).

However, certain anthropogenic activities, such as agricultural irrigation, wastewater injection practices, and landfills can change the quality of groundwater (Lau, 1987).

7.7.4 Groundwater Protection

The DOH established an Underground Injection Control (UIC) Line around the island of Oahu in 1984 to preclude the siting of certain types of facilities and activities mauka (landward) of these areas and the BWS established a No-Pass Line in the 1970s to protect drinking water resources.

7.7.4.1 Underground Injection Control Line

The UIC Program serves to protect the State's existing and future potable underground sources of drinking water (USDW) resources from chemical, physical, radioactive, and biological contamination that could originate from subsurface disposal/injection of wastewater.

The program regulations are accompanied by UIC maps, which demarcate a boundary line known as the "UIC Line." This boundary between non-drinking water aquifers and underground sources of drinking water was established by the Safe Drinking Water Branch of the DOH (Figure 7-7).

Areas makai (oceanward) of the UIC line are distinguished as areas considered suitable for injection well installation by DOH. Injection wells require a UIC Permit or Permit Exemption. Subject to agency approval, wastewater injection into the subsurface is permitted in coastal regions, while injection is not permitted inland. The Safe Drinking Water Branch of DOH provided coordinates of documented injection wells. The coordinates were used to create a GIS shape file of the injection wells (Figure 7-8). The groundwater makai of the UIC line generally has a high salinity concentration and is not used for drinking water purposes. A landfill that is makai of the UIC line is not likely to impact drinking water resources and subsequently drinking water consumers. Each landfill's geographic location relative to the UIC Line (makai or mauka) is listed in Table 7-5.

7.7.4.2 No-Pass Line

The No-Pass Line is the line between the Pass, No-Pass Zones, which divides areas of thick caprock and the basal aquifer (Figure 7-9). The No-Pass Line was established by the BWS. It is a regulatory tool to protect groundwater quality.

The No-Pass Zones are areas in which the installation of waste disposal facilities, which may contaminate groundwater resources used or expected to be used for domestic water supplies, are

prohibited. These No-Pass Zones are delineated on No-Pass Zone maps, which are used by the BWS as guidelines in implementing protection, development, and conservation of water resources.

Since 1987, DOH has administered the No-Pass Program. Each landfill's geographic location relative to the No-Pass Line (makai or mauka) is listed in Table 7-5.

7.7.4.3 Wellhead Protection Areas

Oahu's prime watersheds are very important. They allow the capture, filtration and percolation of rainfall into the underlying aquifers that sustain a population of over 900,000 people. Protecting watersheds protects the quality of drinking water, naturally and at minimal costs (State of Hawaii-DOH- Emergency Services Department [ESD], 2000).

Land use controls and permitting help protect and manage watersheds by preserving natural forests and open spaces, and restrict inappropriate land uses and activities. The County preservation zoning and State conservation district rules are the land use controls that protect watersheds from urban and agricultural encroachment. The Clean Water Act and Coastal Zone Management rules administer permit conditions on construction projects utilizing best management practices that minimize groundwater and surface water pollution (State of Hawaii-DOH-ESD, 2000).

Current monitoring efforts indicate that both aquifer quantity and quality are stable. The BWS, Commission of Water Resource Management (CWRM), and USGS have monitoring procedures to maintain hydrologic data from rain and stream gauges and monitor aquifers through monitoring well and production well sampling (State of Hawaii-DOH-ESD, 2000).

In addition, groundwater hydrologic computer models are being calibrated and validated with deep monitoring well data so that aquifer trends and pumpage optimization scenarios can be reasonably simulated and applied (State of Hawaii-DOH-ESD, 2000).

The 1986 Safe Drinking Water Act Amendment defines a wellhead protection area (WHPA) as "the surface and subsurface area surrounding a water well or wellfield, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or wellfield." (State of Hawaii, 1998).

Understanding how aquifers work and what activities may contaminate them provides the basis for protection policies and efforts. The Hawaii Wellhead Protection Program (HWHPP) and the HISWAP provide the application of assessment information necessary for policy and regulatory decision-making (State of Hawaii, 1998).

In April 1992, WRRC completed research on appropriate wellhead protection methodology for Hawaii. The study identified the necessary elements for establishing WHPAs and delineation methods. The criteria and criteria thresholds (the factors that determine the size of the WHPA) they recommended were distance, time of travel, and flow-boundaries. The study determined that due to the lack of detailed hydrological information, a simple delineation technique should be applied. Hawaii has complex hydrologic characteristics where infiltration and contaminant transport are more horizontal than vertical due to lava inclusions. The lack of detailed hydrological information precludes the use of sophisticated delineation techniques. WRRC's ideal protection area would be an aquifer protection area that encompasses the entire recharge area of a well. However, conflicts with landowners and inconsistent protection of adjacent and hydrologically linked aquifers are limiting factors to aquifer protection areas (State of Hawaii, 1998).

The EPA formally approved the HWHPP in 1995. The HWHPP is comprised of the program elements of:

- delineation of WHPAs,
- inventory of contamination sources within the WHPAs,
- development of management measures,
- development of contingency plans, and
- an infrastructure of stakeholder workgroups involved in the WHPAs.

DOH contracted Matthew Hagemann, EPA's hydrogeologist, to perform wellhead delineations, assessment, and vulnerability studies for the Central Oahu region of Oahu. Delineations were the initial step in a HWHPP demonstration project for the island. The report identified four wellhead protection areas extending from Pearl Harbor to Schofield Barracks and to Haleiwa (State of Hawaii, 1998).

These project areas were chosen because:

- past contamination of public water supply wells in the project area indicated significant groundwater vulnerability,
- numerous and significant sources of groundwater contamination had been identified,
- the wells in the project area constitute significant public water supplies for the island of Oahu, and
- sufficient data were available for the Central Oahu region.

To assess the WHPA's vulnerability to contaminants, its aquifer sensitivity or hydrogeological characteristics were characterized using WRRC data, and sources of contamination were identified within the WHPAs. Hagemann worked with DOH to apply GIS to combine map shape files of the WHPAs, land use and contamination data comprised of State land use districts, underground storage tank locations, water quality maps, and hazardous waste sites. Data shape files were layered to assess the vulnerability of each WHPA. The methodology developed during this study provided a significant step in identifying wellhead protection areas and assessing their vulnerability to surrounding contaminant sources (State of Hawaii, 1998).

The DOH wellhead vulnerability study recognized sugar and pineapple production activities, leaking underground storage tanks, and military facilities as significant sources of groundwater contamination in the Central Oahu region. Specifically, the 1995 Central Oahu study placed WHPAs I and III in a category of "confirmed vulnerability." In these areas, numerous leaking tanks and agricultural land uses have contributed to the degradation of groundwater to levels in excess of drinking water standards. In WHPAs II and IV, vulnerability was ranked as moderate because no point sources of contamination had been identified in the subsurface, and detections of chemicals were below State drinking water standards.

7.8 Surface Water

Surface water hydrologic patterns are dependent on the size and land use characteristics of drainage basins. Many basins on Oahu are urbanized in nature with streets, roads, and buildings producing large areas of impervious surfaces that generate near 100% runoff. In these urban areas stream flow is, for the most part, a measure of the rainfall amounts. Conversely, in areas that are basically uninhabited, soil type and vegetation are extremely variable and will dictate the amount of surface water runoff that is expected (Pierce, 2000). Oahu's surface water features are shown in Figure 7-10.

8.0 PROJECT GEOGRAPHIC INFORMATION SYSTEM DEVELOPMENT

GIS is a computer-based system capable of storing, managing, analyzing, and presenting geographic information via customized outputs. GIS stores information linked to geographic points within a coordinate system as a collection of thematic layers (known as coverages or shape files) that can be linked together by geography or thematic similarities. Geography acts as the framework for mapping features and events, and for studying their relationships and processes. This simple but extremely powerful and versatile concept of linking areas by characteristics of interest was critical to this project.

The GIS uses a geographic database as the warehouse for information. A geographic database is a collection of spatial data (e.g. parcels with specific coordinate boundaries) and related descriptive data that were used for a variety of purposes. ArcView Version 8.0, a leading GIS software package developed by Environmental Systems Research Institute, Inc. (ESRI), was used to perform the spatial analyses. The software system was used to analyze and model (manipulate, overlay, measure, compute, and retrieve) the digital spatial data and display the new map products and tabular resource information showing the results of the spatial analysis.

For example, each site's location was overlaid with a rainfall shape file to identify the amount of rainfall in the vicinity of each landfill. Additionally, each site's location underwent multiple layer analyses to reveal unique site information, further characterize the site, and identify relevant areas. Combining aquifer stratigraphy, aquifer vulnerability, and each site's location, for example, may reveal the landfills most likely to impact groundwater. This comparing of a variety of input data sources was an essential tool to identify and map drinking water wells "vulnerable" to releases from landfills.

The results of these types of spatial analyzes are maps, which graphically illustrate physical characteristics in the vicinity of each landfill and related tabular information that was used to populate the database.

Most of the shape files were retrieved from the State GIS website at the following address - http://www.hawaii.gov/dbedt/gis/. A detailed list of the original source and history of the various shape files is included in Table 8-1. All the shape files used in the investigation are projected in the Universal Transverse Mercator (UTM) zone 4 system referenced to the 1983 North American Datum (NAD 83).

9.0 DATABASE DEVELOPMENT

URS assembled information collected during the desktop audit and site reconnaissance in a Microsoft® Access 2000 database. The database includes fields covering the location, history, soils, geology, hydrology, and engineering (if any) of the sites. The database was developed using existing site information but has the flexibility to incorporate new data collected during subsequent phases of the project.

10.0 DESKTOP AUDIT

A desktop audit was performed to explore, analyze, and catalog publicly available information on the inactive landfills. Historical site information was gathered and assessed to develop an understanding of the nature and extent of groundwater impacts and to subsequently strategize potential corrective measures necessary to mitigate impacts. As information was obtained, URS personnel sorted through it to identify relevant information and data gaps, and then attempted to fill critical information needs.

URS initiated the project by examining the existing compilation of data on inactive landfills, including *Garbage in Paradise, A History of Honolulu's Refuse Division* (Young, 1993) and *Evaluation of Closed Landfills on Oahu* (Bagaosian, 1997), which were discussed in the report to the City Council of May 6, 2003. Additional BWS, ENV, DOH, and U.S. EPA resources on landfills were reviewed along with other materials in the public record. The focus of the file review and subsequent construction of the environmental database was based on information that is relevant to public health exposures.

A request for access to public government records was submitted to the C&C BWS, ENV, the Hazardous and Solid Waste and HEER branches of the DOH, and the U.S. EPA's CERCLIS and Archived Site databases. Available files were reviewed for results of site environmental investigations; types of permits held; available compliance information and monitoring data; actions taken by U.S. EPA, state agencies, or site operators to address contaminant releases from the site; and remedial activities and other risk management strategies implemented, planned, or proposed (including past, current, and future monitoring practices and/or institutional controls).

At a minimum, the following previously conducted studies were used to gather information about the sites:

- *Inventory of Potential Sanitary and Demolition Sites*, Shimabukuro and Associates, Inc., August 1977.
- *Supplement to Inventory of Potential Sanitary and Demolition Sites*, Shimabukuro and Associates, Inc., November 1979.
- *Garbage in Paradise, A History of Honolulu's Refuse Division*, City Department of Public Works, by Robert Young, 1993.
- *Solid Waste Integrated Management Plan Update*, State of Hawaii, DOH - Office of Solid Waste Management, 1995.

- *Evaluation of Closed Landfills on Oahu*, Apolla Bagaosian, 1997.
- *Final Supplemental Environmental Impact Statement - Waimanalo Gulch Sanitary Landfill Expansion*, RM Towill Corporation, December 2002.
- *Report of the Mayor's Advisory Committee (Blue Ribbon Committee) on Landfill Site Selection*, RM Towill Corporation and Pacific Waste Consulting Group, December 2003.
- *Report to the Twentieth* through the *Twenty-Second Legislature, State of Hawaii,* State of Hawaii, DOH, 1998 to 2003
- *Hawaii Source Water Assessment Program Report, Honolulu Board of Water Supply, Island of Oahu.* State of Hawaii, DOH - SDWB and University of Hawaii - WRRC, 2004.
- University of Hawaii-WRRC Technical Reports.

During the data collection process, emphasis was not placed on (1) landfills that are covered with semi-impermeable barriers (e.g., asphalt, buildings, etc.), (2) landfills currently being investigated under a separate project (i.e., Waipahu Ash Landfill), or (3) military landfills as most have been evaluated and mitigated.

11.0 SITE RECONNAISSANCE

A site reconnaissance was performed for each landfill mauka of the "No-Pass Line" (Table 11-1, Figure 11-1). Military landfills were excluded from site reconnaissance.

Site reconnaissance included a site walkover to make visual observations of existing site conditions and operations, recording Global Positioning System (GPS) waypoints of relevant landfill landmarks and pertinent receptor information, sketching site features, interviewing the landowner and/or lessees (if available) familiar with the site history, conducting a drive-by survey of the area, and photo-documentation of pertinent portions of the landfill. URS used a modified Phase I ESA level of approach. Table 11-1 includes a list of the sites that were visited, the dates the sites were visited, and a brief explanation regarding sites that were not visited.

Visual observations of existing site conditions and operations were made, where site boundaries were accessible and clearly defined. Issues concerning site accessibility were noted, including the presence, integrity, and suitability of warning signs, fences, gates, and other security measures, as well as physical signs that people or animals have gained access to the site. Depending on the vegetation, terrain, and accessibility, the site reconnaissance was limited to readily accessible roads located on the property. The site reconnaissance was limited to one day per site. Hand-held GPS locations for relevant landmarks were recorded and entered into a GIS data layer. Site sketch maps and photographs were also generated.

The site visit to each of the identified Oahu inactive landfills mauka of the No-Pass Line included:

- The landowner and/or lessees, or designees, who were familiar with the site history and operations, were interviewed.
- Portions of the site that may be impacted or have the potential to be impacted with hazardous substances were photographed. Select photographs are incorporated into Appendix A of this report.
- The locations of potential chemical, biological, or physical hazards (such as stacked drums, unexploded ordnance, pits, dams, dikes, and unsafe structures) at the site that may constitute a public health concern were sketched on a map.
- The locations of recreational uses of the site (such as dirt biking, camping, fishing, and hunting) and areas around or near the site (such as parks, playgrounds, and beaches) were sketched on a map.

- The presence of surface impoundments and smaller sources of contamination aside from the landfill itself (e.g., junk yards, gas stations, etc.) that could still contribute to contamination and/or exposure were noted.
- Adjacent properties were viewed from site boundaries, again assuming the site boundaries were clearly defined. If this was not the case, the site reconnaissance was limited.
- A drive-by survey of the area was conducted en route to the site to observe the general types of land use within the search area.
- A handheld GPS unit was used to locate documented and accessible drinking water wells. If other wells were noted in the area, they were photographed and their locations marked with the GPS unit. Additionally, the condition of accessible wells was noted because poor well integrity may increase the likelihood of groundwater contamination where surface runoff exists near well locations.

URS developed standard forms for the cataloging of data. Upon completion of the tasks described above, the data collected were assembled in a database. A brief narrative description of each site visit is included in Appendix A.

12.0 ANALYSIS

The analyses performed on each of the 76 inactive Oahu landfills are summarized in this Section. An individual landfill report that details the results of these analyses along with a brief narrative is included in Appendix A.

12.1 Climate

The amount, rate, and intensity of rainfall are factors in how much rainwater runs off to surface water bodies and how much rainwater ponds locally and ultimately infiltrates downward. GIS was used to overlay each site's location with digital spatial data (i.e., rainfall shape file) to identify the amount of rainfall in the vicinity of each site. The results of this spatial analysis were used to populate the database and are shown in Figure 7-3, which graphically illustrates the amount of rainfall in the vicinity of each landfill. Precipitation information was gathered from the State of Hawaii DLNR *Rainfall Atlas of Hawaii* (Giambelluca et al, 1986).

12.2 Regional Soils

Soil characteristics such as drainage traits and thickness can retard infiltration rates and subsequently influence potential releases. GIS was used to overlay each site's location with digital spatial data (i.e., soil type shape file) to identify soil types at and near each site. The results of this spatial analysis were used to populate the database. Information on soil conditions was gathered from the U.S. Department of Agriculture Soil Conservation Service's *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii* (Foote et al., 1972).

12.3 Hydrogeology

The characteristics of the aquifer system over which a landfill lies determines the aquifer's susceptibility to contamination. GIS was used to overlay each site's location with digital spatial data (i.e., aquifer shape file) to identify the aquifer(s) that underlie each site. The results of this spatial analysis were used to populate the database and are shown in Figure 7-5, which graphically illustrates which aquifer underlies each landfill. Aquifers underlying the landfills and their corresponding vulnerability were identified using Mink and Lau's *Aquifer Identification and Classification for Oahu: Groundwater Protection Strategy for Hawaii* (1990).

12.4 Underground Injection Control and No-Pass Lines

Each landfill's geographic location relative to the UIC and No-Pass Lines were used as an indicator in determining if the landfill poses a potential threat to the underlying drinking water source. GIS was employed as a means of comparing each landfill's geographic location relative to the UIC and No-Pass Lines. The results of this spatial analysis were used to populate the database and are shown in Figures 7-6 and 7-8, which graphically illustrates each site's location relative to the UIC and No-Pass Lines, respectively. The Safe Drinking Water Branch of DOH provided the UIC Line shape file. The No-Pass Line shape file was provided by the BWS.

12.5 No-Pass Line and Drinking Water Wells vs. Landfill Locations

The potential of each landfill to impact drinking water wells was evaluated based on its proximity to the No-Pass Line and drinking water wells. Drinking water wells include both "domestic", "military", and "municipal" wells. BWS wells are a subset of the "municipal" wells. The BWS and the DLNR provided GIS shape files and associated tables of documented public and private groundwater wells. Details concerning the use of the wells, well depth, installation dates, and locations were included with the GIS shape files.

Each inactive landfill's geographic location relative to drinking water wells was used to determine if the site poses a potential threat to drinking water consumers. It should be noted that proximity to an inactive landfill alone does not mean that a particular well has been impacted, only that, the well could be impacted if there were a release from the associated landfill.

GIS was employed as a means of comparing each landfill's geographic location relative to the locations of drinking water wells (provided by DLNR) and the No-Pass Line to identify and map landfills that may affect these drinking water wells. This was accomplished by plotting a one-mile radius around each landfill along with:

- All the BWS wells on the island of Oahu (Appendix B -Table B-1, Figure 12-1)
- All well types (municipal, military, irrigation, industrial, domestic, observation, etc.) located in the Schofield Plateau (the area determined to be most vulnerable to releases) (Appendix B - Table B-2, Figure 12-2)
- Drinking water wells in the Schofield Plateau (Appendix B - Table B-3, Figure 12-3)

- All types of BWS wells in the Schofield Plateau (Appendix B - Table B-4, Figure 12-4)
- BWS drinking water wells in the Schofield Plateau (Appendix B - Table B-5, Figure 12-5)

Based on this spatial analysis, landfills were then separated into the following three categories (Figure 12-6):

CATEGORY 1: Mauka of the No-Pass Line (i.e., located over potable aquifers) and within one mile of drinking water wells. These landfills have the highest potential to impact drinking water wells.

CATEGORY 2: Mauka of the No-Pass Line and greater than one mile from the nearest drinking water well. These landfills have a moderate potential to impact drinking water wells.

CATEGORY 3: Makai of the No-Pass Line and not anticipated to affect drinking water wells based on the distance from the nearest drinking water well. These landfills have the lowest potential to impact drinking water wells.

Landfills in Category 1 were given the highest priority during data collection because they are the most likely to impact potable aquifer water supplies (Table 12-1, Figure 12-7). Relative risk modeling was only performed on landfills in Category 1. Military landfills were excluded from risk modeling.

Twenty-three landfills were determined to lie within one mile of a drinking water well (Table 12-2). Of those 23 landfills, 12 landfills are also located mauka of the No-Pass Line (Table 12-3). Details on the drinking water wells (well number, name, owner, etc.) that are located within one mile of a Category 1 landfill are included in Table 12-4. The results of this spatial analysis are shown in Figure 12-8.

12.6 Hawaii Source Water Assessment Program

The HISWAP Report (2004) prepared by the DOH-SDWB and the University of Hawaii-WRRC modeled capture zones for each BWS well. A capture zone is an areal demarcation of the portion of an aquifer that contributes groundwater to a well during a certain period of pumping. Capture zones in the HISWAP report were delineated using the USGS three-dimensional

groundwater model MODFLOW and the contaminant flow model MODPATH. The calculations used to create the capture zones considered the surrounding hydrogeologic properties of the underlying aquifer such as conductivity, porosity, and groundwater gradient. Modeling also took the characteristics of each well (i.e., depth and pumping rate of the well) into consideration.

Three different capture zones were delineated for each BWS well. The capture zones determined for each well represent 1) the area defined by a 50-foot radius (Zone A), 2) a two-year pumping period (Zone B), and 3) a 10-year pumping period (Zone C). It is assumed that contamination within the capture zone of a well could potentially affect the well.

GIS was employed as a means of comparing each landfill's geographic location relative to the HISWAP delineated capture zones to identify and map landfills that may affect drinking water wells.

Fifteen of the 76 landfills were determined to lay within the BWS well capture zones predicted by the HISWAP report (Table 12-7, Figure 12-9). Seven landfills were determined to lie within the 2-year capture zone (Zone B) of a BWS well (Table 12-5). Eight landfills were determined to lie within the 10-year capture zone (Zone C) of a BWS well (Table 12-6). The results of this spatial analysis are tabulated in Table 12-7 and shown in Figure 12-9.

Of the fifteen landfills that fall within HISWAP delineated capture zones, only five are also Category 1 Landfills (Table 12-8, Figure 12-10). The five landfills are Mililani Old Landfill, Oahu sugar Dump 3, Oahu sugar Dump 5, Oahu Sugar Dump 6, and Wahiawa Dump A.

12.7 Interrelationships of Category 1 Landfills, Landfills within a BWS Capture Zone, and Landfills Associated with Impacted BWS Wells

12.7.1 Category 1 Landfills

Twelve landfills were determined to be Category 1 landfills. Seven of the 12 landfills determined to be Category 1 landfills are associated with BWS wells that had at least one constituent detected above the method detection limit and/or the reporting limit (Table 12-9).

12.7.2 Landfills within a BWS Capture Zone

Fifteen landfills were determined to lay within the BWS well capture zones. Eleven of the 15 landfills determined to lie within the BWS well capture zones are associated with BWS wells that had at least one constituent detected above the method detection limit and/or the reporting limit (Table 12-10).

12.7.3 Landfills Associated with Impacted BWS Wells

As stated in the HISWAP, the only direct evidence that a drinking water source is susceptible to contamination is detection of contaminants in the water extracted from the well. DOH and BWS currently monitor water sources for a number of constituents. As part of the HISWAP report, electronic data generated from DOH's monitoring program (1995 to 2004) were electronically linked to the potential contaminating activities (PCA) table of the HISWAP report, which lists contaminants commonly associated with particular activities. Incidentally, one of the PCAs included in that table is "landfills/dumps/historic dumps."

Thirty-seven BWS wells were found to lie within one-mile of Category 1 landfills. Some wells lie within one mile of multiple landfills. According to the HISWAP report, of those 37 wells, 24 wells had at least one constituent detected above the method detection limit and/or the reporting limit (Table 12-9). Wells with at least one constituent detected above the method detection limit and/or the reporting limit are hereafter referred to as "impacted wells." HISWAP tables that include the constituent concentrations previously detected in the subject wells are included in Appendix C.

Forty-three BWS wells have a landfill that lies within their capture zone. Some landfills fall within the capture zone of several wells. According to the HISWAP report, of those 43 wells, 23 wells had at least one constituent detected above the method detection limit and/or the reporting limit (Table 12-10). HISWAP tables that include the constituent concentrations previously detected in the subject wells are included in Appendix C.

Seventeen impacted BWS wells lie within one-mile of Category 1 landfills and have landfills within their capture zones (Table 12-11).

13.0 RISK MODELING USING THE FRAMES MODEL

As mentioned in Section 12.0, relative risk modeling was only performed on landfills in Category 1 (landfills with the highest potential to impact drinking water wells because they are located over potable aquifers and in close proximity to drinking water wells). These target landfills were numerically simulated using standardized contaminant inventories and landfill volumes, as well as site-specific data. As a result of this approach, the differences in modeled risk among the Category 1 landfills reflects the *variability of the site-specific hydrogeologic systems*, and their ability to transport potential contaminants from the inactive landfill to the nearest municipal or domestic drinking water well.

There are currently no indications that the Oahu landfill sites are a threat to public health. The purpose of the risk modeling performed in this investigation was to provide a relative *ranking* of the potential risk posed by individual landfills to BWS wells, assuming that a release of constituents from an abandoned landfill were to be discovered.

13.1 Introduction to the FRAMES Model

URS used the Framework for Risk Analysis in Multimedia Environmental Systems (FRAMES; the "model") software system for the relative-risk phase of the study. FRAMES is a multimedia (air, soil, and water) risk calculation program that uses modular subroutines to calculate contaminant releases and their transport to receptors. The modules also estimate the health risks associated with these exposures based on a peer-reviewed and EPA-approved toxicological database. FRAMES was chosen by URS because of its EPA origins, which give it credibility. The program was also chosen because it can be set up to develop both a very simple risk screening calculation, and a site-specific, comprehensive risk assessment.

The FRAMES software system was set up to mimic the CSM and was used to execute a set of scientifically based calculations to simulate physical and physiological phenomena. Using the site-specific information acquired during the desktop audit and site reconnaissance along with reasonable default values, URS developed, reviewed, and input data files formatted to the requirements of the software system.

The program calculated the probability of exceeding a risk threshold for a particular ***hypothetical*** scenario. An increased risk of less than 1 in 1,000,000 was considered acceptable, but an

increased risk of greater than one in 100,000 was considered unacceptable, in accordance with EPA protocol.

FRAMES was used to "score" the potential risk of Category 1 landfills to drinking water receptors; then the landfills were ranked relative to each other based on that score.

13.2 Model Input Parameters

The purpose of the modeling was not to create a "risk assessment." While the software has the ability to perform that function, not enough site-specific data were available for each landfill to perform a CERCLA-style risk assessment.

13.2.1 Contaminant Path in the Subsurface

The FRAMES program calculates risks to the exposed public based on a "pathway analysis"; i.e. a contaminant concentration, or dose, at the point of exposure is based on the physical transport mechanism (through air or water) of the contaminant between the source (the landfill) and the human receptor (users of the well). For this investigation, we have assumed that a landfill is the contaminant source and that it becomes exposed to infiltrating precipitation and/or surface water runoff. Compounds are leached from the contaminated soil and seep downward to the water table, where they are passively carried, or advected, to the nearest municipal well. As a conservative approach, the model assumed that no processes (chemical degradation of the compounds or reattachment to soil particles) were slowing the movement of the seeping contamination and that it arrived at the water table instantly.

The model required landfill dimensions. Because of uncertainties regarding the geometries of each site, identical landfill volumes, based on the Kapaa Landfill, were used for each site (Table 13-1). The model was calibrated by attempting to reproduce measured concentrations (to within an order of magnitude) at Kapaa Landfill monitoring wells. Soil properties such as bulk density and porosity were estimated based on Kapaa Landfill data (Table 13-2).

Site-specific parameters of the greatest importance for determining the fate and transport of contaminants in the subsurface are included in Table 13-2 and include:

- Flow per unit cross sectional area of the substrate surrounding the landfill (Darcy velocity)
- Mean daily precipitation
- Groundwater recharge rate
- Mean total precipitation
- Infiltration rate of surface soil
- Distance to the nearest well

Once a contaminant is mobilized, it moves to the aquifer and the well intake via aqueous transport. FRAMES requires an estimate of the infiltration of surface water to and through the waste zone and this estimate necessitates some assumptions about the movement of groundwater near the Category 1 sites. For this analysis, several sources of hydrogeological information were utilized (Soroos, 1973; Takasaki and Mink, 1985; Nichols, et al, 1996; Oki, 1998; Finstick, 1998; Golder Associates, 1998; Hunt, 1996; Oki and Brasher, 2003). The mass balance analysis used by Hunt (1996) provided an estimate of the percentage of rainfall that is recharged to the aquifer. This figure was combined with local rainfall estimates (Giambelluca et al, 1986) to produce local infiltration factors that were input into FRAMES (Table 13-2).

FRAMES also requires an estimate of the groundwater velocity in order to evaluate the mobility of the advected contaminant to the groundwater. Estimates of the velocity of groundwater movement were adapted from the hydraulic conductivities used or measured in various references. The estimates were chosen based on regional conditions and were adjusted based on the geological conditions of the site. Sensitivity analyses indicate that the velocity of groundwater is the most critical input parameter for this model.

The distance to the closest municipal well was determined via a GIS analysis, which utilized a DLNR well shape file. In almost every case a BWS well was used as an entry point to the receptor environment. Well depth, the thickness of the aquifer, and the depth of the screen were also inputs to the program and were taken from well records in the DLNR database (where available). To be conservative, no attenuation of the contaminants was assumed despite the fact that several of the organic solvents are known to degrade over time.

Textural data on the soils, along with the pH, organic content, iron, and aluminum concentration of the soil were used by FRAMES to determine the equilibrium constant (K_d) for adsorption of the contaminant onto the soil particles. This factor strongly affects the ability of the soil to slow the movement of some compounds in the subsurface. Soil textural data for each site were taken from the U.S. Department of Agriculture Soil Conservation Service's *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii* (Foote et al., 1972), as contained in the State Soil GIS (STATSGO) database. Other soil parameters were kept constant with a soil pH of 6.8.

13.2.2 Inventory of Contaminants

It is important to understand that since the purpose of this investigation was not to calculate absolute risk human health from the landfills, the actual contaminant inventory at any site is not critical to the modeling exercise. However, it is critical that a *consistent* inventory be assumed for all the landfills in order for the comparison (i.e., apples to apples) of the health risks posed by the sites to be valid. It should be noted that the selected inventory of contaminants does not necessarily exist at all the subject sites.

Chemical data are not available for most of the sites; as a result, the specific contaminants in each landfill are unknown. Therefore, URS used representative contaminants that *might* be found in an abandoned Oahu landfill, but are not necessarily present at each particular site. This representative suite of common landfill contaminants helped to ensure that the modeled difference in risk between landfills was not due to differences in unknown or unquantifiable inventories of constituents.

Table 13-3 includes commonly found contaminants at landfills throughout the mainland and Hawaii as well as specific constituents found in leachate at the Kapaa Landfill, which is a well-characterized landfill. We compared Oahu's municipal solid waste leachate results to mainland leachate results and found that the two are very similar.

The possible exceptions include:

1. Pesticides are commonly used on Hawaii to treat termite infestation (dieldrin, for example). Although pesticides are not unique to Hawaii, a higher rate of application and soil chemistry of Oahu may be exacerbating their persistence at disposal sites on Oahu.

2. Dinoseb, a contact herbicide for post-emergence weed control, was detected at Kapaa; therefore, it was included in the constituent inventory.
3. 2,4-Dichlorophenoxyacetic acid (2,4-D), which was the first successful selective herbicide developed. It was introduced in 1946, and rapidly became the most widely used herbicide in the world. A selective herbicide is one that controls weeds in a crop without damaging that crop.

The mix of contaminants listed in Table 13-4 was the contaminant inventory used during risk modeling and, in general, is representative of risk from leachate on Oahu.

13.2.3 Concentration of Contaminants

The chaotic nature of refuse is such that it is impossible to predict or even estimate the concentration of any particular compound that may migrate to groundwater from any particular landfill without a thorough understanding of contaminant levels in the waste. URS made a simplifying assumption to arrive at estimated concentrations that were used in the model. U.S. EPA Region IX provides a list of concentrations to use when screening sites that may or may not require remedial action. These concentrations, called Preliminary Remediation Goals (PRGs), are based upon conservative risk screening models that use generic pathway analysis between soil and water contaminant sources and public health exposure points (see http://www.epa.gov/region09/waste/sfund/prg/index.htm). Since the concentration of contaminants at each landfill is unknown, we used the soil screening PRG concentrations as our assumed contaminant concentrations in the abandoned landfills. This is analogous to assuming that a preliminary assessment has been performed at each landfill and the contamination concentrations warrant remedial investigation. Setting the values equal to PRGs is considered a conservative approach because the site-specific concentrations are probably lower than PRGs.

The concentrations assumed for all of the Category 1 landfills are equal to the PRGs for most of the representative compounds (Table 13-4). In the case of lead, national EPA guidance for soil clean-up levels was used. EPA Region III clean-up levels were used for 2,4-D, Dieldrin, and Dinoseb.

13.2.4 Use of the Contaminant Inventory

An identical constituent and concentration inventory was run through the model for each landfill in Category 1. Using an identical inventory allowed a comparison to be made of the landfills relative to each other. A relative ranking system to compare the landfills (Table 13-5) is

presented instead of explicitly presenting their Hazard Quotients or Excess Cancer Risk Hazard Indexes, which could potentially be misconstrued by readers.

13.2.5 Impacts to Receptors

Ingestion of drinking water is the principal exposure route for human-health risk. The default CERCLA scenario of two liters of drinking water per day over a seventy-year period for a person weighing seventy kilograms was assumed in the receptor model. In addition, risks from dermal and inhalation exposure in bathing scenarios, and the ingestion of water via vegetables and animal meat were also evaluated. Both a lifetime cancer incidence rate and a hazards index for non-carcinogens were calculated by contaminant for each site.

13.3 Results and Discussion

None of the landfills modeled has an Excess Cancer Risk Hazard Index greater than 1 in 1,000,000.

No risk calculated by the model exceeded the EPA threshold for site clean up (Table 13-5). Although no definition of "acceptable risk" has universal support, the U.S. EPA CERCLA program defines an acceptable risk of developing cancer from hazardous waste sites as a probability of "1 in 1,000,000" or 10^{-6}. A risk range of 10^{-6} to 10^{-4} for Superfund clean-ups requires decision-making by an oversight regulatory agency. All risk greater than 10^{-6} to 10^{-4} initiates action, while risk below 10^{-6} normally generates no further action from the regulatory authority.

None of the Category 1 landfills modeled during this study exceed 1 in 9 x 10^{-7} in cancer incident risk. What this means is that if a release of the modeled contaminants occurred at a Category 1 landfill, site remediation would not be justified on the sole basis of health risks to proximal well users. Of course, other factors might justify, in specific instances, some regulatory or remedial action. For example, if a release was confirmed at one of the Oahu sites, the DOH and the U.S. EPA would require additional site information before any risk assessment methodology were employed.

More relevant to this study is a ranking of the sites by how likely they are to contaminate groundwater (Table 13-5). In order to better characterize this risk of contamination, and to discourage misinterpretation of these numbers, groundwater contamination risks for each site

were normalized to the highest risk value and reported as a risk relative to that maximum. For example, of the Category 1 sites, Puu Palailai has the highest risk of contaminating groundwater and therefore has a relative risk of one, while Wahiawa A has the lowest risk of contaminating groundwater with a relative risk of 0.03, compared to Puu Palailai. This allows the sites to be ranked from 1 to 12 on a scale of relative risk (Table 13-5).

The elevated risk value calculated for Puu Palailai is due to slow groundwater velocity and low rainfall at the site, relative to other locations. This results in the potential for a less dilute slug of contaminated water reaching a well. Recall that the model calculates an immediate arrival of the contaminants at the well, at concentrations represented by the calculated mixing with groundwater, and no degradation of compounds. This means that slow-moving groundwater systems are not "flushed" as efficiently as fast systems. This behavior has actually been documented in groundwater studies at contaminated sites.

Oahu Sugar Dump 4, Fort Shafter Dump, and the Laie Landfill are similar in relative risk (Table 13-5). Risk incrementally decreases by about one half for Oahu Sugar Dump 3, Oahu Sugar Dump 2, through the Wahiawa A Dump, which is similar to the Pearl City Landfill. Finally, Oahu Sugar Dumps 5 and 6, and the Mililani Old Landfill and Wahiawa A Dump all have risks of about 5% or less of the Puu Palailai Landfill.

Examining the model results by contaminants, the principal source of risk at these sites is arsenic. For example, at Puu Palailai Landfill, arsenic contributes 8.900×10^{-7} to the total in cancer incident risk of 8.919×10^{-7}. The remainder of the risk for Puu Palailai Landfill results from vinyl chloride, trichloroethylene, tetracholorethylene, and benzene. Neither metals nor pesticides have a significant impact on the total risk. URS believes that the sensitivity of the model to arsenic comes from the high solubility of that element and its presumed existence in the subsurface.

13.4 Recommendations for Future Work

There is no indication at this time that a more detailed calculation of risk is warranted at any of these sites. Even if contamination at the level of the PRGs were to be found at these landfills, the risk to off-site users of BWS or other municipal wells is significantly below the remediation goals calculated by the U.S. EPA (in many cases up to 10 times lower). If, on the other hand, much higher contaminant concentrations are found on or adjacent to these sites, risk modeling should be reconsidered and site-specific contaminant transport data should be collected.

Particular attention should be given to the discovery of any contaminant that is regulated under the drinking water rules. The concentration of these contaminants (if detected) should drive the monitoring frequency and decisions for installing treatment systems for drinking water. If unregulated contaminants are discovered, U.S. EPA health advisories should be consulted (e.g. U.S. EPA, 2006).

13.4.1 Monitoring

If elevated concentrations of contaminants (e.g. greater than the maximum contaminant level) are detected in BWS wells, a deliberate annual sampling of the impacted wells is suggested initially. If results from this initial sampling event indicate that there are actually no unacceptable impacts to drinking water, based on those results, the suggested monitoring frequency is generally once every two years. However, this suggested monitoring frequency is dependent on the toxic and physical characteristics of the contaminant detected. The higher the detected contaminant's toxicity, solubility, etc., the higher the suggested frequency of the well sampling.

If, as a conservative approach, additional analytical sampling of existing BWS water supply wells is conducted in association with this investigation, it should be focused on the seventeen impacted wells that lie within one-mile of Category 1 landfills and that have landfills within their capture zones.

One round of groundwater sampling is suggested initially. The recommended constituents for this one round of sampling are those included in Tables 13-3 and 13-4. If this initial sampling event indicates that there are impacts to drinking water, based on those results, an increased frequency of sampling may be warranted (e.g. once per year to detect constituent concentration trends).

13.4.2 Additional Characterization

If elevated concentrations of contaminants are detected in BWS wells proximal to inactive landfills, additional characterization work may be warranted to determine if the actual sources of groundwater impacts are attributable to the inactive landfill sites.

13.4.3 Best Available Technologies for the Treatment of Drinking Water

If elevated concentrations of contaminants are detected in BWS wells proximal to inactive landfills, treatment of drinking water from those wells may also become necessary. Several reliable and proven methods to remove contaminants from water are described by the report, *Water Treatment Primer for Communities in Need*, developed by the Bureau of Reclamation of the Denver Federal Center. This report provides advantages, disadvantages, and cost information about each applicable best available technology (BAT). The BATs to remove heavy metals, nonmetals, and organic constituents listed in Tables 13-3 and 13-4 have been summarized in Table 13.6. Unit costs estimates were adjusted to 2001 dollars and are accurate within +30% to -15%.

14.0 MITIGATION OVERVIEW

The objective of mitigation is to interrupt and/or eliminate current and future potential for human exposure to elevated levels of constituents in groundwater (due to a landfill release) through cost-effective measures. Although, there are currently no indications that Oahu landfill sites are a threat to human health, an overview of potential mitigative measures is included in this section. The overview includes a review of current remedial action technologies with the objective of scaling the list down to those deemed relevant and appropriate should mitigative and regulatory actions become necessary in the future.

14.1 Remedial Action Categories

General response action categories that are commonly recognized by U.S. EPA's Office of Superfund Remediation and Technology Innovation (OSRTI) are noted in *Treatment Technologies for Site Cleanup: Annual Status Report* (U.S. EPA, 2004). An overview of the primary categories is provided below, along with the "no action" alternative.

- **No action**. This general response action is defined as not including any actions that could contain, treat, or mitigate human exposure to the contaminated media.
- **Institutional controls**. This general response action seeks to mitigate exposure to contaminated media, but does not provide any containment or treatment. This option, though viable for Oahu inactive landfills, was not included as a stand-alone remedy in Figure 14-1 as institutional controls are typically implemented along with remedial actions that require engineering and/or implementation of intrusive site activities.
- **Containment**. This is the U.S. EPA's presumptive remedy for municipal landfills (U.S. EPA, 1993) and would likely be the selected course of action for most Oahu inactive landfills should mitigative and regulatory actions become necessary. Containment is defined as any approach that seeks to prevent further contaminant migration from the source. Containment is possible where contamination is highly localized and from a specific source. This technique is often used in combination with groundwater withdrawal and treatment. Contaminants are first isolated or limited in their movement through containment measures, then withdrawn and treated through pumping, gravity drainage, or excavation. Containment measures may include installation of sheet piles or a trenched slurry wall downgradient or upgradient from a pollution source to prevent its horizontal migration; use of grouting or liners to prevent both horizontal and vertical migration; and sealing the surface of the pollution source to prevent infiltration of rainwater from carrying contaminants downward into the aquifer.

- **Removal**. Removal technologies can be used to excavate or collect waste or contaminated media from their present location and move the waste to an alternate location for treatment or disposal.
- **Ex-Situ Treatment**. This general response action involves the reduction of toxicity, mobility, or volume of contamination after the impacted media have been removed or collected.
- **In-Situ Treatment**. This general response action is defined as any approach that provides reduction of toxicity, mobility, or volume of the contaminated media without removing or collecting the media.
- **Disposal**. Disposal options include transportation of the media and/or waste and on-site or off-site disposal. Disposal may occur at existing, permitted facilities or at new facilities.

A current review of specific technologies within each general response action category is provided in Table 14-1. Included in this table are process options, a description of the technology, effectiveness, implementability, relative cost, and whether or not the option was retained for further consideration.

14.2 Preliminary Screening of Potential Technologies

A wide range of remedial alternatives were considered from Table 14-1. A preliminary screening of those alternatives and associated technologies was performed to determine which of these were viable for Oahu inactive landfills based on cost feasibility, appropriateness, and technical practicability. The scaled down list of remedial alternatives is summarized in Table 14-2 by general response actions and their representative process options (technology). This list contains remedies that address both soil and groundwater contamination pathways that may lead to drinking water impacts.

14.3 Selection of Relevant and Appropriate Remedial Alternatives

A second evaluation was performed with the objective of only identifying technologies that address groundwater and are relevant and appropriate for Oahu inactive landfills.

The 2002 Federal Remediation Technologies Roundtable (FRTR) *Remediation Technologies Screening Matrix and Reference Guide, Version 4.0*, a technology application matrix tool for various types of media requiring treatment, was used along with professional judgment for

further identifying and screening potential remedial alternatives and associated technologies during the second and final technology evaluation.

This evaluation identified five process option technologies within three general response categories for groundwater as the sole media or treatment group. These included:

General Response Action	Representative Process Option Technology
Containment	Not specified (see Table 14-1 and 14-2)
Ex-Situ Treatment	Ex-Situ Biological Treatment (assuming pumping) Ex-Situ Physical/Chemical Treatment (assuming pumping)
In-Situ Treatment	In-Situ Biological Treatment In-Situ Physical/Chemical Treatment

Reference: http://www.frtr.gov/matrix2/section3/sec3_int.html

Specific technologies within the three general response action groups were screened for their suitability and potential applicability. Site- and waste-specific characteristics were also considered in the screening, along with current and reasonably anticipated future land uses associated with the sites. Evaluation of the preliminary remedial alternatives and selection of potential technologies were based on available information about the landfills and professional judgment considering such factors as:

- cost,
- feasibility,
- constructability,
- long-term operation and maintenance (O&M),
- environmental impact,
- current site conditions,
- the relative risk ranking of each landfill, and
- current DOH policy.

Institutional controls are often implemented in conjunction with most, if not all, specific remedial action selections.

Based on these input parameters, the following list of remedial alternatives was identified:

1. **No Action**
2. **Containment**
   - Impermeable Caps
   - Soil/Vegetative Cover
3. **Disposal**
   - Soil/Landfill Materials Excavation and Disposal/Recycling
   - Groundwater Extraction/Treatment and Disposal (when drinking water resources are impacted)
4. **Institutional Controls**
   - Long-Term Groundwater Monitoring
   - Wellhead Protection

In summary, no action is the default alternative for sites that are not a risk to drinking water users. Containment, the U.S. EPA presumptive remedy for municipal landfills (U.S. EPA, 1993), was selected because of cost considerations and the established use of containment alternatives for landfill settings throughout the United States. Disposal, although not an FRTR (2004) response action for the groundwater media, was resurrected as a relevant and appropriate alternative primarily because of the presence of hot spots and continuing source features at landfills will require removal and disposal. Along with debris, surrounding impacted soil will also be included in the excavation process. Specific institutional controls to include long-term groundwater monitoring and wellhead protection were selected based on cost and established applications throughout the country (AFCEE, 1999).

These remedial strategies are general enough that they can be applied to landfills that fall into the same relative risk category. Unit cost estimates for application of these measures are presented in Table 14-3 along with supporting information relative to the specific technology or approach. Using this information, a protocol for site-specific remedial technology selection was constructed as a decision-making tool. The goal of technology selection is to select the most cost effective and reliable treatment technology to achieve a desired clean up objective in a reasonable amount of time. Given this goal, the protocol for site-specific remedial technology selection is provided as a stand-alone component of this chapter in Section 14.4.

According to a 1998 study in the State of Maine, the Department of Environmental Protection estimated that the cost of closing landfill sites was approximately $200,000 per site based on roughly five million dollars needed to close 26 landfills[2].

A summary description of each selected remedial technology alternative, with the exception of no action, is provided below.

14.3.1 Containment

Containment treatments are often performed to prevent, or significantly reduce, the migration of contaminants in soils or ground water. Containment is necessary whenever contaminated materials are to be buried or left in place at a site. In general, containment is performed when extensive subsurface contamination at a site precludes excavation and removal of wastes because of potential hazards, unrealistic cost, or lack of adequate treatment technologies.

Containment treatments offer quick installation times and are typically a low to moderate cost treatment group. Unlike ex situ treatment groups, containment does not require excavation of soils that lead to increased costs from engineering design of equipment, possible permitting, and material handling. However, these treatments require periodical inspections for settlement, ponding of liquids, erosion, and naturally occurring invasion by deep-rooted vegetation. Additionally, ground water monitoring wells, associated with the treatments, need to be periodically sampled and maintained. Even with these long-term requirements, containment treatments usually are considerably more economical than excavation and removal of the wastes (source: http://www.frtr.gov/matrix2/section3/3_7.html).

Impermeable and Soil/Vegetative Caps. Landfill caps can range from a one-layer system of vegetated soil to a complex multi-layer system of soils and geosynthetics. In general, less complex systems are adequate in dry climates and more complex systems are required in wet climates. The material used in the construction of landfill caps includes low-permeability and high-permeability soils and low-permeability geosynthetic products. The low-permeability materials divert water and prevent its passage into the waste. The high permeability materials carry water away that percolates into the cap. Other materials may be used to increase slope stability.

[2] http://www.state.me.us/dep/rwm/rem/documents/landfill/landfillhistory.pdf

14.3.2 Disposal

Contaminated material is removed and transported to permitted off-site treatment and/or disposal facilities. Some pretreatment of the contaminated media usually may be required in order to meet land disposal restrictions.

14.3.3 Institutional Controls

The U.S. EPA has defined institutional controls as "legal, non-engineering remedial mechanisms" or "legal, non-engineering measures to prevent human exposure to contaminants at hazardous waste sites." Institutional controls are usually legal controls placed on land and groundwater use intended to influence human activities in such a way as to prevent or reduce exposure to constituents that potentially pose unacceptable health risks. They are often used in conjunction with, or as a supplement to, other measures. Institutional controls are appealing because they impose restrictions on use of the site in place of more comprehensive and costly cleanups. The facility could use institutional controls at the Site to prevent human exposure at the Site (i.e., prevent completed exposure pathways), thereby addressing protection of human health.

The use of an institutional control to meet a performance standard should include a mechanism to ensure maintenance of the institutional control (detailed herein).

14.3.3.1 Long-Term Groundwater Monitoring

According to the U.S. EPA, long-term monitoring should continue until remediation objectives have been achieved, and until it can be verified that the site no longer poses a threat to human health or the environment. Typically, monitoring is continued for a specified period of time after remediation objectives have been achieved to ensure that:

- concentrations are stable,
- concentrations remain below target levels, and
- enough data are collected to adequately support a decision for closure of the site.

Long-term monitoring uses natural or intrinsic processes such as adsorption, dispersion, destruction, biodegradation, and dilution to dissipate and destroy constituents that are present in

the subsurface. Institutional controls may be necessary to control exposure until the groundwater protection standard is achieved. Long-term monitoring is not a "no action" remedy.

14.3.3.2 Wellhead Protection

Wellhead protection programs serve to create "buffer zones" upgradient and directly adjacent to groundwater recharge areas such that land use activities are restricted where groundwater contamination susceptibility from surface contaminants is significant. Some tools associated with wellhead protection programs include physical barriers such as fencing and barricades as well as administrative controls such as zoning restrictions, banning certain activities such as motor vehicle access or excavation, and policing of protected areas. Wellhead protection programs are typically established with zones drawn according to time-of-travel calculations such that areas closest to drinking water wells receive the most stringent restrictions.

14.4 Protocol for Site-Specific Remedial Technology Selection

The preceding subsections of Section 14 have served to first introduce the most common landfill remedial action alternatives commonly used throughout the United States by federal, state, and local agencies; secondly, these alternatives have been retained or excluded based on an initial evaluation of appropriateness; and, lastly, a second and final evaluation was performed to select only those remedial action alternatives deemed relevant and feasible to the Oahu closed landfill sites addressed by this study. This subsection, through the use of a decision guidance matrix (Figure 14-2), combines these efforts and establishes a resultant protocol that can be applied on a site-specific basis for all landfills requiring further remedial action.

It is hereby assumed that the landfills used for application using this protocol will have completed any investigation requirements such as preliminary assessments or EE/CA investigations and that all media have been fully characterized and applicable contaminants have been specifically identified, based on risk. The COCs should be classified in relation to their hazardous properties and associated human health risks, either carcinogenic or non-carcinogenic, via the drinking water pathway.

The protocol is provided as Figure 14-2 and requires the input parameters of 1) *site size* (in acres); 2) *nature of contamination* (contaminant hazard classification); and 3) *extent of contamination* (i.e., impacted media). For nature of contamination, the COC having the most hazardous health risk characteristics, from the drinking water pathway, should be used.

Otherwise, the COC having the most stringent action level should be use. For extent of contamination, surface soil, subsurface soil, and groundwater are the media of concern. Extent of contamination is not limited to a single media and may include any or all of the above, as indicated in the protocol (Figure 14-2).

Given these three input parameters, the user is capable of determining the Oahu presumptive remedy based on the established protocol. The remedy will not always be in agreement with the EPA "containment" remedy. In addition to selecting the remedial action(s) most appropriate for the site, the estimated time to meet cleanup goals and the relative total cost is also provided using the protocol (Figure 14-2). An example case study is provided on the following page to show how the given site conditions and associated input parameters lead the user through the protocol to arrive at a remedial action(s) and a cost for performing the action.

A Case Study Exercise Using the Protocol (Figure 14-2): "XYZ" Landfill

As an example, the following case study site is provided to give a landfill scenario along with the corresponding remedial action(s) based on use of the protocol.

- **Given Site Conditions**:

  The "XYZ" landfill has been reportedly closed since 1949; however, after several site investigation studies in the early 1990's and a thorough EE/CA-level investigation in 2001, this site was targeted for remedial action. The site is ten (10) acres in size and a BWS well has been impacted with the primary COC, vinyl chloride. Vinyl chloride was the only COC that had a completed pathway via the drinking water scenario; however, this contaminant is a known carcinogen and is present at levels above both State of Hawaii and federal action levels. Surface soil was not impacted due to recent excavation work in the area whereby clean fill was brought on to the site and leveled to grade. The clean fill represents the top 3-4 feet of soil at the site where vinyl chloride was found in subsurface soil.

- **Required Input Parameters for the Protocol:**

  1. Site Size = 10 acres
  2. Nature of Contamination = Vinyl Chloride above action levels
  3. Extent of Contamination = Subsurface Soil and Groundwater

- **Use of the Protocol for Determining Remedial Action(s) and Cost:**

  1. The site size is 10 acres; therefore, 10 acres is carried forward into each corresponding remedial action to determine cost.

2. The nature of contamination is a known carcinogen, vinyl chloride, indicating the site is a high priority for cleanup with a time critical remedial action implementation goal of one year or less.
3. The protocol indicates that a site having subsurface soil and groundwater contamination, where a drinking water resource is impacted (note: BWS well contamination in the conditions statement), results in an "E, B, G" response.

- **Explanation of Remedial Actions/Cost**:

The E, B, G response indicates that an active groundwater remediation and disposal program must be implemented, due to the drinking water resource impact. In addition, a soil/vegetative cap must be installed and a long-term groundwater monitoring program to evaluate contaminant concentrations and natural attenuation capacity must be implemented. Since "G" was selected, the monitoring program must also include land use controls such as site access restrictions and a wellhead protection program for the Board of Water Supply well recharge zone.

Boxes B, E, and G are checked in the protocol's remedial action selection table, a component of the protocol (see example below). Associated costs for these actions are provided on a per acre rate and the subtotal is calculated based on these two numbers to give a total cost. As indicated in the example table below, the total cost for the site removal action is $9,350,000.

Site: _____

		Remedial Action (check box if selected)	Description	Approximate Cost/Acre	Landfill Size (Acres)	Subtotal Cost
A		Containment	Use of impermeable cap material	$410,000.00		
B	X	Containment	Use of soil/vegetative cap material	$50,000.00	10	$500,000
C		Disposal	Excavation/disposal of "hot spot" surface soil impacts	$1,000,000.00		
D		Disposal	Excavation/disposal of "hot spot" surface soil impacts and groundwater pump and treat system required; disposal of soil and impacted water	$1,500,000.00		
E	X	Disposal	Groundwater pump and treat system required; disposal of impacted water	$500,000.00	10	$5,000,000
F		Institutional Controls	Long-term groundwater monitoring with natural attenuation	$375,000.00		
G	X	Institutional Controls	Long-term groundwater monitoring with natural attenuation and land use restrictions	$385,000.00	10	$3,850,000
H		Institutional Controls	Land use restrictions and or permitted access requirements	$10,000.00		
			Total Cost of Remedial Action(s) =	$9,350,000		

15.0 CONCLUSIONS

There are currently no indications that Oahu inactive landfill sites are a threat to human health.

15.1 Background on Lack of Information

According to a July 14, 1942 Honolulu Advertiser article, tons of refuse accumulated at various points throughout the island following the December 7, 1941 attach on Pearl Harbor; therefore, special refuse disposal centers were established across the island. The refuse at these specially designated dumps was burned. It appears, from the lack of information found on many of the sites depicted on the map that accompanied the article, that many of these special rubbish disposal centers were not used again after the accumulated refuse was burned.

In 1977, the C&C commissioned a comprehensive inventory study of potential landfill sites (Shimabukuro, 1977). The report identified thirty-three such sites. A supplementary study in 1979 identified ten additional sites. The C&C then systematically investigated and pursued the identified sites. Competing factors such as groundwater resources, competing private and governmental land uses, and the proximity of residential areas eliminated all but a few of the potential sites. Therefore, some of the "dumps/landfills" included in this investigation may never have existed but instead were only sites that were considered for landfill development.

15.2 Background on Agricultural Landfills

Of those thirty-seven landfills located mauka of the No-Pass Line, twenty-seven landfills are located within the Schofield Plateau physiographic province. Many of Oahu's largest unconfined potable aquifers are located within the Schofield Plateau. These unconfined aquifers have a high vulnerability to contamination. Of twenty-seven landfills located within the Schofield Plateau, nineteen were formerly agricultural landfills. The Schofield Plateau has historically been used for the cultivation of sugarcane and pineapple, and most of the landfills in question are related to the sugarcane and pineapple industry.

Very little information was available for the agricultural landfills. This is due in part to the age of the landfills, poor record keeping, and rotation of agricultural disposal fields or dumps, which may also be the reason that little evidence of former dumping activities was noted during site visits to suspected agricultural dump sites (based on historic maps). Fortunately, most agriculturally related impacts to groundwater are attributable to pesticide and herbicide mixing

and loading sites and the agricultural fields where the pesticides and herbicides are actually applied as opposed to dumps.

15.3 Risk Modeling

The U.S. EPA CERCLA program defines an acceptable risk of developing cancer from hazardous waste sites as a probability of "1 in 1,000,000," or 10^{-6}. Risk modeling was performed on the twelve Category 1 landfills, that is, landfills located over potable aquifers (e.g., mauka of No-Pass Line) and in close proximity (e.g., one mile) to drinking water wells. The landfills were subsequently ranked relative to each other based on the modeled risk posed to drinking water receptors. None of the landfills modeled has an Excess Cancer Risk Hazard Index greater than 1 in 1,000,000.

There is no indication at this time that a more detailed calculation of risk is warranted at any of these sites. Even if contamination at the level of the PRGs were to be found at these landfills, the risk to off-site users of BWS or other municipal wells is significantly below the remediation goals calculated by the U.S. EPA (in many cases up to 10 times lower). If, on the other hand, much higher contaminant concentrations are found on or adjacent to these sites, risk modeling should be reconsidered and site-specific contaminant transport data should be collected.

15.4 Further Investigations and/or Additional Analytical Sampling

Although risk modeling indicated that none of the landfills that were modeled has an Excess Cancer Risk Hazard Index greater than 1 in 1,000,000 (which is considered acceptable by the U.S. EPA CERCLA program), if, as a conservative approach, further investigations are conducted, they should focus on Oahu Sugar Dumps 3, 5, 6, and Wahiawa Dump A because these landfills are (1) within one mile of impacted BWS wells, (2) are above vulnerable potable water sources, (3) no documentation found to indicate that they were capped, and (4) are within the capture zone of impacted BWS wells.

If, as a conservative approach, additional analytical sampling of existing BWS water supply wells is conducted in association with this investigation, it should be focused on the seventeen impacted wells that lie within one-mile of Category 1 landfills and have landfills within their capture zones.

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TABLES

Table 1-1
LANDFILL INVENTORY
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

No.	Landfill Name	No.	Landfill Name
1	Aikahi Dump	39	Kewalo Ash Dump
2	Ala Moana Dump	40	Koko Head Landfill or Kahauloa Crater Dump
3	Bellows Site LF01, Base Landfill	41	Kuapa Pond Dump[$]
4	California Packing Company Dump 1	42	Kunia A Dump
5	Chinese American Club Dump	43	Kunia B Dump
6	Diamond Head Crater Dump[+]	44	Laie Dump
7	Ewa Sugar Mill/Oahu Sugar Company - Coral Wastepit	45	Makalapa Dump
8	Ewa Sugar/Oahu Sugar Company - Waipio Peninsula	46	Mililani New Landfill
9	Ford Island Dump	47	Mililani Old Landfill
10	Fort Hase/Marine Corp Base Hawaii Landfill	48	Nanakuli A Landfill
11	Fort Kamehaheha LF05, Tri-Services Landfill	49	Nanakuli B
12	Fort Shafter Dump	50	Naval Computer and Telecommunication Area Master Station - Old Wahiawa Landfill
13	Haiku Dump	51	Naval Radio Transmitting Facility - Lualualei Landfill
14	Hauula Dump	52	Oahu Prison Dump
15	Hawaiian Pineapple Dump 1 - Poamoho Camp	53	Oahu Sugar Dump 1
16	Hawaiian Pineapple Dump 2 - Wahiawa	54	Oahu Sugar Dump 2
17	Hawaiian Pineapple Dump 3 - Kemoo, Wailua	55	Oahu Sugar Dump 3^
18	Hawaiian Pineapple Dump 4 - Wailua	56	Oahu Sugar Dump 4 - Waipahu
19	Hawaiian Pineapple Dump 5 - Wailua	57	Oahu Sugar Dump 5
20	Hawaiian Pineapple Dump 6 - Wahiawa	58	Oahu Sugar Dump 6
21	Hawaiian Pineapple Dump 7 - Waimea	59	Olomana Limited Dump - Kalihi
22	Hawaiian Pineapple Dump 8 - Ewa	60	Pahounui Dump
23	Hawaiian Pineapple Dump 9 - Ewa	61	Pearl City Peninsula Landfill/Dump - (Navy)
24	Hawaiian Pineapple Dump 10 - Kunia	62	Pearl City Dump - Second Street
25	Hawaii Kai Cinder Cone Dump	63	Punaluu Dump
26	Hickam Site LF01, Landfill 1	64	Pupukea Dump
27	Kaaawa Dump	65	Puu Palailai Landfill
28	Kalaheo Landfill	66	Saki Moru Dump
29	Kalihi-Kai Dump	67	Sand Island Ash Dump
30	Kapaa Central Landfill	68	Schofield Landfill/Dump
31	Kapaa No. 2 Landfill	69	Wahiawa A Dump
32	Kapaa No. 3 Landfill	70	Wahiawa B Dump
33	Kapalama Dump*	71	Waialua Dump
34	Kapiolani Dump	72	Waianae Landfill
35	Kaukonahua Dump	73	Waimanalo Dump - North
36	Kawailoa Landfill	74	Waimanalo Dump - South
37	Kawainui Dump	75	Waipahu Incinerator Ash Landfill/Dump
38	Keawaula Dump	76	Wheeler Army Airfield - Gulch Runway Dump

[+]Diamond Head Crater was considered as a potential incinerator site in 1960 but was never used.

[*]Kapalama Dump was converted to an incinerator only facility in 1944.

[$]Kuapa Pond Dump was reportedly "cleaned-up" by the U.S. army

^Oahu Sugar Dump 3 was likely razed for construction of the Village Park subdivision.

Table 4-1
LANDFILLS CONSIDERED AND SELECTED
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Source						
1	2	3	4	5	6	URS, 2006
Aiea Plantation	--	--	--	Aiea or Honolulu Plantation Dump	Honolulu Plantation Dump	Honolulu Plantation Dump *
Bellows Field	--	Bellows Field	--	Bellows Field Dump	Bellows Field Dump	Bellows Site LF01, Base Landfill
Ewa Plantation	Ewa Plantation	--	--	Ewa Plantation	--	Ewa Sugar Mill/Oahu Sugar Company - Coral Wastepit
Fort Hase	M.C.A.S. Kaneohe	--	--	M.C.A.S. Kaneohe	--	Fort Hase/Marine Corp Base Hawaii Landfill
Fort Ruger	--	--	--	Fort Ruger	Fort Ruger Dump	Fort Ruger Dump *
Hauula	--	--	--	Hauula Dump	Hauula Dump	Hauula Dump
Hickam Field	--	--	--	Hickam Field Dump	Hickam Field Dump	Hickam Site LF01, Landfill 1
Kaaawa	--	Kaaawa	--	Kaaawa Dump	Kaaawa Dump	Kaaawa Dump
Kahuku Plantation	--	--	--	Kahuku Plantation Dump	Kahuku Plantation Dump	Kahuku Plantation Dump*
Kailua	Kailua (Kapaa)	Kapaa No. 1 Kapaa No. 2 and 3	--	Kailua (Kapaa) Kapaa No. B and C	--	Kapaa No. 1 was never developed Kapaa No. 2 and 3
Kaneohe	Kaneohe (Haiku)	--	--	Haiku (Kaneohe) Dump	Haiku Dump	Haiku Dump
Kapalama Dump	--	--	--	Kapalama Dump	Kapalama Dump	Kapalama Dump
Kapalama Ramp	Kapalama	--	--	Kapalama Ramp	--	
Kawaihapai	--	--	--	Kawaihapai Dump	Kawaihapai Dump	Kawaihapai Dump*
Keawaula	--	--	--	Keawaula Dump	Keawaula Dump	Keawaula Dump
Kewalo Incinerator	Kewalo	--	--	Kewalo Incinerator/Kewalo Ash Dump	Kewalo Ash Dump	Kewalo Ash Dump
Laie	Laie	--	--	Laie Dump	Laie Dump	Laie Dump
Makalapa	Makalapa	--	--	Makalapa Dump	Makalapa Dump	Makalapa Dump
Nanakuli	--	Nanakuli	--	Nanakuli Dump	Nanakuli Dump	Nanakuli A and B
Pearl City	--	--	--	Pearl City Dump	Pearl City Dump	Pearl City Dump - Second Street
Pupukea	--	--	--	Pupukea Dump	Pupukea Dump	Pupukea Dump
Schofield Barracks	Schofield Barracks	--	--	Schofield Dump	Schofield Dump	Schofield Landfill/Dump
Wahiawa	Wahiawa	--	--	Wahiawa Dump	Wahiawa Dump	Wahiawa A and B Dumps
Waialua	--	--	--	Waialua Dump	Waialua Dump	Waialua Dump
Waianae	Waianae	--	--	Waianae Dump	Waianae Dump	Waianae Landfill
Waimanalo	--	Waimanalo North Waimanalo South	--	Waimanalo	Waimanalo	Waimanalo Dump - North Waimanalo Dump - South
Waipahu Plantation	--	--	--	Oahu Sugar 1 thru 6	Oahu Sugar 1 thru 6	Oahu Sugar 1 thru 6
	Ford Island	--	--	Ford Island Dump	Ford Island Dump	Ford Island Dump
	Fort Kamehameha	--	--	Fort Kamehameha	Fort Kamehameha Dump	Fort Kamehaheha LF05, Tri-Services Landfill
	Kawailoa	--	--	Kawailoa Dump	Kawailoa Dump	Kawailoa Landfill
	N.A.D. Lualualei	--	--	Lualualei Dump	Lualualei Dump	NRTF - Lualualei Landfill
	N.A.D. Waikele	--	--	--	--	N.A.D. Waikele*
	N.A.D. West Loch	--	--	--	--	N.A.D. West Loch*
	N.A.S. Barber's Point	--	--	Barber's Point Air Station Dump	--	N.A.S. Barber's Point*
	N.C.S. Wahiawa	--	--	--	--	NCTAMS - Old Wahiawa Landfill
	Pearl City	--	--	Pearl City Dump	Pearl City Dump	Pearl City Peninsula Landfill/Dump - (Navy)
	Waipahu	--	--	Waipahu Dump	Waipahu Ash Dump	Waipahu Incinerator Ash Landfill/Dump
		Auloa	--	--	--	Auloa was never developed
		Heeia Kai	--	--	--	Heeia Kai was never developed
		Heeia Uka	--	--	--	Heeia Uka was never developed
		Honouliuli	Honouliuli	--	--	Honouliuli was never developed
		Kaena Quarry	Kaena	--	--	Kaena Quarry was never developed
		Kahaluu	--	--	--	Kahaluu was never developed
		Kalaheo	--	Kalaheo Landfill	Kalaheo Landfill	Kalaheo Landfill
		Kaloi	Kaloi	--	--	Kaloi was never developed
		Kaukonahua	--	--	Kaukonahua	Kaukonahua Dump
		Keekee	Keekee	--	--	Keekee was never developed
		Koko Crater	Koko Crater	Kahauloa Crater Landfill	Koko Head Landfill	Koko Head Landfill or Kahauloa Crater Dump
		Maili	Maili	--	--	Maili was never developed
		Makaiwa	--	--	--	Makaiwa was never developed
		Makua	Makua	--	--	Makua was never developed
		Mililani	--	Oceanic Property Landfill (Mililani New)	Mililani New	Mililani New Landfill
		Ohikilolo	Ohikilolo	--	--	Ohikilolo was never developed
		Olomana	--	--	--	Olomana was never developed
		Poamoho	--	--	--	Poamoho was never developed
		Punaluu	--	Punaluu Dump	Punaluu Dump	Punaluu Dump
		Waiahole	--	--	--	Waiahole was never developed
		Waihee	--	--	--	Waihee was never developed
		Waikane	--	--	--	Waikane was never developed
		Waimanalo Gulch	Waimanalo Gulch	--	--	This RCRA Subtitle D landfill was not included
		Waipahu	--	--	--	This Waipahu site was never developed
		Waipio	Waipio	--	--	Ewa Sugar/Oahu Sugar Company - Waipio Peninsula
			Barbers Point	--	--	Barbers Point was never developed
			Diamond Head	--	--	Diamond Head Crater Dump
			Ewa No. 1	--	--	Ewa No. 1 was never developed
			Ewa No. 2	--	--	Ewa No. 2 was never developed
			Halawa A & B	--	--	Halawa A & B were never developed
			Kahe	--	--	Kahe was never developed
			Kunia A & B	--	--	Kunia A and B Dumps
			Pearl Harbor Swamplands	--	--	Pearl Harbor Swamplands were never developed
			Sand Island	--	Sand Island Dump	Sand Island Ash Dump
			Waianae Expansion	--	--	Waianae Expansion has not been developed
				Aikahi Dump	Aikahi Dump	Aikahi Dump
				Ala Moana Dump	Ala Moana Dump	Ala Moana Dump
				California Packing 1 and 2	California Packing 1 and 2	California Packing Company Dump 1
				Chinese American Club	Chinese American Club Dump	Chinese American Club Dump
				Fort Shafter	Fort Shafter Dump	Fort Shafter Dump
				Hawaiian Pineapple 1 thru 10	Hawaiian Pineapple 1 thru 10	Hawaiian Pineapple 1 thru 10
				Kalihi-Kai Dump	Kalihi-Kai Dump	Kalihi-Kai Dump
				Kapiolani Dump	Kapiolani Dump	Kapiolani Dump
				Kuapa Pond	Kuapa Pond	Kuapa Pond Dump
				Kawainui Landfill	Kawainui Dump/Landfill	Kawainui Dump/Landfill
				Oahu Prison Dump	Oahu Prison Dump	Oahu Prison Dump
				Olomana Limited	Olomana Limited	Olomana Limited Dump - Kalihi
				Pahounui Dump	Pahounui Dump	Pahounui Dump
				Palailai Landfill	Puu Palailai Landfill	Puu Palailai Landfill
					Hawaii Kai Cinder Cone Dump	Hawaii Kai Cinder Cone Dump
					Mililani Old Landfill	Mililani Old Landfill
					Saki Moru Dump	Saki Moru Dump
					Wheeler Dump	Wheeler Army Airfield - Gulch Runway Dump

--= not included
Shaded cells are landfills that were included in this ivestigation.
*Dropped from this investigation due to lack of available information
[1]Honolulu Advertiser, 1942. Map titled "Refuse-Disposal Facilities". July.
[2]Map titled "A Summary of the Present Solid Waste Disposal Sites", dated 1963
[3]Shimabukuro and Associates, Inc., 1977. Inventory of Potential Sanitary and Demolition Landfill Sites on the Island of Oahu. August.
[4]Shimabukuro and Associates, Inc., 1979. Supplement to Inventory of Potential Sanitary and Demolition Landfill Sites on the Island of Oahu. November.
[5]Young, Robert, 1993. Garbage in Paradise, A History of Honolulu's Refuse Division. City Department of Public Works.
[6]Bagaoisan, Apolla, 1997. Evaluation of Closed Landfills on Oahu, Hawaii State Department of Health

Table 5-1
LANDFILLS WITH U.S. EPA IDENTIFICATION NUMBERS
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Landfill Name	CERCLIS Database	Archived Site Database	U.S. EPA ID Number*
Bellows Site LF01, Base Landfill (Bellows Air Force Station)	HI3570028719 (base)	--	HI957302871900
Diamond Head Crater Dump	--	--	HID980736243
Ewa Sugar Mill/Oahu Sugar Company - Coral Wastepit	HID984467605^, HISFN0905533!	--	--
Ewa Sugar Mill/Oahu Sugar Company - Waipio Peninsula	HISFN0905537	--	--
Ford Island Dump (Pearl Harbor Naval Complex)	--	--	HI917002434200
Fort Hase/Marine Corps Base Hawaii Landfill	--	--	HI917302276200
Fort Kamehaheha LF05, Tri-Services Landfill (Hickam Air Force Base)	HI8570090011	--	HI3210022205, HI921452220500
Fort Shafter Dump	HI6214522207	--	HI9214522220700
Hickam Site LF01, Landfill 1 (Hickam Air Force Base)	--	HI8570028722 (base)	HI957302872200
Kalaheo Landfill	--	HID980369557	--
Kappa Central Landfill	--	HID980370100	--
Kapaa No. 2 & 3 Landfills	HID980497176	--	--
Kawailoa Landfill	--	HID980497218	--
Kewalo Ash Dump	--	HID980497226	--
Mililani Old Landfill	--	HID980497275	--
NCTAMS - Old Wahiawa Landfill	HI0170090054	--	HI917002438800
NRTF -Lualualei Landfill	HI9170090055	--	--
Pearl City Peninsula Landfill/Dump	--	HID980585178	--
Puu Palailai Landfill	--	HID980637508	--
Schofield Landfill/Dump	HI3210022239	--	HI921452223900
Waianae Landfill	--	HID980818561	HID000853267
Waipahu Incinerator Ash Landfill/Dump	HID980818629	--	HID000853283
Wheeler Army Airfield - Gulch Runway Dump (Wheeler Air Force Base)	HI3573028732 (base)	--	HI0570090027

CERCLIS = Comprehensive Environmental Response, Compensation, and Liability Information System
NCTAMS = Naval Computer and Telecommunication Area Master Station
NRTF = Naval Radio Transmitting Facility
U.S. EPA = United States Environmental Protection Agency
^ = The Coral Wastepit is one of five subsites associated with this number.
! = only the coral wastepit
* = not listed in the CERCLIS Database or the Archived Sites List

CERCLIS contains information on sites across the nation including location, status, contaminants, and actions taken. It also includes hazardous waste sites, potential hazardous waste sites, and remedial activities, including sites that are on the National Priorities List (NPL) or being considered for the NPL.

Table 5-2
PRELIMINARY ASSESSMENTS
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

No.	Landfill Name
1	Diamond Head Crater Dump
2	Ewa Sugar Mill/Oahu Sugar Company - Coral Wastepit
3	Fort Shafter Dump
4	Hickam Site LF01, Landfill 1
5	Kalihi-Kai Dump
6	Kapaa No. 2 Landfill
7	Kawailoa Landfill
8	Kewalo Ash Landfill
9	Mililani Old Landfill
10	Ewa/Oahu Sugar Company, Waipio Peninsula
11	Pearl City Peninsula Landfill/Dump
12	Schofield Landfill/Dump
13	Waianae Landfill

Table 5-3
SITE INSPECTIONS
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

No.	Landfill Name
1	Ewa Sugar Mill/Oahu Sugar Company - Coral Wastepit
2	Hickam Site LF01, Landfill 1
3	Kapaa No. 2 Landfill
4	NCTAMS - Old Wahiawa Landfill
5	Ewa/Oahu Sugar Company, Waipio Peninsula
6	Pearl City Peninsula Landfill/Dump
7	Schofield Landfill/Dump
8	Waianae Landfill

Table 5-4
SCREENINGS PERFORMED BY THE INITIAL SITE SCREENING TEAM
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

No.	Landfill Name
1	Ford Island Dump
2	Kapaa No. 2 Landfill
3	Kawailoa Landfill
4	Kewalo Ash Landfill
5	Mililani Old Landfill
6	Puu Palailai Landfill
7	Waianae Landfill
8	Waipahu Incinerator Ash Landfill/Dump

Table 6-1
LANDFILL USAGE TYPES
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

No.	Landfill Name	Usage Type	No.	Landfill Name	Usage Type
1	Aikahi Dump	Municipal	39	Kewalo Ash Dump	Municipal
2	Ala Moana Dump	Municipal	40	Koko Head Landfill or Kahauloa Crater Dump	Municipal
3	Bellows Site LF01, Base Landfill	Military	41	Kuapa Pond Dump[$]	Military
4	California Packing Company Dump 1	Agricultural	42	Kunia A Dump	Agricultural
5	Chinese American Club Dump	Municipal	43	Kunia B Dump	Agricultural
6	Diamond Head Crater Dump[+]	Military	44	Laie Dump	Municipal
7	Ewa Sugar Mill/Oahu Sugar Company - Coral Wastepit	Agricultural	45	Makalapa Dump	Military
8	Ewa Sugar/Oahu Sugar Company - Waipio Peninsula	Agricultural	46	Mililani New Landfill	Private
9	Ford Island Dump	Military	47	Mililani Old Landfill	Private
10	Fort Hase/Marine Corp Base Hawaii Landfill	Military	48	Nanakuli A Landfill	Private
11	Fort Kamehaheha LF05, Tri-Services Landfill	Military	49	Nanakuli B	--
12	Fort Shafter Dump	Military	50	Naval Computer and Telecommunication Area Master Station - Old Wahiawa Landfill	Military
13	Haiku Dump	Municipal	51	Naval Radio Transmitting Facility - Lualualei Landfill	Military
14	Hauula Dump	Municipal	52	Oahu Prison Dump	Municipal
15	Hawaiian Pineapple Dump 1 - Poamoho Camp	Agricultural	53	Oahu Sugar Dump 1	Agricultural
16	Hawaiian Pineapple Dump 2 - Wahiawa	Agricultural	54	Oahu Sugar Dump 2	Agricultural
17	Hawaiian Pineapple Dump 3 - Kemoo, Wailua	Agricultural	55	Oahu Sugar Dump 3^	Agricultural
18	Hawaiian Pineapple Dump 4 - Wailua	Agricultural	56	Oahu Sugar Dump 4 - Waipahu	Agricultural
19	Hawaiian Pineapple Dump 5 - Wailua	Agricultural	57	Oahu Sugar Dump 5	Agricultural
20	Hawaiian Pineapple Dump 6 - Wahiawa	Agricultural	58	Oahu Sugar Dump 6	Agricultural
21	Hawaiian Pineapple Dump 7 - Waimea	Agricultural	59	Olomana Limited Dump - Kalihi	Private
22	Hawaiian Pineapple Dump 8 - Ewa	Agricultural	60	Pahounui Dump	Municipal
23	Hawaiian Pineapple Dump 9 - Ewa	Agricultural	61	Pearl City Peninsula Landfill/Dump - (Navy)	Military
24	Hawaiian Pineapple Dump 10 - Kunia	Agricultural	62	Pearl City Dump - Second Street	Municipal
25	Hawaii Kai Cinder Cone Dump	Municipal	63	Punaluu Dump	Municipal
26	Hickam Site LF01, Landfill 1	Military	64	Pupukea Dump	Military
27	Kaaawa Dump	Municipal	65	Puu Palailai Landfill	Private
28	Kalaheo Landfill	Municipal	66	Saki Moru Dump	Private
29	Kalihi-Kai Dump	Municipal	67	Sand Island Ash Dump	Municipal
30	Kapaa Central Landfill	Municipal	68	Schofield Landfill/Dump	Military
31	Kapaa No. 2 Landfill	Municipal	69	Wahiawa A Dump	Municipal
32	Kapaa No. 3 Landfill	Municipal	70	Wahiawa B Dump	Municipal
33	Kapalama Dump*	Municipal	71	Waialua Dump	Municipal
34	Kapiolani Dump	Municipal	72	Waianae Landfill	Municipal
35	Kaukonahua Dump	Agricultural	73	Waimanalo Dump - North	Municipal
36	Kawailoa Landfill	Municipal	74	Waimanalo Dump - South	Municipal
37	Kawainui Dump	Municipal	75	Waipahu Incinerator Ash Landfill/Dump	Municipal
38	Keawaula Dump	Municipal	76	Wheeler Army Airfield - Gulch Runway Dump	Military

[+]Diamond Head Crater was considered as a potential incinerator site in 1960 but was never used.

[*]Kapalama Dump was converted to an incinerator only facility in 1944.

[$]Kuapa Pond Dump was reportedly "clean-up" by the U.S. army

^Oahu Sugar Dump 3 was likely razed for construction of the Village Park subdivision.

Table 7-1
APPLICABLE SOIL TYPES AND PROPERTIES
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Map Symbol	Soil Association	Soil Series	USDA Classification	AASHO Classification	Topsoil Rating	Thickness of Solum (inches)	Moist Bulk Density (gm/cc)	Organic Carbon Content (%)	Drainage Capacity	Moisture Retention (%)	Permeability (inches/hour)	Corrosivity	pH
AeE	Lolekaa-Waikane	Alaeloa	Silty Clay	A-7	Poor	0-58	1.00-1.40	4.0-7.0	Moderately well	0.12-0.14	2-6	High	5.1-6.0
ALF	Lolekaa-Waikane	Alaeloa	Silty Clay	A-7	Poor	0-60	1.00-1.40	4.0-7.0	Moderately well	0.12-0.14	2-6	High	5.1-6.0
BS	Not Applicable	Beaches	Beach Sand	A-1 to A-4	Poor	0-60	1.35-1.60	0.0-0.1	well	0.03-0.05	6-20	High	6.1-7.8
CR	Kaena-Waialua	Coral Outcrop	Coral Outcrop	Not applicable	Poor	0-60	Not available	Not available	Very poor	Not available	Not available	Not available	Not available
EaB	Lualualei-Fill land Ewa	Ewa	Silty Clay Loam	A-6 to A-7	Fair	0-60	1.10-1.30	1.0-4.0	Moderately well	0.10-0.12	0.6-2	Moderate	6.6-7.3
EmA	Lualualei-Fill land Ewa	Ewa	Silty Clay Loam	A-6 to A-7	Fair	0-29	1.10-1.30	2.0-4.0	well	0.10-0.12	0.6-2	Moderate	6.6-7.3
Fd	Lualualei-Fill land Ewa	Fill Land	Silty Clay Loam	A-7	Poor	0-40	1.00-1.20	10-15	Poor	0.14-0.16	0.6-2	Moderate	6.1-7.3
FL	Lualualei-Fill land Ewa	Fill Land, Mixed	Fill Land, Mixed	A-1 to A-7	Poor	0-60	1.20-1.40	0.1-5.0	Poor	0.06-0.12	0.1-2	High	6.1-7.3
HeA	Kaena-Waialua	Haleiwa	Silty Clay	A-7	Poor	0-60	1.10-1.30	1.0-3.0	Moderately well	0.13-0.15	0.6-2	Moderate	6.1-6.5
HeB	Kaena-Waialua	Haleiwa	Silty Clay	A-7	Poor	0-60	1.10-1.30	1.0-3.0	Moderately well	0.13-0.15	0.6-2	Moderate	6.1-6.5
HLMG	Helemano-Wahiawa	Helemano	Silty Clay	A-7	Poor	0-60	1.00-1.20	2.0-5.0	Moderately well	0.10-0.12	2-6	High	5.6-7.3
HnA	Kaena-Waialua	Hanalei	Silty Clay and Silty Clay Loam	A-7	Poor	0-26	0.70-1.10	3.0-6.0	Poor	0.16-0.18	0.6-2	High	4.5-6.5
HxA	Lualualei-Fill land Ewa	Honouliuli	Clay	A-7	Poor	0-60	1.40-1.50	2.0-3.0	Very poor	0.14	0.1-0.6	Moderate	6.6-7.3
JaC	Kaena-Waialua	Jaucas	Sand	A-2 to A-3	Fair	0-60	1.55-1.60	0.5-1.0	well	0.04-0.05	6-20	Moderate	6.6-7.3
JcC	Kaena-Waialua	Jaucas	Sand, Saline	A-1 to A-3	Poor	0-60	1.20-1.40	0.5-1.0	well	0.05-0.07	6-20	High	7.9-8.4
Kfb	Kaena-Waialua	Kaloko Variant	Clay and Silty Clay	A-7	Poor	0-60	0.99-1.15	2.0-4.0	Very poor	0.12-0.14	0.0000-0.1	Moderate	6.1-7.3
KgC	Lolekaa-Waikane	Kaneohe	Silty Clay and Silty Clay Loam	A-7	Poor	0-60	1.00-1.30	5.0-7.0	Moderately well	0.11-0.13	2-6	High	5.1-6.5
KlA	Kaena-Waialua	Kawaihapai	Clay Loam; Stony or Very Stony	A-6 to A-7	Poor	0-54	1.10-1.40	1.0-2.0	Moderately well	0.12-0.15	0.6-2	Moderate	6.6-7.3
KlaB	Kaena-Waialua	Kawaihapai	Clay Loam; Stony or Very Stony	A-6 to A-7	Poor	0-54	1.10-1.40	1.0-2.0	Moderately well	0.10-0.13	0.6-2	Moderate	6.6-7.3
KlB	Kaena-Waialua	Kawaihapai	Clay Loam; Stony or Very Stony	A-6 to A-7	Poor	0-54	1.10-1.40	1.0-2.0	Moderately well	0.12-0.15	0.6-2	Moderate	6.6-7.3
KlbC	Kaena-Waialua	Kawaihapai	Clay Loam; Stony or Very Stony	A-6 to A-7	Fair	0-54	1.10-1.40	1.0-2.0	Moderately well	0.08-0.11	0.6-2	Moderate	6.6-7.3
KlC	Kaena-Waialua	Kawaihapai	Clay Loam; Stony or Very Stony	A-6 to A-7	Poor	0-54	1.10-1.40	1.0-2.0	Moderately well	0.12-0.15	0.6-2	Moderate	6.6-7.3
KmA	Kaena-Waialua	Keaau	Clay and Silty Clay	A-7	Poor	0-57	1.10-1.30	2.0-5.0	Very poor	0.12-0.14	0.0000-0.1	High	7.4-7.8
KmbA	Kaena-Waialua	Keaau	Clay and Silty Clay, Saline	A-7	Poor	0-57	1.10-1.30	1.0-2.0	Very poor	0.12-0.14	0.0000-0.1	High	7.4-7.8
KsB	Kaena-Waialua	Koko	Silt Loam and Clay Loam	A-4, A-7	good	0-60	0.45-0.85	3.0-5.0	Moderately well	0.16-0.18	0.6-2	Moderate	6.6-7.3
KsD	Kaena-Waialua	Koko	Silt Loam and Clay Loam	A-4, A-7	Poor	0-60	0.45-0.85	3.0-5.0	Moderately well	0.16-0.18	0.6-2	Moderate	6.6-7.3
KtC	Kaena-Waialua	Kokokahi	Clay and Very Stony Clay	A-7	Poor	0-44	1.10-1.40	0.5-2.0	Very poor	0.12-0.14	0.1-0.6	High	6.1-7.3
KuC	Tropohumults-Dystrandepts	Kolekole	Silty Clay Loam	A-4, A-7	Poor	0-60	1.00-1.20	2.0-4.0	Poor	0.09-0.11	2-6	High	4-5.5
KuD	Tropohumults-Dystrandepts	Kolekole	Silty Clay Loam	A-4, A-7	Poor	0-60	1.00-1.20	2.0-4.0	Poor	0.09-0.11	2-6	High	4-5.5
KyA	Helemano-Wahiawa	Kunia	Silty Clay	A-7	Poor	0-60	1.10-1.40	1.0-4.0	Moderately well	0.12-0.14	0.6-2	Moderate	5.6-6.0
KyB	Helemano-Wahiawa	Kunia	Silty Clay	A-7	Poor	0-60	1.10-1.40	1.0-4.0	Moderately well	0.12-0.14	0.6-2	Moderate	5.6-6.0
KyC	Helemano-Wahiawa	Kunia	Silty Clay	A-7	Poor	0-60	1.10-1.40	1.0-4.0	Moderately well	0.12-0.14	0.6-2	Moderate	5.6-6.0
LaB	Helemano-Wahiawa	Lahaina	Silty Clay	A-7	Poor	0-60	1.10-1.35	1.0-4.0	Moderately well	0.10-0.12	0.6-2	Moderate	5.1-6.0
LaC	Helemano-Wahiawa	Lahaina	Silty Clay	A-7	Poor	0-60	1.10-1.35	1.0-4.0	Moderately well	0.10-0.12	0.6-2	Moderate	5.1-6.0
LeB	Kaena-Waialua	Leilehua	Silty Clay and Clay	A-7	Poor	0-60	1.00-1.30	5.0-6.0	Moderately well	0.10-0.12	2-6	High	3.6-4.4
LeC	Kaena-Waialua	Leilehua	Silty Clay and Clay	A-7	Poor	0-60	1.00-1.30	5.0-6.0	Moderately well	0.10-0.12	2-6	High	3.6-4.4
LoB	Tropohumults-Dystrandepts	Lolekaa	Silty Clay	A-7	Poor	0-60	1.00-1.10	6.0-7.0	Moderately well	0.10-0.12	2-6	High	4.5-5.5
LoC	Tropohumults-Dystrandepts	Lolekaa	Silty Clay	A-7	Poor	0-60	1.00-1.10	6.0-7.0	Moderately well	0.10-0.12	2-6	High	4.5-5.5
LoD	Tropohumults-Dystrandepts	Lolekaa	Silty Clay	A-7	Poor	0-60	1.00-1.10	6.0-7.0	Moderately well	0.10-0.12	2-6	High	4.5-5.5
LoE	Tropohumults-Dystrandepts	Lolekaa	Silty Clay	A-7	Poor	0-60	1.00-1.10	6.0-7.0	Moderately well	0.10-0.12	2-6	High	4.5-5.5
LPE	Rock land-Stony steep	Lualualei	Extremely Stony Clay	A-7	Poor	0-60	1.20-1.56	0.5-2.0	Very poor	0.08-0.10	0.0000-0.1	Moderate	6.6-7.3
LuA	Rock land-Stony steep	Lualualei	Clay	A-7	Poor	0-60	1.20-1.35	0.5-2.0	Very poor	0.10-0.12	0.0000-0.1	Moderate	6.6-7.3
MdB	Helemano-Wahiawa	Makalapa	Clay	A-7	Poor	0-38	1.10-1.40	0.5-2.0	Very poor	0.11-0.13	0.0000-0.1	High	7.4-7.8
MdC	Helemano-Wahiawa	Makalapa	Clay	A-7	Poor	0-38	1.10-1.40	0.5-2.0	Very poor	0.11-0.13	0.0000-0.1	High	7.4-7.8
MkA	Helemano-Wahiawa	Makiki	Clay Loam; Stony or Very Stony	A-7	Fair	0-60	0.90-1.10	7.0-10	Moderately well	0.13-0.15	2-6	Moderate	5.1-5.5
MnC	Tropohumults-Dystrandepts	Mamala	Stony Silty Clay Loam	A-7	Poor	0-19	1.10-1.33	2.0-4.0	Very poor	0.16-0.18	0.6-2	Moderate	6.6-7.3
MpD2	Lolekaa-Waikane	Manana	Silty Clay Loam and Silty Clay	A-7	Poor	0-60	1.00-1.20	3.0-6.0	Moderately well	0.09-0.11	2-6	High	4.5-5.5

Table 7-1
APPLICABLE SOIL TYPES AND PROPERTIES
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Map Symbol	Soil Association	Soil Series	USDA Classification	AASHO Classification	Topsoil Rating	Thickness of Solum (inches)	Moist Bulk Density (gm/cc)	Organic Carbon Content (%)	Drainage Capacity	Moisture Retention (%)	Permeability (inches/hour)	Corrosivity	pH
Ms	Kaena-Waialua	Mokuleia	Clay Loam, Loam, or Fine Sandy Loam	A-4	Poor	0-50	1.20-1.40	1.0-2.0	Moderately well	0.09-0.12	2-6	High	6.6-7.3
Mt	Kaena-Waialua	Mokuleia	Clay Loam, Loam, or Fine Sandy Loam	A-6 to A-7	Poor	0-50	1.10-1.30	1.0-2.0	Moderately well	0.13-0.15	0.6-2	High	6.6-7.3
MuA	Helemano-Wahiawa	Molokai	Silty Clay Loam	A-7	Poor	0-60	1.10-1.35	1.0-4.0	Moderately well	0.11-0.13	0.6-2	Moderate	6.6-7.8
MuB	Helemano-Wahiawa	Molokai	Silty Clay Loam	A-7	Poor	0-60	1.10-1.35	1.0-4.0	Moderately well	0.11-0.13	0.6-2	Moderate	6.6-7.8
MuC	Helemano-Wahiawa	Molokai	Silty Clay Loam	A-7	Poor	0-60	1.10-1.35	1.0-4.0	Moderately well	0.11-0.13	0.6-2	Moderate	6.6-7.8
MuD	Lualualei-Fill land Ewa	Molokai	Silty Clay Loam	A-7	Poor	0-72	1.10-1.35	1.0-4.0	Moderately well	0.11-0.13	0.6-2	Moderate	6.6-7.8
MZ	Kaena-Waialua	Marsh	Marsh	A-8	Poor	0-60	Not available	60-99	Very poor	0.24-0.30	2-6	High	6.6-7.3
Ph	Kaena-Waialua	Pearl Harbor	Clay	A-7	Poor	0-31	1.10-1.30	10-15	Very poor	0.10-0.12	0.0000-0.1	High	6.6-7.3
PkB	Lolekaa-Waikane	Pohakupu	Silty Clay Loam	A-7	Fair	0-60	0.90-1.10	4.0-6.0	Moderately well	0.12-0.14	2-6	Moderate	6.1-6.5
PvC	Kaena-Waialua	Pulehu	Very Stony Clay Loam	A-7	Fair	0-60	1.10-1.40	1.0-2.0	Moderately well	0.09-0.12	0.6-2	Moderate	6.6-7.3
PYF	Kapaa	Papaa	Clay	A-6 to A-7	Poor	0-40	1.10-1.30	4.0-7.0	Very poor	0.10-0.12	0.0000-0.1	Moderate	6.1-6.5
QU	Rock Land-Stony steep	Quarry	Quarry Rock	Not applicable	Poor	Not available	Not available	Not available	Not available	Not available	Not available	Not available	Not available
Quarry	Rock Land	Quarry	Quarry Rock	Not available	Poor	Not available	Not available	Not available	Not available	Not available	Not available	Not available	Not available
rRK	Rock land	Rock Land	Silty Clay Loam, Unweathered Bedrock	A-7	Poor	0-8	1.20-1.40	3.0-6.0	Very poor	0.12-0.16	0.6-2	Moderate	Not available
rRT	Rock land-Stony steep	Land	Bedrock	A-7	Poor	0-60	0.80-1.10	20-30	Very poor	0.14-0.16	2-6	High	3.5-5.0
rSY	Stony Steep Land	Stony Steep Land	Extremely Stony Silty Clay	A-7	Poor	0-60	0.70-1.40	1.0-3.0	Moderately well	0.08-0.10	2-6	High	5.1-6.5
W	Not Applicable	Water	Water	Not applicable	Poor	Not available	Not available	Not available	Not available	Not available	Not available	Not available	Not available
WaA	Helemano-Wahiawa	Wahiawa	Silty Clay	A-7	Poor	0-60	1.20-1.45	2.0-5.0	Moderately well	0.11-0.13	2-6	Moderate	5.1-6.0
WaB	Helemano-Wahiawa	Wahiawa	Silty Clay	A-7	Poor	0-60	1.20-1.45	2.0-5.0	Moderately well	0.11-0.13	2-6	Moderate	5.1-6.0
WaC	Helemano-Wahiawa	Wahiawa	Silty Clay	A-7	Poor	0-60	1.20-1.45	2.0-5.0	Moderately well	0.11-0.13	2-6	Moderate	5.1-6.0

Sources: USDA Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii, August 1972 and the USDA Natural Resources Conservation Service' update information located at http://www.ctahr.hawaii.edu/soilsurvey/soils.htm.

Notes: AASHO = American Assoication of State Highway Officials
gm/cc = grams per cubic centimeter
USDA = United States Department of Agriculture
% = percent

Table 7-2
CORRELATION OF GEOLOGIC UNITS AND ROCK TYPES
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Stearns, 1938			Hunt, 1996
Geologic Symbol	**Geologic Unit**	**Geologic Description**	**Rock Type**
Pa	Consolidated noncalcareous deposits	Chiefly older alluvium, generally consisting of mottled brown to red-brown, deeply weathered, poorly-assorted, and nearly impermeable friable conglomerates, in places cemented with limonite or hematite and usually forming conspicuous terraces along the principal streams. Near the mouths of the valleys and especially around Pearl Harbor and near Waialua the older alluvium grades into partly consolidated sands and silts that are emerged delta deposits. The degree of consolidation is largely dependent upon the amount of rainfall, for in dry regions the material is much better cemented than in wet regions. Near the heads of valleys the older alluvium grades into coarse angular talus and landslide deposits which, in places, carry considerable water. In the large semiarid valleys in the Waianae Range these deposits are firmly cemented breccias. Poorly permeable in wet areas and hold up perched water in the Honolulu volcanic series, but in the dry areas they yield small supplies of potable water.	Alluvium-older-consolidated
Pd	Consolidated calcareous dunes	Thin-bedded and cross-bedded eolian limestone composed of uniform fine calcareous grains blown inland from ancient beaches and later lithified. It contains sufficient solution channels to be permeable, and locally it carries water, which is apt to be brackish near the sea.	Dunes-consolidated
Pls	Consolidated calcareous marine sediments	Chiefly emerged coral reefs but in places, especially near Pearl Harbor, finely laminated lagoon limestone. Beach deposits resembling the various types of present calcareous beaches in lithified form are included, as well as a few inextensive consolidated beach deposits that may have been formed at the present stand of the sea. Extremely permeable because of primary and secondary cavities and yields water copiously, but the water is apt to be brackish.	Coral-in situ reef limestone
Qhb	Honolulu volcanic series	Dense and vesicular jointed aa and pahoehoe flows of olivine, nephelite, and nephelite-melilite basalt, from about 10 to 300 feet thick, generally flooring valleys in the Koolau Range and poured out of numerous vents. Most of the flows carry perched water at their base.	Honolulu Volcanics-lava flows
Qhf	Honolulu volcanic series	Firefountain deposits of friable red to black bedded cinders, spatter, pumice, and bombs, coarse, thick, and forming cones near the vents but thin and finer grained elsewhere; they are permeable but too local to carry water except in a few places in Nuuanu Valley.	Honolulu Volcanics-cinders
Qht	Honolulu volcanic series	Consolidated gray, lavender, and brown bedded, only slightly permeable deposits of basic vitric-crystal-lithic tuff composed of angular fragments of Koolau and post-Koolau basalt, limestone, and other ejecta in a matrix of palagonite and glass, commonly cemented by calcite, forming cones near the vents but thin elsewhere and caused by phreatomagmatic explosions.	Honolulu Volcanics-tuff
Qkb	Honolulu volcanic series	Permeable thin vesicular black aa and pahoehoe flows from several vents along Koko fissure, and forming part of Koko volcanics. The flows cover dry areas close to the sea, hence usually contain brackish water, or, if above sea level, are probably dry.	Honolulu Volcanics-lava flows
Qkf	Honolulu volcanic series	Permeable friable red to brown coarse firefountain deposits consisting chiefly of cinders and spatter forming cones around vents along the Koko fissure and forming part of Koko volcanics; too small in area to be water bearers.	Honolulu Volcanics-cinders
Qkt	Honolulu volcanic series	Slightly permeable gray to red-brown bedded deposits of vitric-crystal-lithic tuff composed of angular fragments of Koolau and post-Koolau basalt, limestone, and other ejecta in a matrix of palagonite or glass, generally cemented by calcite or zeolites; caused by phreatomagmatic explosions along the Koko fissure, and forming part of Koko volcanics.	Honolulu Volcanics-tuff
Ra	Unconsolidated noncalcareous deposits	Chiefly younger alluvium, a black to brown fluviatile deposit generally consisting of coarse permeable detritus only slightly weathered and in many places subangular. In the valley bottoms near the sea it usually consists of nearly impermeable black, sticky mud called taro-patch clay. Much of the younger alluvium is reworked older alluvium. Included also is talus composed of angular blocks, usually with brown interstitial soil, forming aprons on the steep slopes at the base of cliffs. In the mountain areas much of the younger alluvium resembles, includes, and is often inseparable from landslide deposits, because of the torrential character of the streams and the precipitous valley walls. Extensive mantles of hill wash are included. Wells develop water from it in small quantities.	Alluvium-younger
Rf	Artificial fill composed of marine deposits*	Brown to white permeable marine mud containing shells, coral, and other calcareous marine organisms dredged from the ocean floor and used to fill up salt marshes and other lowlands.	Sand-unconsolidated
Rs	Unconsolidated marine calcareous sediments	Chiefly cream-colored and light-tan, very permeable beach sand consisting of grains of worn coral, coralline algae, and shells with appreciable amounts of foraminifers and other calcareous marine organisms. Abundant water in this sand, but it is either brackish or ocean water.	Sand-unconsolidated

Table 7-2
CORRELATION OF GEOLOGIC UNITS AND ROCK TYPES
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Geologic Symbol	Geologic Unit	Geologic Description	Rock Type
Tkadc	Kailua volcanic series	A denuded rift zone consisting of greenish-gray to black, usually vertical single and multiple basalt dikes, a few inches to 6 feet thick, usually microcrystalline, a few with olivine phenocrysts, chiefly cross-jointed, some platy and amygdalodial, intruded into the basalt flows and filling fissures through which the basalt flows issued, the amount of extrusive basalt present is negligible; the joint cracks in the dikes are nearly all filled with secondary minerals, chiefly quartz, and water does not occur in them; the dikes outside the rift zone are not differentiated on the map from the dikes of the Koolau volcanic series. It is believed that the Kailua volcanic series was formed in and under the caldera of the Koolau volcano.	Koolau Basalt-Lava flows-dike complex
Tkb	Koolau volcanic series	Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.	Koolau Basalt-saprolite
Tkbr	Koolau volcanic series	Firmly cemented, usually structureless impermeable gray throat breccia containing angular intrusive and extrusive basalt fragments as much as about 6 feet in diameter filling ancient craters.	Koolau Basalt-breccia
Twb	Waianae volcanic series	The lower basalt member includes one thick trachyte flow with the remainder chiefly effusive aphanitic and porphyritic pahoehoe basalts, with small amounts of aa, varying from 10 to 200 feet in thickness and having a total thickness of over 2,000 feet. The middle member consists of both aa and pahoehoe in nearly equal amounts, and the upper member comprises chiefly massive aa flows; the total thickness of the flow lavas exceeds 4,000 feet. The conspicuous phenocrysts are olivine and feldspar; the three basalt members are all very permeable and are the important aquifers of the Waianae Range.	Waianae Volcanics-Lava flows-dike free

Sources: Stearns, H.T. 1938. Geologic and Topographic Map of the Island of Oahu, Hawaii. Prepared in cooperation with the United States Geological Survey.
Hunt, C.D., Jr. 1996. Geohydrology of the Island of Oahu, Hawaii: Regional Aquifer System Analysis – Oahu, Hawaii, U. S. Geological Survey Professional Paper 1412-B.

* When correlating Stearns' geologic unit "Rf - Artificial fill composed of marine deposits" to Hunt's "rock types", unconsolidated sand was considered the closest match because the geologic description for Rf indicates that the unit is permeable. Lagoonal-mud was not used because its permeability was considered very low by Hunt.

Table 7-3
HYDROGEOLOGIC PROPERTIES SUMMARY
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Rock Type	Permeability	Hydraulic Conductivity (feet per day)	Groundwater Occurrence-Principal	Groundwater Occurrence-Secondary
Alluvium-older-consolidated	Very low	<1	Perched	--
Alluvium-older-unconsolidated	Low	1 - 100	Perched	Basal
Alluvium-younger	Moderate to low	1 - 500	Perched	Perched
Coral-in situ reef limestone	Moderate to very high	100 - 20,000	Basal	Perched
Coral-reworked coral rubble	Moderate to very high	100 - 10,000	Basal	Perched
Dunes-consolidated	Low	1 - 100	Perched	Basal
Dunes-unconsolidated	Low to moderate	1 - 500	Basal	Perched
Honolulu Volcanics-cinders	Low to moderate	1 - 500	Perched	--
Honolulu Volcanics-lava flows	Low to moderate	1 - 500	Perched	--
Honolulu Volcanics-saprolite	Very low	<1	Perched	--
Honolulu Volcanics-tuff	Low	1 - 100	Perched	--
Koolau Basalt-breccia	Low	1 - 100	Perched	--
Koolau Basalt-Lava flows-dike complex	Low to moderate	1 - 500	Dike impounded	Perched
Koolau Basalt-Lava flows-dike free	Moderate to very high	500 - 5,000	Basal	--
Koolau Basalt-Lava flows-marginal dike zone	Moderate to high	100 - 1,000	Dike impounded	Basal
Koolau Basalt-saprolite	Very low	<1	Perched	--
Lagoonal-mud	Very low	<1	Basal	Perched
Lagoonal-sand	Low to moderate	1 - 500	Basal	--
Sand-consolidated	Low to moderate	1 - 500	Basal	--
Sand-unconsolidated	Moderate to high	100 - 1,000	Basal	--
Waianae Volcanics-breccia	Low	1 - 100	Perched	--
Waianae Volcanics-Lava flows-dike complex	Low to moderate	1 - 500	Dike impounded	Perched
Waianae Volcanics-Lava flows-dike free	Moderate to very high	500 - 5,000	Basal	--
Waianae Volcanics-Lava flows-marginal dike zone	Moderate to high	100 - 1,000	Dike impounded	Basal
Waianae Volcanics-saprolite	Very low	<1	Perched	--

Source: Hunt, C.D., Jr. 1996. Geohydrology of the Island of Oahu, Hawaii: Regional Aquifer System Analysis – Oahu, Hawaii, U. S. Geological Survey Professional Paper 1412-B.

Notes:

Basal refers to the deepest or main water table near sea level, typically corresponding to a lens of freshwater floating on seawater.

Table 7-4
APPLICABLE AQUIFERS CONSIDERED HIGHLY VULNERABLE
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Aquifer/Status Code	Aquifer Sector	Aquifer System	Aquifer Type-1	Aquifer Type-2	Aquifer Type-Geology	Status Code-Development Stage	Status Code-Utility	Status Code-Salinity (milligrams per liter-chloride)	Status Code-Uniqueness	Status Code-Vulnerability	Affiliated Landfill(s)
3060211612211	Windward	Kahana	Basal	Unconfined	Sedimentary	Currently used	Ecologically important	Low (250-1000)	Irreplaceable	**High**	Punaluu Dump
3030311613311	Waianae	Waianae	Basal	Unconfined	Sedimentary	Currently used	Neither	Moderate (1,000-5,000)	Irreplaceable	**High**	Waianae Landfill
3040211612211	North	Waialua	Basal	Unconfined	Sedimentary	Currently used	Ecologically important	Low (250-1000)	Irreplaceable	**High**	Waialua Dump
3040311111111	North	Kawailoa	Basal	Unconfined	Flank	Currently used	Drinking	Fresh (<250)	Irreplaceable	**High**	Hawaiian Pineapple Dump 7 - Waimea
3040311612211	North	Kawailoa	Basal	Unconfined	Sedimentary	Currently used	Ecologically important	Low (250-1000)	Irreplaceable	**High**	Kawailoa Landfill
3010511623421	Honolulu	Waialae	Basal	Unconfined	Sedimentary	Potential use	Neither	High (5,000-15,000)	Replaceable	**High**	Diamond Head Crater Dump, Hawaii Kai Cinder Cone Dump, Koko Head Landfill
3060111622221	Windward	Koolauloa	Basal	Unconfined	Sedimentary	Potential use	Ecologically important	Low (250-1000)	Replaceable	**High**	Hauula Dump, Laie Dump
3030511633421	Waianae	Keaau	Basal	Unconfined	Sedimentary	No potential use	Neither	High (5,000-15,000)	Replaceable	**High**	Keawaula Dump
3010211613321	Honolulu	Nuuanu	Basal	Unconfined	Sedimentary	Currently used	Neither	Moderate (1,000-5,000)	Replaceable	**High**	Ala Moana Dump, Kapiolani Dump, Kewalo Ash Dump
3010111623321	Honolulu	Palolo	Basal	Unconfined	Sedimentary	Potential use	Neither	Moderate (1,000-5,000)	Replaceable	**High**	Chinese American Club Dump
3060411612211	Windward	Waimanalo	Basal	Unconfined	Sedimentary	Currently used	Ecologically important	Low (250-1000)	Irreplaceable	**High**	Aikahi Dump, Fort Hase Dump, Kawainui Dump
3060421211111	Windward	Waimanalo	High Level	Unconfined	Dike	Currently used	Drinking	Fresh (<250)	Irreplaceable	**High**	Bellows Site LF01, Base Landfill, Kaaawa Dump, Kalaheo Landfill, Kapaa Central Landfill, Kapaa No. 2 Landfill, Kapaa No. 3 Landfill, Waimanalo Dump - North, Waimanalo Dump - South
3040211111111	North	Waialua	Basal	Unconfined	Flank	Currently used	Drinking	Fresh (<250)	Irreplaceable	**High**	Hawaiian Pineapple Dump 3 - Kemoo, Wailua, Hawaiian Pineapple Dump 4 - Wailua, Hawaiian Pineapple Dump 5 - Wailua
3050121211111	Central	Wahiawa	High Level	Unconfined	Dike	Currently used	Drinking	Fresh (<250)	Irreplaceable	**High**	California Packing Company Dump 1, Hawaiian Pineapple Dump 1 - Poamoho Camp, Hawaiian Pineapple Dump 2 - Wahiawa, Hawaiian Pineapple Dump 6 - Wahiawa, Kaukonahua Dump, Schofield Landfill/Dump, Wahiawa Dump
3020311111111	Pearl Harbor	Waipahu	Basal	Unconfined	Flank	Currently used	Drinking	Fresh (<250)	Irreplaceable	**High**	Hawaiian Pineapples Dumps 8, 9, (Ewa) and 10 (Kunia), Kunia Dumps A and B, Mililani Old Landfill, Oahu Sugar Dumps 1, 2, 3, and 5, Wheeler Army Airfield - Gulch Runway Dump
3030211613311	Waianae	Lualualei	Basal	Unconfined	Sedimentary	Currently used	Neither	Moderate (1,000-5,000)	Irreplaceable	**High**	Nanakuli B, Saki Moru Dump
3030211223321	Waianae	Lualualei	Basal	Unconfined	Dike	Potential use	Neither	Moderate (1,000-5,000)	Replaceable	**High**	Nanakuli A
3020411111111	Pearl Harbor	Ewa	Basal	Unconfined	Flank	Currently used	Drinking	Fresh (<250)	Irreplaceable	**High**	Puu Palailai Landfill
3010311613321	Honolulu	Kalihi	Basal	Unconfined	Sedimentary	Currently used	Neither	Moderate (1,000-5,000)	Replaceable	**High**	Kalihi-Kai Dump, Kapalama Dump, Pahounui Dump
3020311612211	Pearl Harbor	Waipahu	Basal	Unconfined	Sedimentary	Currently used	Ecologically important	Low (250-1000)	Irreplaceable	**High**	Oahu Sugar Dump 4 - Waipahu, Waipahu Incinerator Ash Landfill/Dump
3020211612211	Pearl Harbor	Waiawa	Basal	Unconfined	Sedimentary	Currently used	Ecologically important	Low (250-1000)	Irreplaceable	**High**	Pearl City Dump - Second Street
3020211111111	Pearl Harbor	Waiawa	Basal	Unconfined	Flank	Currently used	Drinking	Fresh (<250)	Irreplaceable	**High**	Mililani New Landfill, Oahu Sugar Dump 6, Pearl City Peninsula Landfill/Dump - (Navy)
3010411623321	Honolulu	Moanalua	Basal	Unconfined	Sedimentary	Potential use	Neither	Moderate (1,000-5,000)	Replaceable	**High**	Fort Kamehaheha LF05, Tri-Services Landfill, Hickam Site LF01, Landfill 1, Oahu Prison Dump, Olomana Limited Dump - Keehi

Source: Mink, J.F., and Lau, L.S. 1990. Aquifer Identification and Classification for the Island of Oahu: Groundwater Protection Strategy for Hawaii.

Table 7-5
LANDFILLS' PROXIMITY TO UIC AND NO-PASS LINES
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

No.	Landfill Name	UIC Line	No-Pass Line	Category	No.	Landfill Name	UIC Line	No-Pass Line	Category
1	Aikahi Dump	Makai	Makai	3	39	Kewalo Ash Dump	Makai	Makai	3
2	Ala Moana Dump	Makai	Makai	3	40	Koko Head Landfill or Kahauloa Crater Dump	Makai	Makai	3
3	Bellows Site LF01, Base Landfill	Makai	Makai	3	41	Kuapa Pond Dump[$]	Mauka	Mauka	2
4	California Packing Company Dump 1	Mauka	Mauka	2	42	Kunia A Dump	Mauka	Mauka	2
5	Chinese American Club Dump	Mauka	Makai	3	43	Kunia B Dump	Mauka	Mauka	2
6	Diamond Head Crater Dump[+]	Makai	Makai	3	44	Laie Dump	Mauka	Mauka	1
7	Ewa Sugar Mill/Oahu Sugar Company - Coral Waste	Makai	Makai	3	45	Makalapa Dump	Makai	Makai	3
8	Ewa Sugar/Oahu Sugar Company - Waipio Peninsula	Mauka	Mauka	3	46	Mililani New Landfill	Mauka	Makai	3
9	Ford Island Dump	Makai	Makai	3	47	Mililani Old Landfill	Mauka	Mauka	1
10	Fort Hase/Marine Corp Base Hawaii Landfill	Makai	Makai	3	48	Nanakuli A Landfill	Mauka	Mauka	2
11	Fort Kamehaheha LF05, Tri-Services Landfill	Makai	Makai	3	49	Nanakuli B	Mauka	Mauka	2
12	Fort Shafter Dump	Mauka	Mauka	1	50	NCTAMS - Old Wahiawa Landfill	Mauka	Mauka	1
13	Haiku Dump	Makai	Makai	3	51	NRTF - Lualualei Landfill	Makai	Makai	3
14	Hauula Dump	Makai	Makai	3	52	Oahu Prison Dump	Makai	Makai	3
15	Hawaiian Pineapple Dump 1 - Poamoho Camp	Mauka	Mauka	2	53	Oahu Sugar Dump 1	Mauka	Mauka	2
16	Hawaiian Pineapple Dump 2 - Wahiawa	Mauka	Mauka	2	54	Oahu Sugar Dump 2	Mauka	Mauka	1
17	Hawaiian Pineapple Dump 3 - Kemoo, Wailua	Mauka	Mauka	2	55	Oahu Sugar Dump 3^	Mauka	Mauka	1
18	Hawaiian Pineapple Dump 4 - Wailua	Mauka	Mauka	2	56	Oahu Sugar Dump 4 - Waipahu	Mauka	Mauka	1
19	Hawaiian Pineapple Dump 5 - Wailua	Mauka	Mauka	2	57	Oahu Sugar Dump 5	Mauka	Mauka	1
20	Hawaiian Pineapple Dump 6 - Wahiawa	Mauka	Mauka	2	58	Oahu Sugar Dump 6	Mauka	Mauka	1
21	Hawaiian Pineapple Dump 7 - Waimea	Mauka	Mauka	2	59	Olomana Limited Dump - Kalihi	Makai	Makai	3
22	Hawaiian Pineapple Dump 8 - Ewa	Mauka	Mauka	2	60	Pahounui Dump	Makai	Makai	3
23	Hawaiian Pineapple Dump 9 - Ewa	Mauka	Mauka	2	61	Pearl City Peninsula Landfill/Dump - (Navy)	Makai	Makai	3
24	Hawaiian Pineapple Dump 10 - Kunia	Mauka	Mauka	2	62	Pearl City Dump - Second Street	Mauka	Mauka	1
25	Hawaii Kai Cinder Cone Dump	Mauka	Mauka	2	63	Punaluu Dump	Makai	Makai	3
26	Hickam Site LF01, Landfill 1	Makai	Makai	3	64	Pupukea Dump	Mauka	Mauka	2
27	Kaaawa Dump	Mauka	Mauka	2	65	Puu Palailai Landfill	Mauka	Mauka	1
28	Kalaheo Landfill	Makai	Makai	3	66	Saki Moru Dump	Mauka	Makai	3
29	Kalihi-Kai Dump	Makai	Makai	3	67	Sand Island Ash Dump	Makai	Makai	3
30	Kapaa Central Landfill	Makai	Makai	3	68	Schofield Landfill/Dump	Mauka	Mauka	2
31	Kapaa No. 2 Landfill	Makai	Makai	3	69	Wahiawa A Dump	Mauka	Mauka	1
32	Kapaa No. 3 Landfill	Makai	Makai	3	70	Wahiawa B Dump	Mauka	Mauka	2
33	Kapalama Dump*	Makai	Makai	3	71	Waialua Dump	Makai	Makai	3
34	Kapiolani Dump	Mauka	Makai	3	72	Waianae Landfill	Makai	Makai	3
35	Kaukonahua Dump	Mauka	Mauka	2	73	Waimanalo Dump - North	Makai	Makai	3
36	Kawailoa Landfill	Makai	Makai	3	74	Waimanalo Dump - South	Mauka	Makai	3
37	Kawainui Dump	Makai	Makai	3	75	Waipahu Incinerator Ash Landfill/Dump	Makai	Makai	3
38	Keawaula Dump	Makai	Makai	3	76	Wheeler Army Airfield - Gulch Runway Dump	Mauka	Mauka	2

Category number 1 = Mauka of the No-Pass Line and within one mile of drinking water wells.

Category number 2 = Mauka of the No-Pass Line and not within one mile of drinking water wells.

Category number 3 = Makai of the No-Pass Line and not anticipated to affect drinking water wells

[+]Diamond Head Crater was considered as a potential incinerator site in 1960 but was never used.

[*]Kapalama Dump was converted to an incinerator only facility in 1944.

[$]Kuapa Pond Dump was reportedly "cleaned-up" by the U.S. army

^Oahu Sugar Dump 3 was likely razed for construction of the Village Park subdivision.

Table 8-1
GEOGRAPHIC INFORMATION SYSTEM
COVERAGE DETAILS
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

GIS Coverage	File Name	GIS Data Type	Source	History	Existing Data Type
General Reference					
Roads - USGS major	majroads n83.shp	Line	USGS Digital Line Graphs, 1983 version.	Subset of the roads layer of the 1983 DLGs, obtained by reselecting arcs using USGS major and minor codes. H-3 was added to the layer by the OP.	digital
Roads - USGS other	othroads n83.shp	Line	USGS Digital Line Graphs, 1983 version.	Subset of the roads layer of the 1983 DLGs, obtained by reselecting arcs using USGS major and minor codes. Updated by DLNR, DOFAW, January, 2001.	digital
Coastlines	oahshore_n83.shp	Polygon	USGS Digital Line Graphs, 1983 version.	Extracted by OSP staff from the 1983 1:24,000 USGS Digital Line Graphs	digital
Hydrology					
Annual rainfall	rainfall n83.shp	Line	Giambelluca, T.W., Nullet, M.A., and Schroeder, T.A. 1986. Hawaii Rainfall Atlas, Report R76, Hawaii DOWALD, DLNR, Honolulu. vi + 267 p.	Digitized in early 1990's in Arc/Info by the OP using ArcEdit from island-wide mylar maps (obtained from DLNR/DOWALD) of varying scales and sizes.	digital
DLNR wells	oahwells.shp	Point	Department of Land and Natural Resources	Digitized by DLNR Commission on Water Resources	
DOH aquifers	dohaq n83.shp	Polygon	Original maps prepared by John F. Mink and L. Stephen Lau (WRRC) for the DOH's Groundwater Protection Program. Digitized by DOH - Environmental Planning Office from the original mylars, based on USGS 1:24,000 scale maps.	Digitized in 1992 by DOH - Environmental Planning Office from the original mylars, based on USGS 1:24,000 scale maps.	digital
Perennial streams	strmsperen n83.shp	Line	USGS Digital Line Graphs, 1983 version; CWRM HSA database, 1993.	Arcs were extracted from the 1983 DLG hydrography layers based on the CWRM HSA maps and database, then coded with the HSA stream code, and the HSA stream name.	digital
Wetlands	wetlnds py n83.shp, wetlnds ln n84.shp	Polygon	U.S. Department of the Interior, Fish and Wildlife Service	Received in digital format from U.S. Fish and Wildlife Service, 1992. OP Staff separated into polygon and line coverages using DISSOLVE command and ArcEdit, 1993, 1999. Converted to NAD 83, April, 2003.	digital
Land Use					
Tax map key	parcel.shp	Polygon	C&C of Honolulu Dept of Planning and Permitting HoLIS	Digitized by C&C of Honolulu Dept of Planning and Permitting in 2001 from parcel maps.	digital
Land use/land cover	lulc n83.shp	Polygon	1:100,000 1976 Digital GIRAS files.	LULC data consists of historical land use and land cover classification data that was based primarily on the manual interpretation of 1970's and 1980's aerial photography. Secondary sources included land use maps and surveys. There are 21 possible categories of cover type The spatial resolution for all LULC files will depend on the format and feature type. Files in GIRAS format will have a minimum polygon area of 10 acres (4 hectares) with a minimum width of 660 feet (200 meters) for manmade features. Non-urban or natural features have a minimum polygon area of 40 acres (16 hectares) with a minimum width of 1320 feet (400 meters). Files in CTG format will have a resolution of 30 meters.	digital
Physiographic Provinces	phys_n83.shp	Polygon	US Geological Survey	Digitized by USGS from Hunt, Charles D., 1996, Geohydrology of the island of Oahu, Hawaii, USGS professional paper; 1412-B.	
Census block 2000	blocks00 n83.shp	Polygon	www.geographynetwork.com (May, 2001).	Downloaded from www.geographynetwork.com. Merged all 5 counties into one layer using ArcView's Geoprocessing extension. Projected from decimal degrees to UTM Zone 4 using 'Hawaii Datums and Projections' extension in ArcView. 2000 block population added only to the shapefile.	digital
Public school locations	pubschools n83.shp	Point	USGS GNIS- 1992, DAGS Planning - 2000, C&C of Honolulu - 2001.	Created by Office of Planning, 2001, using various sources. August, 2002 - converted to double precision. Corrected location of Sunset Beach Elem School, Aug 2002.	digital
Various pineapple and sugar company maps	oahpine n83.shp	Polygon	OAHPINE - Digitized by OP from 1:24,000 ortho-photo quads, 1989.	Digitized by OP staff in ArcInfo.	digital
	oahsugco n83.shp	Polygon	OAHSUGCO - Digitized by OP from maps of varying scale provided by Oahu Sugar Company, 1989.	Digitized by OP staff in ArcInfo.	digital
Soils					
Soil types	hi990_a, hi990_b, hi990_p, hi990_q	Polygon	USDA - Natural Resources Conservation Service, SSURGO Data	The Islands of Kauai, Oahu, Maui, Molokai, and Lanai Soil Survey was published in 1972 at 1:24,000 scale. The soil survey in was updated in 1993. Compilation, digitizing, and quality control were performed by the Hawaii Natural Resources Conservation Service State Office in 1/16/2001.	digital
Groundwater Protection					
UIC line	uiclinepoly.shp	Line	UIC line overlays on USGS 7.5 minute quad maps from the DOH Safe Drinking Water Branch UIC Program.	--	digital
No-Pass line	nopass nad83.shp	Line	BWS	--	digital
Injection wells	uicwells_oldhawaiian.shp	Point	Safe Drinking Water Branch of DOH provided injection well coordinates	--	
Raster and Backgrounds					
Landsat	landsat oahu n83.shp	JPEG image	Georeferenced LANDSAT images in JPEG format with corresponding .jgw world files. 30 meter pixels.	Pacific Disaster Center. Converted from .tif to .jpg using Photoshop. See www.hawaii.gov/dbedt/gis/data/cloud_free_landsat_meta.htm for original PDC metadata.	digital
Oahu hill shade	hilloah_n83.jpg	JPEG image	Office of State Planning	Created from the USGS 10 meter DEM, 2003.	digital
USGS 7.5-minute quadrangle	newquads n83.shp	Polygon	USGS 7.5' topo maps	Created by Rod Low in the NAD83 datum using the lat/long coordinates of the quad boundaries and the ARC GENERATE command.	digital
URS Created Coverages					
Oahu landfills/dumps	oahlandfill_n83.shp schofield landfills.shp	Point	created using historical maps	--	digital
Pineapple and sugarcane field lineage	converted from Libby.shp converted from Del Monte to Dole.shp converted from Dole to Del Monte.shp converted from Libby parcels.shp Dole parcels.shp Libby parcels.shp Del Monte parcels.shp	Polygon	created using Waialua Sugar Company and Oahu sugar Compnay coverages and work by Oki and Giambelluca, 1985	--	digital

All the shape files used in the investigation are projected in the UTM zone 4 system referenced to the 1983 North American Datum (NAD 83).

BWS = Board of Water Supply
C&C = City and County
CTG = Composite Theme Grid
CWRM = Commission of Water Resource Management
DAGS = Department of Accounting and General Services
Datum = NAD 83
DEM = Digital elevation model
DLG = Digital Line Graph
DLNR = Department of Land and Natural Resources
DOA = State Department of Agriculture
DOH = State Department of Health
DOFAW = Department of Fish and Wildlife
DOWALD = Division of Water and Land Development
GDSI = Geographical Decision Systems International
GIRAS = Geographic Information Retrieval and Analysis
GIS = Geographic Information System
GNIS = Geographic Names Information System
HoLIS = Honolulu Land Information System
HSA = Hawaii Stream Assessment
JPEG = Joint Photographic Experts Group
LUC = Land Use Commission
LUD = Land Use Designation
LULC = Land Use and Land Cover
NAD83 = North American Datum of 1983
OP = Office of Planning
OSP = Office of State Planning
PDC = Pacific Disaster Center
Projection = Universal Trans Mercator, Zone 4
SSURGO = Soil Survey Geographic
TIGER = Topologically Integrated Geographic Encoding and Referencing
UIC = Underground Injection Control
USDA = United States Department of Agriculture
USGS = United States Geological Survey
UTM = Universal Transverse Mercator
WHPA = Wellhead Protection Area
WRRC = Water Resources Research Center
-- = no associated information

Table 11-1
SITE RECONNAISSANCE
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Landfill Name	Status	Date Completed
California Packing Company Dump 1	Site reconnaissance was not performed because of access issues and non-response of property owner.	--
Hawaiian Pineapple Dump 1 - Poamoho Camp	Completed	October 20, 2004
Hawaiian Pineapple Dump 2 - Wahiawa	Site reconnaissance was not performed because of access issues and non-response of property owner.	--
Hawaiian Pineapple Dump 3 - Kemoo, Wailua	Completed	December 2, 2004
Hawaiian Pineapple Dump 4 - Wailua	Site reconnaissance was not performed because of access issues and non-response of property owner.	--
Hawaiian Pineapple Dump 5 - Wailua	Site reconnaissance was not performed because property owner and consultant could not agree on terms of the Consent of Entry agreement.	--
Hawaiian Pineapple Dump 6 - Wahiawa	Site reconnaissance was not performed because of access issues and non-response of property owner.	December 2, 2004
Hawaiian Pineapple Dump 7 - Waimea	Site reconnaissance was not performed because property owner and consultant could not agree on terms of the Consent of Entry agreement.	--
Hawaiian Pineapple Dump 8 - Ewa	Completed	September 24, 2004
Hawaiian Pineapple Dump 9 - Ewa	Completed	October 6, 2004
Hawaiian Pineapple Dump 10 - Kunia	Completed	October 6, 2004
Hawaii Kai Cinder Cone Dump	Completed	September 28, 2004
Kaaawa Dump	Completed	October 13, 2004
Kaukonahua Dump	Site reconnaissance was not performed because of access issues and non-response of property owner.	--
Kuapa Pond Dump	The U.S. Army admitted improperly dumping rubbish near Kuapa Pond in 1945 and subsequently cleaned up the area.	--
Kunia A Dump	Completed	October 6, 2004
Kunia B Dump	Completed	October 6, 2004
Laie Dump	Completed	October 14, 2004 and December 17, 2004
Mililani New Landfill	Completed	October 21, 2004
Mililani Old Landfill	Completed	September 28, 2004
Nanakuli A Landfill	PVT Land Company, Ltd. declined the Consent of Entry agreement.	--
Nanakuli B	Leeward Land Company, Ltd. declined the Consent of Entry agreement.	--
Oahu Sugar Dump 1	Completed	September 24, 2004
Oahu Sugar Dump 2	Completed	November 19, 2004
Oahu Sugar Dump 3	Completed	October 20, 2004
Oahu Sugar Dump 4 - Waipahu	Completed	September 28, 2004
Oahu Sugar Dump 5	Completed	December 2, 2004
Oahu Sugar Dump 6	Completed	December 23, 2004
Pearl City Dump - Second Street	Completed	October 21, 2004
Pupukea Dump	Completed	November 17, 2004
Puu Palailai	Completed	October 5, 2004
Wahiawa A Dump	Completed	October 21, 2004
Wahiawa B Dump	Completed	December 2, 2004

Table 12-1
CATEGORY 1 LANDFILLS
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

No.	Landfill Name
1	Fort Shafter Dump
2	Laie Dump
3	Mililani Old Landfill
4	Naval Computer and Telecommunication Area Master Station - Old Wahiawa Landfill
5	Oahu Sugar Dump 2
6	Oahu Sugar Dump 3
7	Oahu Sugar Dump 4 - Waipahu
8	Oahu Sugar Dump 5
9	Oahu Sugar Dump 6
10	Pearl City Dump - Second Street
11	Puu Palailai Landfill
12	Wahiawa Dump A

Category 1 landfills are within one mile of a drinking water well and mauka of the No-Pass Line.

	Aikahi Dump	Ala Moana Dump	Bellows Site LF01, Base Landfill	California Packing Company Dump 1	Chinese American Club Dump	Diamond Head Crater Dump	Ewa Sugar Mill/ Oahu Sugar Company - Coral Wastepit	Ewa Sugar/ Oahu Sugar Company - Waipio Peninsula	Ford Island Dump	Fort Hase/Marine Corp Base Hawaii Landfill	Fort Kamehaheha LF05, Tri-Services Landfill	Fort Shafter Dump	Haiku Dump	Hauula Dump	Hawaiian Pineapple Dump 1 - Poamoho Camp
Domestic	--	--	--	--	**1**	--	--	**19**	--	--	--	**4**	--	--	--
Municipal + Military	--	--	--	--	**13**	--	--	**4**	--	--	--	**3**	**2**	**1**	--
BWS^+	--	--	--	--	**12**	--	--	**4**	--	--	--	**3**	**1**	**1**	--
Irrigation	--	--	--	1	1	2	--	10	--	--	--	2	1	1	1
Industrial	--	2	--	--	--	--	--	--	1	--	--	--	--	--	--
Observation	--	1	--	3	7	--	--	3	--	--	--	2	--	1	--
Sealed	--	21	--	--	42	--	--	2	7	--	--	15	--	1	1
Unused	1	4	--	--	8	5	--	20	2	--	--	2	1	6	--
Lost	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Other	--	16	--	--	7	3	--	--	--	--	--	--	--	1	--
Total Number of Wells Within a One Mile Radius	1	44	--	4	80	10	--	61	10	--	--	28	5	11	2

	Hawaiian Pineapple Dump 2 - Wahiawa	Hawaiian Pineapple Dump 3 - Kemoo, Wailua	Hawaiian Pineapple Dump 4 - Wailua	Hawaiian Pineapple Dump 5 - Wailua	Hawaiian Pineapple Dump 6 - Wahiawa	Hawaiian Pineapple Dump 7 - Waimea	Hawaiian Pineapple Dump 8 - Ewa	Hawaiian Pineapple Dump 9 - Ewa	Hawaiian Pineapple Dump 10 - Kunia	Hawaii Kai Cinder Cone Dump	Hickam Site LF01, Landfill 1	Kaaawa Dump	Kalaheo Landfill	Kalihi-Kai Dump	Kapaa Central, No. 2, and No. 3 Landfills
Domestic	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Municipal + Military	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BWS^+	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Irrigation	--	--	--	--	--	--	1	1	1	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Observation	--	1	--	--	--	--	--	10	9	--	--	--	--	--	--
Sealed	--	--	--	--	--	--	--	--	--	1	3	--	--	10	--
Unused	--	--	--	--	--	--	--	--	--	7	--	--	4	5	2
Lost	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Other	--	--	--	--	--	--	--	--	--	5	--	--	--	3	--
Total Number of Wells Within a One Mile Radius	--	1	--	--	--	--	1	11	10	13	3	--	5	19	3

	Kapalama Dump	Kapiolani Dump	Kaukonahua Dump	Kawailoa Landfill	Kawainui Dump	Keawaula Dump	Kewalo Ash Dump	Koko Head Landfill or Kahauloa Crater Dump	Kuapa Pond Dump	Kunia A Dump	Kunia B Dump	Laie Dump	Makalapa Dump	Mililani New Landfill	Mililani Old Landfill
Domestic	--	**1**	--	--	--	**3**	--	--	--	--	--	**4**	--	--	**1**
Municipal + Military	**8**	**10**	--	--	--	--	--	--	--	--	--	--	--	--	--
BWS^+	**8**	**9**	--	--	--	--	--	--	--	--	--	--	--	--	--
Irrigation	--	1	1	--	--	--	1	--	--	1	--	7	--	--	--
Industrial	5	2	--	--	--	--	2	--	--	--	--	--	--	--	--
Observation	5	3	6	3	--	--	2	--	--	1	1	--	4	--	2
Sealed	22	39	--	24	--	--	13	--	2	--	--	1	32	--	--
Unused	10	3	--	--	2	--	6	--	2	--	--	2	1	2	1
Lost	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--
Other	10	23	--	1	--	1	21	--	1	--	--	--	3	--	--
Total Number of Wells Within a One Mile Radius	61	83	7	28	3	4	46	--	5	2	1	14	41	2	5

	Nanakuli A Landfill	Nanakuli B	NCTAMS - Old Wahiawa Landfill	Naval Radio Transmitting Facility - Lualualei Landfill	Oahu Prison Dump	Oahu Sugar Dump 1	Oahu Sugar Dump 2	Oahu Sugar Dump 3	Oahu Sugar Dump 4 - Waipahu	Oahu Sugar Dump 5	Oahu Sugar Dump 6	Olomana Limited Dump - Kalihi	Pahounui Dump	Pearl City Dump - Second Street	Pearl City Peninsula Landfill/Dump - (Navy)
Domestic	--	--	--	--	**2**	--	--	--	--	**1**	--	--	--	**19**	**21**
Municipal + Military	--	--	**1**	--	**8**	--	**10**	**17**	**13**	**1**	**10**	--	--	**3**	**--**
BWS^+	--	--	--	--	**8**	--	**9**	**14**	**10**	**1**	**10**	--	--	**3**	**--**
Irrigation	2	2	--	1	--	--	--	1	2	--	--	--	--	26	25
Industrial	2	2	--	--	--	--	--	--	--	--	--	--	--	3	--
Observation	--	--	--	--	2	1	1	2	3	5	2	--	--	2	1
Sealed	--	--	--	1	16	--	--	10	24	--	--	13	11	28	24
Unused	6	7	3	9	4	--	1	16	31	1	--	4	4	9	8
Lost	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Other	--	--	--	1	2	--	--	3	3	--	--	2	2	3	1
Total Number of Wells Within a One Mile Radius	10	11	4	15	34	1	12	49	76	9	12	19	17	97	83

	Punaluu Dump	Pupukea Dump	Puu Palailai Landfill	Saki Moru Dump	Sand Island Ash Dump	Schofield Landfill/Dump	Wahiawa Dump A	Wahiawa Dump B	Waialua Dump	Waianae Landfill	Waimanalo Dump - North	Waimanalo Dump - South	Waipahu Incinerator Ash Landfill/Dump	Wheeler Army Airfield - Gulch Runway Dump
Domestic	--	--	--	**1**	--	--	--	--	--	**1**	--	--	--	--
Municipal + Military	--	--	**1**	--	--	--	**5**	--	--	**2**	--	--	--	--
BWS^+	--	--	**1**	--	--	--	**5**	--	--	**2**	--	--	--	--
Irrigation	2	--	2	14	--	1	--	1	14	5	--	1	--	--
Industrial	--	--	--	2	--	--	--	--	1	--	--	1	--	--
Observation	--	--	--	--	--	5	--	3	9	2	--	7	--	8
Sealed	1	1	1	5	--	--	--	--	14	--	--	--	--	--
Unused	4	6	6	21	1	--	1	--	3	7	1	5	--	1
Lost	--	--	--	--	--	--	--	--	--	--	--	--	6	--
Other	1	--	2	4	2	--	--	--	2	2	--	4	--	--
Total Number of Wells Within a One Mile Radius	8	8	12	47	4	6	6	4	48	47	1	18	6	9

Notes:

-- = no wells associated with the specified well type

The summary is based on a Geographic Information System shapefile and associated metadata provided by the Department of Land and Natural Resources.

Highlighted cells with bold font indicate wells used for drinking water.

^The count of BWS wells only includes the wells designated as municipal wells and excludes wells designated as sealed, unused, observation, domestic, irrigation, and or blank.

+Board of Water Supply (BWS) wells are a subset of the municipal wells, subsequently these wells don't contribute to the total number of wells.

NCTAMS = Naval Computer and Telecommunication Area Master Station

Table 12-2

SUMMARY OF WELLS WITHIN ONE MILE OF EACH LANDFILL

Oahu Inactive Landfills - Relative Risk Evaluation

December 2006

Table 12-3
SUMMARY OF LANDFILLS WITH DRINKING WATER WELLS WITHIN A ONE MILE RADIUS AND MAUKA OF THE NO-PASS LINE
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Well Details	Chinese American Club Dump	Ewa Sugar/ Oahu Sugar Company - Waipio Peninsula	Fort Shafter Dump	Haiku Dump	Hauula Dump	Kapalama Dump	Kapiolani Dump	Keawaula Dump	Laie Dump	Mililani Old Landfill	NCTAMS - Old Wahiawa Landfill	Oahu Prison Dump	Oahu Sugar Dump 2	Oahu Sugar Dump 3	Oahu Sugar Dump 4 - Waipahu	Oahu Sugar Dump 5	Oahu Sugar Dump 6	Pearl City Dump - Second Street	Pearl City Peninsula Dump - (Navy)	Puu Palailai Landfill	Saki Moru Dump	Wahiawa Dump A	Waianae Landfill
Total Number of Wells Within a One Mile Radius	80	61	28	5	11	61	83	4	14	5	4	34	12	49	76	9	12	97	83	12	47	6	47
Municipal and Military	13	4	3	2	1	8	10	0	0	0	1	8	10	17	13	1	10	3	0	1	0	5	2
BWS^+	12	4	3	1	1	8	9	0	0	0	0	8	9	14	10	1	10	3	0	1	0	5	2
Domestic	1	19	4	0	0	0	1	3	4	1	0	2	0	0	0	1	0	19	21	0	1	0	1
Irrigation	1	10	2	1	1	0	1	0	7	0	0	0	0	1	2	0	0	26	25	2	14	0	5
Industrial	0	0	0	0	0	5	2	0	0	0	0	0	0	0	0	0	0	3	0	0	2	0	0
Observation	7	3	2	0	1	5	3	0	0	2	0	2	1	2	3	5	2	2	1	0	0	0	2
Sealed	42	2	15	0	1	22	39	0	1	0	0	16	0	10	24	0	0	28	24	1	5	0	0
Unused	8	20	2	1	6	10	3	0	2	1	3	4	1	16	31	1	0	9	8	6	21	1	7
Lost	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	7	0	0	0	1	10	23	1	0	0	0	2	0	3	3	0	0	3	1	2	4	0	2
LANDFILL PRIORITIZATION CATEGORY	3	3	**1**	3	3	3	3	3	**1**	**1**	**1**	3	**1**	**1**	**1**	**1**	**1**	**1**	3	**1**	3	**1**	3

1 = Mauka of the No-Pass Line and within one mile of drinking water wells.

2 = Mauka of the No-Pass Line and not within one mile of drinking water wells.

3 = Makai of the No-Pass Line and not anticipated to affect drinking water wells

Highlighted cells with bold font indicate landfills that will be risk modeled.

^The count of BWS wells only includes the wells designated as municipal wells and excludes wells designated as sealed, unused, observation, domestic, irrigation, and or blank.

+Board of Water Supply (BWS) wells are a subset of the municipal wells, subsequently these wells don't contribute to the total number of wells.

NCTAMS = Naval Computer and Telecommunication Area Master Station

Table 12-4
DETAILS OF DOMESTIC, MILITARY AND MUNICIPAL WELLS WITHIN ONE MILE OF CATEGORY 1 LANDFILLS
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Landfill Name	Type of Well	Number of Wells	Well No	Name	Well Owner	Well Type	Year of Construction	Aquifer	Elevation of Ground Surface (feet amsl)	Well Depth (feet bgs)	Elevation of Bottom of Boring (feet amsl)	Initial Water Level Elevation (feet amsl)	Pump Capacity (mgd)	Upgradient or Downgradient
Fort Shafter Dump	Military	4	2153-07	Moanalua	U S Army	--	1945	30104	30	302	-272	21.2	1.872	Upgradient
			2153-08	Moanalua	U S Army	--	1945	30104	29	306	-277	21.4	1.872	Upgradient
			2053-11	Ft Shafter	U S Army	--	1960	30104	21	330	-309	--	--	Upgradient
			2053-13	Fort Shafter	U S Army	Percussion	1995	--	20	290	-270	--	1.584	Upgradient
	Municipal	3	2153-10	Moanalua 1	Honolulu BWS	Rotary	1973	30104	36	300	-264	--	2.016	Upgradient
			2153-11	Moanalua 2	Honolulu BWS	Rotary	1973	30104	35	300	-265	18.6	2.016	Upgradient
			2153-12	Moanalua 3	Honolulu BWS	Rotary	1974	30104	35	335	-300	18.4	2.016	Upgradient
Laie Dump	Domestic	4	3855-06	BYU Campus	Laie Water Co	--	1890	30601	9	288	-279	16.1	0.302	Upgradient
			3855-07	Byu Ceramic	Laie Water Co	--	1890	30601	11	251	-240	16	1.224	Upgradient
			3956-01	Malaekahana	Campbell Est	--	--	30601	18	--	--	--	--	Upgradient
			3956-03	Laie Temple	Laie Water Co	--	--	30601	6	345	-339	--	--	Upgradient
Mililani Old Landfill	Domestic	1	2600-02	Kipapa Gulch	Dairy Co Inc	--	1957	30203	297	401	-104	22.9	0.345	Downgradient
NCTAMS - Old Wahiawa Landfill	Military	1	3100-02	Wahiawa	U S Navy	Rotary	1942	30501	1145	970	175	288	0.576	Downgradient
Oahu Sugar Dump 2	Municipal	10	2202-21	Ep 15,16	Campbell Est	Shaft	1939	30203	150	156	-6	22.4	27	Downgradient
			2302-01	Kunia I P1	Honolulu BWS	--	1957	30203	201	350	-149	20.8	2.52	Downgradient
			2302-02	Kunia I P2	Honolulu BWS	--	1957	30203	201	338	-137	20.9	2.52	Downgradient
			2302-03	Kunia I P3	Honolulu BWS	Rotary	1972	30203	206	427	-221	--	2.52	Downgradient
			2302-04	Kunia I P4	Honolulu BWS	Rotary	1972	30203	201	420	-219	--	2.52	Downgradient
			2303-02	Honouliuli I-2	Honolulu BWS	Percussion	1987	30204	411	563	-152	16	1.26	Downgradient
			2402-01	Kunia II P1	Honolulu BWS	Percussion	1969	30203	430	575	-145	20.6	2.16	Upgradient
			2402-02	Kunia II P2	Honolulu BWS	--	1969	30203	430	575	-145	24.8	2.52	Upgradient
			2402-03	Kunia II P3	Honolulu BWS	Percussion	1990	30203	417	610	-193	17	2.52	Upgradient
			2402-05	Kunia II P4	Honolulu BWS	Rotary	1996	--	420	559	-139	--	2.52	Upgradient

Table 12-4
DETAILS OF DOMESTIC, MILITARY AND MUNICIPAL WELLS WITHIN ONE MILE OF CATEGORY 1 LANDFILLS
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Landfill Name	Type of Well	Number of Wells	Well No	Name	Well Owner	Well Type	Year of Construction	Aquifer	Elevation of Ground Surface (feet amsl)	Well Depth (feet bgs)	Elevation of Bottom of Boring (feet amsl)	Initial Water Level Elevation (feet amsl)	Pump Capacity (mgd)	Upgradient or Downgradient
Oahu Sugar Dump 3	Municipal	17	2301-34	Hoaeae P1	Honolulu BWS	--	1959	30203	131	194	-63	17	2.376	Downgradient
			2301-35	Hoaeae P2	Honolulu BWS	--	1959	30203	133	197	-64	18.2	2.376	Downgradient
			2301-36	Hoaeae P3	Honolulu BWS	--	1959	30203	131	198	-67	19.5	2.376	Downgradient
			2301-37	Hoaeae P4	Honolulu BWS	--	1959	30203	130	195	-65	19.3	2.376	Downgradient
			2301-38	Hoaeae P5	Honolulu BWS	Rotary	1974	30203	126	276	-150	--	2.52	Downgradient
			2301-39	Hoaeae P6	Honolulu BWS	Rotary	1974	30203	123	273	-150	--	2.52	Downgradient
			2302-01	Kunia I P1	Honolulu BWS	--	1957	30203	201	350	-149	20.8	2.52	Downgradient
			2302-02	Kunia I P2	Honolulu BWS	--	1957	30203	201	338	-137	20.9	2.52	Downgradient
			2302-03	Kunia I P3	Honolulu BWS	Rotary	1972	30203	206	427	-221	--	2.52	Downgradient
			2302-04	Kunia I P4	Honolulu BWS	Rotary	1972	30203	201	420	-219	--	2.52	Downgradient
			2401-04	Kunia III-1	C&C DHCD	Rotary	1995	--	317	452	-135	--	--	Upgradient
			2401-05	Kunia III-2	C&C DHCD	Rotary	1995	--	316	454	-138	--	--	Upgradient
			2401-06	Kunia III-3	C&C DHCD	Rotary	1995	--	315	460	-145	--	--	Upgradient
			2402-01	Kunia II P1	Honolulu BWS	Percussion	1969	30203	430	575	-145	20.6	2.16	Upgradient
			2402-02	Kunia II P2	Honolulu BWS	--	1969	30203	430	575	-145	24.8	2.52	Upgradient
			2402-03	Kunia II P3	Honolulu BWS	Percussion	1990	30203	417	610	-193	17	2.52	Upgradient
			2402-05	Kunia II P4	Honolulu BWS	Rotary	1996	--	420	559	-139	--	2.52	Upgradient

Table 12-4
DETAILS OF DOMESTIC, MILITARY AND MUNICIPAL WELLS WITHIN ONE MILE OF CATEGORY 1 LANDFILLS
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Landfill Name	Type of Well	Number of Wells	Well No	Name	Well Owner	Well Type	Year of Construction	Aquifer	Elevation of Ground Surface (feet amsl)	Well Depth (feet bgs)	Elevation of Bottom of Boring (feet amsl)	Initial Water Level Elevation (feet amsl)	Pump Capacity (mgd)	Upgradient or Downgradient
Oahu Sugar Dump 4 - Waipahu	Municipal	13	2301-34	Hoaeae P1	Honolulu BWS	--	1959	30203	131	194	-63	17	2.376	Downgradient
			2301-35	Hoaeae P2	Honolulu BWS	--	1959	30203	133	197	-64	18.2	2.376	Downgradient
			2301-36	Hoaeae P3	Honolulu BWS	--	1959	30203	131	198	-67	19.5	2.376	Downgradient
			2301-37	Hoaeae P4	Honolulu BWS	--	1959	30203	130	195	-65	19.3	2.376	Downgradient
			2301-38	Hoaeae P5	Honolulu BWS	Rotary	1974	30203	126	276	-150	--	2.52	Downgradient
			2301-39	Hoaeae P6	Honolulu BWS	Rotary	1974	30203	123	273	-150	--	2.52	Downgradient
			2301-44	Waipahu IV-2	Honolulu BWS	Rotary	1998	30203	133	273	-140	--	--	Upgradient
			2301-45	Waipahu IV-3	Honolulu BWS	Rotary	1998	30203	136	276	-140	--	--	Upgradient
			2301-46	Waipahu IV-1	Honolulu BWS	Rotary	1998	30203	131	271	-140	--	--	Upgradient
			2301-47	Waipahu IV-4	Honolulu BWS	Percussion	1999	30203	134	273	-139	--	--	Upgradient
			2302-01	Kunia I P1	Honolulu BWS	--	1957	30203	201	350	-149	20.8	2.52	Downgradient
			2302-02	Kunia I P2	Honolulu BWS	--	1957	30203	201	338	-137	20.9	2.52	Downgradient
			2302-03	Kunia I P3	Honolulu BWS	Rotary	1972	30203	206	427	-221	--	2.52	Downgradient
			2302-04	Kunia I P4	Honolulu BWS	Rotary	1972	30203	201	420	-219	--	2.52	Downgradient
			2400-01	Waipahu I -P2	Honolulu BWS	--	1954	30203	200	355	-155	17.4	2.736	Upgradient
			2400-02	Waipahu I -P1	Honolulu BWS	--	1954	30203	200	355	-155	18.2	2.736	Upgradient
			2400-03	Waipahu I P-4	Honolulu BWS	--	1969	30203	200	386	-186	24.3	2.736	Upgradient
			2400-04	Waipahu I P-3	Honolulu BWS	--	1969	30203	200	386	-186	24.3	2.736	Upgradient
			2400-05	Waipahu II-P1	Honolulu BWS	Percussion	1983	30203	207	342	-135	--	1.584	Upgradient
			2400-06	Waipahu II-P2	Honolulu BWS	Percussion	1983	30203	211	344	-133	20.6	1.584	Upgradient
			2400-08	Waipahu II-P3	Honolulu BWS	Rotary	1993	30203	206	340	-134	15.2	1.512	Upgradient
			2401-04	Kunia III-1	C&C DHCD	Rotary	1995	--	317	452	-135	--	--	Upgradient
			2401-05	Kunia III-2	C&C DHCD	Rotary	1995	--	316	454	-138	--	--	Upgradient
			2401-06	Kunia III-3	C&C DHCD	Rotary	1995	--	315	460	-145	--	--	Upgradient
Oahu Sugar Dump 5	Domestic	1	2600-02	Kipapa Gulch	Dairy Co Inc	--	1957	30203	297	401	-104	22.9	0.345	Downgradient
	Municipal	1	2600-04	Mililani III-2	Honolulu BWS	Rotary	1979	30203	665	815	-150	--	2.016	Upgradient

Table 12-4
DETAILS OF DOMESTIC, MILITARY AND MUNICIPAL WELLS WITHIN ONE MILE OF CATEGORY 1 LANDFILLS
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Landfill Name	Type of Well	Number of Wells	Well No	Name	Well Owner	Well Type	Year of Construction	Aquifer	Elevation of Ground Surface (feet amsl)	Well Depth (feet bgs)	Elevation of Bottom of Boring (feet amsl)	Initial Water Level Elevation (feet amsl)	Pump Capacity (mgd)	Upgradient or Downgradient
Oahu Sugar Dump 6	Municipal	10	2400-09	Waipahu III-1	Honolulu BWS	Rotary	1994	--	318	458	-140	18.8	1.512	Downgradient
			2400-10	Waipahu III-2	Honolulu BWS	Rotary	1994	--	317	457	-140	--	1.512	Downgradient
			2400-11	Waipahu III-3	Honolulu BWS	Rotary	1994	--	312	455	-143	--	1.512	Downgradient
			2400-12	Waipahu III-5	Honolulu BWS	Rotary	1994	--	314	456	-142	--	1.512	Downgradient
			2400-13	Waipahu III-4	Honolulu BWS	Rotary	1995	--	314	453	-139	--	1.512	Downgradient
			2459-19	Waipio Hts 2	Honolulu BWS	Rotary	1964	30202	202	337	-135	16.9	2.16	Downgradient
			2459-20	Waipio Hts 1	Honolulu BWS	Rotary	1964	30202	202	337	-135	16.9	2.16	Downgradient
			2459-23	Waipio Hts. I-3	Honolulu BWS	Percussion	1977	30202	200	325	-125	14.6	1.512	Downgradient
			2500-01	Waipio Hts II-1	Honolulu BWS	Rotary	1978	30203	416	546	-130	18	1.512	Downgradient
			2500-02	Waipio Hts II-2	Honolulu BWS	Rotary	1978	30203	419	560	-141	18	1.512	Downgradient
Pearl City Dump - Second Street	Domestic	19	2358-24	Pearl City	Taba S	--	1949	30202	23	120	-97	16.7	--	Upgradient
			2358-30	Pearl City	Sakamoto E M	--	1953	30202	11	103	-92	15.2	0.027	Upgradient
			2358-36	Pearl City	Sakai K	--	1954	30202	13	102	-89	15.1	0.029	Upgradient
			2358-38	Pearl City	Gora G	--	1955	30202	12	100	-88	17.6	--	Upgradient
			2358-40	Pearl City	Nakama W T	--	1957	30202	18	119	-101	14.3	--	Upgradient
			2358-43	Pearl City	Kini A	--	1959	30202	25	30	-5	--	--	Upgradient
			2358-45	Pearl City	Gora G	--	1967	30202	38	101	-63	16	--	Upgradient
			2358-47	Pearl City	Alipio Sos	--	1967	30202	35	141	-106	--	--	Upgradient
			2358-49	Pearl City	Nazarene Church	Rotary	1976	30202	21	125	-104	14.3	0.064	Upgradient
			2358-50	Waiawa	Young K P	Percussion	1985	30202	38	80	-42	--	--	Upgradient
			2358-52	Waiawa-Gendrano	Crabbe F & J	Percussion	1990	30202	15	75	-60	--	0.028	Upgradient
			2359-10	Waipahu	Gora G	--	1954	30202	23	100	-77	14.3	--	Downgradient
			2359-11	Waipahu	Kobashigawa K	--	1954	30202	30	130	-100	19.8	--	Upgradient
			2359-13	Waipahu	Nishida I	--	1955	30202	8	130	-122	19	--	Downgradient
			2359-18	Waipahu	Jiminez E	--	1959	30202	24	126	-102	--	--	Downgradient
			2459-17	Waipahu	Gora G	--	1957	30202	19	142	-123	22	--	Upgradient
			2459-18	Waipahu	Kawano H T	--	1963	30202	22	185	-163	--	--	Upgradient
			2459-22	Waipahu	Alipio S A	--	1979	30202	--	114	--	--	--	Upgradient
			2459-25	Pearl City	Cabitac R M	--	1977	30202	21	100	-79	14.3	0.043	Upgradient
	Municipal	3	2458-01	Pearl City Shaft	Honolulu BWS	Shaft	1940	30202	111	151	-40	18.9	2.304	Upgradient
			2458-03	Pearl City I-1	Honolulu BWS	--	1953	30202	120	150	-30	18.7	1.008	Upgradient
			2458-04	Pearl City I-2	Honolulu BWS	--	1953	30202	120	140	-20	17.5	1.008	Upgradient

Table 12-4
DETAILS OF DOMESTIC, MILITARY AND MUNICIPAL WELLS WITHIN ONE MILE OF CATEGORY 1 LANDFILLS
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Landfill Name	Type of Well	Number of Wells	Well No	Name	Well Owner	Well Type	Year of Construction	Aquifer	Elevation of Ground Surface (feet amsl)	Well Depth (feet bgs)	Elevation of Bottom of Boring (feet amsl)	Initial Water Level Elevation (feet amsl)	Pump Capacity (mgd)	Upgradient or Downgradient
Puu Palailai Landfill	Municipal	1	2004-04	Makakilo	Honolulu BWS	Percussion	1981	30204	141	268	-127	14.9	--	Upgradient
Wahiawa Dump A	Municipal	5	2901-08	Wahiawa I	Honolulu BWS	--	1941	30501	870	880	-10	275.4	2.16	Downgradient
			2901-11	Wahiawa I	Honolulu BWS	Rotary	1962	30501	873	821	52	272.9	3.456	Downgradient
			2901-12	Wahiawa I	Honolulu BWS	Rotary	1983	30501	874	858	16	279	3.456	Downgradient
			2902-01	Wahiawa II	Honolulu BWS	Rotary	1974	30501	866	986	-120	275.8	3.024	Downgradient
			2902-02	Wahiawa II-2	Honolulu BWS	Rotary	1996	--	868	861	7	--	2.52	Downgradient

amsl = above mean sea level
bgs = below ground surface
BWS = Board of Water Supply
mgd = million gallons per day
NCTAMS = Naval Computer and Telecommunication Area Master Station

Table 12-5
LANDFILLS WITHIN SWAP DELINEATED CAPTURE ZONE B
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Landfill Name	Well Number	Well Name	Well Owner	Use
Hawaiian Pineapple Dump 3	3405-01	Waialua	Honolulu BWS	Municipal
Hawaiian Pineapple Dump 3	3405-02	Waialua	Honolulu BWS	Municipal
Kapiolani Dump	1851-12	Beretania P Station	Honolulu BWS	Municipal
Kapiolani Dump	1851-13	Beretania P Station	Honolulu BWS	Municipal
Kapiolani Dump	1851-24	Beretania P Station	Honolulu BWS	Sealed
Kapiolani Dump	1851-25	Beretania P Station	Honolulu BWS	Sealed
Kapiolani Dump	1851-31	Beretania P Station	Honolulu BWS	Municipal
Kapiolani Dump	1851-32	Beretania P Station	Honolulu BWS	Sealed
Kapiolani Dump	1851-33	Beretania P Station	Honolulu BWS	Municipal
Kapiolani Dump	1851-34	Beretania P Station	Honolulu BWS	Municipal
Kunia Dump B	2402-01	Kunia II P1	Honolulu BWS	Municipal
Kunia Dump B	2402-02	Kunia II P2	Honolulu BWS	Municipal
Kunia Dump B	2402-03	Kunia II P3	Honolulu BWS	Municipal
Kunia Dump B	2402-04	Kunia II P4	Honolulu BWS	Municipal
Oahu Sugar Dump 3	2302-01	Kunia I P1	Honolulu BWS	Municipal
Oahu Sugar Dump 3	2302-02	Kunia I P2	Honolulu BWS	Municipal
Oahu Sugar Dump 3	2302-03	Kunia I P3	Honolulu BWS	Municipal
Oahu Sugar Dump 3	2302-04	Kunia I P4	Honolulu BWS	Municipal
Oahu Sugar Dump 6	2459-19	Waipio Hts 2	Honolulu BWS	Municipal
Oahu Sugar Dump 6	2459-20	Waipio Hts 1	Honolulu BWS	Municipal
Oahu Sugar Dump 6	2459-23	Waipio Hts. I-3	Honolulu BWS	Municipal
Oahu Sugar Dump 6	2459-24	Waipio Hts. I-4	Honolulu BWS	Municipal
Wahiawa Dump A	2902-01	Wahiawa II	Honolulu BWS	Municipal
Wahiawa Dump A	2902-02	Wahiawa II-2	Honolulu BWS	Municipal
Waianae Landfill	2712-30	Kamaile 2	Honolulu BWS	Municipal
Waianae Landfill	2712-31	Kamaile 1	Honolulu BWS	Municipal

Capture Zone B = 2-year pumping period

Table 12-6
LANDFILLS WITHIN SWAP DELINEATED CAPTURE ZONE C
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Landfill Name	Well Number	Well Name	Well Owner	Use
Hawaiian Pineapple Dump 8	2303-03	Honouliuli II-3	Honolulu BWS	Municipal
Hawaiian Pineapple Dump 8	2303-04	Honouliuli II-4	Honolulu BWS	Municipal
Hawaiian Pineapple Dump 8	2303-05	Honouliuli II-5	Honolulu BWS	Municipal
Hawaiian Pineapple Dump 8	2303-06	Honouliuli II-6	Honolulu BWS	Municipal
Hawaiian Pineapple Dumps 9 + 10	2402-01	Kunia II P1	Honolulu BWS	Municipal
Hawaiian Pineapple Dumps 9 + 10	2402-02	Kunia II P2	Honolulu BWS	Municipal
Hawaiian Pineapple Dumps 9 + 10	2402-03	Kunia II P3	Honolulu BWS	Municipal
Hawaiian Pineapple Dumps 9 + 10	2402-04	Kunia II P4	Honolulu BWS	Municipal
Mililani New Landfill	2459-19	Waipio Hts 2	Honolulu BWS	Municipal
Mililani New Landfill	2459-20	Waipio Hts 1	Honolulu BWS	Municipal
Mililani New Landfill	2459-23	Waipio Hts. I-3	Honolulu BWS	Municipal
Mililani New Landfill	2459-24	Waipio Hts. I-4	Honolulu BWS	Municipal
Mililani Old Landfill	2301-34	Hoaeae P1	Honolulu BWS	Municipal
Mililani Old Landfill	2301-35	Hoaeae P2	Honolulu BWS	Municipal
Mililani Old Landfill	2301-36	Hoaeae P3	Honolulu BWS	Municipal
Mililani Old Landfill	2301-37	Hoaeae P4	Honolulu BWS	Municipal
Mililani Old Landfill	2301-38	Hoaeae P5	Honolulu BWS	Municipal
Mililani Old Landfill	2301-39	Hoaeae P6	Honolulu BWS	Municipal
Oahu Sugar Dump 1	2303-03	Honouliuli II-3	Honolulu BWS	Municipal
Oahu Sugar Dump 1	2303-04	Honouliuli II-4	Honolulu BWS	Municipal
Oahu Sugar Dump 1	2303-05	Honouliuli II-5	Honolulu BWS	Municipal
Oahu Sugar Dump 1	2303-06	Honouliuli II-6	Honolulu BWS	Municipal
Oahu Sugar Dump 5	2301-44	Waipahu IV-2	Honolulu BWS	Unused
Oahu Sugar Dump 5	2301-45	Waipahu IV-3	Honolulu BWS	Unused
Oahu Sugar Dump 5	2301-46	Waipahu IV-1	Honolulu BWS	Unused
Oahu Sugar Dump 5	2301-47	Waipahu IV-4	Honolulu BWS	Unused
Oahu Sugar Dump 5	2400-05	Waipahu II-2	Honolulu BWS	Municipal
Oahu Sugar Dump 5	2400-06	Waipahu II-1	Honolulu BWS	Municipal
Oahu Sugar Dump 5	2400-08	Waipahu II-3	Honolulu BWS	Municipal
Wheeler Army Airfield - Gulch Runway Dump	2302-01	Kunia I P1	Honolulu BWS	Municipal
Wheeler Army Airfield - Gulch Runway Dump	2302-02	Kunia I P2	Honolulu BWS	Municipal
Wheeler Army Airfield - Gulch Runway Dump	2302-03	Kunia I P3	Honolulu BWS	Municipal
Wheeler Army Airfield - Gulch Runway Dump	2302-04	Kunia I P4	Honolulu BWS	Municipal

Capture Zone C = 10-year pumping period

Table 12-7
LANDFILLS WITHIN A SWAP DELINEATED CAPTURE ZONE
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

No.	Landfill Name	Landfill Within a SWAP Delineated Capture Zone
1	Hawaiian Pineapple Dump 3	x
2	Hawaiian Pineapple Dump 8	x
3	Hawaiian Pineapple Dump 9	x
4	Hawaiian Pineapple Dump 10	x
5	Kapiolani Dump	x
6	Kunia Dump B	x
7	Mililani New Landfill	x
8	Mililani Old Landfill	x
9	Oahu Sugar Dump 1	x
10	Oahu Sugar Dump 3	x
11	Oahu Sugar Dump 5	x
12	Oahu Sugar Dump 6	x
13	Wahiawa Dump A	x
14	Waianae Landfill	x
15	Wheeler Army Airfield - Gulch Runway Dump	x

NCTAMS = Naval Computer and Telecommunication Area Master Station
SWAP = Source Water Assessment Program

Table 12-8
CATEGORY 1 LANDFILLS AND LANDFILLS WITHIN A SWAP DELINEATED CAPTURE ZONE
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

No.	Landfill Name	Category 1*	Landfill Within a SWAP Delineated Capture Zone
1	Fort Shafter Dump	x	
2	Hawaiian Pineapple Dump 3		x
3	Hawaiian Pineapple Dump 8		x
4	Hawaiian Pineapple Dump 9		x
5	Hawaiian Pineapple Dump 10		x
6	Kapiolani Dump		x
7	Kunia Dump B		x
8	Laie Dump	x	
9	Mililani New Landfill		x
10	Mililani Old Landfill	x	x
11	NCTAMS-Old Wahiawa Landfill	x	
12	Oahu Sugar Dump 1		x
13	Oahu Sugar Dump 2	x	
14	Oahu Sugar Dump 3	x	x
15	Oahu Sugar Dump 4 - Waipahu	x	
16	Oahu Sugar Dump 5	x	x
17	Oahu Sugar Dump 6	x	x
18	Pearl City Dump - Second Street	x	
19	Puu Palailai Landfill	x	
20	Wahiawa Dump A	x	x
21	Waianae Landfill		x
22	Wheeler Army Airfield - Gulch Runway Dump		x

NCTAMS = Naval Computer and Telecommunication Area Master Station

SWAP = Source Water Assessment Program

*Landfills within one mile of a drinking water well and mauka of the No-Pass Line

Table 12-9
SUMMARY OF HAWAII SOURCE WATER ASSESSMENT PROGRAM DATA FROM IMPACTED BWS WELLS WITHIN ONE MILE OF CATEGORY I LANDFILLS
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Station Name	BWS Well Number	Well Name	Constituent(s)	Number of Detects Exceeding Method Detection Limit	Number of Detects Exceeding Reporting Limit	MCL Exceeded? [MCL in mg/L]	GAC Treatment System Exists/Planned	Landfill(s) within One Mile
Moanalua 1	2153-10	Moanalua 1	Trichloroethene	1	--	No, [0.005]	No	Fort Shafter Dump
Hoaeae	2301-34	Hoaeae P1	Atrazine	--	1	Yes, [0.003]	Yes	Oahu Sugar Dump 3, Oahu Sugar Dump 4 - Waipahu
			1,2,3-Trichloropropane	8	--	No MCL established		
	2301-35	Hoaeae P2	1,2,3-Trichloropropane	11	10	No MCL established		
	2301-36	Hoaeae P3	Atrazine	1	7	Yes, [0.003]		
			Dieldrin	--	2	No MCL established		
			1,2,3-Trichloropropane	14	11	No MCL established		
	2301-37	Hoaeae P4	Atrazine	--	1	Yes, [0.003]		
			1,2,3-Trichloropropane	12	11	No MCL established		
	2301-38	Hoaeae P5	1,2,3-Trichloropropane	23	9	No MCL established		
	2301-39	Hoaeae P6	1,2,3-Trichloropropane	20	11	No MCL established		
Kunia I	2302-01	Kunia I P1	Atrazine	--	5	Yes, [0.003]	Yes	Oahu Sugar Dump 2, Oahu Sugar Dump 3, Oahu Sugar Dump 4 - Waipahu
			Trichloroethene	6	--	No, [0.005]		
			1,2,3-Trichloropropane	6	23	No MCL established		
	2302-02	Kunia I P2	Atrazine	--	3	Yes,[0.003]		
			1,2-Dibromo-3-chloropropane	1	--	No, [0.0002]		
			Trichloroethene	4	--	No, [0.005]		
			1,2,3-Trichloropropane	4	19	No MCL established		
	2302-03	Kunia I P3	Atrazine	--	3	Yes, [0.003]		
			1,2,3-Trichloropropane	10	24	No MCL established		
	2302-04	Kunia I P4	Atrazine	--	1	Yes,[0.003]		
			1,2,3-Trichloropropane	1	24	No MCL established		
Waipahu I	2400-01	Waipahu I P2	Ethylene dibromide	31	--	No, [0.00005]	Yes	Oahu Sugar Dump 4- Waipahu
			Trichloroethene	7	--	No, [0.005]		
			1,2,3-Trichloropropane	13	--	No MCL established		
	2400-02	Waipahu I P1	Ethylene dibromide	25	--	No, [0.00005]		
			1,2,3-Trichloropropane	17	--	No MCL established		
	2400-03	Waipahu I P3	Ethylene dibromide	17	--	No, [0.00005]		
			Trichloroethene	2	--	No, [0.005]		
			1,2,3-Trichloropropane	15	--	No MCL established		
	2400-04	Waipahu I P4	Ethylene dibromide	19	--	No, [0.00005]		
			Trichloroethene	5	--	No, [0.005]		
			1,2,3-Trichloropropane	15	--	No MCL established		
Waipahu II	2400-05	Waipahu II-2	Ethylene dibromide	18	--	No, [0.00005]	Yes	Oahu Sugar Dump 4- Waipahu
			1,2,3-Trichloropropane	12	--	No MCL established		
	2400-06	Waipahu II-1	Ethylene dibromide	26	--	No, [0.00005]		
			1,2,3-Trichloropropane	12	--	No MCL established		
	2400-08	Waipahu II-3	Ethylene dibromide	2	--	No, [0.00005]		
Kunia II	2402-01	Kunia II P1	1,2-Dibromo-3-chloropropane	10	--	No, [0.0002]	Yes	Oahu Sugar Dump 2, Oahu Sugar Dump 3
			1,2-Dichloropropane	1	--	No, [0.005]		
			Trichloroethene	3	--	No, [0.005]		
			1,2,3-Trichloropropane	--	18	No MCL established		
	2402-02	Kunia II P2	1,2-Dibromo-3-chloropropane	10	--	No, [0.0002]		
			1,2-Dichloropropane	1	--	No, [0.005]		
			Trichloroethene	9	--	No, [0.005]		
			1,2,3-Trichloropropane	2	22	No MCL established		
	2402-03	Kunia II P3	1,2-Dibromo-3-chloropropane	13	--	No, [0.0002]		
			1,2-Dichloropropane	3	--	No, [0.005]		
			Trichloroethene	16	--	No, [0.005]		
			1,2,3-Trichloropropane	--	27	No MCL established		

Table 12-9
SUMMARY OF HAWAII SOURCE WATER ASSESSMENT PROGRAM DATA FROM IMPACTED BWS WELLS WITHIN ONE MILE OF CATEGORY I LANDFILLS
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Station Name	BWS Well Number	Well Name	Constituent(s)	Number of Detects Exceeding Method Detection Limit	Number of Detects Exceeding Reporting Limit	MCL Exceeded? [MCL in mg/L]	GAC Treatment System Exists/Planned	Landfill(s) within One Mile
Waipio Heights I	2459-19	Waipio Heights 2	1,2,3-Trichloropropane	--	10	No MCL established	Planned	Oahu Sugar Dump 6
	2459-20	Waipio Heights 1	Ethylene dibromide	2	--	No, [0.00005]		
			1,2,3-Trichloropropane	3	13	No MCL established		
	2459-23	Waipio Heights I-3	1,2,3-Trichloropropane	--	13	No MCL established		
Waipio Heights II	2500-01	Waipio Heights II-1	1,2-Dichloropropane	2	--	No, [0.005]	Planned	Oahu Sugar Dump 6
			Trichloroethene	15	12	No, [0.005]		
			1,2,3-Trichloropropane	8	19	No MCL established		
	2500-02	Waipio Heights II-2	Ethylene dibromide	1	--	No, [0.00005]		
			Trichloroethene	2	3	Yes, [0.005]		
			1,2,3-Trichloropropane	4	1	No MCL established		
Mililani	2600-04	Mililani III-2	1,2-Dibromo-3-chloropropane	--	8	Yes, [0.0002]	Yes	Oahu Sugar Dump 5
			1,2-Dichloropropane	3	--	No, [0.005]		
			1,2,3-Trichloropropane	--	5	No MCL established		
Waipio Heights III	2659-02	Waipio Heights III-1	Ethylene dibromide	9	--	No, [0.00005]	Yes	Oahu Sugar Dump 5
			1,2,3-Trichloropropane	11	--	No MCL established		
	2659-03	Waipio Heights III-2	1,2-Dibromo-3-chloropropane	1	--	No,[0.0002]		
			Ethylene dibromide	4	--	No,[0.00005]		
			1,2,3-Trichloropropane	6	--	No MCL established		
Wahiawa I	2901-08	Wahiawa I	Carbon tetrachloride	30	7	No, [0.005]	No	Wahiawa Dump A
			Tetrachloroethylene	--	32	Yes, [0.005]		
			Tetrachlorethene	--	7	Yes, [0.005]		
	2901-11	Wahiawa I	Carbon tetrachloride	35	2	No, [0.005]		
			1,2-Dibromo-3-chloropropane	7	2	No, [0.0002]		
			Tetrachloroethylene	25	7	No, [0.005]		
			Trichloroethene	7	--	No, [0.005]		
			1,2,3-Trichloropropane	1	--	No MCL established		
	2901-12	Wahiawa I	Carbon tetrachloride	12	5	No, [0.005]		
			1,2-Dibromo-3-chloropropane	2	--	No, [0.0002]		
			Tetrachloroethylene	9	3	No, [0.005]		
			Tetrachlorethene	3	2	No, [0.005]		
Wahiawa II	2902-01	Wahiawa II	Carbon tetrachloride	34	--	No, [0.005]	No	Wahiawa Dump A
			Tetrachloroethylene	15	15	[0.005]		
			1,2,3-Trichloropropane	10	11	No MCL established		
			Tetrachlorethene	1	6	[0.005]		

BWS = Board of Water Supply

GAC = granular activated carbon

MCL = maximum contaminant level

mg/L = milligrams per liter

The data considered in the Hawaii Source Water Assessment Program report was Department of Health monitoring program data from 1995 to 2004.

Table 12-10
SUMMARY OF HAWAII SOURCE WATER ASSESSMENT PROGRAM DATA FROM IMPACTED BWS WELLS THAT HAVE LANDFILLS WITHIN THEIR CAPTURE ZONES
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Station Name	BWS Well Number	Well Name	Constituent(s)	Number of Detects Exceeding Method Detection Limit	Number of Detects Exceeding Reporting Limit	MCL Exceeded? [MCL in mg/L]	GAC Treatment Systems Exists/Planned	Landfill(s) within Well Capture Zone(s)	Landfill(s) Lie within BWS Well Capture Zone(s)
Hoaeae	2301-34	Hoaeae P1	Atrazine	--	1	Yes, [0.003]	Yes	Mililani Old Landfill^	C
			1,2,3-Trichloropropane	8	--	No MCL established			
	2301-35	Hoaeae P2	1,2,3-Trichloropropane	11	10	No MCL established			
	2301-36	Hoaeae P3	Atrazine	1	7	Yes, [0.003]			
			Dieldrin	--	2	No MCL established			
			1,2,3-Trichloropropane	14	11	No MCL established			
	2301-37	Hoaeae P4	Atrazine	--	1	Yes, [0.003]			
			1,2,3-Trichloropropane	12	11	No MCL established			
	2301-38	Hoaeae P5	1,2,3-Trichloropropane	23	9	No MCL established			
	2301-39	Hoaeae P6	1,2,3-Trichloropropane	20	11	No MCL established			
Kunia I	2302-01	Kunia I P1	Atrazine	--	5	Yes, [0.003]	Yes	Oahu Sugar Dump 3^, Wheeler Army Airfield - Gulch Runway Dump	B & C
			Trichloroethene	6	--	No, [0.005]			
			1,2,3-Trichloropropane	6	23	No MCL established			
	2302-02	Kunia I P2	Atrazine	--	3	Yes, [0.003]			
			1,2-Dibromo-3-chloropropane	1	--	No, [0.0002]			
			Trichloroethene	4	--	No, [0.005]			
			1,2,3-Trichloropropane	4	19	No MCL established			
	2302-03	Kunia I P3	Atrazine	--	3	Yes, [0.003]			
			1,2,3-Trichloropropane	10	24	No MCL established			
	2302-04	Kunia I P4	Atrazine	--	1	Yes, [0.003]			
			1,2,3-Trichloropropane	1	24	No MCL established			
Waipahu II	2400-05	Waipahu II-2	Ethylene dibromide	18	--	No, [0.00005]	Yes	Oahu Sugar Dump 5^	B
			1,2,3-Trichloropropane	12	16	No MCL established			
	2400-06	Waipahu II-1	Ethylene dibromide	26	--	No, [0.00005]			
			1,2,3-Trichloropropane	12	15	No MCL established			
	2400-08	Waipahu II-3	Ethylene dibromide	2	--	No, [0.00005]			
			1,2,3-Trichloropropane	--	2	No MCL established			
Kunia II	2402-01	Kunia II	1,2-Dibromo-3-chloropropane	10	--	No, [0.0002]	Yes	Kunia Dump B, Hawaiian Pineapple Dumps 9 & 10	B & C
			1,2-Dichloropropane	1	--	No, [0.005]			
			Trichloroethene	3	--	No, [0.005]			
			1,2,3-Trichloropropane	--	18	No MCL established			
	2402-02	Kunia II P2	1,2-Dibromo-3-chloropropane	10	--	No, [0.0002]			
			1,2-Dichloropropane	1	--	No, [0.005]			
			Trichloroethene	9	--	No, [0.005]			
			1,2,3-Trichloropropane	2	22	No MCL established			
	2402-03	Kunia II P3	1,2-Dibromo-3-chloropropane	13	--	No, [0.0002]			
			1,2-Dichloropropane	3	--	No, [0.005]			
			Trichloroethene	16	--	No, [0.005]			
			1,2,3-Trichloropropane	--	27	No MCL established			

Table 12-10
SUMMARY OF HAWAII SOURCE WATER ASSESSMENT PROGRAM DATA FROM IMPACTED BWS WELLS THAT HAVE LANDFILLS WITHIN THEIR CAPTURE ZONES
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Station Name	BWS Well Number	Well Name	Constituent(s)	Number of Detects Exceeding Method Detection Limit	Number of Detects Exceeding Reporting Limit	MCL Exceeded? [MCL in mg/L]	GAC Treatment Systems Exists/Planned	Landfill(s) within Well Capture Zone(s)	Landfill(s) Lie within BWS Well Capture Zone(s)
Waipio Heights I	2459-19	Waipio Heights 2	1,2,3-Trichloropropane	--	10	No MCL established	Planned	Oahu Sugar Dump 6^, Mililani New Landfill	B & C
	2459-20	Waipio Heights 1	Ethylene dibromide	2	--	No, [0.00005]			
			1,2,3-Trichloropropane	3	13	No MCL established			
	2459-23	Waipio Heights I-3	1,2,3-Trichloropropane	--	13	No MCL established			
	2459-24	Waipio Heights. I-4	1,2,3-Trichloropropane	--	11	No MCL established			
Wahiawa II	2902-01	Wahiawa II	Carbon tetrachloride	34	--	No, [0.005]	No	Wahiawa Dump A^	C
			Tetrachloroethylene	15	15	Yes, [0.005]			
			1,2,3-Trichloropropane	10	11	No MCL established			
			Tetrachlorethene	1	6	Yes, [0.005]			
Waialua	3405-01	Waialua	Trichloroethene	4	1	Yes, [0.005]	Yes	Hawaiian Pineapple Dump 3	C
			1,2,3-Trichloropropane	--	6	No MCL established			
	3405-02	Waialua	1,2-Dibromo-3-chloropropane	1	--	No, [0.0002]			
			Trichloroethene	4	1	Yes, [0.005]			
			1,2,3-Trichloropropane	6	--	No MCL established			

Capture Zone B = 2-year pumping period
Capture Zone C = 10-year pumping period
^ = Category 1 landfill

BWS = Board of Water Supply
GAC = granular activated carbon
MCL = maximum contaminant level
mg/L = milligrams per liter
The data considered in the Hawaii Source Water Assessment Program report was Department of Health monitoring program data from 1995 to 2004.

Table 12-11
SUMMARY OF HAWAII SWAP
DATA FROM IMPACTED BWS WELLS WITHIN ONE MILE OF CATEGORY I LANDFILLS AND FOR BWS WELLS THAT HAVE LANDFILLS W/IN THEIR CAPTURE ZONES
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Station Name	BWS Well Number	Well Name	Constituent(s)	Number of Detects Exceeding Method Detection Limit	Number of Detects Exceeding Reporting Limit	MCL Exceeded? [MCL in mg/L]	GAC Treatment Systems Exists/Planned	Landfills Within One Mile	Landfills Within Well Capture Zone(s)	Landfill(s) Lie within BWS Well Capture Zone(s)
Hoaeae	2301-34	Hoaeae P1	Atrazine	--	1	Yes, [0.003]	Yes	Oahu Sugar Dump 3, Oahu Sugar Dump 4 - Waipahu	Mililani Old Landfill^	C
			1,2,3-Trichloropropane	8	--	No MCL established				
	2301-35	Hoaeae P2	1,2,3-Trichloropropane	11	10	No MCL established				
	2301-36	Hoaeae P3	Atrazine	1	7	Yes, [0.003]				
			Dieldrin	--	2	No MCL established				
			1,2,3-Trichloropropane	14	11	No MCL established				
	2301-37	Hoaeae P4	Atrazine	--	1	Yes, [0.003]				
			1,2,3-Trichloropropane	12	11	No MCL established				
	2301-38	Hoaeae P5	1,2,3-Trichloropropane	23	9	No MCL established				
	2301-39	Hoaeae P6	1,2,3-Trichloropropane	20	11	No MCL established				
Kunia I	2302-01	Kunia I P1	Atrazine	--	5	Yes, [0.003]	Yes	Oahu Sugar Dump 2, Oahu Sugar Dump 3, Oahu Sugar Dump 4 - Waipahu	Oahu Sugar Dump 3^, Wheeler Army Airfield - Gulch Runway Dump	B & C
			Trichloroethene	6	--	No, [0.005]				
			1,2,3-Trichloropropane	6	23	No MCL established				
	2302-02	Kunia I P2	Atrazine	--	3	Yes, [0.003]				
			1,2-Dibromo-3-chloropropane	1	--	No, [0.0002]				
			Trichloroethene	4	--	No, [0.005]				
			1,2,3-Trichloropropane	4	19	No MCL established				
	2302-03	Kunia I P3	Atrazine	--	3	Yes, [0.003]				
			1,2,3-Trichloropropane	10	24	No MCL established				
	2302-04	Kunia I P4	Atrazine	--	1	Yes, [0.003]				
			1,2,3-Trichloropropane	1	24	No MCL established				
Kunia II	2402-01	Kunia II	1,2-Dibromo-3-chloropropane	10	--	No, [0.0002]	Yes	Oahu Sugar Dump 2, Oahu Sugar Dump 3	Kunia Dump B, Hawaiian Pineapple Dumps 9 & 10	B & C
			1,2-Dichloropropane	1	--	No, [0.005]				
			Trichloroethene	3	--	No, [0.005]				
			1,2,3-Trichloropropane	--	18	No MCL established				
	2402-02	Kunia II P2	1,2-Dibromo-3-chloropropane	10	--	No, [0.0002]				
			1,2-Dichloropropane	1	--	No, [0.005]				
			Trichloroethene	9	--	No, [0.005]				
			1,2,3-Trichloropropane	2	22	No MCL established				
	2402-03	Kunia II P3	1,2-Dibromo-3-chloropropane	13	--	No, [0.0002]				
			1,2-Dichloropropane	3	--	No, [0.005]				
			Trichloroethene	16	--	No, [0.005]				
			1,2,3-Trichloropropane	--	27	No MCL established				
Waipio Heights I	2459-19	Waipio Heights 2	1,2,3-Trichloropropane	--	10	No MCL established	Planned	Oahu Sugar Dump 6	Oahu Sugar Dump 6^, Mililani New Landfill	B & C
	2459-20	Waipio Heights 1	Ethylene dibromide	2	--	No, [0.00005]				
			1,2,3-Trichloropropane	3	13	No MCL established				
	2459-23	Waipio Heights I-3	1,2,3-Trichloropropane	--	13	No MCL established				
Wahiawa II	2902-01	Wahiawa II	Carbon tetrachloride	34	--	No, [0.005]	No	Wahiawa Dump A	Wahiawa Dump A^	C
			Tetrachloroethylene	15	15	Yes, [0.005]				
			1,2,3-Trichloropropane	10	11	No MCL established				
			Tetrachlorethene	1	6	Yes, [0.005]				

BWS = Board of Water Supply
GAC = granular activated carbon
MCL = maximum contaminant level
mg/L = milligrams per liter
The data considered in the Hawaii Source Water Assessment Program report was Department of Health monitoring program data from 1995 to 2004.

Capture Zone B = 2-year pumping period
Capture Zone C = 10-year pumping period
^ = Category 1 landfill

Table 13-1
SOURCE TERM PARAMETERS USED IN FRAMES MODELING
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Landfill Geometry	
Thickness of known overburden[1]	0.6 m
Thickness[1]	4 m
Length[1]	550 m
Width[1]	550 m
Area[1]	50 acres
Soil Parameters	
pH[1]	6.8
Moisture content[2]	42 %
Total porosity[2]	48 %
Bulk density[1]	2.65 g/cc

g/cc = grams per cubic centimeter

FRAMES = Framework for Risk Analysis in Multimedia Environmental Systems

m = meter

% = percent

Sources:

[1]Kapaa site inspection report

[2]Multimedia Environmental Pollutant Exposure Assessment System default

Table 13-2
TRANSPORT PARAMETERS USED IN FRAMES RISK MODELING
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

INPUT PARAMETERS COMMON TO ALL MODELED LANDFILLS	
% flux entering aquifer[1]	100 %
pH of pore water[2]	6.8
Total porosity[3]	39.8 %
Effective porosity[1]	10 %
Thickness of aquifer[4]	80 ft
Normal distance to well MW-6	0
Vertical distance to screen	0

SITE-SPECIFIC PARAMETERS						
Parameter	**Puu Palailai Landfill**	**Pearl City Dump - Second Street**	**Wahiawa A Dump**	**NCTAMS - Old Wahiawa Landfill**	**Mililani Old Landfill**	**Fort Shafter Dump**
Darcy velocity (ft/day)	80	820	2317	655	1486	100
Mean daily precipitation (Mgal/day)	754	88	754	754	754	88
Recharge rate (Mgal/day)	341	18	341	341	341	18
Mean total precipitation (inches/yr)	25	35	50	50	50	35
Annual infiltration (inches/yr)	11.3	7.2	22.6	22.6	22.6	7.2
Distance to closest well (feet)	3420	4471	3386	3373	3432	7591

Parameter	**Laie Dump**	**Oahu Sugar Dump 2**	**Oahu Sugar Dump 3**	**Oahu Sugar Dump 4 - Waipahu**	**Oahu Sugar Dump 5**	**Oahu Sugar Dump 6**
Darcy velocity (ft/day)	470	283	191	99.9	1486	1500
Mean daily precipitation (Mgal/day)	536	754	754	754	754	88
Recharge rate (Mgal/day)	198	341	341	341	341	18
Mean total precipitation (inches/yr)	70	30	30	40	50	35
Annual infiltration (inches/yr)	25.9	13.6	13.6	18.1	22.6	7.2
Distance to closest well (feet)	2367	3670	1740	2016	2788	3187

FRAMES = Framework for Risk Analysis in Multimedia Environmental Systems
ft = feet
ft/day = feet per day
Mgal = million gallons
MW = Monitoring Well
NCTAMS = Naval Computer and Telecommunication Area Master Station
yr = year

Sources:
[1]FRAMES default
[2]Department of Health Kapaa file data
[3]Kapaa site inspection report
[4]Board of Water Supply's Geographic Information System database
Other hydrogeological data from: Soroos 1973; Takasaki and Mink 1985; Nichols, et al 1996; Oki 1998; Finstick 1998; Golder Associates 1998; Hunt 1996; Oki and Brasher 2003

Table 13-3
MUNICIPAL SOLID WASTE LANDFILL INVENTORY SOURCE DATA FROM THE LITERATURE
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

	PRG (Soil Screening)	Kapaa Landfill	Golder 2002	Weber, et al 2002	Southwest Landfill, Bend, Oregon	Tulalip Landfill	Cartwright, et al 1977	Kylefors 2003
Organics & Nonmetals								
Benzene	0.002 mg/kg	NA	NA	NA	0.35 mg/L	NA	NA	BDL-1.2 mg/L
1,2 DCB	0.9 mg/kg	BDL - 7.1 mg/L	NA	NA	NA	NA	NA	NA
PCE	0.003 mg/kg	BDL - 10.8 mg/L	NA	NA	0.92 mg/L	NA	NA	BDL-0.1 mg/L
TCE	0.003 mg/kg	BDL - 7.8 mg/L	NA	NA	0.55 mg/L	NA	NA	9.1-120 mg/L
Vinyl chloride	0.0007 mg/kg	BDL - 88.3 mg/L	NA	4.3 mg/L	0.31 mg/L	NA	NA	NA
Toluene	0.6 mg/kg	NA	NA	NA	0.37 mg/L	NA	NA	BDL-0.4 mg/L
2,4-D	NA	BDL - 1.78 mg/L	NA	BDL	BDL	NA	NA	BDL- 11.0 mg/L
Nitrate	NA	NA	2.6 mg/L	NA	BDL	NA	NA	.09 - 7.4 mg/L
Arsenic	1.0 mg/kg	BDL - 16 mg/L	NA	NA	BDL	0.018-0.209 mg/L	0.11 mg/L	BDL - 6.5 mg/L
Heavy Metals								
Cadmium	0.5 mg/kg	BDL	0.001 mg/L	BDL	BDL	.0088-0.0377 mg/L	1.95 mg/L	BDL - .188 mg/L
Chromium	2.0 mg/kg	BDL - 0.018 mg/L	0.018 mg/L	0.0227 mg/L	0.01741 mg/L	0.0027-1.290 mg/L	BDL	3.12 - 8.66 mg/L
Cobalt	NA	NA	0.026 mg/L	NA	0.01387 mg/L	NA	NA	3.49 - 8.6 mg/L
Lead	NA	NA	0.04 mg/L	0.0041 mg/L	0.00222 mg/L	0.0119-4.450 mg/L	4.46 mg/L	BDL - 5.24 mg/L
Nickel	7.0 mg/kg	BDL -0.076 mg/L	0.03 mg/L	0.05 mg/L	0.0963 mg/L	NA	0.3 mg/L	4.4 - 10.2 mg/L
Zinc	620 mg/kg	BDL - 0.052 mg/L	0.2 mg/L	0.1 mg/L	0.05525 mg/L	NA	18.8 mg/L	10.9 - 28.7 mg/L

BDL = below detection limit
2,4-D = 2,4-dichlorophenoxyacetic acid
1,2 DCB = 1,2 dichlorobenzene
NA = not analyzed
mg/L = milligrams/liter
µg/L = micrograms/liter

mg/kg = milligram/kilogram
PCE = Tetrachloroethelyne
PRG = Preliminary Remediation Goal
TCE = Trichloroethelyne

Table 13-4
RISK MODELING CONTAMINANT INVENTORY AND CONCENTRATIONS
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

	U.S. EPA Region IX Preliminary Remediation Goals - Soil Screening Levels for Migration to Groundwater (milligrams/kilogram)
Organics and Non-metals	
Benzene*	0.002
1,2-Dichlorobenzene	0.9
[1]2,4-Dichlorophenoxyacetic Acid (2,4-D)[$]	0.45
[1]Dieldrin[+]	0.00011
[1]Dinoseb	0.0087
Tetrachloroethylene	0.003
Toluene*	0.6
Trichloroethylene	0.003
Vinyl chloride	0.0007
Metals	
Arsenic*	1.0
Cadmium	0.5
Chromium	2.0
[2]Lead*	800
Nickel	7.0
Zinc	620

* Commonly detected landfill constituents

[$] 2,4-D was the first successful selective herbicide developed. It was introduced in 1946, and rapidly became the most widely used herbicide in the world. A selective herbicide is one that controls weeds in a crop without damaging that crop.

[+] Commonly used pesticide in Hawaii

[1] U.S. EPA Region III Preliminary Remediation Goals - Soil Screening Levels for Migration to Groundwater

[2] U.S. EPA lead guidance clean-up goal 800 ppm

Table 13-5
RELATIVE RISK OF CATEGORY 1 LANDFILLS
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Cancer Incident Risk*	Relative Risk	Rank	Landfill Name
8.92×10^{-7}	1	1	Puu Palailai Landfill
7.14×10^{-7}	0.80	2	Oahu Sugar Dump 4 - Waipahu
7.13×10^{-7}	0.80	3	Fort Shafter Dump
7.07×10^{-7}	0.79	4	Laie Dump
3.75×10^{-7}	0.42	5	Oahu Sugar Dump 3
2.52×10^{-7}	0.28	6	Oahu Sugar Dump 2
1.08×10^{-7}	0.12	7	Naval Computer and Telecommunication Area Master Station - Old Wahiawa Landfill
8.75×10^{-8}	0.10	8	Pearl City Dump - Second Street
4.79×10^{-8}	0.05	9	Oahu Sugar Dump 6
4.78×10^{-8}	0.05	10	Mililani Old Landfill
4.78×10^{-8}	0.05	11	Oahu Sugar Dump 5
3.07×10^{-8}	0.03	12	Wahiawa A Dump

* No risk calculated by the model exceeded the U.S. Environmental Protection Agency (U.S. EPA) threshold for site clean-up. Although no definition of "acceptable risk" has universal support, the U.S. EPA Comprehensive Environmental Response, Compensation and Liability Act program defines an acceptable risk of developing cancer from hazardous waste sites as a probability of "one in a million," or 10^{-6}. A risk range of 10^{-6} to 10^{-4} for Superfund clean-ups requires decision-making by an oversight regulatory agency. All risk greater than 10^{-6} to 10^{-4} initiates action, while risk below 10^{-6} normally generates no further action from the regulatory authority. If a release of the modeled contaminants occurred at a Category 1 landfill, site remediation would not be justified on the sole basis of health risks to proximal well users.

Table 13-6
BEST AVAILABLE TECHNOLOGIES FOR REMOVING CONTAMINANTS FROM DRINKING WATER
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

Groundwater Technology	Contaminant	Description	Advantages	Disadvantages	Equipment Cost @ 1 MGD flow rate (2001$)	Annual O&M Cost @ 1 MGD flow rate (2001$)
Coagulation / Filtration	Arsenic, Cadmium, Chromium, Lead	chemical coagulant addition and flocculation to allow suspended and some dissolved solids to clump, filtration provides final removal	reliable, lowest capital and overall operation costs for larger systems	produces contaminated sludge	$490,000	$50,000 - $195,000
Lime Softening	Arsenic, Cadmium, Chromium, Lead, Nickel, Zinc	chemical additions followed by upflow solids contact clarifier to coagulate	reduces corrosion of pipes, proven and reliable, low pretreatment requirements	operator care required when handling chemicals, produces high volume of sludge	$338,000 - $380,000	$74,000 - $220,000
Activated Alumina	Arsenic	treated alumina is porous and adsorptive, contaminants passing through the material becomes adsorbed	well established, typically inexpensive, improves taste and smell, removes chlorine	effectiveness is variable depending on conditions, bacteria may grow on medium surface, adequate flow required for flushing, requires careful monitoring	not available	not available
Distillation	Zinc	contaminants are separated from water through evaporation and condensation	kills biological agents, other heavy metals are precipitated, proven and reliable, unit size can vary, no pretreatment required	may not acheive 100% removal, removes beneficial minierals, may require post filtration, slow process, consumes enormous amounts of energy	not available, depends on production rate	depends on energy costs and consumption
Ion Exchange	Arsenic*, Cadmium, Chromium,Lead, Nickel, Nitrate, Zinc	water is flowed through a bed of resin beads covered in negatively charged ions, the contaminant ion replaces the negatively charged ion on the resin and the negatively charged ion is released into the water	easy to operate, highly reliable, suitable for large and small operations, variety of resins available for removing specific contaminants, pretreatment may be required	needs regular regeneration, usually not feasible with high levels of TDS	$650,000 - $850,000	$35,000 - $70,000
Reverse Osmosis	Arsenic, Cadmium, Chromium, Lead, Nickel, Nitrate, Zinc	high pressure applied to feed water to direct it through a semipermiable membrane where solids and ions are retained	produces high quality water, treats a wide range of contaminants, realtively expensive to install and operate	may be chemically sensitive	$820,000	$450,000
Electrodialysis Reversal	Nitrate	an anode and cathode are used to charge a membrane surface, as ions migrate to the ion-selective semi-permiable membrane they attach to the membrane	operates without fouling or scaling, or chemical additions, low pressure requirements, long membrane life expectancy,	not for high levels of water hardness, limited current density, current leakage, limited to water with <3000 mg/L TDS	$500,000 @ 1,000ppm	$150,000 @ 1,000ppm
Granular Activated Carbon	Benzene, Dinoseb, Tetrachloroethylene, Toluene, Tricholorethylene, 2,4-Dichlorophenoxyacetic acid, 1,2-Dichlorobenzene	porous carbon media adsorbs dissolved contaminants from water	well established, suitable for some organic chemcials, some pesticides, and THMs, typically inexpensive, improves taste and smell, removes chlorine	bacteria may grow on material, requires careful monitoring	$1,400,000	$275,000
Packed Tower Aeration / Air Stripping	Benzene, Tetrachloroethylene, Toluene, Trichloroehthelene, Vinyl chloride, 1,1-Dichlorobenzene	water is sprayed over packing material in a tower as air is blown from the bottom of the tower to allow volatilization of VOCs	well established, highly effective, best for VOCs and large installations	requires design knowledge, requires careful monitoring, potential for clogging, low volatility contaminants may require preheating, off-gas mary require treatment	site specific, depends on organic concentrations	site specific, depends on organic concentrations

The technologies presented in this table are consistent with U.S. EPA approved BATs for the regulated contaminants listed in the table.
For unregulated compounds and/or contaminants not listed in this table, consult U.S. EPA health advisories and other documents for treatment options.
Jurenka, R., S. Martella and R. Rodrigues (US Dept of the Interior, Bureau of Reclamation). 2001. Water Treatment Primer for Communities in Need, September. AWTR Report # 68. http://www.usbr.gov/pmts/water/primer.html
* = EPA. 2003. Arsenic Treatment Technology Evaluation Handbook for Small Systems, July. EPA-816-R-03-014. - use handbook to select treatment technology
http://www.dep.state.fl.us/legal/Rules/drinkingwater/62-560%20Tables%20.pdf#search=%22best%20available%20technology%20drinking%20water%22 (Tables 1-3)

TABLE 14-1
IDENTIFICATION, SCREENING, AND EVALUATION OF REMEDIAL OPTIONS
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

General Response Actions	Remedial Technology	Process Options	Description	Effectiveness	Implementability	Relative Cost[1]	Retained?	Reasons to Retain/ Not Retain Process Option for Oahu Inactive Landfills
No Action	None	Not applicable	No action.	May be applicable to some sites.	Easily implementable.	None	Retained	May be appropriate for some sites.
Institutional Controls	Access restrictions	Deed restrictions	Place restrictions and notifications in the deeds of impacted property. Deed restrictions limit certain types of land uses at a property to enhance the protectiveness of other actions taken as part of an overall site remedy.	Prevents construction in contaminated soils, thereby preventing exposure to contamination. Allows time for natural attenuation.	Implementable.	Low	Retained	Land ownership will vary between sites and this option is only applicable for some locations.
		Land use restrictions	Implement restrictions to prevent access to areas containing contaminated media. Limits exposure pathways to human receptors. May be in the form of government controls (e.g. zoning and permitting requirements) and proprietary controls (e.g. easements, covenants, and reversionary interests).	Prevents exposure to contaminated media. Allows time for natural attenuation.	Implementable.	Low	Retained	Low-cost, potentially effective method of limiting exposure of receptors to contamination.
		Restrictions on Fishing/Fish Consumption	Implement restrictions on fishing and/or fish consumption for areas where fish may contain unacceptable levels of contaminants.	Prevents human ingestion of contaminants from fish tissue.	Implementable	Low	Retained	Low-cost, potentially effective method of limiting exposure of receptors to contamination.
		Fencing and signs	Erect physical barriers and warning signs to prevent access to surface contamination.	Prevents exposure to contaminated media. Allows time for natural attenuation.	Implementable.	Low capital, Low O&M	Retained	Low-cost, potentially effective method of limiting exposure of receptors to contamination.
	Monitoring	Monitoring wells	Install monitoring wells.	Provides semi-permanent location for routine groundwater sampling.	Implementable.	Moderate capital, Low O&M	Retained	Permanent, relatively low-cost monitoring technology. Can be used to monitor migration and potential sources of contamination.
		Visual observation	Use site visits and visual observation to note changes to the landscape such as settling, stressed vegetation, etc.	Useful for documenting conditions.	Easily implementable.	Low	Retained	Useful for documenting conditions.
		Sampling surface water, sediment, groundwater	Collect and analyze samples of contaminated media (surface water, soil/sediment, or groundwater) to gauge/confirm progress of remedial action and/or compliance with regulations.	Useful for documenting conditions or the progress/success of another remedial alternative such as excavation.	Implementable.	Low	Retained	Useful for documenting conditions or the progress/success of another remedial alternative such as excavation.
Containment (U.S. EPA Presumptive Remedy)	Capping	Clay, asphaltic concrete, concrete, or multi-layer cap	Install an impermeable layer over areas of contamination for the purpose of preventing surface water infiltration, controlling leaching of contaminants to groundwater, and limiting the potential for human or ecological receptors to come in contact with contaminated soils.	Effective for preventing infiltration. Prevents exposure to surface contamination. Does not reduce toxicity or volume of contamination.	Moderate to difficult to implement at some sites due to slope and stability limitations.	High capital; Moderate O&M	Retained	Materials for cap would be difficult to transport to some sites.

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IDENTIFICATION, SCREENING, AND EVALUATION OF REMEDIAL OPTIONS
Oahu Inactive Landfills - Relative Risk Evaluation
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General Response Actions	Remedial Technology	Process Options	Description	Effectiveness	Implementability	Relative Cost[1]	Retained?	Reasons to Retain/ Not Retain Process Option for Oahu Inactive Landfills
Containment (cont.)		Synthetic membrane	Install a synthetic membrane as a liner over areas of contamination to limit contact with contaminated soils.	Effective for preventing infiltration. Effective for limiting exposure to surface soil contamination. Does not reduce toxicity or volume of contamination.	Implementable. Synthetic membrane materials must be brought to site.	Low capital; low O&M	Retained	Synthetic membrane materials are relatively easy to transport to the site.
		Gravel and/or organic material cap	Spread gravel and/or organic material over exposed waste or contamination.	Effective for preventing exposure to waste and restoring natural surface conditions, but may not prevent migration of contaminants.	Materials not typically available on-site.	Moderate capital, Low O&M	Retained	Materials for cap would be difficult to transport to some sites. The cap may not prevent infiltration.
	Consolidation	Solid Waste Consolidation and Management Plan	Consolidate solid waste and scrap materials from various sites into one or more central sites that are better protected from high winds. Implement and enforce a solid waste management plan.	Effective for limiting exposure to solid waste. Reduces the potential for waste to be scattered during high winds.	Implementable	Moderate capital, Low O&M	Retained	Solid waste is distributed in small dump sites at some inactive landfill sites. Consolidating these wastes would limit possible future sources of contamination to controlled areas and reduce overall remedial costs.
	Vertical barrier	Slurry wall, grout curtain, or sheet wall	Inject bentonite/soil slurry or grout or install a sheet wall as a vertical barrier to prevent horizontal migration.	Effective for preventing migration of contamination if an impermeable subsurface layer is available to key into. Does not destroy contamination.	Difficult to implement. Must be combined with water handling technology. Difficult to find an impermeable subsurface layer to key into.	High capital, Moderate O&M	Not Retained	Difficult to find an impermeable subsurface layer to key into.
		Polyethylene curtain	Dig a trench that keys into an impermeable layer, place the polyethylene in the trench, and backfill around it with the excavated soil.	Temporarily prevents migration of contaminated media, or prevents clean media from contacting contaminated media. Best used as an interim containment measure.	Difficult to Implement. Must be combined with water handling technology. Difficult to find an impermeable subsurface layer to key into.	Moderate capital, Low O&M	Not Retained	Difficult to find an impermeable subsurface layer to key into. Also, this technology is best used as an interim containment measure.
	Hydraulic barrier	Extraction or injection wells	Install a series of wells and/or interceptor trenches to extract or inject groundwater and thereby control groundwater flow direction. Combine with ex situ treatment of water for pump and treat systems.	Difficult to maintain a cone of depression at some sites.	High extraction rates required but may be highly effective in some application scenarios.	High capital, Moderate O&M	Retained	High extraction rates would be required, and a cone of depression would be difficult to maintain. May be highly effective in some scenarios.

TABLE 14-1
IDENTIFICATION, SCREENING, AND EVALUATION OF REMEDIAL OPTIONS
Oahu Inactive Landfills - Relative Risk Evaluation
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General Response Actions	Remedial Technology	Process Options	Description	Effectiveness	Implementability	Relative Cost[1]	Retained?	Reasons to Retain/ Not Retain Process Option for Oahu Inactive Landfills
Containment (cont.)	Surface controls	Run-on/runoff controls	Divert run-on/runoff water which may contain dissolved phase product or contaminated sediments, or which may become contaminated if allowed to flow through natural path. Stormwater sampling may be needed.	Prevents migration of contaminated media, or prevents clean media from contacting contaminated media.	Implementable, but drains may become clogged. Requires maintenance.	Moderate capital, Low O&M	Retained	May be used with synthetic membrane to control runoff of precipitation.
Removal by Collection/ Excavation	Interception	French drains or interceptor trenches	Construct below grade trenches/drains using rock, pipe or combination of both to obtain a preferential flow path and intercept water flow. Could be used for skimming oil and other free-phase product from top of water table.	Potentially effective for collecting groundwater or free-phase product.	Implementable, but drains may become clogged. Requires maintenance.	Moderate capital, Low O&M	Retained	May be used to collect free-phase product.
	Extraction	Extraction wells	Install a series of vertical wells to extract contaminated groundwater or free-phase product for subsequent treatment and disposal.	Potentially effective for recovery of free-phase product.	Implementable.	Moderate capital, Moderate O&M	Retained	May be effective for removal of free-phase product, if present.
		Dual phase or high-vacuum extraction	Extract soil vapor and groundwater simultaneously. Process volatilizes hydrocarbons into vapor stream. Treats soil and groundwater. Removes free-phase product if present. Groundwater is usually polished before discharge.	Effective for volatile hydrocarbons (e.g., gasoline and diesel). Less effective for contaminants that do not volatilize (PAHs, metals, and pesticides).	Implementable.	Moderate capital, Moderate O&M	Retained	May be effective for treating contamination in soil and groundwater.
		Shallow soil and/or waste excavation (<10 feet)	Use trackhoe or other equipment to remove contaminated soil for subsequent treatment and disposal. Excavation is combined with another technology to treat the soil and/or dispose of the soil in a landfill.	Effective and reliable.	Implementable.	Moderate	Retained	Effective for all contaminants at sites.
		Deep soil excavation (>10 feet)	Use heavy equipment to remove contaminated soil for subsequent treatment and disposal. Excavation is combined with another technology to treat the soil and/or dispose of the soil in a landfill.	Effective and reliable. May be applicable for small sites.	Deep excavations require benching and side sloping, which increase the amount of uncontaminated media that must be excavated, or sheet piling.	High	Retained	May be applicable for small sites where fuel hydrocarbons may have smeared through the formation during groundwater fluctuations.
Ex Situ Treatment	Physical treatment	Liquid phase separation	Remove floating, emulsified, or sinking non-aqueous phase liquids from water. Three common types are oil/water separators, centrifuge equipment, and dissolved air flotation.	Effective in removing liquids that exhibit different specific gravities than water (free-phase product), but does not remove dissolved constituents.	Implementable	High capital, Low O&M	Retained	May be used to separate free-phase product from recovered groundwater.

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Oahu Inactive Landfills - Relative Risk Evaluation
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General Response Actions	Remedial Technology	Process Options	Description	Effectiveness	Implementability	Relative Cost[1]	Retained?	Reasons to Retain/ Not Retain Process Option for Oahu Inactive Landfills
Ex Situ Treatment (cont.)		Filtration	Remove suspended solids from liquid phase by running a fluid stream through a porous medium. Can be used as a pre-treatment before activated carbon to increase the life of the carbon vessel and prevent clogging of the carbon.	Effective and reliable for separating solids from water, but does not remove dissolved constituents.	Implementable.	Low capital, Low O&M	Retained	May be used as pre-treatment for carbon adsorption.
		Carbon adsorption	Adsorb dissolved contaminants onto activated carbon. Prefilters can be used to remove suspended solids, thereby increasing the life of the carbon vessels.	Effective and reliable for water contaminated with most organics and some metals, but prefilters can clog quickly if the water has high turbidity.	Implementable. Used carbon could be thermally regenerated.	Moderate capital, Moderate O&M	Retained	Most of COPCs (TPH, BTEX, PCBs, PAHs, VOCs, SVOCs, and some metals) can be treated by carbon adsorption.
		Air Stripping	Volatilize contaminants by greatly increasing the surface area of the contaminated water exposed to air. Typically conducted in a packed tower or low profile air stripper. Vapors from air stripping vessel may need to be treated.	Effective for water contaminated with volatile organics. Not effective for contaminants that do not volatilize (PAHs, metals, and pesticides)	Implementable	Moderate capital, Low O&M	Retained	Most COPCs at the sites could be treated effectively.
		Dewatering	Use of containment cells to dewater collected sludges/sediments for further handling. Segregates media (water/soil) for subsequent treatment and disposal.	Effective in reducing volume of contaminated media.	Implementable.	Low capital, Low O&M	Retained	May be needed for excavated soil.
		Size segregation	Use a trommel to segregate fine and coarse soils. This allows different treatment methods depending on grain size (e.g., soil washing works best for coarse-grained soils).	Effective for segregating soils. Allows for different treatment of soil based on grain size.	Implementable.	Low capital, Low O&M	Not Retained	Not necessary to segregate soils.
		Soil washing	Mix contaminated material with an aqueous washing solution to rinse out contaminants and reduce contaminated volumes.	Very effective for coarse-grained soils, less effective for fines and organic soils. Effective for SVOCs, fuels, and inorganics.	Implementable. May have to separate out fines first.	Moderate capital, Moderate O&M	Not Retained	Generated water would have to be treated.
	Thermal treatment	Rotary kiln or infrared incineration	Combust contaminants in a horizontally rotating cylinder designed for uniform heat transfer (1600-2000°F). Very high destruction and removal efficiency rating. Frequently used with high temperature thermal desorption, or solidification/stabilization for complete soil treatment.	Effective and reliable for fuel and heavier hydrocarbon contamination. Not effective for metals.	Difficult to implement. Would require transportation of soil to a large treatment facility.	Very high capital, Very high O&M	Not Retained	Difficult to implement because it would require transportation of soil to a large treatment facility.
		High temperature thermal treatment	Heat (600-1000° F) and agitate the soil to drive off volatile and semi-volatile contaminants. Couple with collection and treatment of gases and condensate.	Effective for heavier hydrocarbon contamination (e.g., crude oil, PAHs). Not effective for metals.	Difficult to implement.	Very high capital, High O&M	Not Retained	Difficult to implement because it would require transportation of soil to a large treatment facility.

TABLE 14-1
IDENTIFICATION, SCREENING, AND EVALUATION OF REMEDIAL OPTIONS
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

General Response Actions	Remedial Technology	Process Options	Description	Effectiveness	Implementability	Relative Cost[1]	Retained?	Reasons to Retain/ Not Retain Process Option for Oahu Inactive Landfills
Ex Situ Treatment (cont.)		Low temperature thermal treatment	Heat (300-800°F) and agitate the soil to drive off volatile and semi-volatile contaminants. Couple with collection and treatment of gases and condensate.	Effective for lighter hydrocarbon contamination (e.g., diesel and gasoline). Not effective for metals or pesticides.	Difficult to implement.	High capital, Moderate O&M	Not Retained	Difficult to implement because it would require transportation of soil to a large treatment facility.
		Indirect thermal desorption	Heat is conducted through the walls of a chamber that contains the contaminated media to volatilize the hydrocarbons. The vapors are recovered from the chamber and treated.	Effective for hydrocarbon contamination and PAHs.	Implementable.	Moderate capital, Moderate O&M	Not Retained	Portable unit that could be transported to sites. May be cost-effective.
		Solid Waste Incineration	Use of small-scale incinerator to burn combustible, nonhazardous solid waste.	Effective for combustible solid waste.	Implementable.	Low capital, Low O&M	Retained	Potentially cost-effective treatment option.
		Treatment in on-site power plant generator or solid waste incinerator	Dilute recovered free-phase product and use as fuel for on-site power plant generator or existing on-site incinerator.	Effective for recovered free-phase product. Requires approval of personnel responsible for power plant or incinerator operation.	Implementable.	Low capital, Low O&M	Not Retained	Effective beneficial use for recovered free-phase product.
	Chemical treatment	Solidification /stabilization	Use fly ash, Portland cement, clays, kiln dust or lime to solidify soils or chemically immobilize contaminants. "Waste" can be left on-site. Chemical reactions can improve physical properties and reduce contaminant toxicity and exposure.	Very effective for metals. Less effective for hydrocarbons and pesticides.	Implementable. Bench-scale testing may be required.	Moderate capital, Moderate O&M	Retained	This may be a cost-effective ex situ treatment method for excavated soil with metals contamination.
		Chemical reduction/ oxidation	Reduction/oxidation chemically converts hazardous contaminants to non-hazardous or less toxic compounds that are more stable, less mobile, and/or inert. Commonly used oxidants include ozone, peroxide, and/or ultra violet light.	Effective and reliable for non-chlorinated organic compounds. Not effective for PAHs, metals, or pesticides.	Implementable.	Moderate	Not Retained	Other methods are more effective for contamination.
	Biological treatment	Biopile/ Composting	Aerobically biodegrade contaminated soil and organic scrap material (e.g., scrap paper, wood, etc.) in a pile, treatment bed, biotreatment cell, or windrow by addition of air and organic amendments.	Moderately effective for lighter-end contaminants and diesel contaminated soil; has proven effective in past studies. Not effective for metals or pesticides.	Implementable for moderate volumes of hydrocarbon contaminated soil.	Moderate capital, Low O&M	Retained	This may be a cost-effective ex situ treatment method for organic materials and excavated soil with organic contaminants.

TABLE 14-1
IDENTIFICATION, SCREENING, AND EVALUATION OF REMEDIAL OPTIONS
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

General Response Actions	Remedial Technology	Process Options	Description	Effectiveness	Implementability	Relative Cost[1]	Retained?	Reasons to Retain/ Not Retain Process Option for Oahu Inactive Landfills
Ex Situ Treatment (cont.)		Slurry bioreactor	Aerobically biodegrade contaminated soil or sludge in a heated aboveground bioreactor. Acclimated microorganisms, nutrients, moisture, and pH adjustment chemicals would be added as necessary. Use as backfill when treatment is complete.	Proven effective for fine-grained soils with hydrocarbon contamination. Not effective for metals or pesticides.	Implementable, but coarse material may have to be separated out first. Would require transportation of soil to a large treatment facility. Bench-scale testing may be required.	High capital, Moderate O&M	Not Retained	Would require transportation of soil to a large treatment facility.
		Fixed film bioreactor (e.g., trickle filter)	Aerobically degrade hydrocarbons through contact with bacterial film coating gravel.	Effective for degrading hydrocarbons. Heavy hydrocarbons and pesticides do not degrade well.	Implementable.	Low capital, Low O&M	Not Retained	Other methods are more effective for contamination.
		Landfarming/ Enhanced Bioremediation	Aerobically biodegrade contaminated soil by land application, tilling, nutrient amendment, and/or microbe addition.	Very effective for gasoline or diesel contaminated soil. Not effective for soils with metals or pesticides.	Implementable.	Low capital, Low O&M	Retained	This may be a cost-effective ex situ treatment method for soil/sediment with organic contaminants.
In Situ Treatment	Physical treatment	Soil vapor extraction (SVE)	Apply a vacuum to soil surface to enhance volatilization of organic compounds. Vertical extraction vents are typically used at depths of 5 feet or greater. Contaminated air is drawn from the soil pores and fresh air from the soil surface is drawn down into the soil. The extracted vapors may need to be treated.	Effective for lighter hydrocarbons in deep soils. Not effective for contaminants that do not volatilize (PAHs, metals, and pesticides).	Implementable.	Moderate capital, Moderate O&M	Retained	May be effective for lighter hydrocarbons.
		Dual phase or high-vacuum extraction	Extract soil vapor and groundwater simultaneously. Process volatilizes hydrocarbons into vapor stream. Treats soil and groundwater. Removes free-phase product if present. Groundwater is usually polished before discharge.	Effective for volatile hydrocarbons (e.g., gasoline and diesel). Less effective for contaminants that do not volatilize (PAHs, metals, and pesticides).	Implementable.	Moderate capital, Moderate O&M	Retained	May be effective for treating contamination in soil and groundwater.
		Soil flushing	Flushing solution is applied to the soil or injected into the groundwater to mobilize the contaminants for extraction and treatment.	Effective for SVOCs, fuels, and inorganics. Works best on coarse-grained soils.	Difficult to implement due to problems collecting and containing surfactants/ solvents.	Moderate capital, High O&M	Not Retained	Difficult to implement since it is difficult to collect or contain the surfactants and solvents in situ.

TABLE 14-1
IDENTIFICATION, SCREENING, AND EVALUATION OF REMEDIAL OPTIONS
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

General Response Actions	Remedial Technology	Process Options	Description	Effectiveness	Implementability	Relative Cost[1]	Retained?	Reasons to Retain/ Not Retain Process Option for Oahu Inactive Landfills
In Situ Treatment (cont.)		Treatment Curtain	Bury activated carbon or oil absorbent booms along the perimeter of the site to remove contamination from groundwater before it migrates off-site.	Effective for removing dissolved concentrations of most contaminants. Carbon can clog/break through quickly if the water has high turbidity. Not effective for pesticides.	Implementable. Used carbon could be thermally regenerated.	Moderate capital, Low O&M	Not Retained	Difficult to find an impermeable subsurface layer to key into. Water could flow under the treatment curtain. Also, would require maintenance of carbon to ensure that it did not clog or break through.
		Bimetallic nanoscale particle technology	New technology involving the use of bimetallic (iron/ palladium) nanoscale particles as reductants and catalysts for rapidly treating a variety of contaminants. Nanoscale particles can be injected into the aquifer as water slurries using gravity flow or moderate injection pressures.	Effective for treating chlorinated solvents. May be effective at treating metals and PCBs.	Implementable.	Moderate capital, Low O&M	Retained	Permeable soils would allow bimetallic nanoparticles to disperse in the groundwater and effectively treat subsurface contamination.
		Permeable Reactive Barrier	Create a permeable "wall" of strongly reducing metal (e.g., zero valent iron), strategically placed in the aquifer, through which contaminated groundwater flows. As groundwater flows through the barrier, chloride ions are stripped from the chlorinated compounds.	Effective for chlorinated compounds. Difficult to prevent groundwater from flowing around the barrier instead of through it. Only feasible for shallow groundwater underlain by a confining layer.	Difficult to implement.	Moderate capital, Low O&M	Not Retained	Difficult to find an impermeable subsurface layer to key into. Water could flow around the barrier.
	Thermal treatment	Radio frequency heating	Heat groundwater and soil mass to enhance volatilization. Couple with collection and treatment of gases and condensate.	Effective for lighter hydrocarbons and pesticides in deep (>10 feet bgs) soils.	Difficult to implement.	Very high capital, Moderate O&M	Not Retained	Prohibitive capital costs. Difficult to implement.
		In situ steam stripping	Inject steam into contaminated soils and groundwater to enhance volatilization. Couple with collection and treatment of gases and condensate.	Effective for lighter hydrocarbons and pesticides in deep (>10 feet bgs) soils.	Difficult to implement.	High capital, Moderate O&M	Not Retained	Prohibitive capital costs. Difficult to implement.
		In situ vitrification	Use an electric current to melt soil at extremely high temperatures (2900-3650° F) and thereby immobilize most inorganics and destroy organic pollutants by pyrolysis. Organic contaminants are reduced to simple gases that are collected under a treatment hood and processed. Inorganic and radioactive contaminants are incorporated into the molten soil that solidifies to a vitrified mass similar to volcanic obsidian.	Effective for organics and most inorganics and metals in soil	Difficult to implement. May require long-term monitoring to ensure protection of groundwater.	Very high capital, Very high O&M	Not Retained	Prohibitive capital costs, and may require long-term monitoring to ensure protection of groundwater. Difficult to implement.

TABLE 14-1
IDENTIFICATION, SCREENING, AND EVALUATION OF REMEDIAL OPTIONS
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

General Response Actions	Remedial Technology	Process Options	Description	Effectiveness	Implementability	Relative Cost[1]	Retained?	Reasons to Retain/ Not Retain Process Option for Oahu Inactive Landfills
In Situ Treatment (cont.)		In situ high temperature thermal desorption	In situ thermal desorption is an innovative remedial technology that involves heating contaminated soil to temperatures up to 1000° F, causing the volatilization of water and organic contaminants. The heated vapors are brought to the surface by a vacuum system and treated.	Effective for a variety of organics and volatile metals from several feet to several hundred feet deep.	Difficult to implement.	High capital, High O&M	Not Retained	Prohibitive capital costs. Difficult to implement.
	Chemical treatment	Solidification/ stabilization	Inject and mix stabilizing agents to solidify soils or chemically immobilize contaminants. Commonly involves using large-diameter augers to mix chemical additives (reagents) into the subsurface. The additives reduce contaminant mobility and for some contaminants toxicity. Leachability is typically tested to measure the immobilization of contaminants.	Very effective for metals. Less effective for hydrocarbons and pesticides.	Moderately difficult to implement. Bench-scale testing is advisable. More difficult to implement than ex situ solidification/ stabilization.	Moderate	Retained	This may be a cost-effective in situ treatment method for soil/sediment with metals contamination.
	Biological treatment	Monitored natural attenuation	Degrade organics using naturally occurring processes. The natural processes that contribute to the reduction of hydrocarbons include diffusion, convection, volatilization, sorption, abiotic chemical reaction, and most significantly, biodegradation.	Effective for degrading hydrocarbons. Heavy hydrocarbons and pesticides do not degrade well.	Easily implementable.	Low capital, Low O&M	Retained	This may be a cost-effective in situ treatment method for soil/groundwater with organic contaminants.
		Enhanced bioremediation	Introduction of electron donor source (e.g., vegetable oil) for anaerobic biodegradation of chlorinated compounds, and introduction of electron acceptor source (e.g., oxygen releasing compound) and/or nutrients and microbes for aerobic biodegradation of fuel hydrocarbons.	Effective for degrading chlorinated compounds, and hydrocarbons. Heavy hydrocarbons and pesticides do not degrade well.	Implementable.	Low capital, Moderate O&M	Retained	This may be a cost-effective in situ treatment method for soil/groundwater with organic contaminants.
		Constructed wetlands	Channel surface water flow through an artificially created wetland environment to degrade organics and fix metals to sediments prior to discharging the treated water. Process may include phytoremediation.	Effective for degrading hydrocarbons and fixing metals. Not effective for pesticides.	Implementable.	Moderate capital, Moderate O&M	Not Retained	Potential for exposure of ecological receptors to contaminants.
		Bioslurping	Vacuum-enhanced free-phase product recovery and vadose zone soil aeration. Extracts free-phase product from the capillary fringe and water table and provides oxygen for microbes in the vadose zone.	Effective for LNAPL contamination.	Implementable.	Moderate capital, Low O&M	Retained	May be effective at removing free-phase product and enhancing bioremediation of contamination.
In Situ Treatment (cont.)		Bioventing	Degrade organics using microorganisms (e.g. heterotrophs) by injecting air to increase oxygen concentrations with the goal of stimulating biodegradation.	Effective for lighter hydrocarbons in soils. Only accelerates bioremediation when system is oxygen-limited. Not effective for metals or pesticides.	Implementable.	Moderate capital, Low O&M	Retained	This may be a cost-effective in situ treatment method for soil/sediment with organic contaminants.

TABLE 14-1
IDENTIFICATION, SCREENING, AND EVALUATION OF REMEDIAL OPTIONS
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

General Response Actions	Remedial Technology	Process Options	Description	Effectiveness	Implementability	Relative Cost[1]	Retained?	Reasons to Retain/ Not Retain Process Option for Oahu Inactive Landfills
		Permeable Reactive Barriers	Create a permeable "wall" of carbon rich material (e.g., mulch), strategically placed in the aquifer, through which contaminated groundwater flows. Microbes present in the groundwater use the carbon for dechlorination of contaminants.	Effective for chlorinated compounds. Difficult to prevent groundwater from flowing around the barrier instead of through it. Only feasible for shallow groundwater underlain by a confining layer.	Difficult to implement.	Moderate capital, Low O&M	Not Retained	Difficult to find an impermeable subsurface layer to key into. Water could flow around the barrier.
		Landfarming/ Enhanced Bioremediation	Aerobically biodegrade contaminated soil by land application, tilling, nutrient amendment, and/or microbe addition.	Very effective for gasoline or diesel contaminated soil. Not effective for soils with metals or pesticides.	Implementable.	Low capital, Low O&M	Retained	This may be a cost-effective in situ treatment method for soil/sediment with organic contaminants.
Disposal	On-site disposal	Backfill	Use treated soil to backfill excavated areas (i.e., excavate, treat, and replace).	Effective and reliable.	Easily implemented.	Moderate	Retained	May be a cost-effective option for soil disposal and site restoration.
		Surface discharge	Discharge treated water to the surface.	Effective and reliable.	Implementable. May require NPDES permit.	Low	Retained	May be a cost-effective option for disposal of treated water.
		Use as road material	Use excavated tar/asphalt as asphalt for roads. Use petroleum-contaminated soils for road materials.	Effective.	Implementable.	Moderate	Retained	May be a cost-effective, beneficial use option for soil disposal.
		Nonhazardous waste landfill	Transport excavated nonhazardous waste to a new or existing on-site nonhazardous waste landfill.	Effective and reliable.	Moderately difficult to implement.	High	Not Retained	Construction of a new landfill at all locations assumed to be not feasible.
		On-site detonation of UXO	Detonate unexploded ordnance (UXO) on-site near location of discovery. Limit transport of UXO.	Effective. Provides safe and permanent disposition for UXO.	Implementable.	Moderate	Retained	Transportation of UXO would be dangerous. UXO may not be an issue at any of the sites.
	Off-site disposal	Nonhazardous waste landfill	Transport excavated nonhazardous waste to an existing off-site nonhazardous waste landfill.	Effective and reliable.	Difficult to implement.	Very high	Not Retained	Off-site disposal of nonhazardous waste would not be cost-effective.
		Hazardous waste landfill	Transport excavated hazardous soil or hazardous waste to an existing off-site hazardous waste landfill.	Effective and reliable.	Difficult to implement.	Very high	Retained	Hazardous waste may require off-site disposal at a hazardous waste landfill.

[1] High, moderate, and low compare relative capital and O&M costs of process options within the same remedial technology. O&M costs are not evaluated for technologies that would be complete within three months.

bgs - Below ground surface N/A - Not applicable O&M - Operation and maintenance

TABLE 14-2
SELECTED REPRESENTATIVE GENERAL RESPONSE OPTIONS FOR OAHU INACTIVE LANDFILL SITES
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

General Response Action	Representative Process Options
No Action	No Action
Institutional Controls	Deed Restrictions Land Use Restrictions Fencing and Signs Restrictions on Fishing/Fish Consumption Groundwater Monitoring Impacted Media Sampling and Analysis Visual Observation
Containment	Capping (all options) Consolidation of Solid Waste/Scrap Solid Waste Management Plan Surface Run-on/Run-off Controls Extraction or Injection Wells as Hydraulic Barrier
Removal (Groundwater)	French Drains or Interceptor Trenches Extraction Wells/Pumping Dual-Phase or High Vacuum Extraction
Removal (Soil and Waste)	Soil/Waste Excavation
Ex situ Treatment (Free Product)	Liquid Phase Separation
Ex situ Treatment (Groundwater)	Air Stripping Carbon Adsorption with Filtration
Ex situ Treatment (Petroleum-Contaminated Soil; Organic Scrap Material; Other Solid Waste))	Dewatering Solid Waste Incineration Landfarming/Enhanced Bioremediation Biopile/Composting
Ex-situ Treatment (Metals)	Solidification/Stabilization
In situ Treatment	Soil Vapor Extraction Dual-Phase Extraction Bimetallic Nanoscale Particle Technology Monitored Natural Attenuation Enhanced Bioremediation Bioslurping Bioventing Stabilization/Solidification Landfarming/Enhanced Bioremediation
Disposal (Water)	Surface Discharge
Disposal (Excavated Tar/Asphalt and Petroleum-Contaminated Soil)	Backfill Use as Road Material
Disposal (UXO)	On-Site Detonation
Disposal (Hazardous Waste/Soil)	Off-Site Landfill (Mainland)

Table 14-3
REMEDIAL TECHNOLOGY COST EVALUATION SUMMARY
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

General Response Action	Specific Remedial Technology	General Assumptions	Performance & Reliability	Impacts of Implementation	Timeframe for Cleanup	Estimated Costs	Institutional Requirements
No Action	NA	NA	NA	NA	NA	None	NA
Containment	Impermeable Caps[1]	Includes clay, clay and membrane and geotextile liners.	Landfill caps are very effective when the underlying waste is above the water table. The effective life of landfill components (including cap) can be extended by long-term inspection and maintenance to reduce physical damage to the cap by impacts or vegetation growth. Precautions must be taken to assume that the integrity of the cap is not compromised by post-landfill closure land use activities.	Limitations to land use; potential exposure of contaminants to workers; and operation and maintenance requirements.	NA	$320,000-500,000/acre (mean = $410,000)	Moderate to significant; cap maintenance along with leachate, gas and groundwater monitoring can be substantial over the long term.
	Soil/Vegetative Cover[2]	Alternative soil/vegetative cap used on Kaneohe Marine Base (reference site for cost estimate) is applicable at all sites.			NA	$50,000/acre	
Disposal[3]	Soil/Landfill Materials Excavation and Recycling	The general assumption with the disposal option is that the impacted soil and/or material is discrete and can be fully excavated without the need for further remedial action at the site.	Reliability dependent upon implementing authority	Potential exposure of contaminants to workers during excavation; safety hazards associated with excavation equipment and trenching; and need for clean fill to bring the area to grade after excavation is complete.	< 1 year	>$1,000,000/acre	Negligible
Institutional Controls	Long-Term Groundwater Monitoring	The general assumption with this option is that the impact is limited to groundwater exclusively as soils or other media are not addressed.	Long-term monitoring has been accepted by the USEPA as a viable technology and potential remedy available for use at corrective action sites. Site characteristics are appropriate for this technology.	Impacts to site integrity are minimal; land use may be restricted; site access required for well sampling; and a long-term financial burden is necessary to sample, analyse samples, and maintain well integrity.	20-30 years	$250,000 - $500,000	Institutional requirements associated with this technology are negligible.
	Wellhead Protection	Although wellhead protection programs are often times implemented when groundwater impacted have been documented, this scenario assumes groundwater is uncontaminated but threatened by the landfill.	Reliability dependent upon implementing authority	Impacts to site integrity are minimal; however, land use is restricted and indirect impacts from limits to development can be substantial.	NA	>$10,000	Institutional controls associated with a wellhead protection program are significant as they regulate land use based on wellhead protection zones in relation to groundwater recharge areas.

NA = not applicable (no cost associated with this option).

[1]Source for Impermeable cap costs: http://www.afcee.brooks.af.mil/products/techtrans/LandfillCovers/survey.pdf

[2]Source for the Alternative cap costs: http://p2ashore.nfesc.navy.mil/cgi-bin/project_descriptions/cfpr_results.cfm?PROJECT_ID=171

[3]Cost estimates for excavation and disposal range from $300 to $510 per metric ton ($270 to $460 per ton); source: http://www.frtr.gov/matrix2/section4/4-29.html

FIGURES

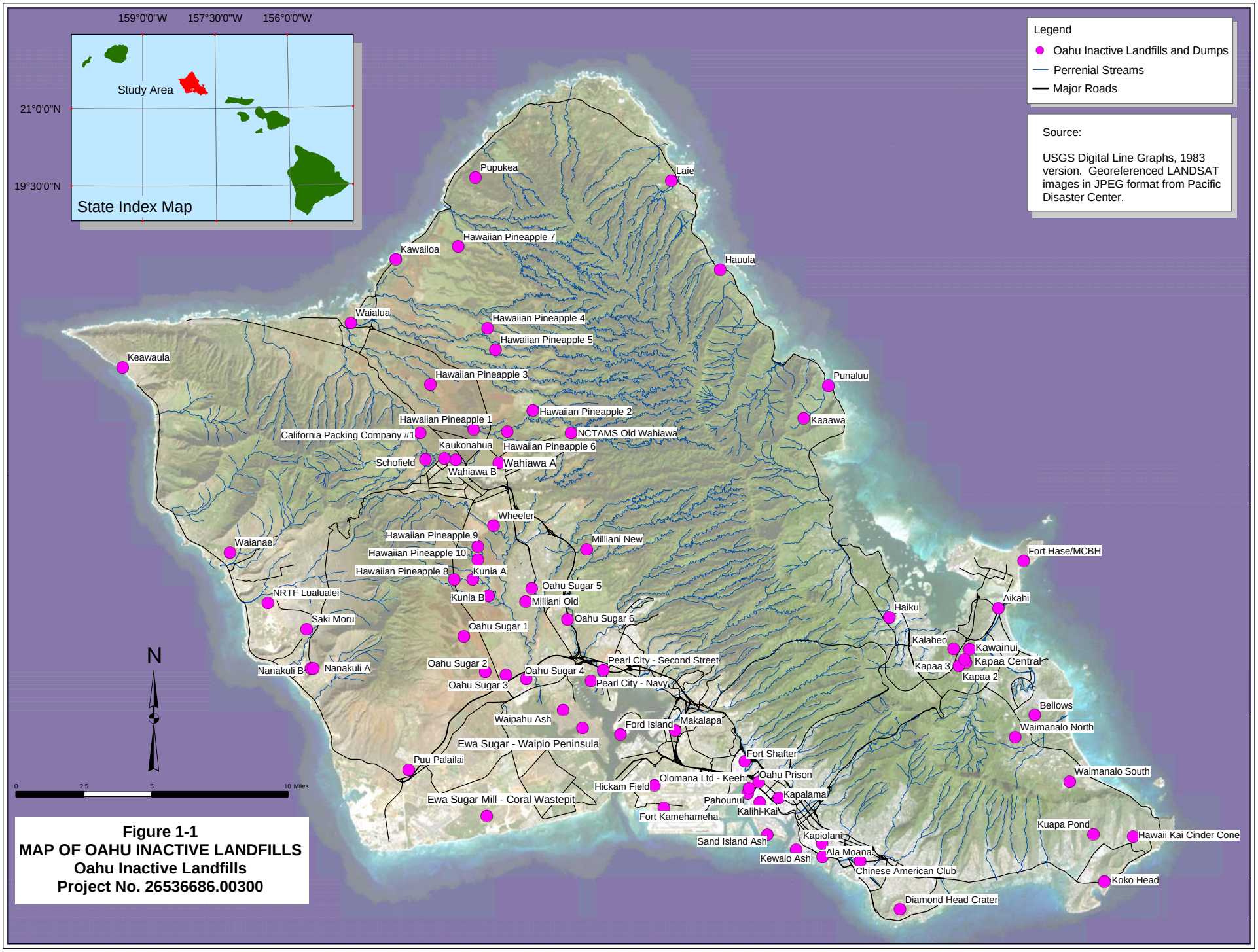

Figure 1-1
MAP OF OAHU INACTIVE LANDFILLS
Oahu Inactive Landfills
Project No. 26536686.00300

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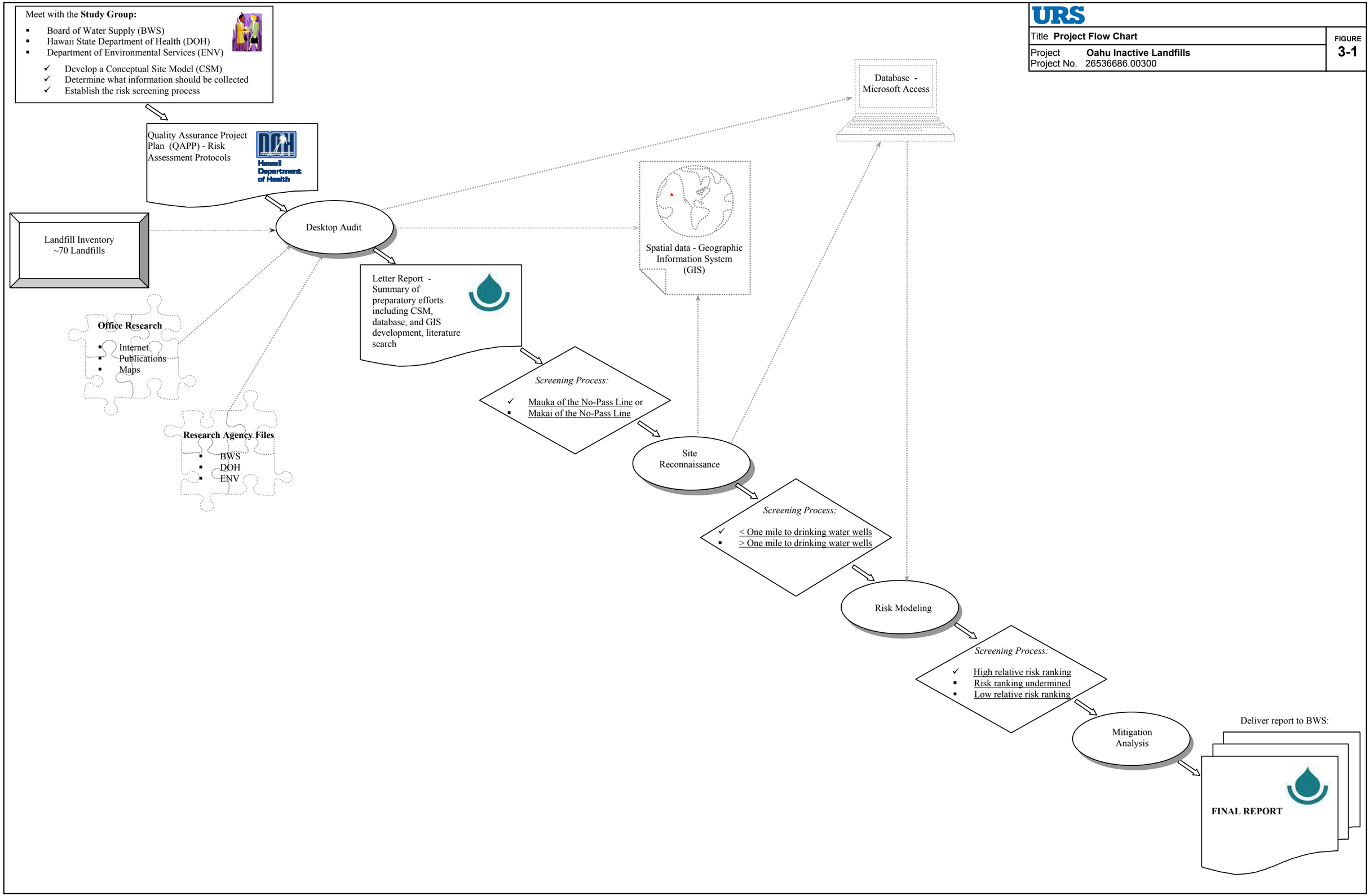
URS

Title **Project Flow Chart**

Project **Oahu Inactive Landfills**
Project No. 26536686.00300

FIGURE **3-1**



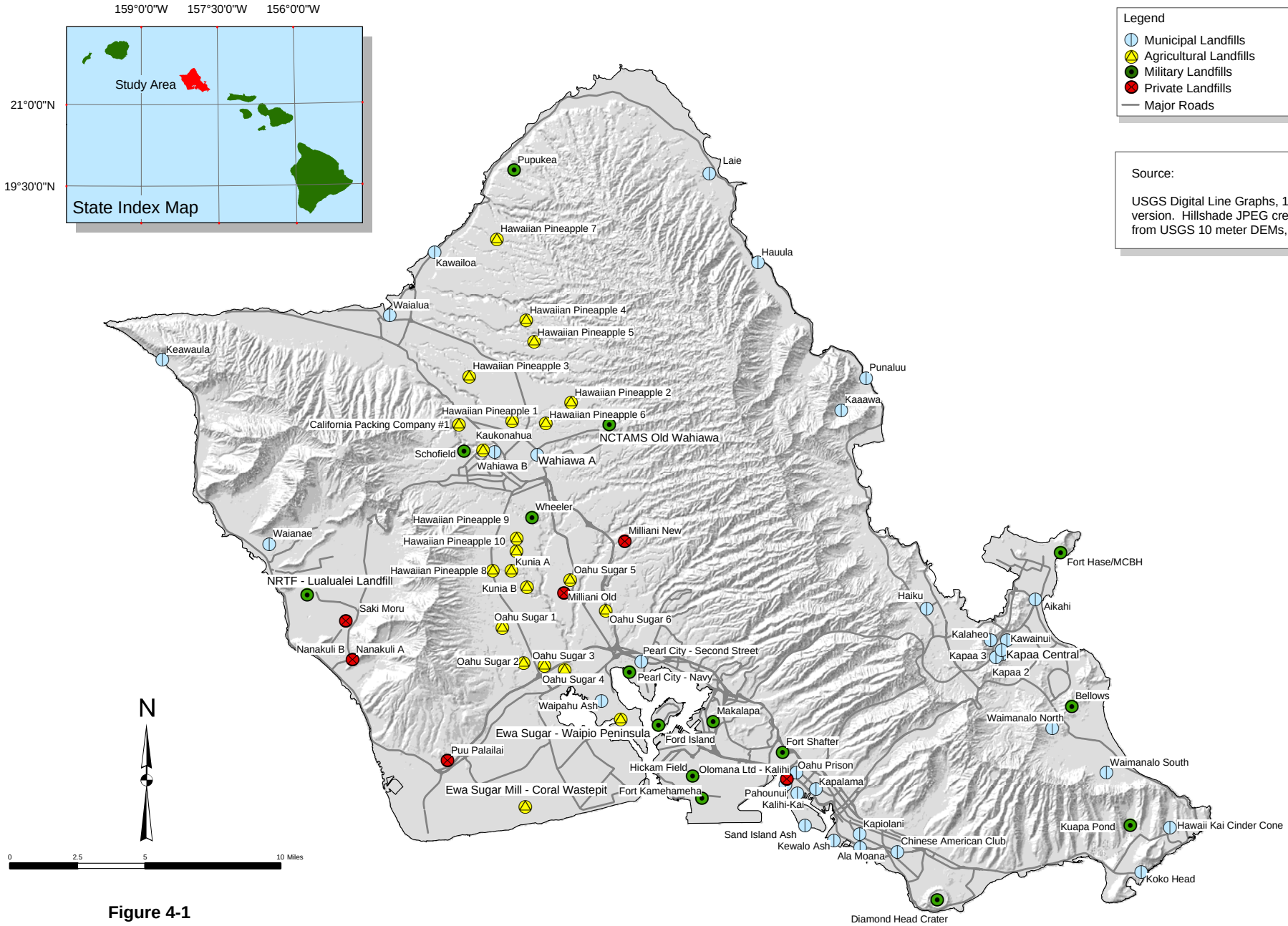


Figure 4-1
MAP OF LANDFILL USAGE TYPES
Oahu Inactive Landfills
Project No. 26536686.00300

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EE/CA Process

EE/CA Approval Memorandum
- Secure management approval and funding for EE/CA
- Include finding of actual or threatened release and, if present, an imminent and substantial endangerment and general site information and costs
- Document that situation meets NCP criteria and action is non-time-critical

EE/CA
Executive Summary
- Identify threat
- Describe removal action objectives
- Summarize recommended action

Site Characterization
- Collect site description and background
- Identify previous removal actions
- Determine source, nature, and extent of contamination
- Collect analytical data
- Perform streamlined risk evaluation
- Identify contaminant- and location-specific ARARs

Identification of Removal Action Objectives
- Evaluate statutory limits
- Determine scope of removal action
- Determine schedule of removal action

Identification and Analysis of Removal Action Alternatives
- Identify treatment technologies (presumptive remedy and treatability studies, as appropriate)

- Evaluate effectiveness
  - Overall protection of human health and the environment
  - Compliance with ARARs
  - Long-term effectiveness and performance
  - Reduction in toxicity, mobility, or volume through treatment
  - Short-term effectiveness
- Evaluate Implementability
  - Technical feasibility
  - Administrative feasibility
  - Availability of services and materials
  - State acceptance
  - Community acceptance
- Evaluate Cost

Comparative Analysis of Removal Action Alternatives

Recommended Removal Action Alternative (summarized in Action Memorandum)

Public comment period of at least 30 days

RI/FS Process

RI/FS Scoping
- Visit site/identify areas of concern
- Generate statement of work
- Collect/analyze existing data
- Determine need for/implement additional studies
- Develop preliminary remedial action alternatives/objectives
- Evaluate need for treatability studies
- Preliminary identification of ARARs
- Identify data needs/Data quality objectives
- Design data collection program
- Develop work plan
- Identify health and safety protocols

REMEDIAL INVESTIGATION

Site Characterization
- Investigate site physical characteristics
- Determine sources, nature, and extent of contamination
- Conduct laboratory and data analyses
- Conduct baseline risk assessment
- Identify contaminant- and location-specific ARARs

- Define remedial action goals

FEASIBILITY STUDY

Development, Screening, and Analysis of Alternatives
- Development of alternatives including consideration of remedial action objectives, general response actions, volumes or areas of media, technology and process options, action-specific ARARs
- Screening of alternatives including consideration of effectiveness, implementability, cost, and innovative technologies
- Performance of treatability studies including gathering required data, performing bench- or pilot-scale studies, preparing a treatability test work plan, and documenting the results

- Detailed analysis of alternatives
  - Overall protection of human health and the environment
  - Compliance with ARARs
  - Long-term effectiveness and performance
  - Reduction in toxicity, mobility, or volume through treatment
  - Short-term effectiveness
  - Implementability including technical and administrative feasibility and availability of services and materials
  - Cost
  - State acceptance
  - Community acceptance

Comparative Analysis of Remedial Action Alternatives

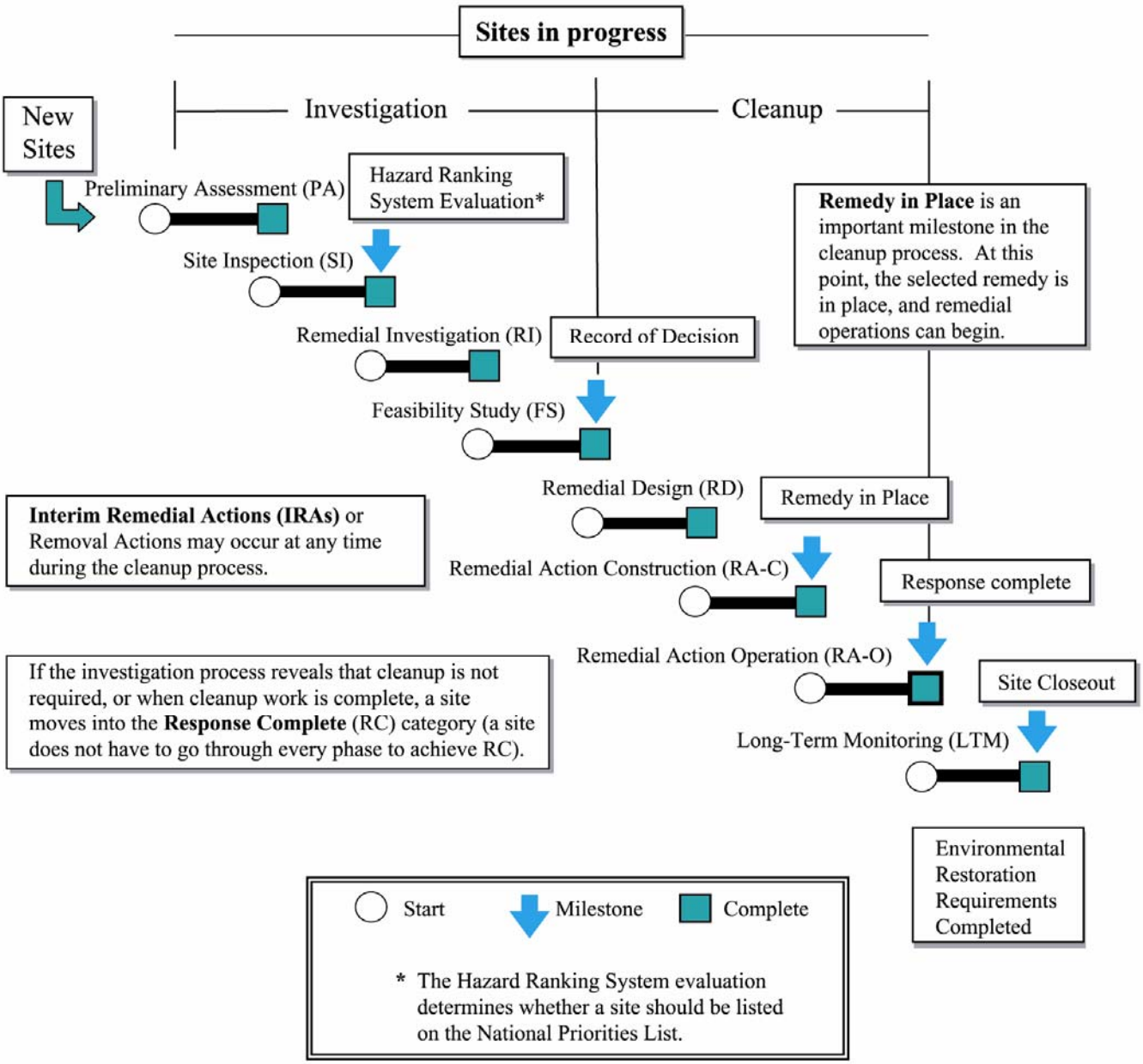
Recommended Remedial Alternative (summarized in Proposed Plan)

Public comment period of at least 30 days

Sources: OSWER, 1993.

ARAR = Applicable or Relevant and Appropriate Requirement
EE/CA = Engineering Evaluation/Cost Analysis
NCP = National Oil and Hazardous Substances Pollution Contingency Plan
RI/FS = Remedial Investigation/Feasibility Study

Title **Comparison of EE/CA Process to RI/FS Process**
Project **Oahu Inactive Landfills**
Project No. 26536686.00300
FIGURE **5-1**



Source: *Restoring Our Past, Protecting Our Future*, Defense Environmental Restoration Program, retrieved from the World Wide Web: www.dtic.mil/envirodod/DERP/DERP.htm

URS	
Title **U.S. EPA Investigation Process**	FIGURE **5-2**
Project **Oahu Inactive Landfills** Project No. 26536686.00300	

Conceptual Site Model

Precipitation

recharge area

run-off

Inactive Landfill
(municipal solid waste)

capped, lined cell

uncapped, lined cell

uncapped, unlined cell

natural attenuation processes reduce contaminant mass

upgradient drinking water well

potentiometric surface - sea level

clay cap

landfill berm

compacted clay liner

downgradient drinking water wells (outside of transport potential)

evaporation and volatilization

downgradient public drinking water well

springs,discharge

artesian well

caprock well

leachate

leachate

LNAPL Plume

DNAPL Plume

dike zone

vadose - unsaturated zone

~100-200 feet

~50-150 feet

coastal plain deposits (caprock)

Pacific Ocean

Groundwater Flow

basal water - zone of fresh water

transition zone - zone of mixture

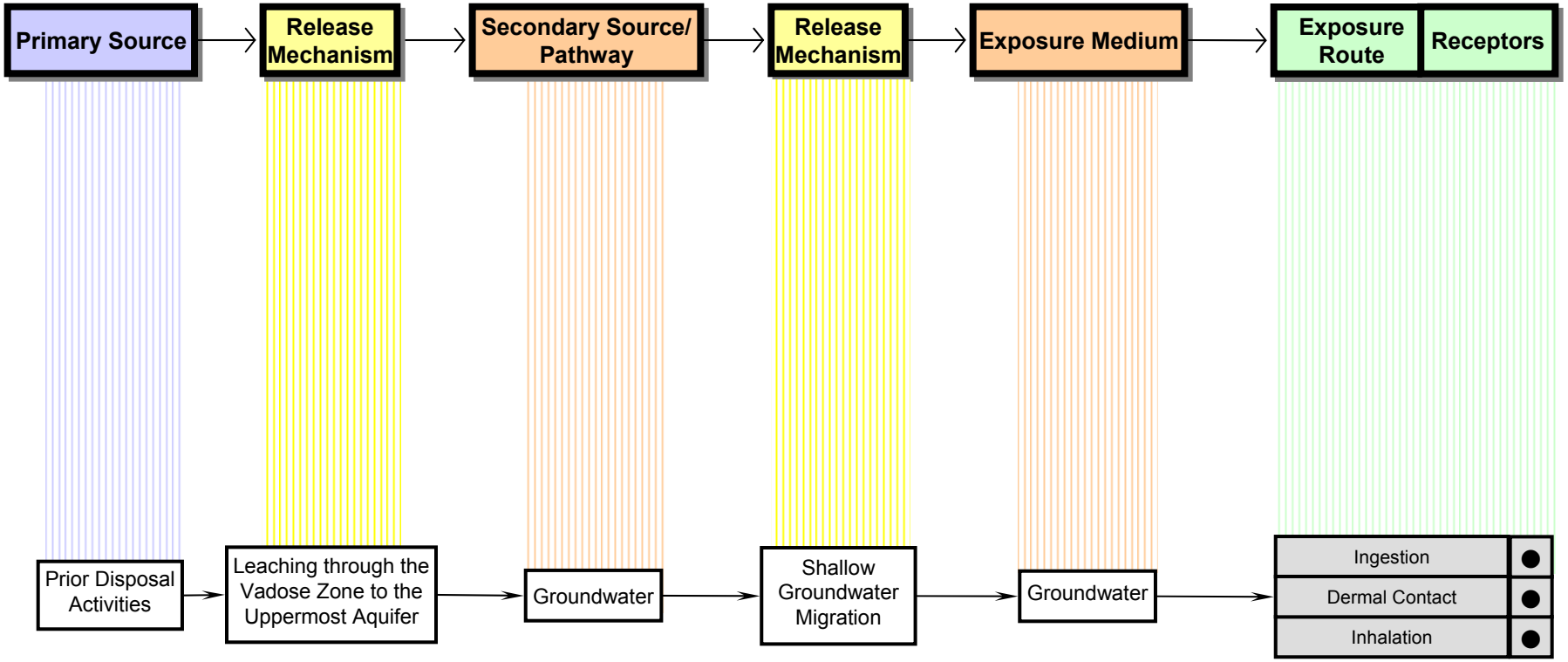
saline groundwater - zone of salt water

Hydrogeologic Setting

- surface soil - loose, porous, lateritic, typically red, clayey
- subsoil - loose, porous, clayey
- saprolite (weathered basalt)
- basalt
- caprock - coastal plain deposits

URS

Title Graphic Conceptual Site Model	FIGURE 6-1
Project Oahu Inactive Landfills Project No. 26536686.00300	



URS

Title	Diagrammatic Conceptual Site Model
Project	Oahu Inactive Landfills
Project No.	26536686.00300

Figure 6-2

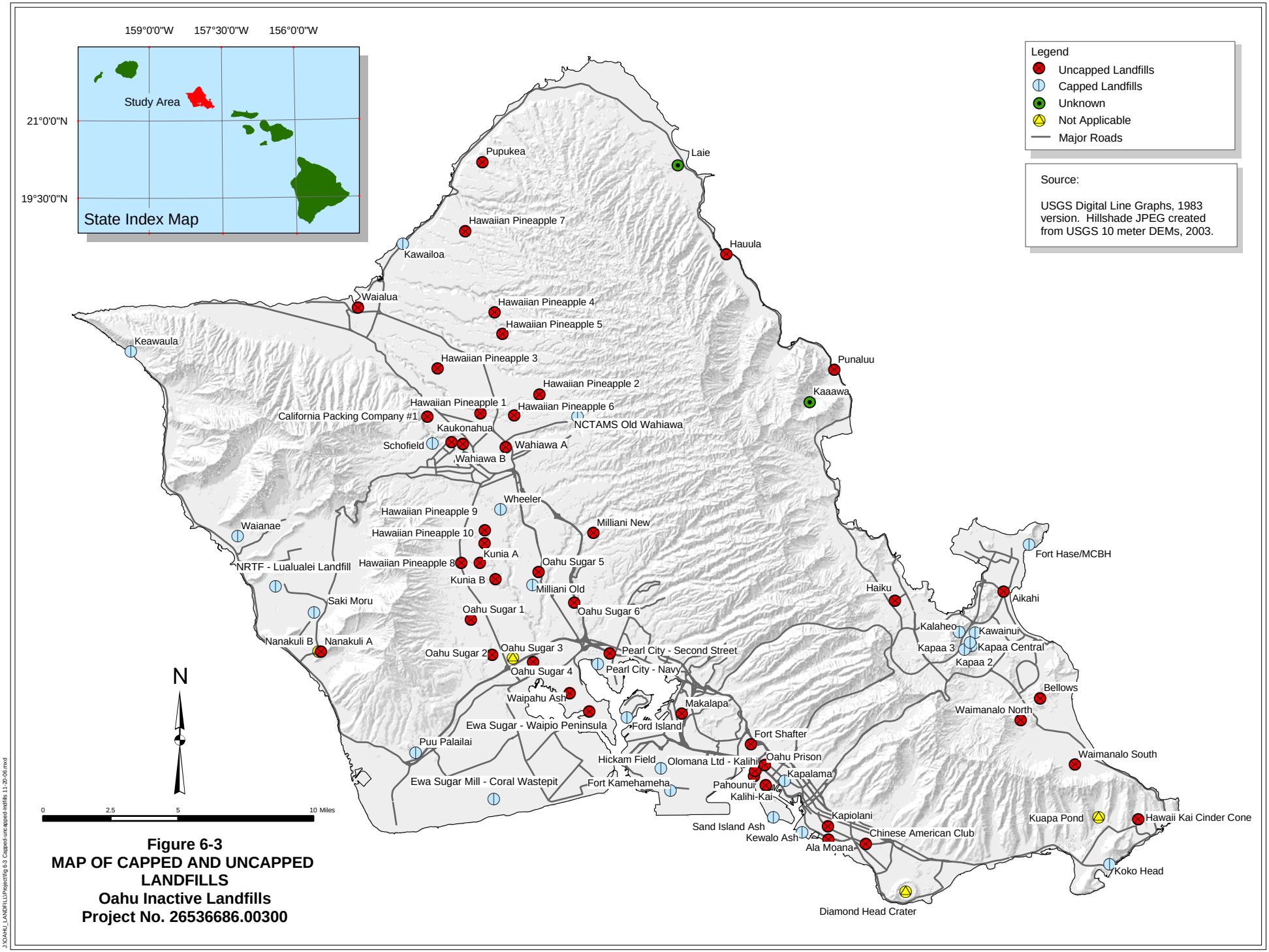


Figure 6-3
MAP OF CAPPED AND UNCAPPED LANDFILLS
Oahu Inactive Landfills
Project No. 26536686.00300

J:\OAHU_LANDFILL\Project\fig 6-3 Capped-uncapped-indfills 11-20-06.mxd

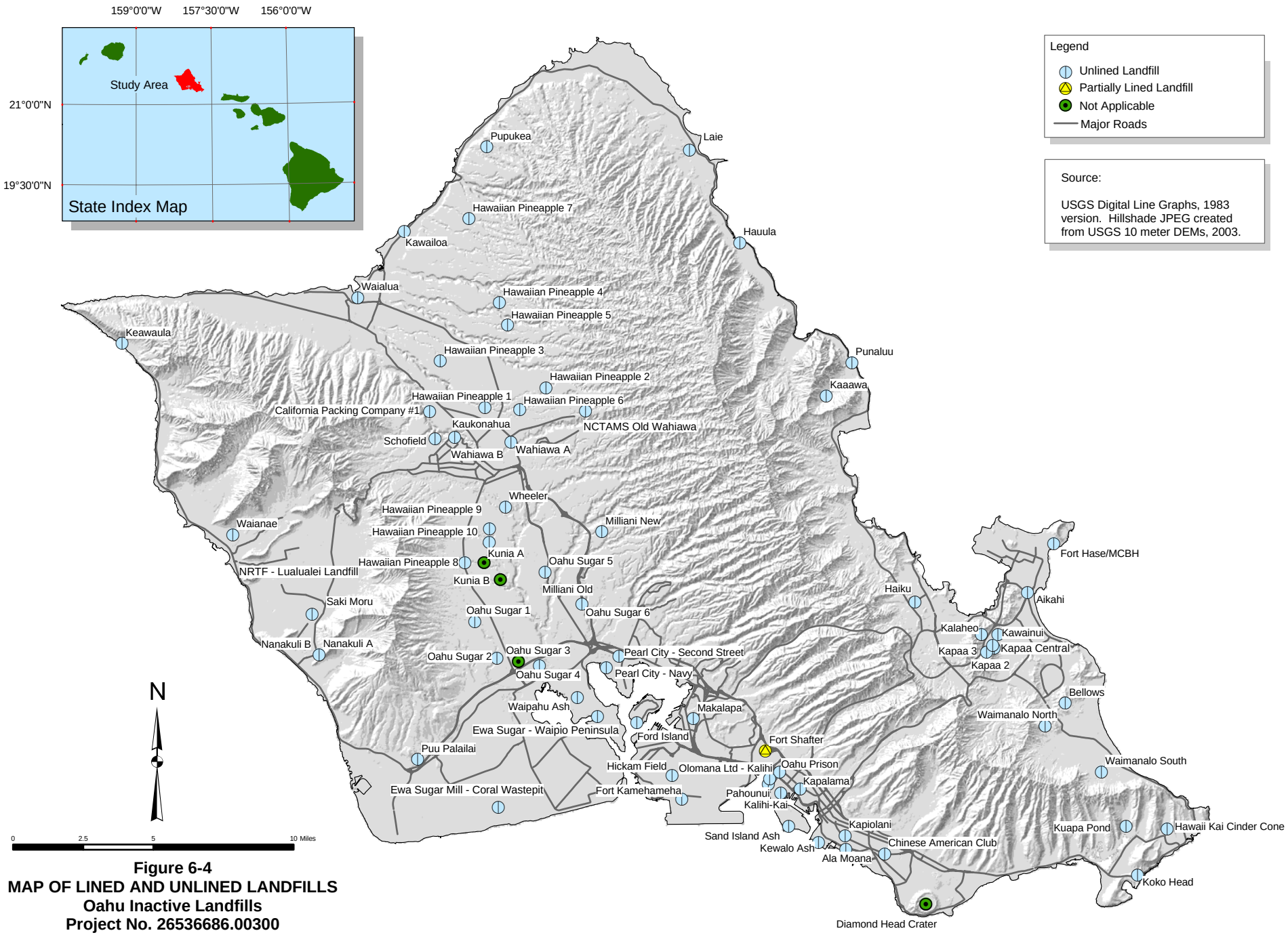


Figure 6-4
MAP OF LINED AND UNLINED LANDFILLS
Oahu Inactive Landfills
Project No. 26536686.00300

J:\OAHU_LANDFILL\Project\fig 6-4 lined-unlined-landfills 11-20-06.mxd

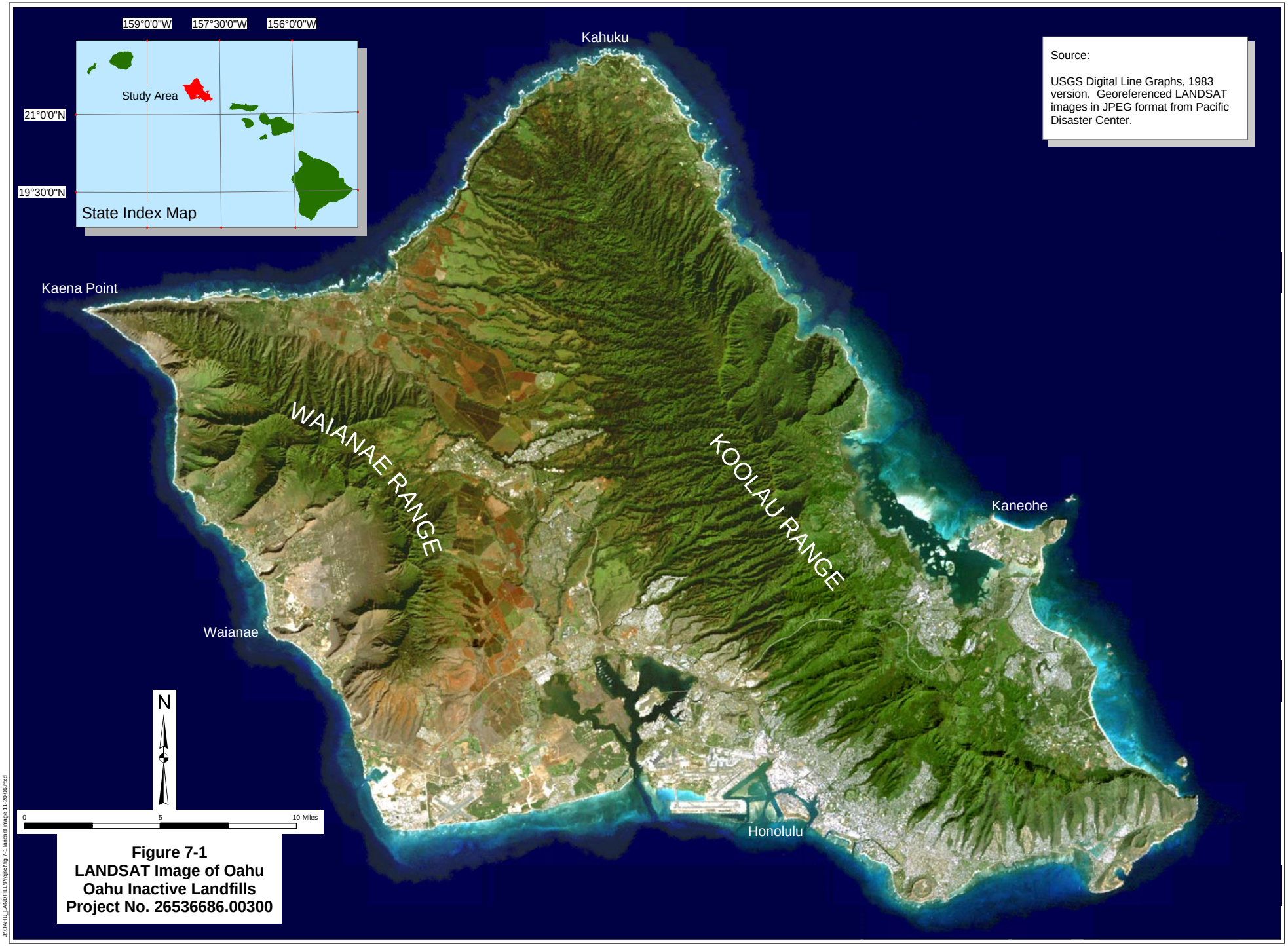


Figure 7-1
LANDSAT Image of Oahu
Oahu Inactive Landfills
Project No. 26536686.00300

J:\OAHU_LANDFILL\Projects\fig 7-1 landsat image 11-20-06.mxd

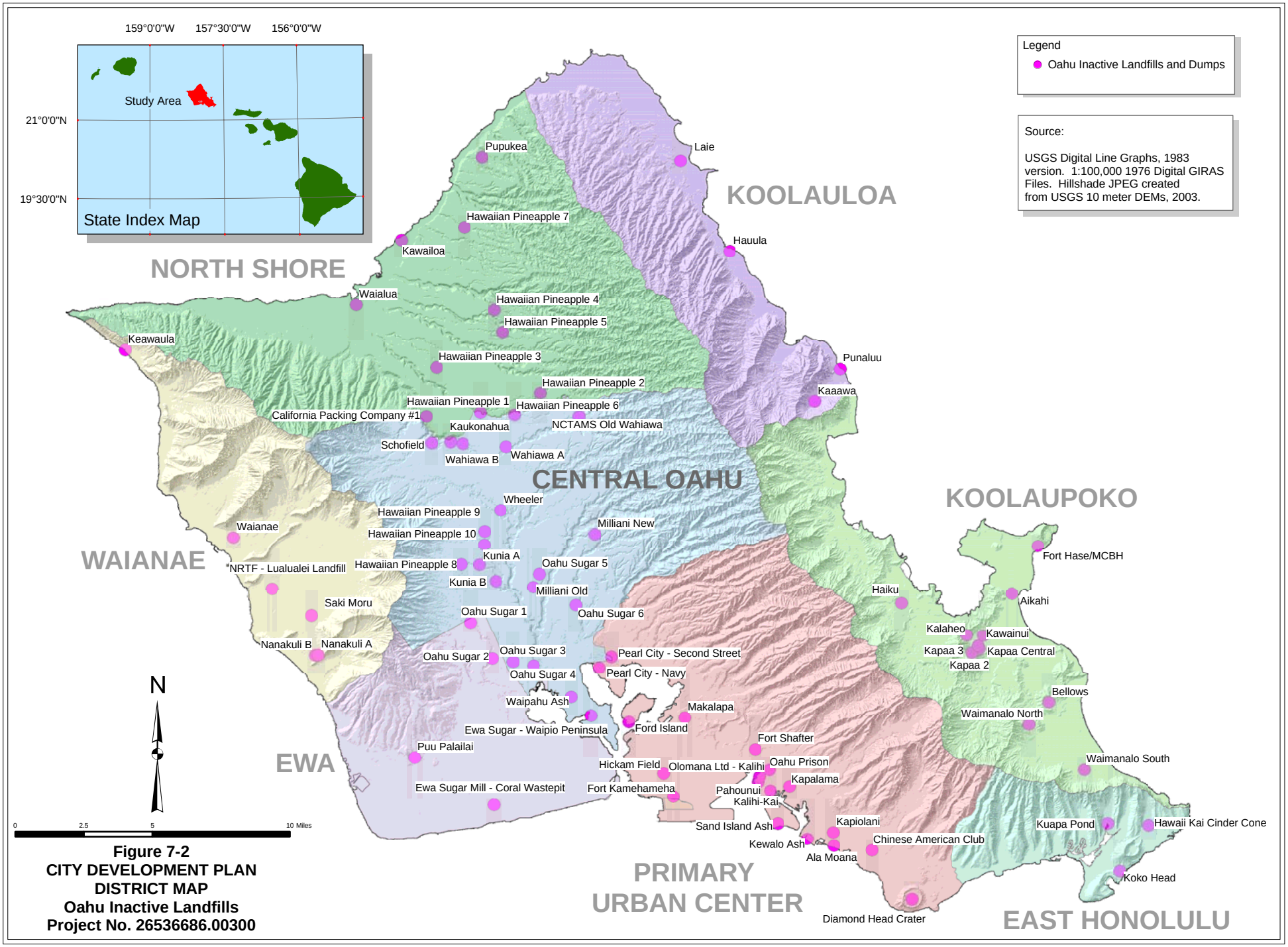


Figure 7-2
CITY DEVELOPMENT PLAN
DISTRICT MAP
Oahu Inactive Landfills
Project No. 26536686.00300

J:\OAHU_LANDFILL\Projects\fig 7-02 City Development 12-12-06.mxd

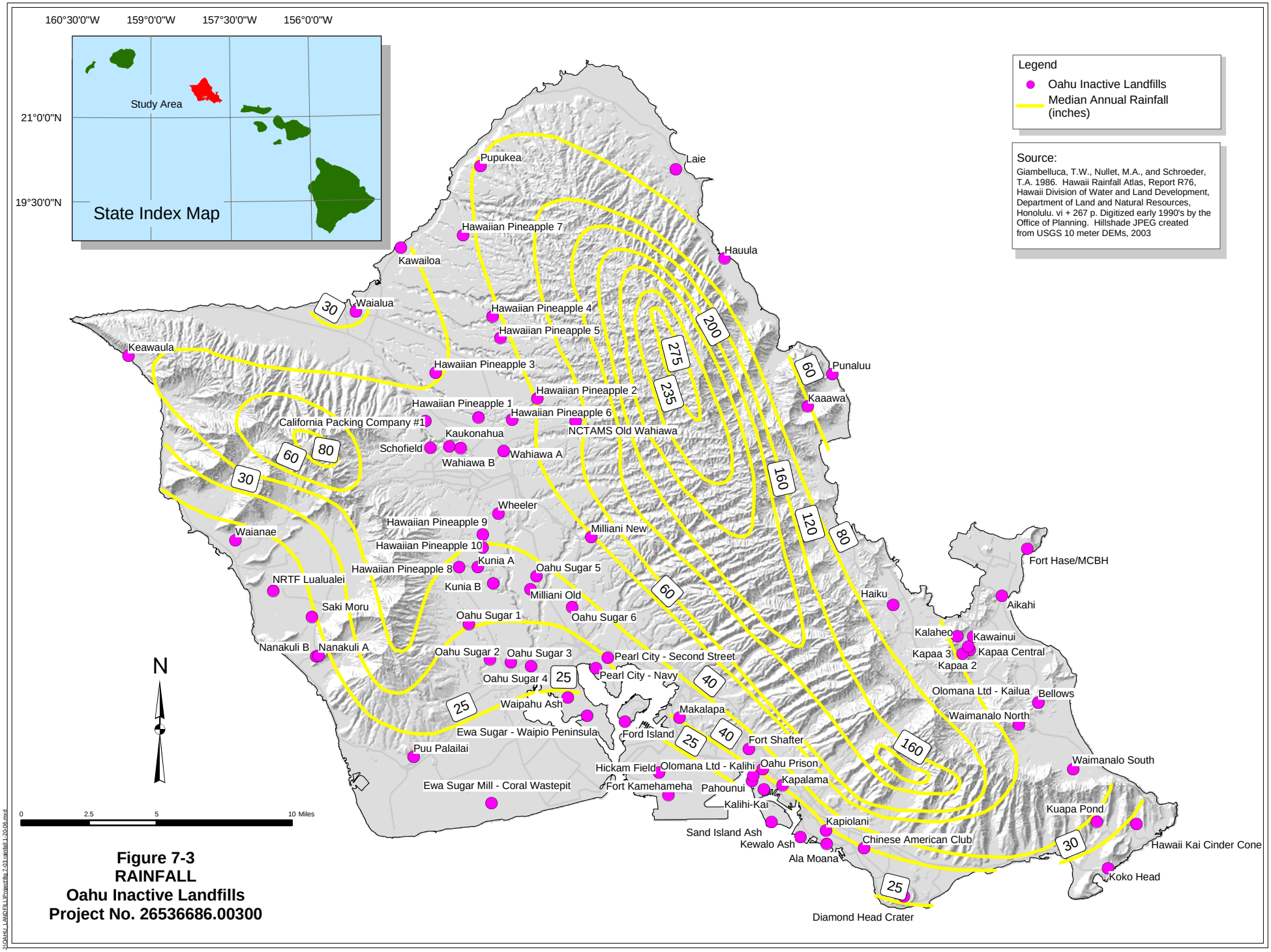


Figure 7-3
RAINFALL
Oahu Inactive Landfills
Project No. 26536686.00300

J:\Oahu_LAND\FILLS\Projects\fig 7-03 rainfall 1-20-06.mxd

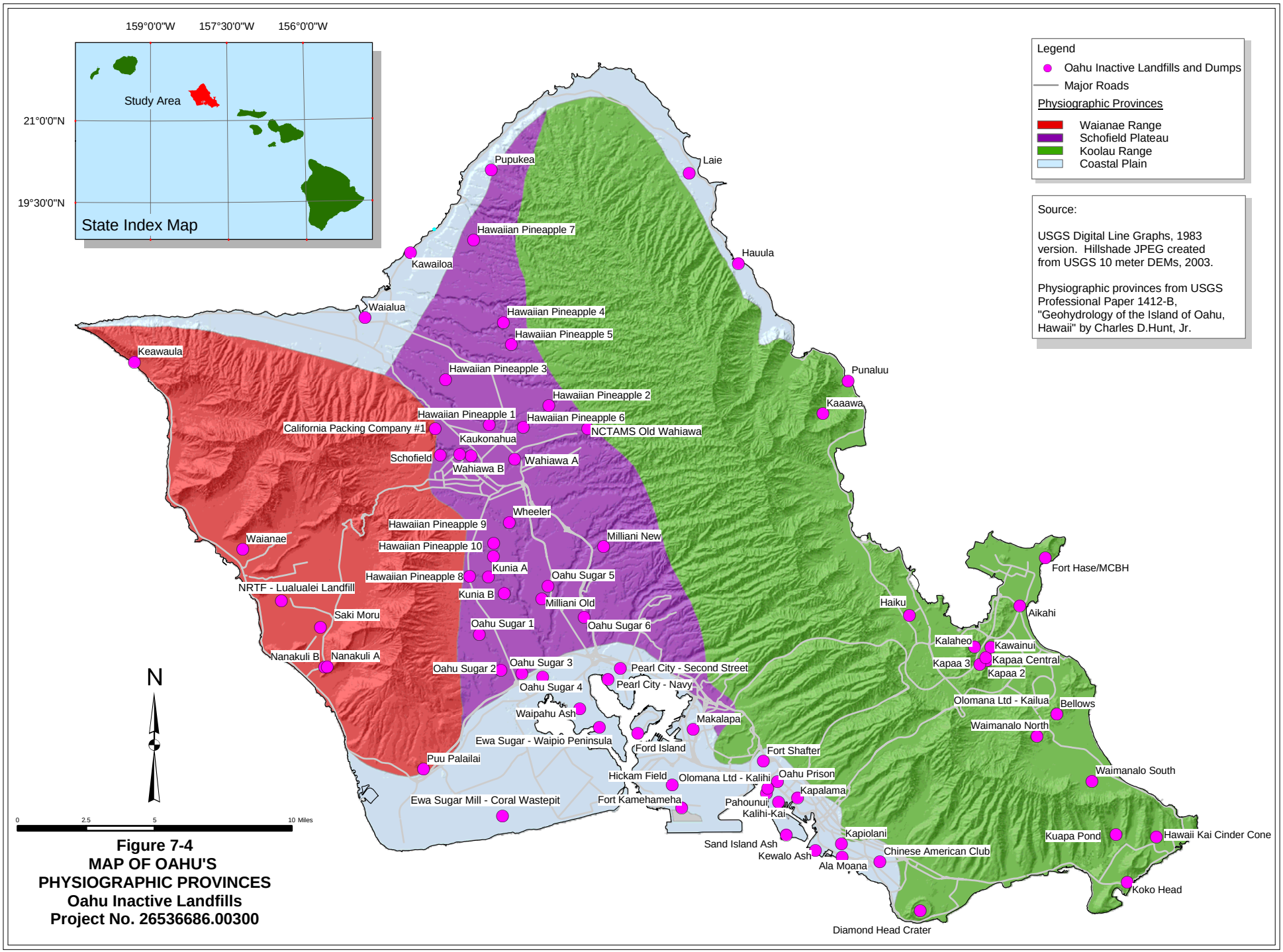


Figure 7-4
MAP OF OAHU'S
PHYSIOGRAPHIC PROVINCES
Oahu Inactive Landfills
Project No. 26536686.00300

J:\OAHU_LANDFILL\Project\fig 7-04 physiographic provinces 12-12-06.mxd

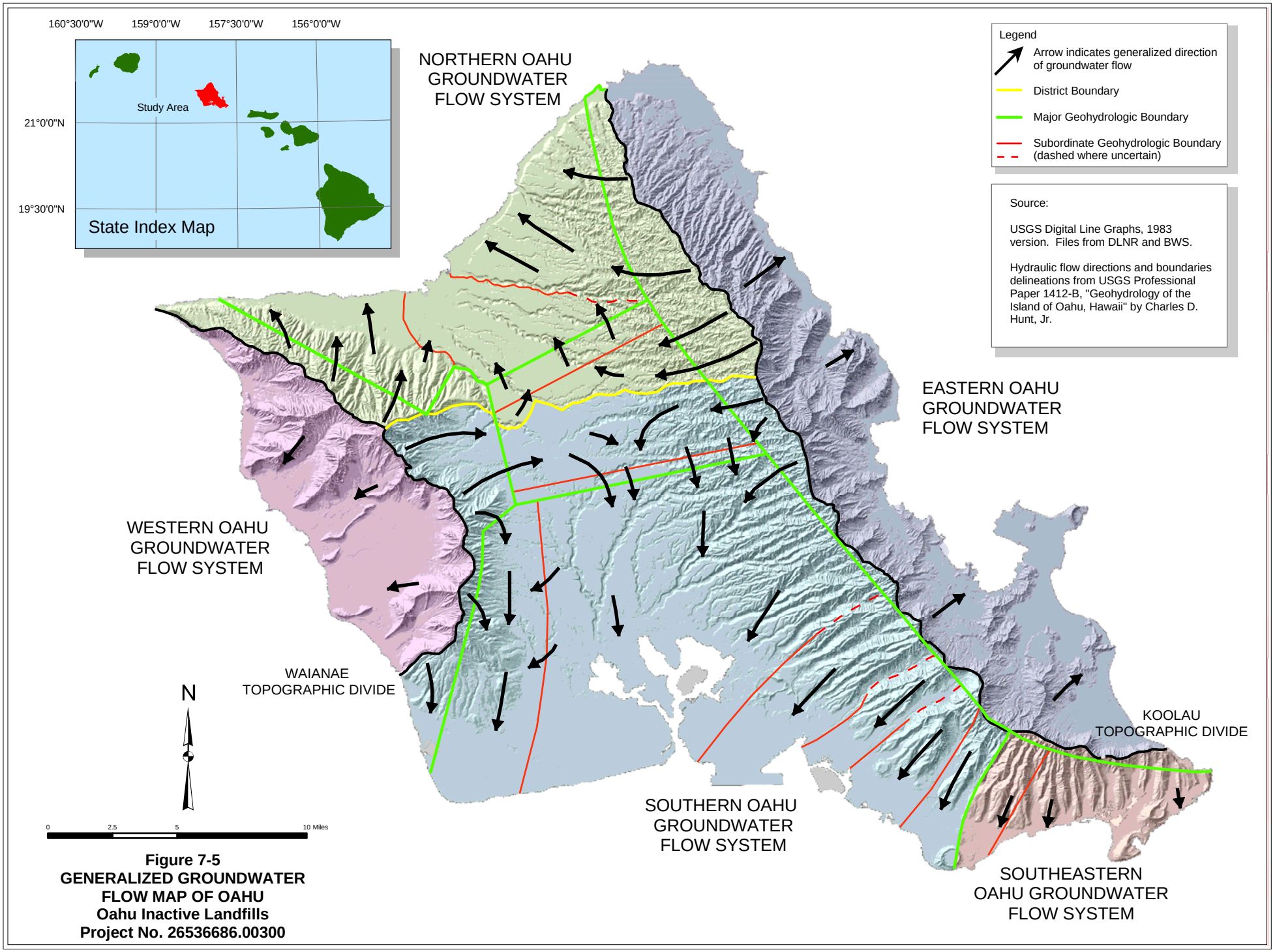


Figure 7-5
GENERALIZED GROUNDWATER FLOW MAP OF OAHU
Oahu Inactive Landfills
Project No. 26536686.00300

J:\OAHU_LANDFILL\Project\fig 7-5 HYDRAULIC GRADIENT 12-12-06.mxd

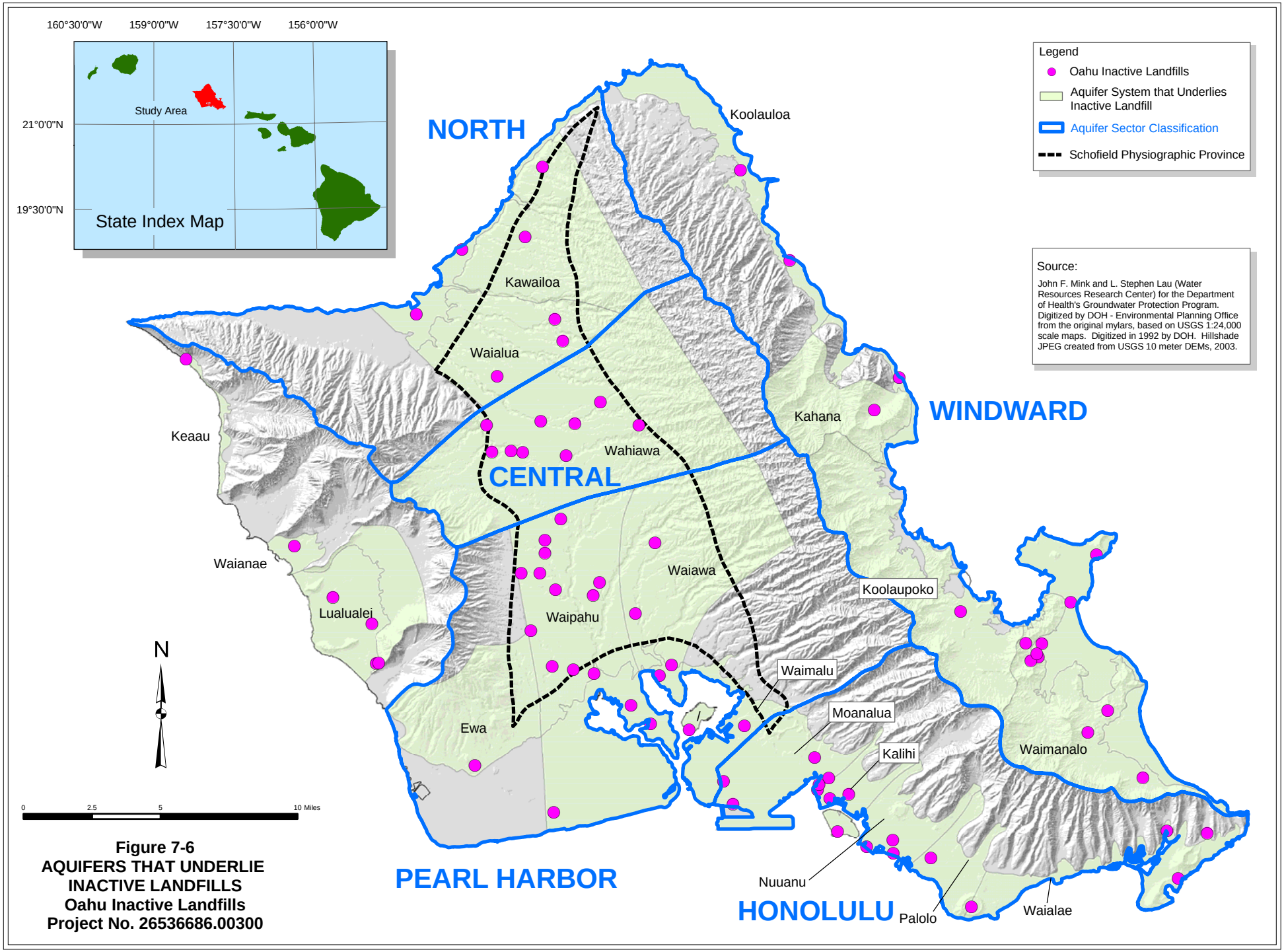


Figure 7-6
AQUIFERS THAT UNDERLIE INACTIVE LANDFILLS
Oahu Inactive Landfills
Project No. 26536686.00300

J:\OAHU_LANDFILL\Project\fig 7-6 aquifers 11-29-06.mxd

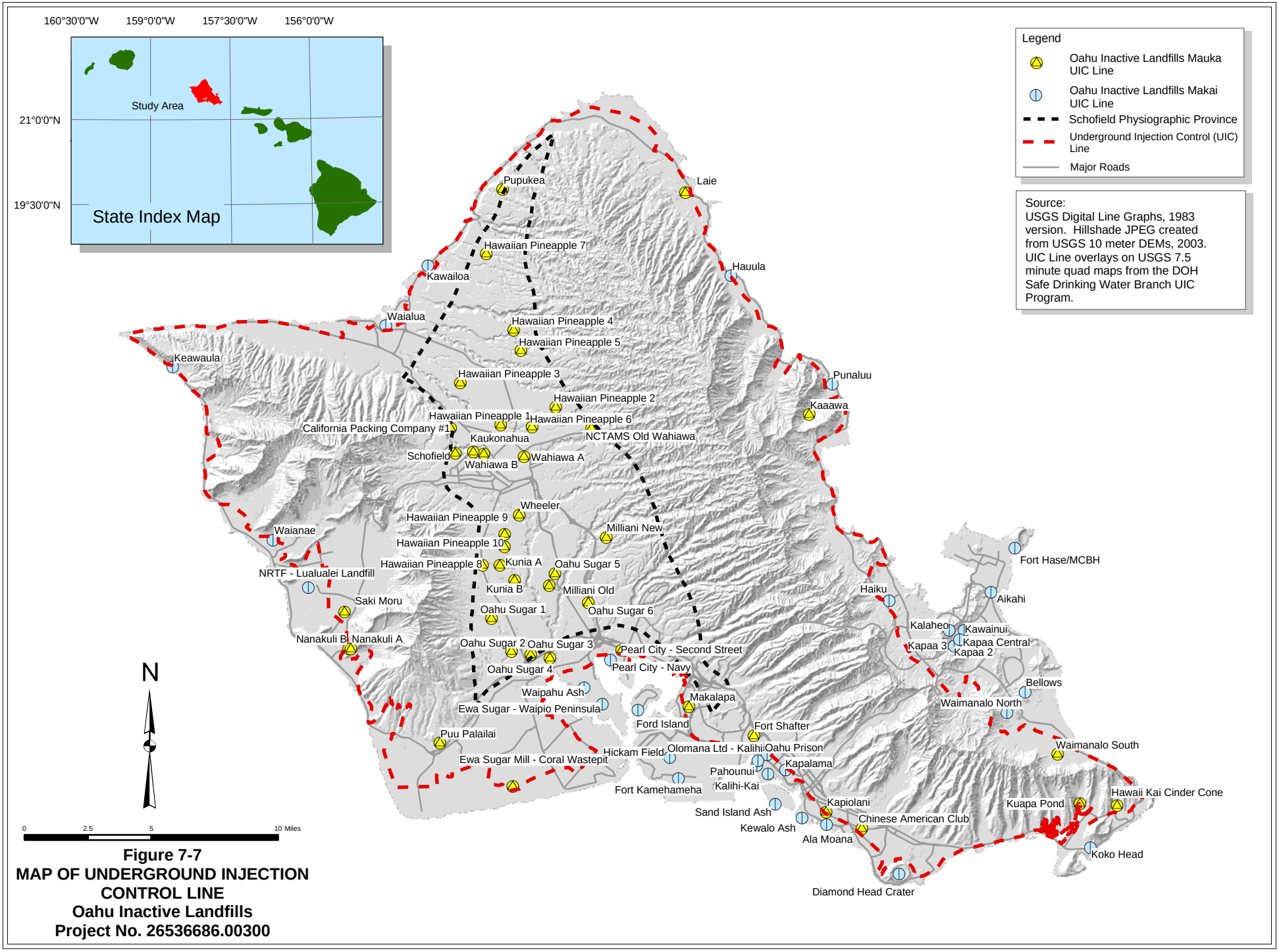


Figure 7-7
MAP OF UNDERGROUND INJECTION CONTROL LINE
Oahu Inactive Landfills
Project No. 26536686.00300

J:\OAHU_LANDFILL\Project\fig 7-7 UIC_line 11-30-06.mxd

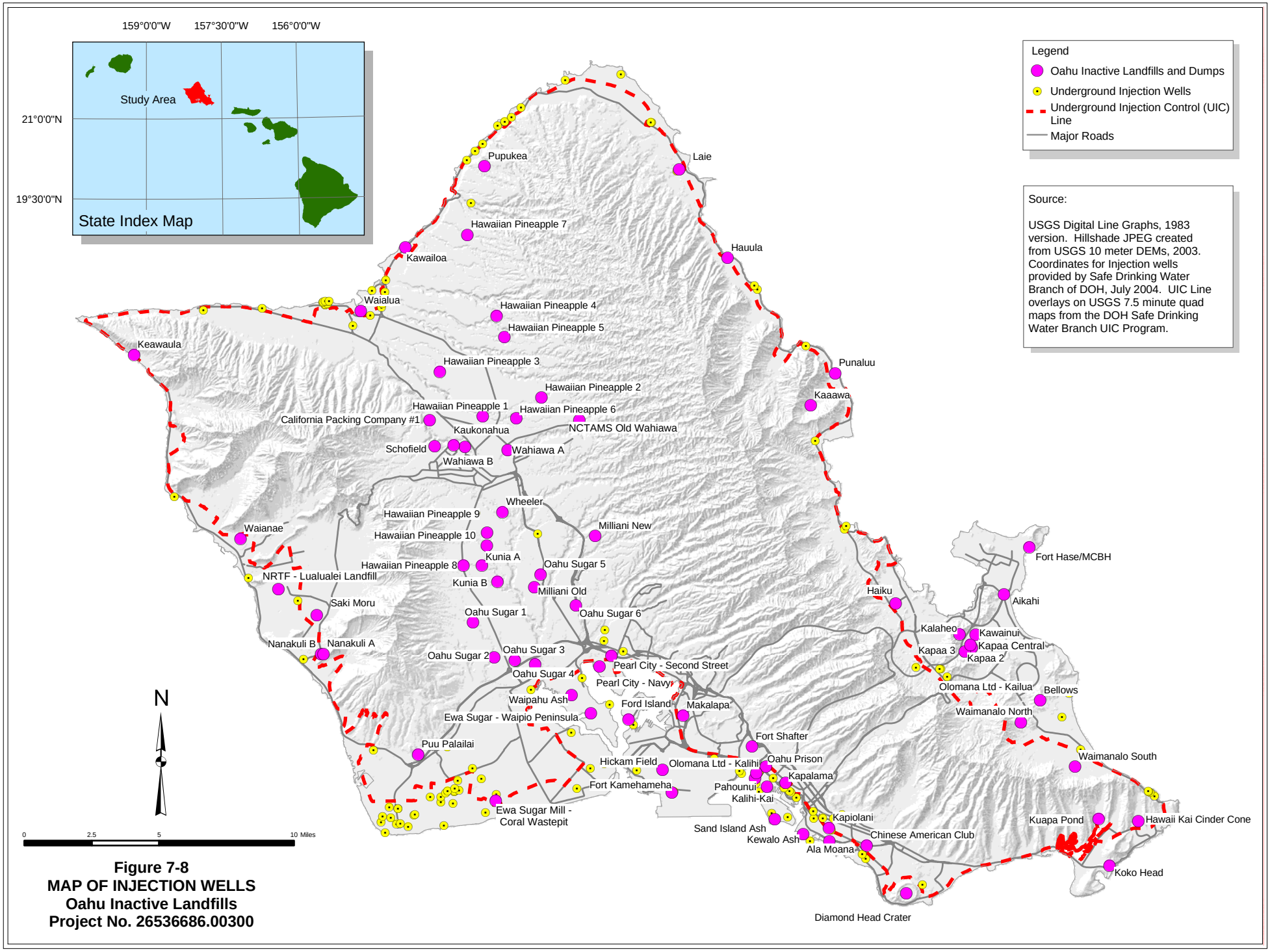


Figure 7-8
MAP OF INJECTION WELLS
Oahu Inactive Landfills
Project No. 26536686.00300

J:\OAHU_LANDFILL\Project\fig 7-08 Injection well 11-20-06.mxd

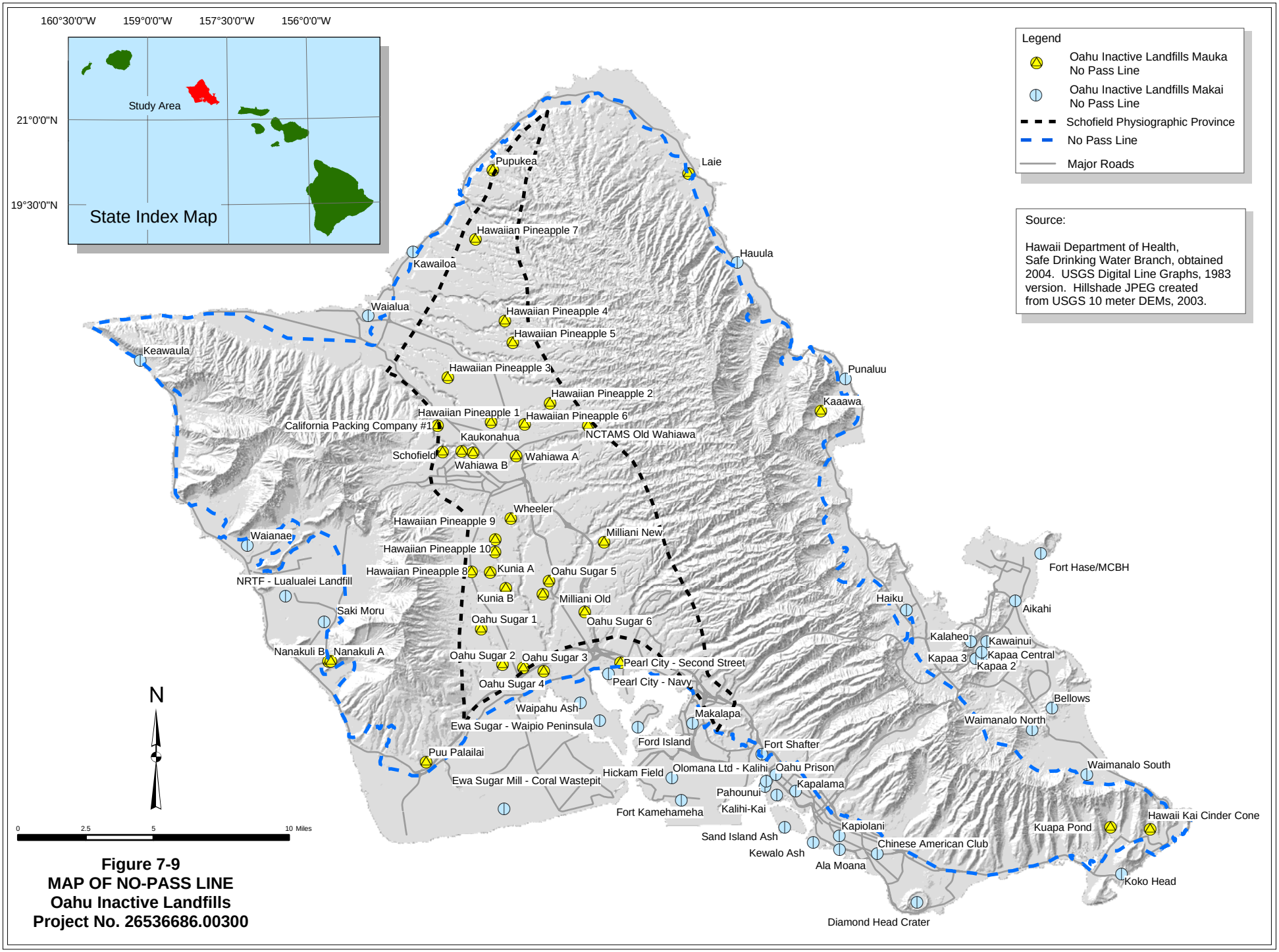


Figure 7-9
MAP OF NO-PASS LINE
Oahu Inactive Landfills
Project No. 26536686.00300

J:\OAHU_LANDFILL\Project\fig 7-9 Nopass.mxd 11-20-06.mxd

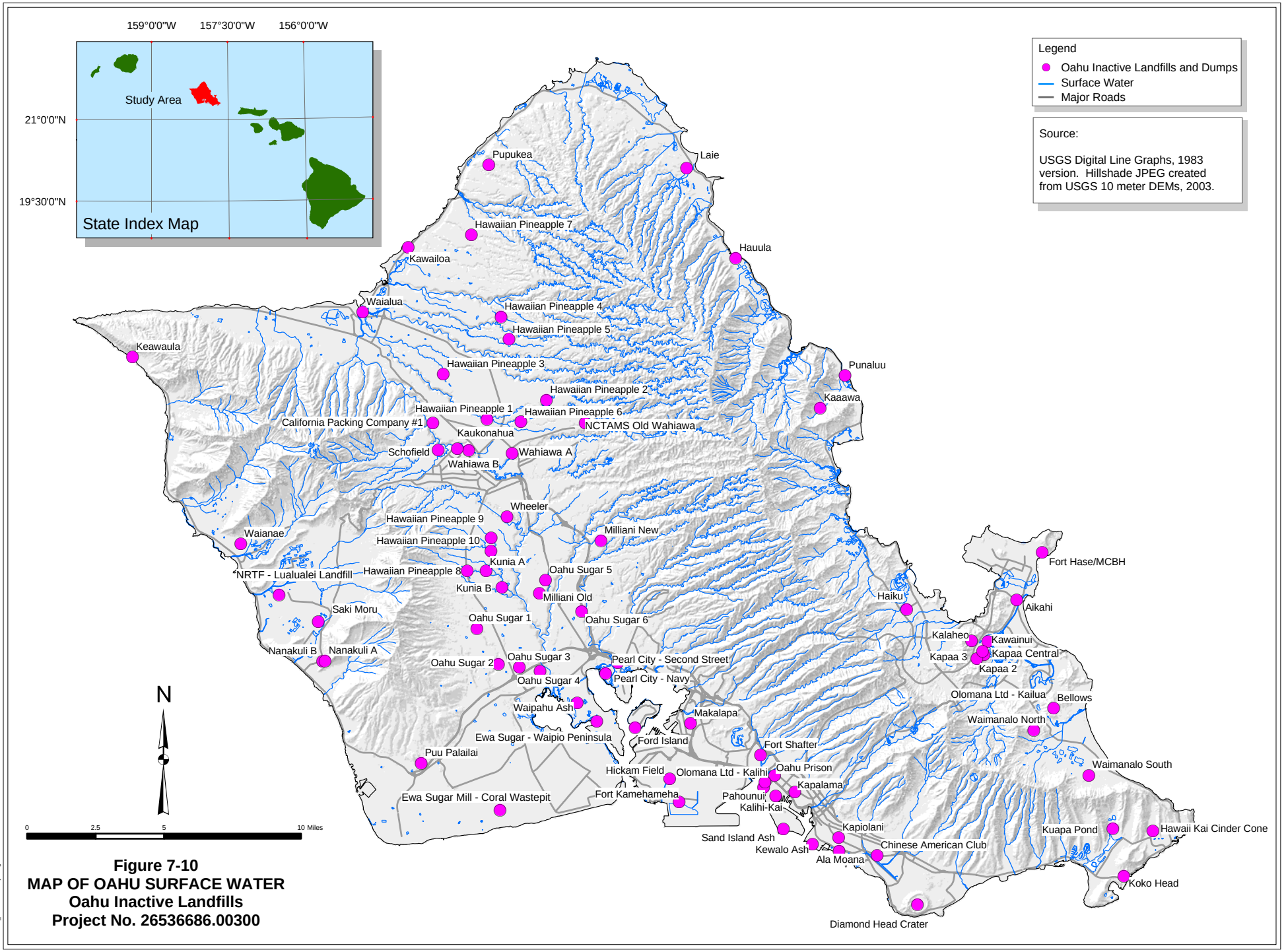


Figure 7-10
MAP OF OAHU SURFACE WATER
Oahu Inactive Landfills
Project No. 26536686.00300

J:\OAHU_LANDFILL\Project\fig 7-10 Surface Water 11-20-06.mxd

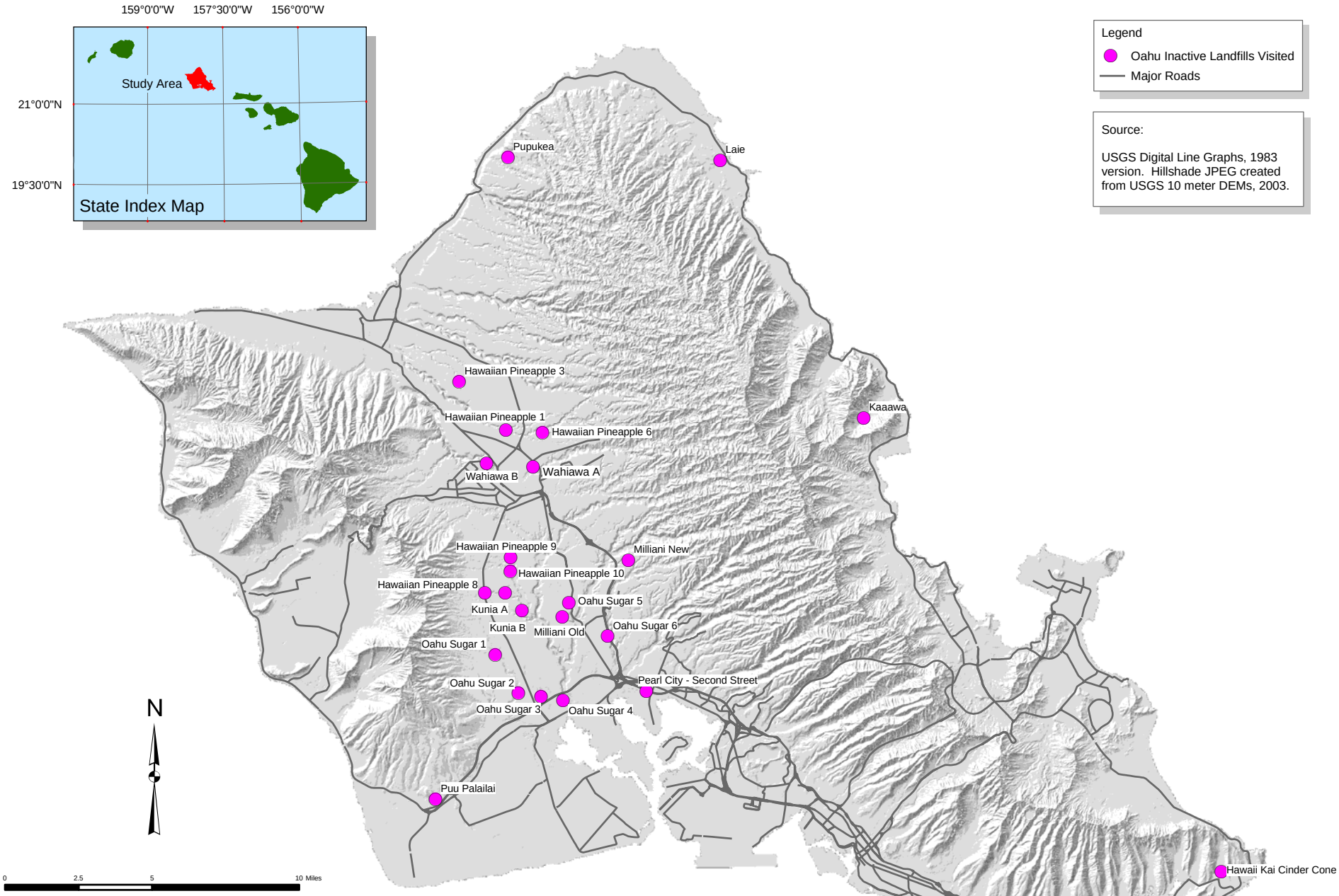


Figure 11-1
MAP OF OAHU INACTIVE LANDFILLS VISITED
Oahu Inactive Landfills
Project No. 26536686.00300

J:\OAHU_LANDFILL\Project\fig 11-1 Site Recon 11-20-06.mxd

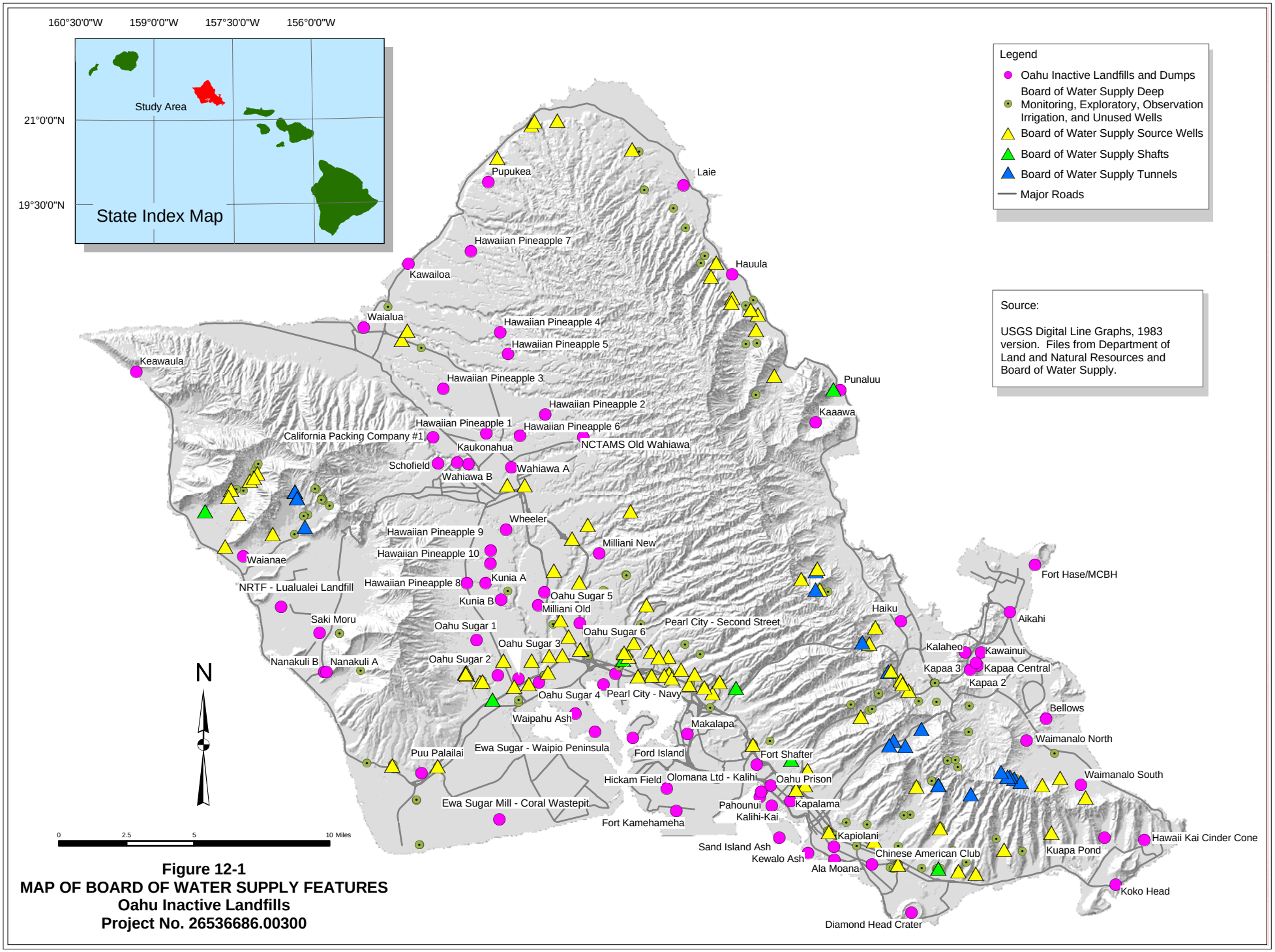


Figure 12-1
MAP OF BOARD OF WATER SUPPLY FEATURES
Oahu Inactive Landfills
Project No. 26536686.00300

J:\OAHU_LANDFILL\Projectfig 12-1 location of all BWS wells 12-19-06.mxd

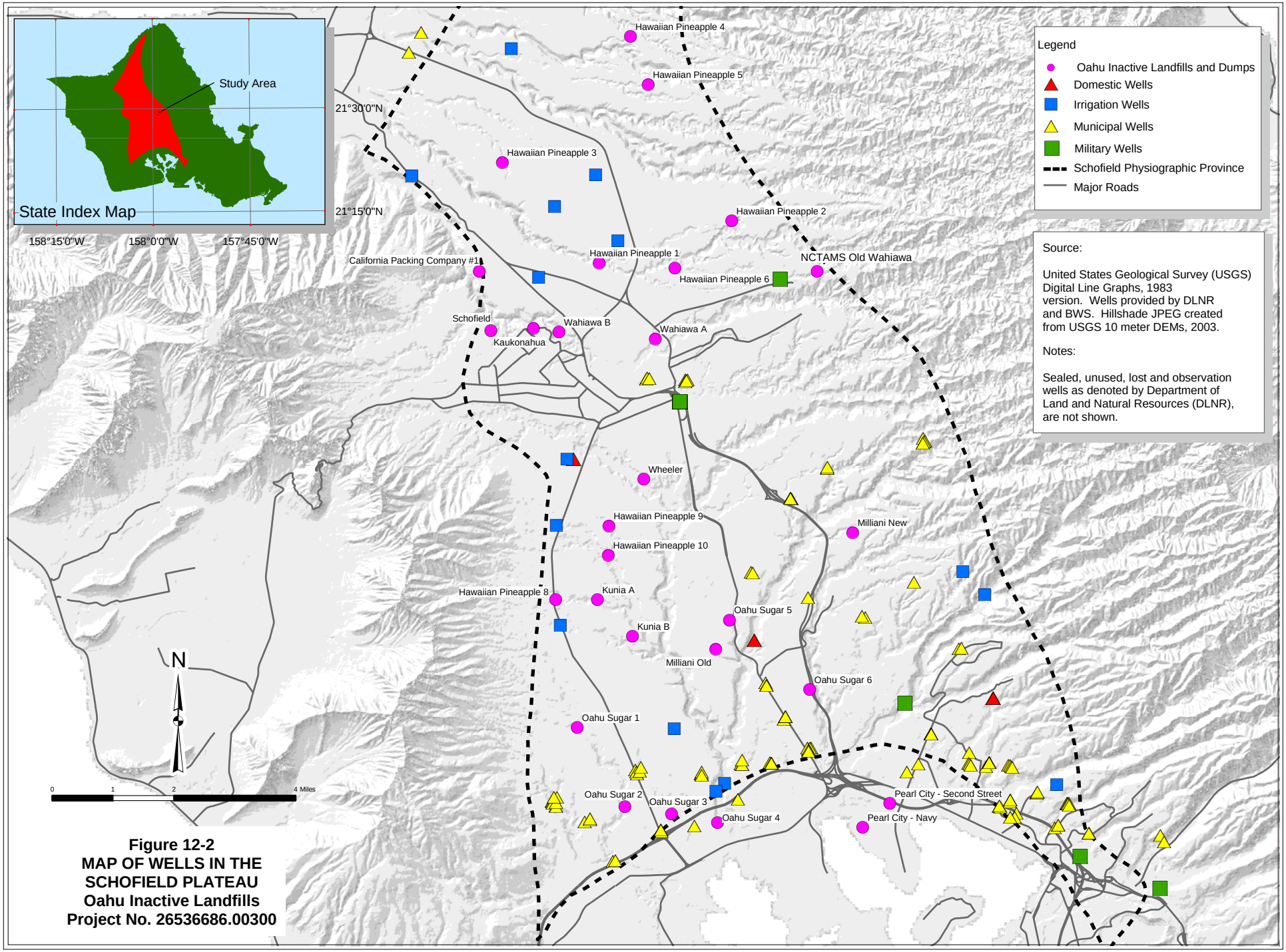


Figure 12-2
MAP OF WELLS IN THE SCHOFIELD PLATEAU
Oahu Inactive Landfills
Project No. 26536686.00300

J:\OAHU_LANDFILL\Project\fig 12-2 schofield wells 11-28-06.mxd

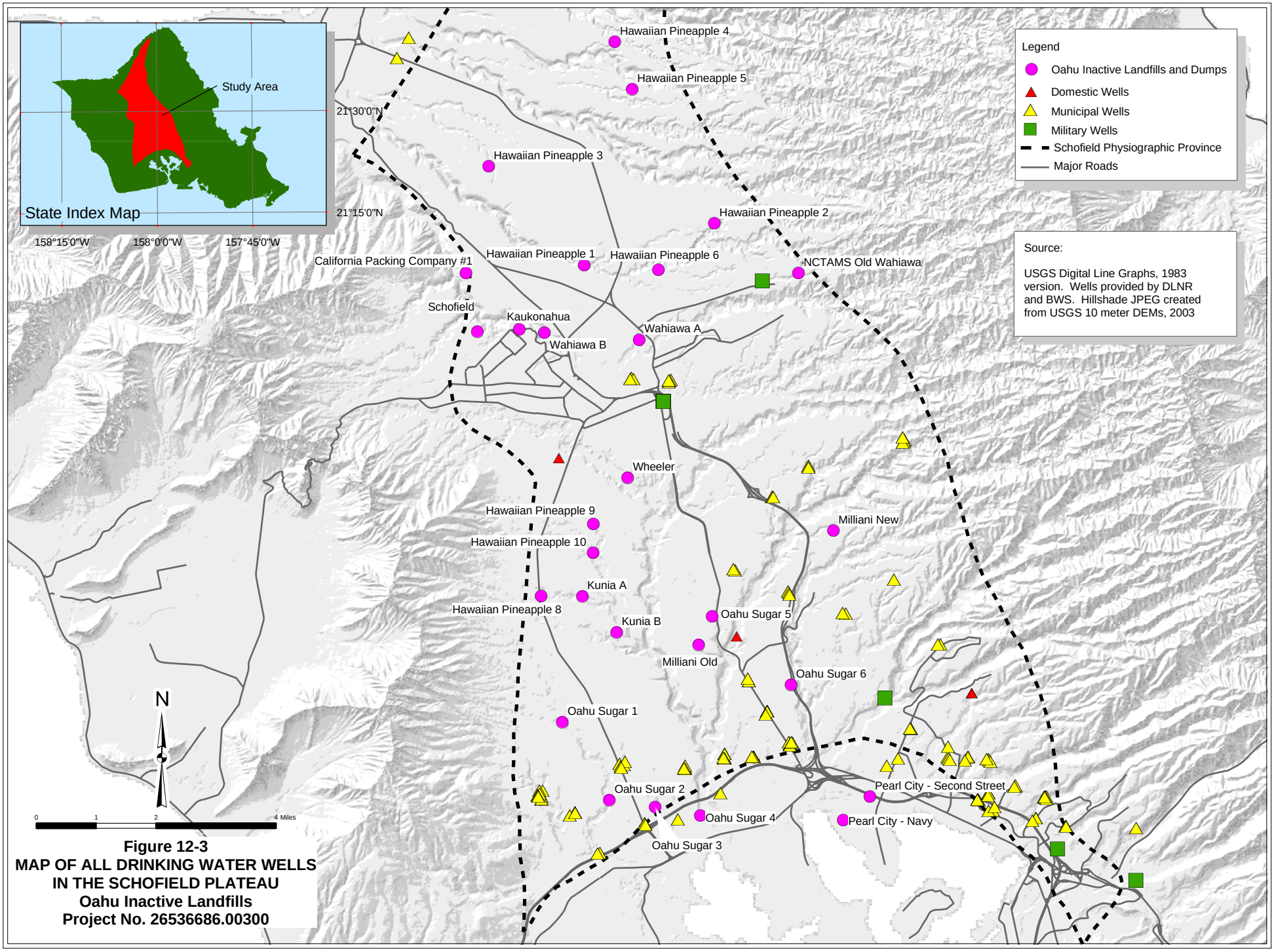


Figure 12-3
MAP OF ALL DRINKING WATER WELLS IN THE SCHOFIELD PLATEAU
Oahu Inactive Landfills
Project No. 26536686.00300

J:\OAHU_LANDFILL\Project\fig 12-3 schofield drinking wells 11-20-06.mxd

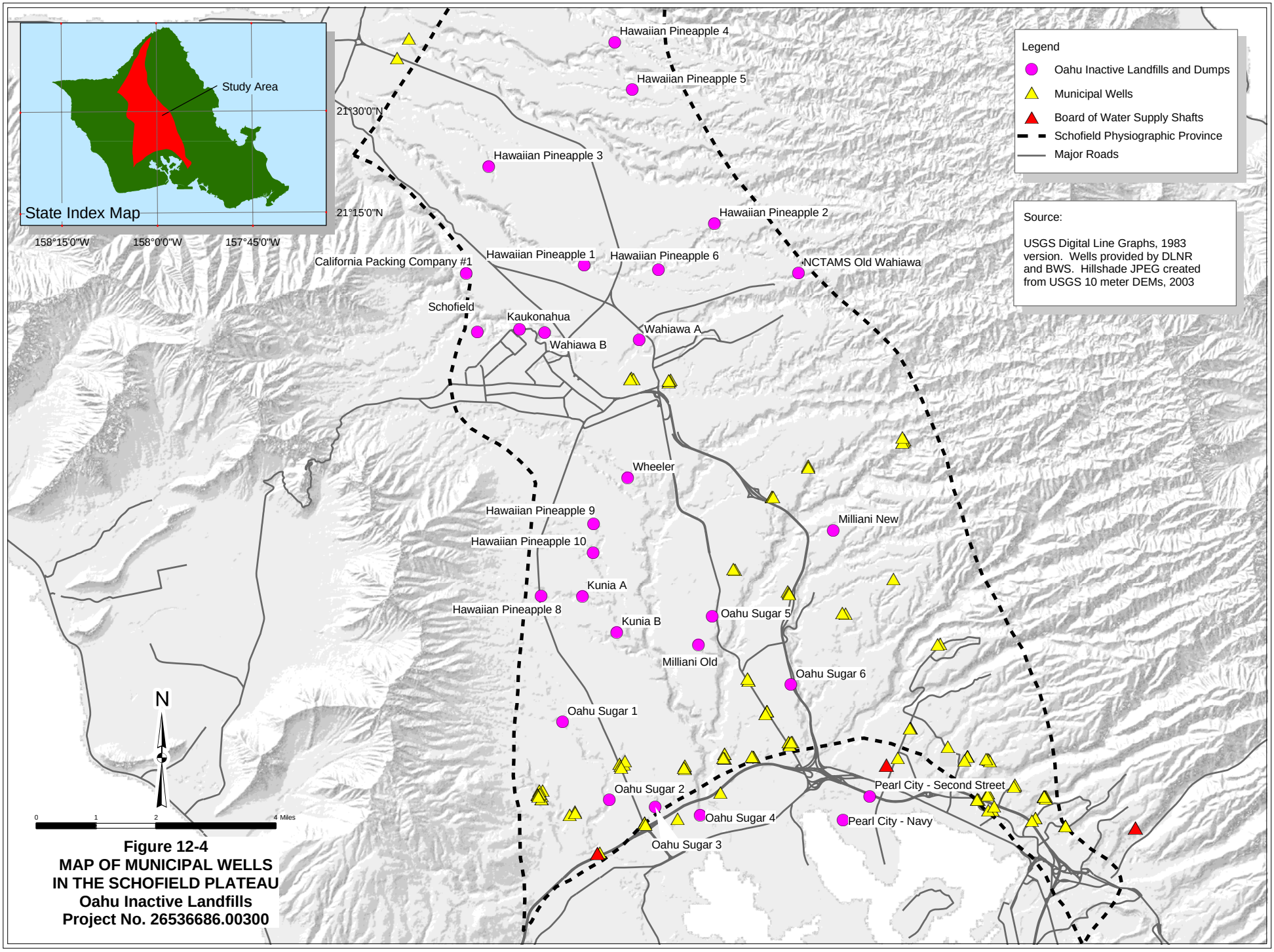


Figure 12-4
MAP OF MUNICIPAL WELLS
IN THE SCHOFIELD PLATEAU
Oahu Inactive Landfills
Project No. 26536686.00300

J:\OAHU_LANDFILL\Project\fig 12-4 schofield drinking wells 11-29-06.mxd

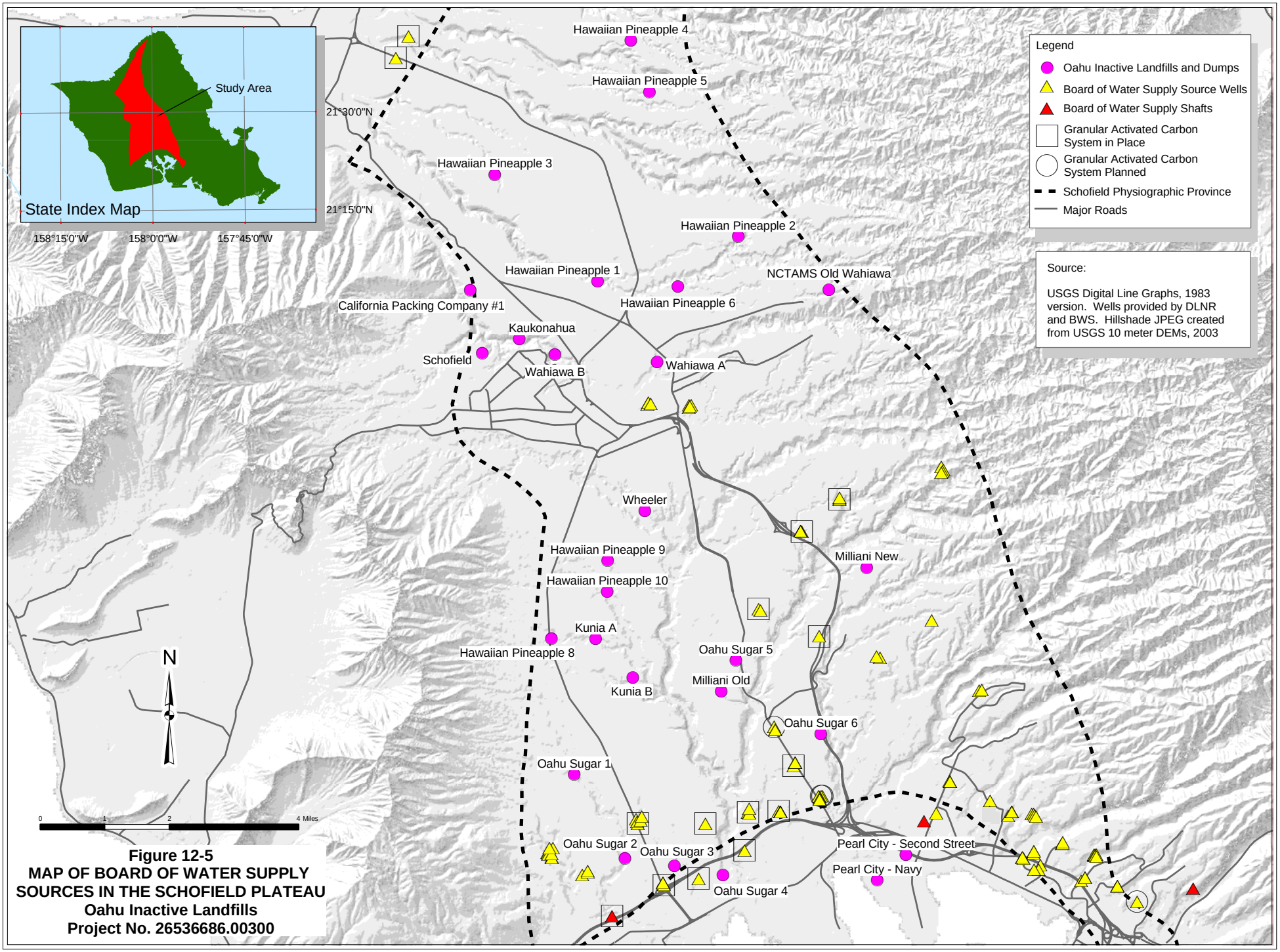


Figure 12-5
MAP OF BOARD OF WATER SUPPLY SOURCES IN THE SCHOFIELD PLATEAU
Oahu Inactive Landfills
Project No. 26536686.00300

J:\OAHU_LANDFILL\Project\fig 12-5 schofield bws wells 11-29-06.mxd

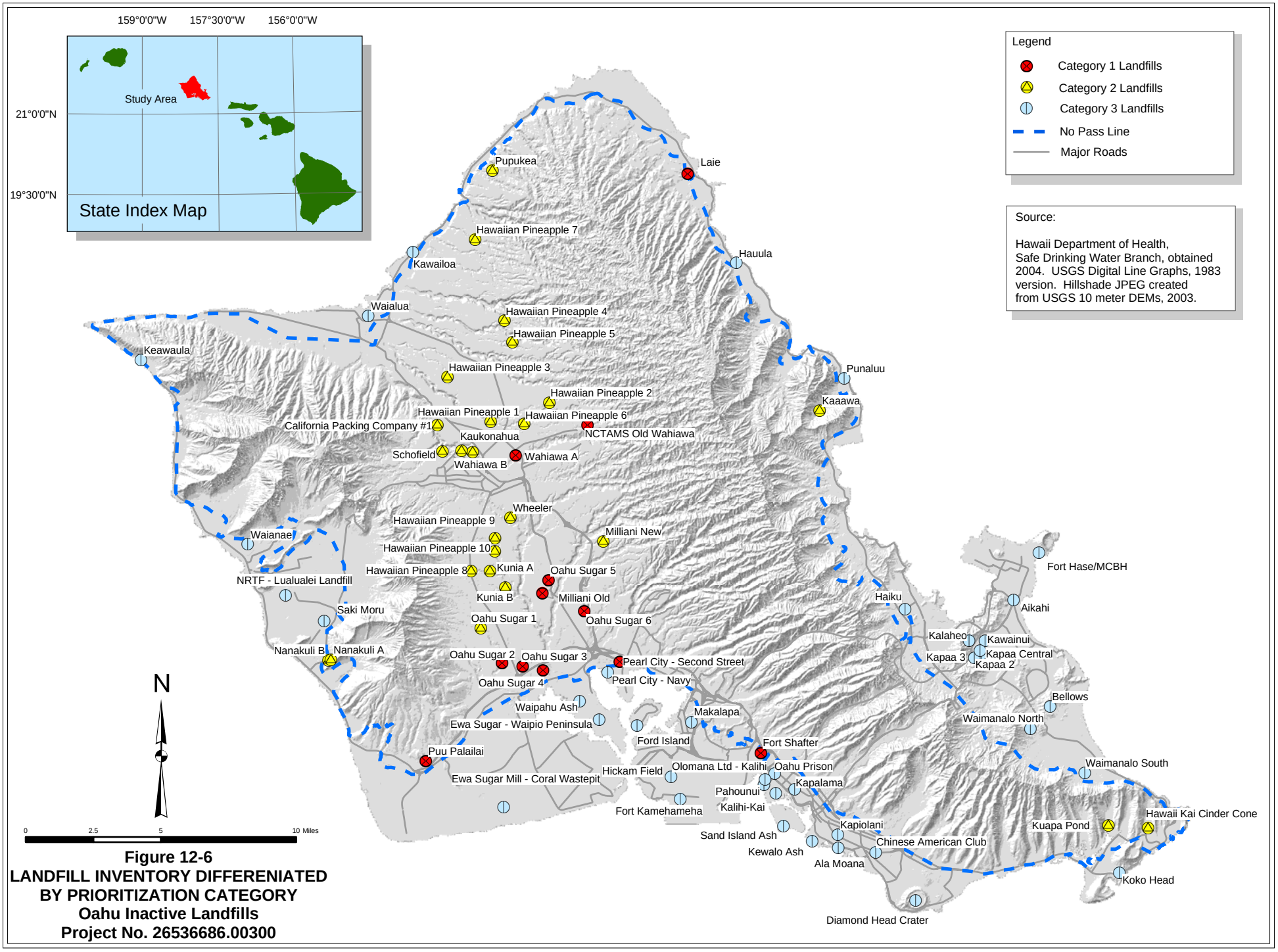


Figure 12-6
LANDFILL INVENTORY DIFFERENIATED BY PRIORITIZATION CATEGORY
Oahu Inactive Landfills
Project No. 26536686.00300

J:\OAHU_LANDFILL\Project\fig 12-6 Cat1-3 Landfills 11-20-06.mxd

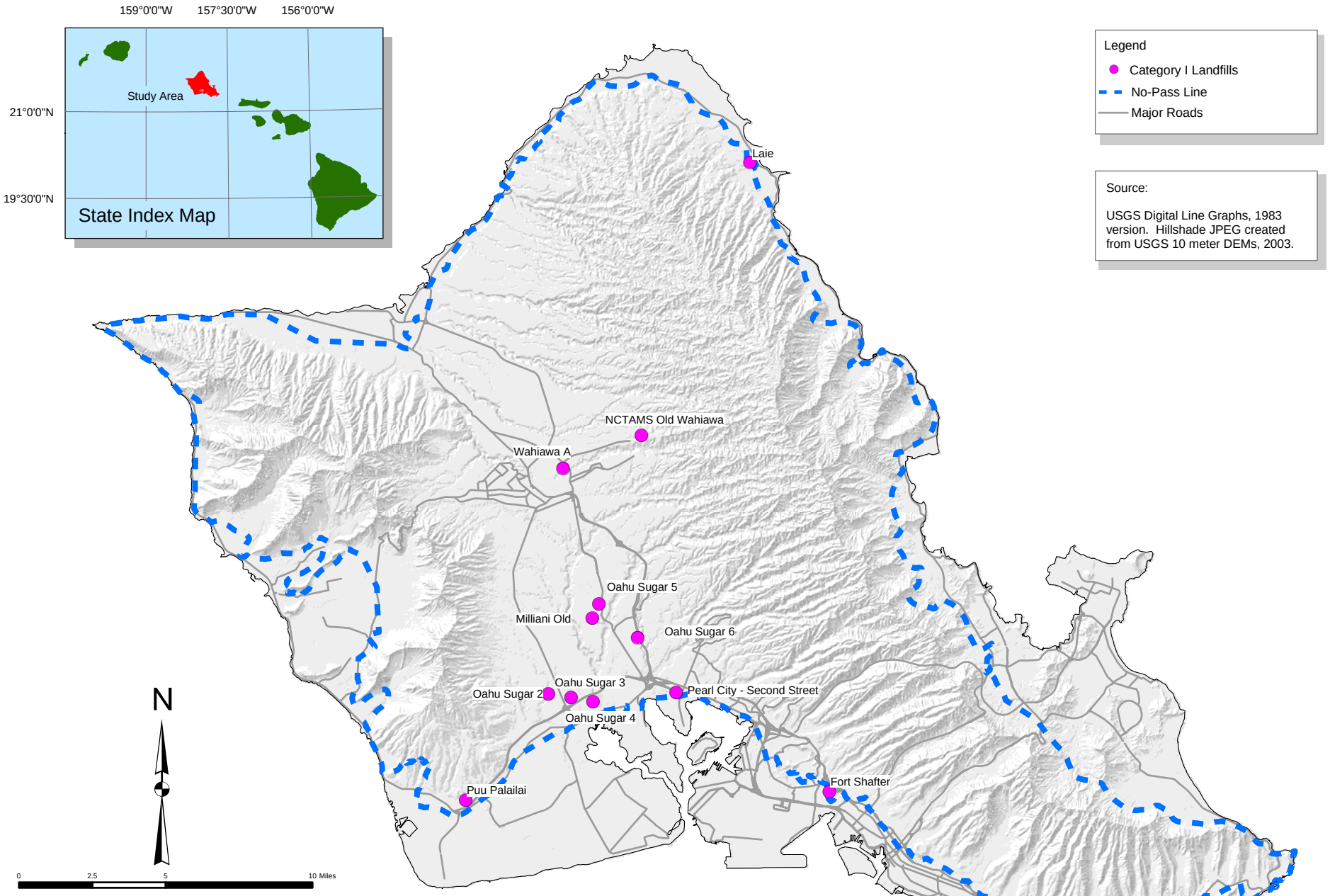
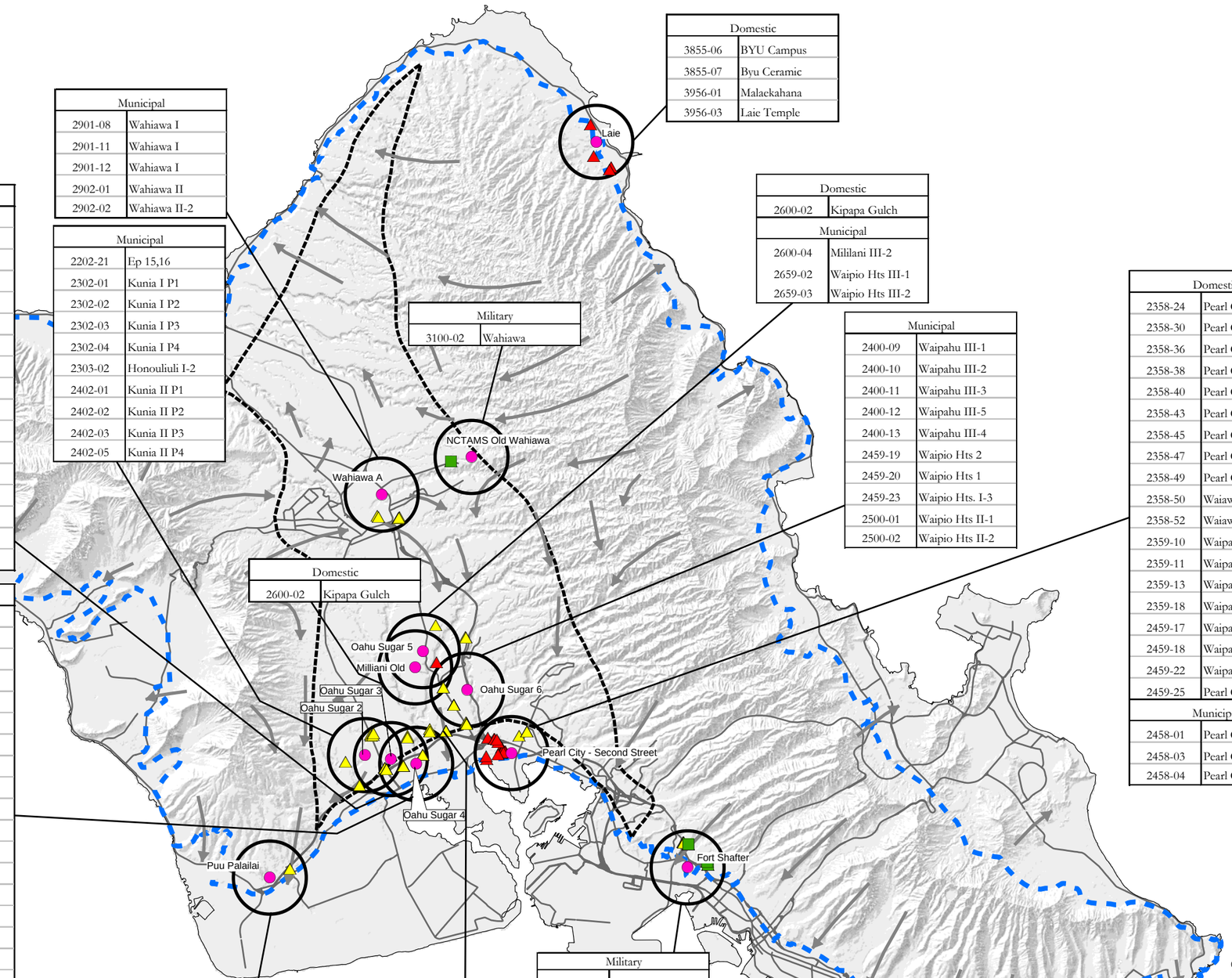


Figure 12-7
CATEGORY 1 LANDFILLS
Oahu Inactive Landfills
Project No. 26536686.00300

J:\OAHU_LANDFILL\Projects\fig 8-2 Cat1 Landfills.mxd



Domestic	
3855-06	BYU Campus
3855-07	Byu Ceramic
3956-01	Malaekahana
3956-03	Laie Temple

Municipal	
2901-08	Wahiawa I
2901-11	Wahiawa I
2901-12	Wahiawa I
2902-01	Wahiawa II
2902-02	Wahiawa II-2

Municipal	
2202-21	Ep 15,16
2302-01	Kunia I P1
2302-02	Kunia I P2
2302-03	Kunia I P3
2302-04	Kunia I P4
2303-02	Honouliuli I-2
2402-01	Kunia II P1
2402-02	Kunia II P2
2402-03	Kunia II P3
2402-05	Kunia II P4

Municipal	
2301-34	Hoaeae P1
2301-35	Hoaeae P2
2301-36	Hoaeae P3
2301-37	Hoaeae P4
2301-38	Hoaeae P5
2301-39	Hoaeae P6
2302-01	Kunia I P1
2302-02	Kunia I P2
2302-03	Kunia I P3
2302-04	Kunia I P4
2401-04	Kunia III-1
2401-05	Kunia III-2
2401-06	Kunia III-3
2402-01	Kunia II P1
2402-02	Kunia II P2
2402-03	Kunia II P3
2402-05	Kunia II P4

Municipal	
2301-34	Hoaeae P1
2301-35	Hoaeae P2
2301-36	Hoaeae P3
2301-37	Hoaeae P4
2301-38	Hoaeae P5
2301-39	Hoaeae P6
2301-44	Waipahu IV-2
2301-45	Waipahu IV-3
2301-46	Waipahu IV-1
2301-47	Waipahu IV-4
2302-01	Kunia I P1
2302-02	Kunia I P2
2302-03	Kunia I P3
2302-04	Kunia I P4
2400-05	Waipahu II-2
2400-06	Waipahu II-1
2400-08	Waipahu II-3
2400-14	Waipahu II-4
2401-04	Kunia III-1
2401-05	Kunia III-2
2401-06	Kunia III-3
2406-01	Waipahu I P2
2406-02	Waipahu I P1
2406-03	Waipahu I P3
2406-04	Waipahu I P4

Domestic	
2600-02	Kipapa Gulch

Military	
3100-02	Wahiawa

Domestic	
2600-02	Kipapa Gulch

Municipal	
2600-04	Mililani III-2
2659-02	Waipio Hts III-1
2659-03	Waipio Hts III-2

Municipal	
2400-09	Waipahu III-1
2400-10	Waipahu III-2
2400-11	Waipahu III-3
2400-12	Waipahu III-5
2400-13	Waipahu III-4
2459-19	Waipio Hts 2
2459-20	Waipio Hts 1
2459-23	Waipio Hts. I-3
2500-01	Waipio Hts II-1
2500-02	Waipio Hts II-2

Domestic	
2358-24	Pearl City
2358-30	Pearl City
2358-36	Pearl City
2358-38	Pearl City
2358-40	Pearl City
2358-43	Pearl City
2358-45	Pearl City
2358-47	Pearl City
2358-49	Pearl City
2358-50	Waiawa
2358-52	Waiawa-Gendrano
2359-10	Waipahu
2359-11	Waipahu
2359-13	Waipahu
2359-18	Waipahu
2459-17	Waipahu
2459-18	Waipahu
2459-22	Waipahu
2459-25	Pearl City

Municipal	
2458-01	Pearl City Shaft
2458-03	Pearl City I-1
2458-04	Pearl City I-2

Municipal	
2004-04	Makakilo

Municipal	
2400-01	Waipahu I P2
2400-02	Waipahu I P1
2400-03	Waipahu I P3
2400-04	Waipahu I P4

Military	
2053-11	Ft Shafter
2053-13	Fort Shafter
2153-07	Moanalua
2153-08	Moanalua

Municipal	
2153-10	Moanalua 1
2153-11	Moanalua 2
2153-12	Moanalua 3

Legend

- Category 1 Landfills
- Major Roads
- One Mile Radius of the Landfill
- Schofield Physiographic Province
- No Pass Line
- Arrow indicates generalized direction of groundwater flow

Well Types

- Domestic Wells
- Municipal Wells
- Military Wells

Source:

USGS Digital Line Graphs, 1983 version. Hillshade JPEG created from USGS 10 meter DEMs, 2003.

N

0 2.5 5 10 Miles

Figure 12-8
DRINKING WATER WELLS LOCATED WITHIN ONE MILE OF A CATEGORY 1 LANDFILL
Oahu Inactive Landfills
Project No. 26536686.00300

J:\OAHU_LANDFILL\Projectfig_12-8 Cat1 Landfills_11x17 12-12-06.mxd

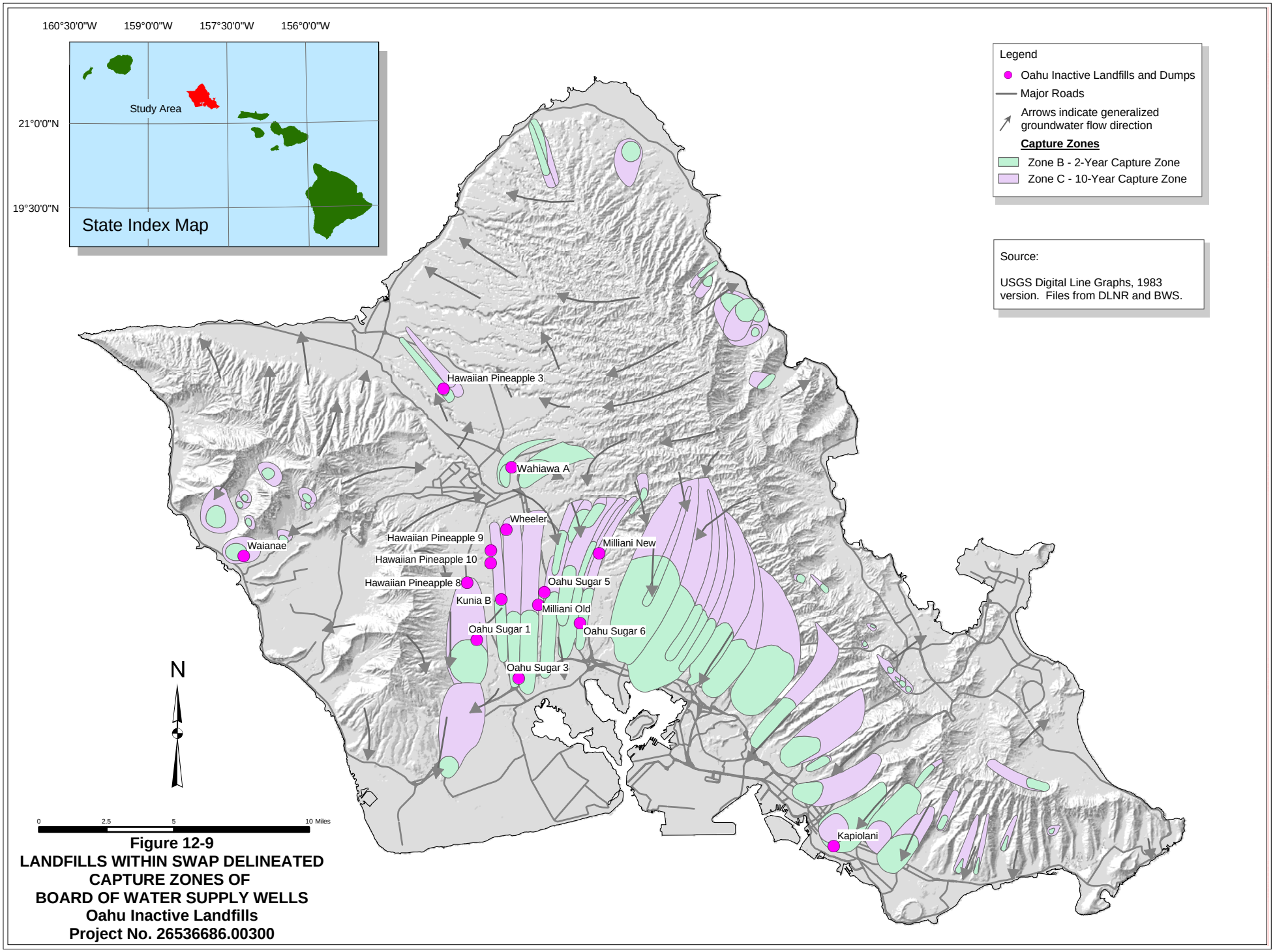


Figure 12-9
LANDFILLS WITHIN SWAP DELINEATED CAPTURE ZONES OF BOARD OF WATER SUPPLY WELLS
Oahu Inactive Landfills
Project No. 26536686.00300

J:\OAHU_LANDFILL\Projects\fig 12-9 capture zones AandB 11-20-06.mxd

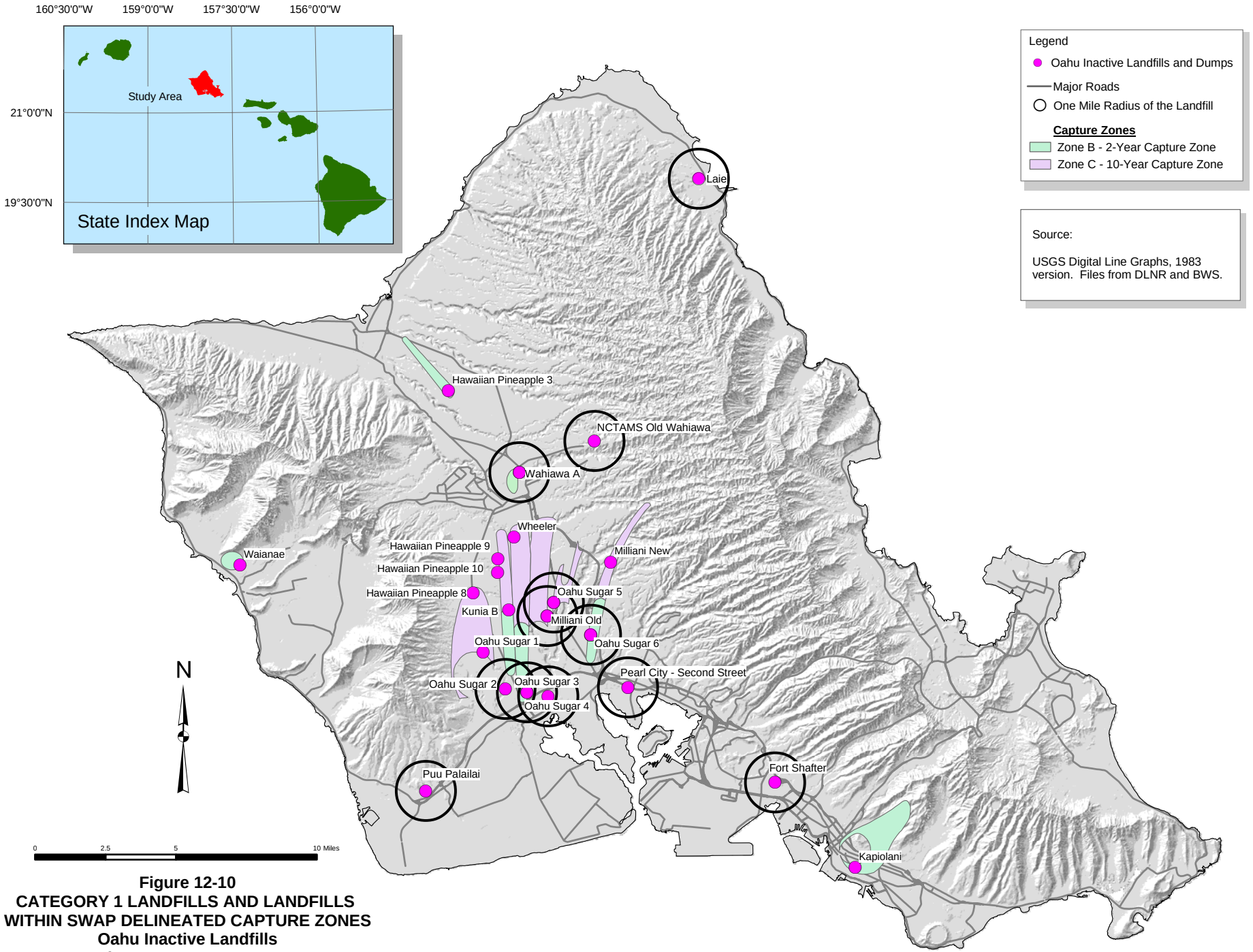
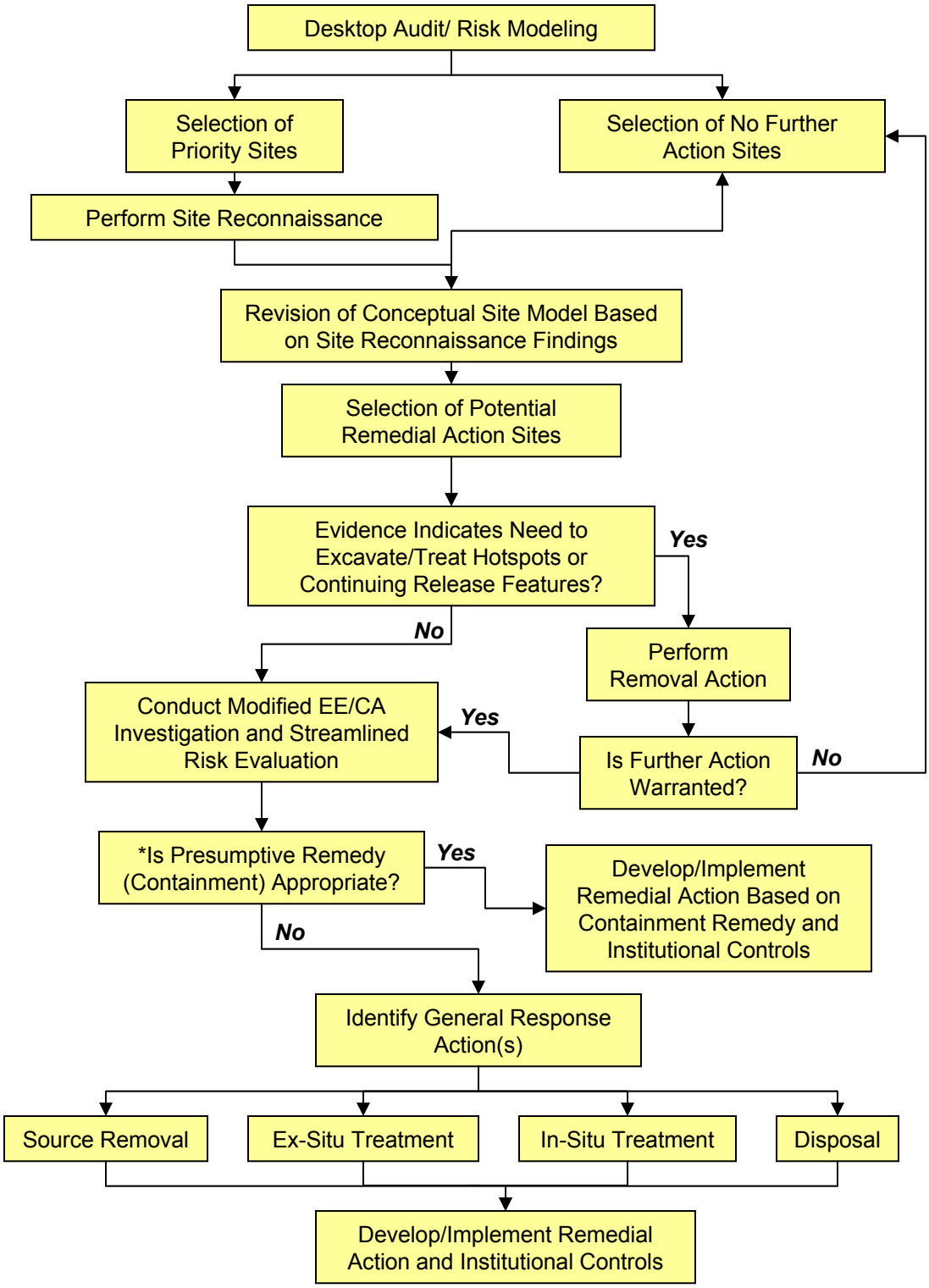


Figure 12-10
CATEGORY 1 LANDFILLS AND LANDFILLS WITHIN SWAP DELINEATED CAPTURE ZONES
Oahu Inactive Landfills
Project No. 26536686.00300

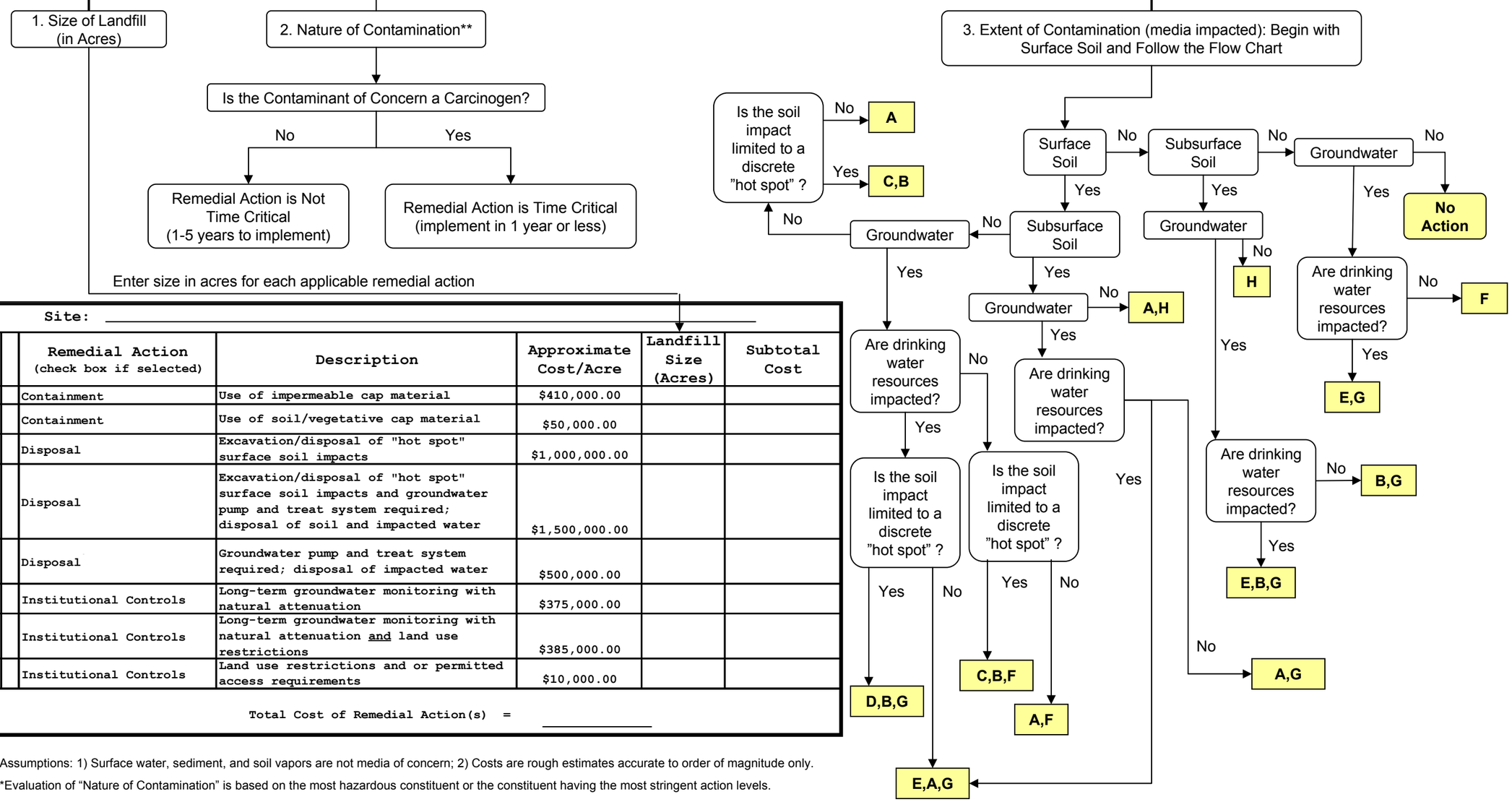
J:\OAHU_LANDFILL\Projectfig 12-10 capture zones and 1mile radius 11-20-06.mxd



*Perform evaluation of site remedial action response using Figure 14-2 protocol.

URS	
Title **Decision Guide for Remedy Selection**	FIGURE **14-1**
Project **Oahu Inactive Landfills** Project No. 26536686.00300	

Input Parameters for Landfill Remedial Action Alternative Selection and Associated Costs*



Enter size in acres for each applicable remedial action

Site: _____

		Remedial Action (check box if selected)	Description	Approximate Cost/Acre	Landfill Size (Acres)	Subtotal Cost
A		Containment	Use of impermeable cap material	$410,000.00		
B		Containment	Use of soil/vegetative cap material	$50,000.00		
C		Disposal	Excavation/disposal of "hot spot" surface soil impacts	$1,000,000.00		
D		Disposal	Excavation/disposal of "hot spot" surface soil impacts and groundwater pump and treat system required; disposal of soil and impacted water	$1,500,000.00		
E		Disposal	Groundwater pump and treat system required; disposal of impacted water	$500,000.00		
F		Institutional Controls	Long-term groundwater monitoring with natural attenuation	$375,000.00		
G		Institutional Controls	Long-term groundwater monitoring with natural attenuation and land use restrictions	$385,000.00		
H		Institutional Controls	Land use restrictions and or permitted access requirements	$10,000.00		

Total Cost of Remedial Action(s) = _____

*Assumptions: 1) Surface water, sediment, and soil vapors are not media of concern; 2) Costs are rough estimates accurate to order of magnitude only.

**Evaluation of "Nature of Contamination" is based on the most hazardous constituent or the constituent having the most stringent action levels.

URS

Title Protocol for Site-Specific Remedial Action Alternative Selection and Costs

Project Oahu Inactive Landfills

Project No. 26536686.00300

FIGURE 14-2

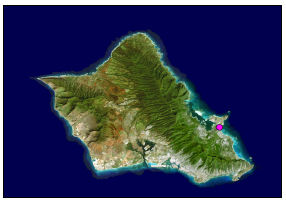
APPENDIX A - Individual Landfill Reports

An individual landfill report, which details the information collected, is included in this Appendix for each site. It should be noted that the database used to create the individual landfill reports was set-up such that it generates reports that only include applicable information for each site (e.g., if a site visit wasn't performed, the database doesn't include the site reconnaissance section in the individual landfill report).

A photographic log with associated captions is included for sites that were visited.

In addition, URS reviewed R.M. Towill's collection of historic aerial photographs of the central portion of the Schofield Plateau, where the majority of the landfills were located. URS personnel also reviewed URS' internal aerial photograph collection and when a site was found in a URS photograph, the photograph was scanned and inserted into a figure, which accompanies the individual landfill report.

Aikahi Dump



Aikahi Dump

Category 3

Site Description

Aikahi Dump, operated by the City and County of Honolulu (C&C), was used to dispose of construction wastes from 1940-1953 (Bagaoisan, 1997). Waste was used as fill material. The closed, uncapped, unlined dump was a burn and dump operation on the Mokapu Peninsula to the north of Kailua. According to Young (1993), Castle Estate gave the C&C permission to establish the dump on Kaneohe Bay Drive in 1940. The size of the landfill was not documented. There are no longer signs of the former dump because the site was redeveloped. The dump may have also been referred to as Mokapu Dump. The parcel on which the dump is suspected to have been located, which is the current location of the Aikahi Park Shopping Center, is owned by the HKL Castle Foundation.

The former dump was reportedly located to the west of Kailua Bay, to the east of Kaneohe Bay, and to the south of the Halekou, Nu'upia, and Kaluapuhu Ponds and Marine Corp Base Hawaii - Kaneohe. Mokapu Boulevard borders the property to the southeast and Kaneohe Bay Drive borders the property to the southwest. The Kawainui Canal is located to the southeast (0.1 mile) and Aikahi Elementary School (0.1 mile) and a sewage disposal plant (0.3 mile) are located to the northwest of the former dump site. The area in the vicinity of the former dump is currently residential and commercial.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	4-4-002:037 (formerly 4-4-11)
2369475.41765	629740.76284	**Zone:**	Koolaupoko
Longitude	**Latitude**	**Section:**	Kaneohe
157 44 53	21 25 22	**Plat:**	Aikahi
Address:	25 Kaneohe Bay Drive	**Quadrangle:**	Mokapu

Ownership

Current Owner: H K L Castle Foundation

Previous Operator: City and County of Honolulu

Site Operation and History

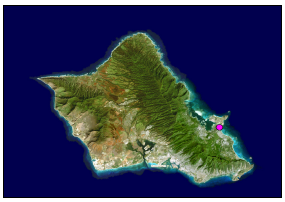
Landfill Type: Municipal

Type of Waste: Construction waste (dirt and rocks)

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940-1953	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump, some fill
Permit Info:	None documented		



Aikahi Dump

Category 3

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line?	Makai
Mauka or Makai of UIC Line?	Makai

Population and Land Use

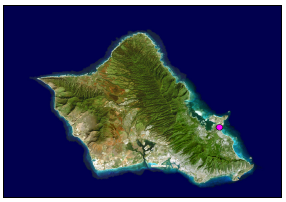
Type of Development in the Surronding Area?	Commercial
City and County Zoning:	B-1
State Land Use District:	Urban
Facilities:	Commercial buildings (1975, 1994), retail complex (1969, 1970, 1975)
TMK Separation:	General merchandise
Flood Zone:	X - 500-year Flood Plain

Geography and Topography

Physiographic Province:	Koolau Range
Elevation Range (ft):	80 **to** 100
Approximate Landfill Acreage:	Unknown (0-14 acres)
Parcel Acreage:	7.21

Climate

Annual Precipitation (cm):	193.80
Precipitation Days Per Year	133
Average Temperature (° F):	74.3
Temperature Range (° F):	68.8 **to** 79.8



Aikahi Dump

Category 3

Soils

Soil Map Symbol:	KtC	**Bulk Density (gm/cc):**	1.10-1.40
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.12-0.14
Soil Series:	Kokokahi	**Organic Carbon (%):**	0.5-2.0
Engineering Classification:	Clay and Very Stony Clay	**Permeability (in/hr):**	0.1-0.6
Drainage Characterisitics:	Very poor	**Slope (%):**	6-12
Thickness of Surface Soil (in):	0-44	**pH:**	6.1-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	Mt	**Bulk Density (gm/cc):**	1.10-1.30
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.13-0.15
Soil Series:	Mokuleia	**Organic Carbon (%):**	1.0-2.0
Engineering Classification:	Clay Loam, Loam, or Fine Sandy Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	--
Thickness of Surface Soil (in):	0-50	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

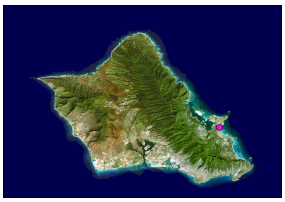
Soil Map Symbol:	JcC	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.05-0.07
Soil Series:	Jaucas	**Organic Carbon (%):**	0.5-1.0
Engineering Classification:	Sand, Saline	**Permeability (in/hr):**	6-20
Drainage Characterisitics:	well	**Slope (%):**	0-12
Thickness of Surface Soil (in):	0-60	**pH:**	7.9-8.4
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

Geologic Symbol(s): Ra

Geologic Unit(s): Unconsolidated noncalcareous deposits

Geologic Description: Chiefly younger alluvium, a black to brown fluviatile deposit generally consisting of coarse permeable detritus only slightly weathered and in many places subangular. In the valley bottoms near the sea it usually consists of nearly impermeable black, sticky mud called taro-patch clay. Much of the younger alluvium is reworked older alluvium. Included also is talus composed of angular blocks, usually with brown interstitial soil, forming aprons on the steep slopes at the base of cliffs. In the mountain areas much of the younger alluvium resembles, includes, and is often inseparable from landslide deposits, because of the torrential character of the streams and the precipitous valley walls. Extensive mantles of hill wash are included. Wells develop water from it in small quantities.



Aikahi Dump

Category 3

Hydrogeology

Rock Type:	Alluvium-younger
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to low
Hydraulic Conductivity (ft/d):	1 - 500

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3060411612211
Aquifer Sector:	Windward
Aquifer System:	Waimanalo
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Currently used
Utility:	Ecologically important
Salinity (mg/L Cl-):	Low (250-1000)
Uniqueness:	Irreplaceable
Vulnerability:	High

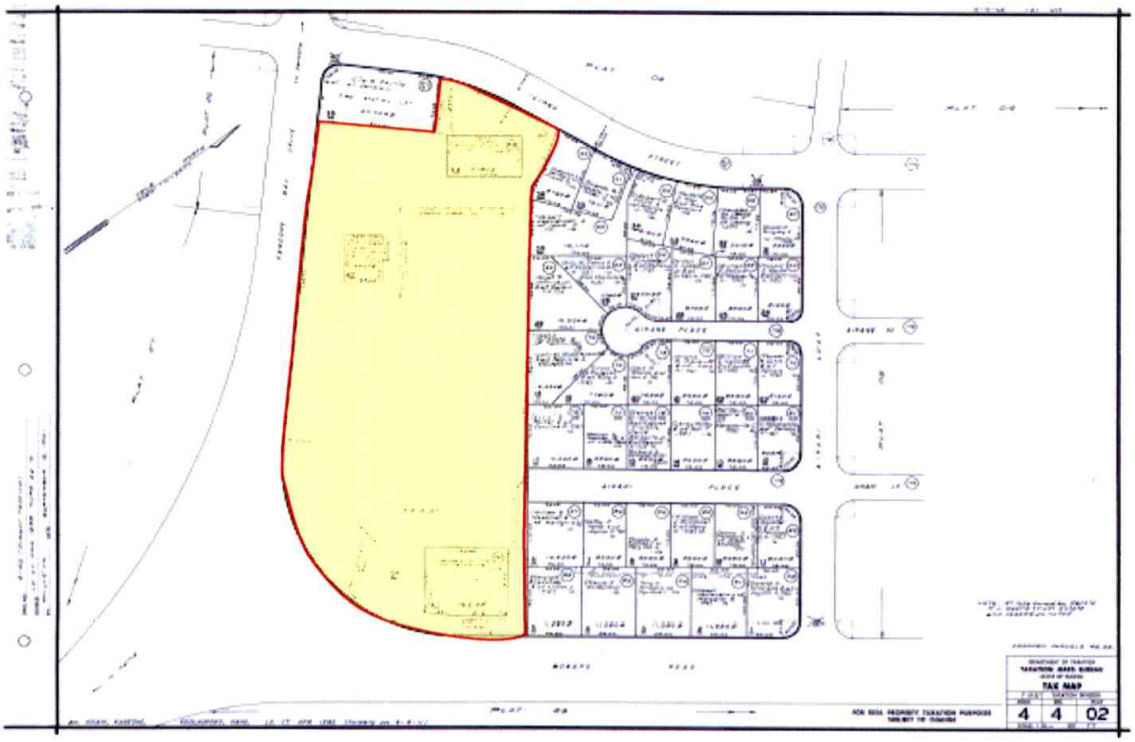
Lower Aquifer

Aquifer Status Code:	3060412211113
Aquifer Sector:	Windward
Aquifer System:	Waimanalo
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Dike
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	Low

Aikahi Dump

Category 3

TMK Map



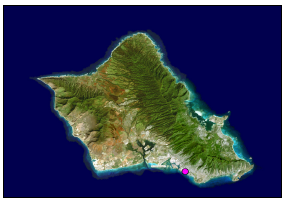
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	1		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	1
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Ala Moana Dump



Ala Moana Dump

Category 3

Site Description

Ala Moana Dump, operated by the City and County of Honolulu (C&C), was used to dispose of household wastes from 1926-1930 (Bagaoisan, 1997). The closed, uncapped, unlined dump was a burn and dump operation in Honolulu. According to Young (1993), this was the first recognized Oahu dump location. The size of the landfill was not documented. A 1925 report recommended the disposal of refuse by dumping on the shore side of Ala Moana Boulevard, "Waikiki" of Sheridan Road. This dumping is considered to be the beginning of the Ala Moana Dump. A 1928 report on refuse disposal described the Ala Moana Dump as being divided into two sections - one part for burning animals and fish waste and the other part for burning combustible rubbish. The parcel on which the dump is suspected to have been located is currently owned by the C&C.

The former dump is now a portion of Ala Moana Beach Park, which is located to the southeast of the Honolulu Harbor (1 mile) and the Kewalo basin (0.1 mile) and to the northwest of the Ala Wai Boat Harbor (0.1 mile). Ala Moana Boulevard borders the property to the north. The area in the vicinity of the former dump is currently residential and commercial.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	2-3-037:001
2354705.02455	619322.54770	**Zone:**	Honolulu
Longitude	**Latitude**	**Section:**	Kaakaukukui
157 50 58	21 17 24	**Plat:**	Not Designated
Address:	1201 Ala Moana Boulevard	**Quadrangle:**	Honolulu

Ownership

Current Owner: City and County of Honolulu

Previous Operator: City and County of Honolulu

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? No wells documented

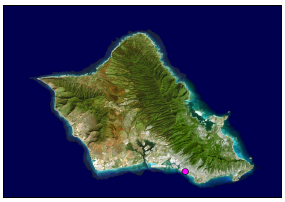
Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1926-1930	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai



Ala Moana Dump

Category 3

Population and Land Use

Type of Development in the Surronding Area?	Public Recreation
City and County Zoning:	P-2
State Land Use District:	Urban
Facilities:	Commercial buildings (1995 x2), park
TMK Separation:	Public recreation
Flood Zone:	A/AE - 100-year Flood Plain

Geography and Topography

Physiographic Province:	Coastal Plain
Elevation Range (ft):	0 **to** 4
Approximate Landfill Acreage:	Unknown
Parcel Acreage:	75.209

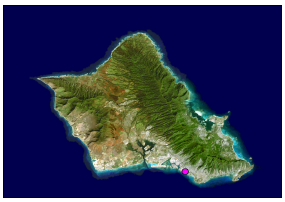
Climate

Annual Precipitation (cm):	60.22
Precipitation Days Per Year	40
Average Temperature (°F):	76.9
Temperature Range (° F):	69.1 **to** 84.6

Soils

Soil Map Symbol:	FL	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.06-0.12
Soil Series:	Fill Land, Mixed	**Organic Carbon (%):**	0.1-5.0
Engineering Classification:	Fill Land, Mixed	**Permeability (in/hr):**	0.1-2
Drainage Characterisitics:	Poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	BS	**Bulk Density (gm/cc):**	1.35-1.60
Soil Association:	Not Applicable	**Moisture Retention (%):**	0.03-0.05
Soil Series:	Beaches	**Organic Carbon (%):**	0.0-0.1
Engineering Classification:	Beach Sand	**Permeability (in/hr):**	6-20
Drainage Characterisitics:	well	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-7.8
Topsoil Rating:	Poor	**Corrosivity:**	High



Ala Moana Dump

Category 3

Geology

Geologic Symbol(s): Rf

Geologic Unit(s): Artificial fill composed of marine deposits

Geologic Description: Brown to white permeable marine mud containing shells, coral, and other calcareous marine organisms dredged from the ocean floor and used to fill up salt marshes and other lowlands.

Hydrogeology

Rock Type:	Sand-unconsolidated
GW Occurrance-Principal:	Basal
GW Occurrance-Secondary:	--
Permeability:	Moderate to high
Hydraulic Conductivity (ft/d):	100 - 1,000

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3010211613321
Aquifer Sector:	Honolulu
Aquifer System:	Nuuanu
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Currently used
Utility:	Neither
Salinity (mg/L Cl-):	Moderate (1,000-5,000)
Uniqueness:	Replaceable
Vulnerability:	High

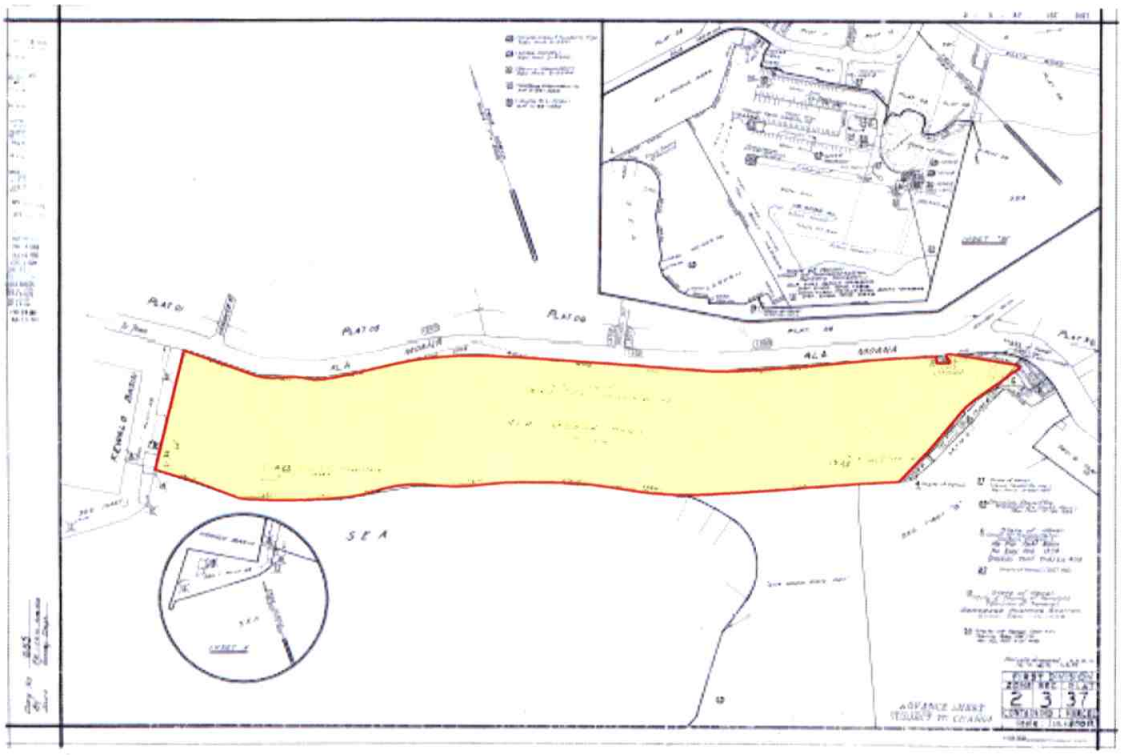
Lower Aquifer

Aquifer Status Code:	3010212111113
Aquifer Sector:	Honolulu
Aquifer System:	Nuuanu
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	Low

Ala Moana Dump

Category 3

TMK Map



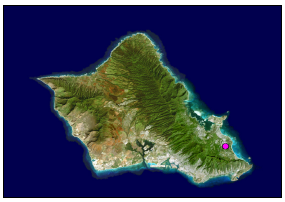
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	44		
Municipal Well(s)within one mile	0	**Observation Well(s)within one mile**	1
BWS Well(s) within one mile	0	**Sealed Well(s)within one mile**	21
Domestic Well(s)within one mile	0	**Unused Well(s) within one mile**	4
Irrigation Well(s)within one mile	0	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	2	**Other Well(s)within one mile**	16

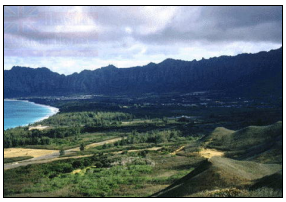
Well Details

Bellows Site LF01, Base Landfill



Bellows Site LF01, Base Landfill

Category 3



Site Description

There are several dump sites at Bellows Air Force Station (AFS), which include AOC-10 [Dump Site Near Communication Station], AOC-18 [WWII Dump], DP06 [Multiple Dump Sites], LF-24 [Pier Dump Site], and LF01 [Base Landfill]. This investigation focuses on the former dump known as "Site LF01, Base Landfill".

Bellows Base Landfill operated by the United States Air Force (USAF), was used to dispose of mixed wastes from 1942 to the mid-1970s. Although the site is referred to as a landfill in historic reports, for the purposes of this report the site is a considered a dump.

Bellows AFS is located to the north and east of the Olomana Golf Course, to the southeast of Keolu Hills residential development, and to the north of Waimanalo. Aircraft operations and related activities at Bellows AFS ended in the 1950s, and since then the installation has been primarily used for military training exercises and recreation. In 1999, more than 1,000 of the approximately 1,600 acres at Bellows AFS were transferred to the United States Navy for use by the United States Marine Corps. Site LF01 is located within the Marine Corps Training Area and is generally inaccessible to the public. It is expected that the installation (including Site LF01) will continue to be used for training exercises and recreation in the foreseeable future. The area in the vicinity of Bellows AFS is mostly residential.

The dump is located in the west-central portion of Bellows AFS, approximately 700 feet northwest of Waimanalo Stream and to the west of abandoned Runway 36 within a former coral borrow pit excavated during World War II to provide fill for Bellows AFS expansion efforts. Various sources indicate that land filling occurred from World War II through the 1970s. The site is relatively open but heavily vegetated in places (CH2M Hill, 2001a, b, c).

The uncapped, unlined dump was a dig and burn/fill operation approximately one acre in size.

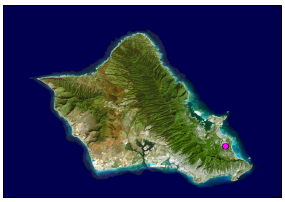
Bellows AFS participated in the Installation Restoration Program (IRP), a specially funded program established by the Department of Defense (DoD) to identify, investigate, and control the migration of hazardous contaminants at military and other DoD facilities.

The State of Hawaii Department of Health's (DOH) Office of Hazard Evaluation and Emergency Response (HEER) provides oversight to all military site cleanups through the DoD/State Memorandum of Agreement grant. Bellows AFS is covered by this agreement.

An IRP Phase I Records Search (Engineering-Science (ES), 1984) reported that waste disposal at the "installation landfill" may have included hazardous materials such as oil, paint thinner, and acid from military shop operations between 1943 and 1946; however, no documented evidence of such disposal at Site LF01 was presented in the ES report. The area encompassing Site LF01 was extensively quarried for coral fill during World War II, making simultaneous refuse and quarry operations at the site unlikely (CH2M Hill, 1998).

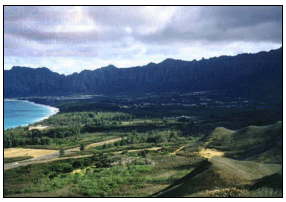
Surface debris was observed in the vicinity of the dump during a visual reconnaissance of the site made in 1998 by CH2M Hill. As part of the Engineering Evaluation/Cost Analysis (EE/CA) investigation performed at Bellows by CH2M Hill between 1998 and 2000, trenching was performed to characterize the landfill contents. A longitudinal north-south trench through the landfill encountered predominately Recreation Center-type waste (pop, beer, and liquor bottles) with construction/demolition waste (concrete, steel rebar, timbers, etc.) and vehicle waste (tires, fenders truck bodies).

Site LF01 was one of four IRP sites included in the EE/CA for Operational Unit 1 at Bellows AFS; the other three sites (DP06 [Multiple Dump Sites], DP17 [Burn and Disposal Site], and SD22) have since been closed under the designation of No Further Response Action Planned Category III. For



Bellows Site LF01, Base Landfill

Category 3

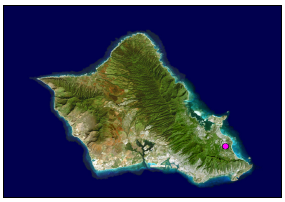


Site LF01, a field investigation was conducted, soil and groundwater samples were collected and analyzed, and a screening-level risk evaluation was performed based on the findings of those activities and previous investigations. The results are documented in the Informal Technical Information Report for Site LF01 (CH2M Hill, June 15, 2001).

Based on the screening-level risk evaluation, lead in surface soil was identified as a chemical of concern (COC) posing potential risks to current and future occupational receptors (i.e., personnel involved in military training exercises) at Site LF01. In the absence of other factors, the risks estimated for both human and ecological receptors at Site LF01 are marginal and would not warrant further action. However, Site LF01 in its current condition presents potential risks to occupational receptors in the form of physical hazards including broken glass, metal, and other debris at the surface, and potentially dangerous materials (e.g., pressurized canisters) in the landfill materials. Therefore, the marginal human and ecological risks potentially posed by metals in surface soil, combined with the physical hazards present at the site, are sufficient cause for further action (CH2M Hill, 2001a, b, c)

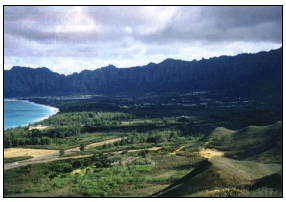
During 2002, Site LF01 was undergoing further investigation by the USAF to evaluate the application of more stringent clean-up levels proposed by an environmental watch group. COCs in the landfill include high levels of lead and low levels of pesticides and PCBs in surface soil. Dioxin/furans were also potential COCs because there were evidences of in-situ burning of landfill materials. The investigation for dioxins/furans revealed levels in the surface soil at the landfill were below screening criteria. The EE/CA completed for the site addressed metals and physical hazards in surface soil. The recommended alternative is soil/vegetative cover with long-term monitoring of groundwater. One environmental group opposed the decision, raising their concerns to the community and other stakeholders. The action memorandum was not signed by the Air Force, holding off all decisions for this site. Several meetings and discussions throughout 2002 involved the active participation of the Restoration Advisory Board and an environmental watch group in an attempt to educate the community and clarify the decisions made for this landfill. Ecological risk assessment (ERA) documents were reviewed in support of the Project Manager to ensure technical adequacy to meet the Department of Health (DOH) requirements for the use of appropriate techniques and procedures. Site reports/information submitted to DOH were reviewed for adequacy of ERA information and followed up with site visits to fully evaluate the adequacy of the ERA documents and preliminary evaluations (State of Hawaii DOH, 2002).

During 2003, the USAF was reassessing options regarding Site LF01 and ordered an EE/CA to update the June 2001 EE/CA. The overall objective of the latest EE/CA is to expedite site characterization and remedial action at Bellows to facilitate the restoration of these sites (State of Hawaii DOH, 2003).



Bellows Site LF01, Base Landfill

Category 3



Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	4-1-015:001
2363116.77257	631911.45347	**Zone:**	Koolaupoko
Longitude	**Latitude**	**Section:**	Waimanalo
157 43 39	21 21 55	**Plat:**	Not Designated
Address:	220 Tinker Road	**Quadrangle:**	Koko Head

Ownership

Current Owner: U.S. Marines

Previous Operator: U.S. Air Force

Site Operation and History

Landfill Type: Military

Type of Waste: Mixed, including drummed hazardous waste

Monitoring Well Network? Yes

Monitoring Well Identification MW-01, MW-02 (a.k.a MW-08), MW-03, MW-04 (a.k.a. MW-07), MW-05, and MW-06

Status:	Remedial action pending	**Analytical Data Available?**	Yes
Active Period:	1942 to mid-1970s	**EPA ID No.:**	HI3570028719, HI957302871900
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Other cleanup activity, Federal Facility-Lead Cleanup
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Dig and burn/fill
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Population and Land Use

Type of Development in the Surronding Area? Recreation/Training

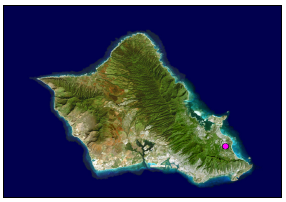
City and County Zoning: P-1/F-1

State Land Use District: Conservation, Urban

Facilities: Military beach park

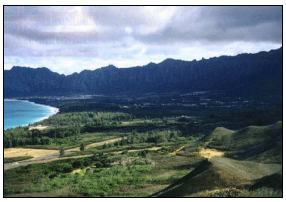
TMK Separation: Military

Flood Zone: AE - 100-year Flood Plain, X - 500-year Flood Plain



Bellows Site LF01, Base Landfill

Category 3



Geography and Topography

Physiographic Province:	Koolau Range
Elevation Range (ft):	140 **to** 160
Approximate Landfill Acreage:	Approximately 1.05
Parcel Acreage:	1571

Climate

Annual Precipitation (cm):	193.80
Precipitation Days Per Year	133
Average Temperature (°F):	74.3
Temperature Range (° F):	68.8 **to** 79.8

Soils

Soil Map Symbol:	PYF	**Bulk Density (gm/cc):**	1.10-1.30
Soil Association:	Rough mountainous land-Kapaa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Papaa	**Organic Carbon (%):**	4.0-7.0
Engineering Classification:	Clay	**Permeability (in/hr):**	0.0000-0.1
Drainage Characterisitics:	Very poor	**Slope (%):**	35-70
Thickness of Surface Soil (in):	0-40	**pH:**	6.1-6.5
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Geology

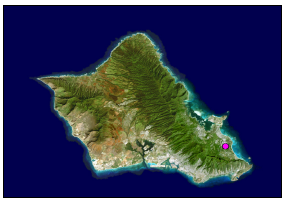
Geologic Symbol(s): Tkadc

Geologic Unit(s): Kailua volcanic series

Geologic Description: A denuded rift zone consisting of greenish-gray to black, usually vertical single and multiple basalt dikes, a few inches to 6 feet thick, usually microcrystalline, a few with olivine phenocrysts, chiefly cross-jointed, some platy and amygdalodial, intruded into the basalt flows and filling fissures through which the basalt flows issued, the amount of extrusive basalt present is negligible; the joint cracks in the dikes are nearly all filled with secondary minerals, chiefly quartz, and water does not occur in them; the dikes outside the rift zone are not differentiated on the map from the dikes of the Koolau volcanic series. It is believed that the Kailua volcanic series was formed in and under the caldera of the Koolau volcano.

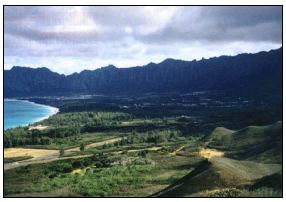
Hydrogeology

Rock Type:	Koolau Basalt-Lava flows-dike complex
GW Occurrance-Principal:	Dike impounded
GW Occurrance-Secondary:	Perched
Permeability:	Low to moderate
Hydraulic Conductivity (ft/d):	1 - 500



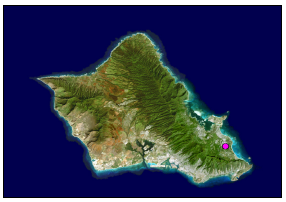
Bellows Site LF01, Base Landfill

Category 3



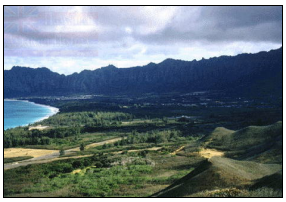
Aquifer(s)

Aquifer Status Code:	3060421211111
Aquifer Sector:	Windward
Aquifer System:	Waimanalo
Aquifer Type 1:	High Level
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Dike
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

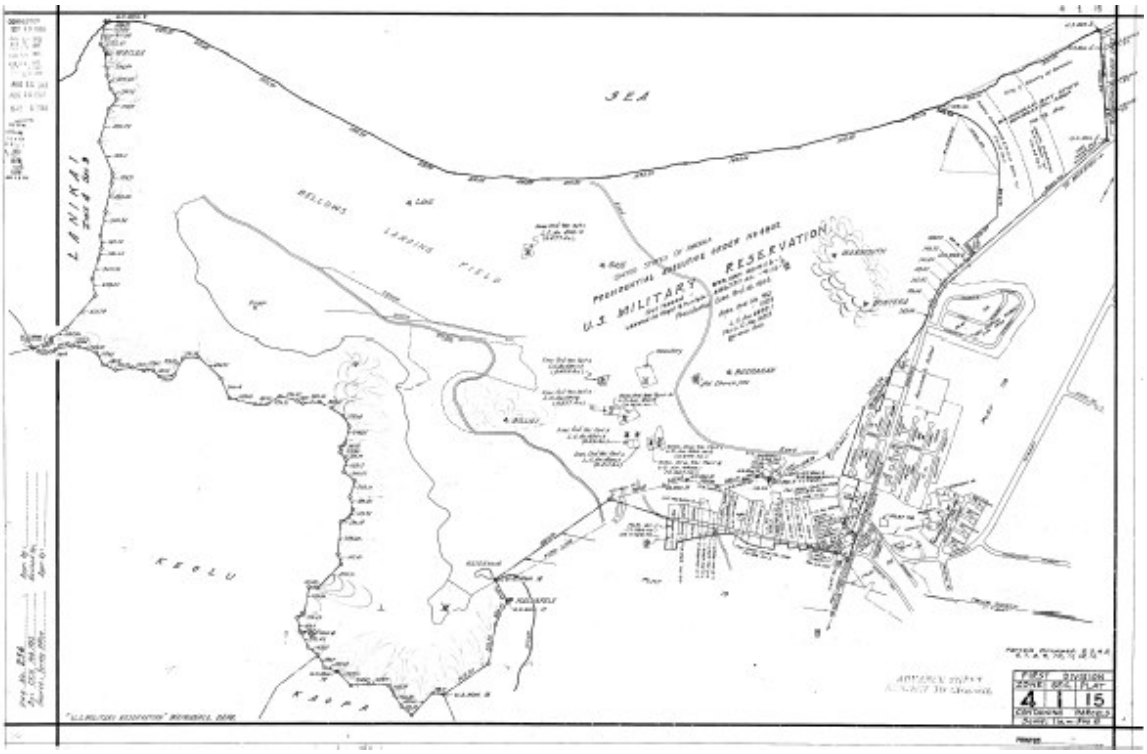


Bellows Site LF01, Base Landfill

Category 3



TMK Map



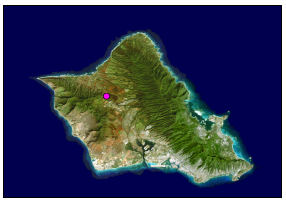
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	0		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

California Packing Company Dump 1



California Packing Company Dump 1

Category 2

Site Description

California Packing Company Dump 1, operated by the California Packing Company (which became Del Monte Corporation), was used to dispose of plantation refuse. According to a historic map (Young, 1993; Map 9a), the open-space dumping area was located to the north of Schofield Barracks, to the west of the intersection of Kaukonahua Road (Route 801) and Wilikina Drive (0.4 mile), and to the east of the Kaukonahua Stream and Poamoho Camp in Wahiawa. No records on the period of operation were located. There was no documentation found which indicated that the dump was permitted, lined, capped, or properly closed. The dump was probably small and was likely located at the edge of an agricultural field in an unusable gulch. The former dump was likely a burn and dump operation. The parcel on which the dump is suspected to have been located in currently owned by Dole Food Company, Incorporated. The area in the vicinity of the former dump is currently agricultural.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	6-5-002:005
2379886.53075	595466.50066	**Zone:**	Waialua
Longitude	**Latitude**	**Section:**	Kaheeka
158 04 41	21 31 08	**Plat:**	Kemoo
Address:	1001 Kaukonahua Road	**Quadrangle:**	Haleiwa

Ownership

Current Owner: Dole Food Company, Incorporated

Previous Operator: California Packing Company

Site Operation and History

Landfill Type: Agricultural

Type of Waste: Plantation refuse

Monitoring Well Network? No wells documented

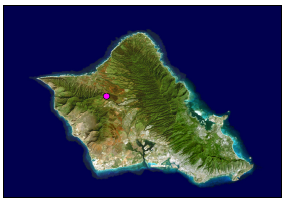
Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	Unknown	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka



California Packing Company Dump 1

Category 2

Population and Land Use

Type of Development in the Surronding Area?	Agricultural
City and County Zoning:	Ag-1
State Land Use District:	Agricultural
Facilities:	--
TMK Separation:	Pineapple field, steep land
Flood Zone:	D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province:	Schofield Plateau
Elevation Range (ft):	920 **to** 940
Approximate Landfill Acreage:	1-5
Parcel Acreage:	317.93

Climate

Annual Precipitation (cm):	142.70
Precipitation Days Per Year	99
Average Temperature (°F):	70.7
Temperature Range (° F):	63.2 **to** 78.1

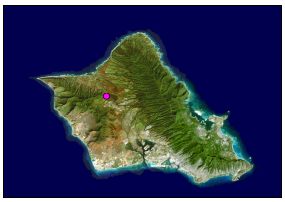
Soils

Soil Map Symbol:	WaA	**Bulk Density (gm/cc):**	1.20-1.45
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Wahiawa	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	0-3
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Geology

Geologic Symbol(s):	Tkb
Geologic Unit(s):	Koolau volcanic series

Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.



California Packing Company Dump 1

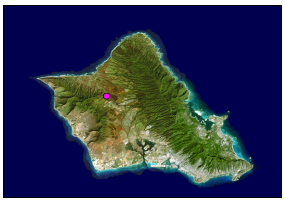
Category 2

Hydrogeology

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Aquifer Status Code:	3050121211111
Aquifer Sector:	Central
Aquifer System:	Wahiawa
Aquifer Type 1:	High Level
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Dike
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

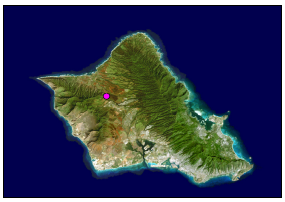


California Packing Company Dump 1

Category 2

Site Reconnaissance

Site Description:	Site reconnaissance was not performed because of access issues during site visit and non-response of property owner.
Type of Property:	Apparent undeveloped land.
Current Site Operations:	None apparent.
Age of Development:	Unknown.
Onsite Building Information:	Unknown.
Was There a Recognizable Dump/Landfill?	Not applicable.
Institutional Controls:	Unknown.
Number of MonitoringWells:	Unknown.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	Not applicable.
Odors, Staining, Distressed Vegetation:	Not applicable.
Drainage Features:	Unknown.
Areas of Ponded Water Onsite:	Unknown.



California Packing Company Dump 1

Category 2

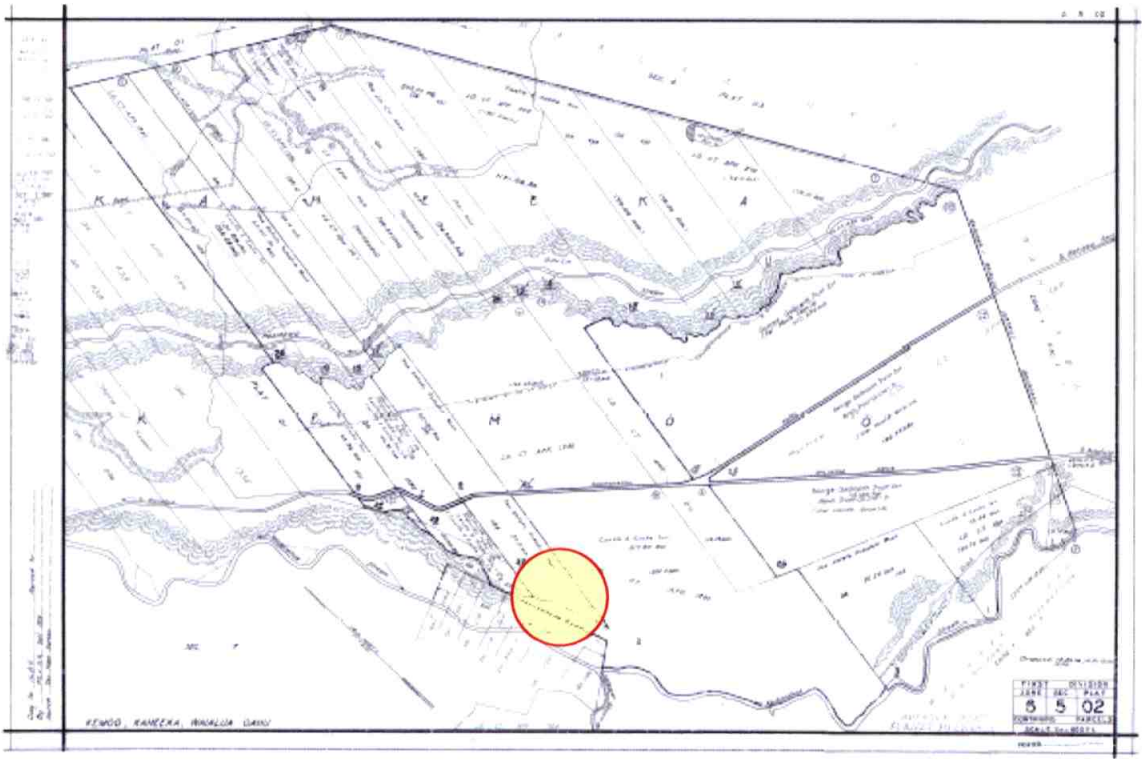
Site Reconnaissance (cont.)

Storm Water Retention Pond:	Unknown.
House and Schools in the Vicinity:	None observed.
Distance to Nearest Residence, School, or Businesses:	Unknown.
How is Drinking Water in the Area Supplied?	Unknown.
Natural Resources, Agriculture, Aquaculture Near the Site?	Pineapple farms are in the vicinity of the site.
Name of Surface Water Within 1-mile of Dump/Landfill:	Kaukonahua Stream.
Distance to Surface Water:	Approximately 0.2 miles.
Proximal Direction of Surface Water:	West
Where Does Surface Water Flow?	USGS topographic maps indicate that surface water would flow west toward the Kaukonahua Stream.
Surface Water Used for Drinking?	No.
Surface Water Used for Recreation?	Unknown.
Wetlands:	Unknown.
Off-site Sources of Contamination:	Surrounding properties appear to have been former plantation lands that may have used pesticides and herbicides.
Does Run-off from other Sites Flow onto Subject Property:	Unknown.
Adjacent Property-North:	Undeveloped property and Wilikina Drive.
Adjacent Property-South:	Undeveloped property.
Adjacent Property-East:	Undeveloped property.
Adjacent Property-West:	Kaukonahua Stream.

California Packing Company Dump 1

Category 2

TMK Map



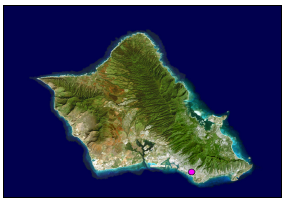
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	4		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	3
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	1	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

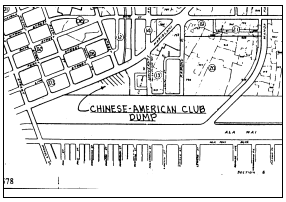
Well Details

Chinese American Club Dump



Chinese American Club Dump

Category 3



Site Description

Chinese American Club Dump, operated by the City and County of Honolulu (C&C), was used to dispose of household waste for a short period during the 1950s (Bagaoisan, 1997). The closed, uncapped, unlined dump was a burn and dump operation in Honolulu. According to Young (1993), the dump, which was located northeast of the Ala Wai Park and Canal, northwest of Manoa-Palolo Drainage Channel and the Ala Wai Golf Course, south of Kapiolani Boulevard, and west of University Avenue, was closed within a few months of opening because of complaints about smoke from the dump drifting into Waikiki. The size of the landfill was not documented but from a historical map review, it appears to be less than 1 acre. The dump's footprint may be within a portion of Ala Wai Park. The parcel on which the dump is suspected to have been located is currently owned by Marco Polo. The area in the vicinity of the former dump is currently residential and commercial.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	2-7-004:001
2354444.16650	621546.83479	**Zone:**	Honolulu
Longitude	**Latitude**	**Section:**	Waikiki
157 49 41	21 17 15	**Plat:**	Not Designated
Address:	2333 Kapiolani Boulevard	**Quadrangle:**	Honolulu

Ownership

Current Owner: Marco Polo

Previous Operator: City and County of Honolulu

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? No wells documented

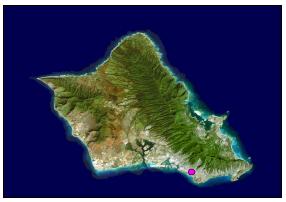
Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1950s?	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

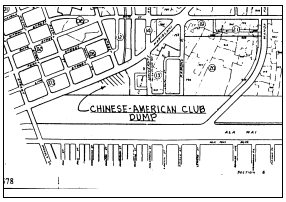
Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Mauka



Chinese American Club Dump

Category 3



Population and Land Use

Type of Development in the Surronding Area? Residential Housing

City and County Zoning: A-3

State Land Use District: Urban

Facilities: Apartments (1970); high density units

TMK Separation: Household dwellings

Flood Zone: A - 100-year Flood Plain, AO - 100-year Flood Plain of an alluvial fan

Geography and Topography

Physiographic Province: Coastal Plain

Elevation Range (ft): 5 **to** 10

Approximate Landfill Acreage: Approximately 1

Parcel Acreage: Approximately 3

Climate

Annual Precipitation (cm): 60.22

Precipitation Days Per Year 40

Average Temperature (°F): 76.9

Temperature Range (° F): 69.1 **to** 84.6

Soils

Soil Map Symbol:	FL	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.06-0.12
Soil Series:	Fill Land, Mixed	**Organic Carbon (%):**	0.1-5.0
Engineering Classification:	Fill Land, Mixed	**Permeability (in/hr):**	0.1-2
Drainage Characterisitics:	Poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

Geologic Symbol(s): Rf

Geologic Unit(s): Artificial fill composed of marine deposits

Geologic Description: Brown to white permeable marine mud containing shells, coral, and other calcareous marine organisms dredged from the ocean floor and used to fill up salt marshes and other lowlands.

Hydrogeology

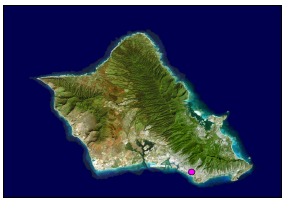
Rock Type: Sand-unconsolidated

GW Occurrance-Principal: Basal

GW Occurrance-Secondary: --

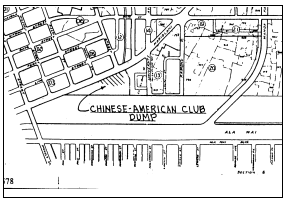
Permeability: Moderate to high

Hydraulic Conductivity (ft/d): 100 - 1,000



Chinese American Club Dump

Category 3

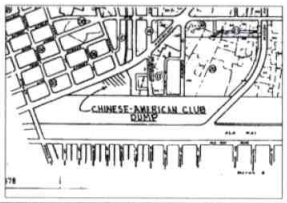


Aquifer(s)

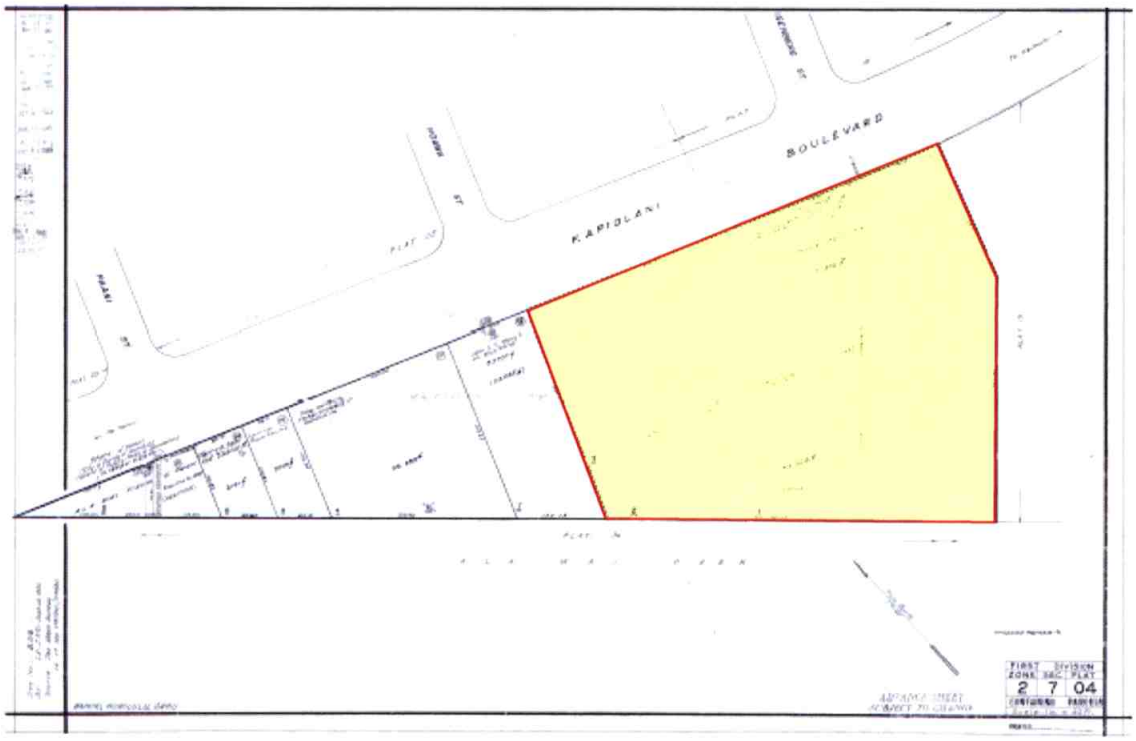
Uppermost Aquifer	**Aquifer Status Code:**	3010111623321
	Aquifer Sector:	Honolulu
	Aquifer System:	Palolo
	Aquifer Type 1:	Basal
	Aquifer Type 2:	Unconfined
	Aquifer Type Geol.:	Sedimentary
	Development State:	Potential use
	Utility:	Neither
	Salinity (mg/L Cl-):	Moderate (1,000-5,000)
	Uniqueness:	Replaceable
	Vulnerability:	High
Lower Aquifer	**Aquifer Status Code:**	3010112111113
	Aquifer Sector:	Honolulu
	Aquifer System:	Palolo
	Aquifer Type 1:	Basal
	Aquifer Type 2:	Confined
	Aquifer Type Geol.:	Flank
	Development State:	Currently used
	Utility:	Drinking
	Salinity (mg/L Cl-):	Fresh (<250)
	Uniqueness:	Irreplaceable
	Vulnerability:	Low

Chinese American Club Dump

Category 3



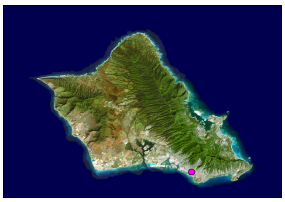
TMK Map



Wells Within One Mile

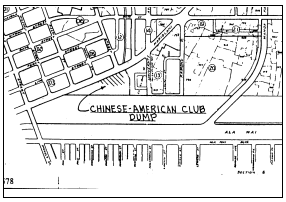
Summary

Total Number of Well(s)within one mile	80		
Municipal Well(s)within one mile	13	**Observation Well(s)within one mile**	7
BWS Well(s) within one mile	12	**Sealed Well(s)within one mile**	42
Domestic Well(s)within one mile	1	**Unused Well(s) within one mile**	8
Irrigation Well(s)within one mile	1	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	7



Chinese American Club Dump

Category 3



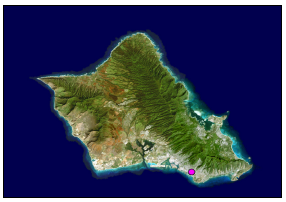
Well Details

USGS Well Number	1849-10	**Aquifer**	30102
Well Name	Manoa Valley	**Elevation of Ground Surface (ft amsl)**	36
Well Owner	Punahou Sch	**Well Depth (feet bgs)**	315
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-279
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	29.1
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1909		

USGS Well Number	1749-19	**Aquifer**	30101
Well Name	Kapahulu	**Elevation of Ground Surface (ft amsl)**	21
Well Owner	Kokusai Kogyo	**Well Depth (feet bgs)**	276
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-255
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	24.7
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	500
Drilling Method	--		
Year of Construction	1927		

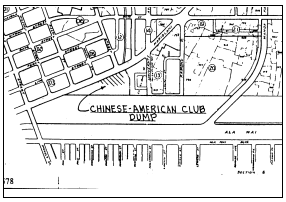
USGS Well Number	1849-16	**Aquifer**	30102
Well Name	Wilder Ave. P2	**Elevation of Ground Surface (ft amsl)**	56
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	466
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-410
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	Rotary		
Year of Construction	1962		

USGS Well Number	1849-15	**Aquifer**	30102
Well Name	Wilder Ave. P4	**Elevation of Ground Surface (ft amsl)**	47
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	445
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-398
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	0
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	Rotary		
Year of Construction	1962		



Chinese American Club Dump

Category 3

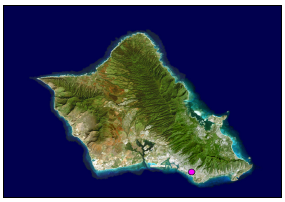


USGS Well Number	1849-14	**Aquifer**	30102
Well Name	Wilder Ave. P1	**Elevation of Ground Surface (ft amsl)**	59
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	460
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-401
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	0
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	Rotary		
Year of Construction	1961		

USGS Well Number	1849-13	**Aquifer**	30102
Well Name	Wilder Ave. P3	**Elevation of Ground Surface (ft amsl)**	53
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	475
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-422
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	Rotary		
Year of Construction	1961		

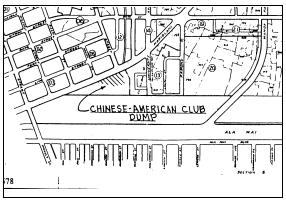
USGS Well Number	1748-06	**Aquifer**	30101
Well Name	Kaimuki Pump Station	**Elevation of Ground Surface (ft amsl)**	27
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	250
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-223
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	24
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1912		

USGS Well Number	1748-05	**Aquifer**	30101
Well Name	Kaimuki Pump Station	**Elevation of Ground Surface (ft amsl)**	37
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	250
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-213
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	22.3
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1912		



Chinese American Club Dump

Category 3

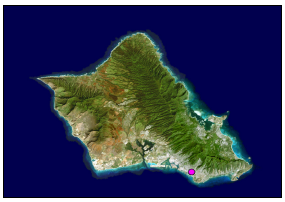


USGS Well Number	1748-04	**Aquifer**	30101
Well Name	Kaimuki Pump Station	**Elevation of Ground Surface (ft amsl)**	26
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	260
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-234
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1898		

USGS Well Number	1748-03	**Aquifer**	30101
Well Name	Kaimuki Pump Station	**Elevation of Ground Surface (ft amsl)**	25
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	260
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-235
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	25.2
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1898		

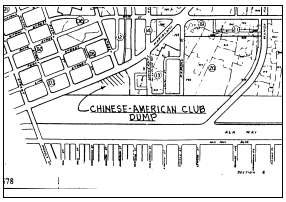
USGS Well Number	1748-08	**Aquifer**	30101
Well Name	Kaimuki Pump Station	**Elevation of Ground Surface (ft amsl)**	28
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	304
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-276
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	23.9
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1925		

USGS Well Number	1748-09	**Aquifer**	30101
Well Name	Kaimuki Pump Station	**Elevation of Ground Surface (ft amsl)**	28
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	302
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-274
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	24.8
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1925		



Chinese American Club Dump

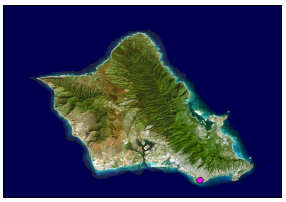
Category 3



USGS Well Number	1748-07	**Aquifer**	30101
Well Name	Kaimuki Pump Station	**Elevation of Ground Surface (ft amsl)**	29
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	301
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-272
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	24.9
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1925		

USGS Well Number	1748-10	**Aquifer**	30101
Well Name	Kaimuki Pump Station	**Elevation of Ground Surface (ft amsl)**	32
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	308
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-276
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	25
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1928		

Diamond Head Crater Dump



Diamond Head Crater Dump

Category 3

Site Description

Diamond Head Crater was considered as a potential incinerator site in 1960 but was never used for incineration. The only record of waste disposal practices associated with Diamond Head Crater indicated that pesticides, DDT, and solvents were stored in Tunnel Number 6 from the 1950s to 1983. The site is currently owned by the State of Hawaii and is designated as a State Monument and Natural Landmark.

A Preliminary Assessment was performed and completed on October 3, 1983. The stored materials, which included ethyl ether, DDT, and copper acetoarsenite (Paris Green), were removed for proper disposal in 1983. The interior of the tunnel is "entirely concreted", making environmental contamination highly unlikely; therefore, no further action was recommended for Tunnel Number 6 (Chang, 1983a).

The State of Hawaii Department of Health's Office of Hazard Evaluation and Emergency Response (HEER) concluded that response actions taken at the site alleviated problems associated with the release of hazardous substances from the site. The HEER office concluded that no further action was necessary at the site (Hataoka, 1997).

In 1977, the City and County of Honolulu (C&C) commissioned a comprehensive inventory study of potential landfill sites (Shimabukuro, 1977). The report identified thirty-three such sites. A supplementary study in 1979 identified ten additional sites of which Diamond Head was one. The C&C then systematically investigated and pursued the identified sites. Competing factors such as groundwater resources, competing private and governmental land uses, and the proximity of residential areas eliminated all but a few of the potential sites. In 2002, another report regarding alternatives disposal sites was prepared. This report, which was based on the 1977 and 1979 reports, became Appendix H of the Waimanalo Gulch Sanitary Landfill Expansion Environmental Impact Statement (RM Towill Corporation, 2002).

This "dump" never existed but instead was only a site that was considered for landfill development.

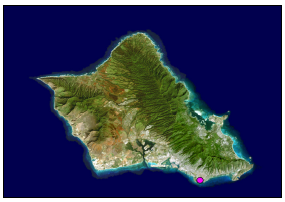
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	3-1-042:006
2351570.92523	623914.03268	**Zone:**	Honolulu
Longitude	**Latitude**	**Section:**	Diamond Head
157 48 20	21 15 41	**Plat:**	Not Designated
Address:	4204, 4206, 4208, 4304 Diamond Head Road	**Quadrangle:**	Honolulu

Ownership

Current Owner: State of Hawaii

Previous Operator: State of Hawaii



Diamond Head Crater Dump

Category 3

Site Operation and History

Landfill Type: Military

Type of Waste: Pesticides, PCB fluids, and solvents

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed in 1983	**Analytical Data Available?**	No data was located
Active Period:	1950s-1980?	**EPA ID No.:**	HID980736243
Lined?	Not applicable, this "dump" never existed but was considered for landfill development.	**Non-NPL status:**	Not applicable
Capped?	Not applicable, this "dump" never existed but was considered for landfill development.	**Method of Operation:**	Storage
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Population and Land Use

Type of Development in the Surronding Area? Conservation

City and County Zoning: P-1, P-2

State Land Use District: Conservation

Facilities: Park; developed trails, tunnels, and a visitor center

TMK Separation: Public recreation

Flood Zone: X - 500-year Flood Plain

Geography and Topography

Physiographic Province: Koolau Range

Elevation Range (ft): 200 **to** 240

Approximate Landfill Acreage: Unknown (0-14 acres)

Parcel Acreage: 115, 303.19

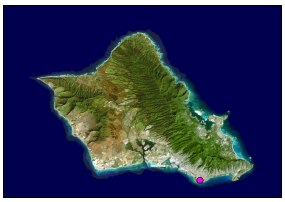
Climate

Annual Precipitation (cm): 60.22

Precipitation Days Per Year 40

Average Temperature (°F): 76.9

Temperature Range (° F): 69.1 **to** 84.6



Diamond Head Crater Dump

Category 3

Soils

Soil Map Symbol:	FL	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.06-0.12
Soil Series:	Fill Land, Mixed	**Organic Carbon (%):**	0.1-5.0
Engineering Classification:	Fill Land, Mixed	**Permeability (in/hr):**	0.1-2
Drainage Characterisitics:	Poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	MdB	**Bulk Density (gm/cc):**	1.10-1.40
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Makalapa	**Organic Carbon (%):**	0.5-2.0
Engineering Classification:	Clay	**Permeability (in/hr):**	0.0000-0.1
Drainage Characterisitics:	Very poor	**Slope (%):**	2-6
Thickness of Surface Soil (in):	0-38	**pH:**	7.4-7.8
Topsoil Rating:	Poor	**Corrosivity:**	High

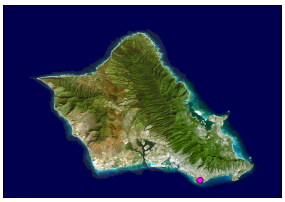
Soil Map Symbol:	MdC	**Bulk Density (gm/cc):**	1.10-1.40
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Makalapa	**Organic Carbon (%):**	0.5-2.0
Engineering Classification:	Clay	**Permeability (in/hr):**	0.0000-0.1
Drainage Characterisitics:	Very poor	**Slope (%):**	6-12
Thickness of Surface Soil (in):	0-38	**pH:**	7.4-7.8
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

Geologic Symbol(s): Ra

Geologic Unit(s): Unconsolidated noncalcareous deposits

Geologic Description: Chiefly younger alluvium, a black to brown fluviatile deposit generally consisting of coarse permeable detritus only slightly weathered and in many places subangular. In the valley bottoms near the sea it usually consists of nearly impermeable black, sticky mud called taro-patch clay. Much of the younger alluvium is reworked older alluvium. Included also is talus composed of angular blocks, usually with brown interstitial soil, forming aprons on the steep slopes at the base of cliffs. In the mountain areas much of the younger alluvium resembles, includes, and is often inseparable from landslide deposits, because of the torrential character of the streams and the precipitous valley walls. Extensive mantles of hill wash are included. Wells develop water from it in small quantities.



Diamond Head Crater Dump

Category 3

Hydrogeology

Rock Type:	Alluvium-younger
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to low
Hydraulic Conductivity (ft/d):	1 - 500

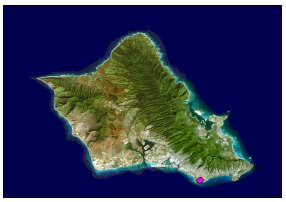
Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3010511623421
Aquifer Sector:	Honolulu
Aquifer System:	Waialae
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Potential use
Utility:	Neither
Salinity (mg/L Cl-):	High (5,000-15,000)
Uniqueness:	Replaceable
Vulnerability:	High

Lower Aquifer

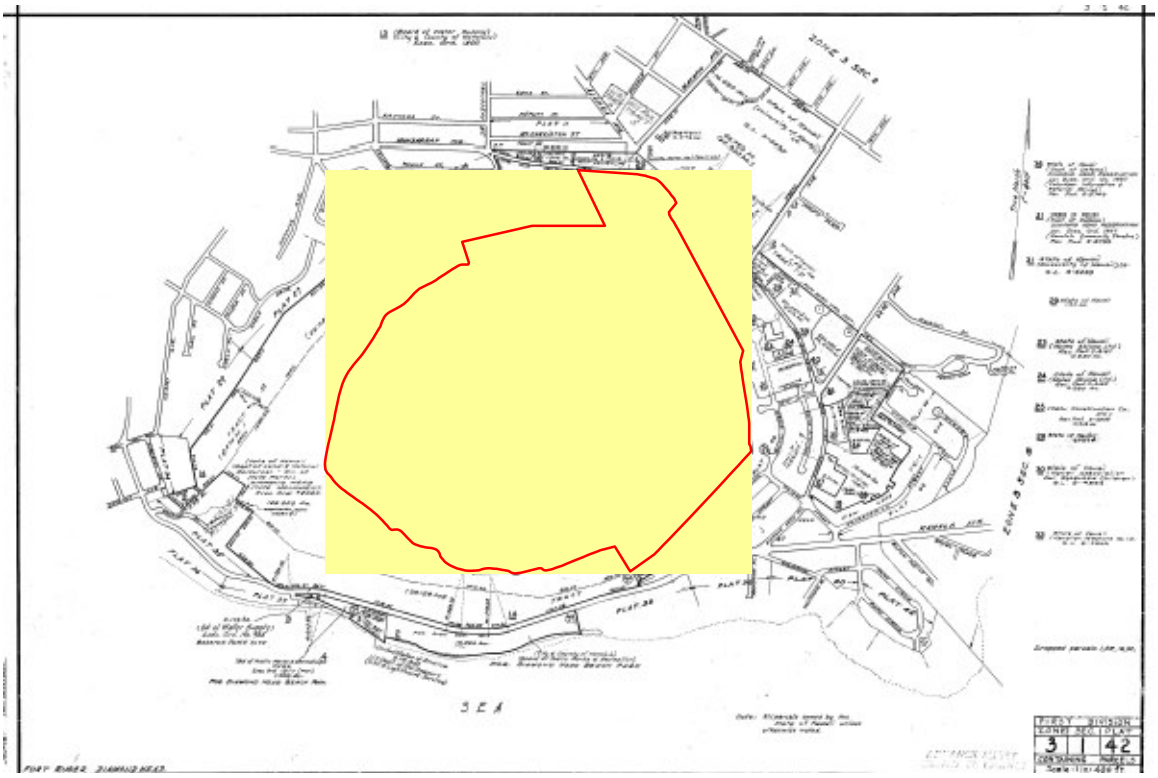
Aquifer Status Code:	3010512121113
Aquifer Sector:	Honolulu
Aquifer System:	Waialae
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Flank
Development State:	Potential use
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	Low



Diamond Head Crater Dump

Category 3

TMK Map



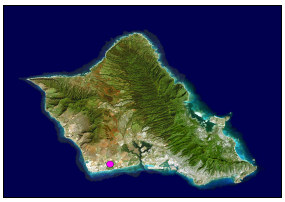
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	10		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	5
Irrigation Well(s)within one mile	2	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	3

Well Details

Ewa Sugar Mill/Oahu Sugar Company - Coral Wastepit



Ewa Sugar Mill/Oahu Sugar Company - Coral Wastepit

Category 3

Picture Not Available

Site Description

The Ewa Sugar Mill/Oahu Sugar Company had five dump sub sites (Baylor, 1998). They are the Fumigant Storage Area, Waipio Peninsula, the Pesticide Mixing/Loading site, Kunia Staging Area, and the Coral Wastepit. The focus of this report is on the Coral Wastepit (also known as AMFAC's Barbers Point Abandoned Coral Quarry).

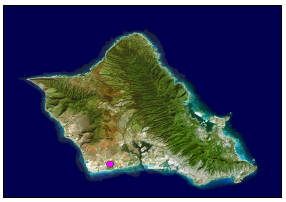
The Coral Wastepit is a 10-acre site in a former agricultural area of Ewa Beach located on Renton Road, 1.8 miles south of the Ewa Sugar Mill and 0.7 miles north of the coastline. The site was formerly owned by Castle & Cooke and was originally leased to the Ewa Plantation Company (EPC). Quarry operations are the only known former usage of the site.

In 1968, Ewa Sugar Plantation was renamed Ewa Sugar Company. Oahu Sugar Company Limited (OSC) bought Ewa Sugar Company in 1970. The pit was used by the Ewa Plantation Company prior to 1970 and by the OSC after 1970. Specific records indicating when operations began could not be located. OSC and the Department of Health sources indicated that many of EPC's records may have been lost in 1970 when EPC was acquired by OSC. Use of the site as a landfill ended around 1980 when the City and County of Honolulu (C&C) began solid waste collection at the Ewa Villages. In January 1998, the site was owned by Haseko (Hawaii) Inc., a developer with plans to build a golf course in the area (Baylor, 1998). The site is currently property of the United States government.

There are a few possible sources of contamination at the site. During the Sugar Mill's operation, the Coral Wastepit was used as a landfill for municipal solid waste from Ewa Villages and industrial waste from plantation activities. Empty pesticide drums were also disposed of in the Wastepit. In 1985, OSC decommissioned some Underground Storage Tanks (USTs) and dumped 62,000 gallons of mixed waste into the Coral Wastepit, 12,000 gallons of which were not analyzed. In 1986, OSC dumped 8,400 gallons of a 50% mixture of water and waste bunker fuel into the Wastepit. A May 29, 1986 analysis by AECOS Laboratory found hazardous levels of chromium and lead in the waste oil. However a report commissioned by OSC from Industrial Analytical Laboratory contradicted the AECOS report and found no hazardous waste characteristics in the waste oil. No action from the United States Environmental Protection Agency (EPA) resulted (Hataoka, 1993).

Debris and coral mixed with ash was removed from the Coral Wastepit and landfilled at the PVT Nanakuli Landfill in Nanakuli. The material primarily consisted of debris, coral, and incidental amounts of ash. The coral mixed with ash was screened and the coral was placed in the construction debris section of the landfill while the ash was placed in the special waste section of the landfill. After the waste profile was reviewed and approved by Waste Management, Inc., the remaining ash at the Coral Wastepit was disposed at the Waimanalo Gulch Sanitary Landfill (Piccolo, 1998).

According to the United States EPA's Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database, the landfill's "Discovery" was October 31, 1991. A Preliminary Assessment was completed on June 16, 1993 and a Site Inspection was completed on September 17, 1999. The Site Inspection (SI) concluded that there were no completed pathways or down gradient drinking water wells in the vicinity of the Coral Wastepit but because of the associated sub sites, the Coral Wastepit could not be archived yet. Further remedial site assessment under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is not required but the United States EPA retained the site in the CERCLIS database because the Federal Superfund program still has an interest in the site.



Ewa Sugar Mill/Oahu Sugar Company - Coral Wastepit

Category 3

Picture Not Available

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	9-1-012:039
2357122.32324	599404.67831	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Not Designated
158 02 29	21 18 53	**Plat:**	Not Designated
Address:	91-1001 Kaimalie Street, Suite 205	**Quadrangle:**	

Ownership

Current Owner: United States government

Previous Operator: Ewa Sugar Company/Oahu Sugar Company

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal solid waste, industrial waste from plantation activities, empty pesticide drums, mixed wastes from OSC's underground storage tanks, waste bunker fuel

Monitoring Well Network? No wells documented

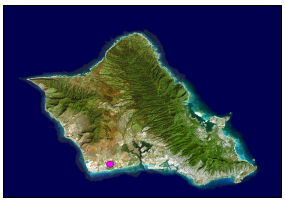
Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	Yes
Active Period:	Pre-1970 through 1980	**EPA ID No.:**	HID984467605, HISFN0905533
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Further remedial site assessment under CERCLA is not required (NFA) but the U.S. EPA retained the site in the CERCLIS database because the Federal Superfund program still has an interest in the site.
Capped?	Covered	**Method of Operation:**	not specified
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line?

Mauka or Makai of UIC Line?



Ewa Sugar Mill/Oahu Sugar Company - Coral Wastepit

Category 3

Picture Not Available

Population and Land Use

Type of Development in the Surronding Area?	Agricultural, Urban, Conservation
City and County Zoning:	A-2, BMX-3, P-2, R-5
State Land Use District:	Agricultural, Conservation, Urban
Facilities:	--
TMK Separation:	Military
Flood Zone:	D - Undetermined but possible flood hazards, X - 500-year Flood Plain

Geography and Topography

Physiographic Province:	Coastal Plain
Elevation Range (ft):	0 **to** 0
Approximate Landfill Acreage:	10
Parcel Acreage:	183.198

Climate

Annual Precipitation (cm):	49.40
Precipitation Days Per Year	30
Average Temperature (°F):	76.0
Temperature Range (° F):	67.4 **to** 84.5

Soils

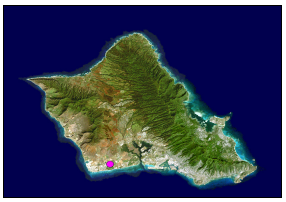
Soil Map Symbol:	CR	**Bulk Density (gm/cc):**	Not available
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	Not available
Soil Series:	Coral Outcrop	**Organic Carbon (%):**	Not available
Engineering Classification:	Coral Outcrop	**Permeability (in/hr):**	Not available
Drainage Characterisitics:	Very poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Not available

Geology

Geologic Symbol(s): Pls

Geologic Unit(s): Consolidated calcareous marine sediments

Geologic Description: Chiefly emerged coral reefs but in places, especially near Pearl Harbor, finely laminated lagoon limestone. Beach deposits resembling the various types of present calcareous beaches in lithified form are included, as well as a few inextensive consolidated beach deposits that may have been formed at the present stand of the sea. Extremely permeable because of primary and secondary cavities and yields water copiously, but the water is apt to be brackish.



Ewa Sugar Mill/Oahu Sugar Company - Coral Wastepit

Category 3

Picture Not Available

Hydrogeology

Rock Type:	Coral-in situ reef limestone
GW Occurrance-Principal:	Basal
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to very high
Hydraulic Conductivity (ft/d):	100 - 20,000

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3020311612211
Aquifer Sector:	Pearl Harbor
Aquifer System:	Waipahu
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Currently used
Utility:	Ecologically important
Salinity (mg/L Cl-):	Low (250-1000)
Uniqueness:	Irreplaceable
Vulnerability:	High

Lower Aquifer

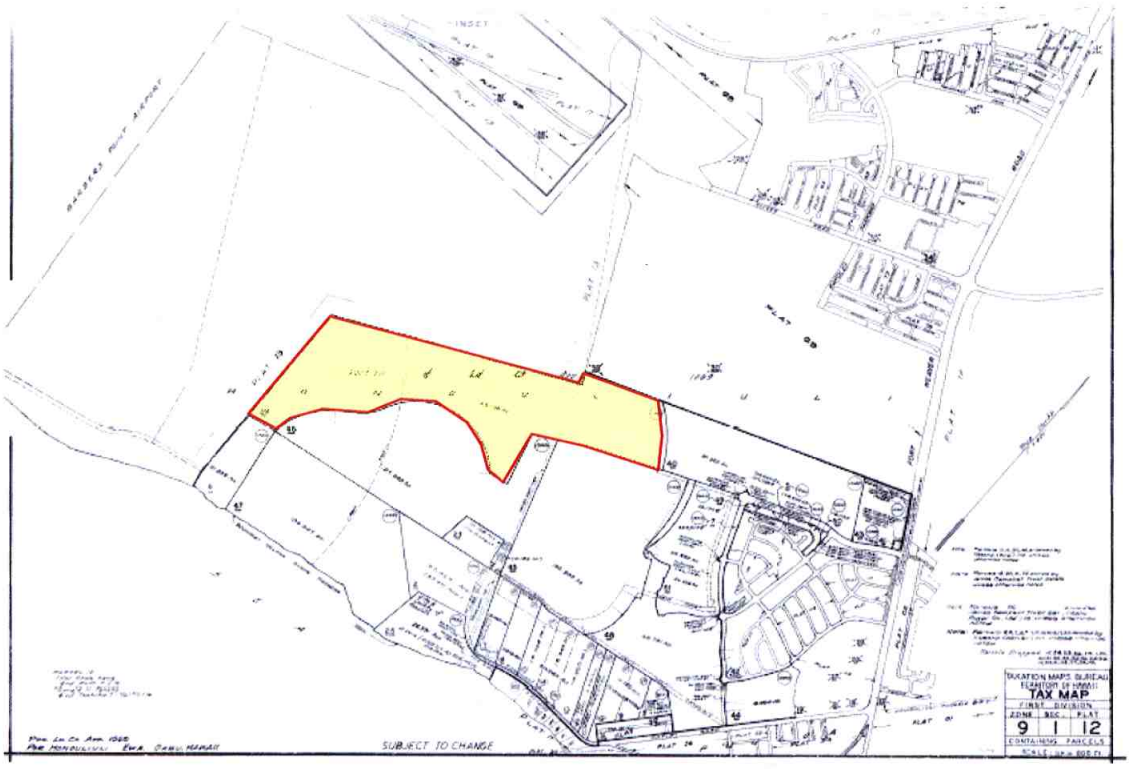
Aquifer Status Code:	3020312112212
Aquifer Sector:	Pearl Harbor
Aquifer System:	Waipahu
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Ecologically important
Salinity (mg/L Cl-):	Low (250-1000)
Uniqueness:	Irreplaceable
Vulnerability:	Moderate

Ewa Sugar Mill/Oahu Sugar Company - Coral Wastepit

Category 3

Picture Not Available

TMK Map



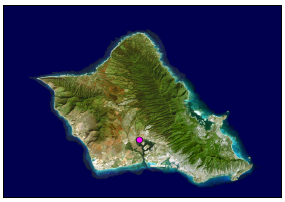
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	0		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile		Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Ewa Sugar/Oahu Sugar Company - Waipio Peninsula



Ewa Sugar/Oahu Sugar Company - Waipio Peninsula

Category 3

Site Description

The entire lower Waipio Peninsula is a United States Naval Reservation, which was leased to Oahu Sugar Company for agricultural purposes (Shimabukuro, 1979). A portion of the site was used by Oahu Sugar Company as their disposal site for cane wash down water and bagasse as well as a Herbicide/Fertilizer Mixing Area. No records on the period of operation were located. The parcel is currently owned by the federal government.

The Ewa/Oahu Sugar Company, Waipio Peninsula site (part of the Pearl Harbor National Priorities List (NPL) site) is on the State Priority List. Cleanup is currently being managed in the Preliminary Assessment/Site Inspection Program by the State of Hawaii Department of Health's (DOH) Office of Hazard Evaluation and Emergency Response (HEER).

The Navy is working with the United States Environmental Protection Agency (EPA) and DOH to expedite response action at the Oahu Sugar Company (OSC) Herbicide/Fertilizer Mixing Area site located at the head of Walker Bay. The primary contaminants are dioxins and furans, a byproduct of the fertilizers stored in the area. OSC is currently under an Administrative Order from DOH to investigate and cleanup the site. EPA has also requested (in writing) that OSC and the Navy construct an interim cap over the contaminated area. OSC is finalizing a work plan for additional sampling at the site (Navy Region Hawaii, 2004b).

The EPA is requiring the OSC to conduct additional site characterization for an interim remedial action (RA). The EPA sent a letter to the Navy and OSC outlining the need to expedite the RA at the site due to elevated dioxin levels in soil. The OSC responded, claiming that the company is not financially capable of funding the interim cleanup. The EPA is currently verifying this claim (Navy Region Hawaii, 2004b).

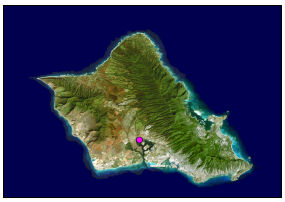
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	9-3-002:001
2362339.48088	605090.53866	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Waipio
157 59 11	21 21 36	**Plat:**	Not Designated
Address:	65 Waipio Point Access Road	**Quadrangle:**	Waipahu

Ownership

Current Owner: United States government (U.S. Military Reservation)

Previous Operator: Ewa Sugar Company/Oahu Sugar Company



Ewa Sugar/Oahu Sugar Company - Waipio Peninsula

Category 3

Site Operation and History

Landfill Type: Agricultural

Type of Waste: Plantation refuse

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	Unknown	**EPA ID No.:**	HISFN0905537
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	No Further Response Action Planned
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Agricultural

City and County Zoning: Ag-2, F-1

State Land Use District: Agricultural, Conservation, Urban

Facilities: --

TMK Separation: Military

Flood Zone: D - Undetermined but possible flood hazards, X - 500-year Flood Plain

Geography and Topography

Physiographic Province: Coastal Plain

Elevation Range (ft): 120 **to** 140

Approximate Landfill Acreage: 5-10

Parcel Acreage: 195.887

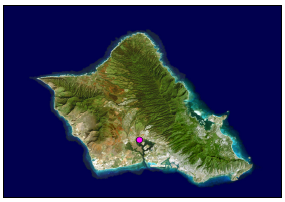
Climate

Annual Precipitation (cm): 49.40

Precipitation Days Per Year 30

Average Temperature (°F): 76.0

Temperature Range (° F): 67.4 **to** 84.5



Ewa Sugar/Oahu Sugar Company - Waipio Peninsula

Category 3

Soils

Soil Map Symbol:	MuB	**Bulk Density (gm/cc):**	1.10-1.35
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Molokai	**Organic Carbon (%):**	1.0-4.0
Engineering Classification:	Silty Clay Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	3-7
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.8
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	rRK	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Rock land	**Moisture Retention (%):**	0.12-0.16
Soil Series:	Rock Land	**Organic Carbon (%):**	3.0-6.0
Engineering Classification:	Silty Clay Loam, Unweathered Bedrock	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Very poor	**Slope (%):**	>15
Thickness of Surface Soil (in):	0-8	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Geology

Geologic Symbol(s): Tkb

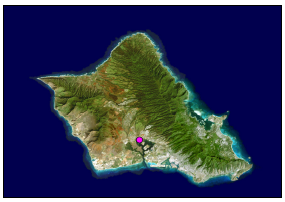
Geologic Unit(s): Koolau volcanic series

Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.

Geologic Symbol(s): Ra

Geologic Unit(s): Unconsolidated noncalcareous deposits

Geologic Description: Chiefly younger alluvium, a black to brown fluviatile deposit generally consisting of coarse permeable detritus only slightly weathered and in many places subangular. In the valley bottoms near the sea it usually consists of nearly impermeable black, sticky mud called taro-patch clay. Much of the younger alluvium is reworked older alluvium. Included also is talus composed of angular blocks, usually with brown interstitial soil, forming aprons on the steep slopes at the base of cliffs. In the mountain areas much of the younger alluvium resembles, includes, and is often inseparable from landslide deposits, because of the torrential character of the streams and the precipitous valley walls. Extensive mantles of hill wash are included. Wells develop water from it in small quantities.



Ewa Sugar/Oahu Sugar Company - Waipio Peninsula

Category 3

Hydrogeology

Rock Type:	Alluvium-younger
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to low
Hydraulic Conductivity (ft/d):	1 - 500

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3020311612211
Aquifer Sector:	Pearl Harbor
Aquifer System:	Waipahu
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Currently used
Utility:	Ecologically important
Salinity (mg/L Cl-):	Low (250-1000)
Uniqueness:	Irreplaceable
Vulnerability:	High

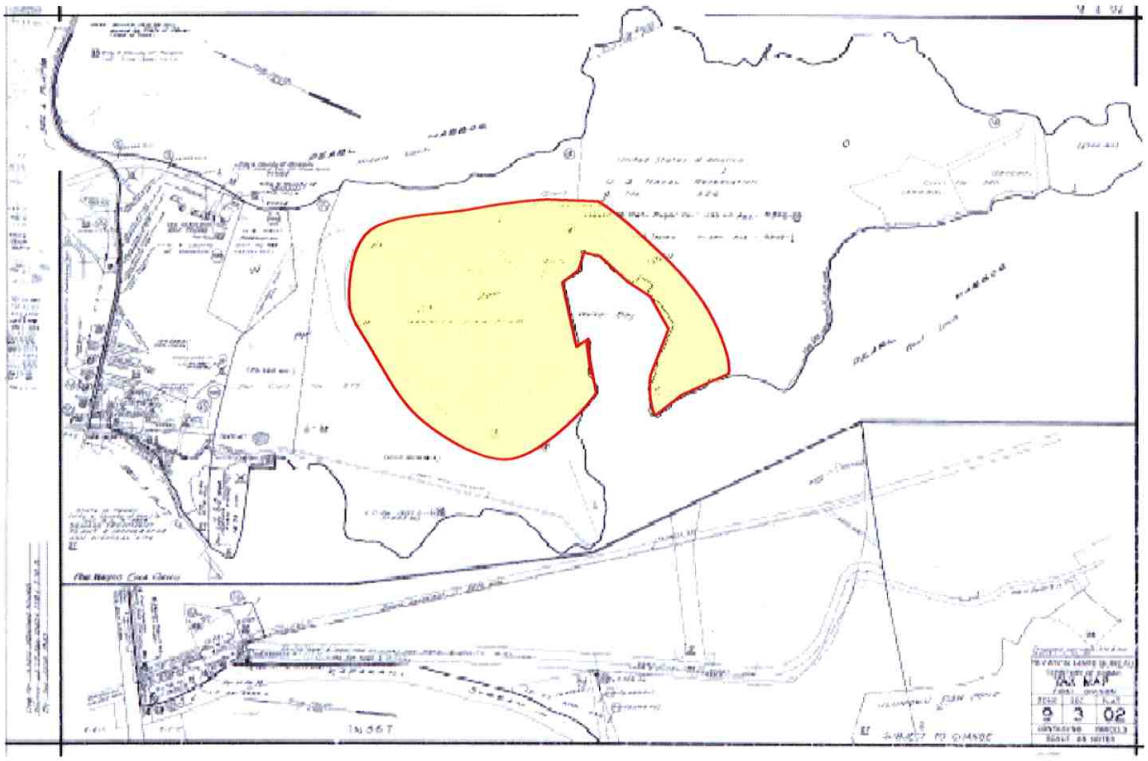
Lower Aquifer

Aquifer Status Code:	3020312112212
Aquifer Sector:	Pearl Harbor
Aquifer System:	Waipahu
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Ecologically important
Salinity (mg/L Cl-):	Low (250-1000)
Uniqueness:	Irreplaceable
Vulnerability:	Moderate

Ewa Sugar/Oahu Sugar Company - Waipio Peninsula

Category 3

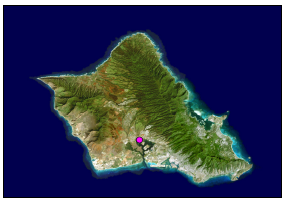
TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	61		
Municipal Well(s)within one mile	4	**Observation Well(s)within one mile**	3
BWS Well(s) within one mile	4	**Sealed Well(s)within one mile**	2
Domestic Well(s)within one mile	19	**Unused Well(s) within one mile**	20
Irrigation Well(s)within one mile	10	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	0



Ewa Sugar/Oahu Sugar Company - Waipio Peninsula

Category 3

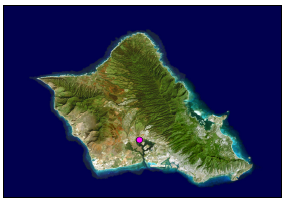
Well Details

USGS Well Number	2358-30	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	11
Well Owner	Sakamoto E M	**Well Depth (feet bgs)**	103
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-92
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	15.2
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	19
Drilling Method	--		
Year of Construction	1953		

USGS Well Number	2359-11	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	30
Well Owner	Kobashigawa K	**Well Depth (feet bgs)**	130
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-100
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	19.8
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1954		

USGS Well Number	2359-13	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	8
Well Owner	Nishida I	**Well Depth (feet bgs)**	130
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-122
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	19
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1955		

USGS Well Number	2359-18	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	24
Well Owner	Jiminez E	**Well Depth (feet bgs)**	126
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-102
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1959		



Ewa Sugar/Oahu Sugar Company - Waipio Peninsula

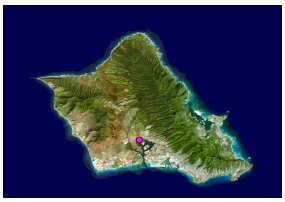
Category 3

USGS Well Number	2459-25	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	21
Well Owner	Cabitac R M	**Well Depth (feet bgs)**	100
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-79
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	0
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	30
Drilling Method	--		
Year of Construction	1977		

USGS Well Number	2459-24	**Aquifer**	30202
Well Name	Waipio Hts. I-4	**Elevation of Ground Surface (ft amsl)**	200
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	315
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-115
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	15.57
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1050
Drilling Method	Percussion		
Year of Construction	1977		

USGS Well Number	2459-23	**Aquifer**	30202
Well Name	Waipio Hts. I-3	**Elevation of Ground Surface (ft amsl)**	200
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	325
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-125
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	14.56
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1050
Drilling Method	Percussion		
Year of Construction	1977		

USGS Well Number	2459-22	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	
Well Owner	Alipio S A	**Well Depth (feet bgs)**	114
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1979		



Ewa Sugar/Oahu Sugar Company - Waipio Peninsula

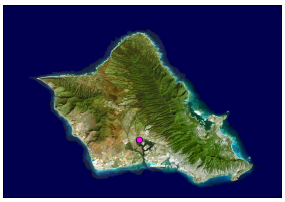
Category 3

USGS Well Number	2459-20	**Aquifer**	30202
Well Name	Waipio Hts 1	**Elevation of Ground Surface (ft amsl)**	202
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	337
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-135
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	16.9
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1500
Drilling Method	Rotary		
Year of Construction	1964		

USGS Well Number	2459-17	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	19
Well Owner	Gora G	**Well Depth (feet bgs)**	142
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-123
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	22
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1957		

USGS Well Number	2459-19	**Aquifer**	30202
Well Name	Waipio Hts 2	**Elevation of Ground Surface (ft amsl)**	202
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	337
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-135
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	16.9
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1500
Drilling Method	Rotary		
Year of Construction	1964		

USGS Well Number	2358-24	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	23
Well Owner	Taba S	**Well Depth (feet bgs)**	120
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-97
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	16.7
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1949		



Ewa Sugar/Oahu Sugar Company - Waipio Peninsula

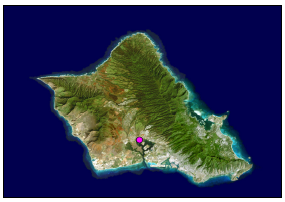
Category 3

USGS Well Number	2358-45	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	38
Well Owner	Gora G	**Well Depth (feet bgs)**	101
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-63
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	16
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1967		

USGS Well Number	2358-36	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	13
Well Owner	Sakai K	**Well Depth (feet bgs)**	102
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-89
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	15.08
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	20
Drilling Method	--		
Year of Construction	1954		

USGS Well Number	2358-38	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	12
Well Owner	Gora G	**Well Depth (feet bgs)**	100
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-88
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	17.64
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1955		

USGS Well Number	2358-40	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	18
Well Owner	Nakama W T	**Well Depth (feet bgs)**	119
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-101
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	14.34
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1957		



Ewa Sugar/Oahu Sugar Company - Waipio Peninsula

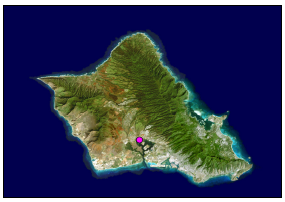
Category 3

USGS Well Number	2358-43	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	25
Well Owner	Kini A	**Well Depth (feet bgs)**	30
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-5
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1959		

USGS Well Number	2359-10	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	23
Well Owner	Gora G	**Well Depth (feet bgs)**	100
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-77
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	14.28
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1954		

USGS Well Number	2358-52	**Aquifer**	30202
Well Name	Waiawa-Gendrano	**Elevation of Ground Surface (ft amsl)**	15
Well Owner	Crabbe F & J	**Well Depth (feet bgs)**	75
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-60
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	20
Drilling Method	Percussion		
Year of Construction	1990		

USGS Well Number	2358-50	**Aquifer**	30202
Well Name	Waiawa	**Elevation of Ground Surface (ft amsl)**	38
Well Owner	Young K P	**Well Depth (feet bgs)**	80
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-42
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	Percussion		
Year of Construction	1985		



Ewa Sugar/Oahu Sugar Company - Waipio Peninsula

Category 3

USGS Well Number	2358-49	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	21
Well Owner	Nazarene Chrch	**Well Depth (feet bgs)**	125
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-104
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	14.3
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	45
Drilling Method	Rotary		
Year of Construction	1976		

USGS Well Number	2358-47	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	35
Well Owner	Alipio Sos	**Well Depth (feet bgs)**	141
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-106
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1967		

USGS Well Number	2459-18	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	22
Well Owner	Kawano H T	**Well Depth (feet bgs)**	185
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-163
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1963		

Ford Island Dump

Source: R.M. Towill Corporation

12-14-73

URS

Title **Aerial Photograph – Vicinity of Ford Island**

Project **Oahu Inactive Landfills Relative Risk Evaluation**

Project No. 26536686.00300

Ford Island Dump

Category 3

Site Description

The Ford Island Dump is located on the extreme southwestern end of Ford Island at the end of a runway. Ford Island is part of the Pearl Harbor Naval Complex and is located in Pearl Harbor, 0.4 miles to the southeast of the Pearl City Peninsula and 0.4 miles to the east of the Waipio Peninsula. The property where the dump is located is currently owned by the United States Navy (Navy).

The 4.4-acre unlined dump was operated by the Navy for various waste streams on Ford Island, including the Naval Air Station aircraft and vehicle maintenance shops. According to the State of Hawaii Department of Health (DOH) 1998 report, this site was used for burning and disposal of solid wastes from the 1930s through the 1960s. There are three types of materials that appear to make up Ford Island Dump/Landfill wastes: construction-related debris, domestic refuse, and incineration residues (Ogden, 1997). Historical evidence indicates that the landfill extends into Pearl Harbor. Ash discovered below the water table near the current landfill shoreline suggests that incinerated wastes were dumped into Pearl Harbor. Landfill waste begins approximately 40 feet southwest of Wasp Boulevard and extends to Pearl Harbor. Waste thickness ranges from 4 to 9 feet in the inland portion of the landfill to approximately 14 feet at the landfill shoreline. Assuming wastes cover approximately 88 percent of the landfill and that waste thickness varies linearly from zero to 14 feet at the landfill shoreline, the estimated total volume of waste material in the landfill is 43,500 cubic yards (Ogden, 1997).

Bulk waste disposal activities were continued until 1982, when the Navy discontinued dumping at the landfill and covered approximately 80 percent of the landfill with a layer of soil. Onsite surveys conducted during the early 1990s described construction rubble and metallic debris protruding through the cover. A Site Investigation revealed contaminant concentrations in the groundwater under the landfill below levels that would pose a threat to Pearl Harbor; however, debris on the surface of the landfill could pose a potential threat to people who may use the landfill in the future for recreation. As a result, a Removal Action involved the construction of a landfill cap and implementation of groundwater monitoring. The cap was completed in December 1996. Ground water monitoring is being performed quarterly.

According to a 2002 DOH report, there have been no significant levels of hazardous substance contamination found in the ground water. Annual monitoring and cap maintenance is into its seventh year. Monitoring reports are routinely submitted to the United States Environmental Protection Agency (EPA) and the DOH. The Navy is currently updating the landfill Monitoring and Maintenance Plan (Navy Region Hawaii, 2004b). Groundwater beneath the landfill exceeds State Surface Water Quality Standards for copper and may require corrective action. Currently, the Navy is in discussions with the EPA and DOH to determine how to proceed (Navy Region Hawaii, 2004b).

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	9-9-001:015
2361973.55217	607342.72997	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Halawa
157 57 37	21 21 49	**Plat:**	Not Designated
Address:	Ford Island, East Loch, Pearl Harbor	**Quadrangle:**	Pearl Harbor

Ownership

Current Owner: U.S. Navy

Previous Operator: U.S. Naval Engineering Service

Ford Island Dump

Category 3

Site Operation and History

Landfill Type: Military

Type of Waste: Construction-related debris, domestic refuse, and incineration residues

Monitoring Well Network? Yes

Monitoring Well Identification MW-1, MW-2, MW-3, MW-4

Status:	Closed	**Analytical Data Available?**	Yes
Active Period:	1930-1980s	**EPA ID No.:**	HI917002434200
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Long-Term Monitoring - Monitored Natural Attenuation
Capped?	Yes (1996)	**Method of Operation:**	Burn and dump
Permit Info:	Undetermined		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Population and Land Use

Type of Development in the Surronding Area? Aircraft Runway

City and County Zoning: F-1

State Land Use District: Urban

Facilities: --

TMK Separation: Military

Flood Zone: D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province: Coastal Plain

Elevation Range (ft): 0 **to** 15

Approximate Landfill Acreage: 4.4

Parcel Acreage: 304.733

Climate

Annual Precipitation (cm): 49.40

Precipitation Days Per Year 30

Average Temperature (°F): 76.0

Temperature Range (° F): 67.4 **to** 84.5

Ford Island Dump

Category 3

Soils

Soil Map Symbol:	CR	**Bulk Density (gm/cc):**	Not available
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	Not available
Soil Series:	Coral Outcrop	**Organic Carbon (%):**	Not available
Engineering Classification:	Coral Outcrop	**Permeability (in/hr):**	Not available
Drainage Characterisitics:	Very poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Not available

Geology

Geologic Symbol(s): Pls

Geologic Unit(s): Consolidated calcareous marine sediments

Geologic Description: Chiefly emerged coral reefs but in places, especially near Pearl Harbor, finely laminated lagoon limestone. Beach deposits resembling the various types of present calcareous beaches in lithified form are included, as well as a few inextensive consolidated beach deposits that may have been formed at the present stand of the sea. Extremely permeable because of primary and secondary cavities and yields water copiously, but the water is apt to be brackish.

Hydrogeology

Rock Type:	Coral-in situ reef limestone
GW Occurrance-Principal:	Basal
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to very high
Hydraulic Conductivity (ft/d):	100 - 20,000

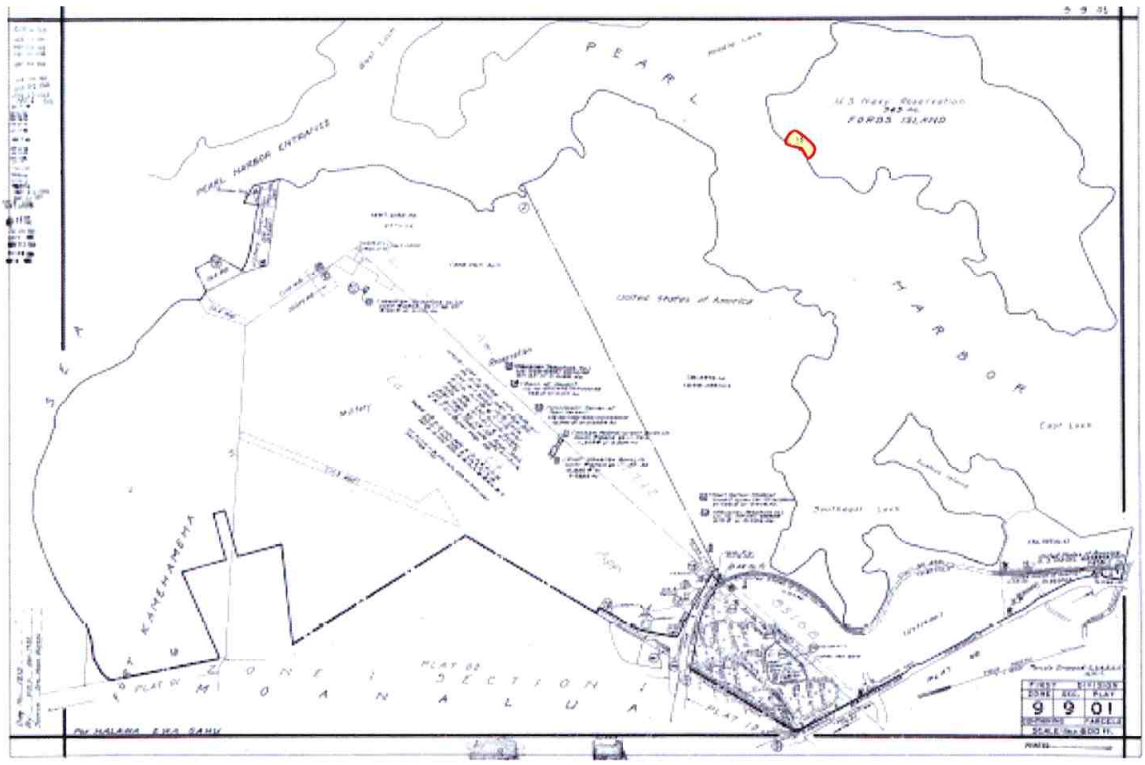
Aquifer(s)

Aquifer Status Code:	Not Applicable
Aquifer Sector:	--
Aquifer System:	--
Aquifer Type 1:	--
Aquifer Type 2:	--
Aquifer Type Geol.:	--
Development State:	--
Utility:	--
Salinity (mg/L Cl-):	--
Uniqueness:	--
Vulnerability:	--

Ford Island Dump

Category 3

TMK Map



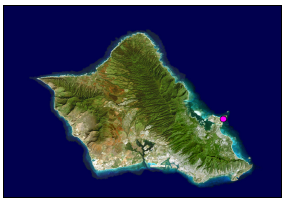
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	10		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	7
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	2
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	1	Other Well(s)within one mile	0

Well Details

Fort Hase/Marine Corp Base Hawaii Landfill



Fort Hase/Marine Corp Base Hawaii Landfill

Category 3

Site Description

The Marine Corp Base Hawaii, operated by the United States Naval Engineering Service, has operated the Fort Hase Cove landfill since 1974. The landfill is located on the eastern side of the Mokapu Peninsula. The landfill is not lined and has no leachate collection system (Parametrix, 1996b). Historic records indicate that the site was first permitted in 1990. Originally, there were two dumping areas; one was capped in 1994 and the uncapped portion still accepts construction and yard waste. The United States government owns the property on which the dump is located.

The landfill is located in the northeastern portion of the Mokapu Peninsula to the north of Fort Hase Cove. The site is bounded on the north by Magazine Road, on the west by an open area adjacent to Daly Road, and on the south by Middaugh Street. The landfill is located to the south of the rifle range. The landfill site is comprised of two general areas. A terraced area occupies the eastern two-thirds of the site and is the existing solid waste disposal area. The western portion of the site, characterized by more irregular ground features, is a borrow area from which topsoil was taken to the landfill to serve as cover material (Marine Corps Base Hawaii (MCBH) Kaneohe Bay Sanitary Landfill, 1995).

A military maintained dump site identified as "Fort Hase" on a 1940's era map (Young, 1993; Map 10) is likely the MCBH Landfill. This map is not of an appropriate scale to definitively determine the site's exact location. Prior to 1951, the site was a portion of Fort Hase. "M.C.A.S. Kaneohe" is identified, as a military open disposal site, on a 1960's era map in the vicinity of the current MCBH Landfill location on Young's Map 31 (1993).

The landfill is approximately 1,500 feet long and varies from 300 to 800 feet wide. Waste are unloaded and spread in long, narrow strips in layers 16 to 30 inches in depth. Each layer is compacted until the height of the compacted waste is 6 to 10 feet high. A 6 to 10 inch layer of soil is placed on the compacted fill each day. Trash such as yard waste, paper products, plastics, metal scraps, and lumber and fill material such as broken concrete, asphalt concrete, earth, etc. are disposed of the landfill (EMC Engineers, 1991). The current permit limits the operating rate to less than 20 tons per day. In addition, the permit authorizes the facility to operate a wood chipping area and a construction/demolition debris storage area.

As previously mentioned, during the summer of 1994 the Naval Facilities Engineering Services Center and Los Alamos National Laboratory installed a demonstration cap over a portion of the landfill. Data was collected on precipitation, runoff, and percolation beginning November 1995 through July 1996. The purpose of the cap is to demonstrate that evapotranspiration caps are viable alternatives to conventional Resource Conservation and Recovery Act covers.

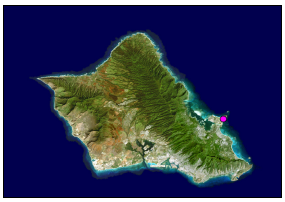
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	4-4-009:003
2372283.17518	631250.88842	**Zone:**	Koolaupoko
Longitude	**Latitude**	**Section:**	Kaneohe
157 44 00	21 26 53	**Plat:**	Ulupau & Kuwaaohe
Address:	Environmental. Branch MCBH, Kaneohe Bay	**Quadrangle:**	Mokapu

Ownership

Current Owner: United States government

Previous Operator: U.S. Naval Engineering Service



Fort Hase/Marine Corp Base Hawaii Landfill

Category 3

Site Operation and History

Landfill Type: Military

Type of Waste: Construction and yard waste currently. A construction/demolition debris storage area for concrete, asphalt concrete and soils.

Monitoring Well Network? Yes

Monitoring Well Identification MW-1, MW-2, MW-3, MW-4, MW-5, MW-6

Status:	Limited use	**Analytical Data Available?**	Yes
Active Period:	1974-present	**EPA ID No.:**	HI917302276200
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Long-Term Monitoring - Monitored Natural Attenuation
Capped?	Yes	**Method of Operation:**	Area fill and cell cover

Permit Info: Permit numbers SW-275293 (Dec. 10, 1990-Dec. 1 1995), LF-0041-95 (Oct. 2. 1995), and current permit LF-0052-02 (Jul. 1, 2003-Jun. 30, 2008). The landfill has been issued permits under Chapter 58 of the Hawaii Administrative Rule (effective Nov. 1981-Oct. 1993) and Chapter 58.1 (effective Oct. 1993 to present).

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Population and Land Use

Type of Development in the Surronding Area? Recreation

City and County Zoning: F-1, P-1

State Land Use District: Conservation, Urban

Facilities: --

TMK Separation: Military

Flood Zone: AE - 100-year Flood Plain, D - Undetermined but possible flood hazards, VE - 100-year Flood Plain with velocity hazard (wave action)

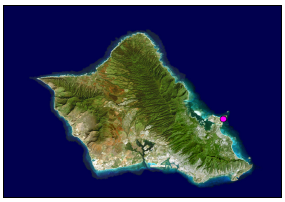
Geography and Topography

Physiographic Province: Koolau Range

Elevation Range (ft): 16 **to** 106

Approximate Landfill Acreage: 27.5

Parcel Acreage: 865.0408



Fort Hase/Marine Corp Base Hawaii Landfill

Category 3

Climate

Annual Precipitation (cm):	193.80
Precipitation Days Per Year	133
Average Temperature (°F):	74.3
Temperature Range (° F):	68.8 **to** 79.8

Soils

Soil Map Symbol:	MdB	**Bulk Density (gm/cc):**	1.10-1.40
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Makalapa	**Organic Carbon (%):**	0.5-2.0
Engineering Classification:	Clay	**Permeability (in/hr):**	0.0000-0.1
Drainage Characterisitics:	Very poor	**Slope (%):**	2-6
Thickness of Surface Soil (in):	0-38	**pH:**	7.4-7.8
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	MdC	**Bulk Density (gm/cc):**	1.10-1.40
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Makalapa	**Organic Carbon (%):**	0.5-2.0
Engineering Classification:	Clay	**Permeability (in/hr):**	0.0000-0.1
Drainage Characterisitics:	Very poor	**Slope (%):**	6-12
Thickness of Surface Soil (in):	0-38	**pH:**	7.4-7.8
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

Geologic Symbol(s): Pls

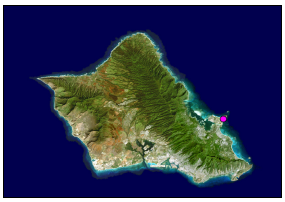
Geologic Unit(s): Consolidated calcareous marine sediments

Geologic Description: Chiefly emerged coral reefs but in places, especially near Pearl Harbor, finely laminated lagoon limestone. Beach deposits resembling the various types of present calcareous beaches in lithified form are included, as well as a few inextensive consolidated beach deposits that may have been formed at the present stand of the sea. Extremely permeable because of primary and secondary cavities and yields water copiously, but the water is apt to be brackish.

Geologic Symbol(s): Ra

Geologic Unit(s): Unconsolidated noncalcareous deposits

Geologic Description: Chiefly younger alluvium, a black to brown fluviatile deposit generally consisting of coarse permeable detritus only slightly weathered and in many places subangular. In the valley bottoms near the sea it usually consists of nearly impermeable black, sticky mud called taro-patch clay. Much of the younger alluvium is reworked older alluvium. Included also is talus composed of angular blocks, usually with brown interstitial soil, forming aprons on the steep slopes at the base of cliffs. In the mountain areas much of the younger alluvium resembles, includes, and is often inseparable from landslide deposits, because of the torrential character of the streams and the precipitous valley walls. Extensive mantles of hill wash are included. Wells develop water from it in small quantities.



Fort Hase/Marine Corp Base Hawaii Landfill

Category 3

Hydrogeology

Rock Type:	Alluvium-younger
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to low
Hydraulic Conductivity (ft/d):	1 - 500

Rock Type:	Coral-in situ reef limestone
GW Occurrance-Principal:	Basal
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to very high
Hydraulic Conductivity (ft/d):	100 - 20,000

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3060411612211
Aquifer Sector:	Windward
Aquifer System:	Waimanalo
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Currently used
Utility:	Ecologically important
Salinity (mg/L Cl-):	Low (250-1000)
Uniqueness:	Irreplaceable
Vulnerability:	High

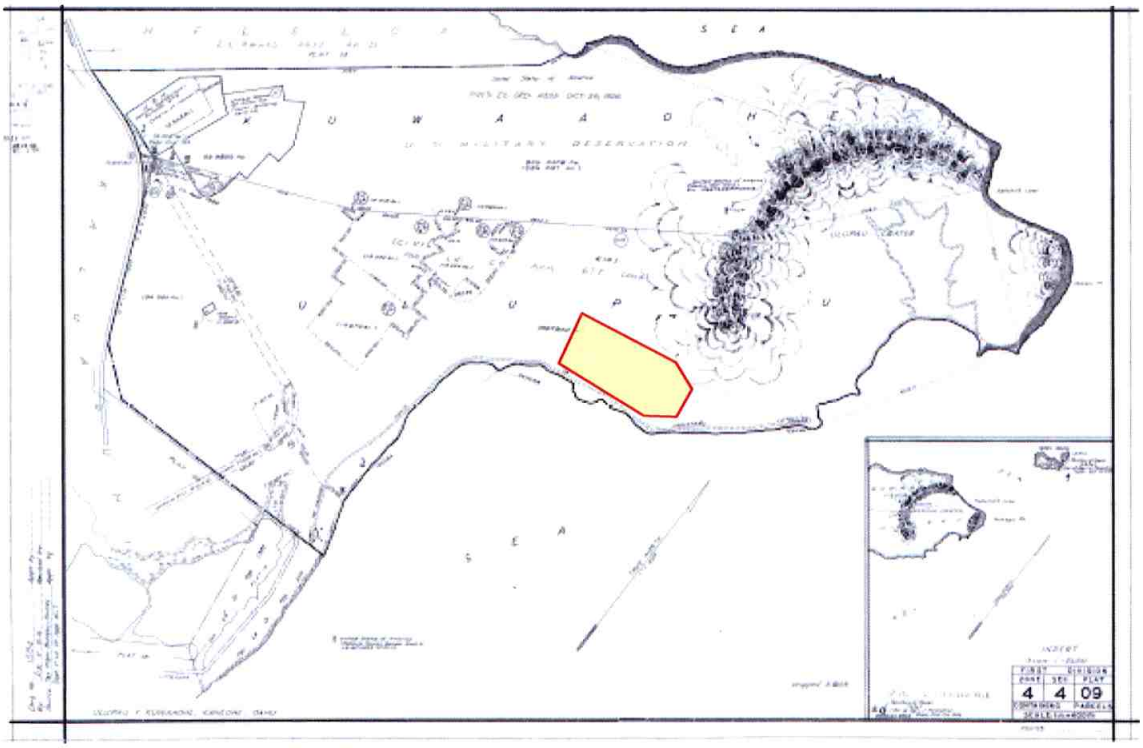
Lower Aquifer

Aquifer Status Code:	3060412211113
Aquifer Sector:	Windward
Aquifer System:	Waimanalo
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Dike
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	Low

Fort Hase/Marine Corp Base Hawaii Landfill

Category 3

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	0		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Fort Kamehameha LF05, Tri-Services Landfill

Fort Kamehameha LF05, Tri-Services Landfill

Category 3

Site Description

The Tri-Services Landfill and is also referred to as Site LF-05. The landfill is located on the southeastern portion of Hickam Air Force Base (AFB) on property that was formerly part of Fort Kamehameha. Fort Kamehameha, which was a sub installation of Fort Shafter, covered approximately 506 acres.

Hickam AFB is bounded on the east by Honolulu International Airport, on the south by the Pacific Ocean (the Reef Runway Lagoon and Mamala Bay), on the west by the Pearl Harbor Entrance Channel, and on the north by the Pearl Harbor Naval Complex. The United States Army acquired the area encompassing Fort Kamehameha in 1907. The area was mostly marshlands and fill material that was brought in from the dredging of Pearl Harbor. On March 14, 1993, Fort Kamehameha was transferred from the Department of Army to the Department of the Air Force (CH2M Hill, 1998). The United States Army and the United States Air Force performed an Interservice Transfer of Real Property that involved a swap of Fort Kamehameha Military Reservation and Wheeler AFB.

The landfill operated from 1950 to 1965 and was used by the United States Air Force, Army, and Navy; hence the name Tri-Services Landfill. The landfill lies under present-day Mamala Bay Golf Course. The former landfill is located to the south of Worchester Avenue and to the northeast of Hickam Harbor. At its peak, the landfill received about 55,000 tons of waste per year, much of which was burned. The Air Force designed and built a golf course over and around the landfill (CH2M Hill, 2003). Approximately 1,000,000 cubic yards of landfilled materials are buried beneath a thin (and in a few locations, absent) vegetated soil cover at the golf course. According to a 1964 United States Public Health Report (Wiley, 1964), following the consolidation of landfill waste in preparation for construction of the golf course, the landfill was situated on approximately 93 acres of land. Based on geophysical data, the total area of the landfill debris is approximately 51 acres. The golf course, a driving range, a clubhouse, golf course maintenance facilities, and a restaurant are now in operation at the former landfill location (CH2M Hill, 2003).

According to the Wiley report, disposal operations consisted of daily land filling and periodic burning of waste. At intervals of two or more weeks, small amounts of crushed coral fill material was spread over the waste and the ash. Occasionally, waste oil was spread over the fill material to aid in burning and for dust suppression. The landfill was unlined.

The refuse in the landfill is primarily composed of roofing material, lumber, metals, cans, glass bottles, trimmings, paper, construction rubble, and municipal garbage. Although hazardous waste was not specifically prohibited at the landfill, it is known that at least some hazardous waste was disposed of at the landfill in the form of bottles containing pure solvents, which were discovered during the Remedial Investigation. The bottles and other materials buried in the landfill have contaminated the subsurface soil and shallow groundwater at the former landfill site (CH2M Hill, 2003).

Hickam AFB participated in the Installation Restoration Program (IRP), a specially funded program established by the Department of Defense (DoD) to identify, investigate, and control the migration of hazardous contaminants at military and other DoD facilities. According to an IRP, Stage 3, Remedial Investigation/Feasibility Study (RI/FS) Draft Work Plan dated July 1991, the landfill is 20 to 30 feet deep.

According to the United States Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database, the landfill's "Discovery" was completed on June 1, 1981. An IRP Phase I Records Search was conducted during 1983. An IRP Phase II Stage 1 Investigation was completed in 1986. An IRP Phase II Stage 2 Investigation was completed in 1990. An IRP Phase II Stage 3 Investigation was performed at the site in 1992-1993. An Engineering Evaluation/Cost Analysis (EE/CA) was originally planned for the site but based on the findings, the EE/CA was converted to a RI/FS Study project. Long-term groundwater monitoring was performed at the site from 1992 through 1997 as a

continuation of the RI/FS process. The Feasibility Study is being performed to address the risks posed by the site (CH2M Hill, 2003).

Fort Kamehameha LF05, Tri-Services Landfill

Category 3

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	1-1-001:001
2357613.08310	609922.62853	**Zone:**	Honolulu
Longitude	**Latitude**	**Section:**	Moanalua
157 56 24	21 19 01	**Plat:**	Not Designated
Address: Hickam AFB		**Quadrangle:**	Pearl Harbor

Ownership

Current Owner: U.S. Air Force

Previous Operator: Military (used by U.S. Air Force, Army, and Navy)

Site Operation and History

Landfill Type: Military

Type of Waste: roofing material, lumber, metals, cans, glass bottles, trimmings, paper, construction rubble, and municipal garbage, 4,548 liters per year of liquid waste including petroleum/oil/lubricants, solvents, photo wastes, acids, detergents, bleach, waste oil, etc.

Monitoring Well Network? Yes

Monitoring Well Identification MW-5, MW-6, MW-7, MW-8

Status:	Not active	**Analytical Data Available?**	Yes
Active Period:	1950-1965	**EPA ID No.:**	HI8570090011, HI3210022205, HI921452220500
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	No Further Response Action Planned
Capped?	Earth cover	**Method of Operation:**	Dig and fill

Permit Info: U.S. EPA referenced; no Hawaii permit on record

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Fort Kamehameha LF05, Tri-Services Landfill

Category 3

Population and Land Use

Type of Development in the Surronding Area?	Recreation
City and County Zoning:	F-1
State Land Use District:	Urban
Facilities:	Golf course currently occupies the former dump area
TMK Separation:	No data available
Flood Zone:	A - 100-year Flood Plain, D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province:	Coastal Plain
Elevation Range (ft):	0 **to** 12
Approximate Landfill Acreage:	93
Parcel Acreage:	Not applicable

Climate

Annual Precipitation (cm):	52.20
Precipitation Days Per Year	31
Average Temperature (°F):	77.1
Temperature Range (° F):	70.2 **to** 84.0

Soils

Soil Map Symbol:	FL	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.06-0.12
Soil Series:	Fill Land, Mixed	**Organic Carbon (%):**	0.1-5.0
Engineering Classification:	Fill Land, Mixed	**Permeability (in/hr):**	0.1-2
Drainage Characterisitics:	Poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	W	**Bulk Density (gm/cc):**	Not available
Soil Association:	Not Applicable	**Moisture Retention (%):**	Not available
Soil Series:	Water	**Organic Carbon (%):**	Not available
Engineering Classification:	Water	**Permeability (in/hr):**	Not available
Drainage Characterisitics:	Not available	**Slope (%):**	--
Thickness of Surface Soil (in):	Not available	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Not available

Fort Kamehameha LF05, Tri-Services Landfill

Category 3

Geology

Geologic Symbol(s): Rs

Geologic Unit(s): Unconsolidated marine calcareous sediments

Geologic Description: Chiefly cream-colored and light-tan, very permeable beach sand consisting of grains of worn coral, coralline algae, and shells with appreciable amounts of foraminifers and other calcareous marine organisms. Abundant water in this sand, but it is either brackish or ocean water.

Hydrogeology

Rock Type:	Sand-unconsolidated
GW Occurrance-Principal:	Basal
GW Occurrance-Secondary:	--
Permeability:	Moderate to high
Hydraulic Conductivity (ft/d):	100 - 1,000

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3010411623321
Aquifer Sector:	Honolulu
Aquifer System:	Moanalua
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Potential use
Utility:	Neither
Salinity (mg/L Cl-):	Moderate (1,000-5,000)
Uniqueness:	Replaceable
Vulnerability:	High

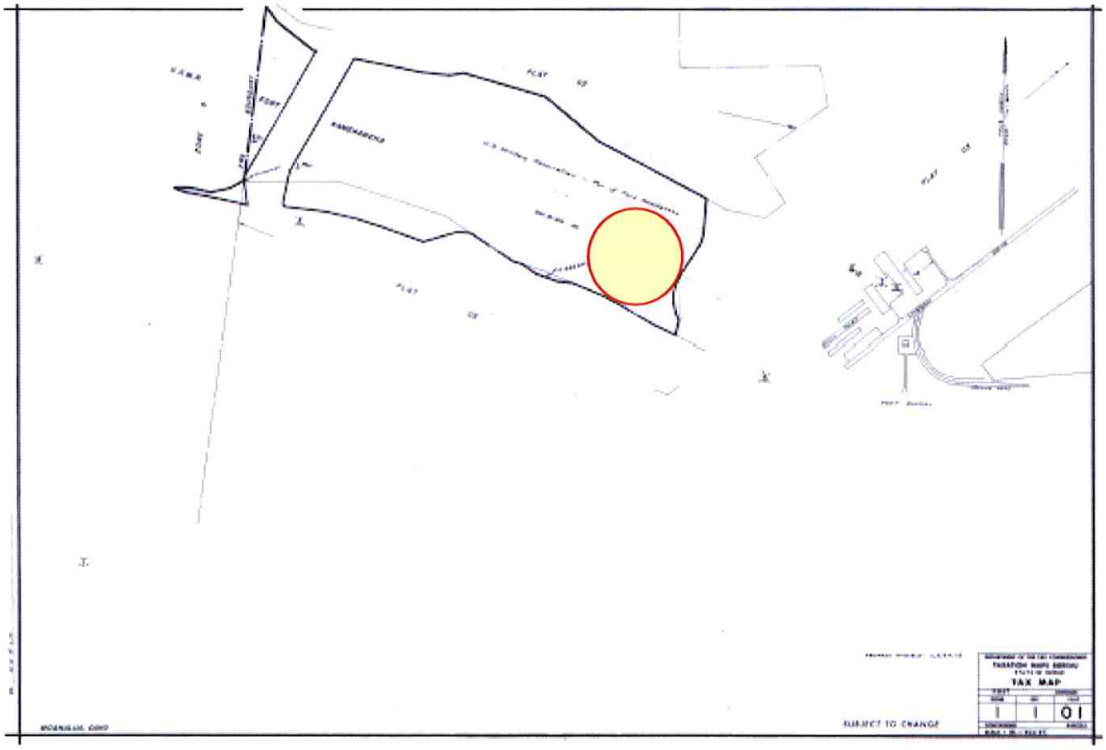
Lower Aquifer

Aquifer Status Code:	3010412111113
Aquifer Sector:	Honolulu
Aquifer System:	Moanalua
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	Low

Fort Kamehameha LF05, Tri-Services Landfill

Category 3

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	0		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Fort Shafter Dump

Source: R.M. Towill Corporation

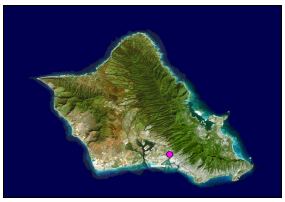
02-06-68

URS

Title **Aerial Photograph – Vicinity of Fort Shafter**

Project **Oahu Inactive Landfills Relative Risk Evaluation**

Project No. 26536686.00300



Fort Shafter Dump

Category 2

Site Description

Fort Shafter Dump, operated by the United States Army, was used to dispose of mixed waste. The site is situated within the boundaries of the Fort Shafter Military Post, which is located to the west of Honolulu. The landfill is located on an area of the base know as Fort Shafter Flats, to the east of Moanalua Stream, to the north of Nimitz Highway (0.4 mile), and to the southwest of H-1 Freeway (0.3 mile). The site is triangular in shape: one side is bounded by Moanalua Canal, and the other two sides are fenced. The site covers approximately 3.2 acres and was likely a surficial dumping operation (Dames and Moore, 1994). The United States Army currently owns the property on which the dump is located.

Open dumping reportedly began in the 1960s. The exact date on which the site was first used for dumping is unknown, but a review of aerial photographs indicated that the site was used for this purpose since at least 1975.

With the exception of refuse piles (made up of construction/ demolition debris, soil, and vegetation) the general topography of the area is flat. The refuse piles vary in height from approximately 2 to 15 feet high. In 1991 a 20,000 square foot area was bermed on the northern portion of the site. The bermed area was plastic-lined (40 mm plastic) and used for storing soil potentially impacted with petroleum. The structural integrity of the liner beneath the soil storage area is unknown. Drums observed on site in 1994 were in deteriorated condition, were partially buried beneath soil, and had no identifying labels.

According to the United States Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database, the dump's "Discovery" was completed in February 1985. A September, 1987 Preliminary Assessment from United States EPA Region IX to Fort Shafter indicates, "Between 1960 and 1973 (approximate dates), lab wastes, waste oils, and solvents were disposed of in a 0.2 hectares landfill at Tripler Army Medical Center (TAMC)". The report also notes "[t]his landfill is located on the border of Monanalua Stream." The subject landfill appears to be the Fort Shafter Dump.

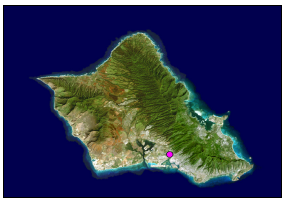
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	1-1-008:005
2360361.66298	614710.55180	**Zone:**	Honolulu
Longitude	**Latitude**	**Section:**	Moanalua
157 53 37	21 20 29	**Plat:**	Not Designated
Address:	U.S. Army Support Command, Ft. Shafter	**Quadrangle:**	Honolulu

Ownership

Current Owner: United States government

Previous Operator: U.S. Army



Fort Shafter Dump

Category 2

Site Operation and History

Landfill Type: Military

Type of Waste: Mixed, including petroleum contaminated soils

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Unknown	**Analytical Data Available?**	No data was located
Active Period:	1960s-?	**EPA ID No.:**	HI6214522207, HI9214522220700
Lined?	Partially - A 20,000 square foot, bermed, plastic-lined (40 mm plastic), area on the northern portion of the site was used for storing petroleum-impacted soil.	**Non-NPL status:**	Site Inspection Start Needed
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Surficial dumping and temporary storage
Permit Info:	Undetermined		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area?

City and County Zoning: F-1, P-1

State Land Use District: Conservation, urban

Facilities: --

TMK Separation: Military

Flood Zone: A - 100-year Flood Plain, D - Undetermined but possible flood hazards, X - 500-year Flood Plain

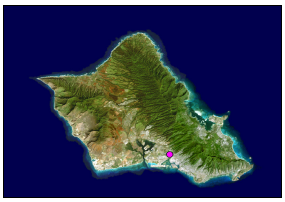
Geography and Topography

Physiographic Province: Coastal Plain

Elevation Range (ft): 0 **to** 5

Approximate Landfill Acreage: 3.2

Parcel Acreage: 473 (TMK parcel)



Fort Shafter Dump

Category 2

Climate

Annual Precipitation (cm):	52.20
Precipitation Days Per Year	31
Average Temperature (°F):	77.1
Temperature Range (° F):	70.2 **to** 84.0

Soils

Soil Map Symbol:	FL	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.06-0.12
Soil Series:	Fill Land, Mixed	**Organic Carbon (%):**	0.1-5.0
Engineering Classification:	Fill Land, Mixed	**Permeability (in/hr):**	0.1-2
Drainage Characterisitics:	Poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	W	**Bulk Density (gm/cc):**	Not available
Soil Association:	Not Applicable	**Moisture Retention (%):**	Not available
Soil Series:	Water	**Organic Carbon (%):**	Not available
Engineering Classification:	Water	**Permeability (in/hr):**	Not available
Drainage Characterisitics:	Not available	**Slope (%):**	--
Thickness of Surface Soil (in):	Not available	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Not available

Geology

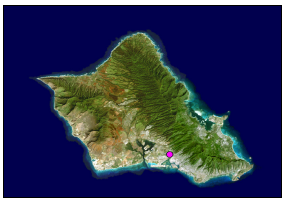
Geologic Symbol(s): Ra

Geologic Unit(s): Unconsolidated noncalcareous deposits

Geologic Description: Chiefly younger alluvium, a black to brown fluviatile deposit generally consisting of coarse permeable detritus only slightly weathered and in many places subangular. In the valley bottoms near the sea it usually consists of nearly impermeable black, sticky mud called taro-patch clay. Much of the younger alluvium is reworked older alluvium. Included also is talus composed of angular blocks, usually with brown interstitial soil, forming aprons on the steep slopes at the base of cliffs. In the mountain areas much of the younger alluvium resembles, includes, and is often inseparable from landslide deposits, because of the torrential character of the streams and the precipitous valley walls. Extensive mantles of hill wash are included. Wells develop water from it in small quantities.

Hydrogeology

Rock Type:	Alluvium-younger
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to low
Hydraulic Conductivity (ft/d):	1 - 500



Fort Shafter Dump

Category 2

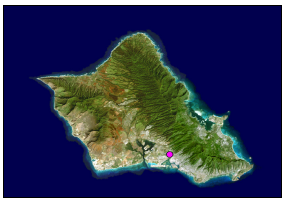
Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3010411623321
Aquifer Sector:	Honolulu
Aquifer System:	Moanalua
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Potential use
Utility:	Neither
Salinity (mg/L Cl-):	Moderate (1,000-5,000)
Uniqueness:	Replaceable
Vulnerability:	High

Lower Aquifer

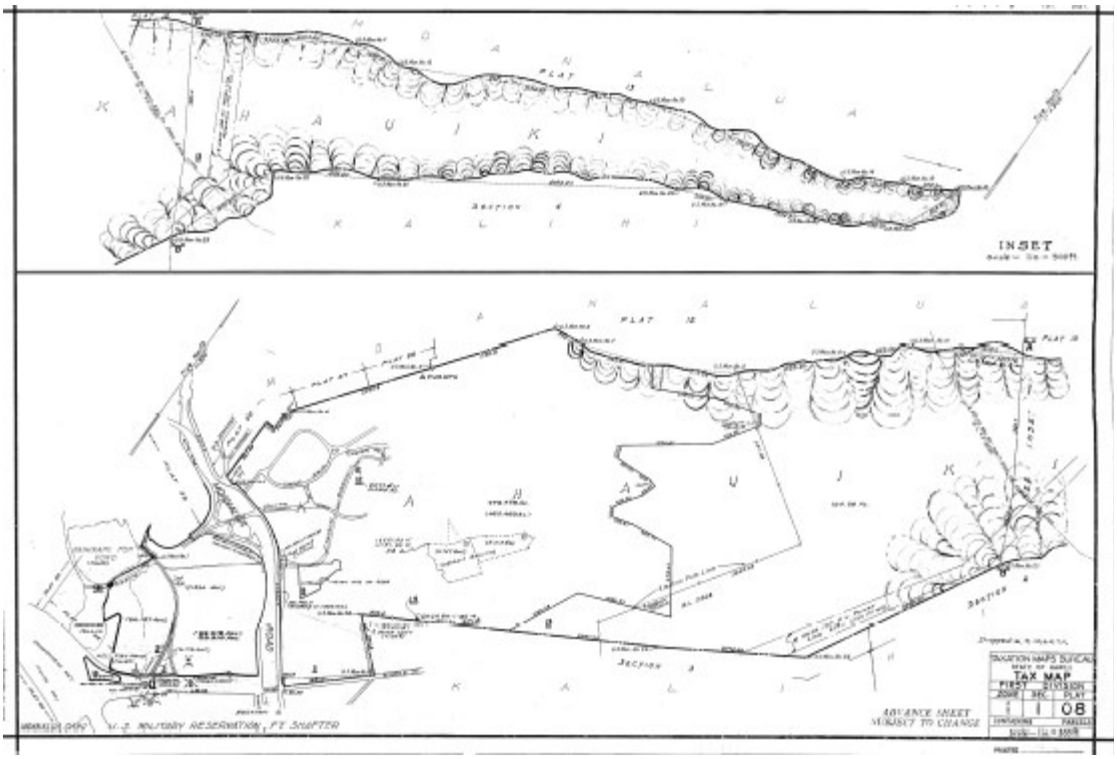
Aquifer Status Code:	3010412111113
Aquifer Sector:	Honolulu
Aquifer System:	Moanalua
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	Low



Fort Shafter Dump

Category 2

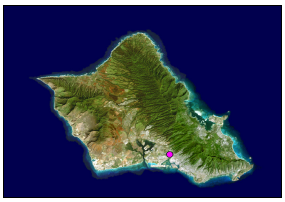
TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	28		
Municipal Well(s)within one mile	3	Observation Well(s)within one mile	2
BWS Well(s) within one mile	3	Sealed Well(s)within one mile	15
Domestic Well(s)within one mile	4	Unused Well(s) within one mile	2
Irrigation Well(s)within one mile	2	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0



Fort Shafter Dump

Category 2

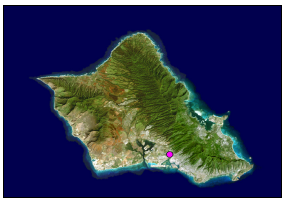
Well Details

USGS Well Number	2153-07	**Aquifer**	30104
Well Name	Moanalua	**Elevation of Ground Surface (ft amsl)**	30
Well Owner	U S Army	**Well Depth (feet bgs)**	302
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-272
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	21.2
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1300
Drilling Method	--		
Year of Construction	1945		

USGS Well Number	2153-08	**Aquifer**	30104
Well Name	Moanalua	**Elevation of Ground Surface (ft amsl)**	29
Well Owner	U S Army	**Well Depth (feet bgs)**	306
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-277
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	21.4
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1300
Drilling Method	--		
Year of Construction	1945		

USGS Well Number	2153-10	**Aquifer**	30104
Well Name	Moanalua 1	**Elevation of Ground Surface (ft amsl)**	36
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	300
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-264
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1400
Drilling Method	Rotary		
Year of Construction	1973		

USGS Well Number	2153-11	**Aquifer**	30104
Well Name	Moanalua 2	**Elevation of Ground Surface (ft amsl)**	35
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	300
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-265
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	18.58
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1400
Drilling Method	Rotary		
Year of Construction	1973		



Fort Shafter Dump

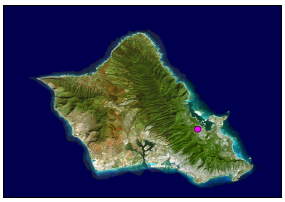
Category 2

USGS Well Number	2153-12	**Aquifer**	30104
Well Name	Moanalua 3	**Elevation of Ground Surface (ft amsl)**	35
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	335
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-300
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	18.4
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1400
Drilling Method	Rotary		
Year of Construction	1974		

USGS Well Number	2053-13	**Aquifer**	
Well Name	Fort Shafter	**Elevation of Ground Surface (ft amsl)**	20
Well Owner	U S Army	**Well Depth (feet bgs)**	290
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-270
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	19.8
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1100
Drilling Method	Percussion		
Year of Construction	1995		

USGS Well Number	2053-11	**Aquifer**	30104
Well Name	Ft Shafter	**Elevation of Ground Surface (ft amsl)**	21
Well Owner	U S Army	**Well Depth (feet bgs)**	330
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-309
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1960		

Haiku Dump



Haiku Dump

Category 3

Site Description

Haiku Dump, operated by the City and County of Honolulu (C&C), was used to dispose of household wastes from 1937-1963 or 1964. There was no documentation found which indicated that the dump was permitted, lined, capped, or properly closed. The burn and dump operation was located in Heeia, Kaneohe. According to Young (1993), the site was located at the top of a small cliff. Burned residue was pushed over the edge of the cliff into a gully.

The former dump was reportedly located between Kamehameha Highway and Kahehili Highway to the north of Windward Community College (0.5 mile) and to the southwest of Kaneohe Bay. The dump is suspected to have been located at the corner of Haiku Road and Heeia Street. The area in the vicinity of the former dump is currently residential and commercial.

According to Bagaoisan (1997), while the dump was operational, approximately 1,200 tons of refuse was deposited per month. The parcels on which the dump is suspected to have been located are currently owned by various individual home owners in a residential subdivision. The Haiku Dump was likely 1-5 acres in size. Haiku Dump may have also been known as Kaneohe Dump. A rural rubbish dump site identified as "Kaneohe" on a 1940's era map (Young, 1993; Map 10) is likely the Haiku Dump. This map is not of an appropriate scale to definitively determine the site's exact location. "Kaneohe (Haiku)" is also identified as a C&C open disposal site on Young's Map 31 (1993).

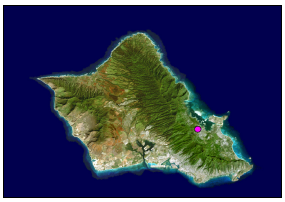
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	4-6-024:017, 018, 073, 074
2368925.03607	623283.22392	**Zone:**	Koolaupoko
Longitude	**Latitude**	**Section:**	Heeia
157 48 37	21 25 06	**Plat:**	Not Designated
Address:	46-219, 46-221, 46-223, Haiku Road, 46-302 Heeia St	**Quadrangle:**	Kaneohe

Ownership

Current Owner: Individual home owners

Previous Operator: City and County of Honolulu



Haiku Dump

Category 3

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1937-1963	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump, twice a week a bulldozer leveled the area and pushes the burn residue into the gully (Bagaoisan, 1997)

Permit Info: None documented

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Population and Land Use

Type of Development in the Surronding Area? Residential

City and County Zoning: R-5 Residential District

State Land Use District: Urban

Facilities: Detached dwellings (1977 x3, 1978)

TMK Separation: Household dwellings

Flood Zone: X - 500-year Flood Plain

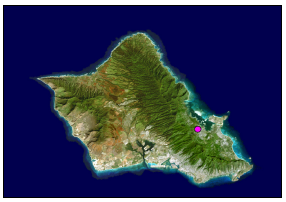
Geography and Topography

Physiographic Province: Koolau Range

Elevation Range (ft): 150 **to** 170

Approximate Landfill Acreage: 1-5

Parcel Acreage: Various



Haiku Dump

Category 3

Climate

Annual Precipitation (cm):	193.80
Precipitation Days Per Year	133
Average Temperature (°F):	74.3
Temperature Range (° F):	68.8 **to** 79.8

Soils

Soil Map Symbol:	LoB	**Bulk Density (gm/cc):**	1.00-1.10
Soil Association:	Tropohumults-Dystrandepts	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Lolekaa	**Organic Carbon (%):**	6.0-7.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	3-8
Thickness of Surface Soil (in):	0-60	**pH:**	4.5-5.5
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

Geologic Symbol(s): Pa

Geologic Unit(s): Consolidated noncalcareous deposits

Geologic Description: Chiefly older alluvium, generally consisting of mottled brown to red-brown, deeply weathered, poorly-assorted, and nearly impermeable friable conglomerates, in places cemented with limonite or hematite and usually forming conspicuous terraces along the principal streams. Near the mouths of the valleys and especially around Pearl Harbor and near Waialua the older alluvium grades into partly consolidated sands and silts that are emerged delta deposits. The degree of consolidation is largely dependent upon the amount of rainfall, for in dry regions the material is much better cemented than in wet regions. Near the heads of valleys the older alluvium grades into coarse angular talus and landslide deposits which, in places, carry considerable water. In the large semiarid valleys in the Waianae Range these deposits are firmly cemented breccias. They are poorly permeable in wet areas and hold up perched water in the Honolulu volcanic series, but in the dry areas they yield small supplies of potable water.

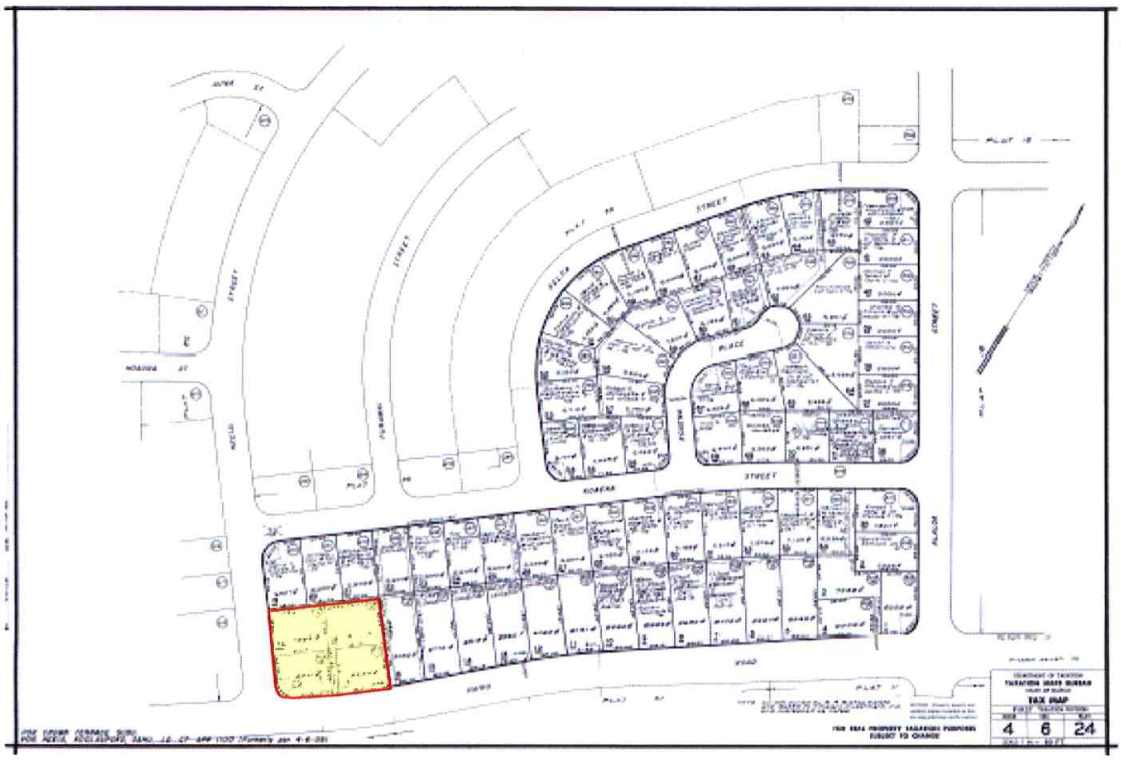
Hydrogeology

Rock Type:	Alluvium-older-consolidated
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Haiku Dump

Category 3

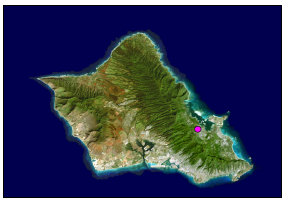
TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	5		
Municipal Well(s)within one mile	2	**Observation Well(s)within one mile**	0
BWS Well(s) within one mile	1	**Sealed Well(s)within one mile**	0
Domestic Well(s)within one mile	0	**Unused Well(s) within one mile**	1
Irrigation Well(s)within one mile	1	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	0



Haiku Dump

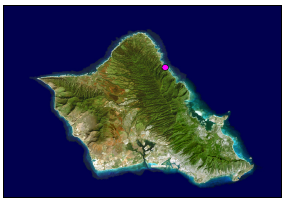
Category 3

Well Details

USGS Well Number	2449-01	**Aquifer**	30603
Well Name	Kaneohe	**Elevation of Ground Surface (ft amsl)**	238
Well Owner	C&C Honolulu	**Well Depth (feet bgs)**	92
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	146
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	170
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1945		

USGS Well Number	2549-01	**Aquifer**	30603
Well Name	Iolekaa	**Elevation of Ground Surface (ft amsl)**	485
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	423
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	62
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	210
Drilling Method	--		
Year of Construction	1966		

Hauula Dump



Hauula Dump

Category 3

Picture Not Available

Site Description

Hauula Dump, which was operated by the City and County of Honolulu (C&C), was used to dispose of household wastes during the 1930s-1940s (Bagaoisan, 1997). There was no documentation found which indicated that the dump was permitted, lined, capped, or properly closed. Hauula Dump was likely a dump and burn operation of less than 1 acre in size. The Hauula Dump was noted as a rural rubbish dump site on a 1940's era map (Young, 1993; Map 10). This map is not of an appropriate scale to definitively determine the site's exact location.

The former dump was reportedly located to the east of the Hauula Homesteads and to the northwest of Sacred Heart State Park (0.6 mile). The lot on which the dump is reported to have been located is at the corner of Halai Road and Hauula Homestead Road. The area in which the dump is suspected to have been located is currently residential.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	5-3-015:001
2389582.15093	613248.61573	**Zone:**	Koolauloa
Longitude	**Latitude**	**Section:**	Makao
157 54 21	21 36 20	**Plat:**	Not Designated
Address:	6 Halai Street	**Quadrangle:**	Hauula

Ownership

Current Owner: Kenneth Lelling

Previous Operator: City and County of Honolulu

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? No wells documented

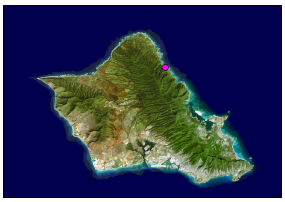
Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1930s-1940s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai



Hauula Dump

Category 3

Picture Not Available

Population and Land Use

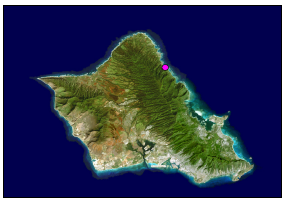
Type of Development in the Surronding Area?	Residential
City and County Zoning:	Country District
State Land Use District:	Agricultural
Facilities:	Detached dwelling (1972)
TMK Separation:	Household dwelling
Flood Zone:	X - 500-year Flood Plain

Geography and Topography

Physiographic Province:	Coastal Plain
Elevation Range (ft):	0 **to** 20
Approximate Landfill Acreage:	1
Parcel Acreage:	Approximately 1

Climate

Annual Precipitation (cm):	138.53
Precipitation Days Per Year	120
Average Temperature (° F):	74.4
Temperature Range (° F):	65.2 **to** 83.5



Hauula Dump

Category 3

Picture Not Available

Soils

Soil Map Symbol:	Ms	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.09-0.12
Soil Series:	Mokuleia	**Organic Carbon (%):**	1.0-2.0
Engineering Classification:	Clay Loam, Loam, or Fine Sandy Loam	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	--
Thickness of Surface Soil (in):	0-50	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	Mt	**Bulk Density (gm/cc):**	1.10-1.30
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.13-0.15
Soil Series:	Mokuleia	**Organic Carbon (%):**	1.0-2.0
Engineering Classification:	Clay Loam, Loam, or Fine Sandy Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	--
Thickness of Surface Soil (in):	0-50	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	JaC	**Bulk Density (gm/cc):**	1.55-1.60
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.04-0.05
Soil Series:	Jaucas	**Organic Carbon (%):**	0.5-1.0
Engineering Classification:	Sand	**Permeability (in/hr):**	6-20
Drainage Characterisitics:	well	**Slope (%):**	0-15
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.3
Topsoil Rating:	Fair	**Corrosivity:**	Moderate

Geology

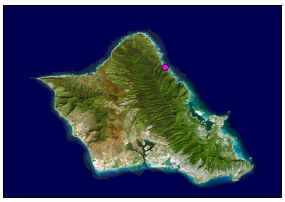
Geologic Symbol(s): Rs

Geologic Unit(s): Unconsolidated marine calcareous sediments

Geologic Description: Chiefly cream-colored and light-tan, very permeable beach sand consisting of grains of worn coral, coralline algae, and shells with appreciable amounts of foraminifers and other calcareous marine organisms. Abundant water in this sand, but it is either brackish or ocean water.

Hydrogeology

Rock Type:	Sand-unconsolidated
GW Occurrance-Principal:	Basal
GW Occurrance-Secondary:	--
Permeability:	Moderate to high
Hydraulic Conductivity (ft/d):	100 - 1,000



Hauula Dump

Category 3

Picture Not Available

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3060111622221
Aquifer Sector:	Windward
Aquifer System:	Koolauloa
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Potential use
Utility:	Ecologically important
Salinity (mg/L Cl-):	Low (250-1000)
Uniqueness:	Replaceable
Vulnerability:	High

Lower Aquifer

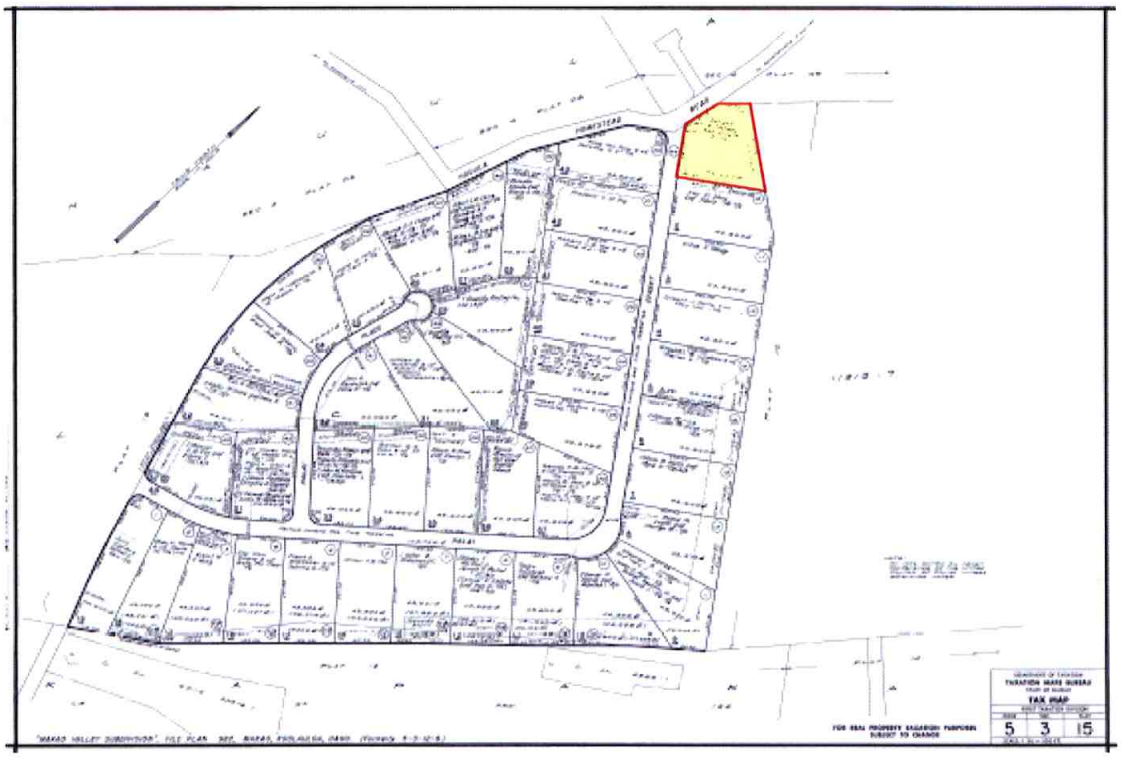
Aquifer Status Code:	3060112221122
Aquifer Sector:	Windward
Aquifer System:	Koolauloa
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Dike
Development State:	Potential use
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Replaceable
Vulnerability:	Moderate

Hauula Dump

Category 3

Picture Not Available

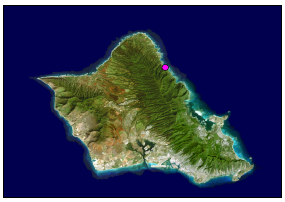
TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	11		
Municipal Well(s)within one mile	1	Observation Well(s)within one mile	1
BWS Well(s) within one mile	1	Sealed Well(s)within one mile	1
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	6
Irrigation Well(s)within one mile	1	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	1



Hauula Dump

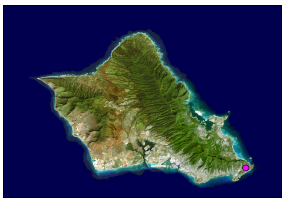
Category 3

Picture Not Available

Well Details

USGS Well Number	3655-01	**Aquifer**	30601
Well Name	Hauula	**Elevation of Ground Surface (ft amsl)**	20
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	253
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-233
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	320
Drilling Method	--		
Year of Construction	--		

Hawaii Kai Cinder Cone Dump



Hawaii Kai Cinder Cone Dump

Category 2

Site Description

Hawaii Kai Cinder Cone Dump was a municipal dump used primarily to dispose of household wastes between 1970-1971. The former dump was reportedly located to the north of Hawaii Kai Golf Course (0.2 mile) and to the northeast of Koko Crater, in the Kalama Valley.

The former dump was likely a burn and dump operation. The location of the former Hawaii Kai Cinder Cone Dump is suspected to be where the Kalama Valley Community Park is currently located (Bagaoisan, 1997). The City and County of Honolulu currently owns the park. There were no visible indications of the presence of the former dump during the site visit. The area in the vicinity of the former dump is currently residential.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	3-9-092:039
2355901.16665	637749.27685	**Zone:**	Honolulu
Longitude	**Latitude**	**Section:**	Moanalua
157 40 19	21 17 59	**Plat:**	Not Designated
Address:	555 Kealahou Street	**Quadrangle:**	Koko Head

Ownership

Current Owner: City and County

Previous Operator: City and County of Honolulu

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? No wells documented

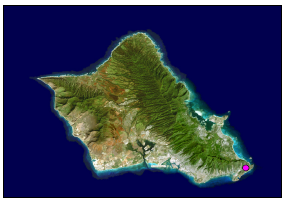
Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1970-1971	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka



Hawaii Kai Cinder Cone Dump

Category 2

Population and Land Use

Type of Development in the Surronding Area?	Residential
City and County Zoning:	P-2
State Land Use District:	Urban
Facilities:	--
TMK Separation:	Unsubdivided vacant land
Flood Zone:	D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province:	Koolau Range
Elevation Range (ft):	80 **to** 80
Approximate Landfill Acreage:	1-5
Parcel Acreage:	Approximately 6

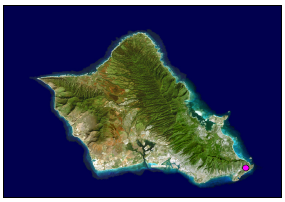
Climate

Annual Precipitation (cm):	60.22
Precipitation Days Per Year	40
Average Temperature (°F):	76.9
Temperature Range (° F):	69.1 **to** 84.6

Soils

Soil Map Symbol:	KsD	**Bulk Density (gm/cc):**	0.45-0.85
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.16-0.18
Soil Series:	Koko	**Organic Carbon (%):**	3.0-5.0
Engineering Classification:	Silt Loam and Clay Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	12-25
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	KsB	**Bulk Density (gm/cc):**	0.45-0.85
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.16-0.18
Soil Series:	Koko	**Organic Carbon (%):**	3.0-5.0
Engineering Classification:	Silt Loam and Clay Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	2-6
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.3
Topsoil Rating:	good	**Corrosivity:**	Moderate



Hawaii Kai Cinder Cone Dump

Category 2

Geology

Geologic Symbol(s): Qkf

Geologic Unit(s): Honolulu volcanic series

Geologic Description: Permeable friable red to brown coarse firefountain deposits consisting chiefly of cinders and spatter forming cones around vents along the Koko fissure and forming part of Koko volcanics; too small in area to be water bearers.

Geologic Symbol(s): Qkb

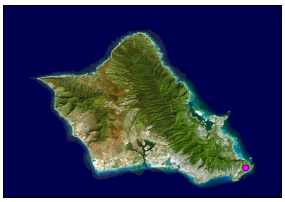
Geologic Unit(s): Honolulu volcanic series

Geologic Description: Permeable thin vesicular black aa and pahoehoe flows from several vents along Koko fissure, and forming part of Koko volcanics. The flows cover dry areas close to the sea, hence usually contain brackish water, or, if above sea level, are probably dry.

Hydrogeology

Rock Type:	Honolulu Volcanics-cinders
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Low to moderate
Hydraulic Conductivity (ft/d):	1 - 500

Rock Type:	Honolulu Volcanics-lava flows
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Low to moderate
Hydraulic Conductivity (ft/d):	1 - 500

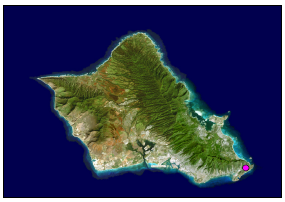


Hawaii Kai Cinder Cone Dump

Category 2

Aquifer(s)

Uppermost Aquifer	**Aquifer Status Code:**	3010511623421
	Aquifer Sector:	Honolulu
	Aquifer System:	Waialae
	Aquifer Type 1:	Basal
	Aquifer Type 2:	Unconfined
	Aquifer Type Geol.:	Sedimentary
	Development State:	Potential use
	Utility:	Neither
	Salinity (mg/L Cl-):	High (5,000-15,000)
	Uniqueness:	Replaceable
	Vulnerability:	High
Lower Aquifer	**Aquifer Status Code:**	3010512121113
	Aquifer Sector:	Honolulu
	Aquifer System:	Waialae
	Aquifer Type 1:	Basal
	Aquifer Type 2:	Confined
	Aquifer Type Geol.:	Flank
	Development State:	Potential use
	Utility:	Drinking
	Salinity (mg/L Cl-):	Fresh (<250)
	Uniqueness:	Irreplaceable
	Vulnerability:	Low

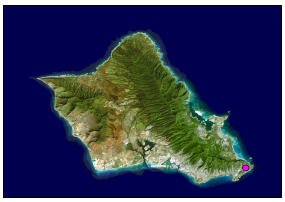


Hawaii Kai Cinder Cone Dump

Category 2

Site Reconnaissance

Site Description:	The suspected location of the former Hawaii-Kai Cinder Cone Dump is currently the Kalama Valley Community Park. There were no visible indications of the presence of the former dump.
Type of Property:	Community park.
Current Site Operations:	The site is a community park, with sports playing fields and children's playgrounds.
Age of Development:	
Onsite Building Information:	Public restroom facilities.
Was There a Recognizable Dump/Landfill?	No.
Institutional Controls:	The site is open to the public.
Number of MonitoringWells:	None observed.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	None observed.
Odors, Staining, Distressed Vegetation:	None observed.
Drainage Features:	There were no drainage features observed onsite. A stormwater channel is adjacent to the eastern site boundary. Two stormwater manholes were observed within the site.
Areas of Ponded Water Onsite:	None observed.



Hawaii Kai Cinder Cone Dump

Category 2

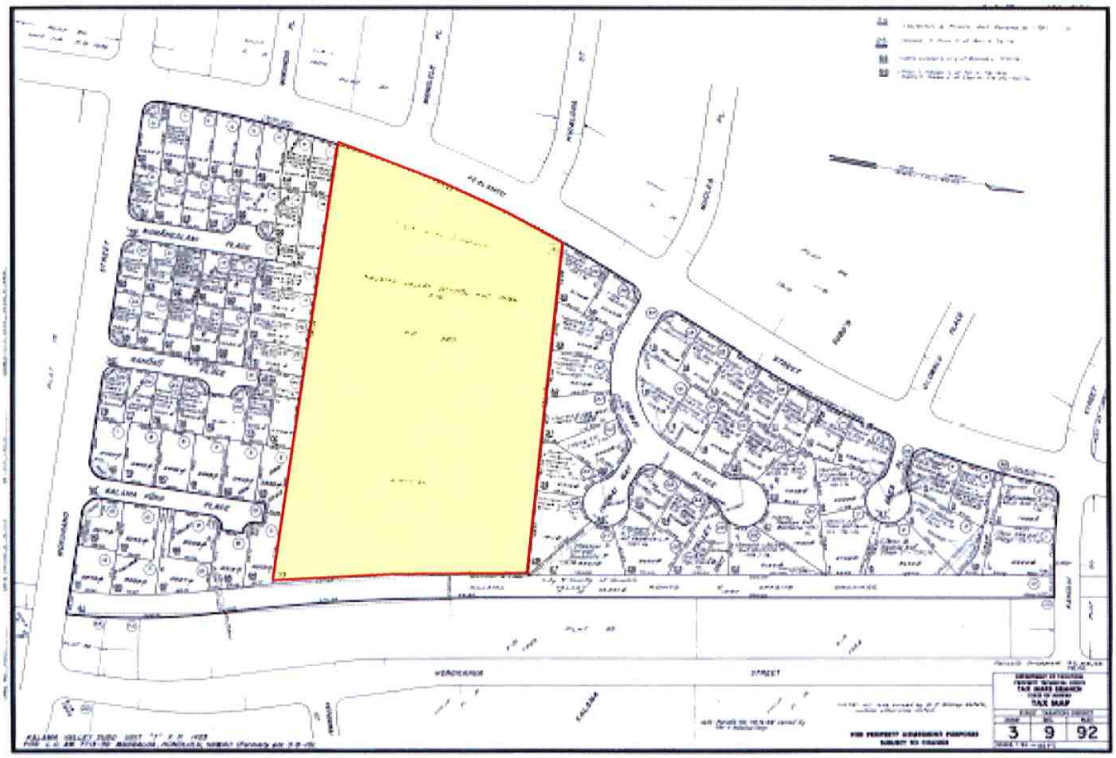
Site Reconnaissance (cont.)

Storm Water Retention Pond:	None observed.
House and Schools in the Vicinity:	The site is located within a residential development.
Distance to Nearest Residence, School, or Businesses:	Houses are adjacent to the northern and southern site boundaries. Houses are within 50 feet of the eastern and western site boundaries.
How is Drinking Water in the Area Supplied?	Municipal water supply.
Natural Resources, Agriculture, Aquaculture Near the Site?	Surrounding properties consist of residential homes.
Name of Surface Water Within 1-mile of Dump/Landfill:	Pacific Ocean.
Distance to Surface Water:	Approximately 0.75 miles.
Proximal Direction of Surface Water:	South-southeast.
Where Does Surface Water Flow?	Stormwater drainage channel along the eastern boundary of the site.
Surface Water Used for Drinking?	No.
Surface Water Used for Recreation?	Yes.
Wetlands:	None observed.
Off-site Sources of Contamination:	None observed.
Does Run-off from other Sites Flow onto Subject Property:	None observed.
Adjacent Property-North:	Residential houses.
Adjacent Property-South:	Residential houses.
Adjacent Property-East:	Stormwater drainage channel; residential homes.
Adjacent Property-West:	Kealahou Road; residential homes.

Hawaii Kai Cinder Cone Dump

Category 2

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	13		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	1
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	7
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	5

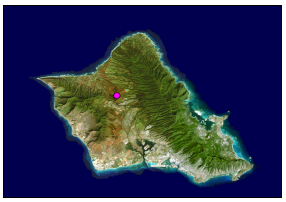
Well Details

Photo 1. **Looking at the southwest section of Kalama Valley Park, which is suspected to be situated on the former Hawaii-Kai Cinder Cone Dump.**

Photo 2. **Looking at the northwest section of the park, which is now a playground.**

Photo 3. Looking at the southeast corner of the park, which is now a sports playing field.

Hawaiian Pineapple Dump 1 - Poamoho Camp



Hawaiian Pineapple Dump 1 - Poamoho Camp

Category 2

Site Description

Hawaiian Pineapple Dump 1, operated by Del Monte, was likely used to dispose of plantation refuse. Although no records on the period of operation were located, the dump probably operated during the 1940s to 1950s. There was no documentation found to indicate that the dump was permitted, lined, capped, or properly closed. The former dump was likely a burn and dump operation.

The suspected location of the former Hawaiian Pineapple Dump 1 is in Poamoho Stream Gulch, just south of a small bridge that crosses the stream, to the northwest of Poamoho Camp (a collection of houses, 0.3 miles), and to the north of the Schofield Barracks (1.4 miles). According to a historic map (Young, 1993; Map 8), the open-space dumping area was adjacent to Poamoho Camp. The dump was probably small and was likely located at the edge of an agricultural field in a gulch not useable for farming. The property was leased from the George Galbraith Trust Estate. Pineapple fields are located up gradient and to the north and south of the site, and the gulch itself is undeveloped.

During a recent site visit, evidence of both past and recent dumping was observed along the southern face of the gulch including cars, car parts, and household debris. In addition, a bulldozed area on the road just south of Poamoho Stream contained solid wastes in the berms.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	7-1-001:003
2380108.53817	598638.75844	**Zone:**	Wahiawa
Longitude	**Latitude**	**Section:**	Not Designated
158 02 51	21 31 15	**Plat:**	Not Designated
Address:	Kaukona Hua Road	**Quadrangle:**	Haleiwa

Ownership

Current Owner: George Galbraith Trust (PPI Del Monte Fresh Produce-lessee); Bank of Hawaii manages this property of behalf of the Galbraith Estate

Previous Operator: Del Monte Fresh Produce

Site Operation and History

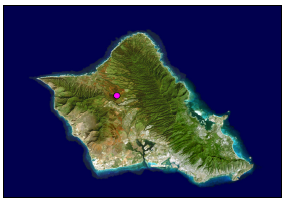
Landfill Type: Agricultural

Type of Waste: Plantation refuse

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940s-1950s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Open space burn and dump
Permit Info:	None documented		



Hawaiian Pineapple Dump 1 - Poamoho Camp

Category 2

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line?	Mauka
Mauka or Makai of UIC Line?	Mauka

Population and Land Use

Type of Development in the Surronding Area?	Agricultural
City and County Zoning:	Ag-1
State Land Use District:	Agricultural
Facilities:	--
TMK Separation:	Pineapple field, steep land
Flood Zone:	D - Undetermined but possible flood hazards

Geography and Topography

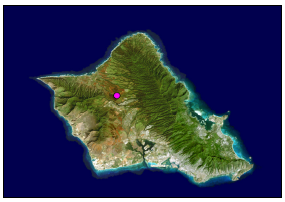
Physiographic Province:	Schofield Plateau
Elevation Range (ft):	800 **to** 900
Approximate Landfill Acreage:	1-5
Parcel Acreage:	145.145

Climate

Annual Precipitation (cm):	142.70
Precipitation Days Per Year	99
Average Temperature (° F):	70.7
Temperature Range (° F):	63.2 **to** 78.1

Soils

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High



Hawaiian Pineapple Dump 1 - Poamoho Camp

Category 2

Geology

Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

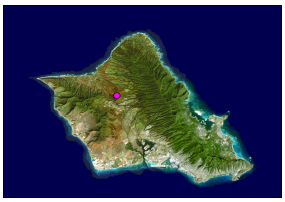
Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.

Hydrogeology

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Aquifer Status Code:	3050121211111
Aquifer Sector:	Central
Aquifer System:	Wahiawa
Aquifer Type 1:	High Level
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Dike
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High



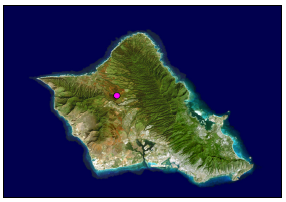
Hawaiian Pineapple Dump 1 - Poamoho Camp

Category 2

Site Reconnaissance

Site Description: The suspected location of the former dump is in Poamoho Stream Gulch, just south of a small bridge that crosses the stream, to the northwest of Poamoho Camp (a collection of houses, 0.3 mile), and to the north of the Schofield Barracks (1.4 miles). Evidence of both past and recent dumping were observed onsite, including cars, car parts, and household debris. Debris was observed along the southern face of the gulch. In addition, a bulldozed area on the road just south of Poamoho Stream contained solid wastes (in the berms). Pineapple fields are located to the north and south of the site. The area in the vicinity of the former dump is currently agricultural.

Type of Property:	Undeveloped land in the Poamoho Gulch. Properties to the north and south of the site are farms.
Current Site Operations:	No current onsite operations. Surrounding area operations include pineapple farming.
Age of Development:	Unknown.
Onsite Building Information:	None.
Was There a Recognizable Dump/Landfill?	Evidence of both past and recent dumping were observed onsite, including cars, car parts, and household debris.
Institutional Controls:	Access to the site is through Poamoho Camp. According to Dorothy Tom, of the Bank of Hawaii, the gate is locked at night.
Number of MonitoringWells:	None observed.
Stability (signs of erosion, etc):	Not stable. URS observed loose dirt around large portions of the site.
Leachate, Seeps:	None observed.
Odors, Staining, Distressed Vegetation:	None observed.
Drainage Features:	None observed.
Areas of Ponded Water Onsite:	None observed.



Hawaiian Pineapple Dump 1 - Poamoho Camp

Category 2

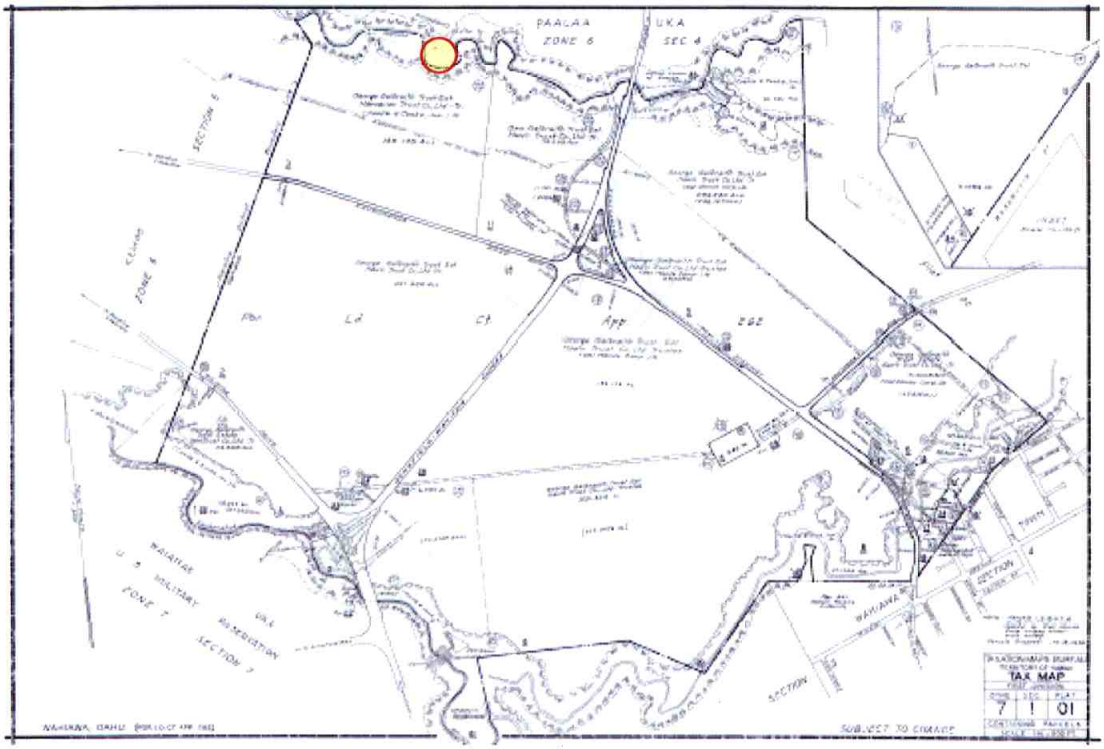
Site Reconnaissance (cont.)

Storm Water Retention Pond:	None observed.
House and Schools in the Vicinity:	Poamoho Camp, a collection of houses is located to the southeast of the site.
Distance to Nearest Residence, School, or Businesses:	Approximately 0.25 miles.
How is Drinking Water in the Area Supplied?	There are no water supplies to the site. The water supply for neighboring farms is unknown.
Natural Resources, Agriculture, Aquaculture Near the Site?	Properties upgradient and to the north and south of the site are farms.
Name of Surface Water Within 1-mile of Dump/Landfill:	Poamoho Stream flows through the Poamoho Gulch in a westerly direction.
Distance to Surface Water:	Onsite.
Proximal Direction of Surface Water:	Onsite.
Where Does Surface Water Flow?	Poamoho Stream.
Surface Water Used for Drinking?	No.
Surface Water Used for Recreation?	Unknown.
Wetlands:	None observed.
Off-site Sources of Contamination:	The agricultural farms located north and south of the site may be using pesticides and herbicides.
Does Run-off from other Sites Flow onto Subject Property:	Runoff already in the Poamoho Gulch from upstream locations, would flow through the site. Runoff from the neighboring farms upgradient to the north and south would flow into the stream within the gulch.
Adjacent Property-North:	Agricultural farmland.
Adjacent Property-South:	Pineapple farm.
Adjacent Property-East:	Poamoho Gulch.
Adjacent Property-West:	Poamoho Gulch.

Hawaiian Pineapple Dump 1 - Poamoho Camp

Category 2

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	2		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	1
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	1	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Photo 1. Looking southeast from the ridgeline that runs along the northern side of the Poamoho Gulch, in which the dump is thought to be located.

Photo 2. Looking south at the conditions of the terrain down by the Poamoho Stream from the north side of the Poamoho Gulch.

Photo 3. Facing southeast from the north side of the Poamoho Stream. Looking at an abandoned automobile on the south side of the Poamoho Gulch wall.

Photo 4. On south side of Poamoho Stream, facing north. Looking closer at the vehicles shown in Photo 3.

Photo 5. Standing on the bridge that crosses the Poamoho Stream, looking west at the stream.

Photo 6. Looking east from the bridge that crosses the Poamoho Stream.

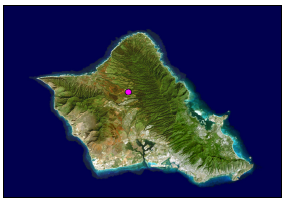
Photo 7. On the south side of the stream facing west. Debris (cans, metal pipes, fabrics, etc.) was observed in mounds formed by a bulldozer.

Photo 8. Metal pipe sticking out of the ground near the bulldozed mounds.

Photo 9. Standing near the second plantation road switchback, on the south side of Poamoho Stream. Old bottles observed on the ground.

Photo 10. Standing near the second road switchback, on the south side of Poamoho Stream. Observed metal debris along the gulch wall.

Hawaiian Pineapple Dump 2 -Wahiawa



Hawaiian Pineapple Dump 2 - Wahiawa

Category 2

Site Description

Hawaiian Pineapple Dump 2, operated by the Hawaiian Pineapple Company (which became Dole), was likely used to dispose of plantation refuse. Although no records on the period of operation were located, the dump probably operated during the 1940s to 1950s. There was no documentation found to indicate that the dump was permitted, lined, capped, or properly closed. The dump was probably small and was likely located at the edge of an agricultural field in a gulch not useable for farming. The former dump was probably a burn and dump operation. The parcel on which the dump is suspected to have been located is currently owned by Dole Food Company, Incorporated.

During a recent site visit, observations were made from approximately 200 feet south of the suspected dump location at a higher elevation. From that vantage point, no visible signs of the presence of the former dump were observed.

The former Hawaiian Pineapple Dump 2 was reportedly located on undeveloped land in the Upper Helemano Ditch Gulch, to the southeast of Helemano Military Reservation (0.2 miles), to the north of Whitmore Village (1.2 miles), and to the east of the Upper Helemano Reservoir (0.6 miles). The gulch is very steep and heavily vegetated which makes accessing the dump location dangerous and difficult. The area in the vicinity of the former dump is currently used for agricultural and military purposes. Access to Dole Plantation property is restricted.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	6-4-004:001
2381230.85111	602140.43837	**Zone:**	Wahiawa
Longitude	**Latitude**	**Section:**	Paalaa Uka
158 00 49	21 31 51	**Plat:**	Not Designated
Address:	Not available	**Quadrangle:**	Hauula

Ownership

Current Owner: Dole Food Company, Incorporated

Previous Operator: Dole Pineapple

Site Operation and History

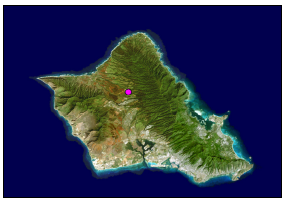
Landfill Type: Agricultural

Type of Waste: Plantation refuse

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940s-1950s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump, some fill
Permit Info:	None documented		



Hawaiian Pineapple Dump 2 - Wahiawa

Category 2

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line?	Mauka
Mauka or Makai of UIC Line?	Mauka

Population and Land Use

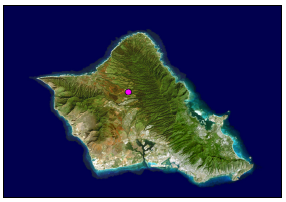
Type of Development in the Surronding Area?	Agricultural
City and County Zoning:	Ag-1
State Land Use District:	Agricultural
Facilities:	--
TMK Separation:	Sugar cane field/steep land
Flood Zone:	D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province:	Schofield Plateau
Elevation Range (ft):	1E **to** 1100
Approximate Landfill Acreage:	1-5
Parcel Acreage:	1,692.996

Climate

Annual Precipitation (cm):	142.70
Precipitation Days Per Year	99
Average Temperature (°F):	70.7
Temperature Range (° F):	63.2 **to** 78.1



Hawaiian Pineapple Dump 2 - Wahiawa

Category 2

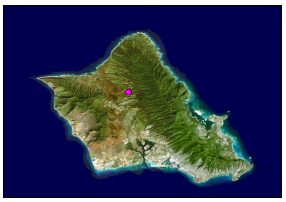
Soils

Soil Map Symbol:	WaA	**Bulk Density (gm/cc):**	1.20-1.45
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Wahiawa	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	0-3
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	FL	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.06-0.12
Soil Series:	Fill Land, Mixed	**Organic Carbon (%):**	0.1-5.0
Engineering Classification:	Fill Land, Mixed	**Permeability (in/hr):**	0.1-2
Drainage Characterisitics:	Poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	rRT	**Bulk Density (gm/cc):**	0.80-1.10
Soil Association:	Rock land-Stony steep	**Moisture Retention (%):**	0.14-0.16
Soil Series:	Rough Mountainous Land	**Organic Carbon (%):**	20-30
Engineering Classification:	Very Cobbly Clay Loam, Weathered Bedrock	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Very poor	**Slope (%):**	>15
Thickness of Surface Soil (in):	0-60	**pH:**	3.5-5.0
Topsoil Rating:	Poor	**Corrosivity:**	High



Hawaiian Pineapple Dump 2 - Wahiawa

Category 2

Geology

Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

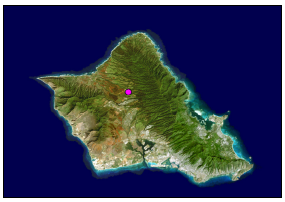
Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.

Hydrogeology

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Aquifer Status Code:	3050121211111
Aquifer Sector:	Central
Aquifer System:	Wahiawa
Aquifer Type 1:	High Level
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Dike
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

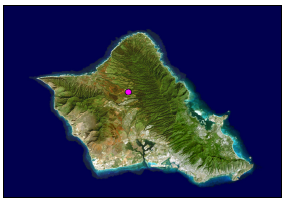


Hawaiian Pineapple Dump 2 - Wahiawa

Category 2

Site Reconnaissance

Site Description:	Site reconnaissance was not performed because of access issues during site visit and non-response of property owner.
Type of Property:	Unknown.
Current Site Operations:	Unknown.
Age of Development:	Unknown.
Onsite Building Information:	Unknown.
Was There a Recognizable Dump/Landfill?	Not applicable.
Institutional Controls:	The site is located within Dole Plantation property. Access to Dole property is restricted.
Number of MonitoringWells:	Unknown.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	Not applicable.
Odors, Staining, Distressed Vegetation:	Not applicable.
Drainage Features:	Unknown.
Areas of Ponded Water Onsite:	Unknown.



Hawaiian Pineapple Dump 2 - Wahiawa

Category 2

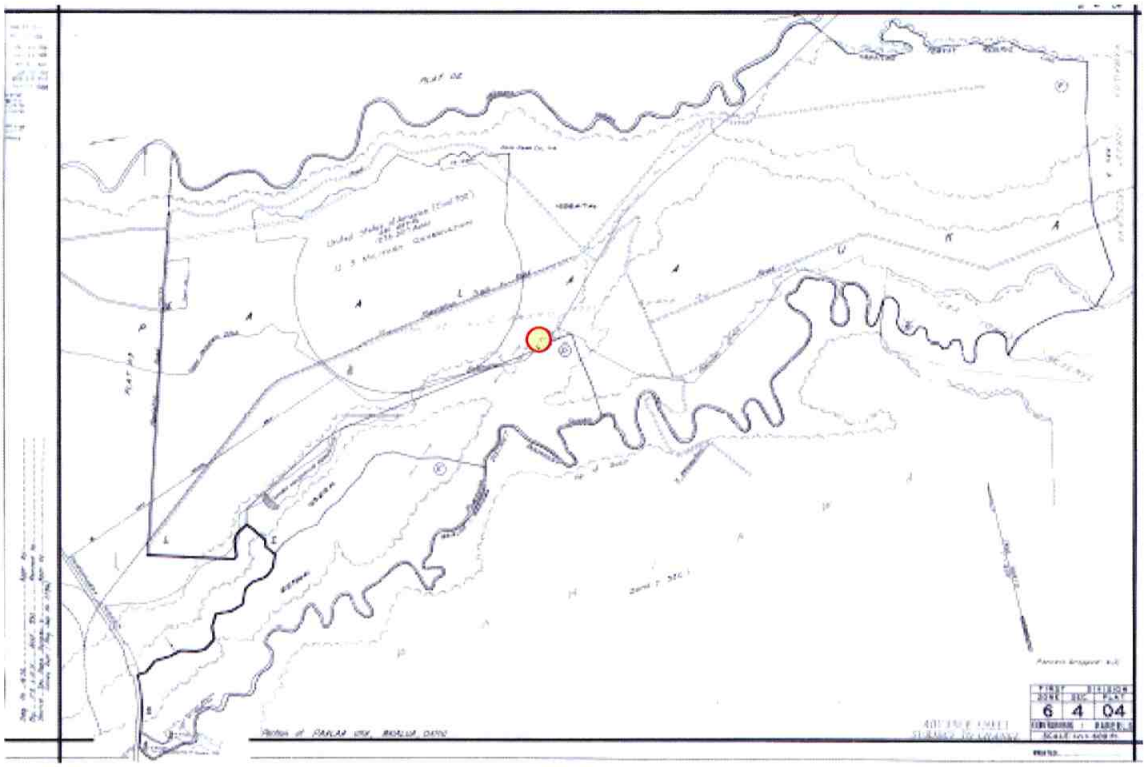
Site Reconnaissance (cont.)

Storm Water Retention Pond:	Unknown.
House and Schools in the Vicinity:	Unknown. Assume no.
Distance to Nearest Residence, School, or Businesses:	Unknown.
How is Drinking Water in the Area Supplied?	Unknown.
Natural Resources, Agriculture, Aquaculture Near the Site?	Unknown.
Name of Surface Water Within 1-mile of Dump/Landfill:	USGS topographic maps indicate that an intermittant stream is close to the site.
Distance to Surface Water:	Less than 200 feet.
Proximal Direction of Surface Water:	South.
Where Does Surface Water Flow?	USGS topographic maps indicate that surface water would flow south toward an intermittant stream.
Surface Water Used for Drinking?	Unknown. Assume No.
Surface Water Used for Recreation?	Unknown.
Wetlands:	Unknown.
Off-site Sources of Contamination:	The site appears to be entire located within Dole Plantation property. The plantation may have used pesticides and herbicides.
Does Run-off from other Sites Flow onto Subject Property:	Unknown.
Adjacent Property-North:	Unknown.
Adjacent Property-South:	Unknown.
Adjacent Property-East:	Unknown.
Adjacent Property-West:	Unknown.

Hawaiian Pineapple Dump 2 - Wahiawa

Category 2

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	0		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Hawaiian Pineapple Dump 3 - Kemoo, Wailua

Source: R.M. Towill Corporation

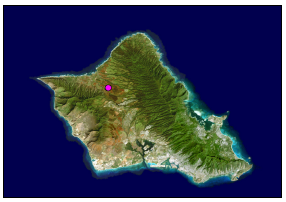
09-20-51; photograph DACE-1-51-A

URS

Title **Aerial Photograph – Hawaiian Pineapple Dump 3**

Project **Oahu Inactive Landfills Relative Risk Evaluation**

Project No. 26536686.00300



Hawaiian Pineapple Dump 3 - Kemoo, Wailua

Category 2

Site Description

Hawaiian Pineapple Dump 3, operated by the Hawaiian Pineapple Company (which became Dole), was likely used to dispose of plantation refuse. Although no records on the period of operation were located, the dump probably operated during the 1940s to 1950s. There was no documentation found to indicate that the dump was permitted, lined, capped, or properly closed. The dump was probably small and was likely located at the edge of an agricultural field in a gulch not useable for farming. The former dump was probably a burn and dump operation. The parcel on which the dump is suspected to have been located is currently owned by Dole Food Company, Incorporated.

According to a historic map (Young, 1993; Map 8), the former Hawaiian Pineapple Dump 3 was reportedly located to the north of Kaheaka Road (0.25 miles) and North Poamoho Stream (0.7 miles), and to the south of Twin Bridge Road (1.0 mile). The area in the vicinity of the former dump is currently agricultural. No distinct indications of the specific dump location were noted during the site visit.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	6-5-002:011
2382770.51000	596075.26684	**Zone:**	Waialua
Longitude	**Latitude**	**Section:**	Kaheeka
158 04 19	21 32 42	**Plat:**	Kemoo
Address:	Not available	**Quadrangle:**	Haleiwa

Ownership

Current Owner: Dole Food Company, Incorporated

Previous Operator: Dole Pineapple

Site Operation and History

Landfill Type: Agricultural

Type of Waste: Plantation refuse

Monitoring Well Network? No wells documented

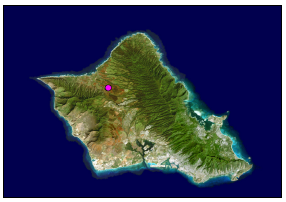
Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940s-1950s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump, some fill
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka



Hawaiian Pineapple Dump 3 - Kemoo, Wailua

Category 2

Population and Land Use

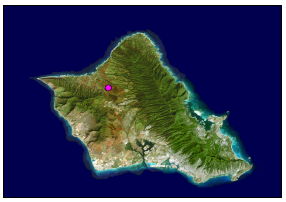
Type of Development in the Surronding Area?	Agricultural
City and County Zoning:	Ag-1
State Land Use District:	Agricultural
Facilities:	--
TMK Separation:	Sugar cane field/steep land
Flood Zone:	D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province:	Schofield Plateau
Elevation Range (ft):	740 **to** 800
Approximate Landfill Acreage:	1-5
Parcel Acreage:	1,171.04

Climate

Annual Precipitation (cm):	142.70
Precipitation Days Per Year	99
Average Temperature (° F):	70.7
Temperature Range (° F):	63.2 **to** 78.1



Hawaiian Pineapple Dump 3 - Kemoo, Wailua

Category 2

Soils

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	WaC	**Bulk Density (gm/cc):**	1.20-1.45
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Wahiawa	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	8-15
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

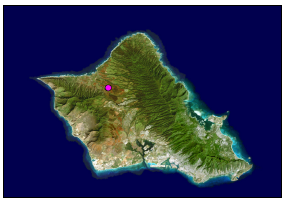
Soil Map Symbol:	WaB	**Bulk Density (gm/cc):**	1.20-1.45
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Wahiawa	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	3-8
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Geology

Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.



Hawaiian Pineapple Dump 3 - Kemoo, Wailua

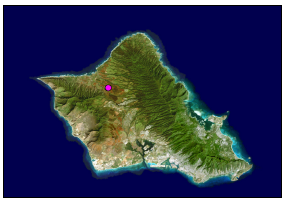
Category 2

Hydrogeology

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Aquifer Status Code:	3040211111111
Aquifer Sector:	North
Aquifer System:	Waialua
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

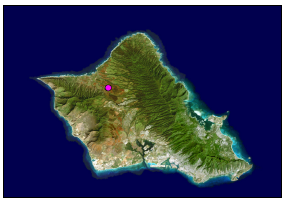


Hawaiian Pineapple Dump 3 - Kemoo, Wailua

Category 2

Site Reconnaissance

Site Description:	The suspected location of the former Hawaiian Pineapple Dump 3 is in an unnamed gulch located within the Dole Plantation. The gulch is very steep and heavily vegetated, which made accessing the actual dump location dangerous and difficult. Oversize concrete pieces and old irrigation hoses were observed approximately 225 feet south of the site. The debris was observed near the side north side of the plantation road.
Type of Property:	Undeveloped land in a gulch.
Current Site Operations:	None.
Age of Development:	Not applicable.
Onsite Building Information:	None.
Was There a Recognizable Dump/Landfill?	No.
Institutional Controls:	The site is located within Dole Plantation property. Access to Dole property is restricted.
Number of MonitoringWells:	None observed.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	None observed.
Odors, Staining, Distressed Vegetation:	A patch of distressed vegetation was observed approximately 225 feet south of the site.
Drainage Features:	There were no drainage features observed.
Areas of Ponded Water Onsite:	None observed.



Hawaiian Pineapple Dump 3 - Kemoo, Wailua

Category 2

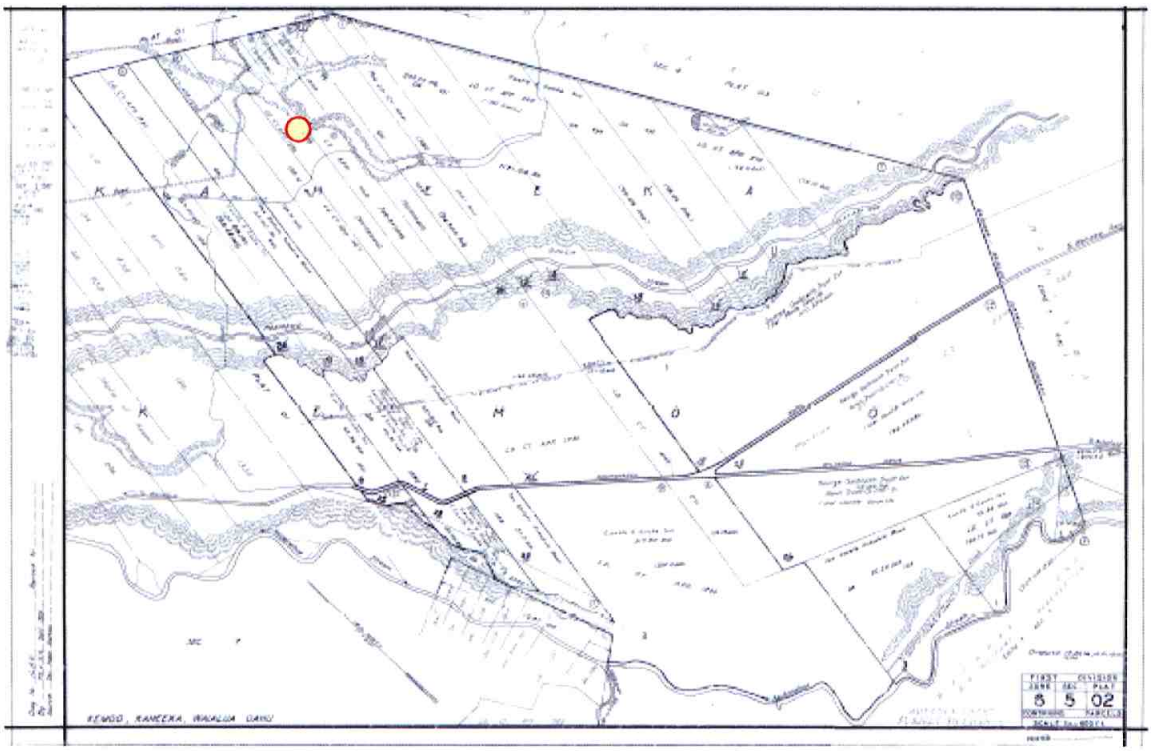
Site Reconnaissance (cont.)

Storm Water Retention Pond:	None observed.
House and Schools in the Vicinity:	Unknown.
Distance to Nearest Residence, School, or Businesses:	Unknown.
How is Drinking Water in the Area Supplied?	Unknown.
Natural Resources, Agriculture, Aquaculture Near the Site?	Surrounding properties consist of pineapple farmland.
Name of Surface Water Within 1-mile of Dump/Landfill:	USGS topographic maps indicate that a stream runs through the gulch.
Distance to Surface Water:	Onsite.
Proximal Direction of Surface Water:	Onsite.
Where Does Surface Water Flow?	Run-off on the site will continue to flow north through the gulch.
Surface Water Used for Drinking?	No.
Surface Water Used for Recreation?	No.
Wetlands:	None observed.
Off-site Sources of Contamination:	Properties immediately to the north and south of the site consist of pineapple plantations that may use herbicides and pesticides.
Does Run-off from other Sites Flow onto Subject Property:	Run-off from neighboring plantations would flow into the site and then north through the gulch.
Adjacent Property-North:	Unnamed gulch.
Adjacent Property-South:	Unnamed gulch.
Adjacent Property-East:	Plantation road and pineapple plantation.
Adjacent Property-West:	Plantation road and pineapple plantation.

Hawaiian Pineapple Dump 3 - Kemoo, Wailua

Category 2

TMK Map



Wells Within One Mile

Summary

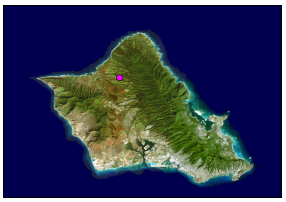
Total Number of Well(s)within one mile	1		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	1
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Photo 1. **Looking east from a plantation road into the North Poamoho Stream Gulch in which Hawaiian Pineapple Dump 3 is presumed to have been located. No distinct indications of the specific dump location were noted during the site visit.**

Photo 2. **Looking northeast at concrete and irrigation hose debris along the top of the gulch edge south of Hawaiian Pineapple Dump 3.**

Hawaiian Pineapple Dump 4 - Wailua



Hawaiian Pineapple Dump 4 - Wailua

Category 2

Site Description

Hawaiian Pineapple Dump 4, operated by the Hawaiian Pineapple Company (which became Dole), was likely used to dispose of plantation refuse. Although no records on the period of operation were located, the dump probably operated during the 1940s to1950s. There was no documentation found to indicate that the dump was permitted, lined, capped, or properly closed. The dump was probably small and was likely located at the edge of an agricultural field in a gulch not useable for farming. The former dump was probably a burn and dump operation. The parcel on which the dump is suspected to have been located is currently owned by Dole Food Company, Incorporated.

According to a historic map (Young, 1993; Map 8), the former Hawaiian Pineapple Dump 4 was reportedly located to the south of Opaeula Road, to the west of Opaeula 2 Reservoir, and to the north of Opaeula Stream (0.3 miles) and Twin Bridges Road (0.7 mile). The area in the vicinity of the former dump is currently agricultural.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	6-2-011:001
2386117.91798	599465.71899	**Zone:**	Waialua
Longitude	**Latitude**	**Section:**	Kawailoa
158 02 21	21 34 30	**Plat:**	Not Designated
Address:	Not available; along Opaeula Road	**Quadrangle:**	Haleiwa

Ownership

Current Owner: Dole Food Company, Incorporated

Previous Operator: Dole Pineapple

Site Operation and History

Landfill Type: Agricultural

Type of Waste: Plantation refuse

Monitoring Well Network? No wells documented

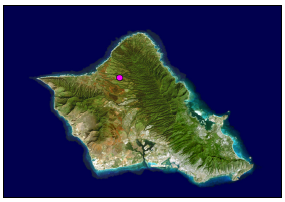
Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940s-1950s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump, some fill
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka



Hawaiian Pineapple Dump 4 - Wailua

Category 2

Population and Land Use

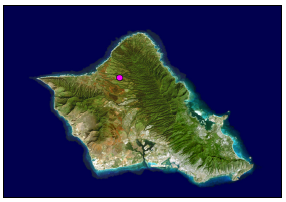
Type of Development in the Surronding Area?	Agricultural
City and County Zoning:	Ag-1, P-1
State Land Use District:	Agricultural, Conservation
Facilities:	--
TMK Separation:	Sugar cane field, unsubdivided vacant land, steep land
Flood Zone:	D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province:	Schofield Plateau
Elevation Range (ft):	680 **to** 720
Approximate Landfill Acreage:	1-5
Parcel Acreage:	1,930.250

Climate

Annual Precipitation (cm):	142.70
Precipitation Days Per Year	99
Average Temperature (°F):	70.7
Temperature Range (° F):	63.2 **to** 78.1



Hawaiian Pineapple Dump 4 - Wailua

Category 2

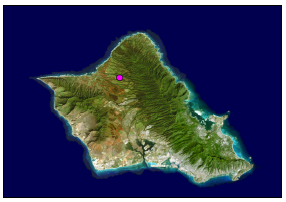
Soils

Soil Map Symbol:	WaB	**Bulk Density (gm/cc):**	1.20-1.45
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Wahiawa	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	3-8
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	LeB	**Bulk Density (gm/cc):**	1.00-1.30
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Leilehua	**Organic Carbon (%):**	5.0-6.0
Engineering Classification:	Silty Clay and Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	2-6
Thickness of Surface Soil (in):	0-60	**pH:**	3.6-4.4
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	LeC	**Bulk Density (gm/cc):**	1.00-1.30
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Leilehua	**Organic Carbon (%):**	5.0-6.0
Engineering Classification:	Silty Clay and Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	6-12
Thickness of Surface Soil (in):	0-60	**pH:**	3.6-4.4
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High



Hawaiian Pineapple Dump 4 - Wailua

Category 2

Geology

Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

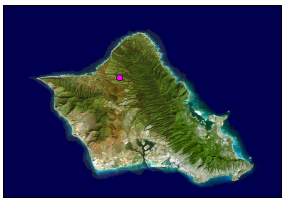
Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.

Hydrogeology

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Aquifer Status Code:	3040211111111
Aquifer Sector:	North
Aquifer System:	Waialua
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

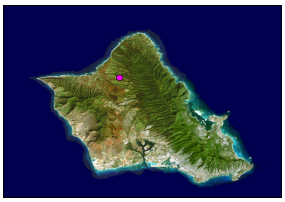


Hawaiian Pineapple Dump 4 - Wailua

Category 2

Site Reconnaissance

Site Description:	Site reconnaissance was not performed because of access issues during site visit and non-response of property owner.
Type of Property:	Unknown.
Current Site Operations:	Unknown.
Age of Development:	Unknown.
Onsite Building Information:	Unknown.
Was There a Recognizable Dump/Landfill?	Not applicable.
Institutional Controls:	The site is completely within Dole Plantation property. Access to Dole property is restricted.
Number of MonitoringWells:	Unknown.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	Not applicable.
Odors, Staining, Distressed Vegetation:	Not applicable.
Drainage Features:	Unknown.
Areas of Ponded Water Onsite:	Unknown.

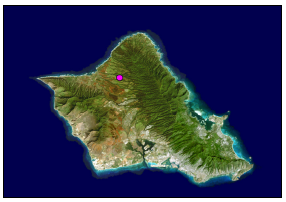


Hawaiian Pineapple Dump 4 - Wailua

Category 2

Site Reconnaissance (cont.)

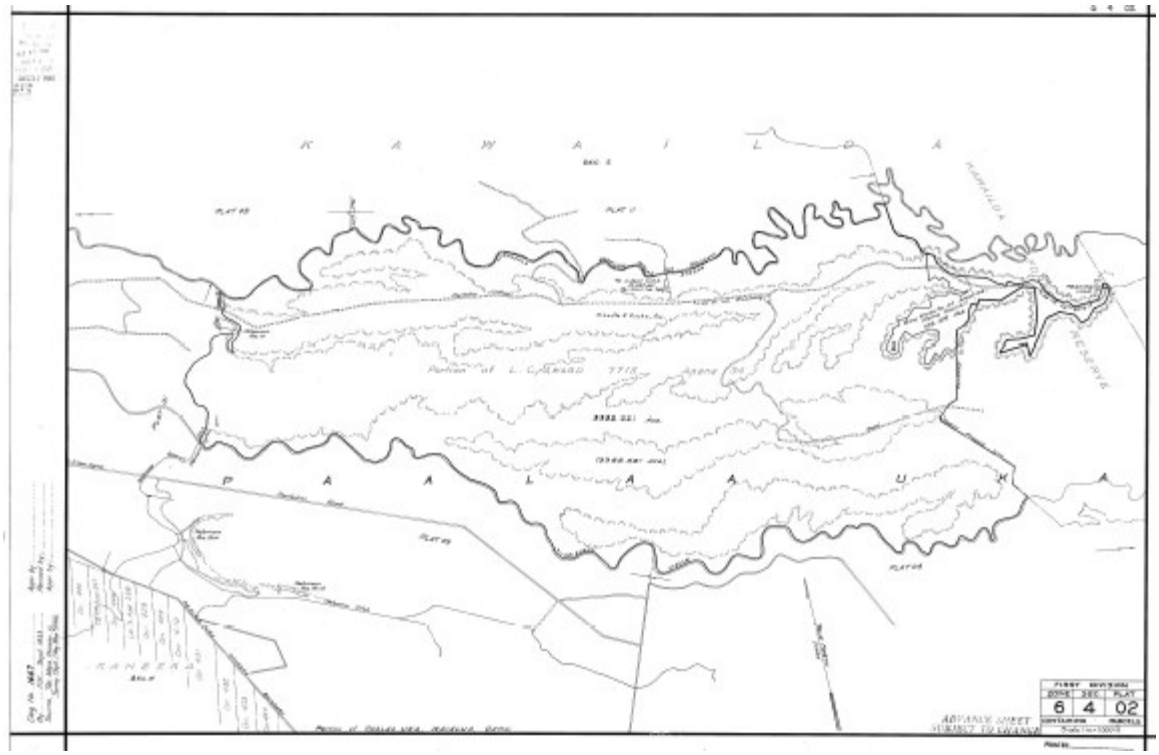
Storm Water Retention Pond:	Unknown.
House and Schools in the Vicinity:	None.
Distance to Nearest Residence, School, or Businesses:	Unknown.
How is Drinking Water in the Area Supplied?	Unknown.
Natural Resources, Agriculture, Aquaculture Near the Site?	Unknown.
Name of Surface Water Within 1-mile of Dump/Landfill:	USGS topographic maps indicate that Opaeula 2 Reservoir is located nearby.
Distance to Surface Water:	Less than 500 feet.
Proximal Direction of Surface Water:	East.
Where Does Surface Water Flow?	Unknown.
Surface Water Used for Drinking?	Unknown.
Surface Water Used for Recreation?	Unknown.
Wetlands:	Unknown.
Off-site Sources of Contamination:	Unknown.
Does Run-off from other Sites Flow onto Subject Property:	Unknown.
Adjacent Property-North:	Unknown.
Adjacent Property-South:	Unknown.
Adjacent Property-East:	Unknown.
Adjacent Property-West:	Unknown.



Hawaiian Pineapple Dump 4 - Wailua

Category 2

TMK Map



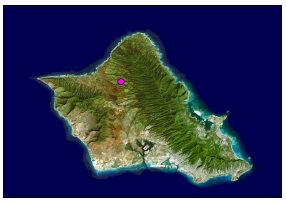
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	0		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Hawaiian Pineapple Dump 5 - Wailua



Hawaiian Pineapple Dump 5 - Wailua

Category 2

Site Description

Hawaiian Pineapple Dump 5, operated by the Hawaiian Pineapple Company (which became Dole), was likely used to dispose of plantation refuse. Although no records on the period of operation were located, the dump probably operated during the 1940s to1950s. There was no documentation found to indicate that the dump was permitted, lined, capped, or properly closed. The dump was probably small and was likely located at the edge of an agricultural field in a gulch not useable for farming. The former dump was probably a burn and dump operation. The parcel on which the dump is suspected to have been located is currently owned by the Bernice Pauahi Bishop Trust Estate.

According to a historic map (Young, 1993; Map 8), the former Hawaiian Pineapple Dump 5 was reportedly located to the south of Twin Bridges Road (0.1 mile) and Opaeula Stream (0.3 miles) and to the north of Helemano Stream (0.9 miles). The area in the vicinity of the former dump is agricultural.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	6-4-002:001
2384836.69805	599931.61715	**Zone:**	Waialua
Longitude	**Latitude**	**Section:**	Paalaa Uka
158 02 05	21 33 49	**Plat:**	Not Designated
Address:	Not available; along Twin Bridge Road	**Quadrangle:**	Haleiwa

Ownership

Current Owner: Bernice Pauahi Bishop Trust Estate

Previous Operator: Dole Pineapple

Site Operation and History

Landfill Type: Agricultural

Type of Waste: Plantation refuse

Monitoring Well Network? No wells documented

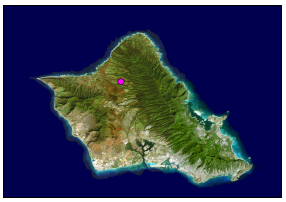
Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940s-1950s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump, some fill
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka



Hawaiian Pineapple Dump 5 - Wailua

Category 2

Population and Land Use

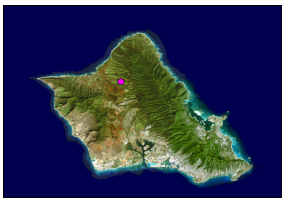
Type of Development in the Surronding Area?	Agricultural
City and County Zoning:	Ag-1
State Land Use District:	Agricultural
Facilities:	--
TMK Separation:	Sugar cane field, pineapple field, steep land
Flood Zone:	D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province:	Schofield Plateau
Elevation Range (ft):	960 **to** 1020
Approximate Landfill Acreage:	1-5
Parcel Acreage:	3,385.661

Climate

Annual Precipitation (cm):	142.70
Precipitation Days Per Year	99
Average Temperature (° F):	70.7
Temperature Range (° F):	63.2 **to** 78.1



Hawaiian Pineapple Dump 5 - Wailua

Category 2

Soils

Soil Map Symbol:	WaB	**Bulk Density (gm/cc):**	1.20-1.45
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Wahiawa	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	3-8
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	LeB	**Bulk Density (gm/cc):**	1.00-1.30
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Leilehua	**Organic Carbon (%):**	5.0-6.0
Engineering Classification:	Silty Clay and Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	2-6
Thickness of Surface Soil (in):	0-60	**pH:**	3.6-4.4
Topsoil Rating:	Poor	**Corrosivity:**	High

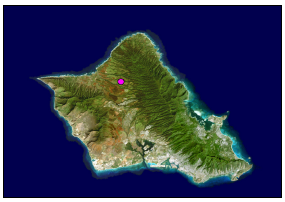
Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.



Hawaiian Pineapple Dump 5 - Wailua

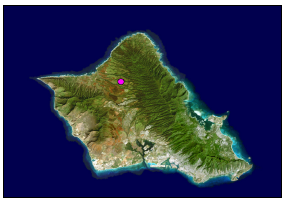
Category 2

Hydrogeology

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Aquifer Status Code:	3040211111111
Aquifer Sector:	North
Aquifer System:	Waialua
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

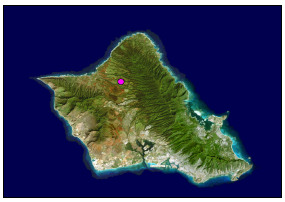


Hawaiian Pineapple Dump 5 - Wailua

Category 2

Site Reconnaissance

Site Description:	Site reconnaissance was not performed because property owner and consultant could not agree on terms of the Consent of Entry agreement.
Type of Property:	Unknown.
Current Site Operations:	Unknown.
Age of Development:	Unknown.
Onsite Building Information:	Unknown.
Was There a Recognizable Dump/Landfill?	Not applicable.
Institutional Controls:	Unknown.
Number of MonitoringWells:	Unknown.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	Not applicable.
Odors, Staining, Distressed Vegetation:	Not applicable.
Drainage Features:	Unknown.
Areas of Ponded Water Onsite:	Unknown.

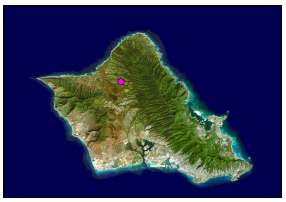


Hawaiian Pineapple Dump 5 - Wailua

Category 2

Site Reconnaissance (cont.)

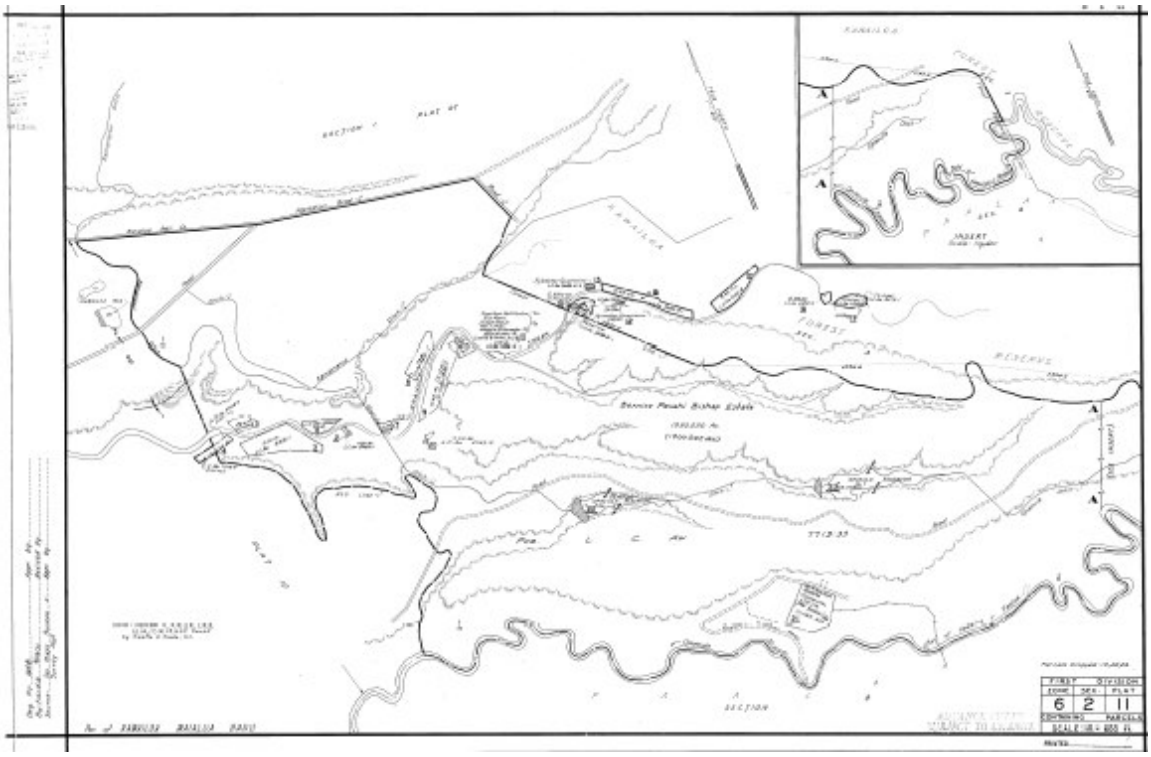
Storm Water Retention Pond:	Unknown.
House and Schools in the Vicinity:	Unknown.
Distance to Nearest Residence, School, or Businesses:	Unknown.
How is Drinking Water in the Area Supplied?	Unknown.
Natural Resources, Agriculture, Aquaculture Near the Site?	Unknown.
Name of Surface Water Within 1-mile of Dump/Landfill:	Kawaihalona Stream and Helemano Stream.
Distance to Surface Water:	Approximately 0.2 and 0.75 miles, respectively.
Proximal Direction of Surface Water:	North and south, respectively.
Where Does Surface Water Flow?	Unknown.
Surface Water Used for Drinking?	Unknown. Assume no.
Surface Water Used for Recreation?	Unknown.
Wetlands:	Unknown.
Off-site Sources of Contamination:	Unknown.
Does Run-off from other Sites Flow onto Subject Property:	Unknown.
Adjacent Property-North:	Unknown.
Adjacent Property-South:	Unknown.
Adjacent Property-East:	Unknown.
Adjacent Property-West:	Unknown.



Hawaiian Pineapple Dump 5 - Wailua

Category 2

TMK Map



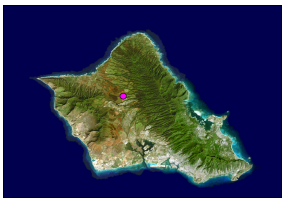
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	0		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Hawaiian Pineapple Dump 6 - Wahiawa



Hawaiian Pineapple Dump 6 - Wahiawa

Category 2

Site Description

Hawaiian Pineapple Dump 6, operated by the Hawaiian Pineapple Company (which became Dole), was likely used to dispose of plantation refuse. Although no records on the period of operation were located, the dump probably operated during the 1940s to1950s. There was no documentation found to indicate that the dump was permitted, lined, capped, or properly closed. The dump was probably small and was likely located at the edge of an agricultural field in a gulch not useable for farming. The former dump was probably a burn and dump operation. The parcel on which the dump is suspected to have been located is currently owned by Dole Food Company, Incorporated.

According to a historic map (Young, 1993; Map 8), the former Hawaiian Pineapple Dump 6 was located to the north of Whitmore Village (0.3 miles), to the south of the Upper Helemano Stream, and to the east of Poamoho Village (0.8 miles). The area in the vicinity of the former dump is currently agricultural and residential.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	7-1-002:030
2379980.21949	600634.82671	**Zone:**	Wahiawa
Longitude	**Latitude**	**Section:**	Paalaa Uka
158 01 41	21 31 10	**Plat:**	Not Designated
Address:	Not available	**Quadrangle:**	Haleiwa

Ownership

Current Owner: Dole Food Company, Incorporated

Previous Operator: Dole Pineapple

Site Operation and History

Landfill Type: Agricultural

Type of Waste: Plantation refuse

Monitoring Well Network? No wells documented

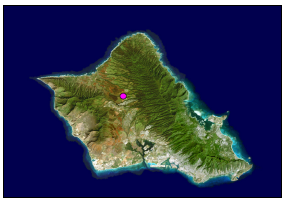
Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940s-1950s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump, some fill
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka



Hawaiian Pineapple Dump 6 - Wahiawa

Category 2

Population and Land Use

Type of Development in the Surronding Area?	Agricultural
City and County Zoning:	Ag-1
State Land Use District:	Agricultural
Facilities:	--
TMK Separation:	Pineapple field, steep land
Flood Zone:	D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province:	Schofield Plateau
Elevation Range (ft):	960 **to** 980
Approximate Landfill Acreage:	1-5
Parcel Acreage:	189.283

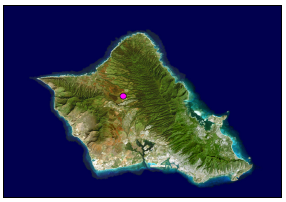
Climate

Annual Precipitation (cm):	142.70
Precipitation Days Per Year	99
Average Temperature (°F):	70.7
Temperature Range (° F):	63.2 **to** 78.1

Soils

Soil Map Symbol:	WaA	**Bulk Density (gm/cc):**	1.20-1.45
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Wahiawa	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	0-3
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High



Hawaiian Pineapple Dump 6 - Wahiawa

Category 2

Geology

Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

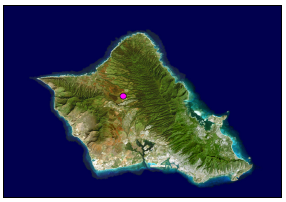
Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.

Hydrogeology

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Aquifer Status Code:	3050121211111
Aquifer Sector:	Central
Aquifer System:	Wahiawa
Aquifer Type 1:	High Level
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Dike
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

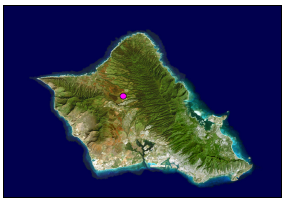


Hawaiian Pineapple Dump 6 - Wahiawa

Category 2

Site Reconnaissance

Site Description:	Site reconnaissance was not performed because of access issues during site visit and non-response of property owner.
Type of Property:	Unknown.
Current Site Operations:	Unknown.
Age of Development:	Unknown.
Onsite Building Information:	Unknown.
Was There a Recognizable Dump/Landfill?	Not applicable.
Institutional Controls:	The site is completely within Dole Plantation property. Access to Dole property is restricted.
Number of MonitoringWells:	Unknown.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	Not applicable.
Odors, Staining, Distressed Vegetation:	Not applicable.
Drainage Features:	Unknown.
Areas of Ponded Water Onsite:	Unknown.



Hawaiian Pineapple Dump 6 - Wahiawa

Category 2

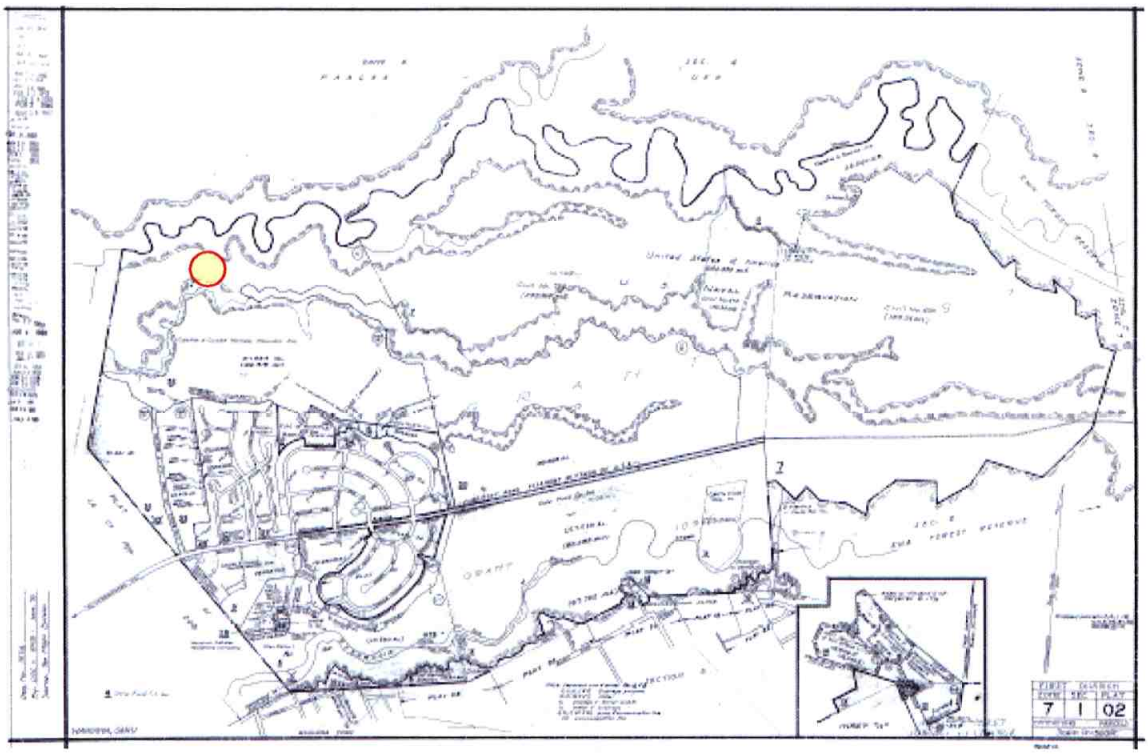
Site Reconnaissance (cont.)

Storm Water Retention Pond:	Unknown.
House and Schools in the Vicinity:	Yes.
Distance to Nearest Residence, School, or Businesses:	Less than 0.5 miles south.
How is Drinking Water in the Area Supplied?	Unknown.
Natural Resources, Agriculture, Aquaculture Near the Site?	Unknown.
Name of Surface Water Within 1-mile of Dump/Landfill:	Helamano Stream.
Distance to Surface Water:	Approximately 0.1 miles.
Proximal Direction of Surface Water:	North.
Where Does Surface Water Flow?	USGS topographic maps indicate that surface water would flow north toward an intermittant stream.
Surface Water Used for Drinking?	Unknown. Assume no.
Surface Water Used for Recreation?	Unknown.
Wetlands:	Unknown.
Off-site Sources of Contamination:	Unknown.
Does Run-off from other Sites Flow onto Subject Property:	Unknown.
Adjacent Property-North:	Unknown.
Adjacent Property-South:	Unknown.
Adjacent Property-East:	Unknown.
Adjacent Property-West:	Unknown.

Hawaiian Pineapple Dump 6 - Wahiawa

Category 2

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	0		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Hawaiian Pineapple Dump 7 - Waimea

Source: R.M. Towill Corporation

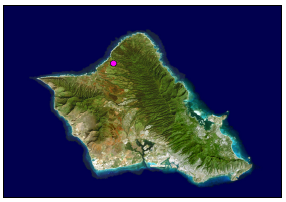
1951; photograph DACE-1-48

URS

Title **Aerial Photograph – Vicinity of Hawaiian Pineapple 7**

Project **Oahu Inactive Landfills Relative Risk Evaluation**

Project No. 26536686.00300



Hawaiian Pineapple Dump 7 - Waimea

Category 2

Site Description

Hawaiian Pineapple Dump 7, operated by the Hawaiian Pineapple Company (which became Dole), was likely used to dispose of plantation refuse. Although no records on the period of operation were located, the dump probably operated during the 1940s to1950s. There was no documentation found to indicate that the dump was permitted, lined, capped, or properly closed. The dump was probably small and was likely located at the edge of an agricultural field in a gulch not useable for farming. The former dump was probably a burn and dump operation. The parcel on which the dump is suspected to have been located is currently owned by Bernice Pauahi Bishop Trust Estate.

According to a historic map (Young, 1993; Map 8), the former Hawaiian Pineapple Dump 7 was reportedly located to the east of Leftovers Beach Park (1.3 miles), to the north of Ashley Road (0.2 miles), and to the southwest of Waimea Falls (1.0 mile). The area in the vicinity of the former dump is currently agricultural.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	6-1-006:001
2390962.66573	597719.71415	**Zone:**	Waialua
Longitude	**Latitude**	**Section:**	Kawailoa
158 03 20	21 37 08	**Plat:**	Not Designated
Address:	Not available, north of Ashley Road	**Quadrangle:**	Haleiwa

Ownership

Current Owner: Bernice Pauahi Bishop Trust Estate

Previous Operator: Dole Pineapple

Site Operation and History

Landfill Type: Agricultural

Type of Waste: Plantation refuse

Monitoring Well Network? No wells documented

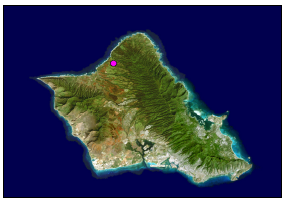
Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940s-1950s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump, some fill
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka



Hawaiian Pineapple Dump 7 - Waimea

Category 2

Population and Land Use

Type of Development in the Surronding Area?	Agricultural
City and County Zoning:	Ag-1, P-1
State Land Use District:	Agricultural, Conservation
Facilities:	--
TMK Separation:	Sugar cane field, field crop-not sugar cane or pineapple, steep land
Flood Zone:	D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province:	Schofield Plateau
Elevation Range (ft):	430 **to** 530
Approximate Landfill Acreage:	1-5
Parcel Acreage:	2,050

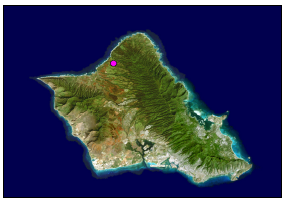
Climate

Annual Precipitation (cm):	138.53
Precipitation Days Per Year	120
Average Temperature (°F):	74.4
Temperature Range (° F):	65.2 **to** 83.5

Soils

Soil Map Symbol:	WaB	**Bulk Density (gm/cc):**	1.20-1.45
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Wahiawa	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	3-8
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High



Hawaiian Pineapple Dump 7 - Waimea

Category 2

Geology

Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

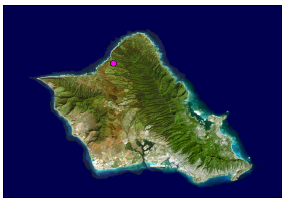
Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.

Hydrogeology

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Aquifer Status Code:	3040311111111
Aquifer Sector:	North
Aquifer System:	Kawailoa
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

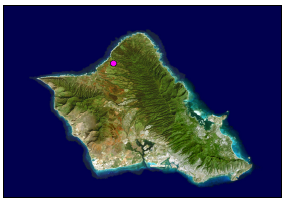


Hawaiian Pineapple Dump 7 - Waimea

Category 2

Site Reconnaissance

Site Description:	Site reconnaissance was not performed because property owner and consultant could not agree on terms of the Consent of Entry agreement.
Type of Property:	Not applicable.
Current Site Operations:	Unknown.
Age of Development:	Unknown.
Onsite Building Information:	Unknown.
Was There a Recognizable Dump/Landfill?	Not applicable.
Institutional Controls:	Unknown.
Number of MonitoringWells:	Unknown. Assume no.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	Not applicable.
Odors, Staining, Distressed Vegetation:	Not applicable.
Drainage Features:	Unknown.
Areas of Ponded Water Onsite:	Unknown.



Hawaiian Pineapple Dump 7 - Waimea

Category 2

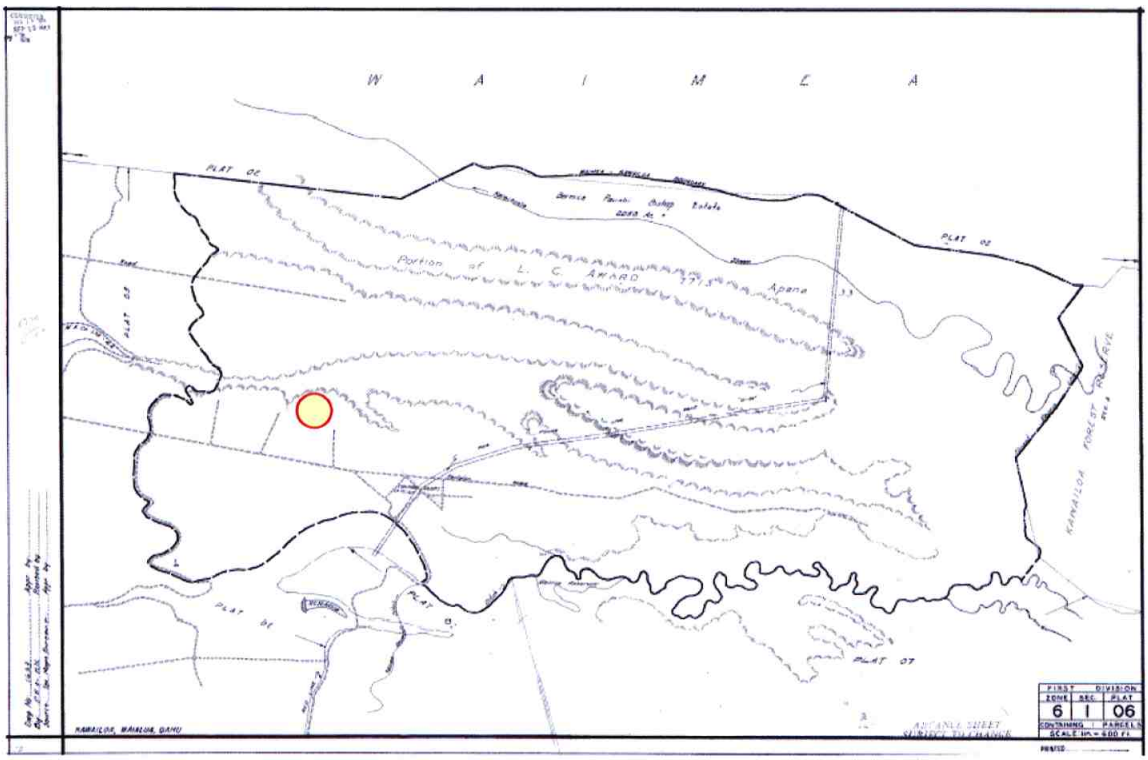
Site Reconnaissance (cont.)

Storm Water Retention Pond:	Unknown.
House and Schools in the Vicinity:	Unknown.
Distance to Nearest Residence, School, or Businesses:	Unknown.
How is Drinking Water in the Area Supplied?	Unknown.
Natural Resources, Agriculture, Aquaculture Near the Site?	Unknown.
Name of Surface Water Within 1-mile of Dump/Landfill:	USGS topographic maps indicate that an intermittant stream is close to the site.
Distance to Surface Water:	Less than 200 feet.
Proximal Direction of Surface Water:	North.
Where Does Surface Water Flow?	Unknown.
Surface Water Used for Drinking?	Unknown. Assume no.
Surface Water Used for Recreation?	Unknown. Assume no.
Wetlands:	Unknown.
Off-site Sources of Contamination:	Unknown.
Does Run-off from other Sites Flow onto Subject Property:	Unknown.
Adjacent Property-North:	Unknown.
Adjacent Property-South:	Unknown.
Adjacent Property-East:	Unknown.
Adjacent Property-West:	Unknown.

Hawaiian Pineapple Dump 7 - Waimea

Category 2

TMK Map



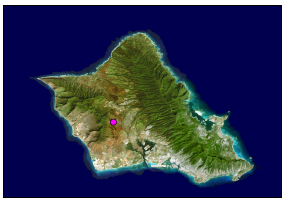
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	0		
Municipal Well(s)within one mile	0	**Observation Well(s)within one mile**	0
BWS Well(s) within one mile	0	**Sealed Well(s)within one mile**	0
Domestic Well(s)within one mile	0	**Unused Well(s) within one mile**	0
Irrigation Well(s)within one mile	0	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	0

Well Details

Hawaiian Pineapple Dump 8 - Ewa



Hawaiian Pineapple Dump 8 - Ewa

Category 2

Site Description

Hawaiian Pineapple Dump 8 and California Packing Company Dump 2 may have been the same dumping area. Hawaiian Pineapple Dump 8 was likely operated by the California Packing Company (which became Del Monte Corporation) and/or Dole. The dump was used to dispose of plantation refuse. Although no records on the period of operation were located, the dump probably operated during the 1940s to 1950s. There was no documentation found to indicate that the dump was permitted, lined, capped, or properly closed. The dump was probably small and was likely located at the edge of an agricultural field in a gulch not useable for farming. The former dump was probably a burn and dump operation. The parcel on which the dump is suspected to have been located is currently owned by Ekahanui, Incorporated.

According to a historic map (Young, 1993; Map 8), the former Hawaiian Pineapple Dump 8 was reportedly located to the east of Kunia Road, to the south of Kunia (1.2 miles), and in the area of the Huliwai Gulch. The suspected location of the dump is on property currently known as Hawaii Country Club. The area in the vicinity of the former dump is currently agricultural.

During a recent site visit, an "out-of-place", elongated, heavily vegetated mound that could be a remnant of the former dump was noted. The mound could also have been formed during construction of the Hawaii Country Club golf course. No definitive indications of current or former dumping activities were observed at the site.

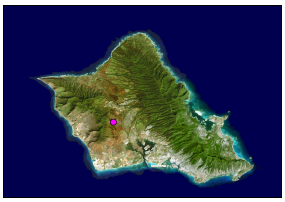
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	9-4-004:020
2371192.35926	597487.14671	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Honouliuli
158 03 33	21 26 25	**Plat:**	Not Designated
Address:	1211 Kunia Road	**Quadrangle:**	Schofield Barracks

Ownership

Current Owner: Ekahanui, Inc.

Previous Operator: Dole Pineapple



Hawaiian Pineapple Dump 8 - Ewa

Category 2

Site Operation and History

Landfill Type: Agricultural

Type of Waste: Plantation refuse

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940s-1950s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump, some fill
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Agricultural

City and County Zoning: P-2

State Land Use District: General Preservation

Facilities: Warehouses (1941, 1968, 1976), golf course (1964)

TMK Separation: Country club, unsubdivided vacant land

Flood Zone: D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province: Schofield Plateau

Elevation Range (ft): 820 **to** 820

Approximate Landfill Acreage: 1-5

Parcel Acreage: 136

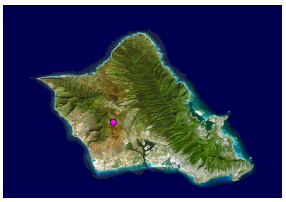
Climate

Annual Precipitation (cm): 142.70

Precipitation Days Per Year 99

Average Temperature (°F): 70.7

Temperature Range (° F): 63.2 **to** 78.1



Hawaiian Pineapple Dump 8 - Ewa

Category 2

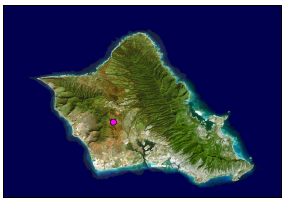
Soils

Soil Map Symbol:	KuD	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Tropohumults-Dystrandepts	**Moisture Retention (%):**	0.09-0.11
Soil Series:	Kolekole	**Organic Carbon (%):**	2.0-4.0
Engineering Classification:	Silty Clay Loam	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Poor	**Slope (%):**	12-25
Thickness of Surface Soil (in):	0-60	**pH:**	4-5.5
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	KyB	**Bulk Density (gm/cc):**	1.10-1.40
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.12-0.14
Soil Series:	Kunia	**Organic Carbon (%):**	1.0-4.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	3-8
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	KuC	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Tropohumults-Dystrandepts	**Moisture Retention (%):**	0.09-0.11
Soil Series:	Kolekole	**Organic Carbon (%):**	2.0-4.0
Engineering Classification:	Silty Clay Loam	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Poor	**Slope (%):**	6-12
Thickness of Surface Soil (in):	0-60	**pH:**	4-5.5
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High



Hawaiian Pineapple Dump 8 - Ewa

Category 2

Geology

Geologic Symbol(s): Pa

Geologic Unit(s): Consolidated noncalcareous deposits

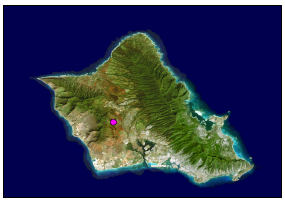
Geologic Description: Chiefly older alluvium, generally consisting of mottled brown to red-brown, deeply weathered, poorly-assorted, and nearly impermeable friable conglomerates, in places cemented with limonite or hematite and usually forming conspicuous terraces along the principal streams. Near the mouths of the valleys and especially around Pearl Harbor and near Waialua the older alluvium grades into partly consolidated sands and silts that are emerged delta deposits. The degree of consolidation is largely dependent upon the amount of rainfall, for in dry regions the material is much better cemented than in wet regions. Near the heads of valleys the older alluvium grades into coarse angular talus and landslide deposits which, in places, carry considerable water. In the large semiarid valleys in the Waianae Range these deposits are firmly cemented breccias. They are poorly permeable in wet areas and hold up perched water in the Honolulu volcanic series, but in the dry areas they yield small supplies of potable water.

Hydrogeology

Rock Type:	Alluvium-older-consolidated
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Aquifer Status Code:	3020311111111
Aquifer Sector:	Pearl Harbor
Aquifer System:	Waipahu
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

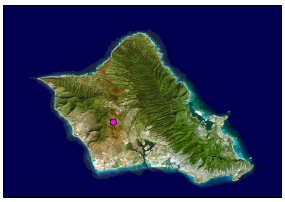


Hawaiian Pineapple Dump 8 - Ewa

Category 2

Site Reconnaissance

Site Description:	The suspected location of the Hawaiian Pineapple Dump 8 is on property currently known as Hawaii Country Club. No definitive indications of current or former dumping activities were observed during the site visit.
Type of Property:	Golf course.
Current Site Operations:	Golf course operations.
Age of Development:	Unknown.
Onsite Building Information:	There are no buildings in the immediate area of the suspected dump location. The clubhouse and course operation buildings are assumed to be located on the property to the south.
Was There a Recognizable Dump/Landfill?	An elongated, heavily vegetated, approximately 12 foot high mound that could be remnants of Hawaiian Pineapple 8 was noted on the eastern side of Kunia Road. Although the mound is located in the vicinity of where historic maps indicated the dump was located, the mound could also have been formed during construction of the Hawaii Country Club golf course.
Institutional Controls:	The suspected dump site is located within the property operated by the Hawaii Country Club. The gated access road to the property along Kunia Road is locked during non-business hours.
Number of MonitoringWells:	None observed.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	None observed.
Odors, Staining, Distressed Vegetation:	None observed.
Drainage Features:	None observed.
Areas of Ponded Water Onsite:	A man-made reservoir was observed approximately 300 feet east of Kunia Road on the northern portion of the golf course.



Hawaiian Pineapple Dump 8 - Ewa

Category 2

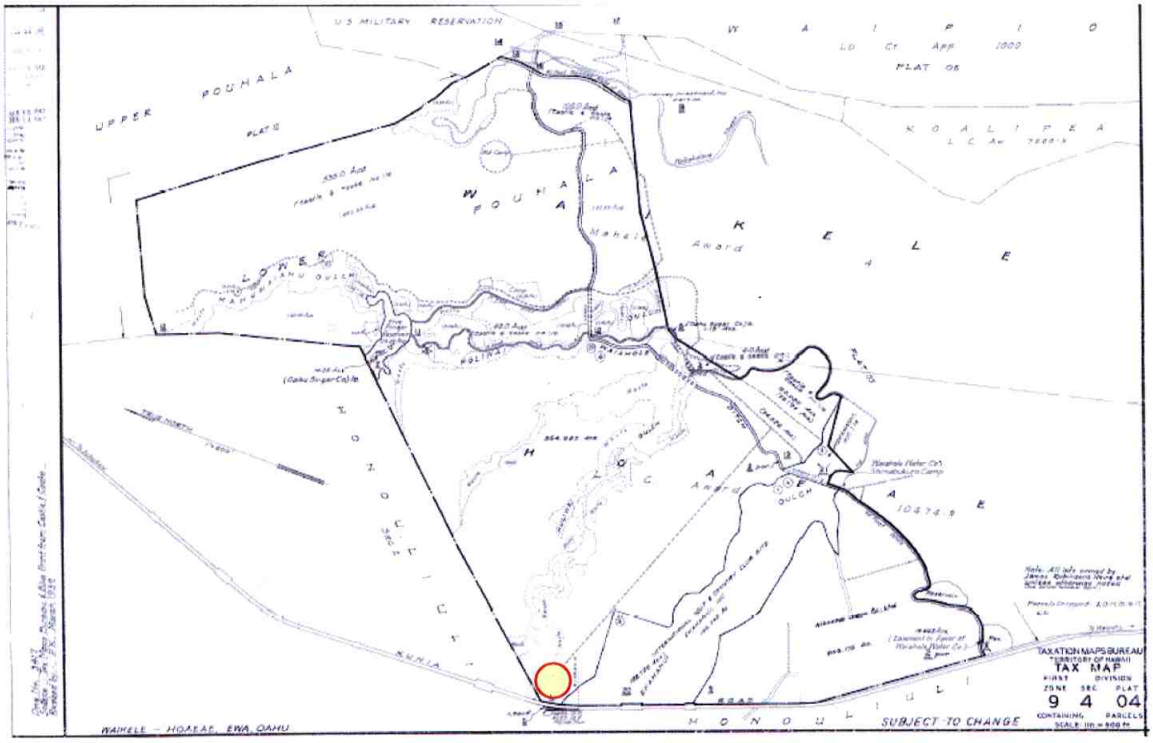
Site Reconnaissance (cont.)

Storm Water Retention Pond:	Unknown. None observed.
House and Schools in the Vicinity:	Unknown.
Distance to Nearest Residence, School, or Businesses:	Unknown.
How is Drinking Water in the Area Supplied?	Unknown. Assume Waiahole and Wakane Streams like the neighboring farms.
Natural Resources, Agriculture, Aquaculture Near the Site?	Agricultural farms neighbor the golf course on all sides.
Name of Surface Water Within 1-mile of Dump/Landfill:	USGS topographic maps indicate that a stream runs through the Huliwai Gulch.
Distance to Surface Water:	Approximately 0.2 miles.
Proximal Direction of Surface Water:	North.
Where Does Surface Water Flow?	Unknown.
Surface Water Used for Drinking?	No.
Surface Water Used for Recreation?	No.
Wetlands:	None observed.
Off-site Sources of Contamination:	Surrounding properties of the suspected dump site consist of farmland. According to Jonathon Jefts of Waikele Farms, Waikele Farms uses pesticides and herbicides as part of their farm operations.
Does Run-off from other Sites Flow onto Subject Property:	None observed.
Adjacent Property-North:	Del Monte farms - agricultural land.
Adjacent Property-South:	Waikele farms - agricultural land.
Adjacent Property-East:	Waikele farms - agricultural land.
Adjacent Property-West:	Kunia Road and agricultural farms.

Hawaiian Pineapple Dump 8 - Ewa

Category 2

TMK Map



Wells Within One Mile

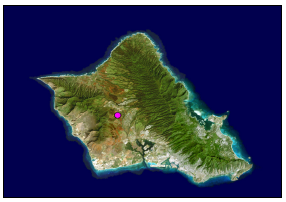
Summary

Total Number of Well(s)within one mile	1		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	1	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Photo 1. **Looking southwest at an approximately 12 foot high, elongated, heavily vegetated mound that could be remnants of Hawaiian Pineapple 8. The mound could also have been formed during construction of the Hawaii County Club golf course. The tree line in the foreground is growing at the base of the mound. The mound is located on the eastern side of Kunia Road.**

Hawaiian Pineapple Dump 9 - Ewa



Hawaiian Pineapple Dump 9 - Ewa

Category 2

Site Description

Hawaiian Pineapple Dump 9, operated by Hawaiian Pineapple Company (which became Dole), was likely used to dispose of plantation refuse. Although no records on the period of operation were located, the dump probably operated during the 1940s to1950s. There was no documentation found to indicate that the dump was permitted, lined, capped, or properly closed. The dump was probably small and was likely located at the edge of an agricultural field in a gulch not useable for farming. The former dump was probably a burn and dump operation.

The suspected location of the Hawaiian Pineapple Dump 9 is on property currently managed by Waikele Farms and owned by the Robinson Estate, to the east of Kunia (0.9 miles) and to the south of Wheeler Air Force Base. The former dump is presumed to have been situated within the Manuwaiahu Gulch, which is heavily vegetated with trees and tall grass. The sides of the gulch are very steep. No visible indications of current or former dumping activities were observed during the site visit. The area in the vicinity of the former dump is currently agricultural.

During a recent site visit no visible indications of current or former dumping activities were observed. The suspected dumpsite itself is undeveloped and surrounding area operations include vegetable and fruit farming. During a September 20, 2004 telephone interview, Mr. Steven Mau, of the Robinson Trust Estate, didn't recall pesticide/herbicide-mixing operations ever being located on this site. Because agricultural chemicals were likely mixed elsewhere and brought to the site, the wastes associated with the mixing process are not likely to be associated with this dump.

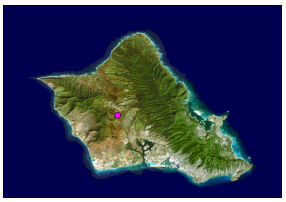
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	9-4-004:012
2373137.24	598891.40	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Waikele-Hoaeae
158 02 42	21 27 39	**Plat:**	Not Designated
Address:	Not available	**Quadrangle:**	Schofield Barracks

Ownership

Current Owner: Robinson Estate et al

Previous Operator: Dole Pineapple



Hawaiian Pineapple Dump 9 - Ewa

Category 2

Site Operation and History

Landfill Type: Agricultural

Type of Waste: Plantation refuse

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940s-1950s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump, some fill
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Agricultural

City and County Zoning: Ag-1

State Land Use District: Agricultural

Facilities: --

TMK Separation: Sugar cane field

Flood Zone: D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province: Schofield Plateau

Elevation Range (ft): 720 **to** 780

Approximate Landfill Acreage: 1-5

Parcel Acreage: 535.0

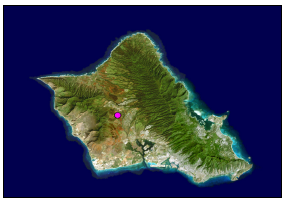
Climate

Annual Precipitation (cm): 142.70

Precipitation Days Per Year 99

Average Temperature (°F): 70.7

Temperature Range (° F): 63.2 **to** 78.1



Hawaiian Pineapple Dump 9 - Ewa

Category 2

Soils

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	WaB	**Bulk Density (gm/cc):**	1.20-1.45
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Wahiawa	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	3-8
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

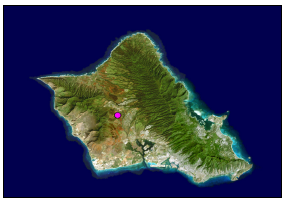
Soil Map Symbol:	WaA	**Bulk Density (gm/cc):**	1.20-1.45
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Wahiawa	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	0-3
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Geology

Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.



Hawaiian Pineapple Dump 9 - Ewa

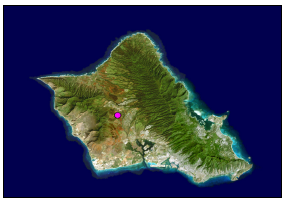
Category 2

Hydrogeology

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Aquifer Status Code:	3020311111111
Aquifer Sector:	Pearl Harbor
Aquifer System:	Waipahu
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

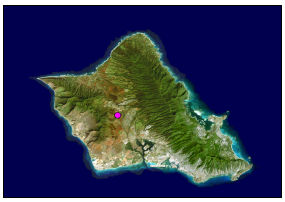


Hawaiian Pineapple Dump 9 - Ewa

Category 2

Site Reconnaissance

Site Description:	The suspected location of the Hawaiian Pineapple Dump 9 is on property currently managed by Waikele Farms. The former dump is presumed to have been situated within the Manuwaiahu Gulch, which is heavily vegetated with trees and tall grass. The sides of the gulch are very steep. No visible indications of current or former dumping activities were observed during the site visit.
Type of Property:	The suspected dump site itself is undeveloped. Surrounding areas consist of agricultural fields.
Current Site Operations:	No current onsite operations. Surrounding area operations include vegetable and fruit farming.
Age of Development:	Over 50 years old.
Onsite Building Information:	None.
Was There a Recognizable Dump/Landfill?	No.
Institutional Controls:	The suspected dump site is located within the property operated by Waikele Farms. Waikele Farms is fenced and the gate located on Kunia Road is locked during non-business hours.
Number of MonitoringWells:	None observed.
Stability (signs of erosion, etc):	Small patches of eroded ground (approximately 100 square feet) were observed along the northern side of the Manuwaiahu Gulch during the site visit. The patches were insignificant compared to the heavy vegetation within the gulch.
Leachate, Seeps:	None observed.
Odors, Staining, Distressed Vegetation:	None observed.
Drainage Features:	None observed.
Areas of Ponded Water Onsite:	None observed.



Hawaiian Pineapple Dump 9 - Ewa

Category 2

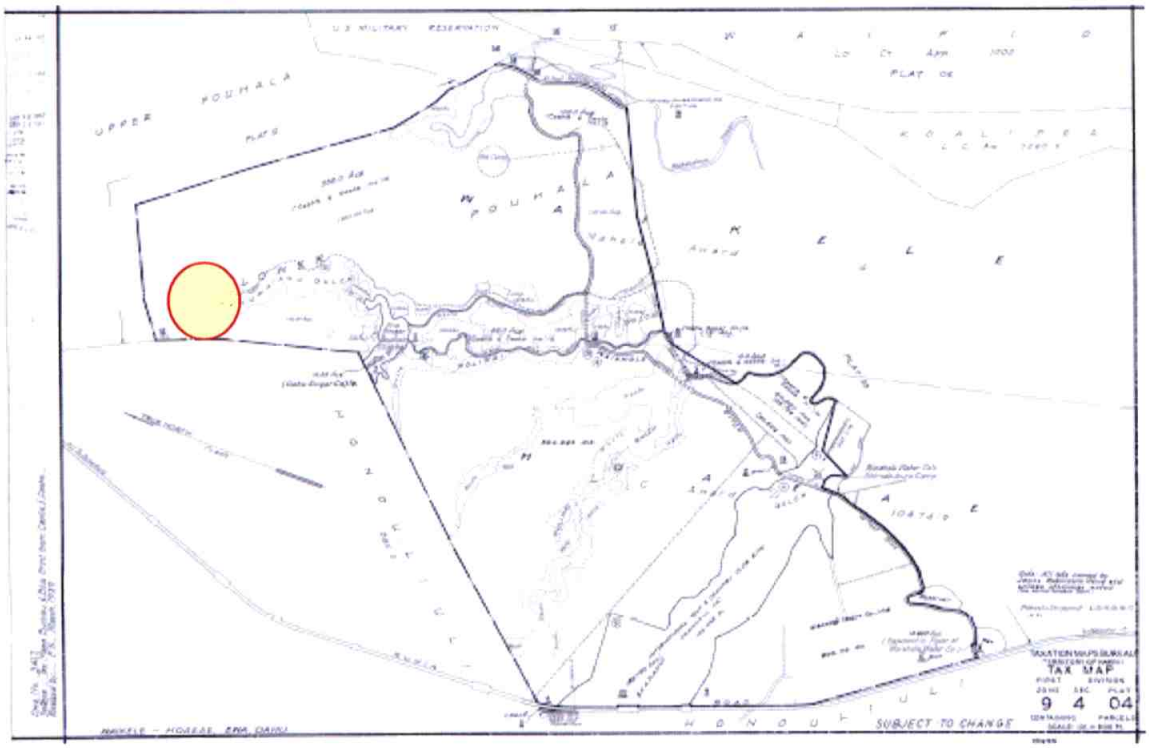
Site Reconnaissance (cont.)

Storm Water Retention Pond:	None observed.
House and Schools in the Vicinity:	None observed.
Distance to Nearest Residence, School, or Businesses:	Unknown.
How is Drinking Water in the Area Supplied?	According to Jonathon Jefts, water for Waikele Farms is supplied from the Waiahole and Waikane Streams.
Natural Resources, Agriculture, Aquaculture Near the Site?	Surrounding properties consist of agricultural farms.
Name of Surface Water Within 1-mile of Dump/Landfill:	Surface water was not flowing through the gulch at the time of the site visit. However, USGS topographic maps indicate that a stream flows through the Manuwaiahu Gulch.
Distance to Surface Water:	Onsite.
Proximal Direction of Surface Water:	Onsite.
Where Does Surface Water Flow?	The suspected dump site is located in the Manuwaiahu Gulch. Surface water runoff flows to the southeast through gulch in which the site is suspected to have been located.
Surface Water Used for Drinking?	No.
Surface Water Used for Recreation?	No.
Wetlands:	None observed.
Off-site Sources of Contamination:	Surrounding properties of the suspected dump site consist of farmland. A potential offsite source of impact to the subject property is upstream runoff into the gulch.
Does Run-off from other Sites Flow onto Subject Property:	Surface water runoff already in the Manuwaiahu Gulch from upstream locations, flows to the southeast past the suspected dump site.
Adjacent Property-North:	Manuwaiahu Gulch.
Adjacent Property-South:	Manuwaiahu Gulch.
Adjacent Property-East:	Waikele Farms - agricultural farmland.
Adjacent Property-West:	Agricultural farmland.

Hawaiian Pineapple Dump 9 - Ewa

Category 2

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	11		
Municipal Well(s)within one mile	0	**Observation Well(s)within one mile**	10
BWS Well(s) within one mile	0	**Sealed Well(s)within one mile**	0
Domestic Well(s)within one mile	0	**Unused Well(s) within one mile**	0
Irrigation Well(s)within one mile	1	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	0

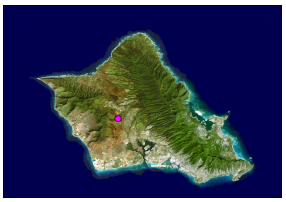
Well Details

Photo 1. **Looking southeast across the Manuwaiahu Gulch in which the dump is presumed to have been situated. No distinct indications of the specific dump location were noted during the site visit.**

Photo 2. **Looking south down the axis of the Manuwaiahu Gulch.**

Photo 3. Looking southeast at the dirt road that borders the eastern side of the Manuwaiahu Gulch.

Hawaiian Pineapple Dump 10 - Kunia



Hawaiian Pineapple Dump 10 - Kunia

Category 2

Site Description

Hawaiian Pineapple Dump 10, operated by the Hawaiian Pineapple Company (which became Dole), was likely used to dispose of plantation refuse. Although no records on the period of operation were located, the dump probably operated during the 1940s to 1950s. There was no documentation found to indicate that the dump was permitted, lined, capped, or properly closed. The dump was probably small and was likely located at the edge of an agricultural field in a gulch not useable for farming. The former dump was probably a burn and dump operation. The parcel on which the dump is suspected to have been located is currently managed by Waikele Farms and owned by the Robinson Estate.

The suspected location of the former Hawaiian Pineapple Dump 10 is on undeveloped property to the southeast of Kunia (1.0 mile) and to the south of the Wheeler Air Force Base (1.5 miles) within the Poliwai Gulch. According to a historic map (Young, 1993; Map 8), the open-space dumping area was located on property currently managed by Waikele Farms. Mr. Jonathon Jefts of Waikele Farms indicated that the area was once used as a reservoir. No visible indications of current or former dumping activities were observed during the site visit. The area in the vicinity of the former dump is currently agricultural.

During a September 20, 2004 telephone interview, Mr. Steven Mau, of the Robinson Trust Estate, didn't recall pesticide/herbicide mixing operations ever being located on this site. Because agricultural chemicals were likely mixed elsewhere and brought to the site, the wastes associated with the mixing process may not have gone into this dump.

During a recent site visit no indications of current or former dumping activities were observed.

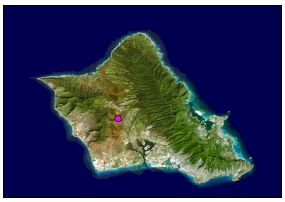
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	9-4-004:007
2372363.06252	598878.98281	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Waikele-Hoaeae
158 02 44	21 27 03	**Plat:**	Not Designated
Address:	Not available	**Quadrangle:**	Schofield Barracks

Ownership

Current Owner: Robinson Estate et al

Previous Operator: Dole Pineapple



Hawaiian Pineapple Dump 10 - Kunia

Category 2

Site Operation and History

Landfill Type: Agricultural

Type of Waste: Plantation refuse

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940s-1950s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump, some fill
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Agricultural

City and County Zoning: Ag-1

State Land Use District: Agricultural

Facilities: --

TMK Separation: Sugar cane field

Flood Zone: D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province: Schofield Plateau

Elevation Range (ft): 700 **to** 720

Approximate Landfill Acreage: 1-5

Parcel Acreage: 14.45

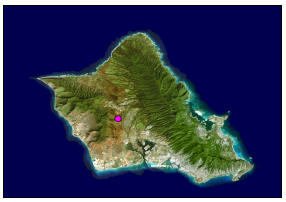
Climate

Annual Precipitation (cm): 142.70

Precipitation Days Per Year 99

Average Temperature (°F): 70.7

Temperature Range (° F): 63.2 **to** 78.1



Hawaiian Pineapple Dump 10 - Kunia

Category 2

Soils

Soil Map Symbol:	KlA	**Bulk Density (gm/cc):**	1.10-1.40
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.12-0.15
Soil Series:	Kawaihapai	**Organic Carbon (%):**	1.0-2.0
Engineering Classification:	Clay Loam; Stony or Very Stony	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	0-2
Thickness of Surface Soil (in):	0-54	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

Geologic Symbol(s): Tkb

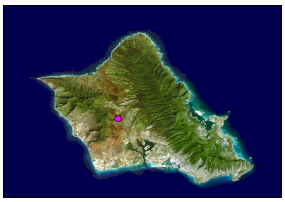
Geologic Unit(s): Koolau volcanic series

Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.

Geologic Symbol(s): Pa

Geologic Unit(s): Consolidated noncalcareous deposits

Geologic Description: Chiefly older alluvium, generally consisting of mottled brown to red-brown, deeply weathered, poorly-assorted, and nearly impermeable friable conglomerates, in places cemented with limonite or hematite and usually forming conspicuous terraces along the principal streams. Near the mouths of the valleys and especially around Pearl Harbor and near Waialua the older alluvium grades into partly consolidated sands and silts that are emerged delta deposits. The degree of consolidation is largely dependent upon the amount of rainfall, for in dry regions the material is much better cemented than in wet regions. Near the heads of valleys the older alluvium grades into coarse angular talus and landslide deposits which, in places, carry considerable water. In the large semiarid valleys in the Waianae Range these deposits are firmly cemented breccias. They are poorly permeable in wet areas and hold up perched water in the Honolulu volcanic series, but in the dry areas they yield small supplies of potable water.



Hawaiian Pineapple Dump 10 - Kunia

Category 2

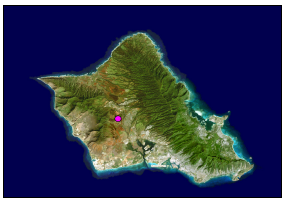
Hydrogeology

Rock Type:	Alluvium-older-consolidated
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Aquifer Status Code:	3020311111111
Aquifer Sector:	Pearl Harbor
Aquifer System:	Waipahu
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High



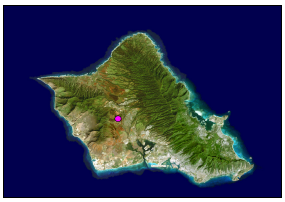
Hawaiian Pineapple Dump 10 - Kunia

Category 2

Site Reconnaissance

Site Description: The suspected location of the former Hawaiian Pineapple Dump 10, is on property currently managed by Waikele Farms. The former dump is presumed to have been situated within the Poliwai Gulch. Jonathon Jefts, of Waikele Farms, indicated that the area was once used as a reservoir. No visible indications of current or former dumping activities were observed during the site visit.

Type of Property:	The property on which the dump is suspected to be located is undeveloped. Surrounding areas consist of agricultural development.
Current Site Operations:	No current onsite operations. Surrounding area operations include vegetable and fruit farming.
Age of Development:	Over 50 years old.
Onsite Building Information:	None.
Was There a Recognizable Dump/Landfill?	No.
Institutional Controls:	The suspected dump site is located within the property operated by Waikele Farms. Waikele farms has fencing around their property and a gate located on Kunia Road that is locked during non-business hours.
Number of MonitoringWells:	None observed.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	None observed.
Odors, Staining, Distressed Vegetation:	None observed.
Drainage Features:	None observed.
Areas of Ponded Water Onsite:	None observed. J Jefts indicated that the area was a formerly reservoir, but it is now dry.



Hawaiian Pineapple Dump 10 - Kunia

Category 2

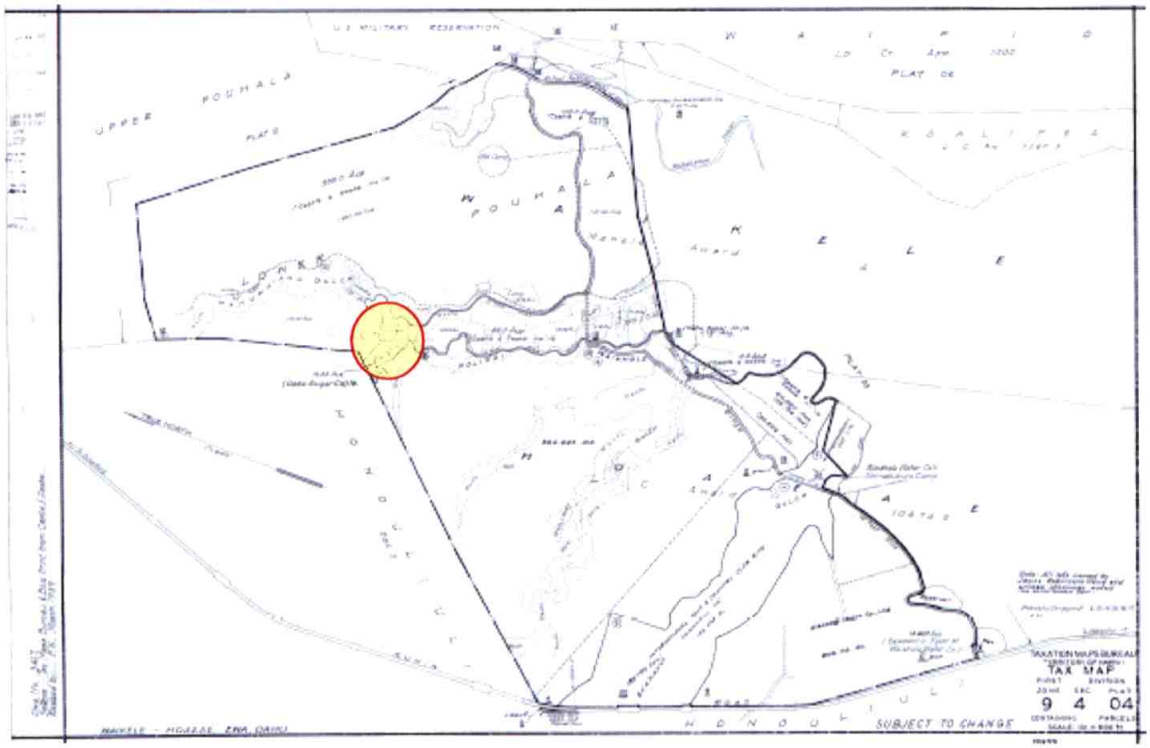
Site Reconnaissance (cont.)

Storm Water Retention Pond:	None observed.
House and Schools in the Vicinity:	None observed.
Distance to Nearest Residence, School, or Businesses:	Unknown.
How is Drinking Water in the Area Supplied?	According to Jonathon Jefts, water for Waikele Farms is supplied from the Waiahole and Waikane Streams.
Natural Resources, Agriculture, Aquaculture Near the Site?	Surrounding properties consist of agricultural farms.
Name of Surface Water Within 1-mile of Dump/Landfill:	URS did not observe water flowing through the gulch. However, USGS topographic maps indicate that a stream runs through the Poliwai Gulch.
Distance to Surface Water:	Onsite.
Proximal Direction of Surface Water:	Onsite.
Where Does Surface Water Flow?	The suspected dump site is located in the Poliwai Gulch. Surface water runoff flows through the site in a southern direction.
Surface Water Used for Drinking?	No.
Surface Water Used for Recreation?	No.
Wetlands:	None observed.
Off-site Sources of Contamination:	Properties that surround the subject parcel, on which the former dump is suspected to be located, consist of farmland. According to Jonathon Jefts of Waikele Farms, Waikele Farms uses pesticides and herbicides in farm operations. A potential offsite source of impact to the subject property is upstream runoff into the gulch.
Does Run-off from other Sites Flow onto Subject Property:	Runoff already in the Manuwaiahu gulch from upstream locations would flow through the suspected dump site and remain onsite due to the plantation road that crosses the gulch.
Adjacent Property-North:	Poliwai Gulch.
Adjacent Property-South:	Poliwai Gulch.
Adjacent Property-East:	Waikele Farms - agricultural farmland.
Adjacent Property-West:	Waikele Farms - agricultural farmland.

Hawaiian Pineapple Dump 10 - Kunia

Category 2

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	10		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	9
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	1	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

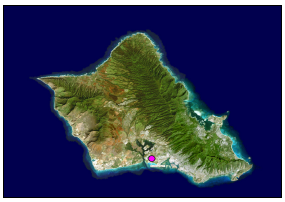
Well Details

Photo 1. Looking northwest across the Poliwai Gulch in which the former dump is presumed to have been situated.

Photo 2. Looking southwest at the Poliwai Gulch. The gulch is bordered by agricultural fields on both sides.

Photo 3. Looking east across the Poliwai Gulch. No distinct indications of the specific dump location were noted during the site visit.

Hickam Site LF01, Landfill 1



Hickam Site LF01, Landfill 1

Category 3

Site Description

Hickam Air Force Base (AFB) is bounded on the east by the Honolulu International Airport, on the south by the Pacific Ocean (the Reef Runway Lagoon and Mamala Bay), on the west by the Pearl Harbor Entrance Channel, and on the north by the Pearl Harbor Naval Complex. The total land area of Hickam AFB is approximately 2,520 acres (CH2M Hill, 2003).

There are several dumps at Hickam AFB including:
LF01 - Landfill 1, Site 1
LF14 - Inactive Landfill 2, Site 2
LF15 - Inactive Landfill 3, Site 3
LF16 - Inactive Landfill 4, Site 4
LF17 - Inactive Landfill 6, Site 6
EA01 - Potential Landfill Area (near LF14 and LF15)
EA-39 - Kuntz Avenue Entrance Dump
EA40 - Honolulu Airport Debris/Potential Landfill

However, the focus during this investigation was on the former dump known as "LF01".

Landfill LF01 is located near taxiway A-4 and Kamakahi Street to the north of Kumumauu Canal, and to the west of the Manuwai Canal. The landfill encompasses approximately 320,000 square feet. The depth of the landfill is unknown.

The dump was the primary refuse disposal site for the Air Force during World War II operations (1942-1946). The dig and fill operation was used to dispose of municipal solid waste as well as non-recyclable Air Force shop wastes including solvents and hazardous sludges. The dump was reportedly capped upon closure with native fill (Bagaoisan, 1997). An estimated 4,800 gallons, or 84 drums of material, were deposited into the landfill (Hirota, 1983). Suspected contaminants from the landfill identified by a Phase I report include lubricants, paint wastes, solvents, and heavy metal sludges (Engineering Science, 1992).

Hickam AFB participated in the Installation Restoration Program (IRP), a specially funded program established by the Department of Defense (DoD) to identify, investigate, and control the migration of hazardous contaminants on military and other DoD facilities. Landfill LF01 has been investigated under the IRP program.

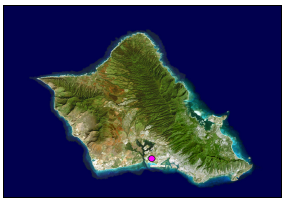
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	1-1-002:002
2358956.21893	609362.25162	**Zone:**	Honolulu
Longitude	**Latitude**	**Section:**	Moanalua
157 56 43	21 19 45	**Plat:**	Not Designated
Address:	Located on Hickam AFB adjacent to Taxiway V and Kamikahi Street	**Quadrangle:**	Pearl Harbor

Ownership

Current Owner: United States government

Previous Operator: U.S. Air Force



Hickam Site LF01, Landfill 1

Category 3

Site Operation and History

Landfill Type: Military

Type of Waste: Municipal solid waste, solvents, hazardous sludges, paints/paint solvents

Monitoring Well Network? Yes

Monitoring Well Identification MW-9, MW-10, MW-11

Status:	Closed	**Analytical Data Available?**	Yes
Active Period:	1942-1946	**EPA ID No.:**	HI957302872200, HI8570028722 (base)
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Long-Term Monitoring
Capped?	Yes	**Method of Operation:**	Dig and fill
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Population and Land Use

Type of Development in the Surronding Area? Military

City and County Zoning: F-1

State Land Use District: Urban

Facilities: --

TMK Separation: No data available

Flood Zone: D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province: Coastal Plain

Elevation Range (ft): 5 **to** 10

Approximate Landfill Acreage: 15

Parcel Acreage: 626.2089

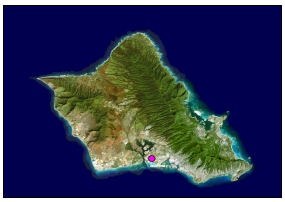
Climate

Annual Precipitation (cm): 52.20

Precipitation Days Per Year 31

Average Temperature (°F): 77.1

Temperature Range (° F): 70.2 **to** 84.0



Hickam Site LF01, Landfill 1

Category 3

Soils

Soil Map Symbol:	FL	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.06-0.12
Soil Series:	Fill Land, Mixed	**Organic Carbon (%):**	0.1-5.0
Engineering Classification:	Fill Land, Mixed	**Permeability (in/hr):**	0.1-2
Drainage Characterisitics:	Poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

Geologic Symbol(s): Pls

Geologic Unit(s): Consolidated calcareous marine sediments

Geologic Description: Chiefly emerged coral reefs but in places, especially near Pearl Harbor, finely laminated lagoon limestone. Beach deposits resembling the various types of present calcareous beaches in lithified form are included, as well as a few inextensive consolidated beach deposits that may have been formed at the present stand of the sea. Extremely permeable because of primary and secondary cavities and yields water copiously, but the water is apt to be brackish.

Geologic Symbol(s): Rf

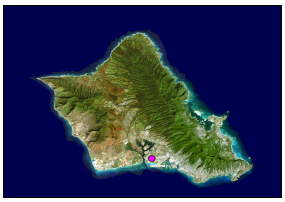
Geologic Unit(s): Artificial fill composed of marine deposits

Geologic Description: Brown to white permeable marine mud containing shells, coral, and other calcareous marine organisms dredged from the ocean floor and used to fill up salt marshes and other lowlands.

Hydrogeology

Rock Type:	Sand-unconsolidated
GW Occurrance-Principal:	Basal
GW Occurrance-Secondary:	--
Permeability:	Moderate to high
Hydraulic Conductivity (ft/d):	100 - 1,000

Rock Type:	Coral-in situ reef limestone
GW Occurrance-Principal:	Basal
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to very high
Hydraulic Conductivity (ft/d):	100 - 20,000



Hickam Site LF01, Landfill 1

Category 3

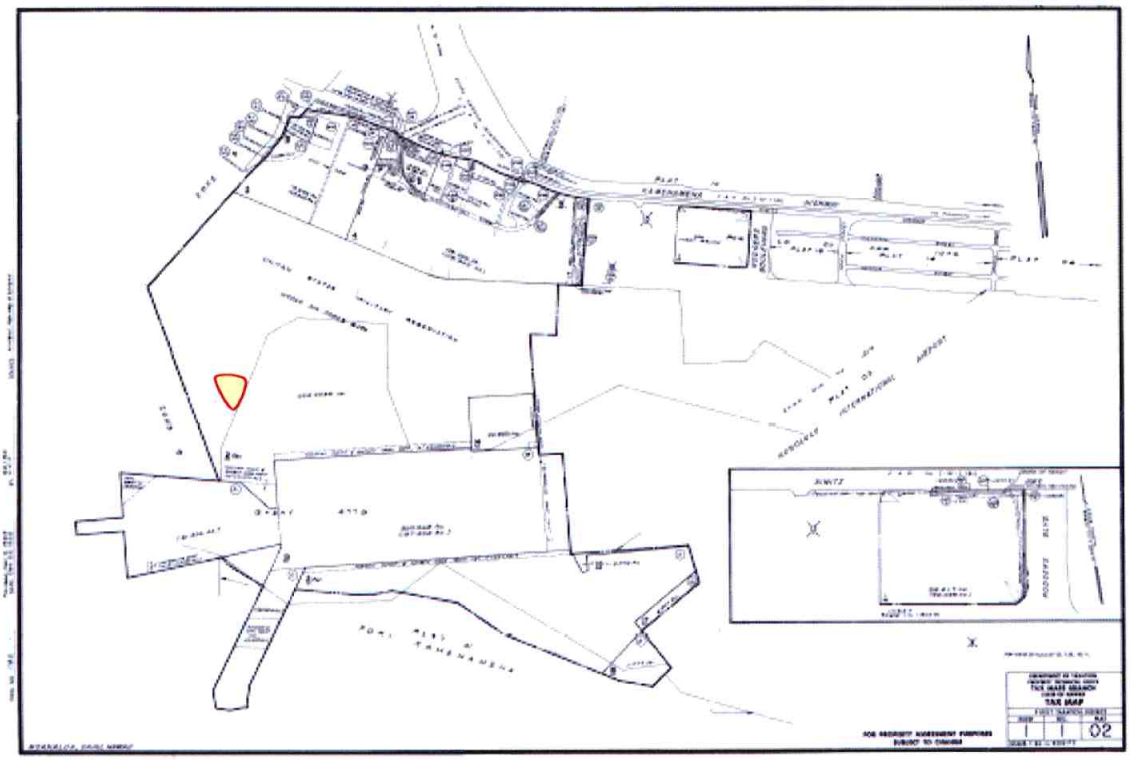
Aquifer(s)

Uppermost Aquifer	**Aquifer Status Code:**	3010411623321
	Aquifer Sector:	Honolulu
	Aquifer System:	Moanalua
	Aquifer Type 1:	Basal
	Aquifer Type 2:	Unconfined
	Aquifer Type Geol.:	Sedimentary
	Development State:	Potential use
	Utility:	Neither
	Salinity (mg/L Cl-):	Moderate (1,000-5,000)
	Uniqueness:	Replaceable
	Vulnerability:	High
Lower Aquifer	**Aquifer Status Code:**	3010412111113
	Aquifer Sector:	Honolulu
	Aquifer System:	Moanalua
	Aquifer Type 1:	Basal
	Aquifer Type 2:	Confined
	Aquifer Type Geol.:	Flank
	Development State:	Currently used
	Utility:	Drinking
	Salinity (mg/L Cl-):	Fresh (<250)
	Uniqueness:	Irreplaceable
	Vulnerability:	Low

Hickam Site LF01, Landfill 1

Category 3

TMK Map



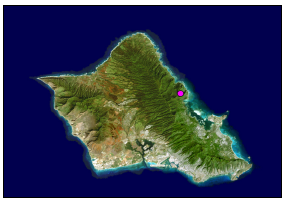
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	3		
Municipal Well(s)within one mile	0	**Observation Well(s)within one mile**	0
BWS Well(s) within one mile	0	**Sealed Well(s)within one mile**	3
Domestic Well(s)within one mile	0	**Unused Well(s) within one mile**	0
Irrigation Well(s)within one mile	0	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	0

Well Details

Kaaawa Dump



Kaaawa Dump

Category 2

Picture Not Available

Site Description

Kaaawa Dump, operated by the City and County of Honolulu (C&C), was used to dispose of municipal solid wastes from 1941-1946 (Bagaoisan, 1997). The site is reported to have been covered and redeveloped after closure.

In a July 14, 1942 Honolulu Advertiser article, it was reported that tons of refuse accumulated at various points throughout the island following the December 7, 1941 bombing. Refuse disposal centers were established across the island and were marked by signs that read, "Official Rubbish Dump-by Order of the Military Governor". The refuse disposal centers were divided into four classes: C&C sites, Navy sites, Army sites, and plantation sites. According to the plan adopted by the United States Surgeon's Office, the Corp of Engineers, and the C&C Public Works Department, refuse was to be burned at these specially designated dumps. The map that accompanied the Honolulu Advertiser article is the same as Young's (1993) map number 10 and is entitled "Refuse-Disposal Facilities". According that map, the Kaaawa Dump was located in the general vicinity of Kualoa Ranch in Kaaawa Valley. While this map is not of an appropriate scale to definitively determine whether the Kaaawa Dump site was on that property, it does indicate that there was a rural rubbish dump in the area during the early 1940s. It appears from the lack of information found on many of the sites depicted on this map (one of which is Kaaawa Dump), that many of these special rubbish disposal centers were not used again after the accumulated refuse was burned.

A review of the steep topography and undisturbed vegetative cover on the Kaaawa Peninsula in the area between Kahana Bay and Kaneohe Bay indicate that the Kualoa Ranch parcel was the most likely area for disposal activities. However, Kualoa Ranch Incorporated has owned the property for over 100 years and maintains that a dump/landfill has never been located on their property. No visible indications of current or former dumping activities were observed during the site visit.

Although the dump would likely have been located mauka of the No-Pass and Underground Injection Control (UIC) Lines, there are few to no groundwater resources in the vicinity and the Board of Water Supply does not consider the area feasible for potable water use (RM Towill and Pacific Waste, 2003).

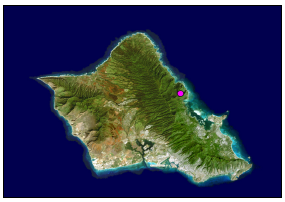
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	5-1-004:001
2380766.06544	618207.19718	**Zone:**	Koolaupoko
Longitude	**Latitude**	**Section:**	Kaaawa
157 51 31	21 31 32	**Plat:**	Not Designated
Address:	Kaaawa Valley Road	**Quadrangle:**	Kahana

Ownership

Current Owner: Kualoa Ranch Incorporated

Previous Operator: City and County of Honolulu



Kaaawa Dump

Category 2

Picture Not Available

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1941-1946	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn, dig, and fill
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Recreation

City and County Zoning: Ag-2

State Land Use District: Agriculture

Facilities: Detached dwellings (1927 x2)

TMK Separation: Field crop-not sugar cane or pineapple

Flood Zone: A/AE - 100-year Flood Plain, D - Undetermined but possible flood hazards, X - 500-year Flood Plain

Geography and Topography

Physiographic Province: Koolau Range

Elevation Range (ft): 160 **to** 200

Approximate Landfill Acreage: 1-5

Parcel Acreage: 497.72

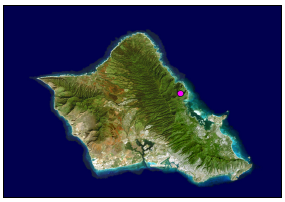
Climate

Annual Precipitation (cm): 193.80

Precipitation Days Per Year 133

Average Temperature (°F): 74.3

Temperature Range (° F): 68.8 **to** 79.8



Kaaawa Dump

Category 2

Picture Not Available

Soils

Soil Map Symbol:	LoB	**Bulk Density (gm/cc):**	1.00-1.10
Soil Association:	Tropohumults-Dystrandepts	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Lolekaa	**Organic Carbon (%):**	6.0-7.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	3-8
Thickness of Surface Soil (in):	0-60	**pH:**	4.5-5.5
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	LoE	**Bulk Density (gm/cc):**	1.00-1.10
Soil Association:	Tropohumults-Dystrandepts	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Lolekaa	**Organic Carbon (%):**	6.0-7.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	25-40
Thickness of Surface Soil (in):	0-60	**pH:**	4.5-5.5
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

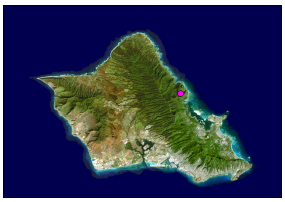
Geologic Symbol(s): Pa

Geologic Unit(s): Consolidated noncalcareous deposits

Geologic Description: Chiefly older alluvium, generally consisting of mottled brown to red-brown, deeply weathered, poorly-assorted, and nearly impermeable friable conglomerates, in places cemented with limonite or hematite and usually forming conspicuous terraces along the principal streams. Near the mouths of the valleys and especially around Pearl Harbor and near Waialua the older alluvium grades into partly consolidated sands and silts that are emerged delta deposits. The degree of consolidation is largely dependent upon the amount of rainfall, for in dry regions the material is much better cemented than in wet regions. Near the heads of valleys the older alluvium grades into coarse angular talus and landslide deposits which, in places, carry considerable water. In the large semiarid valleys in the Waianae Range these deposits are firmly cemented breccias. They are poorly permeable in wet areas and hold up perched water in the Honolulu volcanic series, but in the dry areas they yield small supplies of potable water.

Hydrogeology

Rock Type:	Alluvium-older-consolidated
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1



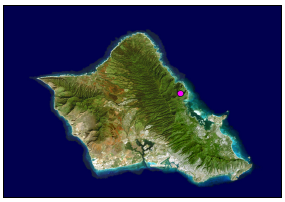
Kaaawa Dump

Category 2

Picture Not Available

Aquifer(s)

Aquifer Status Code:	3060421211111
Aquifer Sector:	Windward
Aquifer System:	Waimanalo
Aquifer Type 1:	High Level
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Dike
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High



Kaaawa Dump

Category 2

Picture Not Available

Site Reconnaissance

Site Description: The Kaaawa Dump is suspected to have been located on property that is currently used as an agricultural, aquacultural, and recreational area. The current owners of the property have owned it for over 100 years and maintain that a dump/landfill has never been located on their property. No visible indications of current or former dumping activities were observed during the site visit.

Type of Property: Agricultural, aquacultural, and recreational property.

Current Site Operations: The site is currently used as a cattle ranch and recreational (horseback riding, 4-wheel motor biking) club. An aquacultural farm, used to raise shrimp, is located in the northeastern portion of the site. Kualoa Ranch also leases out several farm properties on the northeastern side of the site. The tenants grow orchids and papayas. Additionally, the site is commonly used for movie and television filming.

Age of Development: Over 100 years.

Onsite Building Information: Observed a building used for shade and two houses.

Was There a Recognizable Dump/Landfill? No.

Institutional Controls: The site is a recreational ranch open to the public during normal business hours.

Number of MonitoringWells: None observed. A privately owned production well is located onsite.

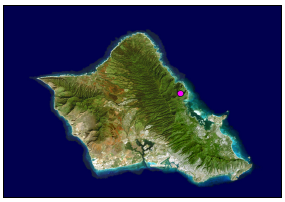
Stability (signs of erosion, etc): None observed.

Leachate, Seeps: None observed.

Odors, Staining, Distressed Vegetation: None observed.

Drainage Features: Runoff from the mountains and the Kaaawa Valley flow into the Kaaawa Stream. When there is adequate flow in the Kaaawa Stream, it is used to maintain the aquaculture farm.

Areas of Ponded Water Onsite: The aquacultural farm is a swampy pond area. However, the ponding is maintained artificially via a well on the site.



Kaaawa Dump

Category 2

Picture Not Available

Site Reconnaissance (cont.)

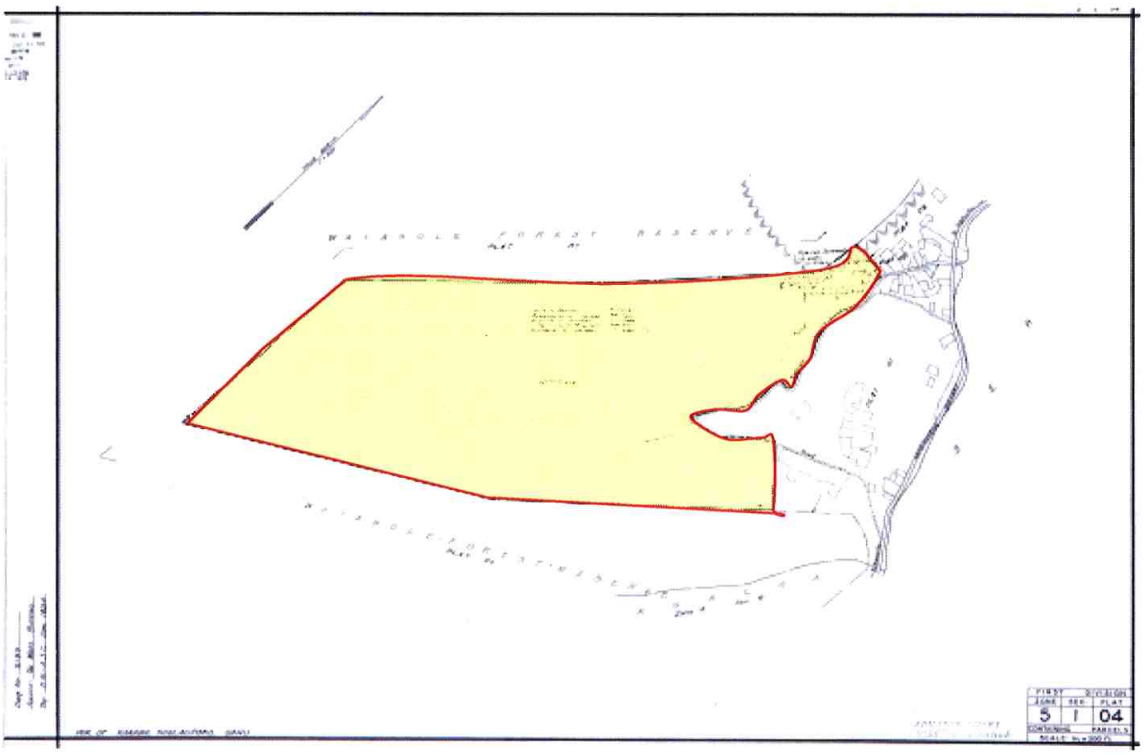
Storm Water Retention Pond:	None observed.
House and Schools in the Vicinity:	Two homes are located within the site boundaries.
Distance to Nearest Residence, School, or Businesses:	Within site boundaries.
How is Drinking Water in the Area Supplied?	Most of the property is without a supply of water. The houses on the property are supplied by the municipal water system. The water for the aquacultural farm is supplied by an onsite production well.
Natural Resources, Agriculture, Aquaculture Near the Site?	The northeastern portion of the site is leased to papaya farmers. Cattle graze throughout the site.
Name of Surface Water Within 1-mile of Dump/Landfill:	Kaaawa Stream and Pacific Ocean.
Distance to Surface Water:	Kaaawa Stream is onsite. The Pacific Ocean is approximately 50 feet from the northeastern site boundary.
Proximal Direction of Surface Water:	Kaaawa Stream is onsite. The Pacific Ocean is to the northeast of the site.
Where Does Surface Water Flow?	Kaaawa Stream, which feeds into the aquaculture farm.
Surface Water Used for Drinking?	No.
Surface Water Used for Recreation?	Yes.
Wetlands:	Swampy area near aquaculture farm.
Off-site Sources of Contamination:	None observed.
Does Run-off from other Sites Flow onto Subject Property:	None observed.
Adjacent Property-North:	Mountains.
Adjacent Property-South:	Mountains.
Adjacent Property-East:	The Kamehameha Highway and the Pacific Ocean border the site to the northeast.
Adjacent Property-West:	Mountains.

Kaaawa Dump

Category 2

Picture Not Available

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	0		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

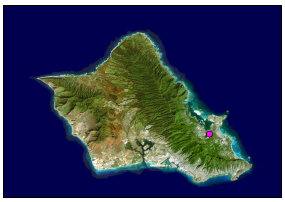
Photo 1. Looking north from the access road in the center of Kaaawa Valley (suspected location of Kaaawa Dump) at the landscape typical of that found in the valley.

Photo 2. Looking southwest along the access road.

Photo 3. Looking northeast along the access road. No distinct indications of the specific dump location were noted during the site visit.

Photo 4. **Groundwater well located within Kaaawa Valley northwest of the access road. Water produced from this well is used for the ranch's aquacultural operations. The water is not used as a drinking water source.**

Kalaheo Landfill



Kalaheo Landfill

Category 3

Site Description

The Kalaheo Landfill is located in Kailua to the south of Kaneohe Bay (0.8 miles), on the north side of the H-3 Freeway, and in proximity (approximately 1,000 feet) from the Central Kapaa site. The City and County of Honolulu (C&C) own the parcel on which the landfill is located. The area in the vicinity of the landfill is currently undeveloped.

The Kalaheo Landfill site had been occupied by Ameron HC&D from 1952 to 1972, and was permitted by the State of Hawaii for municipal solid waste disposal for an operational period of February 1985 through February 1990. The site was not lined and disposal operations were conducted in a "dump and cover" manner. The waste consisted of predominantly household refuse. The landfill reportedly accepted approximately 600 tons of refuse per day and contains from 1.31 to 2.2 million cubic yards of municipal solid waste (depending on the source). The facility was operated by the C&C from March 1986 through March 1990 when it was condemned by the C&C. The landfill was closed under the Hawaii Administrative Rules, Title 11, Chapter 58, which were effective from November 1981-October 1993. An 18-inch thick cover that consists of natural soils, a geosynthetic membrane liner, and vegetative materials was placed over the landfill after closure.

According to Bagaoisan's site visit report of 1997, the landfill was well-vegetated and there were no visible signs of settlement or depression. However, vertical cracks were noted across the landfill surface. The cracks on the top portion of the landfill were shallow and no liner was exposed. The cracks on the middle portion of the landfill were reportedly two feet deep and one to two feet wide, exposing the liner, and a large crack was noted at the bottom portion of the landfill. Abandoned trucks were also noted on top of the landfill.

The Kalaheo landfill is presently the site of a green-waste recycling facility. The land surrounding the landfill up to the ridge summit drains into the facility's runoff catchment system. The average slope of this watershed is steep (24 percent) but the drainage system design appears to minimize runoff from the landfill. This system consists of two main conduits, one on either side of the landfill, with cross branches at each landfill terrace. The main branches meet below the bottom of the landfill in a large (100' x 200'), five-foot deep, de-silting basin. Overflow from this basin is directed under H-3 Freeway via an 8-foot culvert (AECOS, 2004).

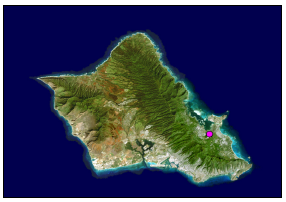
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	4-2-015:001,006
2367066.41527	627094.21031	**Zone:**	Koolaupoko
Longitude	**Latitude**	**Section:**	Kapaa Valley
157 46 25	21 24 04	**Plat:**	Not Designated
Address:	Kalanianaole Highway and H-3 Freeway	**Quadrangle:**	Kaneohe

Ownership

Current Owner: City and County of Honolulu

Previous Operator: City and County of Honolulu



Kalaheo Landfill

Category 3

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal solid waste and commercial solid waste, 1.39 million tons deposited (Bagaoisan, 1997), sewage sludge

Monitoring Well Network? Yes

Monitoring Well Identification MW-3

Status:	Closed	**Analytical Data Available?**	Yes
Active Period:	March 1986-March 1990	**EPA ID No.:**	HID980369557
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	No Further Response Action Planned
Capped?	Geosynthetic membrane	**Method of Operation:**	Dig and fill

Permit Info: Permit number SW-178180 (Feb. 28, 1985-Feb. 1, 1990). The landfill was issued a permit under Hawaii Administrative Rule, Title 11, Chapter 58.

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Population and Land Use

Type of Development in the Surronding Area? Conservation

City and County Zoning: P-2 General Preservation

State Land Use District: Urban

Facilities: Present site of a green waste recycling facility

TMK Separation: Unsubdivided vacant land, steep land

Flood Zone: D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province: Koolau Range

Elevation Range (ft): 200 **to** 680

Approximate Landfill Acreage: 134

Parcel Acreage: 123.9 -134 (depending on the source)

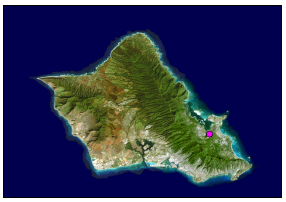
Climate

Annual Precipitation (cm): 193.80

Precipitation Days Per Year 133

Average Temperature (° F): 74.3

Temperature Range (° F): 68.8 **to** 79.8



Kalaheo Landfill

Category 3

Soils

Soil Map Symbol:	ALF	**Bulk Density (gm/cc):**	1.00-1.40
Soil Association:	Lolekaa-Waikane	**Moisture Retention (%):**	0.12-0.14
Soil Series:	Alaeloa	**Organic Carbon (%):**	4.0-7.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	40-70
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	KlaB	**Bulk Density (gm/cc):**	1.10-1.40
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.10-0.13
Soil Series:	Kawaihapai	**Organic Carbon (%):**	1.0-2.0
Engineering Classification:	Clay Loam; Stony or Very Stony	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	2-6
Thickness of Surface Soil (in):	0-54	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Geology

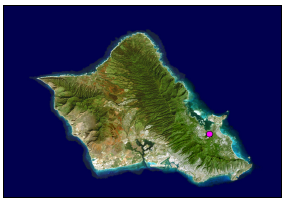
Geologic Symbol(s): Tkbr

Geologic Unit(s): Koolau volcanic series

Geologic Description: Firmly cemented, usually structureless impermeable gray throat breccia containing angular intrusive and extrusive basalt fragments as much as about 6 feet in diameter filling ancient craters.

Hydrogeology

Rock Type:	Koolau Basalt-breccia
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Low
Hydraulic Conductivity (ft/d):	1 - 100



Kalaheo Landfill

Category 3

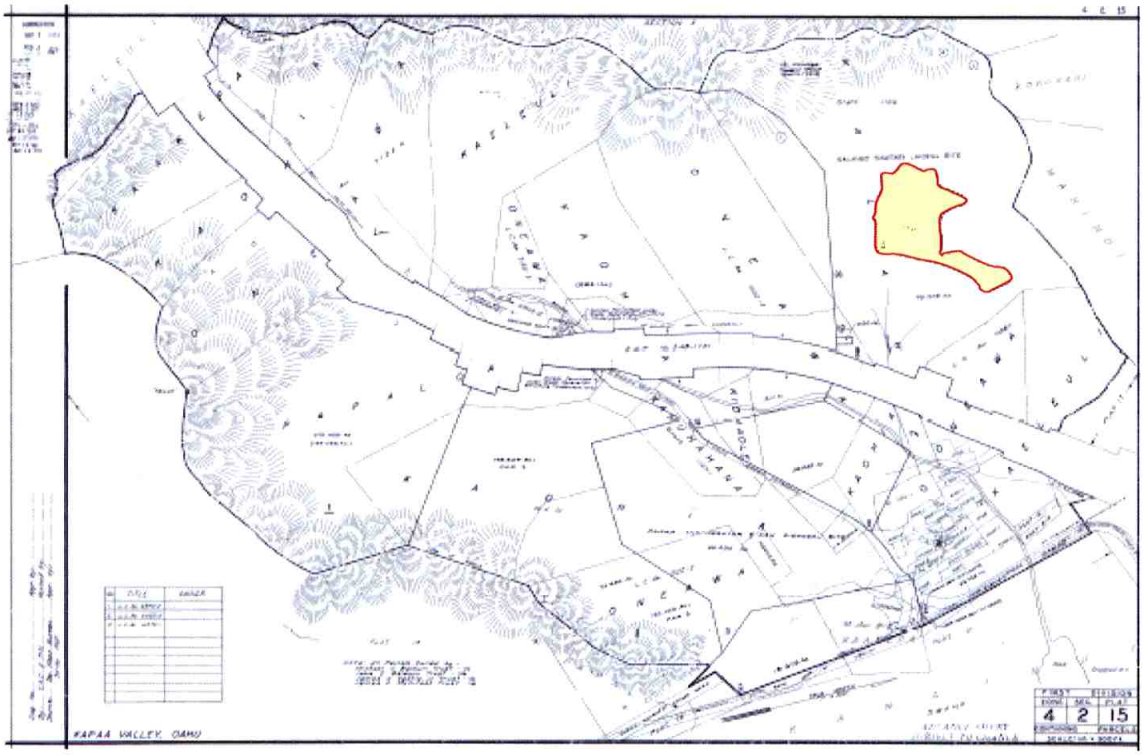
Aquifer(s)

Aquifer Status Code:	3060421211111
Aquifer Sector:	Windward
Aquifer System:	Waimanalo
Aquifer Type 1:	High Level
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Dike
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

Kalaheo Landfill

Category 3

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	5		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	4
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Kalihi-Kai Dump

Kalihi-Kai Dump

Category 3

Site Description

The Kalihi-Kai Dump may have been located in the area of the filled Ananoho and Auiki Ponds in the Kapalama Military Reservation (KMR) area of Honolulu (Young, 1993). The site is located to the east of Keehi Lagoon and to the north of Sand Island and Kapalama Basin. Auiki Pond was formerly located to the southeast of the current intersection of Puuhale Road and Auiki Street, and Ananoho Pond was formerly located to the east and southeast of Auiki Pond. According to an Environmental Assessment for Base Realignment and Closure Report, some of the north/northeast portions of KMR were used as a solid waste landfill during the late 1800s to early 1900s. An Enhanced Preliminary Assessment Report (EPAR) states that the City and County of Honolulu (C&C) may have operated the Kalihi-Kai Dump on land that now comprises Phases II and III of the KMR from 1926-1941. Potential pre-construction disposal sites are shown to the northeast and northwest of Snug Harbor on the KMR in a EPAR figure. A reference to disposal activities was supplied by the Corps of Engineers Pacific Ocean Division (CEPOD), which in turn referenced a 1946 real estate appraisal prepared for the United States Department of Justice. The map supplied by the CEPOD showed two areas that were designated as "C&C Dump" (Roy F. Weston, 1990). The State of Hawaii Department of Transportation (DOT) Harbors Division currently owns the parcel on which the dump is suspected to have been located. The area in the vicinity of the former dump is now industrial and commercial.

There was no documentation found which indicated that the municipal solid waste dump was permitted, lined, capped, or properly closed. A July 1941 Honolulu Advertiser article states that the Army repossessed and closed the Kalihi-Kai Dump in May of 1941 to make way for a pier project.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	1-2-025:011, small portion of the Auiki Pond fill was on 1-2-025:036
2357942.06692	615597.51712	**Zone:**	Honolulu
Longitude	**Latitude**	**Section:**	Kalihi-Kai
157 53 07	21 19 11	**Plat:**	Not Designated
Address:	Auiki Street and Sand Island Access Road	**Quadrangle:**	Honolulu

Ownership

Current Owner: State of Hawaii DOT Harbors Division

Previous Operator: City and County of Honolulu

Kalihi-Kai Dump

Category 3

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? Yes

Monitoring Well Identification MW-1 through MW-17, MW-11D, MW-12D

Status:	Closed	**Analytical Data Available?**	Yes
Active Period:	1926-August, 1941	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Long-Term Monitoring
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Population and Land Use

Type of Development in the Surronding Area? Industrial

City and County Zoning: I-3 Waterfront Industrial

State Land Use District: Urban

Facilities: --

TMK Separation: Warehousing and yard storage

Flood Zone: X - 500-year Flood Plain

Geography and Topography

Physiographic Province: Coastal Plain

Elevation Range (ft): 0 **to** 10

Approximate Landfill Acreage: Approximately 50

Parcel Acreage: 30.1667

Climate

Annual Precipitation (cm): 52.20

Precipitation Days Per Year 31

Average Temperature (°F): 77.1

Temperature Range (° F): 70.2 **to** 84.0

Kalihi-Kai Dump

Category 3

Soils

Soil Map Symbol:	FL	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.06-0.12
Soil Series:	Fill Land, Mixed	**Organic Carbon (%):**	0.1-5.0
Engineering Classification:	Fill Land, Mixed	**Permeability (in/hr):**	0.1-2
Drainage Characterisitics:	Poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

Geologic Symbol(s): Pls

Geologic Unit(s): Consolidated calcareous marine sediments

Geologic Description: Chiefly emerged coral reefs but in places, especially near Pearl Harbor, finely laminated lagoon limestone. Beach deposits resembling the various types of present calcareous beaches in lithified form are included, as well as a few inextensive consolidated beach deposits that may have been formed at the present stand of the sea. Extremely permeable because of primary and secondary cavities and yields water copiously, but the water is apt to be brackish.

Hydrogeology

Rock Type:	Coral-in situ reef limestone
GW Occurrance-Principal:	Basal
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to very high
Hydraulic Conductivity (ft/d):	100 - 20,000

Kalihi-Kai Dump

Category 3

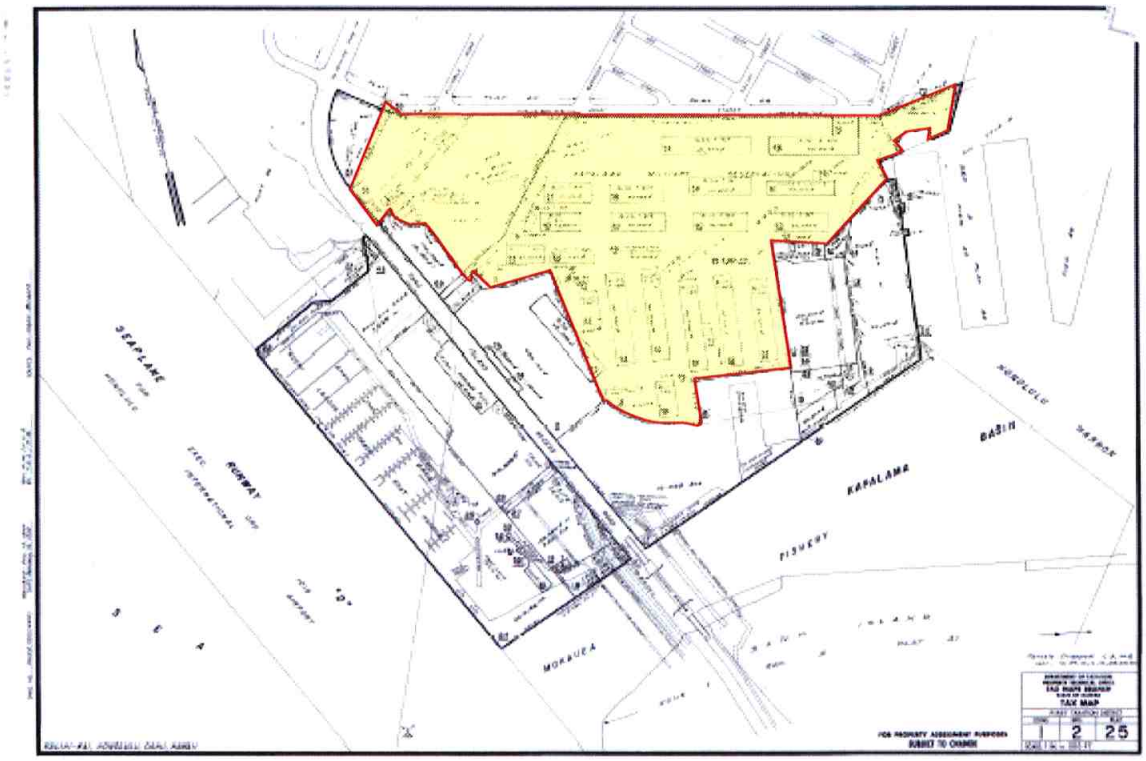
Aquifer(s)

Uppermost Aquifer	**Aquifer Status Code:**	3010311613321
	Aquifer Sector:	Honolulu
	Aquifer System:	Kalihi
	Aquifer Type 1:	Basal
	Aquifer Type 2:	Unconfined
	Aquifer Type Geol.:	Sedimentary
	Development State:	Currently used
	Utility:	Neither
	Salinity (mg/L Cl-):	Moderate (1,000-5,000)
	Uniqueness:	Replaceable
	Vulnerability:	High
Lower Aquifer	**Aquifer Status Code:**	3010312111113
	Aquifer Sector:	Honolulu
	Aquifer System:	Kalihi
	Aquifer Type 1:	Basal
	Aquifer Type 2:	Confined
	Aquifer Type Geol.:	Flank
	Development State:	Currently used
	Utility:	Drinking
	Salinity (mg/L Cl-):	Fresh (<250)
	Uniqueness:	Irreplaceable
	Vulnerability:	Low

Kalihi-Kai Dump

Category 3

TMK Map



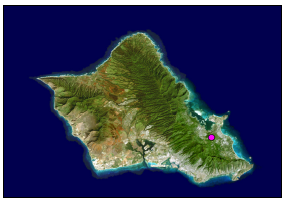
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	19		
Municipal Well(s)within one mile	0	**Observation Well(s)within one mile**	0
BWS Well(s) within one mile	0	**Sealed Well(s)within one mile**	10
Domestic Well(s)within one mile	0	**Unused Well(s) within one mile**	5
Irrigation Well(s)within one mile	0	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	3

Well Details

Kapaa Central Landfill



Kapaa Central Landfill

Category 3

Picture Not Available

Site Description

The Kapaa Municipal Solid Waste Landfill (KMSWL) complex, operated by the City and County of Honolulu (C&C), is comprised of three distinct inactive landfill areas, which were developed in three phases. These phases include the original Central Site, Kapaa No. 2, and Kapaa No. 3. All three sites are on the west side of Kapaa Quarry Access Road between the H-3 Freeway and Kalanianaole Highway in Kailua. Each site is bordered on the west side by conservation district land. A fourth location, Kapaa No. 1, is located to the south of Kapaa No.3 and the Central Site and is adjacent to the southeast of site Kapaa No. 2. Kapaa No. 1 was never developed.

The KMSWL complex is located adjacent and to the west of the Kawainui Marsh, to the south of the Kawainui Landfill, to the southwest of the Kawainui Dump, and to the southeast of the Kalaheo Landfill in the Maunawili Valley. It is not known if hazardous materials were deposited at the landfills (State of Hawaii Department of Health (DOH), 1998).

The KMSWL complex does have a monitoring well network in place and historical analytical data is available for review. Each landfill at the KMSWL complex has a leachate collection system. The system typically consists of a compacted subgrade sloped toward an under drain trench (Barrett Consulting Group, Inc., 1996). The KMSWL complex was one of the two areas considered in the Source Water Assessment Program (SWAP). The other landfill considered in the SWAP was Waimanalo Gulch.

Central Landfill

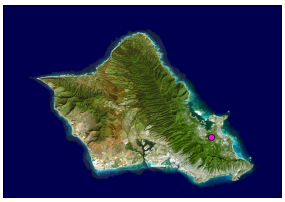
When the C&C tentatively decided to expand its incineration program in the 1960's, it purchased the old Kapaa Quarry (an abandoned basalt quarry) for an incinerator and ash disposal site. However, the site was never developed for incineration because of the frequent air inversions (nearby hills in Kailua contributed to an air inversion that trapped smoke from the dump), so the former quarry became the site of a landfill (referred to as the Central Site or Kapaa A) (Young, 1993).

The Central Site, the original landfill operation, is located in the original Ameron Kapaa Quarry. The quarry operated between 1949 and 1964 (Bourke, 2003). The Central Site is approximately 45 acres in size and was used for waste disposal from 1970-1979 (Barrett Consulting Group, Inc., 1996). According to Chun and Dugan (1981), the landfill began operation in 1964.

One of the factors that favored the siting of a landfill in the vicinity of Kapaa Quarry was the conclusion by early investigators that the poor permeability of soils and slightly metamorphosed basalt underlying them would impede groundwater migration. It was recognized that leachate would occur, but require a "long time" to reach down gradient receiving waters. For example, Mink and Bowles (Hydrogeologic and Soils Study of Proposed Sanitary Landfills for Leeward and Windward Oahu, 1977) note, "in general, the groundwater saturated flow basalts are [sic] compartmentalized by dikes and other intrusives. As a result, the water table elevation (head) varies over short distances and hydraulic continuity between dike compartments is poor… the aquifers in the vicinity of Kapaa are poorly permeable in addition to being discontinuous." (Barrett Consulting Group, Inc., 1996).

According to a September 13, 1974 article in the Honolulu Advertiser, the Kapaa Landfill (assumed to be the Central Site) contained smoldering piles of garbage. The garbage was compacted into 8 to 10-foot high by 150-foot wide piles that were covered with a 6-inch layer of dirt. According to the article, three layers of garbage were already landfilled and there was room for another 50 feet. The operators are quoted as saying they liked the "loose stuff" that comes from the C&C incinerators.

Closure of the Central Site included construction of a surface water drainage channel that directs flow from the east and north sides of the sub-basin into Kawainui Marsh through a desilting basin located alongside Kapaa Quarry Road (AECOS, 2004).



Kapaa Central Landfill

Category 3

Picture Not Available

In 1977, the C&C commissioned a comprehensive inventory study of potential landfill sites (Shimabukuro and Associates, 1977) that identified thirty-three such sites. This study was based on a 1977 report by Bowles and Mink. The C&C then systematically investigated and pursued the identified sites; Kapaa Nos. 2 and 3 were developed as a direct result of this process.

Kapaa No. 2

Kapaa No. 2, also known as Kapaa C, was approximately 22 acres in size and is located to the southwest of the Central Site. Kapaa No. 2 replaced the Central Site and was used from 1979-1997. Kapaa No. 2 is reported to contain approximately 3.5 million cubic yards of municipal waste.

Drainage from this area flows to a circumferential drainage channel constructed around Kapaa No. 3. Runoff in the drainage ditch is transported down slope to a drainage pipe, passes under Kapaa Quarry Access Road via a 48-inch culvert, and discharges over a concrete energy dissipation structure (AECOS, 2004).

Kapaa No. 3

Kapaa No. 3, also known as Kapaa B, was approximately 35 acres in size was used from 1979-1982 concurrently with Kapaa No. 2. Kapaa No. 3 received an estimated 1.05 million tons of solid waste. Kapaa No. 3 was graded and covered with approximately two feet of native soils and re-vegetated. After the cover was placed, an additional two to three feet of cover was added. Therefore, the final cover is approximately four to five feet in the area at the top of the landfill. The cover is not as thick on the side slopes (Barrett Consulting Group, Inc., 1996).

Runoff in the vicinity of Kapaa No. 3 ends up in Kapaa Stream through a culvert near the Ameron entrance gate (AECOS, 2004).

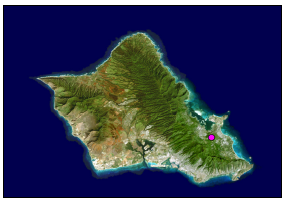
Historic Investigations

The operation of the Kapaa Landfill, located next to Kawainui marsh, raised concern over the possibility that landfill leachate could have adverse effects on the Kawainui marsh. In assessing the continued operation of the landfill, the C&C were concerned about the possible generation and movement of leachate and explosive gas from the facility. To address the concern, the C&C funded four studies in the 1970s-early 1980s. Two of the studies (Bowles and Mink 1977; EMCON Associates 1977) involved the possible generation and movement of leachate from the facility, while Burbank (1972) studied the relationship between the existing landfill and marsh water quality. These three investigations concluded that the landfill operations at Kapaa did not adversely affect the quality of marsh water. A fourth study occurred during 1979 and 1980 and established sampling sites each for surface water and leachate.

The study concluded that there was interchange of the marsh water and groundwater. No particular consistent correlation could be found to relate individual constituents concentrations of the surface water stations or monitoring wells to groundwater levels, rainfall, or seasonal and/or annual changes. If leachate was indeed entering the underlying groundwater its effect at that time was considered minor (Chun and Dugan, 1981).

The Central Site is listed in the United States Environmental Protection Agency (EPA) Archived Sites database; the landfill's "Discovery" was completed during July 1974. The Preliminary Assessment was completed during January 1986. The site was archived January 1, 1986.

According to the United States EPA Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database, the landfill's "Discovery" (Kapaa Nos. 2 and 3?)



Kapaa Central Landfill

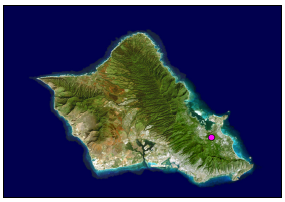
Category 3

Picture Not Available

was completed during November 1979, Preliminary Assessment was completed during January 1980 and the landfill was assigned a priority of low. A Site Inspection was completed during May 1985.

The State of Hawaii Hazard Evaluation and Emergency Response (HEER) Initial Site Screening Team screened the site on April 29, 1996 and determined that no further action was necessary (State of Hawaii DOH, 2002). However, a Site Inspection investigation was performed during 2001 to determine if leachate from the landfill was affecting the Kawainui Marsh. The C&C prepared a groundwater monitoring and leachate characterization plan, which included collecting five sediment and surface water samples from the Kawainui Marsh. Samples were analyzed for volatile organic compounds, semi-volatile organic compounds, pesticides/PCBs, and metals. Results of the groundwater monitoring and leachate characterization were used by the HEER Office to assess the potential for impacts to ecological receptors at the Kawainui Marsh. Analytical results were below regulatory limits (State of Hawaii DOH, 2002).

"Kapaa Landfill" is on the Hawaii State Priority Site List. The HEER Office Preliminary Assessment/Site Inspection Program portion of the Site Discovery, Assessment and Remediation Section is currently managing the site.



Kapaa Central Landfill

Category 3

Picture Not Available

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	4-2-015:004
2366462.24469	627750.07285	**Zone:**	Koolaupoko
Longitude	**Latitude**	**Section:**	Kapaa Valley
157 46 03	21 23 44	**Plat:**	Not Designated
Address:	Kapaa Quarry Road, mailing address is 915 Kalanianaole Highway	**Quadrangle:**	Mokapu

Ownership

Current Owner: City and County of Honolulu

Previous Operator: City and County of Honolulu

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? Yes

Monitoring Well Identification MW-01, MW-02, MW-03, MW-04, MW-05, and MW-06

Status:	Closed	**Analytical Data Available?**	Yes
Active Period:	1970-1979	**EPA ID No.:**	HID980370100
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Long-Term Monitoring
Capped?	Earth cover	**Method of Operation:**	Cover and fill

Permit Info: Permit numbers SW-157148, SW-234242, and SW-089090 (Site 3). The landfill was issued permits under Chapter 46 of the Public Health Regulations (effective Jul. 1974-Nov. 1981) and Chapter 58 of the Hawaii Administrative Rule (effective Nov. 1981-Oct. 1993).

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Population and Land Use

Type of Development in the Surronding Area? General preservation

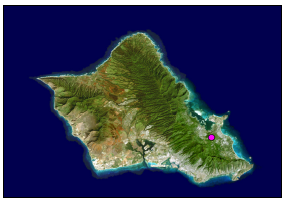
City and County Zoning: P-2

State Land Use District: Urban

Facilities: Repair yard and related facility (1990), office (1990)

TMK Separation: Refuse

Flood Zone: D - Undetermined but possible flood hazards



Kapaa Central Landfill

Category 3

Picture Not Available

Geography and Topography

Physiographic Province: Koolau Range

Elevation Range (ft): 120 **to** 120

Approximate Landfill Acreage: 45

Parcel Acreage: 56.43

Climate

Annual Precipitation (cm): 193.80

Precipitation Days Per Year 133

Average Temperature (°F): 74.3

Temperature Range (° F): 68.8 **to** 79.8

Soils

Geology

Geologic Symbol(s): Qhb

Geologic Unit(s): Honolulu volcanic series

Geologic Description: Dense and vesicular jointed aa and pahoehoe flows of olivine, nephelite, and nephelite-melilite basalt, from about 10 to 300 feet thick, generally flooring valleys in the Koolau Range and poured out of numerous vents. Most of the flows carry perched water at their base.

Hydrogeology

Rock Type: Honolulu Volcanics-lava flows

GW Occurrance-Principal: Perched

GW Occurrance-Secondary: --

Permeability: Low to moderate

Hydraulic Conductivity (ft/d): 1 - 500

Aquifer(s)

Aquifer Status Code: 3060421211111

Aquifer Sector: Windward

Aquifer System: Waimanalo

Aquifer Type 1: High Level

Aquifer Type 2: Unconfined

Aquifer Type Geol.: Dike

Development State: Currently used

Utility: Drinking

Salinity (mg/L Cl-): Fresh (<250)

Uniqueness: Irreplaceable

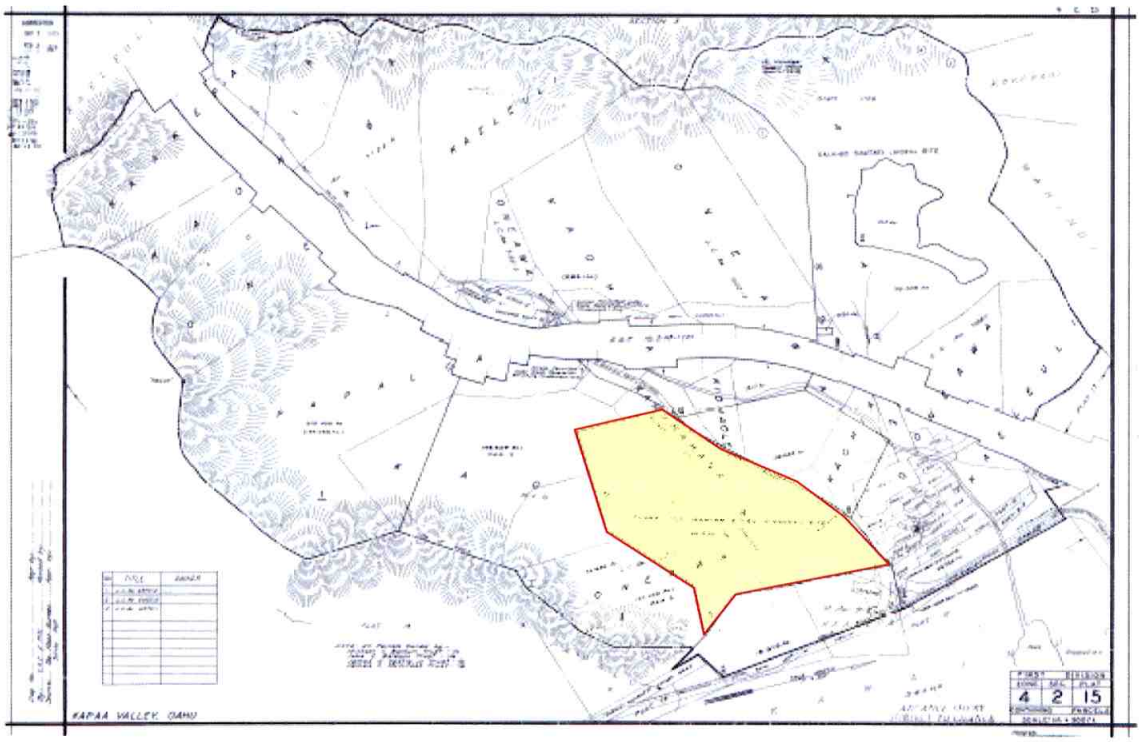
Vulnerability: High

Kapaa Central Landfill

Category 3

Picture Not Available

TMK Map



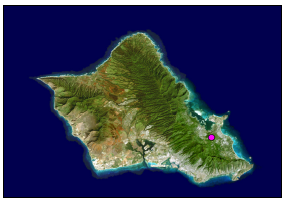
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	0		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile		Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Kapaa No. 2 Landfill



Kapaa No. 2 Landfill

Category 3

Site Description

See Kapaa Central's Site Description

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	4-2-015:003, 004
2366024.55915	627402.70338	**Zone:**	Koolaupoko
Longitude	**Latitude**	**Section:**	Kapaa Valley
157 46 15	21 23 31	**Plat:**	Not Designated
Address:	Kapaa Quarry Road, mailing address is 915 Kalanianaole Highway	**Quadrangle:**	Mokapu

Ownership

Current Owner: [Baldwin(x2), Castle, McIntosh-25% each]; City and County of Honolulu-lessee

Previous Operator: City and County of Honolulu

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? Yes

Monitoring Well Identification MW-01, MW-02, MW-03, MW-04, MW-05, and MW-06

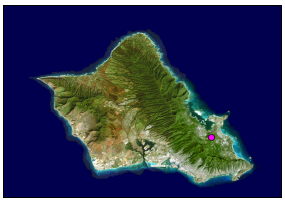
Status:	Closed	**Analytical Data Available?**	Yes
Active Period:	1979-May 6, 1997	**EPA ID No.:**	HID9804971, HID9803701, HID980497176
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Long-Term Monitoring
Capped?	PE and PVC, double-lined geonet layer, 18 inches soil cover, 6 inches top soil, erosional control mat, vegetation	**Method of Operation:**	Refuse deposited on sloped surface, bulldozer pushes and compacts refuse on sloped face

Permit Info: See Kapaa Central for KMSWL permit information

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai



Kapaa No. 2 Landfill

Category 3

Population and Land Use

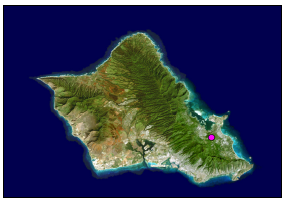
Type of Development in the Surronding Area?	Conservation
City and County Zoning:	P-1/P-2
State Land Use District:	Conservation, Urban
Facilities:	Utility substation (pumping station, transformer vault, gas tank), repair yard and related facility (1990), office (1990)
TMK Separation:	refuse
Flood Zone:	D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province:	Koolau Range
Elevation Range (ft):	120 **to** 320
Approximate Landfill Acreage:	22
Parcel Acreage:	42, 73.456, 35

Climate

Annual Precipitation (cm):	193.80
Precipitation Days Per Year	133
Average Temperature (° F):	74.3
Temperature Range (° F):	68.8 **to** 79.8



Kapaa No. 2 Landfill

Category 3

Soils

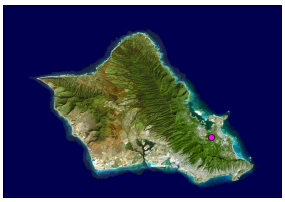
Soil Map Symbol:	ALF	**Bulk Density (gm/cc):**	1.00-1.40
Soil Association:	Lolekaa-Waikane	**Moisture Retention (%):**	0.12-0.14
Soil Series:	Alaeloa	**Organic Carbon (%):**	4.0-7.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	40-70
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	QU	**Bulk Density (gm/cc):**	Not available
Soil Association:	Rock Land-Stony steep	**Moisture Retention (%):**	Not available
Soil Series:	Quarry	**Organic Carbon (%):**	Not available
Engineering Classification:	Quarry Rock	**Permeability (in/hr):**	Not available
Drainage Characterisitics:	Not available	**Slope (%):**	--
Thickness of Surface Soil (in):	Not available	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Not available

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	AeE	**Bulk Density (gm/cc):**	1.00-1.40
Soil Association:	Lolekaa-Waikane	**Moisture Retention (%):**	0.12-0.14
Soil Series:	Alaeloa	**Organic Carbon (%):**	4.0-7.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	15-35
Thickness of Surface Soil (in):	0-58	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	KgC	**Bulk Density (gm/cc):**	1.00-1.30
Soil Association:	Lolekaa-Waikane	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Kaneohe	**Organic Carbon (%):**	5.0-7.0



Kapaa No. 2 Landfill

Category 3

Engineering Classification:	Silty Clay and Silty Clay Loam	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	8-15
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.5
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

Geologic Symbol(s): Qhf

Geologic Unit(s): Honolulu volcanic series

Geologic Description: Firefountain deposits of friable red to black bedded cinders, spatter, pumice, and bombs, coarse, thick, and forming cones near the vents but thin and finer grained elsewhere; they are permeable but too local to carry water except in a few places in Nuuanu Valley.

Geologic Symbol(s): Qhb

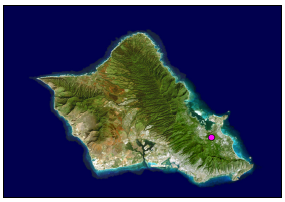
Geologic Unit(s): Honolulu volcanic series

Geologic Description: Dense and vesicular jointed aa and pahoehoe flows of olivine, nephelite, and nephelite-melilite basalt, from about 10 to 300 feet thick, generally flooring valleys in the Koolau Range and poured out of numerous vents. Most of the flows carry perched water at their base.

Hydrogeology

Rock Type:	Honolulu Volcanics-cinders
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Low to moderate
Hydraulic Conductivity (ft/d):	1 - 500

Rock Type:	Honolulu Volcanics-lava flows
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Low to moderate
Hydraulic Conductivity (ft/d):	1 - 500



Kapaa No. 2 Landfill

Category 3

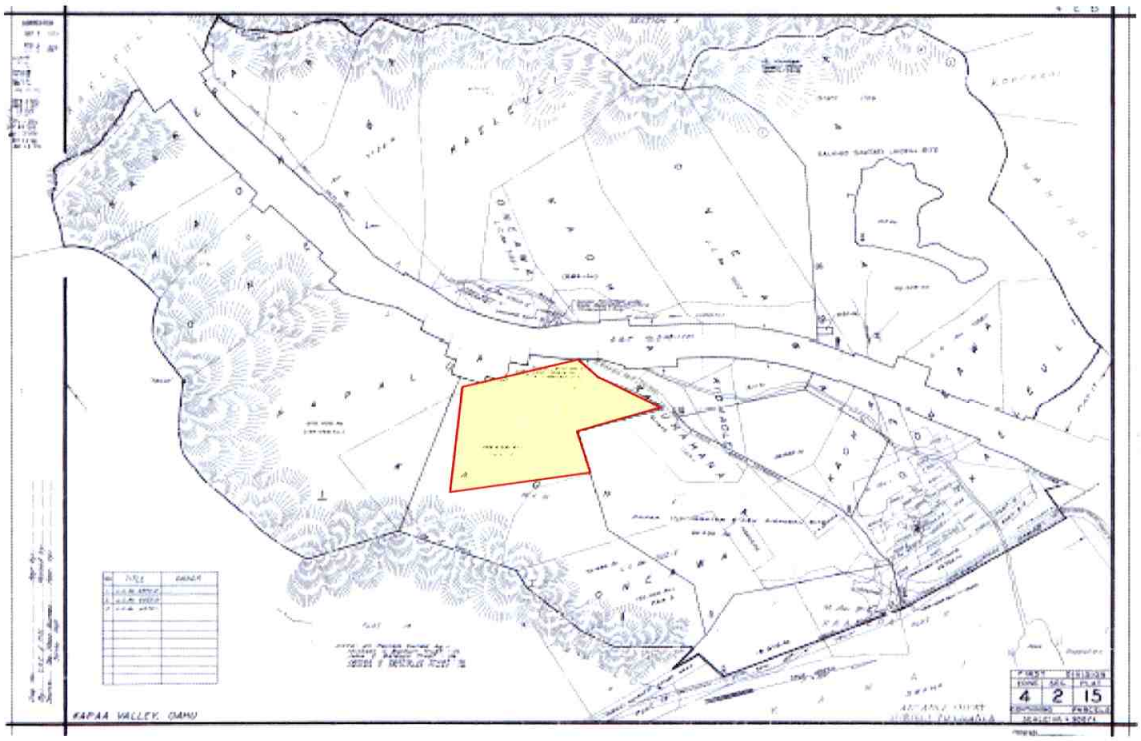
Aquifer(s)

Aquifer Status Code:	3060421211111
Aquifer Sector:	Windward
Aquifer System:	Waimanalo
Aquifer Type 1:	High Level
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Dike
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

Kapaa No. 2 Landfill

Category 3

TMK Map



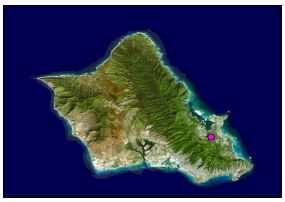
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	3		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	2
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Kapaa No. 3 Landfill



Kapaa No. 3 Landfill

Category 3

Site Description

See Kapaa Central's Site Description

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	4-2-015:003, 004
2366274.66517	627840.38891	**Zone:**	Koolaupoko
Longitude	**Latitude**	**Section:**	Kapaa Valley
157 46 00	21 23 39	**Plat:**	Not Designated
Address:	Kapaa Quarry Road, mailing address is 915 Kalanianaole Highway	**Quadrangle:**	Mokapu

Ownership

Current Owner: [Baldwin(x2), Castle, McIntosh-25% each]; City and County of Honolulu-lessee

Previous Operator: City and County of Honolulu

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? Yes

Monitoring Well Identification MW-01, MW-02, MW-03, MW-04, MW-05, and MW-06

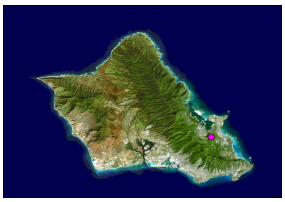
Status:	Closed	**Analytical Data Available?**	Yes
Active Period:	1979-1982	**EPA ID No.:**	HID9804971, HID9803701, HID980497176
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Long-Term Monitoring
Capped?	Earth cover	**Method of Operation:**	Cover and fill

Permit Info: See Kapaa Central for KMSWL permit information

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai



Kapaa No. 3 Landfill

Category 3

Population and Land Use

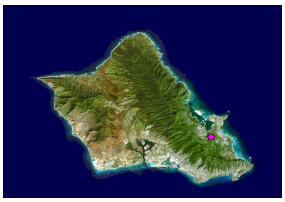
Type of Development in the Surronding Area?	Conservation
City and County Zoning:	P-1/P-2
State Land Use District:	Conservation, Urban
Facilities:	Utility substation (pumping station, transformer vault, gas tank), repair yard and related facility (1990), office (1990)
TMK Separation:	refuse
Flood Zone:	D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province:	Koolau Range
Elevation Range (ft):	120 **to** 320
Approximate Landfill Acreage:	35
Parcel Acreage:	35

Climate

Annual Precipitation (cm):	193.80
Precipitation Days Per Year	133
Average Temperature (° F):	74.3
Temperature Range (° F):	68.8 **to** 79.8



Kapaa No. 3 Landfill

Category 3

Soils

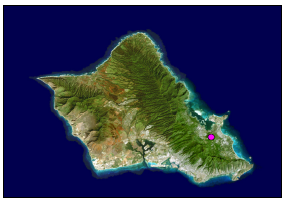
Soil Map Symbol:	ALF	**Bulk Density (gm/cc):**	1.00-1.40
Soil Association:	Lolekaa-Waikane	**Moisture Retention (%):**	0.12-0.14
Soil Series:	Alaeloa	**Organic Carbon (%):**	4.0-7.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	40-70
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	rSY	**Bulk Density (gm/cc):**	0.70-1.40
Soil Association:	Stony Steep Land	**Moisture Retention (%):**	0.08-0.10
Soil Series:	Stony Steep Land	**Organic Carbon (%):**	1.0-3.0
Engineering Classification:	Extremely Stony Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	>15
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.5
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	QU	**Bulk Density (gm/cc):**	Not available
Soil Association:	Rock Land-Stony steep	**Moisture Retention (%):**	Not available
Soil Series:	Quarry	**Organic Carbon (%):**	Not available
Engineering Classification:	Quarry Rock	**Permeability (in/hr):**	Not available
Drainage Characterisitics:	Not available	**Slope (%):**	--
Thickness of Surface Soil (in):	Not available	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Not available

Soil Map Symbol:	KlaB	**Bulk Density (gm/cc):**	1.10-1.40
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.10-0.13
Soil Series:	Kawaihapai	**Organic Carbon (%):**	1.0-2.0
Engineering Classification:	Clay Loam; Stony or Very Stony	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	2-6
Thickness of Surface Soil (in):	0-54	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	KgC	**Bulk Density (gm/cc):**	1.00-1.30
Soil Association:	Lolekaa-Waikane	**Moisture Retention (%):**	0.11-0.13



Kapaa No. 3 Landfill

Category 3

Soil Series:	Kaneohe	**Organic Carbon (%):**	5.0-7.0
Engineering Classification:	Silty Clay and Silty Clay Loam	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	8-15
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.5
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	AeE	**Bulk Density (gm/cc):**	1.00-1.40
Soil Association:	Lolekaa-Waikane	**Moisture Retention (%):**	0.12-0.14
Soil Series:	Alaeloa	**Organic Carbon (%):**	4.0-7.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	15-35
Thickness of Surface Soil (in):	0-58	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

Geologic Symbol(s): Qhf

Geologic Unit(s): Honolulu volcanic series

Geologic Description: Firefountain deposits of friable red to black bedded cinders, spatter, pumice, and bombs, coarse, thick, and forming cones near the vents but thin and finer grained elsewhere; they are permeable but too local to carry water except in a few places in Nuuanu Valley.

Hydrogeology

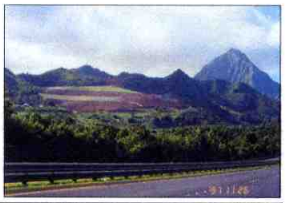
Rock Type:	Honolulu Volcanics-cinders
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Low to moderate
Hydraulic Conductivity (ft/d):	1 - 500

Aquifer(s)

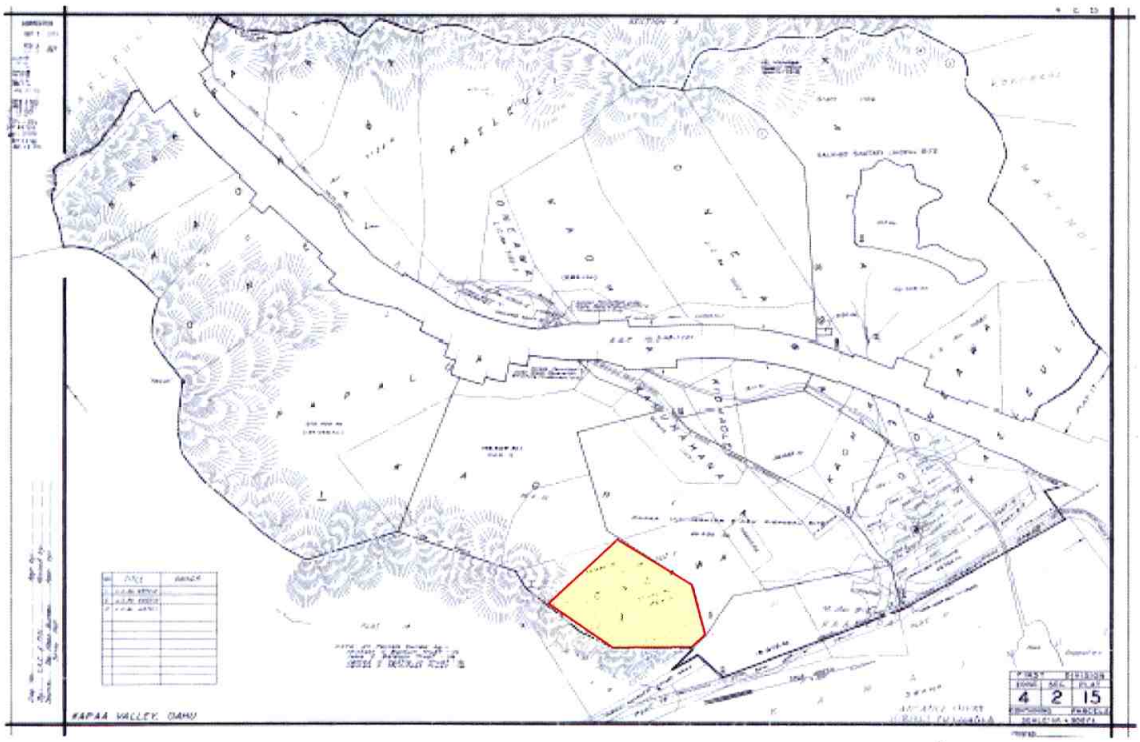
Aquifer Status Code:	3060421211111
Aquifer Sector:	Windward
Aquifer System:	Waimanalo
Aquifer Type 1:	High Level
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Dike
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

Kapaa No. 3 Landfill

Category 3



TMK Map



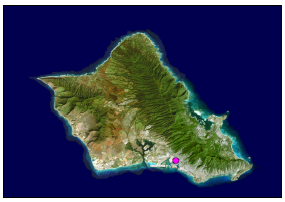
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	3		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	2
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Kapalama Dump



Kapalama Dump

Category 3

Site Description

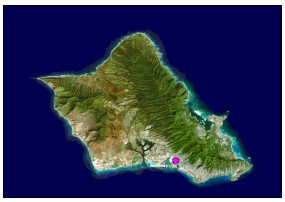
The site known as the Kapalama Incinerator property is a flat, roughly rectangular property at 757 Kokea Street, and is currently bounded by the Honolulu Community College to the southwest and southeast, JBL Hawaii Ltd. and the former Kokea Family Shelter to the northeast, and Kokea Street to the northwest. According to a historic map (Young, 1993; Map 19), the incinerator itself was located to the east of the Kapalama Drainage Canal and Kokea Street and to the north of Kokea Place. Bishop Estate owned the 1.4-acre incinerator property until it was acquired by the City and County of Honolulu (C&C) in 1944. The Territory of Hawaii set aside an additional 1.9 acres for the incinerator. A Sanborn Fire Map from the 1940s shows Nuuhelewai Stream running through the center of the Kapalama Incinerator site. However, during construction of the incinerator, the steam bed was filled and the stream was diverted to what is now the Kapalama Drainage Canal (UET, 1995).

Operation of the incinerator began in 1944 and ended in 1977. Approximately 100 to 120 cubic yards of ash were generated each day, loaded into dump trucks, and hauled to Kewalo Ash Dump for disposal. During renovation of the incinerator in the 1960s, refuse was diverted to the Koko Head Landfill and the Pearl City Peninsula Navy Landfill. According to an October 7, 1970 article in the Honolulu Advertiser, the incinerator was designed to accommodate 100 tons per day but was actually burning 275 tons per day. At an unspecified date, a layer of ash covering approximately 4,000 square feet was disposed on the ground surface near the north corner of the incinerator site. The ash was temporarily capped with several inches of gravel and was not further disturbed. In addition, approximately 100 cubic yards of ash, glass, and metal were buried between 2.5 and 4 feet below ground surface near the west corner of the site. It's not clear if these activities are associated with dumping activities during 1941-1942.

Lead has been detected in soil at the 757 Kokea Street property, where the former Kapalama Incinerator operated. The C&C completed an investigation of the extent of contamination on the incinerator property, and is planning to remove and dispose of hazardous waste and excavate contaminated soils and dispose of them in a local landfill. Future investigations will determine the extent of contamination outside the incinerator property boundaries and evaluate the need for additional cleanup actions. The State of Hawaii Hazard Evaluation and Emergency Response (HEER) Office is providing oversight for the cleanup (State of Hawaii Department of Health (DOH), 2002).

The Kapalama Ramp, where refuse was loaded onto Oahu Railway and Land Company (OR&L) railroad cars, was built to handle and dispose of waste that could no longer go to the Kalihi-Kai Dump, which was repossessed during May 1941 to make way for an Army pier project. On August 15, 1941, the first trainload of refuse was hauled from the Kapalama Ramp to Keaweula, where a temporary dump had been established. In December 1941, because of World War II blackouts, refuse could no longer be burnt at Keaweula so refuse was dumped in a swampy area adjoining the Kapalama Stream mauka of the OR&L tracks. This was the beginning of the Kapalama Dump.

The Kapalama Dump was operated by the C&C from 1941-1942 (Bagaoisan, 1997). The former Kapalama Dump was reportedly an elongated, north-south trending area located on the eastern side of the Kapalama Drainage Canal (Young, 1993; Map 13). The probable dump location is currently a flat, undeveloped site to the west of Honolulu Community College, to the north of Dillingham Boulevard, and to the south of the H-1 Freeway. The C&C and the State of Hawaii Department of Land and Natural Resources now own the parcels on which the dump is thought to have been located. The area in the vicinity of the former dump is now predominately commercial. When the Pahounui Dump opened in September 1942, the Kapalama Dump closed. There was no documentation found which indicated that the dump was permitted, lined, capped, or properly closed.



Kapalama Dump

Category 3

In a July 14, 1942 Honolulu Advertiser article, it was reported that tons of refuse accumulated at various points throughout the island following the December 7, 1941 bombing. Refuse disposal centers were established across the island and were marked by signs that read, "Official Rubbish Dump-by Order of the Military Governor". The refuse disposal centers were divided into four classes: C&C sites, Navy sites, Army sites, and plantation sites. According to the plan adopted by the United States Surgeon's Office, the Corp of Engineers, and the C&C Public Works Department, refuse was to be burned at these specially designated dumps. The map that accompanied the Honolulu Advertiser article is the same as Young's (1993) map number 10 and is entitled "Refuse-Disposal Facilities". It appears from the lack of information found on many of the sites depicted on this map (one of which is Kapalama Dump), that many of these special rubbish disposal centers were not used again after the accumulated refuse was burned.

Kapalama Dump

Category 3

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	1-5-020:007, 015, 017
2358192.08939	616712.34123	**Zone:**	Honolulu
Longitude	**Latitude**	**Section:**	Kapalama
157 52 28	21 19 18	**Plat:**	Not Designated
Address:	1199, 1301 Dillingham Boulevard	**Quadrangle:**	Honolulu

Ownership

Current Owner: City and County of Honolulu, and a portion is owned by the State of Hawaii DLNR

Previous Operator: City and County of Honolulu

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	Yes, soil and groundwater
Active Period:	1941-September, 1942; incinerator from 1944-1977	**EPA ID No.:**	HI7214522214
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	No Further Response Action Planned
Capped?	Yes	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Population and Land Use

Type of Development in the Surronding Area? Recreation

City and County Zoning: IMX-1

State Land Use District: Urban

Facilities: Commercial building (1957, 1997), Limited repair and maintenance (1957)

TMK Separation: Right-of-way, general merchandise, restricted land

Flood Zone: X - 500-year Flood Plain

Kapalama Dump

Category 3

Geography and Topography

Physiographic Province:	Coastal Plain
Elevation Range (ft):	0 **to** 10
Approximate Landfill Acreage:	2.9
Parcel Acreage:	3.4

Climate

Annual Precipitation (cm):	52.20
Precipitation Days Per Year	31
Average Temperature (°F):	77.1
Temperature Range (° F):	70.2 **to** 84.0

Soils

Soil Map Symbol:	FL	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.06-0.12
Soil Series:	Fill Land, Mixed	**Organic Carbon (%):**	0.1-5.0
Engineering Classification:	Fill Land, Mixed	**Permeability (in/hr):**	0.1-2
Drainage Characterisitics:	Poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

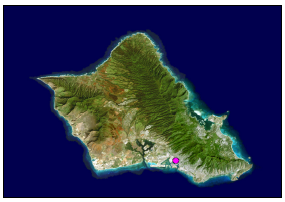
Soil Map Symbol:	W	**Bulk Density (gm/cc):**	Not available
Soil Association:	Not Applicable	**Moisture Retention (%):**	Not available
Soil Series:	Water	**Organic Carbon (%):**	Not available
Engineering Classification:	Water	**Permeability (in/hr):**	Not available
Drainage Characterisitics:	Not available	**Slope (%):**	--
Thickness of Surface Soil (in):	Not available	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Not available

Geology

Geologic Symbol(s): Ra

Geologic Unit(s): Unconsolidated noncalcareous deposits

Geologic Description: Chiefly younger alluvium, a black to brown fluviatile deposit generally consisting of coarse permeable detritus only slightly weathered and in many places subangular. In the valley bottoms near the sea it usually consists of nearly impermeable black, sticky mud called taro-patch clay. Much of the younger alluvium is reworked older alluvium. Included also is talus composed of angular blocks, usually with brown interstitial soil, forming aprons on the steep slopes at the base of cliffs. In the mountain areas much of the younger alluvium resembles, includes, and is often inseparable from landslide deposits, because of the torrential character of the streams and the precipitous valley walls. Extensive mantles of hill wash are included. Wells develop water from it in small quantities.



Kapalama Dump

Category 3

Hydrogeology

Rock Type:	Alluvium-younger
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to low
Hydraulic Conductivity (ft/d):	1 - 500

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3010311613321
Aquifer Sector:	Honolulu
Aquifer System:	Kalihi
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Currently used
Utility:	Neither
Salinity (mg/L Cl-):	Moderate (1,000-5,000)
Uniqueness:	Replaceable
Vulnerability:	High

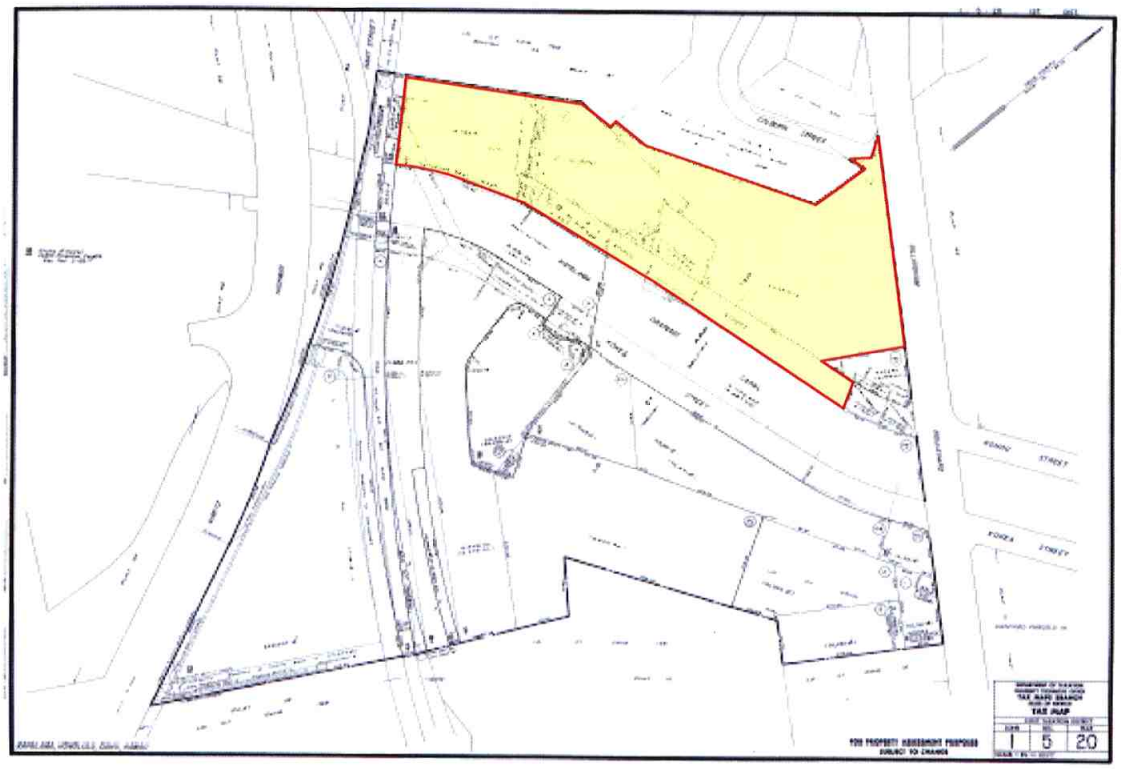
Lower Aquifer

Aquifer Status Code:	3010312111113
Aquifer Sector:	Honolulu
Aquifer System:	Kalihi
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	Low

Kapalama Dump

Category 3

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	61		
Municipal Well(s)within one mile	8	**Observation Well(s)within one mile**	5
BWS Well(s) within one mile	8	**Sealed Well(s)within one mile**	22
Domestic Well(s)within one mile	0	**Unused Well(s) within one mile**	10
Irrigation Well(s)within one mile	0	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	5	**Other Well(s)within one mile**	10

Kapalama Dump

Category 3

Well Details

USGS Well Number	1952-08	**Aquifer**	30103
Well Name	Kalihi Pump Station	**Elevation of Ground Surface (ft amsl)**	21
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	490
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-469
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	29.7
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1900		

USGS Well Number	1952-22	**Aquifer**	30103
Well Name	Kalihi Pump Station	**Elevation of Ground Surface (ft amsl)**	24
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	360
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-336
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	25.9
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1927		

USGS Well Number	1952-18	**Aquifer**	30103
Well Name	Kalihi Pump Station	**Elevation of Ground Surface (ft amsl)**	24
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	442
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-418
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	25.9
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1926		

USGS Well Number	1952-17	**Aquifer**	30103
Well Name	Kalihi Pump Station	**Elevation of Ground Surface (ft amsl)**	19
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	401
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-382
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	26.1
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1926		

Kapalama Dump

Category 3

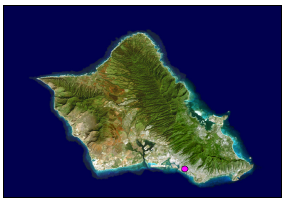
USGS Well Number	1952-16	**Aquifer**	30103
Well Name	Kalihi Pump Station	**Elevation of Ground Surface (ft amsl)**	21
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	430
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-409
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	25.6
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1926		

USGS Well Number	1952-07	**Aquifer**	30103
Well Name	Kalihi Pump Station	**Elevation of Ground Surface (ft amsl)**	20
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	475
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-455
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	28.8
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1900		

USGS Well Number	1952-06	**Aquifer**	30103
Well Name	Kalihi Pump Station	**Elevation of Ground Surface (ft amsl)**	21
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	460
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-439
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	30.4
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1900		

USGS Well Number	1952-19	**Aquifer**	30103
Well Name	Kalihi Pump Station	**Elevation of Ground Surface (ft amsl)**	23
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	414
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-391
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	26
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1926		

Kapiolani Dump



Kapiolani Dump

Category 3

Picture Not Available

Site Description

The former Kapiolani Dump was reportedly located to the north of Kapiolani Boulevard, west of Pensacola Street, and to the east of Ward Street, at the current location of the McKinley High School football field (Young 1993). The parcel on which the dump was reportedly located is now owned by the State of Hawaii, and the surrounding area is residential and commercial. The dump was owned and operated by the City and County of Honolulu (C&C) during 1936 and was a burn and dump operation (Bagaoisan, 1997). There was no documentation found which indicated that the municipal solid waste dump was permitted, lined, capped, or properly closed.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	2-3-009:001
2355495.12637	619296.18056	**Zone:**	Honolulu
Longitude	**Latitude**	**Section:**	Kaakaukukui
157 50 59	21 17 50	**Plat:**	Not Designated
Address:	1039 South King, 600, 620, 630, 634, 638 Pensacola Street	**Quadrangle:**	Honolulu

Ownership

Current Owner: State of Hawaii

Previous Operator: City and County of Honolulu

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? No wells documented

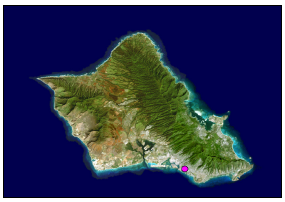
Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1936	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Mauka



Kapiolani Dump

Category 3

Picture Not Available

Population and Land Use

Type of Development in the Surronding Area?	Recreation
City and County Zoning:	Hawaii Community Development Authority and State Jurisdiction
State Land Use District:	Urban
Facilities:	Detached dwelling (1945)
TMK Separation:	Educational services, unsubdivided land, right-of-way
Flood Zone:	A - 100-year Flood Plain, X - 500-year Flood Plain

Geography and Topography

Physiographic Province:	Coastal Plain
Elevation Range (ft):	10 **to** 10
Approximate Landfill Acreage:	2
Parcel Acreage:	Approximately 45

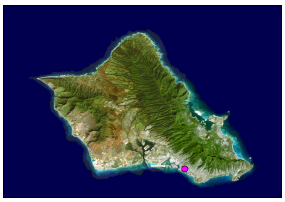
Climate

Annual Precipitation (cm):	60.22
Precipitation Days Per Year	40
Average Temperature (°F):	76.9
Temperature Range (° F):	69.1 **to** 84.6

Soils

Soil Map Symbol:	FL	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.06-0.12
Soil Series:	Fill Land, Mixed	**Organic Carbon (%):**	0.1-5.0
Engineering Classification:	Fill Land, Mixed	**Permeability (in/hr):**	0.1-2
Drainage Characterisitics:	Poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	W	**Bulk Density (gm/cc):**	Not available
Soil Association:	Not Applicable	**Moisture Retention (%):**	Not available
Soil Series:	Water	**Organic Carbon (%):**	Not available
Engineering Classification:	Water	**Permeability (in/hr):**	Not available
Drainage Characterisitics:	Not available	**Slope (%):**	--
Thickness of Surface Soil (in):	Not available	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Not available



Kapiolani Dump

Category 3

Picture Not Available

Geology

Geologic Symbol(s): Rf

Geologic Unit(s): Artificial fill composed of marine deposits

Geologic Description: Brown to white permeable marine mud containing shells, coral, and other calcareous marine organisms dredged from the ocean floor and used to fill up salt marshes and other lowlands.

Hydrogeology

Rock Type:	Sand-unconsolidated
GW Occurrance-Principal:	Basal
GW Occurrance-Secondary:	--
Permeability:	Moderate to high
Hydraulic Conductivity (ft/d):	100 - 1,000

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3010211613321
Aquifer Sector:	Honolulu
Aquifer System:	Nuuanu
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Currently used
Utility:	Neither
Salinity (mg/L Cl-):	Moderate (1,000-5,000)
Uniqueness:	Replaceable
Vulnerability:	High

Lower Aquifer

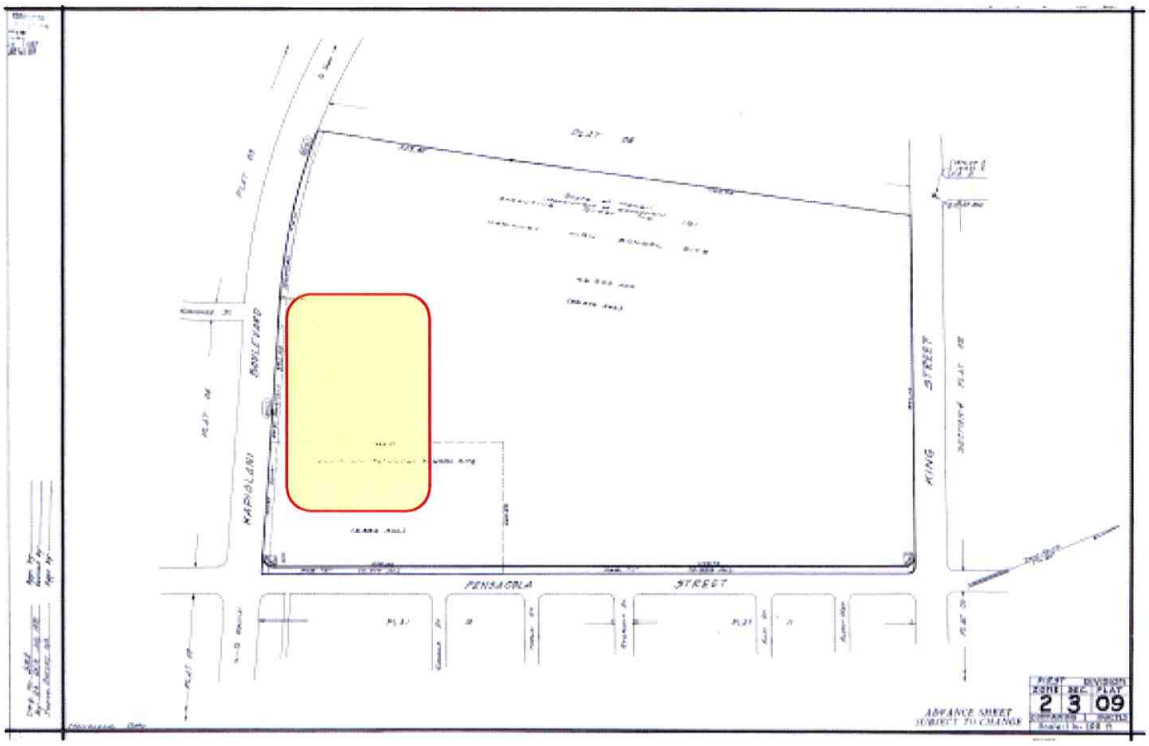
Aquifer Status Code:	3010212111113
Aquifer Sector:	Honolulu
Aquifer System:	Nuuanu
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	Low

Kapiolani Dump

Category 3

Picture Not Available

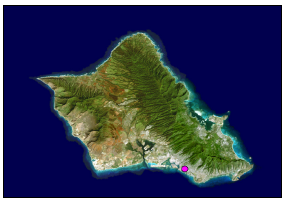
TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	83		
Municipal Well(s)within one mile	10	**Observation Well(s)within one mile**	3
BWS Well(s) within one mile	9	**Sealed Well(s)within one mile**	39
Domestic Well(s)within one mile	1	**Unused Well(s) within one mile**	3
Irrigation Well(s)within one mile	1	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	2	**Other Well(s)within one mile**	23



Kapiolani Dump

Category 3

Picture Not Available

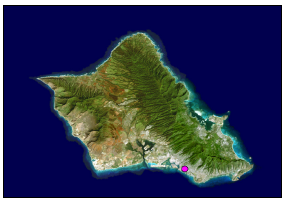
Well Details

USGS Well Number	1851-54	**Aquifer**	30102
Well Name	Queens Hospital	**Elevation of Ground Surface (ft amsl)**	34
Well Owner	Queens Med Ctr	**Well Depth (feet bgs)**	460
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-426
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	28.5
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	750
Drilling Method	--		
Year of Construction	1958		

USGS Well Number	1851-67	**Aquifer**	30102
Well Name	Beretania Obs	**Elevation of Ground Surface (ft amsl)**	18
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	619
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-601
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	3
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	Rotary		
Year of Construction	1968		

USGS Well Number	1851-74	**Aquifer**	30102
Well Name	Beretania Station 1	**Elevation of Ground Surface (ft amsl)**	19
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	598
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-579
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	21
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	Rotary		
Year of Construction	1988		

USGS Well Number	1851-75	**Aquifer**	30102
Well Name	Beretania Station 2	**Elevation of Ground Surface (ft amsl)**	18
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	625
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-607
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	22.9
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	Rotary		
Year of Construction	1989		



Kapiolani Dump

Category 3

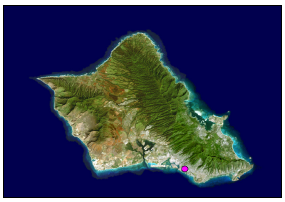
Picture Not Available

USGS Well Number	1851-12	**Aquifer**	30102
Well Name	Beretania P Station	**Elevation of Ground Surface (ft amsl)**	21
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	580
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-559
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	32
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1895		

USGS Well Number	1851-07	**Aquifer**	30102
Well Name	Pacific Club	**Elevation of Ground Surface (ft amsl)**	28
Well Owner	Pacific Club	**Well Depth (feet bgs)**	560
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-532
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	23.2
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	35
Drilling Method	--		
Year of Construction	1884		

USGS Well Number	1851-34	**Aquifer**	30102
Well Name	Beretania P Station	**Elevation of Ground Surface (ft amsl)**	14
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	636
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-622
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	23.6
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1926		

USGS Well Number	1851-13	**Aquifer**	30102
Well Name	Beretania P Station	**Elevation of Ground Surface (ft amsl)**	22
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	616
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-594
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1895		



Kapiolani Dump

Category 3

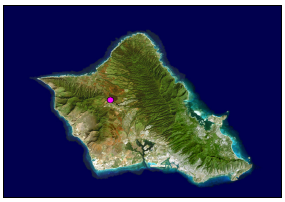
Picture Not Available

USGS Well Number	1851-35	**Aquifer**	30102
Well Name	Beretania P Station	**Elevation of Ground Surface (ft amsl)**	15
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	566
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-551
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	23.3
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1926		

USGS Well Number	1851-33	**Aquifer**	30102
Well Name	Beretania P Station	**Elevation of Ground Surface (ft amsl)**	14
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	533
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-519
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	23.6
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1926		

USGS Well Number	1851-31	**Aquifer**	30102
Well Name	Beretania P Station	**Elevation of Ground Surface (ft amsl)**	20
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	600
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-580
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	28
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1924		

Kaukonahua Dump



Kaukonahua Dump

Category 2

Picture Not Available

Site Description

The open-space dumping area of the former Kaukonahua Dump was likely located to the south of Wilikina Drive, to the north of Schofield Barracks, and at the northern edge of or within the Kaukonahua Stream Valley. The dump was probably small and located in a gulch, and may be the same dump identified as "Wahiawa Dump" on historic maps. The area in the vicinity of the former dump is agricultural. The parcel on which the dump is suspected to have been located is currently owned by the Dole Food Company.

There was limited available information on the Kaukonahua Dump but it was probably used to dispose of plantation refuse. Although no records on the period of operation were located, the dump probably operated during the 1950s. There was no documentation found which indicated that the dump was permitted, lined, capped, or properly closed. The former dump was likely a burn and dump operation. The current status of the site is unknown. The past operator is assumed to be Dole but is uncertain without additional information.

The former dump was likely located to the south of Wilikina Drive and to the north of Schofield Barracks at the edge of or within the north side of the Kaukonahua Stream Valley. The area in the vicinity of the former dump is agricultural.

The Kaukonahua Dump, which was operated by Dole Pineapple, was used to dispose of agricultural refuse during the 1950s. The closed, uncapped, unlined dump was a burn and dump operation. The parcel on which the dump is suspected to have been located is currently owned by Dole Company.

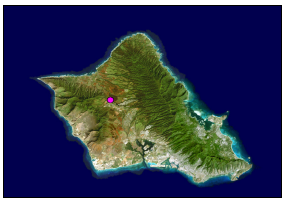
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	6-5-002:001
2378663.71488	596686.12907	**Zone:**	Waialua
Longitude	**Latitude**	**Section:**	Kaheeka
158 03 59	21 30 28	**Plat:**	Kemoo
Address:	Kaukonahua Road	**Quadrangle:**	Haleiwa

Ownership

Current Owner: Dole Food Company (lessee-Waialua Sugar Co + Wahiawa Water Co) + Theodore J.P. Lopez Trust

Previous Operator: Dole Pineapple



Kaukonahua Dump

Category 2

Picture Not Available

Site Operation and History

Landfill Type: Agricultural

Type of Waste: Plantation refuse

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1950s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Agriculture

City and County Zoning: Ag-1

State Land Use District: Agricultural

Facilities: --

TMK Separation: Pineapple field, steep land

Flood Zone: D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province: Coastal Plain

Elevation Range (ft): 800 **to** 880

Approximate Landfill Acreage: 1-5

Parcel Acreage: 34, 73.44+86.25

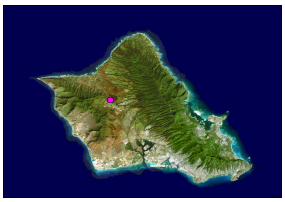
Climate

Annual Precipitation (cm): 142.70

Precipitation Days Per Year 99

Average Temperature (°F): 70.7

Temperature Range (° F): 63.2 **to** 78.1



Kaukonahua Dump

Category 2

Picture Not Available

Soils

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

Geologic Symbol(s): Tkb

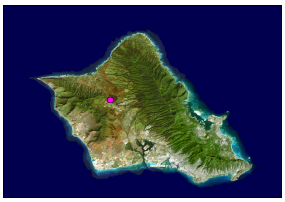
Geologic Unit(s): Koolau volcanic series

Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.

Geologic Symbol(s): Pa

Geologic Unit(s): Consolidated noncalcareous deposits

Geologic Description: Chiefly older alluvium, generally consisting of mottled brown to red-brown, deeply weathered, poorly-assorted, and nearly impermeable friable conglomerates, in places cemented with limonite or hematite and usually forming conspicuous terraces along the principal streams. Near the mouths of the valleys and especially around Pearl Harbor and near Waialua the older alluvium grades into partly consolidated sands and silts that are emerged delta deposits. The degree of consolidation is largely dependent upon the amount of rainfall, for in dry regions the material is much better cemented than in wet regions. Near the heads of valleys the older alluvium grades into coarse angular talus and landslide deposits which, in places, carry considerable water. In the large semiarid valleys in the Waianae Range these deposits are firmly cemented breccias. They are poorly permeable in wet areas and hold up perched water in the Honolulu volcanic series, but in the dry areas they yield small supplies of potable water.



Kaukonahua Dump

Category 2

Picture Not Available

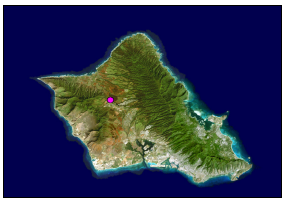
Hydrogeology

Rock Type:	Alluvium-older-consolidated
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Aquifer Status Code:	3050121211111
Aquifer Sector:	Central
Aquifer System:	Wahiawa
Aquifer Type 1:	High Level
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Dike
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High



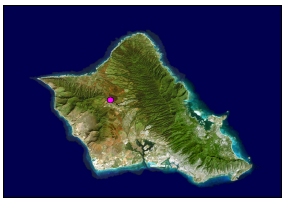
Kaukonahua Dump

Category 2

Picture Not Available

Site Reconnaissance

Site Description:	Site reconnaissance was not performed because of access issues during site visit and non-response of property owner.
Type of Property:	Unknown.
Current Site Operations:	Unknown.
Age of Development:	Unknown.
Onsite Building Information:	Unknown.
Was There a Recognizable Dump/Landfill?	Not applicable.
Institutional Controls:	The site is located within Dole Plantation property. Access to Dole property is restricted.
Number of MonitoringWells:	Unknown.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	Not applicable.
Odors, Staining, Distressed Vegetation:	Not applicable.
Drainage Features:	Unknown.
Areas of Ponded Water Onsite:	Unknown.



Kaukonahua Dump

Category 2

Picture Not Available

Site Reconnaissance (cont.)

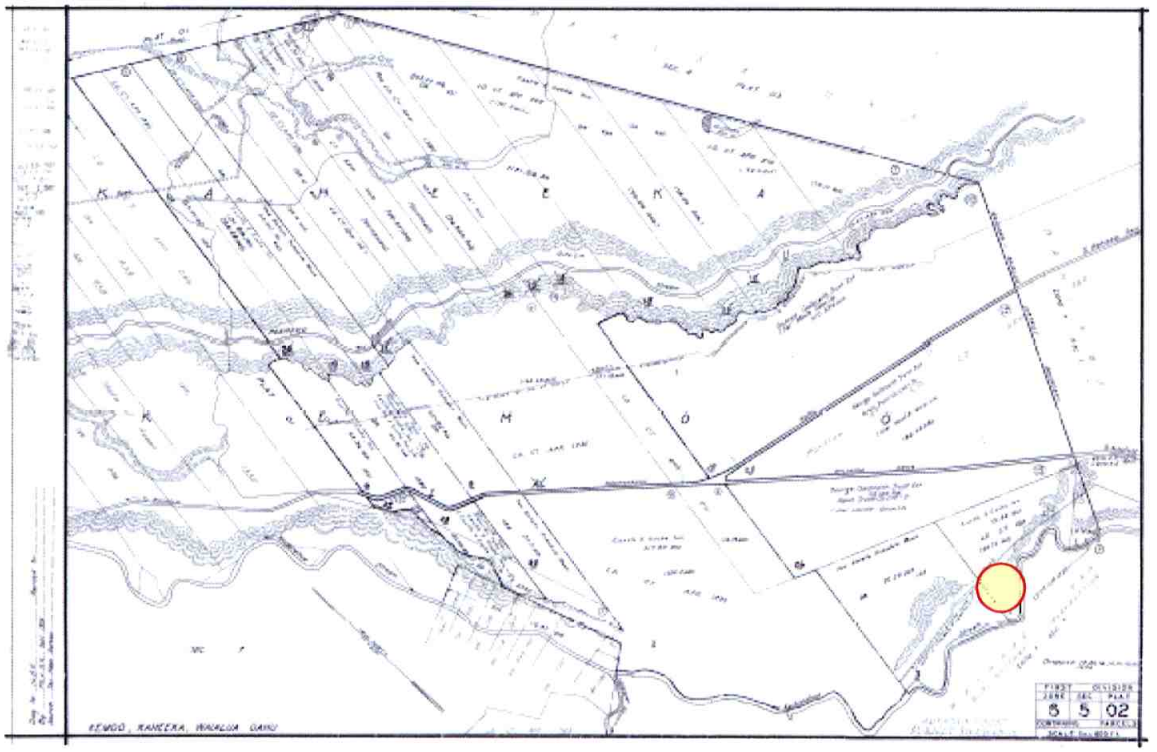
Storm Water Retention Pond:	Unknown.
House and Schools in the Vicinity:	Unknown.
Distance to Nearest Residence, School, or Businesses:	Unknown.
How is Drinking Water in the Area Supplied?	Unknown.
Natural Resources, Agriculture, Aquaculture Near the Site?	The site is in the vicinity of pineapple plantations.
Name of Surface Water Within 1-mile of Dump/Landfill:	Kaukonahua Stream.
Distance to Surface Water:	Less than 200 feet.
Proximal Direction of Surface Water:	North
Where Does Surface Water Flow?	USGS topographic maps indicate run-off would flow north into the Kaukonahua Stream.
Surface Water Used for Drinking?	Unknown. Assume no.
Surface Water Used for Recreation?	Unknown.
Wetlands:	Unknown.
Off-site Sources of Contamination:	Unknown.
Does Run-off from other Sites Flow onto Subject Property:	Unknown.
Adjacent Property-North:	Unknown.
Adjacent Property-South:	Unknown.
Adjacent Property-East:	Not applicable.
Adjacent Property-West:	Unknown.

Kaukonahua Dump

Category 2

Picture Not Available

TMK Map



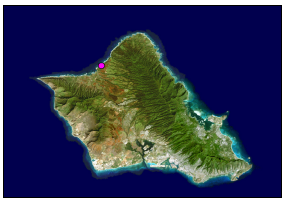
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	7		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	6
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	1	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Kawailoa Landfill



Kawailoa Landfill

Category 3

Site Description

The Kawailoa Landfill is located in Haleiwa in a former marshland on the north side of Kawailoa Road, to the north of Ukoa Pond, to the east of Kamehameha Highway (0.1 miles), and to the west of Kawailoa Camp (0.8 miles). The area in the vicinity of the landfill is relatively undeveloped.

The unlined Kawailoa Landfill was operated by the City and County of Honolulu (C&C) from 1954-1987 and was previously known as the Waialua Garbage Disposal Site. According to Bagaoisan (1997) the western portion of the site was used from 1954 to 1962 and the eastern portion of the site was used from 1965 to 1987. The dump was temporarily abandoned in 1962 due to complaints of smoke and odor. The site reopened in 1965 and was converted to a landfill in 1966. The land was obtained from the Bishop Estate by the C&C in April of 1970 (Parametrix, 1992). The method of operation was dump and burn prior to 1970 and then dump and cover thereafter. The landfill is reported to contain approximately 1.7 million cubic yards of municipal solid waste. The landfill stopped accepting waste on April 1, 1987, and incoming wastes were diverted to the adjacent Kawailoa Transfer Station. The landfill was closed under Hawaii Administrative Rules, Title 11, Chapter 58, which were effective from November 1981-October 1993. The landfill is covered with two to three feet of silty loam soil. Final closure improvements as indicated by the Russ Smith Corporation closure plan included final grading and cover, drainage improvements, installation of monitoring wells, and grassing. Surface runoff on the southwest and northern side of the landfill is towards Ukoa pond and a transfer station is located on the eastern side of the site.

According to the United States Environmental Protection Agency (EPA)'s Archived Sites records, the landfill's "Discovery" was July 1, 1974. A Preliminary Assessment was performed on November 19, 1984 and determined that no further action was necessary; therefore, the landfill became an "Archived Site". The State of Hawaii Hazard Evaluation and Emergency Response (HEER) Initial Site Screening Team screened the site on April 29, 1996 and determined that no further action was necessary (State of Hawaii Department of Health (DOH), 2003).

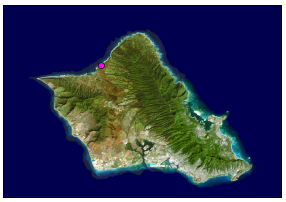
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	6-1-005:018
2390211.69161	594014.71713	**Zone:**	Waialua
Longitude	**Latitude**	**Section:**	Kawailoa-Waimea
158 05 29	21 36 45	**Plat:**	Not Designated
Address:	180 Kawailoa Drive	**Quadrangle:**	Haleiwa

Ownership

Current Owner: City and County of Honolulu-was previously owned by the Bernice Pauahi Bishop Trust Estate

Previous Operator: City and County of Honolulu



Kawailoa Landfill

Category 3

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal solid waste + demolition debris, sewage sludge prior to Aug 1, 1977

Monitoring Well Network? Yes

Monitoring Well Identification MW-1, MW-2, MW-3, MW-4

Status:		**Analytical Data Available?**	Yes
Active Period:	1954- April 1, 1987	**EPA ID No.:**	HID980497218
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Long-Term Monitoring - Monitored Natural Attenuation
Capped?	Two to three feet of silty loam soil cover	**Method of Operation:**	Cover and fill

Permit Info: Permit numbers SW-021019 (Feb. 19, 1975-Feb. 15, 1980), SW-106109 (Apr. 15, 1980-Feb. 15, 1985), and SW-215220 (Jun. 26, 1986-Jun. 1, 1991). The landfill was issued permits under Chapter 46 of the Public Health Regulations (effective Jul. 1974-Nov. 1981) and Chapter 58 of the Hawaii Administrative Rule (effective Nov. 1981-Oct. 1993).

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Population and Land Use

Type of Development in the Surronding Area? Residential/Agricultural

City and County Zoning: Ag-1

State Land Use District: Agricultural

Facilities: Power, sanitary, and refuse

TMK Separation: refuse

Flood Zone: X - 500-year Flood Plain

Geography and Topography

Physiographic Province: Coastal Plain

Elevation Range (ft): 0 **to** 10

Approximate Landfill Acreage: Approximately 28

Parcel Acreage: 28.32

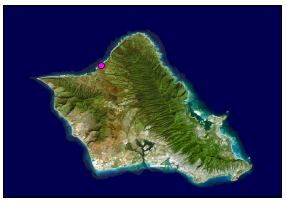
Climate

Annual Precipitation (cm): 77.09

Precipitation Days Per Year 46

Average Temperature (°F): 73.2

Temperature Range (° F): 64.2 **to** 82.1



Kawailoa Landfill

Category 3

Soils

Soil Map Symbol:	JaC	**Bulk Density (gm/cc):**	1.55-1.60
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.04-0.05
Soil Series:	Jaucas	**Organic Carbon (%):**	0.5-1.0
Engineering Classification:	Sand	**Permeability (in/hr):**	6-20
Drainage Characterisitics:	well	**Slope (%):**	0-15
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.3
Topsoil Rating:	Fair	**Corrosivity:**	Moderate

Soil Map Symbol:	BS	**Bulk Density (gm/cc):**	1.35-1.60
Soil Association:	Not Applicable	**Moisture Retention (%):**	0.03-0.05
Soil Series:	Beaches	**Organic Carbon (%):**	0.0-0.1
Engineering Classification:	Beach Sand	**Permeability (in/hr):**	6-20
Drainage Characterisitics:	well	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-7.8
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

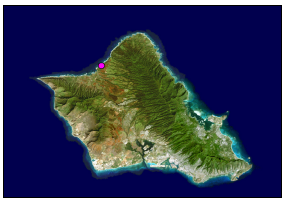
Geologic Symbol(s): Rs

Geologic Unit(s): Unconsolidated marine calcareous sediments

Geologic Description: Chiefly cream-colored and light-tan, very permeable beach sand consisting of grains of worn coral, coralline algae, and shells with appreciable amounts of foraminifers and other calcareous marine organisms. Abundant water in this sand, but it is either brackish or ocean water.

Hydrogeology

Rock Type:	Sand-unconsolidated
GW Occurrance-Principal:	Basal
GW Occurrance-Secondary:	--
Permeability:	Moderate to high
Hydraulic Conductivity (ft/d):	100 - 1,000

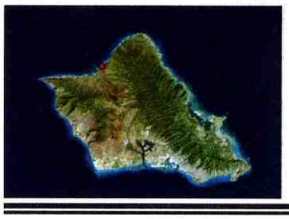


Kawailoa Landfill

Category 3

Aquifer(s)

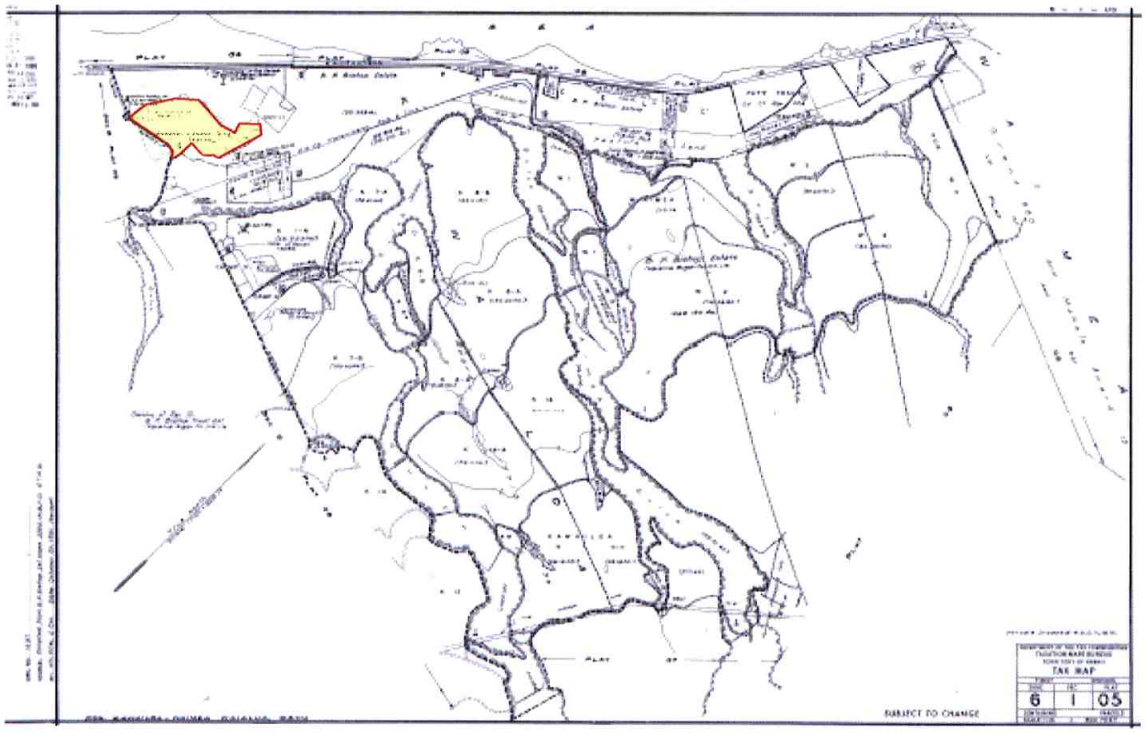
Uppermost Aquifer	**Aquifer Status Code:**	3040311612211
	Aquifer Sector:	North
	Aquifer System:	Kawailoa
	Aquifer Type 1:	Basal
	Aquifer Type 2:	Unconfined
	Aquifer Type Geol.:	Sedimentary
	Development State:	Currently used
	Utility:	Ecologically important
	Salinity (mg/L Cl-):	Low (250-1000)
	Uniqueness:	Irreplaceable
	Vulnerability:	High
Lower Aquifer	**Aquifer Status Code:**	3040312112313
	Aquifer Sector:	North
	Aquifer System:	Kawailoa
	Aquifer Type 1:	Basal
	Aquifer Type 2:	Confined
	Aquifer Type Geol.:	Flank
	Development State:	Currently used
	Utility:	Ecologically important
	Salinity (mg/L Cl-):	Moderate (1,000-5,000)
	Uniqueness:	Irreplaceable
	Vulnerability:	Low



Kawailoa Landfill

Category 3

TMK Map



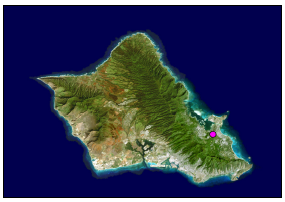
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	28		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	3
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	24
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	1

Well Details

Kawainui Dump



Kawainui Dump

Category 3

Site Description

Kawainui Dump, operated by the City and County of Honolulu (C&C), was used for the disposal of municipal solid waste from 1953-1963. After closure of the Aikahi Dump in 1953, Castle Estate gave the C&C permission to establish a dump on 10 acres of land within the Kawainui Swamp (Young, 1993). The dump was reportedly located to the east of Kapaa Quarry Road and to the south and west of a tributary to Kahanaiki Stream, on the western edge of the Kawainui Swamp. This site may have been used for dumping prior to 1953. A rural rubbish dump site identified as "Kailua" on a 1940's era map (Young, 1993; Map 10) is likely the Kawainui Dump site, though the map is not of an appropriate scale to definitively determine the site's exact location.

Open burning was discontinued at the Kawainui Dump in 1963 following complaints from Kailua residents (Honolulu Advertiser, October 27, 1966). In addition, Castle Estate gave the C&C an additional site across the street from the dump in 1963, which became the C&C's first landfill and was known as Kawainui Landfill. The Kawainui Landfill operated from 1963-1972 before being covered and closed.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	4-2-016:001, 006 (dump) + 4-2-015:006 (landfill)
2367045.40409	628047.38551	**Zone:**	Koolaupoko
Longitude	**Latitude**	**Section:**	Kailua
157 45 52	21 24 04	**Plat:**	Not Designated
Address:	750 Kaha, 1560 Mokapu Blvd, 897 Kalanianaole Hwy; Kapaa Quarry Road	**Quadrangle:**	Mokapu

Ownership

Current Owner: Castle Estate

Previous Operator: City and County of Honolulu

Site Operation and History

Landfill Type: Municipal

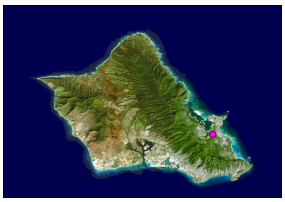
Type of Waste: Municipal

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1953-1972	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	"Covered"	**Method of Operation:**	Burn and dump, daily cover

Permit Info: Permitted in 1963 prior to the Chapter 46 Public Health Regulations (effective Jul. 1974-Nov. 1981). Permit expired in 1972.



Kawainui Dump

Category 3

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line?	Makai
Mauka or Makai of UIC Line?	Makai

Population and Land Use

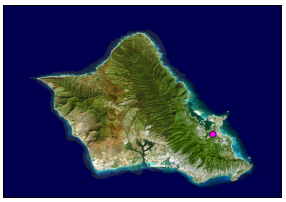
Type of Development in the Surronding Area?	Vacant
City and County Zoning:	P-1, P-2,
State Land Use District:	Conservation, Urban
Facilities:	--
TMK Separation:	Unsubdivided vacant land, restricted land (forest reserve, wildlife refuge, etc),
Flood Zone:	A/AE - 100-year Flood Plain, AH - 100-year Flood Plain with areas of ponding, X - 500-year Flood Plain, D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province:	Koolau Range
Elevation Range (ft):	100 **to** 100
Approximate Landfill Acreage:	28
Parcel Acreage:	599.559(42016001), 61.4(42016006), 43.758 (42015006)

Climate

Annual Precipitation (cm):	193.80
Precipitation Days Per Year	133
Average Temperature (°F):	74.3
Temperature Range (° F):	68.8 **to** 79.8



Kawainui Dump

Category 3

Soils

Soil Map Symbol:	MZ	**Bulk Density (gm/cc):**	Not available
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.24-0.30
Soil Series:	Marsh	**Organic Carbon (%):**	60-99
Engineering Classification:	Marsh	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Very poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	W	**Bulk Density (gm/cc):**	Not available
Soil Association:	Not Applicable	**Moisture Retention (%):**	Not available
Soil Series:	Water	**Organic Carbon (%):**	Not available
Engineering Classification:	Water	**Permeability (in/hr):**	Not available
Drainage Characterisitics:	Not available	**Slope (%):**	--
Thickness of Surface Soil (in):	Not available	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Not available

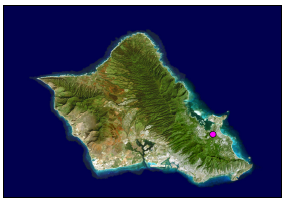
Soil Map Symbol:	Ph	**Bulk Density (gm/cc):**	1.10-1.30
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Pearl Harbor	**Organic Carbon (%):**	10-15
Engineering Classification:	Clay	**Permeability (in/hr):**	0.0000-0.1
Drainage Characterisitics:	Very poor	**Slope (%):**	>15
Thickness of Surface Soil (in):	0-31	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

Geologic Symbol(s): Ra

Geologic Unit(s): Unconsolidated noncalcareous deposits

Geologic Description: Chiefly younger alluvium, a black to brown fluviatile deposit generally consisting of coarse permeable detritus only slightly weathered and in many places subangular. In the valley bottoms near the sea it usually consists of nearly impermeable black, sticky mud called taro-patch clay. Much of the younger alluvium is reworked older alluvium. Included also is talus composed of angular blocks, usually with brown interstitial soil, forming aprons on the steep slopes at the base of cliffs. In the mountain areas much of the younger alluvium resembles, includes, and is often inseparable from landslide deposits, because of the torrential character of the streams and the precipitous valley walls. Extensive mantles of hill wash are included. Wells develop water from it in small quantities.



Kawainui Dump

Category 3

Hydrogeology

Rock Type:	Alluvium-younger
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to low
Hydraulic Conductivity (ft/d):	1 - 500

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3060411612211
Aquifer Sector:	Windward
Aquifer System:	Waimanalo
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Currently used
Utility:	Ecologically important
Salinity (mg/L Cl-):	Low (250-1000)
Uniqueness:	Irreplaceable
Vulnerability:	High

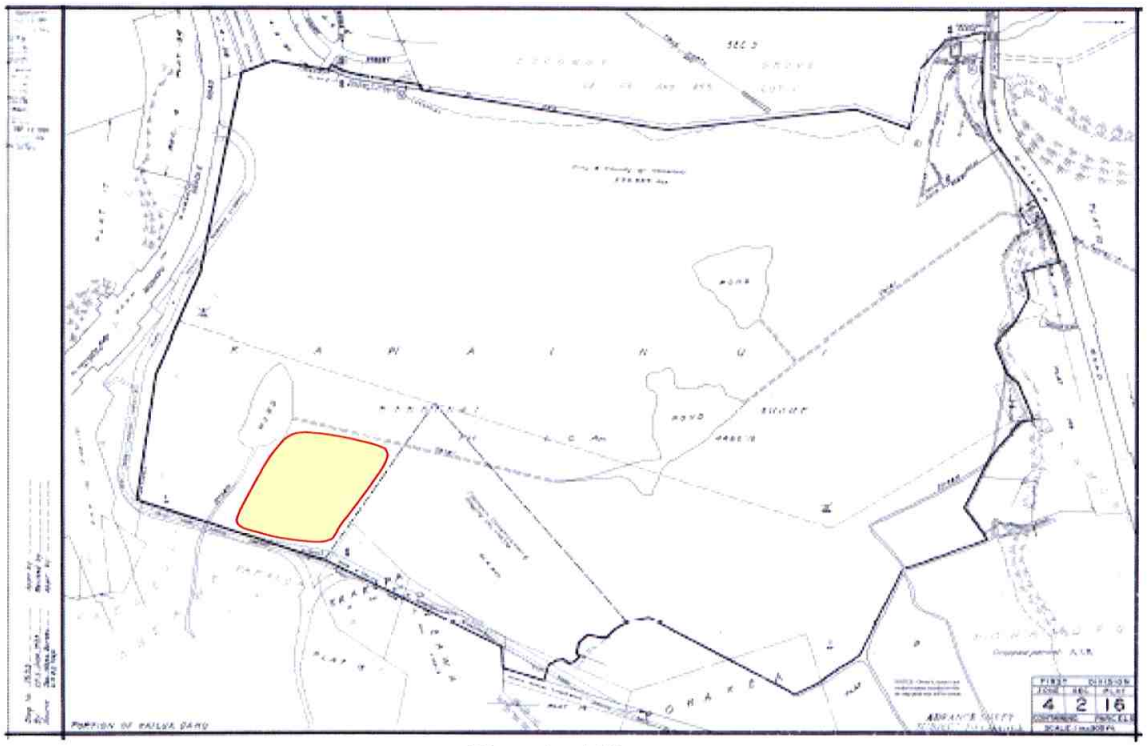
Lower Aquifer

Aquifer Status Code:	3060412211113
Aquifer Sector:	Windward
Aquifer System:	Waimanalo
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Dike
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	Low

Kawainui Dump

Category 3

TMK Map



Kawainui Dump

Wells Within One Mile

Summary

Total Number of Well(s)within one mile	3		
Municipal Well(s)within one mile	0	**Observation Well(s)within one mile**	0
BWS Well(s) within one mile	0	**Sealed Well(s)within one mile**	0
Domestic Well(s)within one mile	0	**Unused Well(s) within one mile**	2
Irrigation Well(s)within one mile	0	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	0

Well Details

Keawaula Dump

Keawaula Dump

Category 3

Site Description

The Keawaula Dump was reportedly located in a valley along the coast approximately 2.5 miles to the southeast of Kaena Point. The area in the vicinity of the former dump is currently Kaena Point State Park.

Keawaula Dump was operated by the City and County of Honolulu (C&C) and was used to dispose of municipal solid waste from 1941-1946 as an emergency measure to contain the growing quantity of waste caused by increased development on the island. Wastes were hauled to the dump by train from Kapalama Ramp. The waste was used to fill low-lying areas in the valley. On August 15, 1941, the first trainload of refuse was hauled from the Kapalama Ramp to Keawaula where the temporary dump had been established. Approximately 125 tons of garbage was hauled daily. In December 1941, because of World War II blackouts, refuse could no longer be burned at Keawaula so refuse was temporarily dumped in a swampy area adjoining the Kapalama Canal. In July 1942, the Keawaula Dump was reopened after a well was constructed to provide water to extinguish fires each day before blackout. The site was covered and closed in 1946. The "Keawaula Garbage Dump" and the Oahu Railway and Land Company tracks are shown to the north of what was formerly Keawaula Beach Park on a Department of Public Work, Division of Land Survey and Acquisition map.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	8-1-001:008
2383780.69781	577828.04252	**Zone:**	Waianae
Longitude	**Latitude**	**Section:**	Keawaula-Kahanahaiki
158 14 54	21 33 18	**Plat:**	Not Designated
Address:	601, 1051 Farrington Hwy	**Quadrangle:**	Kaena

Ownership

Current Owner: State of Hawaii

Previous Operator: City and County of Honolulu

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1941-1946	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	"Covered"	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Keawaula Dump

Category 3

Population and Land Use

Type of Development in the Surronding Area?	Recreation
City and County Zoning:	D-1
State Land Use District:	Conservation
Facilities:	Kaena State Park
TMK Separation:	Public recreation
Flood Zone:	D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province:	Waianae Range
Elevation Range (ft):	0 **to** 30
Approximate Landfill Acreage:	Approximately 60
Parcel Acreage:	Approximately 60

Climate

Annual Precipitation (cm):	77.09
Precipitation Days Per Year	46
Average Temperature (°F):	73.2
Temperature Range (° F):	64.2 **to** 82.1

Keawaula Dump

Category 3

Soils

Soil Map Symbol:	MnC	**Bulk Density (gm/cc):**	1.10-1.33
Soil Association:	Tropohumults-Dystrandepts	**Moisture Retention (%):**	0.16-0.18
Soil Series:	Mamala	**Organic Carbon (%):**	2.0-4.0
Engineering Classification:	Stony Silty Clay Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Very poor	**Slope (%):**	0-12
Thickness of Surface Soil (in):	0-19	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	BS	**Bulk Density (gm/cc):**	1.35-1.60
Soil Association:	Not Applicable	**Moisture Retention (%):**	0.03-0.05
Soil Series:	Beaches	**Organic Carbon (%):**	0.0-0.1
Engineering Classification:	Beach Sand	**Permeability (in/hr):**	6-20
Drainage Characterisitics:	well	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-7.8
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	FL	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.06-0.12
Soil Series:	Fill Land, Mixed	**Organic Carbon (%):**	0.1-5.0
Engineering Classification:	Fill Land, Mixed	**Permeability (in/hr):**	0.1-2
Drainage Characterisitics:	Poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

Geologic Symbol(s): Pls

Geologic Unit(s): Consolidated calcareous marine sediments

Geologic Description: Chiefly emerged coral reefs but in places, especially near Pearl Harbor, finely laminated lagoon limestone. Beach deposits resembling the various types of present calcareous beaches in lithified form are included, as well as a few inextensive consolidated beach deposits that may have been formed at the present stand of the sea. Extremely permeable because of primary and secondary cavities and yields water copiously, but the water is apt to be brackish.

Keawaula Dump

Category 3

Hydrogeology

Rock Type:	Coral-in situ reef limestone
GW Occurrance-Principal:	Basal
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to very high
Hydraulic Conductivity (ft/d):	100 - 20,000

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3030511633421
Aquifer Sector:	Waianae
Aquifer System:	Keaau
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	No potential use
Utility:	Neither
Salinity (mg/L Cl-):	High (5,000-15,000)
Uniqueness:	Replaceable
Vulnerability:	High

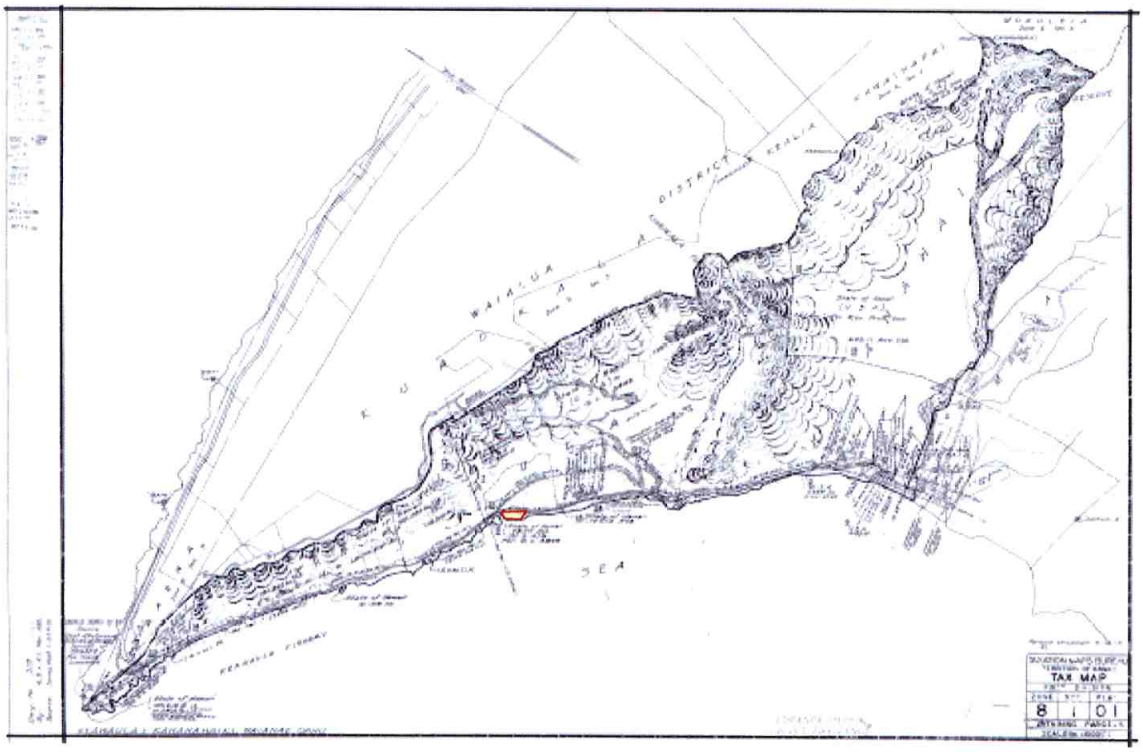
Lower Aquifer

Aquifer Status Code:	3030512211212
Aquifer Sector:	Waianae
Aquifer System:	Keaau
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Dike
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Low (250-1000)
Uniqueness:	Irreplaceable
Vulnerability:	Moderate

Keawaula Dump

Category 3

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	4		
Municipal Well(s)within one mile	0	**Observation Well(s)within one mile**	0
BWS Well(s) within one mile	0	**Sealed Well(s)within one mile**	0
Domestic Well(s)within one mile	3	**Unused Well(s) within one mile**	0
Irrigation Well(s)within one mile	0	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	1

Keawaula Dump

Category 3

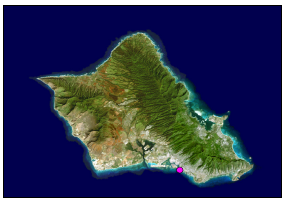
Well Details

USGS Well Number	3314-04	**Aquifer**	
Well Name	Keawaula Bay	**Elevation of Ground Surface (ft amsl)**	
Well Owner	State Parks	**Well Depth (feet bgs)**	21
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	120
Drilling Method	Dug		
Year of Construction	1979		

USGS Well Number	3314-01	**Aquifer**	30305
Well Name	AT & T 1	**Elevation of Ground Surface (ft amsl)**	152
Well Owner	AT & T	**Well Depth (feet bgs)**	232
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-80
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	5.03
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	80
Drilling Method	--		
Year of Construction	1961		

USGS Well Number	3314-02	**Aquifer**	30305
Well Name	AT & T 2	**Elevation of Ground Surface (ft amsl)**	174
Well Owner	AT & T	**Well Depth (feet bgs)**	278
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-104
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	4.6
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	80
Drilling Method	--		
Year of Construction	1962		

Kewalo Ash Dump



Kewalo Ash Dump

Category 3

Site Description

The former Kewalo Incinerator Ash Dump is located on the Kakaako Peninsula in the vicinity of Fort Armstrong, to the west of Kewalo Basin (0.2 miles), to the southwest of Ala Moana Boulevard (0.3 miles), and to the southeast of the Honolulu Channel. According to the Remedial Investigation conducted by Harding Lawson (1995), the landfill site is approximately 1,900 feet long and 400 to 600 feet wide and covers close to 15 acres. The landfill is bordered by the Pacific Ocean to the south, a concrete-lined channel to the west, light industrial facilities and Olomehani Street to the north, and Point Panic Park, the J.K.K. Look Oceanographic Laboratory, and Kewalo Basin to the east (Harding Lawson Associates, 1995). The former dump is capped and in 1992 the State constructed Kakaako Waterfront Park on the ash pile.

Kewalo Incinerator Ash Dump, operated by the City and County of Honolulu (C&C), received both incinerated ash and municipal refuse from 1927-1974. The first municipal refuse incinerator was built on Ahui Street by the C&C and operated on the peninsula from 1937 to 1947 (Young, 1993). A second incinerator, built on Ohe Street, operated from 1946-1974. Ash from these incinerators was placed on the western portion of the site from 1944-1950 and on the southern portion of the site from 1950-1971 (site of Kakaako Park). During the late 1950s and early 1960s refuse was burned on site. During the mid-1960s some excess refuse was deposited at the site without burning. Pesticides and/or rodenticides were applied to this refuse for vector control. During renovation of the incinerator in the 1960s, refuse was diverted to the Koko Head Landfill and the Pearl City Peninsula Navy Landfill. The C&C stop placing ash at Kewalo in 1971. Parts of the ash pile were 25 feet above the seawall. Ash is approximately 40 feet thick across the site.

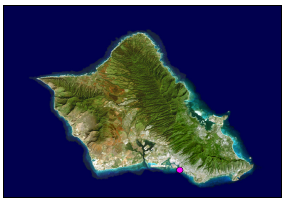
The site was used as a transfer station from 1974 to 1977. After 1977, the site was covered with a cap consisting of soil and construction debris.

Woodward-Clyde investigated conditions at the landfill during 1988. Borings revealed cover material thickness between 12 to 25 feet and refuse material consisting of 14 to 45 feet of ash, wood, glass, concrete blocks, scrap metal, wire, and plastic. The estimated total volume of ash, soil, and refuse in the landfill is approximately 686,000 cubic yards (Woodward-Clyde Consultants, 1989).

According to the United States Environmental Protection Agency (EPA)'s Archived Sites records, the landfill's "Discovery" was on January 1, 1980. A Preliminary Assessment was completed September 19, 1984. A Preliminary Assessment reassessment was performed on March 30, 1989 and determined that no further action was necessary; therefore, the landfill became an "Archived Site". The State of Hawaii Hazard Evaluation and Emergency Response (HEER) Initial Site Screening Team screened the site on January 12, 1996 and determined that no further action was necessary. (State of Hawaii Department of Health (DOH), 2002).

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	2-3-037:001, 002, 008
2355113.70866	617758.27778	**Zone:**	Honolulu
Longitude	**Latitude**	**Section:**	Kaakaukukui
157 51 53	21 17 38	**Plat:**	Not Designated
Address:	40, 41, 43 Ahui Street; 751, 811 Olomehani Street; 98 Koula Street; 709 Kelikoi Street; formal address given as 111 Ohe Street	**Quadrangle:**	Honolulu



Kewalo Ash Dump

Category 3

Ownership

Current Owner: Hawaii Community Development Authority (Richard H.S. Lee Company uses the top surface of the landfill for temporary storage of soil)

Previous Operator: City and County of Honolulu

Site Operation and History

Landfill Type: Municipal

Type of Waste: Ash and unburned MSW; Large appliances and other scrap metal wastes

Monitoring Well Network? Yes

Monitoring Well Identification Four monitoring wells (University of Hawaii), monitoring wells B-1, B-2, B-3, and B-4 (Woodward-Clyde), and HG-1, HG-3, HG-4, HG-6, HG-8, HG-9, HW-3, and HW-4 (Harding Lawson)

Status:	Closed (however, uncontrolled dumping of household waste by unknown sources)	**Analytical Data Available?**	Yes
Active Period:	1933-1974 (1937-1977)	**EPA ID No.:**	HID980497226
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	No Further Response Action Planned
Capped?	Yes	**Method of Operation:**	Dump (burn and dump, on site burn)
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Population and Land Use

Type of Development in the Surronding Area? Industrial

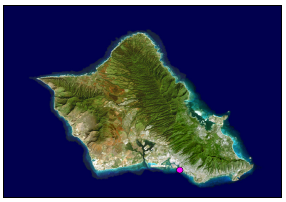
City and County Zoning: Hawaii Community Development Authority, State Jurisdiction

State Land Use District: Urban

Facilities: Office (Federal buildings 1964, 1971 x2), Repair yard and related facilities (1950, 1966 x2), park

TMK Separation: Legal, accounting, engineering, public administration, Public recreation

Flood Zone: X - 500-year Flood Plain



Kewalo Ash Dump

Category 3

Geography and Topography

Physiographic Province:	Coastal Plain
Elevation Range (ft):	0 **to** 35
Approximate Landfill Acreage:	15
Parcel Acreage:	21.408

Climate

Annual Precipitation (cm):	60.22
Precipitation Days Per Year	40
Average Temperature (°F):	76.9
Temperature Range (° F):	69.1 **to** 84.6

Soils

Soil Map Symbol:	FL	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.06-0.12
Soil Series:	Fill Land, Mixed	**Organic Carbon (%):**	0.1-5.0
Engineering Classification:	Fill Land, Mixed	**Permeability (in/hr):**	0.1-2
Drainage Characterisitics:	Poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

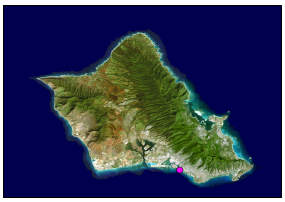
Geology

Geologic Symbol(s):	Rf
Geologic Unit(s):	Artificial fill composed of marine deposits

Geologic Description: Brown to white permeable marine mud containing shells, coral, and other calcareous marine organisms dredged from the ocean floor and used to fill up salt marshes and other lowlands.

Hydrogeology

Rock Type:	Sand-unconsolidated
GW Occurrance-Principal:	Basal
GW Occurrance-Secondary:	--
Permeability:	Moderate to high
Hydraulic Conductivity (ft/d):	100 - 1,000



Kewalo Ash Dump

Category 3

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3010211613321
Aquifer Sector:	Honolulu
Aquifer System:	Nuuanu
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Currently used
Utility:	Neither
Salinity (mg/L Cl-):	Moderate (1,000-5,000)
Uniqueness:	Replaceable
Vulnerability:	High

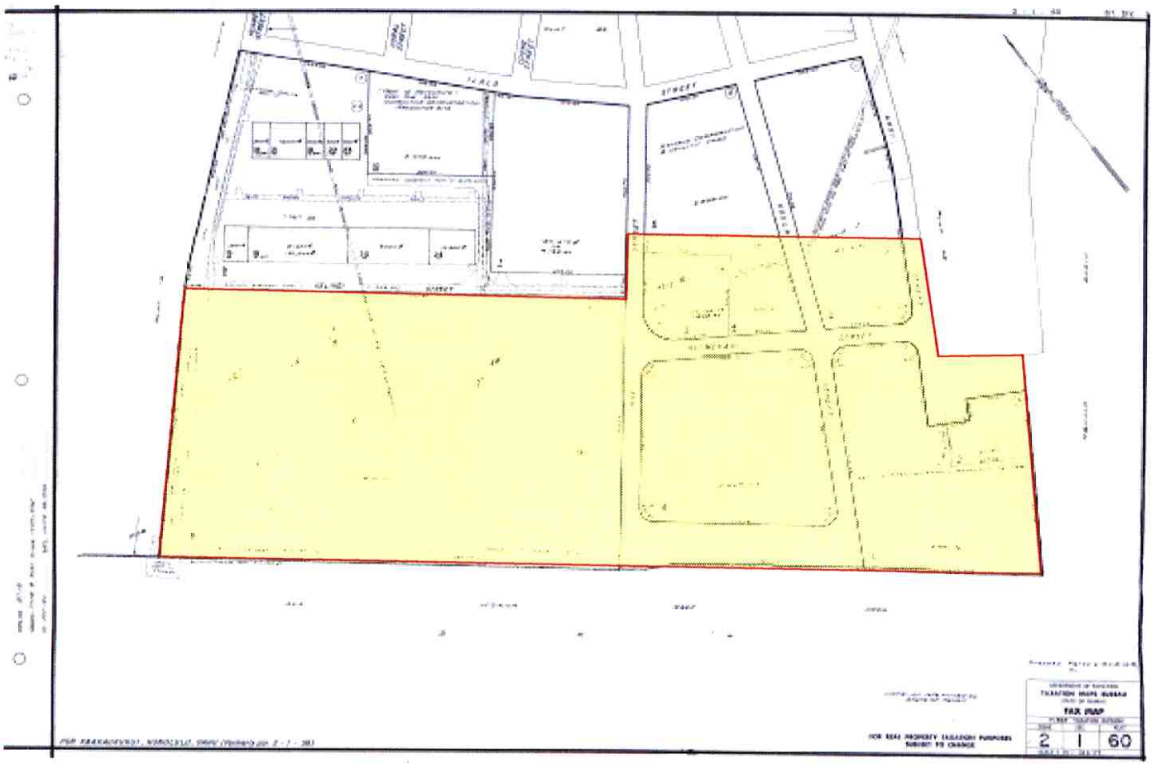
Lower

Aquifer Status Code:	3010212111113
Aquifer Sector:	Honolulu
Aquifer System:	Nuuanu
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	Low

Kewalo Ash Dump

Category 3

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	46		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	2
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	13
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	6
Irrigation Well(s)within one mile	1	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	2	Other Well(s)within one mile	21

Well Details

Koko Head Landfill or Kahauloa Crater Dump

Koko Head Landfill or Kahauloa Crater Dump

Category 3

Site Description

The former Koko Head Landfill (possibly also referred to as Kahauloa Crater Dump) is located to the northeast of Hanauma Bay State Underwater Park (0.4 miles), to the north of Kalanianaole Highway near Hawaii Kai, and is currently used as a rifle range. The City and County of Honolulu (C&C) diverted refuse to the Koko Head Landfill during renovation of the Kapalama and the Kewalo incinerators in 1961-1962. An unusual feature of this landfill was the use of water pumped from the ocean to aid in compaction of the refuse. The site was covered and no sign of the landfill currently exists.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	3-9-012:001
2353235.58234	636042.21115	**Zone:**	Honolulu
Longitude	**Latitude**	**Section:**	Moanalua
157 41 19	21 16 32	**Plat:**	Not Designated
Address:	7430, 7701, 7801,8102 Kalanianaole Hwy, 423 Kaumakani St, 400 Kealahou St	**Quadrangle:**	Koko Head

Ownership

Current Owner: City and County of Honolulu

Previous Operator: City and County of Honolulu

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1961-1962	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	"Covered"	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Koko Head Landfill or Kahauloa Crater Dump

Category 3

Population and Land Use

Type of Development in the Surronding Area?	Recreation
City and County Zoning:	P-1
State Land Use District:	Conservation
Facilities:	Detached dwelling (1963), park
TMK Separation:	Public recreation
Flood Zone:	D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province:	Koolau Range
Elevation Range (ft):	120 **to** 160
Approximate Landfill Acreage:	0-14
Parcel Acreage:	140 acres*, 709

Climate

Annual Precipitation (cm):	60.22
Precipitation Days Per Year	40
Average Temperature (° F):	76.9
Temperature Range (° F):	69.1 **to** 84.6

Koko Head Landfill or Kahauloa Crater Dump

Category 3

Soils

Soil Map Symbol:	KsD	**Bulk Density (gm/cc):**	0.45-0.85
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.16-0.18
Soil Series:	Koko	**Organic Carbon (%):**	3.0-5.0
Engineering Classification:	Silt Loam and Clay Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	12-25
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	KsB	**Bulk Density (gm/cc):**	0.45-0.85
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.16-0.18
Soil Series:	Koko	**Organic Carbon (%):**	3.0-5.0
Engineering Classification:	Silt Loam and Clay Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	2-6
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.3
Topsoil Rating:	good	**Corrosivity:**	Moderate

Soil Map Symbol:	rRK	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Rock land	**Moisture Retention (%):**	0.12-0.16
Soil Series:	Rock Land	**Organic Carbon (%):**	3.0-6.0
Engineering Classification:	Silty Clay Loam, Unweathered Bedrock	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Very poor	**Slope (%):**	>15
Thickness of Surface Soil (in):	0-8	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Geology

Geologic Symbol(s): Qkt

Geologic Unit(s): Honolulu volcanic series

Geologic Description: Slightly permeable gray to red-brown bedded deposits of vitric-crystal-lithic tuff composed of angular fragments of Koolau and post-Koolau basalt, limestone, and other ejecta in a matrix of palagonite or glass, generally cemented by calcite or zeolites; caused by phreatomagmatic explosions along the Koko fissure, and forming part of Koko volcanics.

Koko Head Landfill or Kahauloa Crater Dump

Category 3

Hydrogeology

Rock Type:	Honolulu Volcanics-tuff
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Low
Hydraulic Conductivity (ft/d):	1 - 100

Aquifer(s)

Uppermost Aquifer

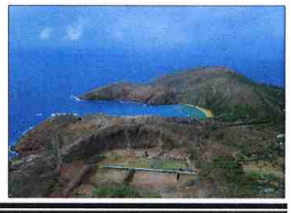
Aquifer Status Code:	3010511623421
Aquifer Sector:	Honolulu
Aquifer System:	Waialae
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Potential use
Utility:	Neither
Salinity (mg/L Cl-):	High (5,000-15,000)
Uniqueness:	Replaceable
Vulnerability:	High

Lower Aquifer

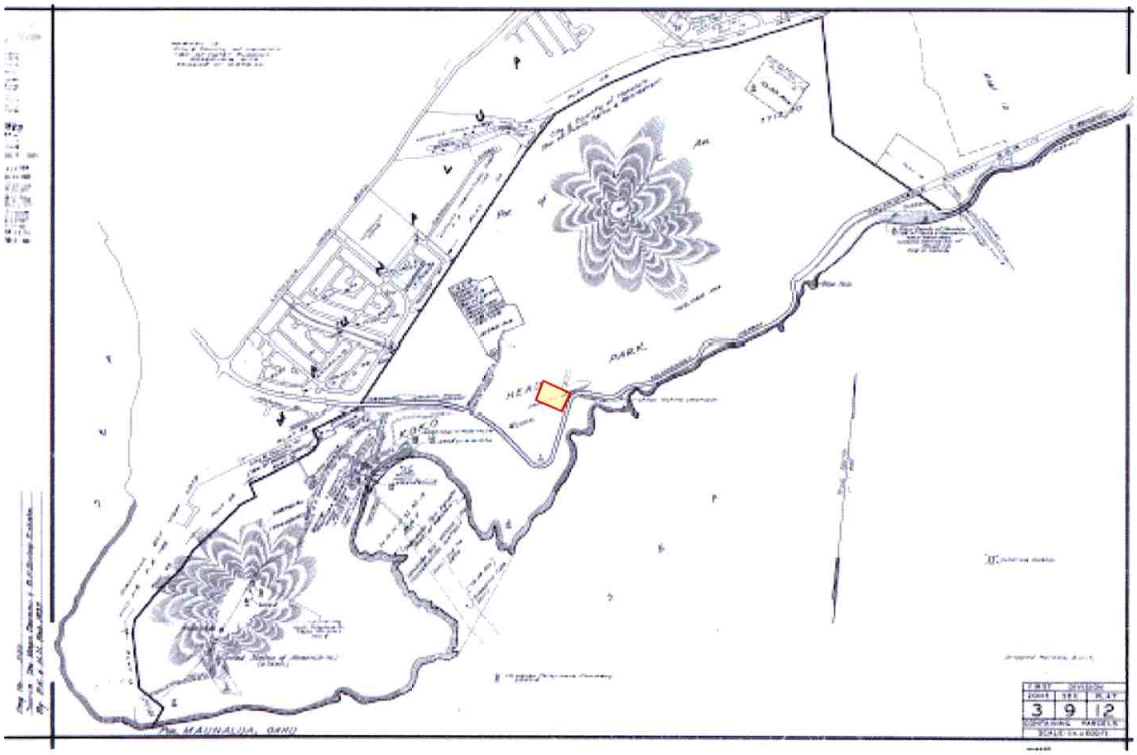
Aquifer Status Code:	3010512121113
Aquifer Sector:	Honolulu
Aquifer System:	Waialae
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Flank
Development State:	Potential use
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	Low

Koko Head Landfill or Kahauloa Crater Dump

Category 3



TMK Map



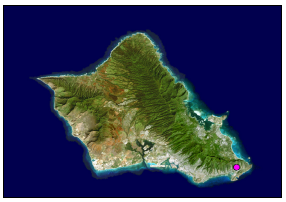
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	0		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Kuapa Pond Dump



Kuapa Pond Dump

Category 2

Site Description

The Kuapa Pond dumping area was likely at the bottom of the Kamilo Nui and Kamiloiki Valleys where they meet the northernmost edge of Kuapa Pond. The United States Army admitted improperly dumping rubbish near Kuapa Pond in 1945 and subsequently cleaned up the area. The area in the vicinity of the former dump site is currently residential.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	3-9-019
2356027.99324	635386.94831	**Zone:**	Honolulu
Longitude	**Latitude**	**Section:**	Moanalua
157 41 41	21 18 03	**Plat:**	Not Designated
Address:	Not available	**Quadrangle:**	Koko Head

Ownership

Current Owner: United States government

Previous Operator: U.S. Army

Site Operation and History

Landfill Type: Military

Type of Waste: Military

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1945	**EPA ID No.:**	Not documented
Lined?	Not applicable, dump was razed	**Non-NPL status:**	Not applicable
Capped?	Not applicable, dump was razed	**Method of Operation:**	Dump
Permit Info:	No		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Residential

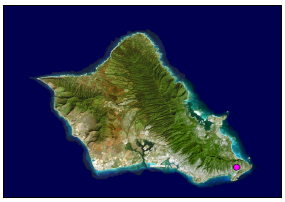
City and County Zoning: Not available

State Land Use District: Urban

Facilities: --

TMK Separation: Not available

Flood Zone: D - Undetermined but possible flood hazards



Kuapa Pond Dump

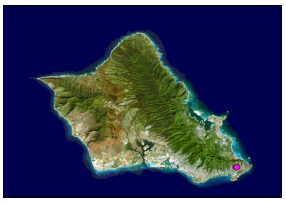
Category 2

Geography and Topography

Physiographic Province:	Koolau Range
Elevation Range (ft):	0 **to** 20
Approximate Landfill Acreage:	1
Parcel Acreage:	Not available

Climate

Annual Precipitation (cm):	60.22
Precipitation Days Per Year	40
Average Temperature (°F):	76.9
Temperature Range (° F):	69.1 **to** 84.6



Kuapa Pond Dump

Category 2

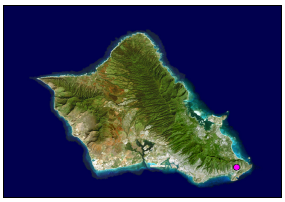
Soils

Soil Map Symbol:	HnA	**Bulk Density (gm/cc):**	0.70-1.10
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.16-0.18
Soil Series:	Hanalei	**Organic Carbon (%):**	3.0-6.0
Engineering Classification:	Silty Clay and Silty Clay Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Poor	**Slope (%):**	0-2
Thickness of Surface Soil (in):	0-26	**pH:**	4.5-6.5
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	W	**Bulk Density (gm/cc):**	Not available
Soil Association:	Not Applicable	**Moisture Retention (%):**	Not available
Soil Series:	Water	**Organic Carbon (%):**	Not available
Engineering Classification:	Water	**Permeability (in/hr):**	Not available
Drainage Characterisitics:	Not available	**Slope (%):**	--
Thickness of Surface Soil (in):	Not available	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Not available

Soil Map Symbol:	KlB	**Bulk Density (gm/cc):**	1.10-1.40
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.12-0.15
Soil Series:	Kawaihapai	**Organic Carbon (%):**	1.0-2.0
Engineering Classification:	Clay Loam; Stony or Very Stony	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	2-6
Thickness of Surface Soil (in):	0-54	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	LuA	**Bulk Density (gm/cc):**	1.20-1.35
Soil Association:	Rock land-Stony steep	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Lualualei	**Organic Carbon (%):**	0.5-2.0
Engineering Classification:	Clay	**Permeability (in/hr):**	0.0000-0.1
Drainage Characterisitics:	Very poor	**Slope (%):**	0-2
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate



Kuapa Pond Dump

Category 2

Geology

Geologic Symbol(s): Qkt

Geologic Unit(s): Honolulu volcanic series

Geologic Description: Slightly permeable gray to red-brown bedded deposits of vitric-crystal-lithic tuff composed of angular fragments of Koolau and post-Koolau basalt, limestone, and other ejecta in a matrix of palagonite or glass, generally cemented by calcite or zeolites; caused by phreatomagmatic explosions along the Koko fissure, and forming part of Koko volcanics.

Geologic Symbol(s): Ra

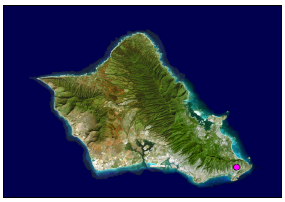
Geologic Unit(s): Unconsolidated noncalcareous deposits

Geologic Description: Chiefly younger alluvium, a black to brown fluviatile deposit generally consisting of coarse permeable detritus only slightly weathered and in many places subangular. In the valley bottoms near the sea it usually consists of nearly impermeable black, sticky mud called taro-patch clay. Much of the younger alluvium is reworked older alluvium. Included also is talus composed of angular blocks, usually with brown interstitial soil, forming aprons on the steep slopes at the base of cliffs. In the mountain areas much of the younger alluvium resembles, includes, and is often inseparable from landslide deposits, because of the torrential character of the streams and the precipitous valley walls. Extensive mantles of hill wash are included. Wells develop water from it in small quantities.

Hydrogeology

Rock Type:	Alluvium-younger
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to low
Hydraulic Conductivity (ft/d):	1 - 500

Rock Type:	Honolulu Volcanics-tuff
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Low
Hydraulic Conductivity (ft/d):	1 - 100

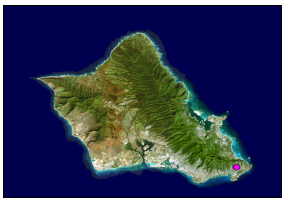


Kuapa Pond Dump

Category 2

Aquifer(s)

Uppermost Aquifer	**Aquifer Status Code:**	3010511623421
	Aquifer Sector:	Honolulu
	Aquifer System:	Waialae
	Aquifer Type 1:	Basal
	Aquifer Type 2:	Unconfined
	Aquifer Type Geol.:	Sedimentary
	Development State:	Potential use
	Utility:	Neither
	Salinity (mg/L Cl-):	High (5,000-15,000)
	Uniqueness:	Replaceable
	Vulnerability:	High
Lower Aquifer	**Aquifer Status Code:**	3010512121113
	Aquifer Sector:	Honolulu
	Aquifer System:	Waialae
	Aquifer Type 1:	Basal
	Aquifer Type 2:	Confined
	Aquifer Type Geol.:	Flank
	Development State:	Potential use
	Utility:	Drinking
	Salinity (mg/L Cl-):	Fresh (<250)
	Uniqueness:	Irreplaceable
	Vulnerability:	Low

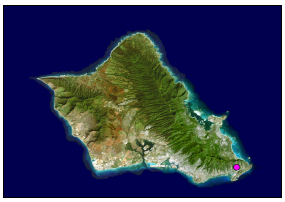


Kuapa Pond Dump

Category 2

Site Reconnaissance

Site Description:	The U.S. Army admitted improperly dumping rubbish near Kuapa Pond in 1945 and subsequently cleaned up the area.
Type of Property:	Unknown.
Current Site Operations:	Unknown.
Age of Development:	Unknown.
Onsite Building Information:	Not applicable.
Was There a Recognizable Dump/Landfill?	Not applicable.
Institutional Controls:	Unknown.
Number of MonitoringWells:	Unknown.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	Not applicable.
Odors, Staining, Distressed Vegetation:	Not applicable.
Drainage Features:	Unknown.
Areas of Ponded Water Onsite:	Unknown.



Kuapa Pond Dump

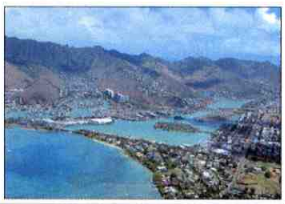
Category 2

Site Reconnaissance (cont.)

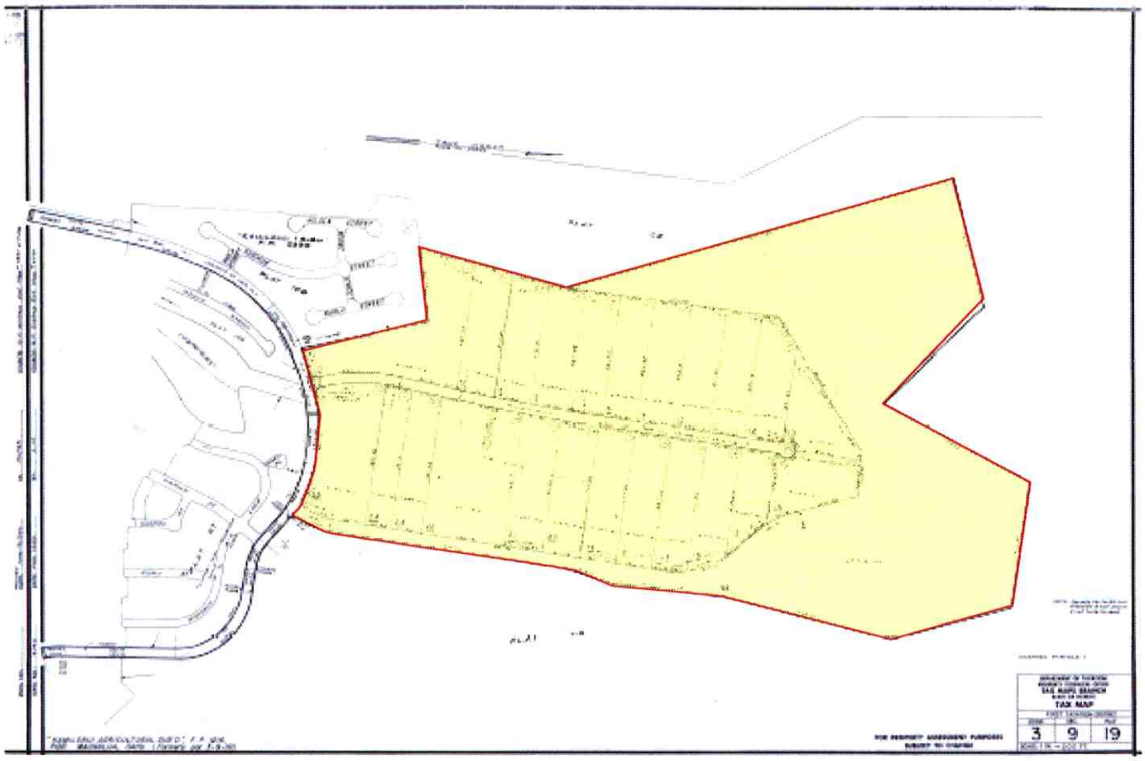
Storm Water Retention Pond:	Unknown.
House and Schools in the Vicinity:	Unknown.
Distance to Nearest Residence, School, or Businesses:	Unknown.
How is Drinking Water in the Area Supplied?	Unknown.
Natural Resources, Agriculture, Aquaculture Near the Site?	Unknown.
Name of Surface Water Within 1-mile of Dump/Landfill:	Unknown.
Distance to Surface Water:	Unknown.
Proximal Direction of Surface Water:	Unknown.
Where Does Surface Water Flow?	Unknown.
Surface Water Used for Drinking?	Unknown.
Surface Water Used for Recreation?	Unknown.
Wetlands:	Unknown.
Off-site Sources of Contamination:	Unknown.
Does Run-off from other Sites Flow onto Subject Property:	Unknown.
Adjacent Property-North:	Unknown.
Adjacent Property-South:	Unknown.
Adjacent Property-East:	Unknown.
Adjacent Property-West:	Unknown.

Kuapa Pond Dump

Category 2



TMK Map



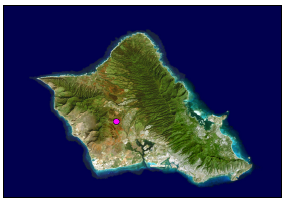
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	5		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	2
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	2
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	1

Well Details

Kunia A Dump



Kunia A Dump

Category 2

Site Description

In 1977, the City and County of Honolulu (C&C) commissioned a comprehensive inventory study of potential landfill sites on the island entitled "Inventory of Potential Sanitary and Demolition Landfill Sites on the Island of Oahu" (Stanley S. Shimabukuro and Associates, Inc. 1977). The report identified thirty-three potential sites and a supplementary study in 1979 identified ten additional sites. The C&C then systematically investigated and pursued the identified sites. Competing factors such as groundwater resources, private versus governmental land uses, and the proximity of residential areas eliminated all but a few of the potential sites. It is not clear whether Kunia A Dump ever existed, or was perhaps instead only considered for landfill development in the 1977 Shimabukuro and Associates report, and subsequently in the Pacific Waste Consulting Group's 2002 report entitled "Alternatives Analysis for Disposal of Municipal Refuse", which became Appendix H of the Waimanalo Gulch Sanitary Landfill Expansion Environmental Impact Statement (RM Towill, 2002).

The general location of the possible dump would have been to the east of Kunia Road (0.7 miles), to the west of Poliwai Gulch, and at the edge of or within the Huliwai Gulch. The parcel where the dump may have been located was formerly used by Dole Food Company, Inc. and is on property currently managed by Waikele Farms. There are no visible indications of current or former dumping activities. The area in the vicinity of the former dump is agricultural.

If Kunia A Dump did exist, based on its location, the dump would likely have been used to dispose of agricultural refuse. During a September 20, 2004 telephone interview, Mr. Steven Mau, of the Robinson Trust Estate, didn't recall pesticide/herbicide mixing operations ever being located on this site. Because agricultural chemicals were likely mixed elsewhere and brought to the site, the wastes associated with the mixing process may not have gone into this dump.

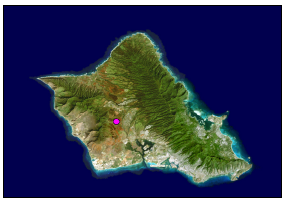
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	9-4-004:004
2371188.69	598589.85	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Waikele-Hoaeae
158 02 54	21 26 30	**Plat:**	Not Designated
Address:	Kunia Road	**Quadrangle:**	Schofield Barracks

Ownership

Current Owner: Estate of James Robinson et al

Previous Operator: Dole and Oahu Sugar Co.



Kunia A Dump

Category 2

Site Operation and History

Landfill Type: Agricultural

Type of Waste: Plantation refuse

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940s-1950s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	No		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Agricultural

City and County Zoning: Ag-1

State Land Use District: Agricultural

Facilities: --

TMK Separation: Sugar cane field, steep land

Flood Zone: D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province: Schofield Plateau

Elevation Range (ft): 640 **to** 680

Approximate Landfill Acreage: 30+

Parcel Acreage: 150, 564.683

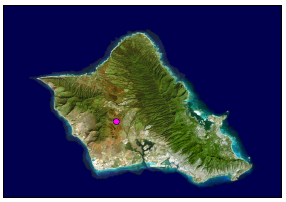
Climate

Annual Precipitation (cm): 49.40

Precipitation Days Per Year 30

Average Temperature (°F): 76.0

Temperature Range (° F): 67.4 **to** 84.5



Kunia A Dump

Category 2

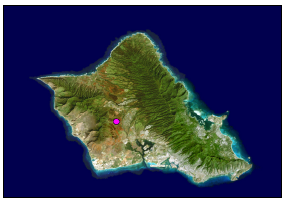
Soils

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	WaB	**Bulk Density (gm/cc):**	1.20-1.45
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Wahiawa	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	3-8
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	KyB	**Bulk Density (gm/cc):**	1.10-1.40
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.12-0.14
Soil Series:	Kunia	**Organic Carbon (%):**	1.0-4.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	3-8
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	KlB	**Bulk Density (gm/cc):**	1.10-1.40
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.12-0.15
Soil Series:	Kawaihapai	**Organic Carbon (%):**	1.0-2.0
Engineering Classification:	Clay Loam; Stony or Very Stony	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	2-6
Thickness of Surface Soil (in):	0-54	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate



Kunia A Dump

Category 2

Geology

Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.

Geologic Symbol(s): Pa

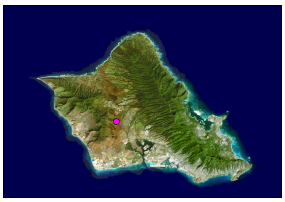
Geologic Unit(s): Consolidated noncalcareous deposits

Geologic Description: Chiefly older alluvium, generally consisting of mottled brown to red-brown, deeply weathered, poorly-assorted, and nearly impermeable friable conglomerates, in places cemented with limonite or hematite and usually forming conspicuous terraces along the principal streams. Near the mouths of the valleys and especially around Pearl Harbor and near Waialua the older alluvium grades into partly consolidated sands and silts that are emerged delta deposits. The degree of consolidation is largely dependent upon the amount of rainfall, for in dry regions the material is much better cemented than in wet regions. Near the heads of valleys the older alluvium grades into coarse angular talus and landslide deposits which, in places, carry considerable water. In the large semiarid valleys in the Waianae Range these deposits are firmly cemented breccias. They are poorly permeable in wet areas and hold up perched water in the Honolulu volcanic series, but in the dry areas they yield small supplies of potable water.

Hydrogeology

Rock Type:	Alluvium-older-consolidated
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

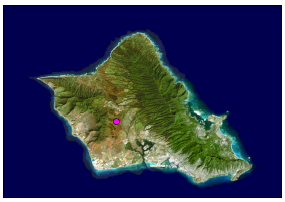


Kunia A Dump

Category 2

Aquifer(s)

Aquifer Status Code:	3020311111111
Aquifer Sector:	Pearl Harbor
Aquifer System:	Waipahu
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

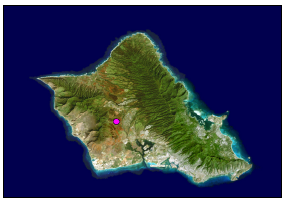


Kunia A Dump

Category 2

Site Reconnaissance

Site Description:	The suspected location of the Kunia A Dump is located on property currently managed by Waikele Farms. The former dump is presumed to have been situated in a gulch that is heavily vegetated with tall grass. There were no visible indications of current or former dumping activities.
Type of Property:	The suspected dump site is undeveloped. Surrounding areas consist of agricultural fields.
Current Site Operations:	No current onsite operations. Surrounding area operations include vegetable and fruit farming.
Age of Development:	Over 50 years old.
Onsite Building Information:	None.
Was There a Recognizable Dump/Landfill?	No.
Institutional Controls:	The suspected dump site is located within the property operated by Waikele Farms. Waikele farms has fencing around their property and a gate located on Kunia Road that is locked during non-business hours.
Number of MonitoringWells:	There were no monitoring wells observed in the vicinity of the suspected dump site location. However, a Board of Water Supply monitoring well is located approximately 4,200 feet to the southeast of the suspected dump site.
Stability (signs of erosion, etc):	Patches of eroded ground were observed on both sides of Huliwai Gulch. The patches were relatively small (approximately 200 square feet) compared to the heavy vegetation at the bottom and on the sides of the gulch.
Leachate, Seeps:	None observed.
Odors, Staining, Distressed Vegetation:	None observed.
Drainage Features:	The suspected dump site is located in the Huliwai Gulch. Soil berms were observed on the northern and southern boundaries of the gulch that would appear to keep runoff from entering the gulch.
Areas of Ponded Water Onsite:	None observed.



Kunia A Dump

Category 2

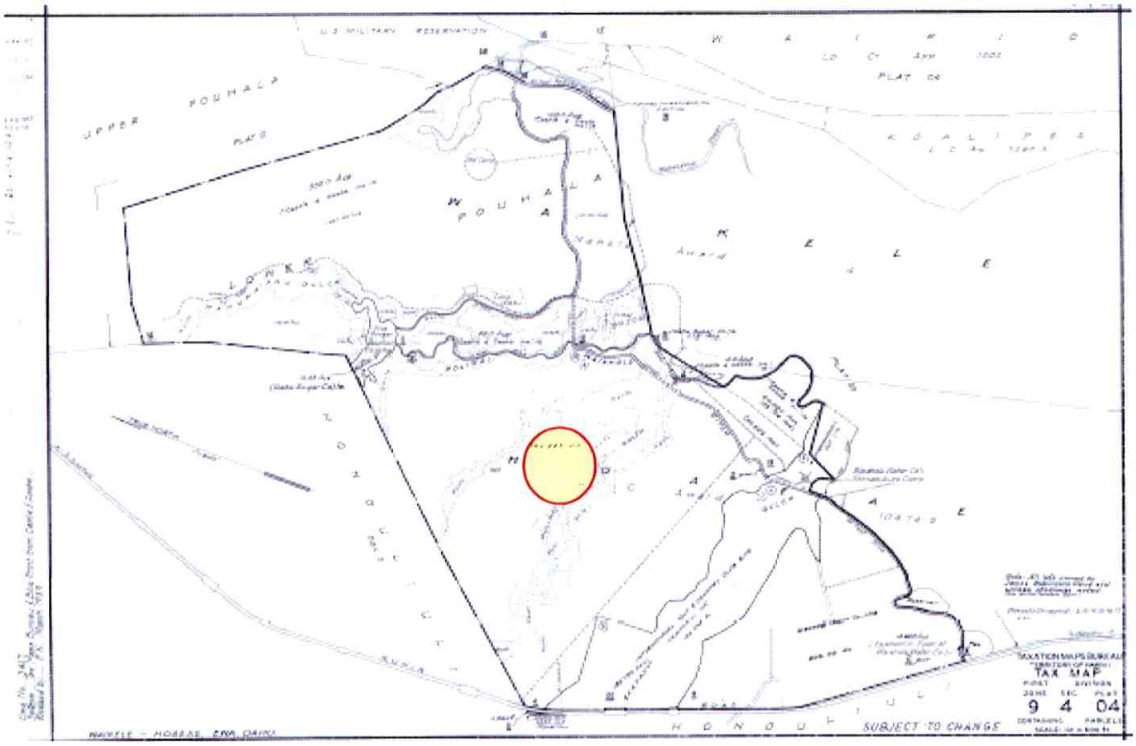
Site Reconnaissance (cont.)

Storm Water Retention Pond:	None observed.
House and Schools in the Vicinity:	None observed.
Distance to Nearest Residence, School, or Businesses:	Unknown.
How is Drinking Water in the Area Supplied?	According to Jonathon Jefts, water for Waikele Farms is supplied from the Waiahole and Waikane Streams.
Natural Resources, Agriculture, Aquaculture Near the Site?	Surrounding properties consist of agricultural farms.
Name of Surface Water Within 1-mile of Dump/Landfill:	URS did not observe water flowing through the gulch; however, noticeable changes in the vegetation in the gulch and USGS topographic maps indicate that water flows intermittently through the gulch.
Distance to Surface Water:	Onsite.
Proximal Direction of Surface Water:	Onsite.
Where Does Surface Water Flow?	The suspected dump site is located in the Huliwai Gulch. Berms along the northern and southern border prevent runoff from entering gulch. Runoff already in the gulch would flow through the gulch in an eastern direction, continuing through the gulch.
Surface Water Used for Drinking?	No.
Surface Water Used for Recreation?	No.
Wetlands:	None observed.
Off-site Sources of Contamination:	Properties surrounding the suspected dump site consist of farmland. According to Jonathon Jefts of Waikele Farms, Waikele Farms uses pesticides and herbicides as part of their farm operations. A potential offsite source of impact to the subject property is upstream runoff into the gulch.
Does Run-off from other Sites Flow onto Subject Property:	Runoff already in the Huliwai gulch from upstream locations, would flow through the suspected dump site, and continue out of the site, in an eastern direction.
Adjacent Property-North:	Waikele Farms - agricultural farmland.
Adjacent Property-South:	Waikele Farms - agricultural farmland.
Adjacent Property-East:	Huliwai Gulch.
Adjacent Property-West:	Huliwai Gulch.

Kunia A Dump

Category 2

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	2		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	1
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	1	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

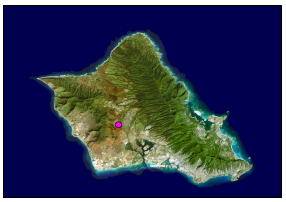
Photo 1. **Looking west up the axis of the Huliwai Gulch in which the former dump is suspected to have been located. No distinct indications of the specific dump location were noted during the site visit.**

Photo 2. **Looking south across the Huliwai Gulch. Agricultural fields border the Huliwai Gulch on both sides.**

Photo 3. **Looking northwest at the road that borders the eastern side of the Huliwai Gulch.**

Photo 4. **Board of Water Supply monitoring well located on parcel 9-4-003:001 l approximately 4,200 feet to the southeast of the Kunia A Dump.**

Kunia B Dump



Kunia B Dump

Category 2

Site Description

In 1977, the City and County of Honolulu (C&C) commissioned a comprehensive inventory study of potential landfill sites on the island entitled "Inventory of Potential Sanitary and Demolition Landfill Sites on the Island of Oahu" (Stanley S. Shimabukuro and Associates, Inc. 1977). The report identified thirty-three potential sites and a supplementary study in 1979 identified ten additional sites. The C&C then systematically investigated and pursued the identified sites. Competing factors such as groundwater resources, private versus governmental land uses, and the proximity of residential areas eliminated all but a few of the potential sites. It is not clear whether Kunia A Dump ever existed, or was perhaps instead only considered for landfill development in the 1977 Shimabukuro and Associates report, and subsequently in the Pacific Waste Consulting Group's 2002 report entitled "Alternatives Analysis for Disposal of Municipal Refuse", which became Appendix H of the Waimanalo Gulch Sanitary Landfill Expansion Environmental Impact Statement (RM Towill, 2002).

The probable location of the Kunia B Dump is a heavily vegetated gully to the east of Kunia Road (1.0 mile), to the southeast of the Hawaii Country Club, and at the edge of or within the Poliwai Gulch on property currently managed by Waikele Farms. There were no visible indications of the old Kunia B Dump, however indications of relatively recent dumping were observed during the site visit. The area in the vicinity of the former dump is agricultural.

If Kunia B Dump did exist, based on its location, the dump would likely have been used to dispose of agricultural refuse. The parcel on which the dump is suspected to have been located was formerly used by Dole Food Company, Incorporated. According to a September 20, 2004 telephone interview with Mr. Steven Mau of the Robinson Trust Estate, Castle and Cooke leased the land in the mid-1960s. Specifically, Oahu Sugar leased lands southeast of the Waiahole ditch that may have included the Kunia B Dump. Mr. Mau didn't recall pesticide/herbicide-mixing operations ever being located on this site. Because agricultural chemicals were likely mixed elsewhere and brought to the site, the wastes associated with the mixing process may not have gone into this dump.

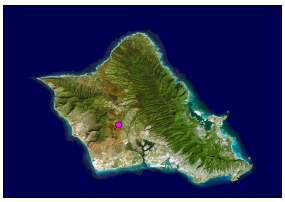
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	9-4-004:019
2370216.44	599514.56	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Waikele-Hoaeae
158 02 33	21 25 57	**Plat:**	Not Designated
Address:	2101 A,B,C,D,E Kunia Road	**Quadrangle:**	Schofield Barracks

Ownership

Current Owner: Estate of James Robinson et al

Previous Operator: Oahu Sugar Company



Kunia B Dump

Category 2

Site Operation and History

Landfill Type: Agricultural

Type of Waste: Plantation refuse

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940s-1950s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	No		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Agricultural

City and County Zoning: Ag-1

State Land Use District: Agricultural

Facilities: --

TMK Separation: Sugar cane field, steep land

Flood Zone: D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province: Schofield Plateau

Elevation Range (ft): 560 **to** 600

Approximate Landfill Acreage: 30+

Parcel Acreage: 60.02

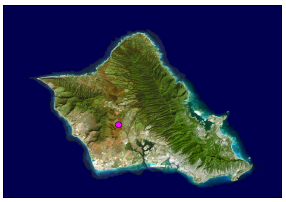
Climate

Annual Precipitation (cm): 49.40

Precipitation Days Per Year 30

Average Temperature (°F): 76.0

Temperature Range (° F): 67.4 **to** 84.5



Kunia B Dump

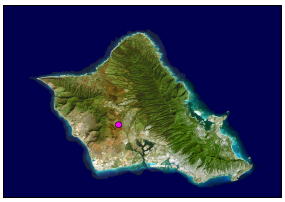
Category 2

Soils

Soil Map Symbol:	WaB	**Bulk Density (gm/cc):**	1.20-1.45
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Wahiawa	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	3-8
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	WaC	**Bulk Density (gm/cc):**	1.20-1.45
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Wahiawa	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	8-15
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High



Kunia B Dump

Category 2

Geology

Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.

Geologic Symbol(s): Pa

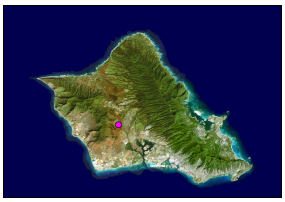
Geologic Unit(s): Consolidated noncalcareous deposits

Geologic Description: Chiefly older alluvium, generally consisting of mottled brown to red-brown, deeply weathered, poorly-assorted, and nearly impermeable friable conglomerates, in places cemented with limonite or hematite and usually forming conspicuous terraces along the principal streams. Near the mouths of the valleys and especially around Pearl Harbor and near Waialua the older alluvium grades into partly consolidated sands and silts that are emerged delta deposits. The degree of consolidation is largely dependent upon the amount of rainfall, for in dry regions the material is much better cemented than in wet regions. Near the heads of valleys the older alluvium grades into coarse angular talus and landslide deposits which, in places, carry considerable water. In the large semiarid valleys in the Waianae Range these deposits are firmly cemented breccias. They are poorly permeable in wet areas and hold up perched water in the Honolulu volcanic series, but in the dry areas they yield small supplies of potable water.

Hydrogeology

Rock Type:	Alluvium-older-consolidated
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

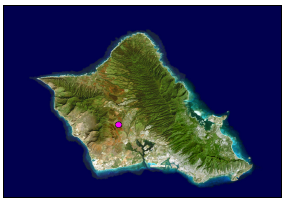


Kunia B Dump

Category 2

Aquifer(s)

Aquifer Status Code:	3020311111111
Aquifer Sector:	Pearl Harbor
Aquifer System:	Waipahu
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

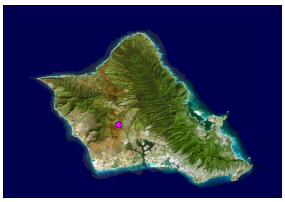


Kunia B Dump

Category 2

Site Reconnaissance

Site Description:	The suspected location of the Kunia B Dump is located within the property currently managed by Waikele Farms. The suspected site is a heavily vegetated gully located approximately 0.25 miles southeast of the Waikele Farms management office. There were no visible indications of the old Kunia B Dump, however indications of relatively recent dumping were observed during the site visit.
Type of Property:	The suspected dump site itself in undeveloped. Surrounding areas consist of agricultural development.
Current Site Operations:	No current onsite operations. Surrounding area operations include vegetable and fruit farming.
Age of Development:	Over 50 years old.
Onsite Building Information:	There were no buildings observed onsite. The management office and open-air storage building of Waikele Farms is located approximately 0.25 miles northwest of site.
Was There a Recognizable Dump/Landfill?	Signs of dumping were observed in the suspected dump site. A small number of concrete and metal pieces were observed on the ground on the side of the gully.
Institutional Controls:	The suspected dump site is located in the middle of Waikele Farms. Waikele farms has fencing around their property and a gate located on Kunia Road that is locked during non-business hours.
Number of MonitoringWells:	There were no monitoring wells observed in the vicinity of the suspected dump site location. However, a Board of Water Supply monitoring well is located approximately 1,850 feet to the southeast of the suspected dump site.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	None observed.
Odors, Staining, Distressed Vegetation:	The gully where the suspected dump site is located is mostly heavily vegetated with tall grass. However, there is a barren patch on the northern side of the gully, in the area where the concrete pieces were observed. The barren patch covers an area of approximately 200 square feet.
Drainage Features:	The suspected dump site is in a gully. Runoff from adjacent farmland to the north may enter the gully area.
Areas of Ponded Water Onsite:	None observed.



Kunia B Dump

Category 2

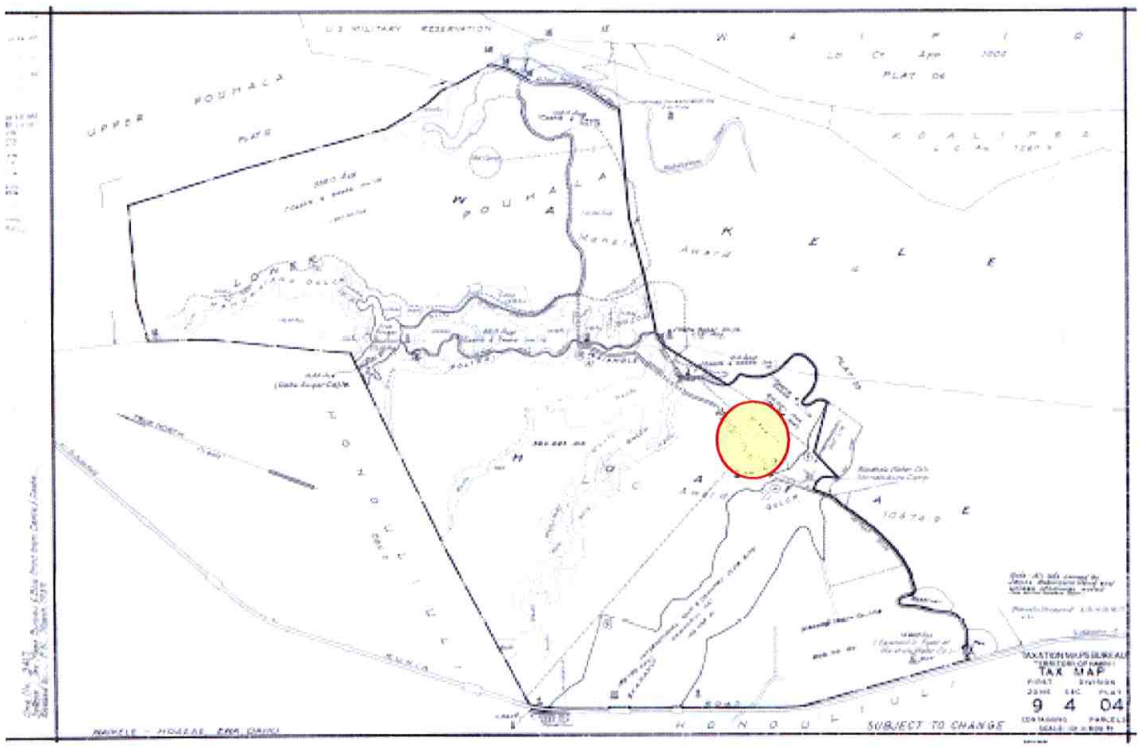
Site Reconnaissance (cont.)

Storm Water Retention Pond:	None observed.
House and Schools in the Vicinity:	None observed.
Distance to Nearest Residence, School, or Businesses:	Unknown.
How is Drinking Water in the Area Supplied?	According to Jonathon Jefts, water for Waikele Farms is supplied from the Waiahole and Waikane Streams.
Natural Resources, Agriculture, Aquaculture Near the Site?	Surrounding properties consist of agricultural farms.
Name of Surface Water Within 1-mile of Dump/Landfill:	None observed.
Distance to Surface Water:	Unknown.
Proximal Direction of Surface Water:	Unknown.
Where Does Surface Water Flow?	Ekahanui Gulch.
Surface Water Used for Drinking?	Unknown.
Surface Water Used for Recreation?	Unknown.
Wetlands:	None observed.
Off-site Sources of Contamination:	All surrounding properties of the suspected dump site consist of farmlands. According to Jonathon Jefts of Waikele Farms, Waikele Farms uses pesticides and herbicides in farm operations. URS did not speak with Waikele Golf Club personnel, however the golf club may also use pesticides and herbicides.
Does Run-off from other Sites Flow onto Subject Property:	None observed.
Adjacent Property-North:	Waikele Farms - agricultural farmland.
Adjacent Property-South:	Waikele Farms - agricultural farmland.
Adjacent Property-East:	Waikele Farms - agricultural farmland.
Adjacent Property-West:	Waikele Farms - agricultural farmland. The eastern border of Waikele Golf Club is located approximately 0.25 miles west of the suspected dump site.

Kunia B Dump

Category 2

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	1		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	1
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Photo 1. **Looking northeast across the Poliwai Gulch in which the former dump is presumed to have been situated.**

Photo 2. **Looking southwest across the Poliwai Gulch. No distinct indications of the specific dump location were noted.**

Photo 3. Board of Water Supply monitoring well located on parcel 9-4-003:001 approximately 1,850 feet to the southeast of the Kunia B Dump.

Laie Dump

Laie Dump

Category 1

Site Description

The Laie Dump was reportedly located to the northwest of the Brigham Young University campus (1.0 mile), to the north of Kahawainui Stream, and to the west of Kamehameha Highway and Laie Bay. The "Laie Dump Site" is shown on a Department of Public Works, Division of Land Survey and Acquisition map (Young, 1993; Map 5). According to Young (1993), the property was formerly owned by Zions Securities Land.

The Laie Dump was operated by the City and County of Honolulu (C&C) and was used to dispose of household wastes from 1934-1970. This site was formerly a swampy area that was filled with refuse. According to an April 4, 1970 article in the Honolulu Advertiser, the C&C permanently closed the dump in April of 1970 in accordance with the Mayor's policy to discontinue the C&C's open burning operations. The article indicated that refuse formerly disposed of at Laie would be redirected to the Waialua and Kailua dumps where it would be disposed of by "sanitary landfill methods".

When inspected by Bagaoisan in 1997, there were junk cars on the Laie Dump property. Some unusual topography and some partially buried waste thought to be attributable to the former dump were noted during the 2004 site visit.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	5-5-005:022
2394883.04643	610359.83931	**Zone:**	Koolauloa
Longitude	**Latitude**	**Section:**	Laie
157 56 00	21 39 13	**Plat:**	Not Designated
Address:	55-510 Kamehameha Highway	**Quadrangle:**	Kahuku

Ownership

Current Owner: Deseret Title Holding Corporation

Previous Operator: City and County of Honolulu

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1934-1970	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	Unknown	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Laie Dump

Category 1

Population and Land Use

Type of Development in the Surronding Area?	Agricultural
City and County Zoning:	Ag-1
State Land Use District:	Urban District
Facilities:	--
TMK Separation:	Field crop-not sugarcane or pineapple (Papaya, macadamia, etc)
Flood Zone:	X - 500-year Flood Plain

Geography and Topography

Physiographic Province:	Coastal Plain
Elevation Range (ft):	0 **to** 20
Approximate Landfill Acreage:	1-5
Parcel Acreage:	17.433

Climate

Annual Precipitation (cm):	138.53
Precipitation Days Per Year	120
Average Temperature (°F):	74.4
Temperature Range (° F):	65.2 **to** 83.5

Soils

Soil Map Symbol:	Kfb	**Bulk Density (gm/cc):**	0.99-1.15
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.12-0.14
Soil Series:	Kaloko Variant	**Organic Carbon (%):**	2.0-4.0
Engineering Classification:	Clay and Silty Clay	**Permeability (in/hr):**	0.0000-0.1
Drainage Characterisitics:	Very poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Laie Dump

Category 1

Geology

Geologic Symbol(s): Pd

Geologic Unit(s): Consolidated calcareous dunes

Geologic Description: Thin-bedded and cross-bedded eolian limestone composed of uniform fine calcareous grains blown inland from ancient beaches and later lithified. It contains sufficient solution channels to be permeable, and locally it carries water, which is apt to be brackish near the sea.

Geologic Symbol(s): Ra

Geologic Unit(s): Unconsolidated noncalcareous deposits

Geologic Description: Chiefly younger alluvium, a black to brown fluviatile deposit generally consisting of coarse permeable detritus only slightly weathered and in many places subangular. In the valley bottoms near the sea it usually consists of nearly impermeable black, sticky mud called taro-patch clay. Much of the younger alluvium is reworked older alluvium. Included also is talus composed of angular blocks, usually with brown interstitial soil, forming aprons on the steep slopes at the base of cliffs. In the mountain areas much of the younger alluvium resembles, includes, and is often inseparable from landslide deposits, because of the torrential character of the streams and the precipitous valley walls. Extensive mantles of hill wash are included. Wells develop water from it in small quantities.

Hydrogeology

Rock Type:	Alluvium-younger
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to low
Hydraulic Conductivity (ft/d):	1 - 500

Rock Type:	Dunes-consolidated
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	Basal
Permeability:	Low
Hydraulic Conductivity (ft/d):	1 - 100

Laie Dump

Category 1

Aquifer(s)

Uppermost Aquifer	**Aquifer Status Code:**	3060111622221
	Aquifer Sector:	Windward
	Aquifer System:	Koolauloa
	Aquifer Type 1:	Basal
	Aquifer Type 2:	Unconfined
	Aquifer Type Geol.:	Sedimentary
	Development State:	Potential use
	Utility:	Ecologically important
	Salinity (mg/L Cl-):	Low (250-1000)
	Uniqueness:	Replaceable
	Vulnerability:	High
Lower Aquifer	**Aquifer Status Code:**	3060112221122
	Aquifer Sector:	Windward
	Aquifer System:	Koolauloa
	Aquifer Type 1:	Basal
	Aquifer Type 2:	Confined
	Aquifer Type Geol.:	Dike
	Development State:	Potential use
	Utility:	Drinking
	Salinity (mg/L Cl-):	Fresh (<250)
	Uniqueness:	Replaceable
	Vulnerability:	Moderate

Laie Dump

Category 1

Site Reconnaissance

Site Description:	The suspected location of the former Laie Dump is land currently used as a horse ranch. Several riding mower machines were observed parked to the east of the horse ranch. The remainder of the site was covered with heavy vegetation. Some unusual topography, partially buried waste, and bare patches thought to be attributable to the former dump were noted during the site visit.
Type of Property:	Horse ranch.
Current Site Operations:	The site appears to be a recreational horse ranch used only to care for horses.
Age of Development:	Unknown.
Onsite Building Information:	Observed one building. It is used as a horse stable.
Was There a Recognizable Dump/Landfill?	No.
Institutional Controls:	A fence was observed around the western portion of the site. The fence appears to be used for keeping the horses in as opposed to keeping people out.
Number of MonitoringWells:	There were no monitoring wells observed in the immediate vicinity of the site. However, a Board of Water Supply monitoring well is located approximately 0.1 feet to the north of the site.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	None observed.
Odors, Staining, Distressed Vegetation:	None observed.
Drainage Features:	None observed.
Areas of Ponded Water Onsite:	A pond of stagnant water was observed onsite. Topography indicates that runoff from the southwestern portion of the property contributes to the pond.

Laie Dump

Category 1

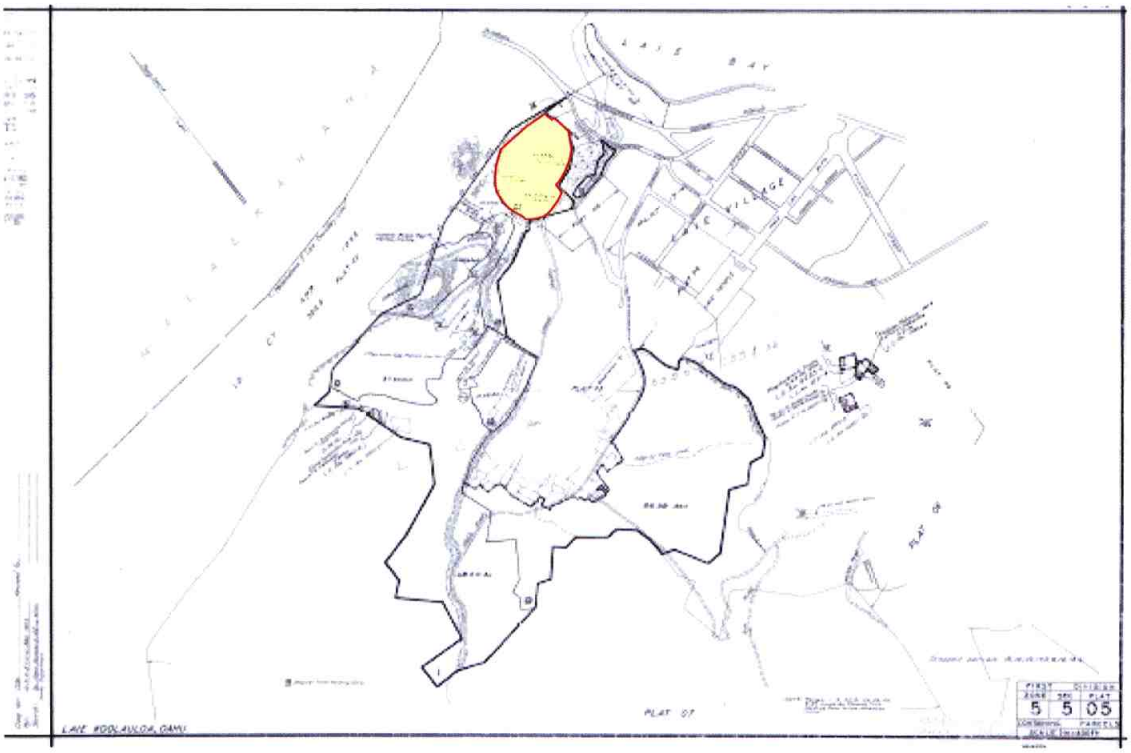
Site Reconnaissance (cont.)

Storm Water Retention Pond:	A naturally formed stagnant water pond was observed on site.
House and Schools in the Vicinity:	Three homes were observed immediately east of the site.
Distance to Nearest Residence, School, or Businesses:	The homes on the adjacent property are within 200 feet of the site. A residential neighborhood was also observed approximately 0.25 miles south of the site.
How is Drinking Water in the Area Supplied?	Municipal water supply.
Natural Resources, Agriculture, Aquaculture Near the Site?	An egg farm and separate plant farm was observed approximately 0.5 miles west-southwest from the site.
Name of Surface Water Within 1-mile of Dump/Landfill:	Kahawainui Stream and Pacific Ocean.
Distance to Surface Water:	The Kahawainui Stream is within 500 feet of the site. The Pacific Ocean is approximately 0.2 miles from the site.
Proximal Direction of Surface Water:	Kawahainui Stream is south of the site. The Pacific Ocean is to the east of the site.
Where Does Surface Water Flow?	Topography indicates that runoff from the site would flow into the Kahawainui Stream and pond located to the south of the site and onsite, respectively.
Surface Water Used for Drinking?	No.
Surface Water Used for Recreation?	Yes.
Wetlands:	None observed.
Off-site Sources of Contamination:	None observed.
Does Run-off from other Sites Flow onto Subject Property:	Runoff from the horse ranch property immediately north of the site may flow onto the site.
Adjacent Property-North:	Horse ranch followed by solid waste transfer station and roads maintenance yard.
Adjacent Property-South:	Kahawainui Stream.
Adjacent Property-East:	Kamehameha Highway followed by vegetated land.
Adjacent Property-West:	A ranch.

Laie Dump

Category 1

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	14		
Municipal Well(s)within one mile	0	**Observation Well(s)within one mile**	0
BWS Well(s) within one mile	0	**Sealed Well(s)within one mile**	1
Domestic Well(s)within one mile	4	**Unused Well(s) within one mile**	2
Irrigation Well(s)within one mile	7	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	0

Laie Dump

Category 1

Well Details

USGS Well Number	3855-06	**Aquifer**	30601
Well Name	BYU Campus	**Elevation of Ground Surface (ft amsl)**	9
Well Owner	Laie Water Co	**Well Depth (feet bgs)**	288
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-279
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	16.1
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	210
Drilling Method	--		
Year of Construction	1890		

USGS Well Number	3855-07	**Aquifer**	30601
Well Name	BYU Ceramic	**Elevation of Ground Surface (ft amsl)**	11
Well Owner	Laie Water Co	**Well Depth (feet bgs)**	251
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-240
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	16
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	850
Drilling Method	--		
Year of Construction	1890		

USGS Well Number	3956-01	**Aquifer**	30601
Well Name	Malaekahana	**Elevation of Ground Surface (ft amsl)**	18
Well Owner	Campbell Est	**Well Depth (feet bgs)**	
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	--		

USGS Well Number	3956-03	**Aquifer**	30601
Well Name	Laie Temple	**Elevation of Ground Surface (ft amsl)**	6
Well Owner	Laie Water Co	**Well Depth (feet bgs)**	345
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-339
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	300
Drilling Method	--		
Year of Construction	--		

Photo 1. **Standing on access road west of Site, looking east. Note the rise in elevation. This location may represent the edge of the former dump.**

Photo 2. **Looking east at a pond of standing water onsite. Topography indicates onsite runoff would flow into this pond.**

Photo 3. **Standing on the higher elevation depicted in Photo 1, patch of concrete was observed partially exposed.**

Photo 4. **Standing on higher elevation depicted in Photo 1. A rusted metal object was observed protruding from the ground.**

Photo 5. **Looking northeast at a patch of ground with no vegetation. This area is downgradient from the area depicted in Photo 2.**

Photo 6. **Standing on the access road north of the Site, looking southwest. Observed riding mowers parked inside the open lot.**

Photo 7. Monitoring well located approximately 500 feet north of the Laie Dump site.

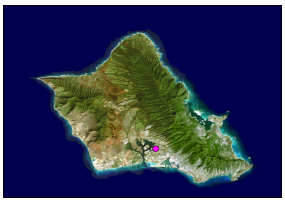
Makalapa Dump

Source: R.M. Towill Corporation

URS

Title **Aerial Photograph – Vicinity of Makalapa Dump**

Project **Oahu Inactive Landfills Relative Risk Evaluation**
Project No. 26536686.00300



Makalapa Dump

Category 3

Site Description

The former Makalapa Dump was reportedly located on the Makalapa Naval Reservation, to the northeast of the Southeast Loch of Pearl Harbor (0.4 miles), to the southwest of Halawa Stream (0.4 miles) and Aloha Stadium (0.8 miles), and to the north of the intersection of Kamehameha Highway and the H-1 Freeway. The Makalapa Dump, operated by the United States Navy, was reportedly used to dispose of mixed waste for more than 20 years during the 1940s-1960s, though limited information is available for this site. The area in the immediate vicinity of the former dump is military and the area in the general vicinity of the former dump is currently industrial and residential.

In a July 14, 1942 Honolulu Advertiser article, it was reported that tons of refuse accumulated at various points throughout the island following the December 7, 1941 bombing. Refuse disposal centers were established across the island and were marked by signs that read, "Official Rubbish Dump-by Order of the Military Governor". The refuse disposal centers were divided into four classes: City and County of Honolulu (C&C) sites, Navy sites, Army sites, and plantation sites. According to the plan adopted by the United States Surgeon's Office, the Corp of Engineers, and the C&C Public Works Department, refuse was to be burned at these specially designated dumps. The map that accompanied the Honolulu Advertiser article is the same as Young's (1993) map number 10 and is entitled "Refuse-Disposal Facilities". A military maintained dumpsite identified as "Makalapa", which is likely the Makalapa Dump, is shown on that map. Although the map is not of an appropriate scale to definitively determine the site's exact location.

The map that accompanied the article is titled "Refuse-Disposal Facilities" and is Young's (1993) map number 10. It appears, from the lack of information found on many of the sites depicted on this map (one of which is Makalapa Dump), that many of these special rubbish disposal centers were not used after the accumulated refuse was burned.

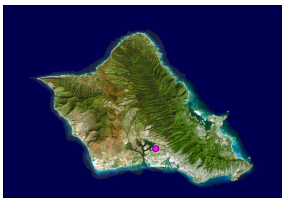
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	9-9-002:004
2362206.31343	610588.82360	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Halawa
157 56 00	21 21 30	**Plat:**	Not Designated
Address:	4361 Salt Lake Boulevard	**Quadrangle:**	Pearl Harbor

Ownership

Current Owner: United States government

Previous Operator: Navy



Makalapa Dump

Category 3

Site Operation and History

Landfill Type: Military

Type of Waste: Municipal

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Inactive	**Analytical Data Available?**	No data was located
Active Period:	1940-1960s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Dump and cover
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Military

City and County Zoning: F-1, P-1

State Land Use District: Conservation, urban

Facilities: --

TMK Separation: Military, right-of-way

Flood Zone: D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province: Coastal Plain

Elevation Range (ft): 35 **to** 40

Approximate Landfill Acreage: 15+

Parcel Acreage: 181.353

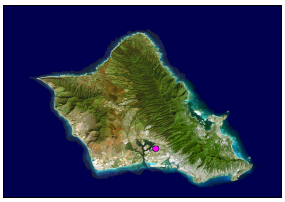
Climate

Annual Precipitation (cm): 52.20

Precipitation Days Per Year 31

Average Temperature (°F): 77.1

Temperature Range (° F): 70.2 **to** 84.0



Makalapa Dump

Category 3

Soils

Soil Map Symbol:	MdB	**Bulk Density (gm/cc):**	1.10-1.40
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Makalapa	**Organic Carbon (%):**	0.5-2.0
Engineering Classification:	Clay	**Permeability (in/hr):**	0.0000-0.1
Drainage Characterisitics:	Very poor	**Slope (%):**	2-6
Thickness of Surface Soil (in):	0-38	**pH:**	7.4-7.8
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

Geologic Symbol(s): Qht

Geologic Unit(s): Honolulu volcanic series

Geologic Description: Consolidated gray, lavender, and brown bedded, only slightly permeable deposits of basic vitric-crystal-lithic tuff composed of angular fragments of Koolau and post-Koolau basalt, limestone, and other ejecta in a matrix of palagonite and glass, commonly cemented by calcite, forming cones near the vents but thin elsewhere and caused by phreatomagmatic explosions.

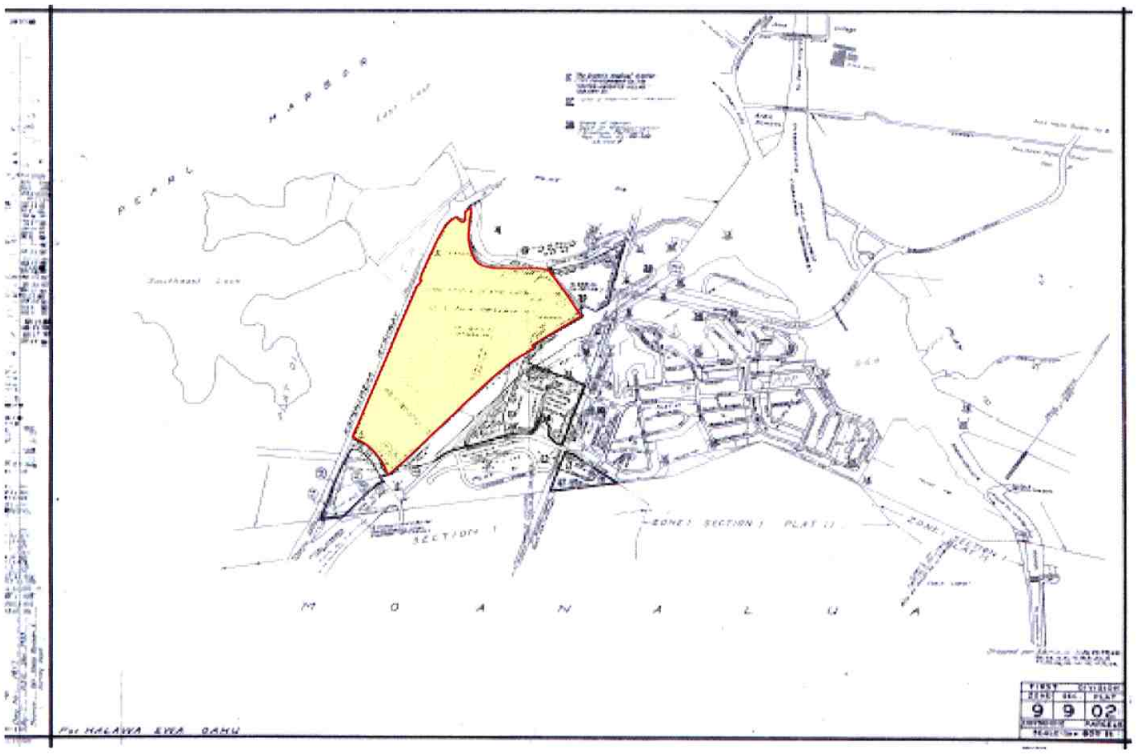
Hydrogeology

Rock Type:	Honolulu Volcanics-tuff
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Low
Hydraulic Conductivity (ft/d):	1 - 100

Makalapa Dump

Category 3

TMK Map



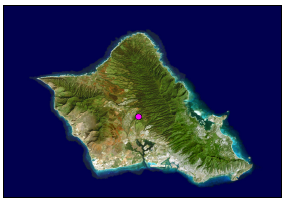
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	41		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	4
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	32
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	1
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	1
Industrial Well(s)within one mile	0	Other Well(s)within one mile	3

Well Details

Mililani New Landfill



Mililani New Landfill

Category 2

Site Description

The Mililani New Landfill is located approximately 2.7 miles northeast of the Roosevelt Bridge, 0.8 miles northeast of Mililani Memorial Park, 0.5 miles mauka of the H-2 Freeway, and just to the north of Plantation Road. The landfill is in a very heavily vegetated gulch that is a tributary of Kipapa Stream and measures approximately 770 feet long, with a bottom width of about 100 feet, and a depth of approximately 44 feet. Due to these conditions and the steepness of the gulch, visual observations of the former landfill were not made.

Libby and Dole made use of the dump parcel prior to its conversion to a landfill. The landfill was operated by Oceanic Properties Incorporated and received waste from 1972 to 1981. The types of waste deposited include pineapple cannery waste, wooden skips, cardboard boxes and cans, plant toppings, concrete, untreated lumber, and metals. The method of operation was dump and cover. The landfill was closed under Hawaii Administrative Rules, Title 11, Chapter 58, which were effective from November 1981-October 1993.

In March 1980, thirteen 30-gallon drums of the pesticide 1,2-Dibromo-3-chloropropane (DBCP) fell at Dole's Honolulu dock and five ruptured. The spill was absorbed with diatomaceous clay and packed into a 55-gallon drum, which was disposed of at Mililani New Landfill along with the five empty, ruptured drums. The total volume of pesticide put into the landfill from this incident was reportedly less than one gallon. In late 1980, M&E Pacific collected and analyzed samples from four soil borings, but DBCP was not detected (M&E Pacific, Inc., 1982). According to December 2 and 3, 1980 articles in the Honolulu Advertiser, the Department of Health issued a "finding of violation" charging Mililani Town Inc. with improperly operating the private one-acre landfill after a June 1980 discovery of several 55-gallon drums labeled as having contained DBCP (which were presumably from the March 1980 incident at Dole's Honolulu dock). According to ICF Technology, Inc. (1988), records indicate that 675 drums containing DBCP were disposed of in the landfill by Dole Company.

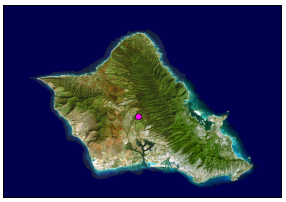
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	9-5-003:001
2372961.05155	605338.29833	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Waipio
157 59 00(157 59	21 27 21(21 27 35)	**Plat:**	Not Designated
Address:	Kipapa Gulch, Waipio	**Quadrangle:**	Waipahu

Ownership

Current Owner: Oceanic Properties Inc., Castle and Cooke Homes Hawaii, Inc. and the Estate of Bernice P. Bishop, Castle and Cooke Foods, Mililani Town, Inc.

Previous Operator: Mililani Town, Inc. and Oceanic Properties, Inc. (Ken Toshi)



Mililani New Landfill

Category 2

Site Operation and History

Landfill Type: Private

Type of Waste: Industrial waste; Pineapple cannery waste, wooden skips, cardboard boxes, cans, pineapple field wastes (toppings), inert building construction debris, no chemically treated materials; Pesticide containers possibly containing 1,2-dibromo-3-chloropropane and ethylene dibromide. Approximately 674 drums/year during 1978-1980 and empty pesticide containers. (Dole Company used the landfill as their primary disposal facility for all of their pesticide waste)

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	Yes
Active Period:	1972-1981(1975-1980)	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	No Further Response Action Planned
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump

Permit Info: Permit numbers SW-043008 (Mar. 20, 1975-Mar. 1, 1980) and SW-104108 (Mar. 10, 1980-Jan. 31, 1985). The landfill was issued permits under Chapter 46 of the Public Health Regulations (effective Jul. 1974-Nov. 1981) and Chapter 58 of the Hawaii Administrative Rule (effective Nov. 1981-Oct. 1993).

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Agricultural

City and County Zoning: Ag-1

State Land Use District: Urban

Facilities: Detached dwellings

TMK Separation: Livestock farm (dairy, poultry), unsubdivided vacant land

Flood Zone: D - Undetermined but possible flood hazards

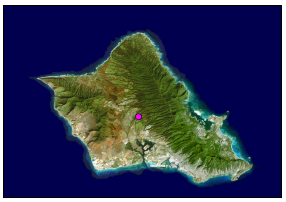
Geography and Topography

Physiographic Province: Schofield Plateau

Elevation Range (ft): 680 **to** 740

Approximate Landfill Acreage: 9.5 (5.0)

Parcel Acreage: 1,045.255, 9.5, 4.56



Mililani New Landfill

Category 2

Climate

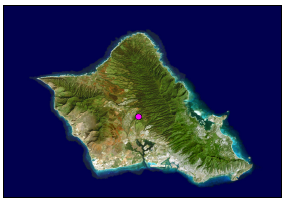
Annual Precipitation (cm):	142.70
Precipitation Days Per Year	99
Average Temperature (°F):	70.7
Temperature Range (° F):	63.2 **to** 78.1

Soils

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	WaA	**Bulk Density (gm/cc):**	1.20-1.45
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Wahiawa	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	0-3
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	WaB	**Bulk Density (gm/cc):**	1.20-1.45
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Wahiawa	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	3-8
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate



Mililani New Landfill

Category 2

Geology

Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

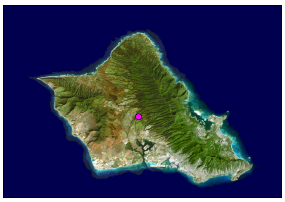
Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.

Hydrogeology

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Aquifer Status Code:	3020211111111
Aquifer Sector:	Pearl Harbor
Aquifer System:	Waiawa
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

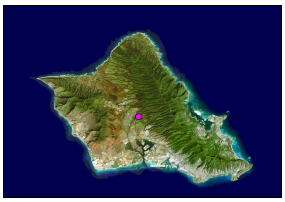


Mililani New Landfill

Category 2

Site Reconnaissance

Site Description:	The suspected location of the former Mililani New Landfill is in a very heavily vegetated gulch. Due to these conditions, visual observations of former landfill were not made.
Type of Property:	Rural Undeveloped.
Current Site Operations:	None observed.
Age of Development:	Unknown.
Onsite Building Information:	None.
Was There a Recognizable Dump/Landfill?	No. The area was heavily vegetated with sword grass approximately 10 feet high..
Institutional Controls:	Gates were observed at the plantation road entrance at Ka Uka Boulevard and along the plantation road immediately west of the bridge that crosses over the H2 freeway. However, these gates were unlocked and open during the site visit.
Number of MonitoringWells:	None observed.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	None observed.
Odors, Staining, Distressed Vegetation:	None observed.
Drainage Features:	None observed.
Areas of Ponded Water Onsite:	None observed.



Mililani New Landfill

Category 2

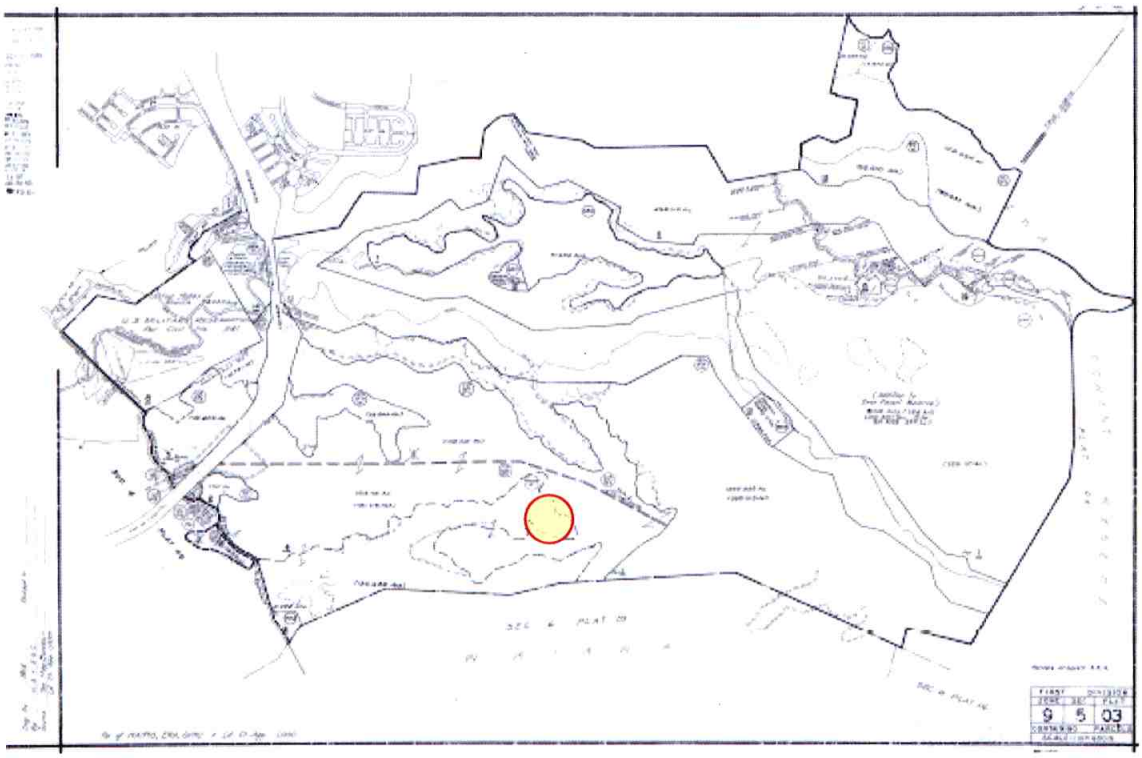
Site Reconnaissance (cont.)

Storm Water Retention Pond:	None observed.
House and Schools in the Vicinity:	No.
Distance to Nearest Residence, School, or Businesses:	Unknown.
How is Drinking Water in the Area Supplied?	Water does not appear to be supplied to the site.
Natural Resources, Agriculture, Aquaculture Near the Site?	A ranch was observed approximately 0.75 miles northeast of the site.
Name of Surface Water Within 1-mile of Dump/Landfill:	Road maps indicate that the gulch immediately southwest of the site is a stream originating point.
Distance to Surface Water:	Approximately 0.05 miles.
Proximal Direction of Surface Water:	Southeast.
Where Does Surface Water Flow?	USGS topographic maps indicate that runoff would flow into the gulch immediately southwest of the site.
Surface Water Used for Drinking?	No.
Surface Water Used for Recreation?	Unknown.
Wetlands:	None observed.
Off-site Sources of Contamination:	None observed.
Does Run-off from other Sites Flow onto Subject Property:	USGS topographic maps indicate that runoff from the area immediately northeast would flow into the site then into the gulch.
Adjacent Property-North:	Unoccupied lands.
Adjacent Property-South:	Plantation road and unoccupied lands.
Adjacent Property-East:	Unoccupied lands.
Adjacent Property-West:	Gulch and unoccupied lands.

Mililani New Landfill

Category 2

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	2		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	2
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Photo 1. Looking west from a plantation road approximately 1,000 feet east of the area believed to be the location of the Mililani New Landfill.

Photo 2. Standing on a plantation road, looking northwest toward the suspected landfill location.

Photo 3. Looking north in the area believed to be the location of the Mililani New Landfill site. This heavily vegetated terrain was typical of that encountered across the site.

Mililani Old Landfill

Mililani Old Landfill

Category 1

Site Description

Mililani Old Landfill is located in a portion of Kipapa Gulch to the west of the Mililani Town sewage treatment plant and Kamehameha Highway (0.3 miles), between the Waikele and Kipapa Streams, and south of the residential area surrounding Mililani. The parcel on which the landfill is located was previously owned by Oceanic Properties Inc, Castle and Cooke Homes Hawaii, Inc., the Estate of Bernice P. Bishop, Castle and Cooke Foods, and Mililani Town, Inc. Watanabe Floral Inc. is the current owner and uses the property for their nursery operations. The nursery may have been built on top of the former landfill.

A 15 to 20 foot deep ravine was used for the landfill. It originally covered 1.9-acres and was expanded to total 7.9 acres. It was located in the midst of pineapple and cane lands, and the waste stream consisted of private agricultural and construction wastes. The landfill was primarily used by affiliate companies of Castle and Cooke, Inc. (specifically Castle & Cooke Foods [Dole] and Mililani Town, Inc.). The original permit was issued in June of 1966. In October of 1966 Castle and Cooke requested that the site be operated as a garbage and rubbish dump instead of a sanitary landfill and that burning of material on site be permitted, but this request was denied. The June 1971 permit renewal request states that refuse was compacted, then covered with soil, and then further compacted. During March of 1973, Castle and Cooke requested and received a six-acre expansion of the landfill. Solid waste permit SW-044011 was issued during March of 1975. In May of 1975, the State of Hawaii Department of Health (DOH) informed Castle and Cooke that in accordance with the Special Condition of Permit SW-044011, the landfill would close on or before July 31, 1975. Under permit SW000011, the facility was to have closed before July 31, 1975, but because the Wahiawa Landfill wasn't open yet, an extension to March 31, 1976 was requested. This extension was granted but an extension to September 1976 was denied. The facility was closed April 30, 1976 under Hawaii Administrative Rules, Title 11, Chapter 46, which were effective from July 1974 through November 1981. Two feet of compacted earth material were placed over the landfill in accordance with Special Condition Number 4 of the operating permit.

According to the United States Environmental Protection Agency (EPA)'s Archived Sites database, the landfill's "Discovery" took place on January 1, 1980. A Preliminary Assessment was completed on September 29, 1984. A Preliminary Assessment reassessment was completed on November 29, 1988 and determined that no further action was necessary; thereafter the landfill became an "Archived Site". The State of Hawaii Hazard Evaluation and Emergency Response (HEER) Initial Site Screening Team screened the site on April 29, 1996 and determined that no further action was necessary. (State of Hawaii DOH, 2002).

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	9-4-005:069 (formerly 9-4-005:011, which was formerly 9-4-05-por.1)
2369879.48152	601716.34403	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Waipio
158 01 06	21 25 42	**Plat:**	Not Designated
Address:	Kipapa Gulch, Waipio	**Quadrangle:**	Waipahu

Ownership

Current Owner: currently Watanabe Floral; previously Oceanic Properties Inc, Castle and Cooke Homes Hawaii, Incorporated, the Estate of Bernice P. Bishop, Castle and Cooke Foods, and Mililani Town, Incorporated

Previous Operator: Mililani Town, Inc.

Mililani Old Landfill

Category 1

Site Operation and History

Landfill Type: Private

Type of Waste: Industrial waste; Pineapple cannery waste, wooden skips, cardboard boxes and cans, pineapple field wastes such as plant toppings, inert bldg construction material from Mililani Town such as concrete, untreated lumber, and metal materials

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	May, 1966-April 30, 1976	**EPA ID No.:**	HID980497275
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	No Further Response Action Planned
Capped?	Two feet compacted earth material	**Method of Operation:**	Dig, dump, cover; Later changed to trench method

Permit Info: Permit number SW-044011 (Jun. 18, 1975-Mar. 31, 1976). The landfill was issued permits under Chapter 46 of the Public Health Regulations (effective Jul. 1974-Nov. 1981).

February 8, 1972; March 19, 1976

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area?

City and County Zoning: Ag-1

State Land Use District: Agricultural

Facilities: Detached dwelling (1984), warehouse (1981)

TMK Separation: Field crop

Flood Zone: D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province: Schofield Plateau

Elevation Range (ft): 460 **to** 520

Approximate Landfill Acreage: 7.9 [1.9 + 6 (expansion)]

Parcel Acreage: 17.565

Mililani Old Landfill

Category 1

Climate

Annual Precipitation (cm):	49.40
Precipitation Days Per Year	30
Average Temperature (°F):	76.0
Temperature Range (° F):	67.4 **to** 84.5

Soils

Soil Map Symbol:	LaB	**Bulk Density (gm/cc):**	1.10-1.35
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Lahaina	**Organic Carbon (%):**	1.0-4.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	3-7
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	LaC	**Bulk Density (gm/cc):**	1.10-1.35
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Lahaina	**Organic Carbon (%):**	1.0-4.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	7-15
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	WaA	**Bulk Density (gm/cc):**	1.20-1.45
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Wahiawa	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	0-3
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Mililani Old Landfill

Category 1

Geology

Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.

Hydrogeology

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Aquifer Status Code:	3020311111111
Aquifer Sector:	Pearl Harbor
Aquifer System:	Waipahu
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

Mililani Old Landfill

Category 1

Site Reconnaissance

Site Description:	The Mililani Old Landfill is located on property currently managed by Watanabe Floral for their nursery operations. The nursery may have been built on top of the former landfill. Indications of recent surfical dumping by the nursery were observed during the site visit.
Type of Property:	Agricultural. A plant nursery currently exist onsite.
Current Site Operations:	Plant Nursery (Watanabe Floral)
Age of Development:	Unknown.
Onsite Building Information:	A warehouse-type structure (approximately 1,000 square feet) sits on the northeastern corner of the property. The building houses the nursery's store and storage.
Was There a Recognizable Dump/Landfill?	Signs of recent dumping were observed on the site. Plant nursery refuse (wood cuttings, plastic pots) was observed along the southern border of the site (along the edge of Kipapa Gulch).
Institutional Controls:	There are fences along the northern, western, and eastern boundaries of the site. Kipapa Gulch prevents access from the southern boundary. A gate at the northeastern corner of the site controls access.
Number of MonitoringWells:	None observed.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	None observed.
Odors, Staining, Distressed Vegetation:	None observed.
Drainage Features:	The site has several drainage channels that direct runoff toward Kipapa Gulch.
Areas of Ponded Water Onsite:	None observed.

Mililani Old Landfill

Category 1

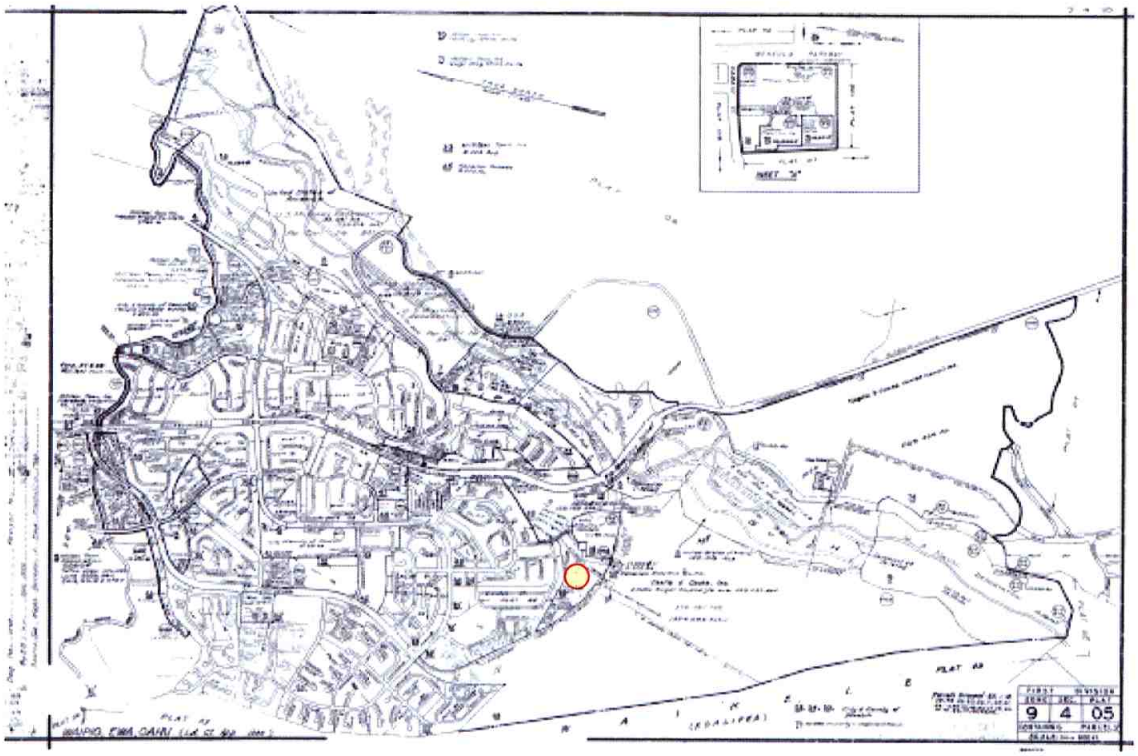
Site Reconnaissance (cont.)

Storm Water Retention Pond:	None observed.
House and Schools in the Vicinity:	Yes. The site borders a residential neighborhood along its northern boundary.
Distance to Nearest Residence, School, or Businesses:	The site is adjacent to the residential neighborhood.
How is Drinking Water in the Area Supplied?	The site appears to be supplied by the municipal water supply.
Natural Resources, Agriculture, Aquaculture Near the Site?	The site is currently a plant nursery.
Name of Surface Water Within 1-mile of Dump/Landfill:	Kipapa Stream.
Distance to Surface Water:	Approximately 0.6 miles.
Proximal Direction of Surface Water:	East.
Where Does Surface Water Flow?	Kipapa Gulch.
Surface Water Used for Drinking?	No.
Surface Water Used for Recreation?	Unknown.
Wetlands:	None observed.
Off-site Sources of Contamination:	Wastewater treatment operations at the facility to the east of the site.
Does Run-off from other Sites Flow onto Subject Property:	Unknown.
Adjacent Property-North:	Residential neighborhood (Mililani).
Adjacent Property-South:	Kipapa Gulch.
Adjacent Property-East:	Stormwater drainage channel; heavily vegetated unoccupied land.
Adjacent Property-West:	Mililani Preliminary Treatment Facility.

Mililani Old Landfill

Category 1

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	5		
Municipal Well(s)within one mile	0	**Observation Well(s)within one mile**	2
BWS Well(s) within one mile	0	**Sealed Well(s)within one mile**	0
Domestic Well(s)within one mile	1	**Unused Well(s) within one mile**	1
Irrigation Well(s)within one mile	0	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	0

Well Details

USGS Well Number	2600-02	**Aquifer**	30203
Well Name	Kipapa Gulch	**Elevation of Ground Surface (ft amsl)**	297
Well Owner	Dairy Co Inc	**Well Depth (feet bgs)**	401
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-104
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	22.93
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	240
Drilling Method	--		
Year of Construction	1957		

Photo 1. **Looking southwest from rear of nursery down into a gully, which may represent the southern portion of the "Old" Mililani Landfill.**

Photo 2. **Looking to the east at the Mililani Preliminary Treatment Facility, which is located adjacent to suspected landfill site.**

Photo 3. **Looking northeast at the plant nursery located on or near the suspected landfill site.**

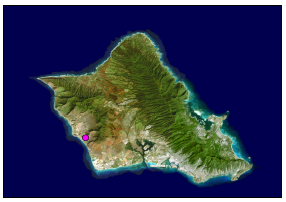
Photo 4. **Woodpile, which is typical of recent waste being dumped along the edge of the gully that borders the property's southern side.**

Photo 5. Scattered plant refuse, presumably from the nursery.

Photo 6. Looking southwest down the slope of the gully at scrap metal waste.

Photo 7. **This sign faces due east in the direction of the wastewater treatment plant.**

Nanakuli A Landfill



Nanakuli A Landfill

Category 2

Site Description

The Nanakuli Dump was noted as a rural rubbish dumpsite on a 1940's era map (Young, 1993; Map 10), but the exact location of this dump cannot be definitively determined. In 1985, PVT Nanakuli landfill was granted a permit to operate a landfill within an existing quarry that was already being used as an illegal refuse dumping site. The Nanakuli Dump and the quarry are likely the same site.

The PVT Nanakuli landfill is located to the north of Farrington Highway and east of Lualualei Naval Road in the southeast portion of Lualualei Valley between Puu Heleakala and the Lualualei Homesteads. Hawaiian Cement borders the site to the north, undeveloped land and the steep ridge of Puu Heleakala on the east, residential areas to the south, and Ulehawa stream to the west. The landfill is sited in a former limestone quarry excavation at approximately 40 feet above mean sea level.

The PVT Nanakuli landfill is a construction and demolition (C&D) landfill privately owned and operated by PVT Land Company, Limited. The landfill accepts C&D waste including concrete, asphalt pavement, steel, wood, glass masonry, flooring, siding, plaster, dirt, rock, roots, stumps, trees, and underbrush on a portion of the current site. The landfill has a maximum limit of 10 percent municipal solid waste (MSW) in any incoming load, but the PVT owner representative stated that in practice they accept very little MSW and no more than 10 percent green waste. Nearly all-incoming material is demolition waste. The landfill operators perform the following checks: 1) a pre-demolition site check, 2) a camera at the landfill videotapes the incoming trucks, and 3) a worker spot-checks the loads as they are being dumped. The landfill has an annual disposal volume of over 260,000 tons per year. The site has the potential for over 20 years capacity with additional horizontal expansions (Belt Collins Hawaii, 2000). The overall capacity of the landfill is approximately 5.25 million cubic yards.

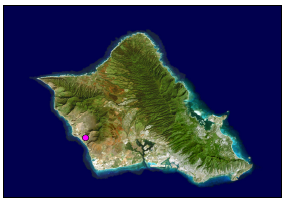
The landfill site is approximately 213 acres of which 120 acres are designated for landfill use. Phase I is unlined and consists of 62.9 acres. It is subdivided into areas 1A, 1B, and 1C. In 1993 a permit was granted to build a 0.83-acre asbestos disposal landfill in the Phase I area. Approximately 13 acres of Phase I are designated for the operation of the asbestos landfill. The asbestos landfill measures approximately 600-feet by 400-feet and is located between Lualualei Naval Road and Ulehawa Stream. Materials received at the asbestos landfill include friable asbestos, such as roofing, ceiling and insulating materials, and fixed asbestos. Weekly quantities range from 100-250 tons per week (Belt Collins, 1994).

A petroleum-contaminated soil reclamation facility operates to the north of the C&D landfill. The soil reclamation facility, which is lined with impermeable material, consists of five bioremediation cells and has operated since 1993.

A 57-acre horizontal expansion (Phase II) was constructed with a compacted clay liner and a Resource Conservation and Recovery Act (RCRA) D composite liner and leachate system in 2003. The Phase II area is used as a construction/demolition waste landfill. Phase II will eventually consist of nine lined cells.

In 1988 a fire on the site burned for 5 days resulting in smoke and odors in the adjacent community; the State of Hawaii Department of Health (DOH) inspectors found violations of the permit including improper disposal of asbestos and tires. In response to concerns about possible groundwater pollution four monitoring wells were installed in 1992. Because the landfill accepts only minimal amounts of MSW there is no landfill gas monitoring and control system.

In 2000 methyl tertiary butyl ether (MtBE), trichlorethane (TCE), and volatile organic compounds (VOCs) detected in wells up gradient of the landfill were thought to have been generated by one of the following off-site sources: 1) an auto and bus junk yard that has expanded into Ulehawa Stream, 2) Hawaiian Cement (closed), 3) pig and chicken ponds, or 4) the Lualualei Naval Facility.



Nanakuli A Landfill

Category 2

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	8-7-009:025 + 8-7-021:026
2365898.10279	589136.83622	**Zone:**	Waianae
Longitude	**Latitude**	**Section:**	Lualualei
158 08 24	21 23 35	**Plat:**	Not Designated
Address:	Lualualei Naval Road	**Quadrangle:**	Schofield Barracks

Ownership

Current Owner: PVT Holdings, Inc. and PVT Land Company Ltd. (reportedly operated in the 1940's by the City and County of Honolulu for MSW [Bagaoisan, 1997])

Previous Operator: PVT Land Company

Site Operation and History

Landfill Type: Private

Type of Waste: Municipal solid waste, construction and demolition

Monitoring Well Network? Yes

Monitoring Well Identification MW-1, MW-1A, MW-2, MW-3

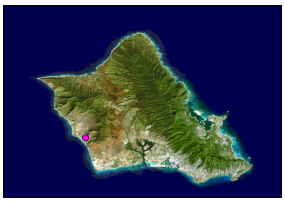
Status:	Permitted	**Analytical Data Available?**	Yes
Active Period:	1940s (permitted from 1985-present for limited use)	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump; Cover and fill

Permit Info: Permit numbers SW-199178 (original permit granted in 1985), SW-277326, LF-0071-93 (asbestos landfill; Aug. 3, 1993-Aug. 1, 1994), LF0021-94, LF-0017-94, and RM-0016-93. The landfill has been issued permits under Chapter 58 of the Hawaii Administrative Rule (effective Nov. 1981-Oct. 1993) and Chapter 58.1 (effective Oct. 1993 to present).

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka



Nanakuli A Landfill

Category 2

Population and Land Use

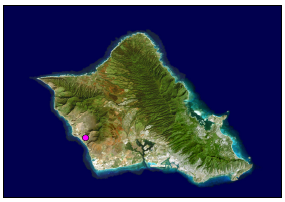
Type of Development in the Surronding Area?	Agricultural/vacant land
City and County Zoning:	Ag-2
State Land Use District:	Urban, Agricultural
Facilities:	--
TMK Separation:	Mine and quarry, unsubdivided vacant land
Flood Zone:	AE - 100-year Flood Plain, D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province:	Waianae Range
Elevation Range (ft):	20 **to** 1000
Approximate Landfill Acreage:	120
Parcel Acreage:	213

Climate

Annual Precipitation (cm):	49.40
Precipitation Days Per Year	30
Average Temperature (°F):	76.0
Temperature Range (° F):	67.4 **to** 84.5



Nanakuli A Landfill

Category 2

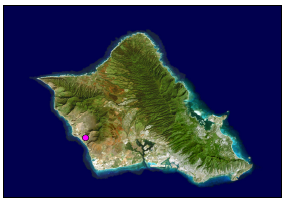
Soils

Soil Map Symbol:	LPE	**Bulk Density (gm/cc):**	1.20-1.56
Soil Association:	Rock land-Stony steep	**Moisture Retention (%):**	0.08-0.10
Soil Series:	Lualualei	**Organic Carbon (%):**	0.5-2.0
Engineering Classification:	Extremely Stony Clay	**Permeability (in/hr):**	0.0000-0.1
Drainage Characterisitics:	Very poor	**Slope (%):**	3-35
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	QU	**Bulk Density (gm/cc):**	Not available
Soil Association:	Rock Land-Stony steep	**Moisture Retention (%):**	Not available
Soil Series:	Quarry	**Organic Carbon (%):**	Not available
Engineering Classification:	Quarry Rock	**Permeability (in/hr):**	Not available
Drainage Characterisitics:	Not available	**Slope (%):**	--
Thickness of Surface Soil (in):	Not available	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Not available

Soil Map Symbol:	MnC	**Bulk Density (gm/cc):**	1.10-1.33
Soil Association:	Tropohumults-Dystrandepts	**Moisture Retention (%):**	0.16-0.18
Soil Series:	Mamala	**Organic Carbon (%):**	2.0-4.0
Engineering Classification:	Stony Silty Clay Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Very poor	**Slope (%):**	0-12
Thickness of Surface Soil (in):	0-19	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	rRK	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Rock land	**Moisture Retention (%):**	0.12-0.16
Soil Series:	Rock Land	**Organic Carbon (%):**	3.0-6.0
Engineering Classification:	Silty Clay Loam, Unweathered Bedrock	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Very poor	**Slope (%):**	>15
Thickness of Surface Soil (in):	0-8	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Moderate



Nanakuli A Landfill

Category 2

Geology

Geologic Symbol(s): Pa

Geologic Unit(s): Consolidated noncalcareous deposits

Geologic Description: Chiefly older alluvium, generally consisting of mottled brown to red-brown, deeply weathered, poorly-assorted, and nearly impermeable friable conglomerates, in places cemented with limonite or hematite and usually forming conspicuous terraces along the principal streams. Near the mouths of the valleys and especially around Pearl Harbor and near Waialua the older alluvium grades into partly consolidated sands and silts that are emerged delta deposits. The degree of consolidation is largely dependent upon the amount of rainfall, for in dry regions the material is much better cemented than in wet regions. Near the heads of valleys the older alluvium grades into coarse angular talus and landslide deposits which, in places, carry considerable water. In the large semiarid valleys in the Waianae Range these deposits are firmly cemented breccias. They are poorly permeable in wet areas and hold up perched water in the Honolulu volcanic series, but in the dry areas they yield small supplies of potable water.

Hydrogeology

Rock Type:	Alluvium-older-consolidated
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

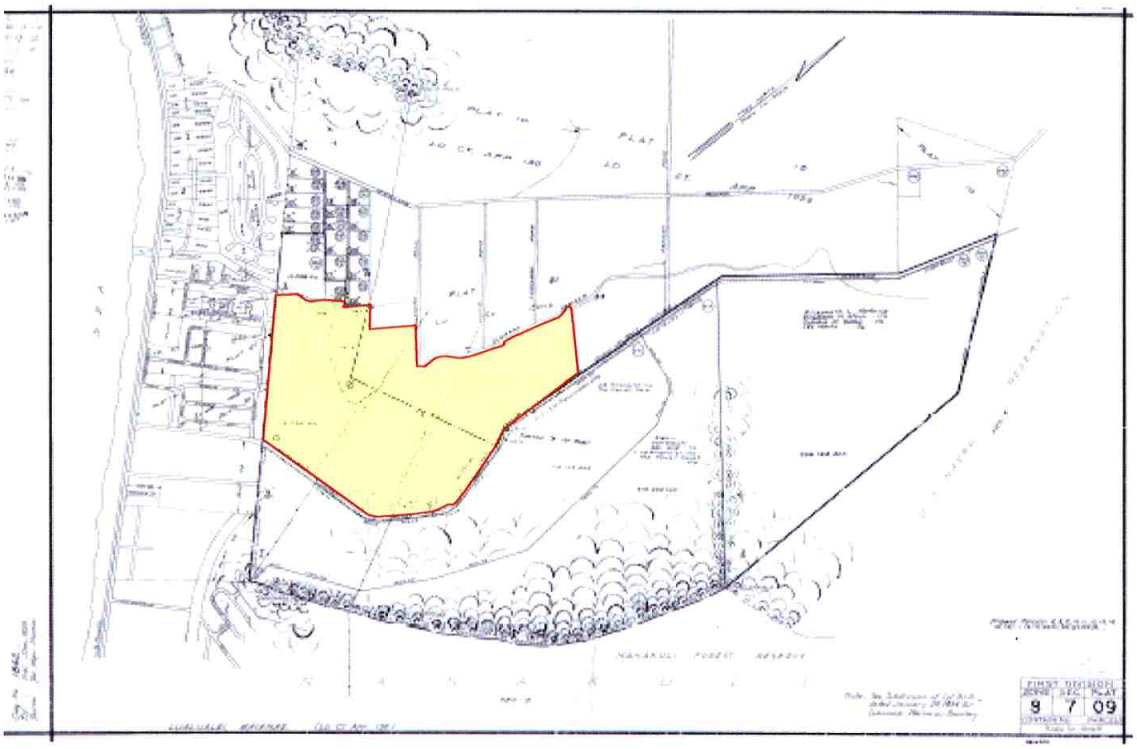
Aquifer(s)

Aquifer Status Code:	3030211223321
Aquifer Sector:	Waianae
Aquifer System:	Lualualei
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Dike
Development State:	Potential use
Utility:	Neither
Salinity (mg/L Cl-):	Moderate (1,000-5,000)
Uniqueness:	Replaceable
Vulnerability:	High

Nanakuli A Landfill

Category 2

TMK Map



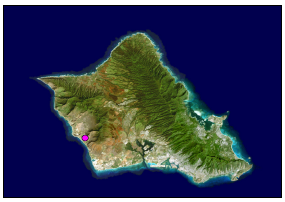
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	10		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	6
Irrigation Well(s)within one mile	2	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	2	Other Well(s)within one mile	0

Well Details

Nanakuli B Landfill



Nanakuli B

Category 2

Picture Not Available

Site Description

The Nanakuli B site is comprised of two parcels owned by the Leeward Land Company Limited totaling 432 total acres. It is not clear from the available records what the current status of this location is and if previous dumping has occurred there.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	8-7-009:001, 007
2365883.02508	588991.08499	**Zone:**	Waianae
Longitude	**Latitude**	**Section:**	Lualualei
158 08 29	21 23 34	**Plat:**	Not Designated
Address:	Lualualei Naval Road	**Quadrangle:**	Schofield Barracks

Ownership

Current Owner: Leeward Land Company Limited

Previous Operator: Leeward Land Company Limited

Site Operation and History

Landfill Type: Proposed Public

Type of Waste: Municipal

Monitoring Well Network? Not applicable

Monitoring Well Identification None documented

Status:	Proposed location under review	**Analytical Data Available?**	No data was located applicable
Active Period:	Not applicable	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Not applicable
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Agricultural/vacant land

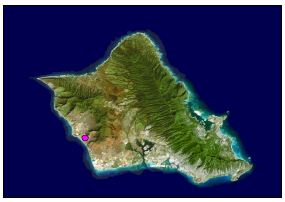
City and County Zoning: Ag-2, P-1

State Land Use District: Agricultural, Conservation

Facilities: Vacant land

TMK Separation: Undivided vacant land, steep land

Flood Zone: D - Undetermined but possible flood hazards



Nanakuli B

Category 2

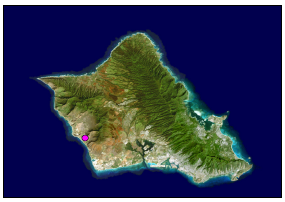
Picture Not Available

Geography and Topography

Physiographic Province:	Waianae Range
Elevation Range (ft):	20 **to** 1000
Approximate Landfill Acreage:	432 (proposed)
Parcel Acreage:	432* , 219.329 (8-7-009:001) + 179.109 acres (8-7-009:007)

Climate

Annual Precipitation (cm):	49.40
Precipitation Days Per Year	30
Average Temperature (°F):	76.0
Temperature Range (° F):	67.4 **to** 84.5



Nanakuli B

Category 2

Picture Not Available

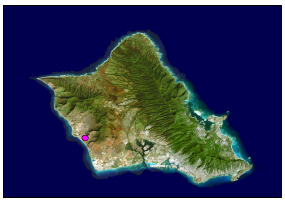
Soils

Soil Map Symbol:	LPE	**Bulk Density (gm/cc):**	1.20-1.56
Soil Association:	Rock land-Stony steep	**Moisture Retention (%):**	0.08-0.10
Soil Series:	Lualualei	**Organic Carbon (%):**	0.5-2.0
Engineering Classification:	Extremely Stony Clay	**Permeability (in/hr):**	0.0000-0.1
Drainage Characterisitics:	Very poor	**Slope (%):**	3-35
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	QU	**Bulk Density (gm/cc):**	Not available
Soil Association:	Rock Land-Stony steep	**Moisture Retention (%):**	Not available
Soil Series:	Quarry	**Organic Carbon (%):**	Not available
Engineering Classification:	Quarry Rock	**Permeability (in/hr):**	Not available
Drainage Characterisitics:	Not available	**Slope (%):**	--
Thickness of Surface Soil (in):	Not available	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Not available

Soil Map Symbol:	MnC	**Bulk Density (gm/cc):**	1.10-1.33
Soil Association:	Tropohumults-Dystrandepts	**Moisture Retention (%):**	0.16-0.18
Soil Series:	Mamala	**Organic Carbon (%):**	2.0-4.0
Engineering Classification:	Stony Silty Clay Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Very poor	**Slope (%):**	0-12
Thickness of Surface Soil (in):	0-19	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	rRK	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Rock land	**Moisture Retention (%):**	0.12-0.16
Soil Series:	Rock Land	**Organic Carbon (%):**	3.0-6.0
Engineering Classification:	Silty Clay Loam, Unweathered Bedrock	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Very poor	**Slope (%):**	>15
Thickness of Surface Soil (in):	0-8	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Moderate



Nanakuli B

Category 2

Picture Not Available

Geology

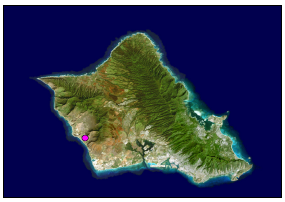
Geologic Symbol(s): Pa

Geologic Unit(s): Consolidated noncalcareous deposits

Geologic Description: Chiefly older alluvium, generally consisting of mottled brown to red-brown, deeply weathered, poorly-assorted, and nearly impermeable friable conglomerates, in places cemented with limonite or hematite and usually forming conspicuous terraces along the principal streams. Near the mouths of the valleys and especially around Pearl Harbor and near Waialua the older alluvium grades into partly consolidated sands and silts that are emerged delta deposits. The degree of consolidation is largely dependent upon the amount of rainfall, for in dry regions the material is much better cemented than in wet regions. Near the heads of valleys the older alluvium grades into coarse angular talus and landslide deposits which, in places, carry considerable water. In the large semiarid valleys in the Waianae Range these deposits are firmly cemented breccias. They are poorly permeable in wet areas and hold up perched water in the Honolulu volcanic series, but in the dry areas they yield small supplies of potable water.

Hydrogeology

Rock Type:	Alluvium-older-consolidated
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1



Nanakuli B

Category 2

Picture Not Available

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3030211613311
Aquifer Sector:	Waianae
Aquifer System:	Lualualei
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Currently used
Utility:	Neither
Salinity (mg/L Cl-):	Moderate (1,000-5,000)
Uniqueness:	Irreplaceable
Vulnerability:	High

Lower Aquifer

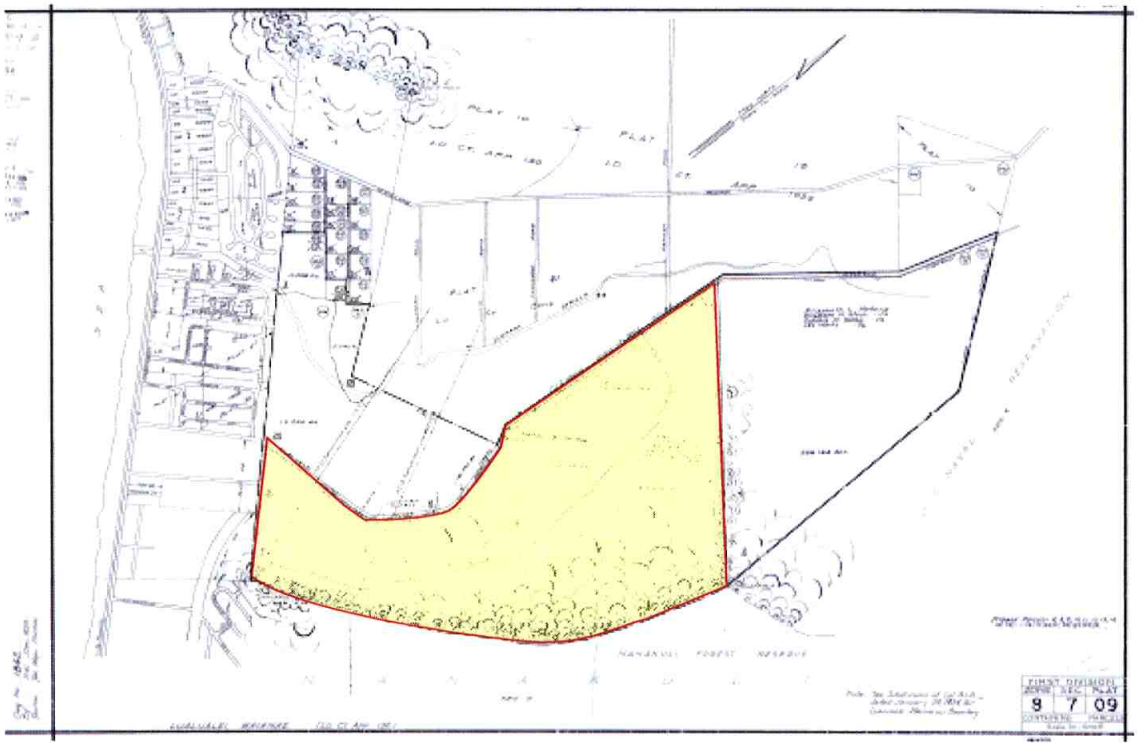
Aquifer Status Code:	3030212223323
Aquifer Sector:	Waianae
Aquifer System:	Lualualei
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Dike
Development State:	Potential use
Utility:	Neither
Salinity (mg/L Cl-):	Moderate (1,000-5,000)
Uniqueness:	Replaceable
Vulnerability:	Low

Nanakuli B

Category 2

Picture Not Available

TMK Map



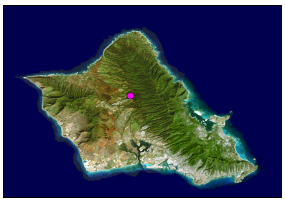
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	11		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	7
Irrigation Well(s)within one mile	2	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	2	Other Well(s)within one mile	0

Well Details

Naval Computer And Telecomm Area Master Station - Old Wahiawa Landfill



Naval Computer and Telecomm Area Master Station (NCTAMS) - Old Wahiawa Landfill

Category 1

Site Description

The Old Wahiawa Landfill is located near the eastern boundary of the Naval Computer and Telecommunications Area Master Station (NCTAMS) Wahiawa. The city of Wahiawa and Whitmore Village are to the south and are separated from NCTAMS Wahiawa by a deep gulch, and the Helemano Military Reservation is located to the north. The landfill is located in a depression adjacent to a dry gulch. Steeply sloping valleys on the north and east sides of the landfill are believed to represent the maximum extent of the landfill, which was covered with soil. The landfill covers approximately 200 x 600 feet and is heavily overgrown with trees and brush. An area identified as the "clearing" for its barren appearance is located in the northeast corner of the landfill. The only access road to the landfill is closed and overgrown. Land adjacent to NCTAMS Wahiawa consists of conservation land and pineapple fields.

The Old Wahiawa Landfill was used for general disposal of all wastes generated at the NCTAMS Pacific Air Command (PAC) from 1942-1973. Industrial and municipal wastes including batteries, herbicides, pigments, paints, metals, mercury, and creosote, and small quantities of waste lubricant oils, dry cleaning solvents, chlorinated and non-chlorinated solvents, transformer oil, hydraulic fluid, and paint thinners, were disposed of in the landfill. The landfill was closed in 1973 and was graded and covered with an additional layer of soil in 1978.

In 1986, as part of the first phase of the Department of Defense's Installation Restoration Program (IRP), the Naval Energy and Environmental Support Activity conducted an initial assessment study (IAS) at NCTAMS PAC to identify potentially contaminated sites. Fourteen potentially contaminated sites were identified during the IAS including the Old Wahiawa Landfill (Luechen et al., 1986). In 1989, as Phase II of the IRP, a site inspection was performed to confirm the findings of the IAS. During the site inspection, soil and groundwater sampling were performed at the sites that were recommended for further study in the IAS (Harding Lawson Associates, 1989). Low-level lead, mercury, total petroleum hydrocarbon, oil, and grease contamination were found in surface and subsurface soils at the landfill. The NCTAMS PAC was proposed for the United States Environmental Protection Agency's National Priorities List in January 1994 and is one of three Hawaii sites listed. Corrective measures were subsequently implemented to mitigate the hazards from contaminated sites that were identified during Phases I and II. Phase III of the IRP is the remedial investigation/feasibility study. The draft Remedial Investigation for Old Wahiawa Landfill was completed in 1997, and the findings suggested that no further remedial action was necessary (Earth Tech, 1997). According to an Agency for Toxic Substances and Disease Registry (ATSDR) report (1998), under past, current, and proposed future uses of the site, exposure to contaminants in soil at the detected levels do not pose a health hazard. Because neither groundwater nor the intermittent surface water is used as drinking water, no exposures, and therefore no health hazards, exist.

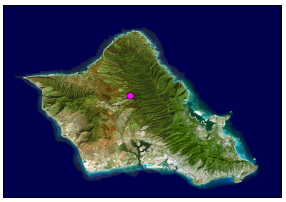
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	7-1-002:007
2379891.26048	604401.49687	**Zone:**	Wahiawa
Longitude	**Latitude**	**Section:**	Not Designated
157 59 31	21 31 07	**Plat:**	Not Designated
Address:		**Quadrangle:**	Haleiwa

Ownership

Current Owner: United States government

Previous Operator: Navy



Naval Computer and Telecomm Area Master Station (NCTAMS) - Old Wahiawa Landfill

Category 1

Site Operation and History

Landfill Type: Military

Type of Waste: Municipal and industrial wastes (i.e., storage batteries, pesticides, various oils, various solvents, TCE, PCB's, fiberglass resin, mercury, and lead)

Monitoring Well Network? Two monitoring wells constructed as part of the 1997 RI/FS

Monitoring Well Identification LF-23, LF-26

Status:	Closed	**Analytical Data Available?**	Yes
Active Period:	1942-1973	**EPA ID No.:**	HI0170090054, HI917002438800
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	
Capped?	Yes; soil cover	**Method of Operation:**	Alternating layers of waste and soil
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Military

City and County Zoning: F-1

State Land Use District: Agricultural

Facilities: Vacant land

TMK Separation: Military

Flood Zone: D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province: Schofield Plateau

Elevation Range (ft): 1E **to** 1280

Approximate Landfill Acreage: 200x600 ft.; Approximately 4

Parcel Acreage: 684.888

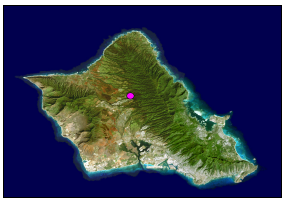
Climate

Annual Precipitation (cm): 142.70

Precipitation Days Per Year 99

Average Temperature (°F): 70.7

Temperature Range (° F): 63.2 **to** 78.1



Naval Computer and Telecomm Area Master Station (NCTAMS) - Old Wahiawa Landfill

Category 1

Soils

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	PaC	**Bulk Density (gm/cc):**	
Soil Association:		**Moisture Retention (%):**	
Soil Series:		**Organic Carbon (%):**	
Engineering Classification:		**Permeability (in/hr):**	
Drainage Characterisitics:		**Slope (%):**	
Thickness of Surface Soil (in):		**pH:**	
Topsoil Rating:		**Corrosivity:**	

Geology

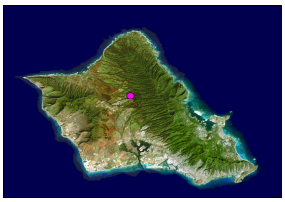
Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.

Hydrogeology

Rock Type:	Koolau Basalt-Lava flows-dike complex
GW Occurrance-Principal:	Dike impounded
GW Occurrance-Secondary:	Perched
Permeability:	Low to moderate
Hydraulic Conductivity (ft/d):	1 - 500

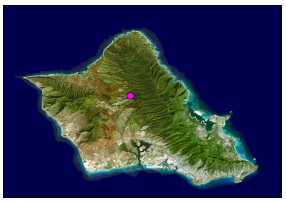


Naval Computer and Telecomm Area Master Station (NCTAMS) - Old Wahiawa Landfill

Category 1

Aquifer(s)

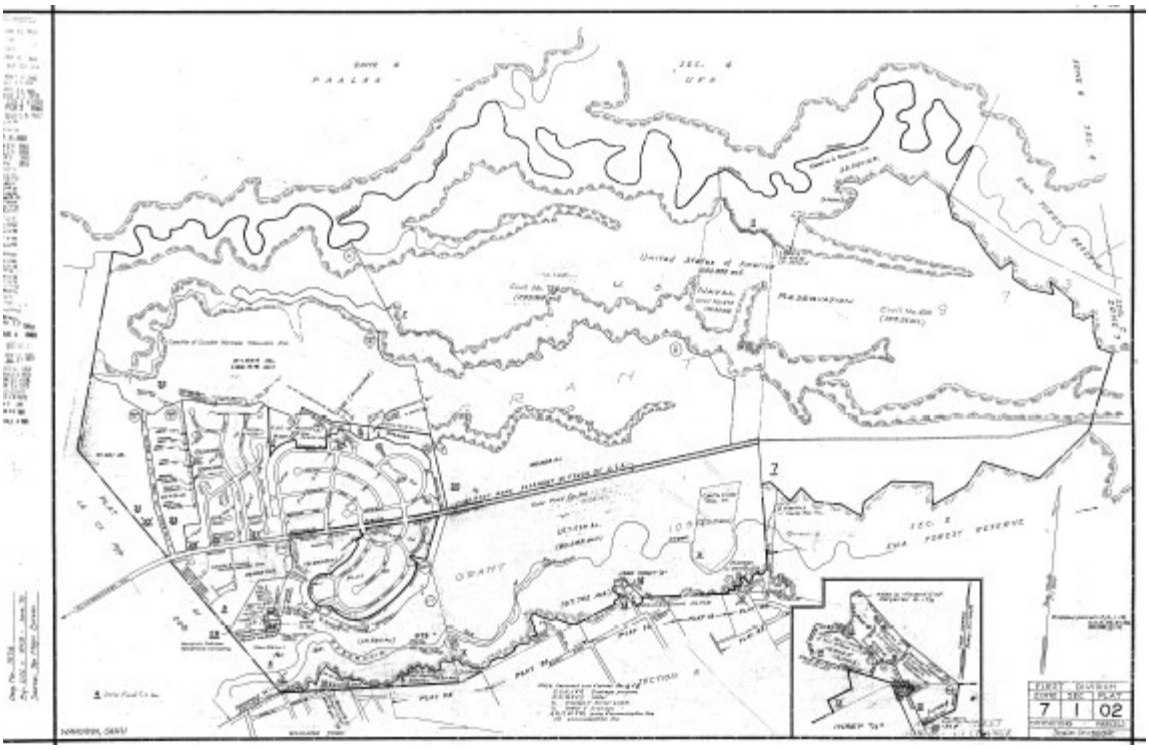
Aquifer Status Code:	3050121211111
Aquifer Sector:	Central
Aquifer System:	Wahiawa
Aquifer Type 1:	High Level
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Dike
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High



Naval Computer and Telecomm Area Master Station (NCTAMS) - Old Wahiawa Landfill

Category 1

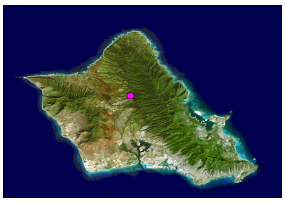
TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	4		
Municipal Well(s)within one mile	1	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	3
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0



Naval Computer and Telecomm Area Master Station (NCTAMS) - Old Wahiawa Landfill

Category 1

Well Details

USGS Well Number	3100-02	**Aquifer**	30501
Well Name	Wahiawa	**Elevation of Ground Surface (ft amsl)**	1145
Well Owner	U S Navy	**Well Depth (feet bgs)**	970
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	175
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	0
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	400
Drilling Method	Rotary		
Year of Construction	1942		

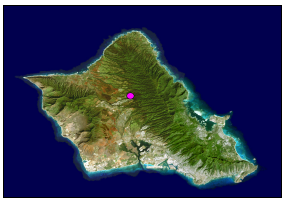
Naval Radio Transmitting Facility - Lualualei Landfill

Source: R.M. Towill Corporation
07-02-70; photograph 5346-3

URS

Title **Aerial Photograph – NRTF - Lualualei Landfill**

Project **Oahu Inactive Landfills Relative Risk Evaluation**
Project No. 26536686.00300



Naval Radio Transmitting Facility (NRTF) -Lualualei Landfill

Category 3

Site Description

The Lualualei Landfill is located in the western portion of the Naval Radio Transmitting Facility (NRTF) north of Paakea Road (0.3 miles), southeast of Pokai Bay (1.8 miles) and Ma'ili'ili Stream (0.4 miles), and northeast of Ma'ili. The site was shown as a dump on general development maps dated 1948 and 1952, and is identified as military open disposal site "N.A.D. Lualualei" on Young's Map 31 (1993). NRTF Lualualei occupies approximately 1,700 acres in a large coastal valley near the southwestern shoreline of Oahu and has a residential population of approximately 25 people housed in 11 units. NRTF Lualualei is contiguous with the Naval Magazine Lualualei that occupies an additional 8,105 acres of the valley. The area in the immediate vicinity of the former landfill is currently military, civilian land use surrounding this facility is largely rural, and the site is surrounded by agricultural and small areas of Urban and Conservation Land Use districts. The closest urban area is the town of Ma'ili, and the towns of Waianae and Nanakuli are also located nearby (GlobalSecurity.org).

The dump operated from pre-1948 to the 1960s. Small amounts of hazardous waste are generated at the site and there is no evidence of disposal of hazardous waste at the site. The landfill is located within a controlled access area with only employees of the Navy, their dependents, and contractors allowed within its perimeters. The former landfill location can be discerned from review of an August 1970 aerial photograph because it appears to be raised above the surrounding topography. A cleared area in the vicinity of the former landfill and a dirt road that leads to the landfill can also be seen in the photograph.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	8-6-002:001
2369770.42181	586438.48245	**Zone:**	Waianae
Longitude	**Latitude**	**Section:**	Lualualei
158 09 57	21 25 42	**Plat:**	Not Designated
Address:		**Quadrangle:**	Schofield Barracks

Ownership

Current Owner: United States government

Previous Operator: Navy

Site Operation and History

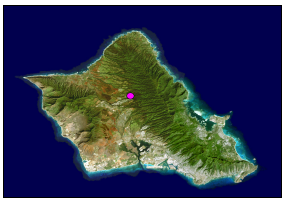
Landfill Type: Military

Type of Waste: Unknown

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	Yes
Active Period:	pre 1948-1960s	**EPA ID No.:**	HI9170090055
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	
Capped?	Yes; soil cover	**Method of Operation:**	Unknown
Permit Info:	None documented		



Naval Radio Transmitting Facility (NRTF) -Lualualei Landfill

Category 3

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Population and Land Use

Type of Development in the Surronding Area? Military

City and County Zoning: F-1

State Land Use District: Agricultural

Facilities: Electrical transformers

TMK Separation: Military

Flood Zone: D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province: Waianae Range

Elevation Range (ft): 32 **to** 38

Approximate Landfill Acreage: Approximately 2

Parcel Acreage: 672.129

Climate

Annual Precipitation (cm): 49.40

Precipitation Days Per Year 30

Average Temperature (°F): 76.0

Temperature Range (° F): 67.4 **to** 84.5

Soils

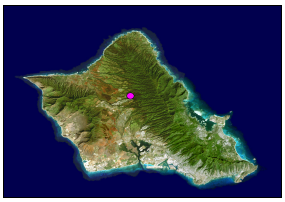
Soil Map Symbol:	MnC	**Bulk Density (gm/cc):**	1.10-1.33
Soil Association:	Tropohumults-Dystrandepts	**Moisture Retention (%):**	0.16-0.18
Soil Series:	Mamala	**Organic Carbon (%):**	2.0-4.0
Engineering Classification:	Stony Silty Clay Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Very poor	**Slope (%):**	0-12
Thickness of Surface Soil (in):	0-19	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Geology

Geologic Symbol(s): Pls

Geologic Unit(s): Consolidated calcareous marine sediments

Geologic Description: Chiefly emerged coral reefs but in places, especially near Pearl Harbor, finely laminated lagoon limestone. Beach deposits resembling the various types of present calcareous beaches in lithified form are included, as well as a few inextensive consolidated beach deposits that may have been formed at the present stand of the sea. Extremely permeable because of primary and secondary cavities and yields water copiously, but the water is apt to be brackish.



Naval Radio Transmitting Facility (NRTF) -Lualualei Landfill

Category 3

Hydrogeology

Rock Type:	Coral-in situ reef limestone
GW Occurrance-Principal:	Basal
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to very high
Hydraulic Conductivity (ft/d):	100 - 20,000

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3030211613311
Aquifer Sector:	Waianae
Aquifer System:	Lualualei
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Currently used
Utility:	Neither
Salinity (mg/L Cl-):	Moderate (1,000-5,000)
Uniqueness:	Irreplaceable
Vulnerability:	High

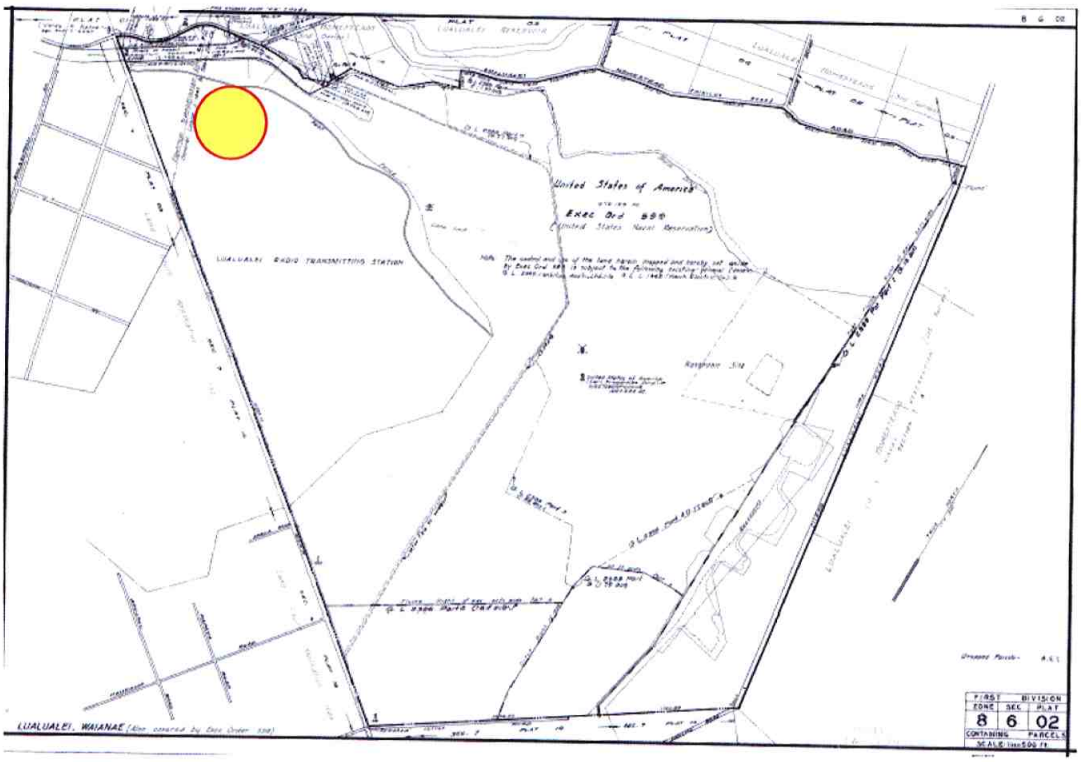
Lower Aquifer

Aquifer Status Code:	3030212223323
Aquifer Sector:	Waianae
Aquifer System:	Lualualei
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Dike
Development State:	Potential use
Utility:	Neither
Salinity (mg/L Cl-):	Moderate (1,000-5,000)
Uniqueness:	Replaceable
Vulnerability:	Low

Naval Radio Transmitting Facility (NRTF) -Lualualei Landfill

Category 3

TMK Map



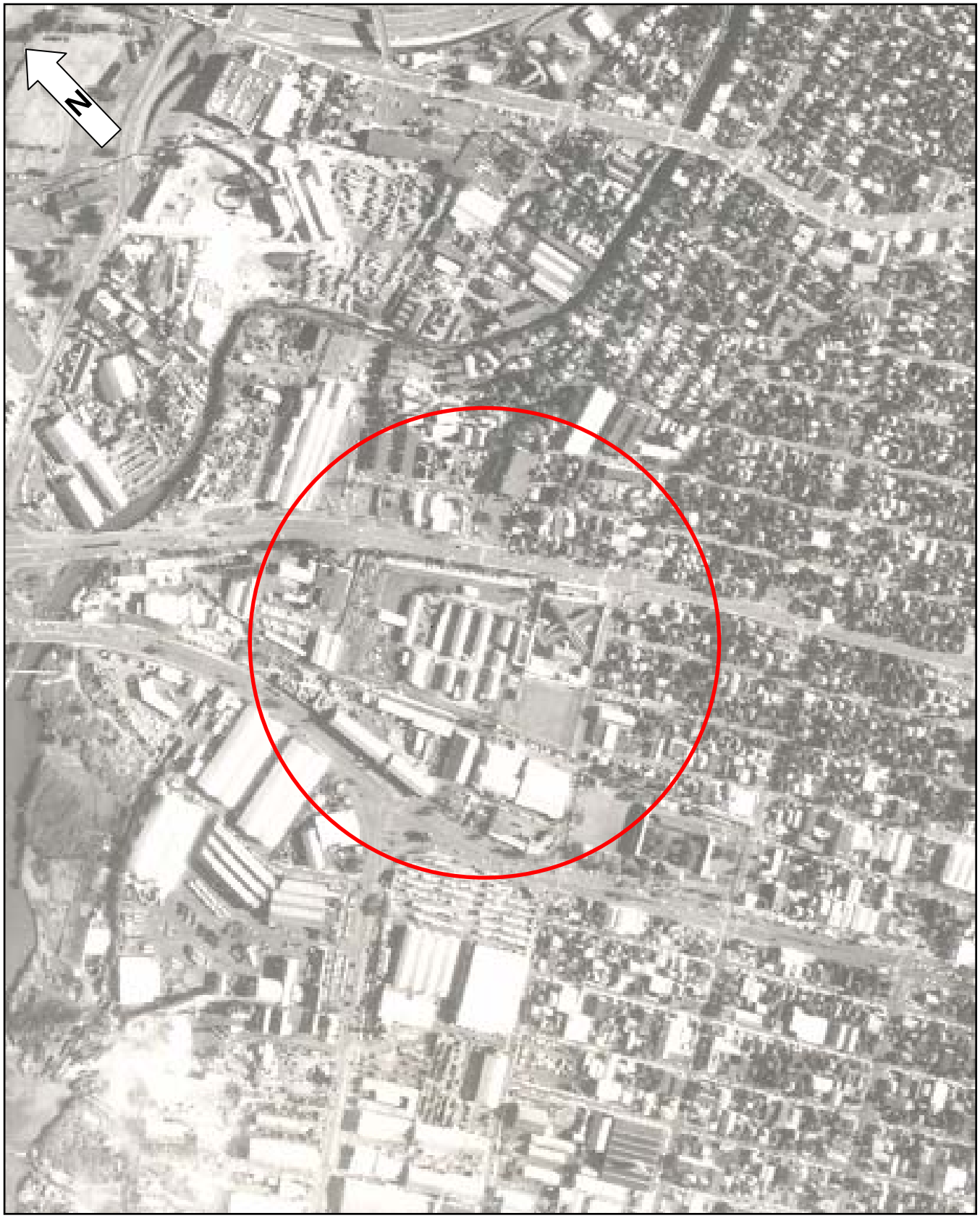
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	15		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	1
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	9
Irrigation Well(s)within one mile	1	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	1

Well Details

Oahu Prison Dump



Source: R.M. Towill Corporation
02-06-68

URS

Title **Aerial Photograph – Vicinity of Oahu Prison Dump**

Project **Oahu Inactive Landfills Relative Risk Evaluation**
Project No. 26536686.00300

Oahu Prison Dump

Category 3

Site Description

The former Oahu Prison Dump (possibly also referred to as Kalihi Dump) was reportedly located to the west of Puuhale Road, to the southwest of Dillingham Boulevard, to the south of Queen Street, to the east of the confluence of Kalihi Stream and Keehi Lagoon (0.3 miles), and in the current location of the Hawaii State Prison. The area in the vicinity of the former dump is currently commercial. The Oahu Prison Dump was operated by the City and County of Honolulu, and was used to dispose of household wastes from 1943-1954 or 1947-1950 (depending on the information source).

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	1-2-013:002, 006
2359148.72084	615537.33068	**Zone:**	Honolulu
Longitude	**Latitude**	**Section:**	Kalihi-Kai
157 53 09	21 19 50	**Plat:**	Not Designated
Address:	2109, 2199, 2277 Kamehameha Highway	**Quadrangle:**	Honolulu

Ownership

Current Owner: State of Hawaii, Newfair Investments

Previous Operator: City and County of Honolulu

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1947-1950	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Oahu Prison Dump

Category 3

Population and Land Use

Type of Development in the Surronding Area?	Industrial
City and County Zoning:	I-2
State Land Use District:	Urban
Facilities:	Prison, reformatory, detention center, light manufacturing, processing, and fabrication facility, warehouse
TMK Separation:	Public order and safety, food processing
Flood Zone:	AO - 100-year Flood Plain of an alluvial fan, X - 500-year Flood Plain

Geography and Topography

Physiographic Province:	Coastal Plain
Elevation Range (ft):	5 **to** 10
Approximate Landfill Acreage:	1-2
Parcel Acreage:	16 + 4

Climate

Annual Precipitation (cm):	52.20
Precipitation Days Per Year	31
Average Temperature (° F):	77.1
Temperature Range (° F):	70.2 **to** 84.0

Soils

Soil Map Symbol:	FL	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.06-0.12
Soil Series:	Fill Land, Mixed	**Organic Carbon (%):**	0.1-5.0
Engineering Classification:	Fill Land, Mixed	**Permeability (in/hr):**	0.1-2
Drainage Characterisitics:	Poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	EmA	**Bulk Density (gm/cc):**	1.10-1.30
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Ewa	**Organic Carbon (%):**	2.0-4.0
Engineering Classification:	Silty Clay Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	well	**Slope (%):**	0-2
Thickness of Surface Soil (in):	0-29	**pH:**	6.6-7.3
Topsoil Rating:	Fair	**Corrosivity:**	Moderate

Oahu Prison Dump

Category 3

Geology

Geologic Symbol(s): Ra

Geologic Unit(s): Unconsolidated noncalcareous deposits

Geologic Description: Chiefly younger alluvium, a black to brown fluviatile deposit generally consisting of coarse permeable detritus only slightly weathered and in many places subangular. In the valley bottoms near the sea it usually consists of nearly impermeable black, sticky mud called taro-patch clay. Much of the younger alluvium is reworked older alluvium. Included also is talus composed of angular blocks, usually with brown interstitial soil, forming aprons on the steep slopes at the base of cliffs. In the mountain areas much of the younger alluvium resembles, includes, and is often inseparable from landslide deposits, because of the torrential character of the streams and the precipitous valley walls. Extensive mantles of hill wash are included. Wells develop water from it in small quantities.

Hydrogeology

Rock Type:	Alluvium-younger
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to low
Hydraulic Conductivity (ft/d):	1 - 500

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3010411623321
Aquifer Sector:	Honolulu
Aquifer System:	Moanalua
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Potential use
Utility:	Neither
Salinity (mg/L Cl-):	Moderate (1,000-5,000)
Uniqueness:	Replaceable
Vulnerability:	High

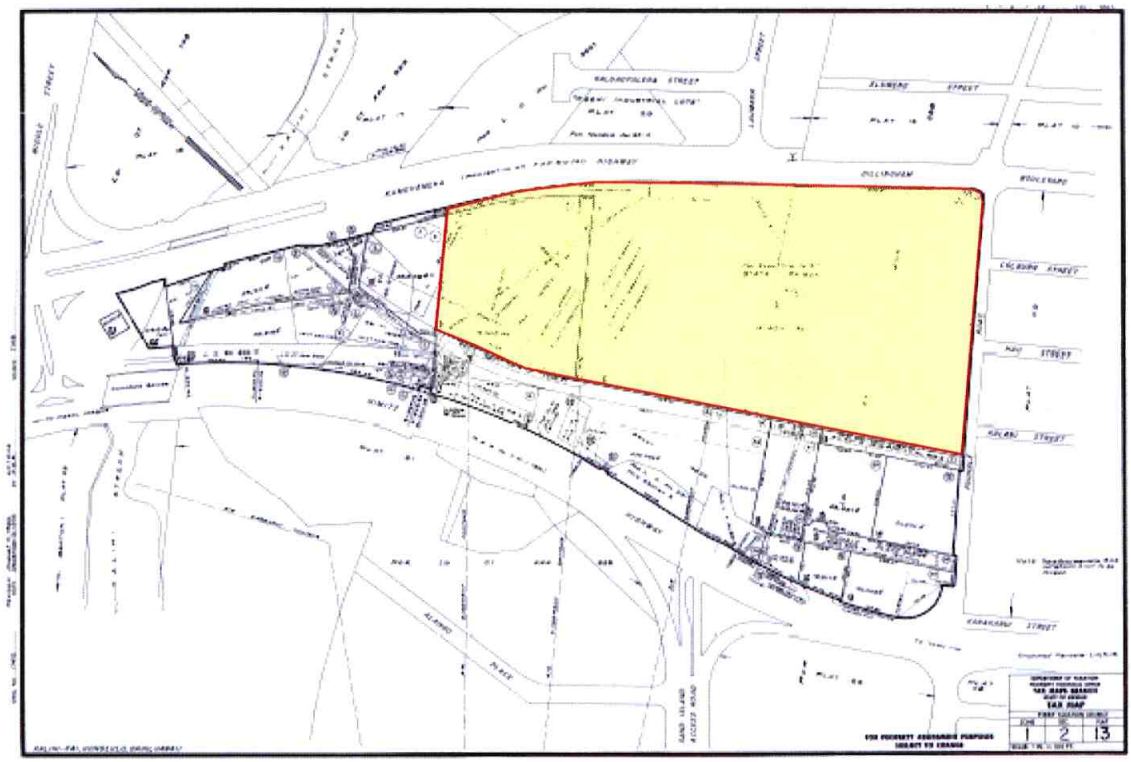
Lower Aquifer

Aquifer Status Code:	3010412111113
Aquifer Sector:	Honolulu
Aquifer System:	Moanalua
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	Low

Oahu Prison Dump

Category 3

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	34		
Municipal Well(s)within one mile	8	**Observation Well(s)within one mile**	2
BWS Well(s) within one mile	8	**Sealed Well(s)within one mile**	16
Domestic Well(s)within one mile	2	**Unused Well(s) within one mile**	4
Irrigation Well(s)within one mile	0	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	2

Oahu Prison Dump

Category 3

Well Details

USGS Well Number	1952-08	**Aquifer**	30103
Well Name	Kalihi Pump Station	**Elevation of Ground Surface (ft amsl)**	21
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	490
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-469
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	29.7
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1900		

USGS Well Number	1952-22	**Aquifer**	30103
Well Name	Kalihi Pump Station	**Elevation of Ground Surface (ft amsl)**	24
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	360
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-336
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	25.9
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1927		

USGS Well Number	1952-19	**Aquifer**	30103
Well Name	Kalihi Pump Station	**Elevation of Ground Surface (ft amsl)**	23
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	414
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-391
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	26
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1926		

USGS Well Number	1952-18	**Aquifer**	30103
Well Name	Kalihi Pump Station	**Elevation of Ground Surface (ft amsl)**	24
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	442
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-418
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	25.9
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1926		

Oahu Prison Dump

Category 3

USGS Well Number	1952-16	**Aquifer**	30103
Well Name	Kalihi Pump Station	**Elevation of Ground Surface (ft amsl)**	21
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	430
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-409
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	25.6
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1926		

USGS Well Number	1952-07	**Aquifer**	30103
Well Name	Kalihi Pump Station	**Elevation of Ground Surface (ft amsl)**	20
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	475
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-455
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	28.8
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1900		

USGS Well Number	1952-06	**Aquifer**	30103
Well Name	Kalihi Pump Station	**Elevation of Ground Surface (ft amsl)**	21
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	460
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-439
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	30.4
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1900		

USGS Well Number	1952-17	**Aquifer**	30103
Well Name	Kalihi Pump Station	**Elevation of Ground Surface (ft amsl)**	19
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	401
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-382
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	26.1
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1926		

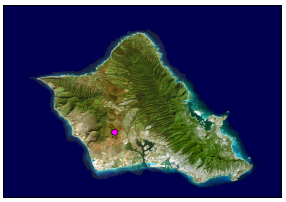
Oahu Prison Dump

Category 3

USGS Well Number	2053-13	**Aquifer**	
Well Name	Fort Shafter	**Elevation of Ground Surface (ft amsl)**	20
Well Owner	U S Army	**Well Depth (feet bgs)**	290
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-270
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	19.8
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1100
Drilling Method	Percussion		
Year of Construction	1995		

USGS Well Number	2053-11	**Aquifer**	30104
Well Name	Ft Shafter	**Elevation of Ground Surface (ft amsl)**	21
Well Owner	U S Army	**Well Depth (feet bgs)**	330
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-309
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1960		

Oahu Sugar Dump 1



Oahu Sugar Dump 1

Category 1

Site Description

According to a historic map (Young, 1993; Map 9), the open-space Oahu Sugar Dump 1 was located south of Kunia and Kupehau Road, west of Kunia Road (0.6 miles), northwest of Waipahu, and at the edge of or within the Honouliuli Stream
Valley. The most likely location of the dump is on the northeast-facing slope of the Honouliuli Stream Valley to the southeast of Kupehau Road. The parcel on which the dump is suspected to have been located is currently owned by the James Campbell Trust Estate. Surrounding properties include pineapple farms and cattle ranches. A sign at the corner of Kunia Road and Kupehau Road informs the public that access is restricted.

Oahu Sugar Dump 1, operated by Oahu Sugar Company, was used to dispose of plantation refuse. Although no records on the period of operation were located, the dump probably operated during the 1940s to 1950s. There was no documentation found to indicate that the dump was permitted, lined, capped, or properly closed. The dump was probably small and was likely located at the edge of an agricultural field in a gulch not useable for farming. The former dump was probably a burn and dump operation.

During a recent site visit, discarded wooden poles, concrete rubble, and a rusted drum (former contents unknown) were among the items observed in the Honouliuli Stream
Valley. However, there were no visible indications of extensive former dumping activities.

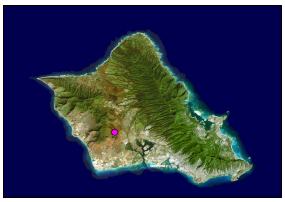
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	9-2-001:001
2367797.31980	598056.23857	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Honouliuli
158 03 14	21 24 35	**Plat:**	Not Designated
Address:	210, 880 Kunia Road	**Quadrangle:**	Schofield Barracks

Ownership

Current Owner: James Campbell Trust Estate (Oahu Sugar Co Ltd-lessee)

Previous Operator: Oahu Sugar Company



Oahu Sugar Dump 1

Category 1

Site Operation and History

Landfill Type: Agricultural

Type of Waste: Plantation refuse

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940s-1950s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	No Further Response Action Planned
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Agricultural

City and County Zoning: Ag-1

State Land Use District: Agricultural

Facilities: --

TMK Separation: no data available

Flood Zone: D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province: Schofield Plateau

Elevation Range (ft): 560 **to** 600

Approximate Landfill Acreage: 1-5

Parcel Acreage: 1,829.842

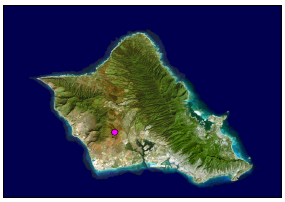
Climate

Annual Precipitation (cm): 49.40

Precipitation Days Per Year 30

Average Temperature (°F): 76.0

Temperature Range (° F): 67.4 **to** 84.5



Oahu Sugar Dump 1

Category 1

Soils

Soil Map Symbol:	KyA	**Bulk Density (gm/cc):**	1.10-1.40
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.12-0.14
Soil Series:	Kunia	**Organic Carbon (%):**	1.0-4.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	0-3
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	KyC	**Bulk Density (gm/cc):**	1.10-1.40
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.12-0.14
Soil Series:	Kunia	**Organic Carbon (%):**	1.0-4.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	8-15
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

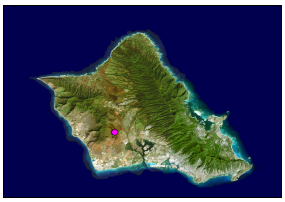
Soil Map Symbol:	KlB	**Bulk Density (gm/cc):**	1.10-1.40
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.12-0.15
Soil Series:	Kawaihapai	**Organic Carbon (%):**	1.0-2.0
Engineering Classification:	Clay Loam; Stony or Very Stony	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	2-6
Thickness of Surface Soil (in):	0-54	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Geology

Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.



Oahu Sugar Dump 1

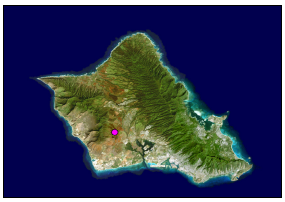
Category 1

Hydrogeology

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Aquifer Status Code:	3020311111111
Aquifer Sector:	Pearl Harbor
Aquifer System:	Waipahu
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High



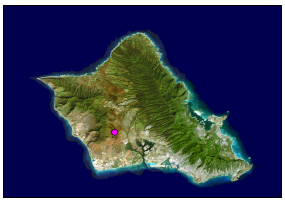
Oahu Sugar Dump 1

Category 1

Site Reconnaissance

Site Description: The area in which the former Oahu Sugar Dump 1 is suspected to have been formerly located is predominately agricultural. Surrounding properties include pineapple farms and cattle ranches. Kupehau Road passes perpendicularly through the northwest-southeast trending Honouliuli Stream Valley in which the former dump is suspected to have been located. Based on historic maps, the most likely location of the dump is on the northeast-facing slope of the Honouliuli Stream Valley to the southeast of Kupehau Road. During the site visit, discarded wooden poles, concrete rubble, and a rusted drum (former contents unknown) were among the items observed in the Honouliuli Stream Valley. However, there were no visible indications of extensive former dumping activities.

Type of Property:	Agricultural.
Current Site Operations:	There were no observed current operations on the suspected site location. Pineapple farms and a cattle ranch was observed on nearby areas to the south.
Age of Development:	Unknown.
Onsite Building Information:	None.
Was There a Recognizable Dump/Landfill?	No.
Institutional Controls:	A wire fence lines the northern and eastern sides of the suspected site location. A sign at the corner of Kunia Road and Kupehau Road informs the public that access is restricted.
Number of MonitoringWells:	None observed.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	None observed.
Odors, Staining, Distressed Vegetation:	The portion of the vegetation in the valley in the vicinity of the suspected dump location appeared to be distressed.
Drainage Features:	A culvert was observed under Kupehau Road. The culvert appears to allow water to flow from the gully southeast of the site into the site.
Areas of Ponded Water Onsite:	A ponding area was observed approximately 0.25 miles southwest of the site. The ponding area was relatively small (approximately 500 square feet).



Oahu Sugar Dump 1

Category 1

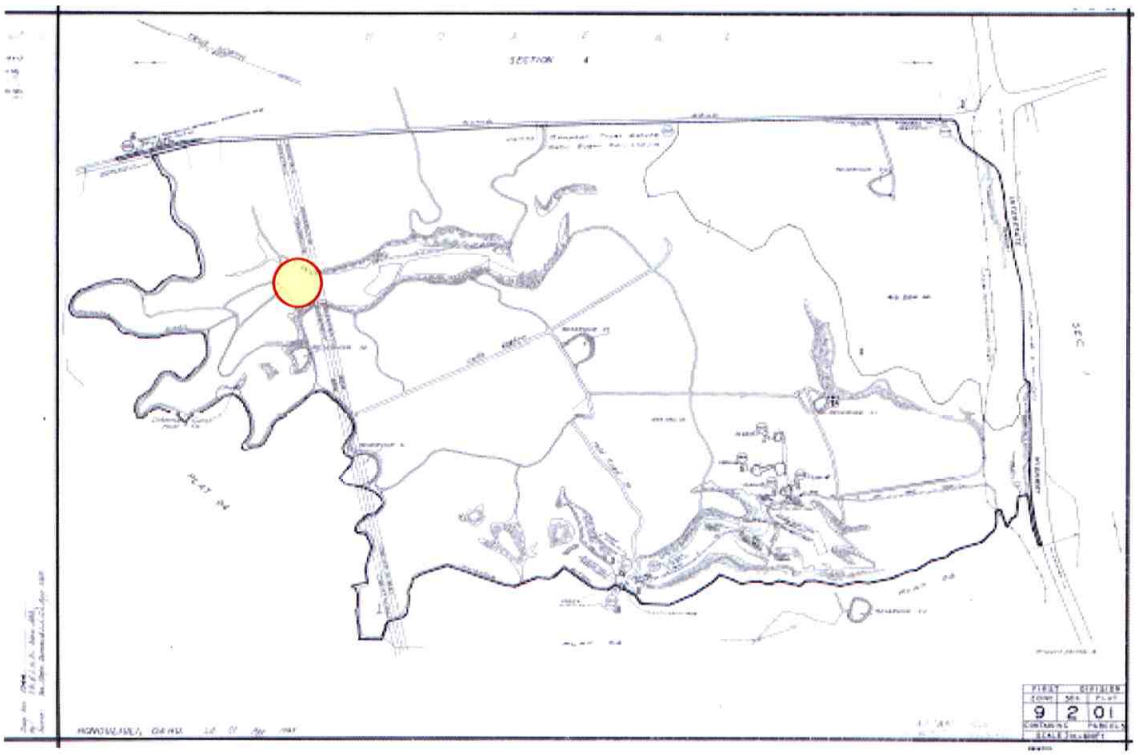
Site Reconnaissance (cont.)

Storm Water Retention Pond:	None observed.
House and Schools in the Vicinity:	None observed.
Distance to Nearest Residence, School, or Businesses:	Unknown.
How is Drinking Water in the Area Supplied?	Unknown.
Natural Resources, Agriculture, Aquaculture Near the Site?	Pineapple farms were observed southwest of the site.
Name of Surface Water Within 1-mile of Dump/Landfill:	Waiahole Stream.
Distance to Surface Water:	Approximately 0.25 miles.
Proximal Direction of Surface Water:	North.
Where Does Surface Water Flow?	USGS topographic maps indicate that surface water would pond in the ponding area observed southwest of the site.
Surface Water Used for Drinking?	Unknown. Assumed no. However, the Waiahole Stream water is used for irrigation of nearby farms.
Surface Water Used for Recreation?	Unknown.
Wetlands:	None observed.
Off-site Sources of Contamination:	The nearby pineapple farm may be using pesticides and herbicides.
Does Run-off from other Sites Flow onto Subject Property:	Yes. Runoff from the gully to the southeast enters the site through the previously mentioned culvert. Topography indicates that runoff from the area immediately northeast would also flow into the site.
Adjacent Property-North:	Plantation road; Across the road was an area of distressed vegetation.
Adjacent Property-South:	Pineapple farm.
Adjacent Property-East:	Kupehau Road; Across the road was a highly vegetated gully.
Adjacent Property-West:	

Oahu Sugar Dump 1

Category 1

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	1		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	1
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Photo 1. **Looking southwest from Kupehau Road at a northeast-facing slope of a swale in which Oahu Sugar Dump 1 is thought to have been located. No distinct indications of the specific dump location were noted during the site visit.**

Photo 2. **Looking southeast down the swale located on the southeastern side of Kupehau Road.**

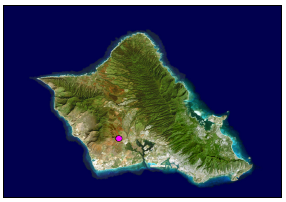
Photo 3. **Looking northwest at discarded telephone poles located on a fenced property, which is in the bottom of the swale on the west side of Kupehau Road.**

Photo 4. **Looking southwest at concrete rubble scattered along a fence line that runs along the northeastern ridgeline of the subject swale.**

Photo 5. **Looking southeast from the ridgeline that runs along the northeastern side of the subject swale.**

Photo 6. **Looking southeast from the ridgeline that runs along the southwestern side of the subject swale.**

Oahu Sugar Dump 2



Oahu Sugar Dump 2

Category 1

Site Description

According to a historic map (Young, 1993; Map 9), the Oahu Sugar Dump 2 was located west of Waipahu, Kunia Road (0.4 miles), and Cane Haul Road, to the north of H-1 Freeway (0.8 miles), and at the edge of or within Honouliuli Stream Valley. The area in which the dump is suspected to have been located is on undeveloped land in a gulch within James Campbell Trust Estate property and is surrounded by agricultural areas.

Oahu Sugar Dump 2, operated by Oahu Sugar Company, was used to dispose of plantation refuse. Although no records on the period of operation were located, the dump probably operated during the 1940s to 1950s. There was no documentation found to indicate that the dump was permitted, lined, capped, or properly closed. The dump was probably small and was likely located at the edge of an agricultural field in a gulch not useable for farming. The former dump was probably a burn and dump operation.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	9-2-001:001
2365703.06174	599317.99653	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Honouliuli
158 02 30	21 23 26	**Plat:**	Not Designated
Address:	210, 880 Kunia Road	**Quadrangle:**	Schofield Barracks

Ownership

Current Owner: James Campbell Trust Estate (Oahu Sugar Co Ltd-lessee)

Previous Operator: Oahu Sugar Company

Site Operation and History

Landfill Type: Agricultural

Type of Waste: Plantation refuse

Monitoring Well Network? No wells documented

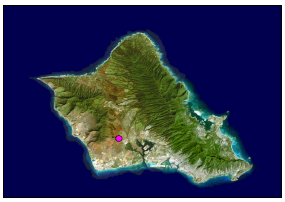
Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940s-1950s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka



Oahu Sugar Dump 2

Category 1

Population and Land Use

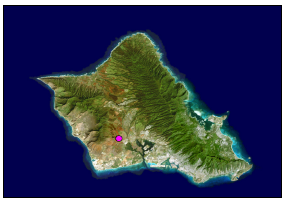
Type of Development in the Surronding Area?	Agricultural
City and County Zoning:	Ag-1
State Land Use District:	Agricultural
Facilities:	--
TMK Separation:	
Flood Zone:	D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province:	Schofield Plateau
Elevation Range (ft):	280 **to** 320
Approximate Landfill Acreage:	1-5
Parcel Acreage:	1,829.842

Climate

Annual Precipitation (cm):	49.40
Precipitation Days Per Year	30
Average Temperature (°F):	76.0
Temperature Range (° F):	67.4 **to** 84.5



Oahu Sugar Dump 2

Category 1

Soils

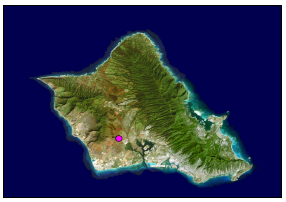
Soil Map Symbol:	MuA	**Bulk Density (gm/cc):**	1.10-1.35
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Molokai	**Organic Carbon (%):**	1.0-4.0
Engineering Classification:	Silty Clay Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	0-3
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.8
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	MuC	**Bulk Density (gm/cc):**	1.10-1.35
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Molokai	**Organic Carbon (%):**	1.0-4.0
Engineering Classification:	Silty Clay Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	7-15
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.8
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	rRK	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Rock land	**Moisture Retention (%):**	0.12-0.16
Soil Series:	Rock Land	**Organic Carbon (%):**	3.0-6.0
Engineering Classification:	Silty Clay Loam, Unweathered Bedrock	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Very poor	**Slope (%):**	>15
Thickness of Surface Soil (in):	0-8	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	KlA	**Bulk Density (gm/cc):**	1.10-1.40
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.12-0.15
Soil Series:	Kawaihapai	**Organic Carbon (%):**	1.0-2.0



Oahu Sugar Dump 2

Category 1

Engineering Classification:	Clay Loam; Stony or Very Stony	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	0-2
Thickness of Surface Soil (in):	0-54	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Geology

Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

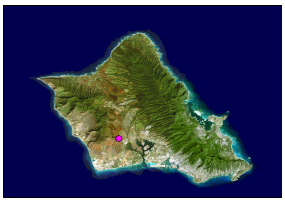
Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.

Hydrogeology

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Aquifer Status Code:	3020311111111
Aquifer Sector:	Pearl Harbor
Aquifer System:	Waipahu
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

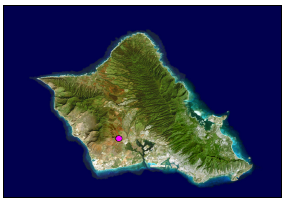


Oahu Sugar Dump 2

Category 1

Site Reconnaissance

Site Description:	The area in which the former Oahu Sugar Dump 2 is suspected to have been located is in a gulch within Campbell Estate property. Plantation areas are located to the east, west, and north of the site. An abandoned plantation road was observed near the northeastern edge of the site. Exposed portions of a concrete pipe was observed along the southern edge of the abandoned plantation road. A rusted, abandoned machine was also observed along the plantation road. The true purpose of the machine is unknown, however Mr. Franzell believes it may be an old water pump station.
Type of Property:	Undeveloped land in a gulch within Campbell Estates properties. Areas to the east and west of the site are farms.
Current Site Operations:	There were no observed current operations on the suspected site location. Plantation farms were observed on nearby areas to the east and west.
Age of Development:	Not applicable.
Onsite Building Information:	None.
Was There a Recognizable Dump/Landfill?	No.
Institutional Controls:	There are no institutional controls around the site itself. However, access the plantation areas is restricted.
Number of MonitoringWells:	None observed.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	None observed.
Odors, Staining, Distressed Vegetation:	None observed.
Drainage Features:	None observed.
Areas of Ponded Water Onsite:	None observed.



Oahu Sugar Dump 2

Category 1

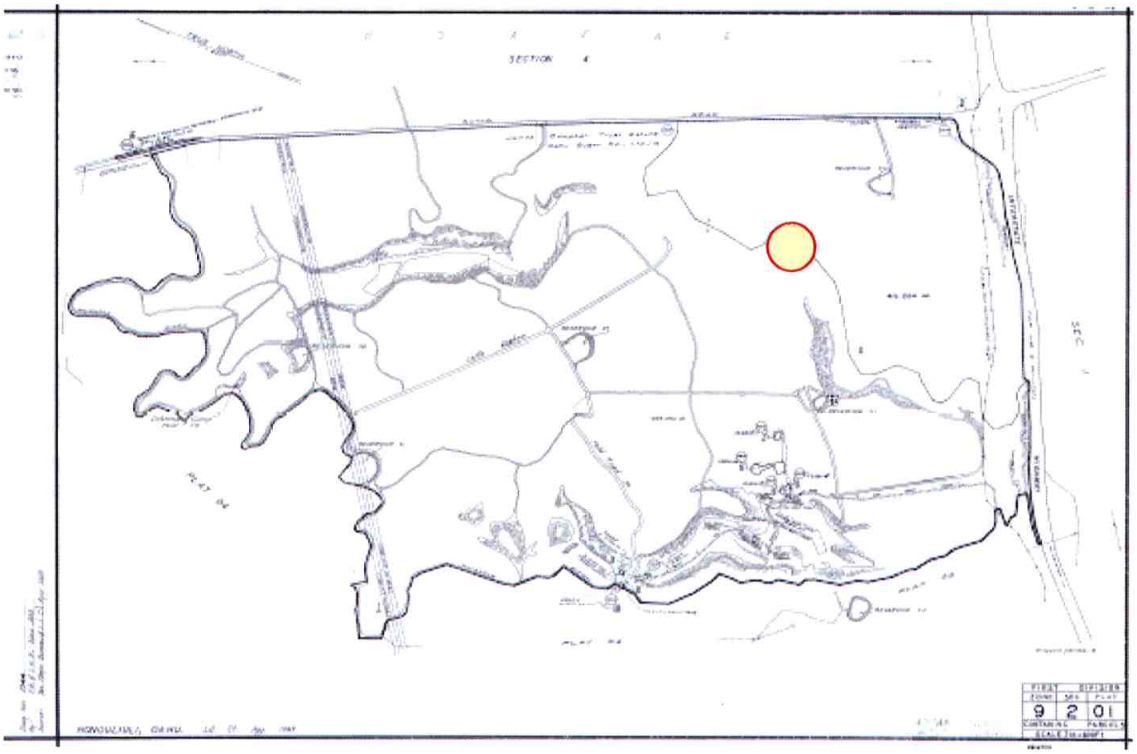
Site Reconnaissance (cont.)

Storm Water Retention Pond:	None observed.
House and Schools in the Vicinity:	None observed.
Distance to Nearest Residence, School, or Businesses:	Unknown.
How is Drinking Water in the Area Supplied?	Unknown.
Natural Resources, Agriculture, Aquaculture Near the Site?	Plantation areas were observed east and west of the site.
Name of Surface Water Within 1-mile of Dump/Landfill:	Honouliuli Stream.
Distance to Surface Water:	Approximately 0.75 miles.
Proximal Direction of Surface Water:	South.
Where Does Surface Water Flow?	USGS topographic maps indicate that surface water would flow through the gulch into the Honouliuli Stream.
Surface Water Used for Drinking?	Unknown. Assumed no.
Surface Water Used for Recreation?	Unknown.
Wetlands:	None observed.
Off-site Sources of Contamination:	The nearby plantation lands may be using pesticides and herbicides.
Does Run-off from other Sites Flow onto Subject Property:	Topography indicates that runoff from the plantation areas to the east and west would flow into the site.
Adjacent Property-North:	Plantation lands.
Adjacent Property-South:	Undeveloped gulch land.
Adjacent Property-East:	Plantation lands.
Adjacent Property-West:	Plantation lands.

Oahu Sugar Dump 2

Category 1

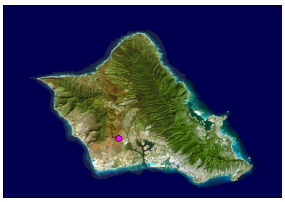
TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	11		
Municipal Well(s)within one mile	9	**Observation Well(s)within one mile**	1
BWS Well(s) within one mile	9	**Sealed Well(s)within one mile**	0
Domestic Well(s)within one mile	0	**Unused Well(s) within one mile**	1
Irrigation Well(s)within one mile	0	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	0



Oahu Sugar Dump 2

Category 1

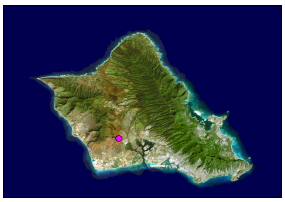
Well Details

USGS Well Number	2302-03	**Aquifer**	30203
Well Name	Kunia I P3	**Elevation of Ground Surface (ft amsl)**	206
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	427
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-221
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	Rotary		
Year of Construction	1972		

USGS Well Number	2303-02	**Aquifer**	30204
Well Name	Honouliuli I-2	**Elevation of Ground Surface (ft amsl)**	411
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	563
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-199
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	16
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	875
Drilling Method	Percussion		
Year of Construction	1987		

USGS Well Number	2202-21	**Aquifer**	30203
Well Name	Ep 15,16	**Elevation of Ground Surface (ft amsl)**	150
Well Owner	Campbell Est	**Well Depth (feet bgs)**	156
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-6
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	22.4
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	18750
Drilling Method	SHF		
Year of Construction	1939		

USGS Well Number	2302-02	**Aquifer**	30203
Well Name	Kunia I P2	**Elevation of Ground Surface (ft amsl)**	201
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	338
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-137
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	20.9
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	--		
Year of Construction	1957		



Oahu Sugar Dump 2

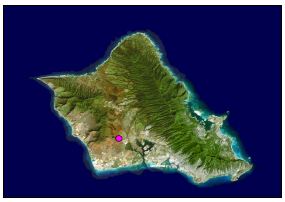
Category 1

USGS Well Number	2302-04	**Aquifer**	30203
Well Name	Kunia I P4	**Elevation of Ground Surface (ft amsl)**	201
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	420
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-219
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	Rotary		
Year of Construction	1972		

USGS Well Number	2402-01	**Aquifer**	30203
Well Name	Kunia II P1	**Elevation of Ground Surface (ft amsl)**	430
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	575
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-145
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	20.6
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1500
Drilling Method	Percussion		
Year of Construction	1969		

USGS Well Number	2402-02	**Aquifer**	30203
Well Name	Kunia II P2	**Elevation of Ground Surface (ft amsl)**	430
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	575
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-145
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	24.8
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	--		
Year of Construction	1969		

USGS Well Number	2402-03	**Aquifer**	30203
Well Name	Kunia II P3	**Elevation of Ground Surface (ft amsl)**	417
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	610
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-193
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	17
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	Percussion		
Year of Construction	1990		



Oahu Sugar Dump 2

Category 1

USGS Well Number	2302-01	**Aquifer**	30203
Well Name	Kunia I P1	**Elevation of Ground Surface (ft amsl)**	201
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	350
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-149
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	20.8
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	--		
Year of Construction	1957		

Photo 1. **Looking west into the gulch in which the former dump is suspected to have been located. No distinct indications of the specific dump location were noted during the site visit.**

Photo 2. **Looking south across the gulch. Agricultural fields border both sides of the gulch.**

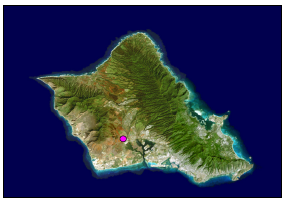
Photo 3. Looking west at the former plantation road that bordered the northern side of the Honouliuli Gulch.

Photo 4. Looking at the exposed portions of an abandoned water pipe that runs along the southern side of the former plantation road.

Photo 5. Pile of asphalt observed along the northern side of the former plantation road.

Photo 6. **Standing on the former plantation road looking at an abandoned machine near the western edge of the road. The machine appears to be an old pumping station.**

Oahu Sugar Dump 3



Oahu Sugar Dump 3

Category 1

Site Description

Oahu Sugar Dump 3, operated by Oahu Sugar Company, was used to dispose of plantation refuse. According to a historic map (Young, 1993; Map 9), the open-space dumping area was reportedly located in what is currently the western portion of Waipahu. The area in which Oahu Sugar Dump 3 was formerly located has been redeveloped. The location of the former dump indicated in aerial photographs and on a historic map (Young, 1993; Map 9) is currently the Village Park subdivision. The surrounding area is residential. No visible indications of current or former dumping activities were observed during the site visit.

Historical aerial photographs, dating back to 1949, were reviewed for Oahu Sugar Dump 3. The review focused on a site bounded by Kunia Road to the west and Highway-1 to the south, which was the location of Oahu Sugar Dump 3 indicated by historic maps. The aerial photographs show what appear to be sugar cane fields on the subject site from 1949 to at least 1956. The next photograph, taken August 23, 1969, shows a relatively small (100 x 200 foot), northeast/southwest trending, vegetation-covered mound, which is assumed to be the former dump, and what appears to be dumping activity along a dirt road on the southwestern portion of the site. The vegetation on and around the mound differs from that on the rest of the parcel. The mound and differing vegetation were noted on photographs from 1969-1976. The next photograph of the site, taken September 21, 1982, shows a subdivision on the parcel. The mound, which is assumed to be the former dump, was no longer visible.

There was no documentation found which indicated that the dump was permitted. The dump was not documented to have a lining. The dump may have been capped with soil prior to being razed for construction of the Village Park subdivision.

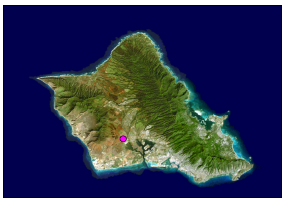
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	9-4-106 (various)
2365511.19649	600550.48691	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Hoaeae
158 01 48	21 23 20	**Plat:**	Not Designated
Address:	south of Kupuna Loop, east of Kupuohi Street, north of Kupuohi Place	**Quadrangle:**	Schofield Barracks

Ownership

Current Owner: Dump location was developed in the 1980s. Numerous individual homeowners now own portions of the former dump site.

Previous Operator: Oahu Sugar Company



Oahu Sugar Dump 3

Category 1

Site Operation and History

Landfill Type: Agricultural

Type of Waste: Plantation refuse

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940s-1950s	**EPA ID No.:**	Not documented
Lined?	Not applicable, dump was razed	**Non-NPL status:**	Not applicable
Capped?	Not applicable, dump was razed	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Residential, agricultural

City and County Zoning: P-2

State Land Use District: Urban

Facilities: Residential homes

TMK Separation: --

Flood Zone: D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province: Schofield Plateau

Elevation Range (ft): 200 **to** 240

Approximate Landfill Acreage: 1-5

Parcel Acreage: Various

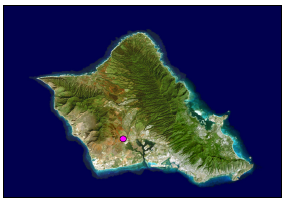
Climate

Annual Precipitation (cm): 49.40

Precipitation Days Per Year 30

Average Temperature (°F): 76.0

Temperature Range (° F): 67.4 **to** 84.5



Oahu Sugar Dump 3

Category 1

Soils

Soil Map Symbol:	MuC	**Bulk Density (gm/cc):**	1.10-1.35
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Molokai	**Organic Carbon (%):**	1.0-4.0
Engineering Classification:	Silty Clay Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	7-15
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.8
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

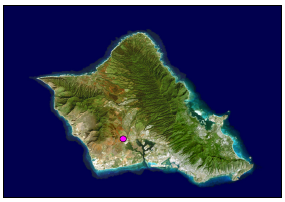
Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.

Hydrogeology

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

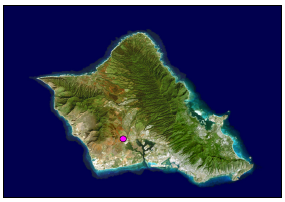


Oahu Sugar Dump 3

Category 1

Aquifer(s)

Aquifer Status Code:	3020311111111
Aquifer Sector:	Pearl Harbor
Aquifer System:	Waipahu
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

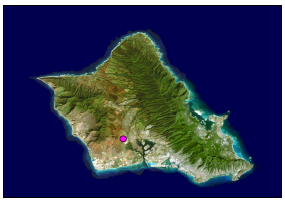


Oahu Sugar Dump 3

Category 1

Site Reconnaissance

Site Description:	The area in which Oahu Sugar Dump 3 was formerly located has been redeveloped into a residential community with single family homes and residential apartment complexes. No visible indications of current or former dumping activities were observed during the site visit.
Type of Property:	Residential community.
Current Site Operations:	The site is a residential community with single family dwellings.
Age of Development:	Approximately 25 years.
Onsite Building Information:	Single family homes and apartments.
Was There a Recognizable Dump/Landfill?	No.
Institutional Controls:	None observed.
Number of MonitoringWells:	None observed.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	None observed.
Odors, Staining, Distressed Vegetation:	None observed.
Drainage Features:	Municipal stormwater drainage system.
Areas of Ponded Water Onsite:	None observed.



Oahu Sugar Dump 3

Category 1

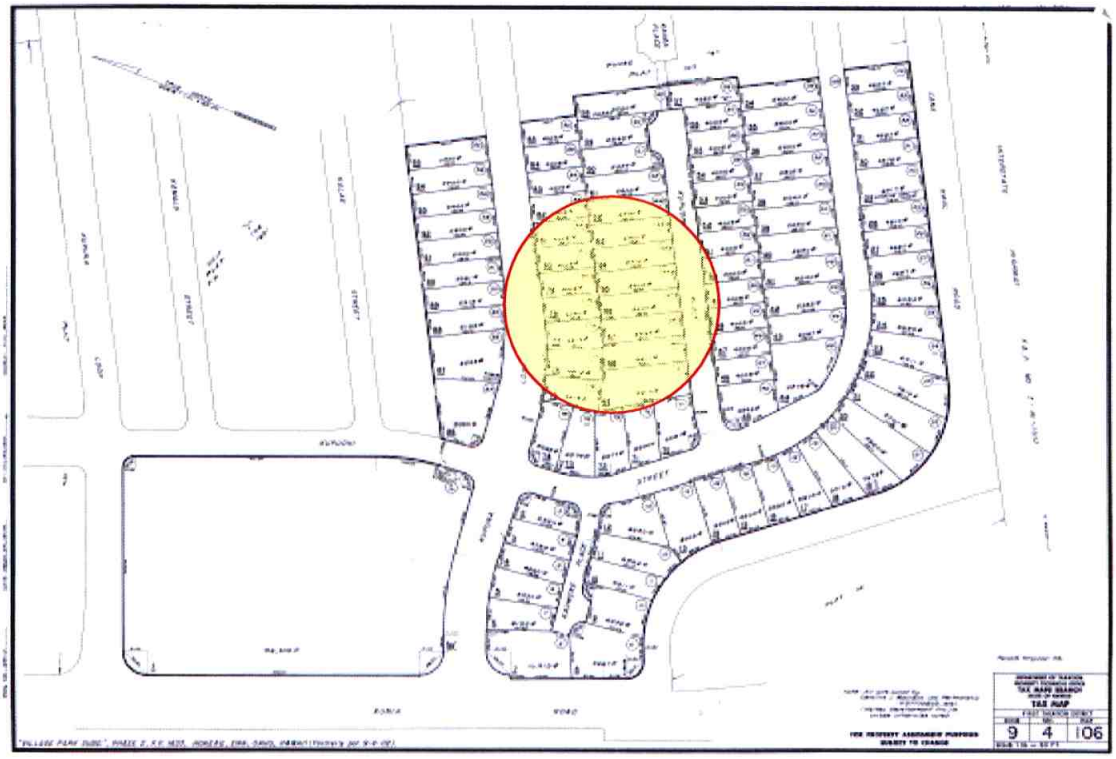
Site Reconnaissance (cont.)

Storm Water Retention Pond:	None observed.
House and Schools in the Vicinity:	Yes.
Distance to Nearest Residence, School, or Businesses:	Kaleiopuu Elementary School is approximately 0.25 miles east of the site. Residences are located onsite and immediately adjacent on all sides.
How is Drinking Water in the Area Supplied?	Municipal water supply.
Natural Resources, Agriculture, Aquaculture Near the Site?	No.
Name of Surface Water Within 1-mile of Dump/Landfill:	Unnamed stream in the gulch.
Distance to Surface Water:	Approximately 0.2 miles.
Proximal Direction of Surface Water:	East
Where Does Surface Water Flow?	Municipal stormwater system.
Surface Water Used for Drinking?	No.
Surface Water Used for Recreation?	No.
Wetlands:	None observed.
Off-site Sources of Contamination:	None observed.
Does Run-off from other Sites Flow onto Subject Property:	None observed.
Adjacent Property-North:	Residential neighborhood.
Adjacent Property-South:	Residential neighborhood.
Adjacent Property-East:	Residential neighborhood and an unnamed gulch.
Adjacent Property-West:	Residential neighborhood.

Oahu Sugar Dump 3

Category 1

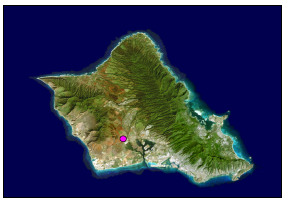
TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	48		
Municipal Well(s)within one mile	16	**Observation Well(s)within one mile**	2
BWS Well(s) within one mile	14	**Sealed Well(s)within one mile**	10
Domestic Well(s)within one mile	0	**Unused Well(s) within one mile**	16
Irrigation Well(s)within one mile	1	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	3



Oahu Sugar Dump 3

Category 1

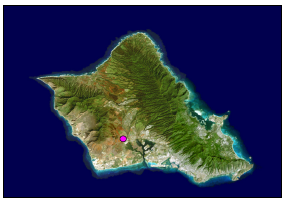
Well Details

USGS Well Number	2402-02	**Aquifer**	30203
Well Name	Kunia II P2	**Elevation of Ground Surface (ft amsl)**	430
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	575
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-145
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	24.8
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	--		
Year of Construction	1969		

USGS Well Number	2302-01	**Aquifer**	30203
Well Name	Kunia I P1	**Elevation of Ground Surface (ft amsl)**	201
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	350
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-149
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	20.8
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	--		
Year of Construction	1957		

USGS Well Number	2302-02	**Aquifer**	30203
Well Name	Kunia I P2	**Elevation of Ground Surface (ft amsl)**	201
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	338
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-137
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	20.9
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	--		
Year of Construction	1957		

USGS Well Number	2301-39	**Aquifer**	30203
Well Name	Hoaeae P6	**Elevation of Ground Surface (ft amsl)**	123
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	273
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-150
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	Rotary		
Year of Construction	1974		



Oahu Sugar Dump 3

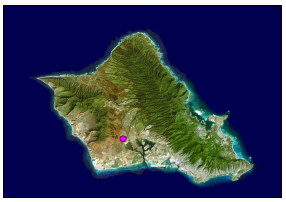
Category 1

USGS Well Number	2401-04	**Aquifer**	
Well Name	Kunia III-1	**Elevation of Ground Surface (ft amsl)**	317
Well Owner	C&C DHCD	**Well Depth (feet bgs)**	452
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-135
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	19.77
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	Rotary		
Year of Construction	1995		

USGS Well Number	2302-03	**Aquifer**	30203
Well Name	Kunia I P3	**Elevation of Ground Surface (ft amsl)**	206
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	427
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-221
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	Rotary		
Year of Construction	1972		

USGS Well Number	2401-05	**Aquifer**	
Well Name	Kunia III-2	**Elevation of Ground Surface (ft amsl)**	316
Well Owner	C&C DHCD	**Well Depth (feet bgs)**	454
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-138
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	19.77
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	Rotary		
Year of Construction	1995		

USGS Well Number	2402-01	**Aquifer**	30203
Well Name	Kunia II P1	**Elevation of Ground Surface (ft amsl)**	430
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	575
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-145
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	20.6
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1500
Drilling Method	Percussion		
Year of Construction	1969		



Oahu Sugar Dump 3

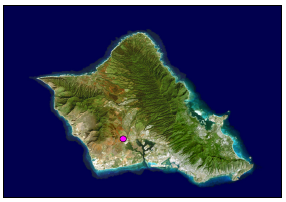
Category 1

USGS Well Number	2301-35	**Aquifer**	30203
Well Name	Hoaeae P2	**Elevation of Ground Surface (ft amsl)**	133
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	197
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-64
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	18.2
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1650
Drilling Method	--		
Year of Construction	1959		

USGS Well Number	2402-03	**Aquifer**	30203
Well Name	Kunia II P3	**Elevation of Ground Surface (ft amsl)**	417
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	610
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-193
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	17
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	Percussion		
Year of Construction	1990		

USGS Well Number	2302-04	**Aquifer**	30203
Well Name	Kunia I P4	**Elevation of Ground Surface (ft amsl)**	201
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	420
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-219
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	Rotary		
Year of Construction	1972		

USGS Well Number	2301-38	**Aquifer**	30203
Well Name	Hoaeae P5	**Elevation of Ground Surface (ft amsl)**	126
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	276
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-150
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	Rotary		
Year of Construction	1974		



Oahu Sugar Dump 3

Category 1

USGS Well Number	2301-34	**Aquifer**	30203
Well Name	Hoaeae P1	**Elevation of Ground Surface (ft amsl)**	131
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	194
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-63
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	17
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1650
Drilling Method	--		
Year of Construction	1959		

USGS Well Number	2301-37	**Aquifer**	30203
Well Name	Hoaeae P4	**Elevation of Ground Surface (ft amsl)**	130
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	195
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-65
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	19.3
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1650
Drilling Method	--		
Year of Construction	1959		

USGS Well Number	2301-36	**Aquifer**	30203
Well Name	Hoaeae P3	**Elevation of Ground Surface (ft amsl)**	131
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	198
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-67
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	19.5
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1650
Drilling Method	--		
Year of Construction	1959		

USGS Well Number	2401-06	**Aquifer**	
Well Name	Kunia III-3	**Elevation of Ground Surface (ft amsl)**	315
Well Owner	C&C DHCD	**Well Depth (feet bgs)**	460
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-145
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	18.54
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	Rotary		
Year of Construction	1995		

Photo 1. Looking south at the gulch that borders the eastern portion of the Village Park (Phase 2) subdivision in which the former dump was located.

Photo 2. Looking north up the axis of the gulch that borders the eastern portion of the Village Park (Phase 2) subdivision in which the former dump was located.

Oahu Sugar Dump 4 - Waipahu

Source: R.M. Towill Corporation

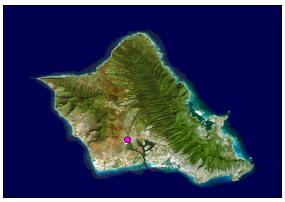
09-25-70

URS

Title **Aerial Photograph – Vicinity of Oahu Sugar Dump 4**

Project **Oahu Inactive Landfills Relative Risk Evaluation**

Project No. 26536686.00300



Oahu Sugar Dump 4 - Waipahu

Category 1

Site Description

According to a historic map (Young, 1993; Map 9), the Oahu Sugar Dump 4 was located between Farrington Highway and the H-1 Freeway, to the north of West Loch, to the west of Waikele Stream, and near the old Waipahu Mill. The most likely location of the dump is on a relatively flat spot situated between Waikele Stream and a residential area. There are four homes located immediately north of the site (within 200 feet), and a large number of apartment complexes located west, southwest, and upgradient of the site.

Oahu Sugar Dump 4, operated by Oahu Sugar Company, was used to dispose of plantation refuse. Although no records on the period of operation were located, the dump probably operated during the 1940s-1950s. There was no documentation found to indicate that the dump was permitted, lined, capped, or properly closed. The dump was probably small and was likely located at the edge of an agricultural field in a gulch not useable for farming. The former dump was probably a burn and dump operation. The parcel on which the dump is suspected to have been located is currently owned by the City and County of Honolulu.

During a recent site visit evidence of recent dumping (e.g. drums), and burning was observed. Stressed vegetation was noted near the northwestern corner of the site near the dumping and burned wastes area. Fill material thought to be covering the remains of the former Oahu Sugar Dump 4 raises the site elevation approximately 5 feet higher than that of the surrounding flat area immediately to the west.

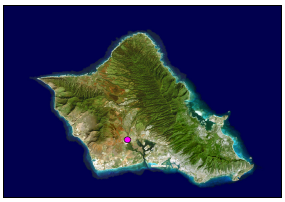
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	9-4-010:041
2365284.82402	601762.51302	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Waikele
158 01 05	21 23 12	**Plat:**	Not Designated
Address:	515 Waipahu Street	**Quadrangle:**	Waipahu

Ownership

Current Owner: City and County

Previous Operator: Oahu Sugar Company



Oahu Sugar Dump 4 - Waipahu

Category 1

Site Operation and History

Landfill Type: Agricultural

Type of Waste: Plantation refuse

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940s-1950s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Urban

City and County Zoning: P-2

State Land Use District: Urban

Facilities: --

TMK Separation: Steep land

Flood Zone: AE - 100-year Flood Plain, X - 500-year Flood Plain

Geography and Topography

Physiographic Province: Coastal Plain

Elevation Range (ft): 40 **to** 60

Approximate Landfill Acreage: 1-5

Parcel Acreage: 19.992

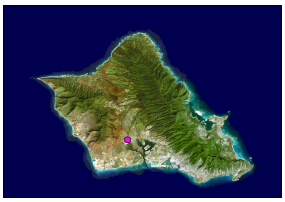
Climate

Annual Precipitation (cm): 49.40

Precipitation Days Per Year 30

Average Temperature (°F): 76.0

Temperature Range (° F): 67.4 **to** 84.5



Oahu Sugar Dump 4 - Waipahu

Category 1

Soils

Soil Map Symbol:	HeA	**Bulk Density (gm/cc):**	1.10-1.30
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.13-0.15
Soil Series:	Haleiwa	**Organic Carbon (%):**	1.0-3.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	0-2
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-6.5
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	rRK	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Rock land	**Moisture Retention (%):**	0.12-0.16
Soil Series:	Rock Land	**Organic Carbon (%):**	3.0-6.0
Engineering Classification:	Silty Clay Loam, Unweathered Bedrock	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Very poor	**Slope (%):**	>15
Thickness of Surface Soil (in):	0-8	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Geology

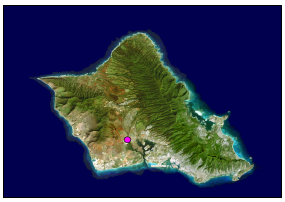
Geologic Symbol(s): Pa

Geologic Unit(s): Consolidated noncalcareous deposits

Geologic Description: Chiefly older alluvium, generally consisting of mottled brown to red-brown, deeply weathered, poorly-assorted, and nearly impermeable friable conglomerates, in places cemented with limonite or hematite and usually forming conspicuous terraces along the principal streams. Near the mouths of the valleys and especially around Pearl Harbor and near Waialua the older alluvium grades into partly consolidated sands and silts that are emerged delta deposits. The degree of consolidation is largely dependent upon the amount of rainfall, for in dry regions the material is much better cemented than in wet regions. Near the heads of valleys the older alluvium grades into coarse angular talus and landslide deposits which, in places, carry considerable water. In the large semiarid valleys in the Waianae Range these deposits are firmly cemented breccias. They are poorly permeable in wet areas and hold up perched water in the Honolulu volcanic series, but in the dry areas they yield small supplies of potable water.

Hydrogeology

Rock Type:	Alluvium-older-consolidated
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

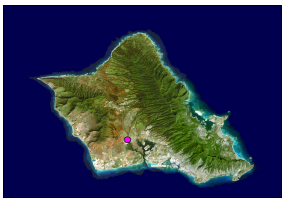


Oahu Sugar Dump 4 - Waipahu

Category 1

Aquifer(s)

Uppermost Aquifer	**Aquifer Status Code:**	3020311612211
	Aquifer Sector:	Pearl Harbor
	Aquifer System:	Waipahu
	Aquifer Type 1:	Basal
	Aquifer Type 2:	Unconfined
	Aquifer Type Geol.:	Sedimentary
	Development State:	Currently used
	Utility:	Ecologically important
	Salinity (mg/L Cl-):	Low (250-1000)
	Uniqueness:	Irreplaceable
	Vulnerability:	High
Lower Aquifer	**Aquifer Status Code:**	3020312112212
	Aquifer Sector:	Pearl Harbor
	Aquifer System:	Waipahu
	Aquifer Type 1:	Basal
	Aquifer Type 2:	Confined
	Aquifer Type Geol.:	Flank
	Development State:	Currently used
	Utility:	Ecologically important
	Salinity (mg/L Cl-):	Low (250-1000)
	Uniqueness:	Irreplaceable
	Vulnerability:	Moderate

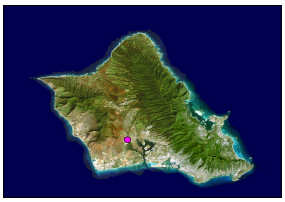


Oahu Sugar Dump 4 - Waipahu

Category 1

Site Reconnaissance

Site Description:	The most likely location of the Oahu Sugar 4 Dump is on a relatively flat area situated between Waikele Stream and residential areas. During the site visit fill material that raised the elevation approximately 5 feet higher than that of the surrounding flat area immediately to the west was noted. It is suspected that the fill material is covering the remains of the former Oahu Sugar Dump 4.
Type of Property:	Undeveloped property.
Current Site Operations:	None.
Age of Development:	The property appears to be at least 20 years old.
Onsite Building Information:	None
Was There a Recognizable Dump/Landfill?	No.
Institutional Controls:	None observed.
Number of MonitoringWells:	None observed.
Stability (signs of erosion, etc):	Possible erosion on the exposed ground near the recent dumping and burned wastes.
Leachate, Seeps:	None observed.
Odors, Staining, Distressed Vegetation:	Distressed vegetation was observed in a small patch near the northwestern corner of the site near the recent dumping and burned wastes.
Drainage Features:	None.
Areas of Ponded Water Onsite:	None observed.



Oahu Sugar Dump 4 - Waipahu

Category 1

Site Reconnaissance (cont.)

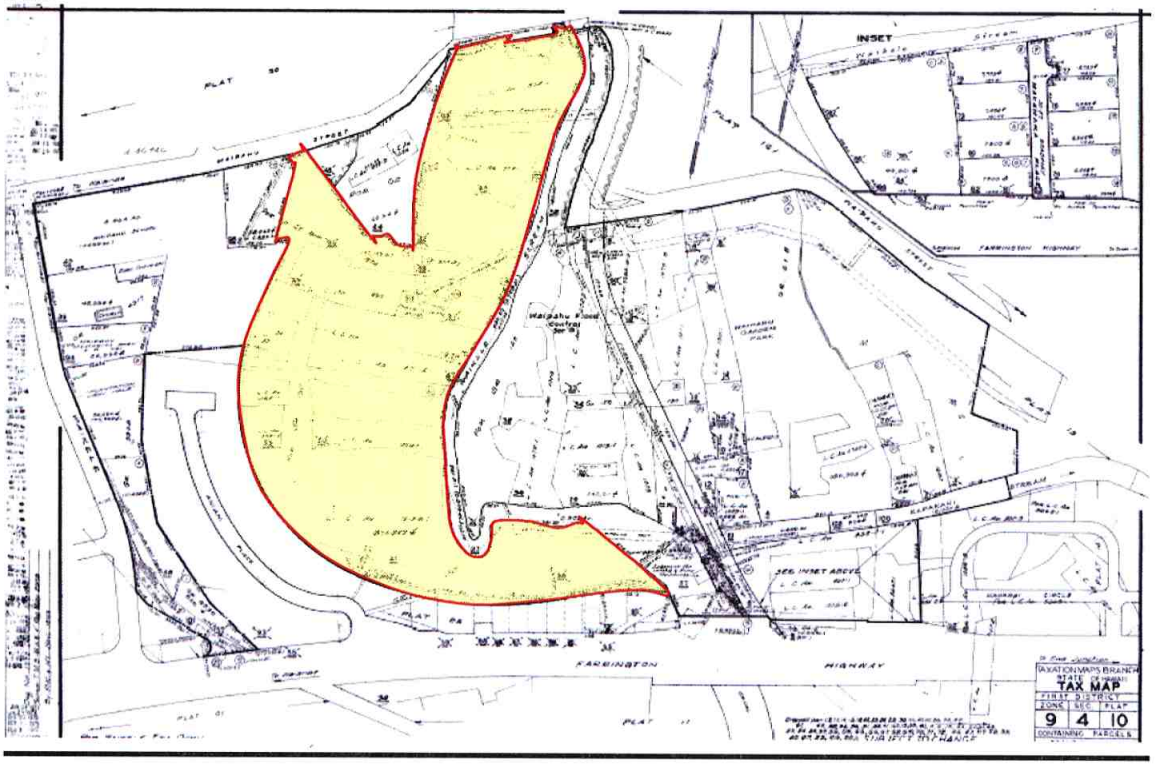
Storm Water Retention Pond:	None observed.
House and Schools in the Vicinity:	Yes.
Distance to Nearest Residence, School, or Businesses:	There are 4 homes located immediately north of the site (within 200 feet). There are also a large number of apartment complexes located west and southwest of the site. They are within 500 feet and upgradient of the site.
How is Drinking Water in the Area Supplied?	Water is currently not being supplied to the site. Surrounding properties appear to be supplied by the municipal water system.
Natural Resources, Agriculture, Aquaculture Near the Site?	No.
Name of Surface Water Within 1-mile of Dump/Landfill:	Waikele Stream.
Distance to Surface Water:	Approximately 0.25 miles.
Proximal Direction of Surface Water:	East.
Where Does Surface Water Flow?	Topography indicates surface water would flow to the east toward Waikele Stream.
Surface Water Used for Drinking?	Unknown. Assumed no.
Surface Water Used for Recreation?	Unknown.
Wetlands:	None observed.
Off-site Sources of Contamination:	None observed.
Does Run-off from other Sites Flow onto Subject Property:	Runoff from the preschool and the homes would flow toward the site. However, the raised fill material on site would divert the runoff to the east and eventually to the Waikele Stream.
Adjacent Property-North:	The site is bordered to the north by residential homes followed by Waipahu Road and more residential areas.
Adjacent Property-South:	The site is bordered to the south by heavy vegetation.
Adjacent Property-East:	The site is bordered to the east by a vegetated area that is relatively flat, but then drops into Waikele Stream.
Adjacent Property-West:	The site is bordered to the west by grassy land with a steep (~40 degree) incline, followed by residential apartment complexes.

Oahu Sugar Dump 4 - Waipahu

Category 1

TMK Map

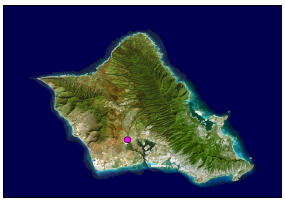
300



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	76		
Municipal Well(s)within one mile	13	**Observation Well(s)within one mile**	3
BWS Well(s) within one mile	10	**Sealed Well(s)within one mile**	24
Domestic Well(s)within one mile	0	**Unused Well(s) within one mile**	31
Irrigation Well(s)within one mile	2	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	3



Oahu Sugar Dump 4 - Waipahu

Category 1

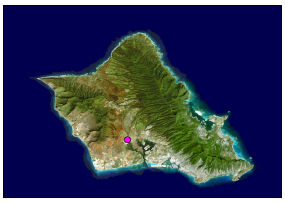
Well Details

USGS Well Number	2401-04	**Aquifer**	
Well Name	Kunia III-1	**Elevation of Ground Surface (ft amsl)**	317
Well Owner	C&C DHCD	**Well Depth (feet bgs)**	452
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-135
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	19.77
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	Rotary		
Year of Construction	1995		

USGS Well Number	2301-34	**Aquifer**	30203
Well Name	Hoaeae P1	**Elevation of Ground Surface (ft amsl)**	131
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	194
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-63
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	17
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1650
Drilling Method	--		
Year of Construction	1959		

USGS Well Number	2301-35	**Aquifer**	30203
Well Name	Hoaeae P2	**Elevation of Ground Surface (ft amsl)**	133
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	197
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-64
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	18.2
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1650
Drilling Method	--		
Year of Construction	1959		

USGS Well Number	2301-36	**Aquifer**	30203
Well Name	Hoaeae P3	**Elevation of Ground Surface (ft amsl)**	131
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	198
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-67
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	19.5
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1650
Drilling Method	--		
Year of Construction	1959		



Oahu Sugar Dump 4 - Waipahu

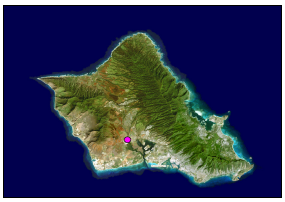
Category 1

USGS Well Number	2301-37	**Aquifer**	30203
Well Name	Hoaeae P4	**Elevation of Ground Surface (ft amsl)**	130
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	195
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-65
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	19.3
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1650
Drilling Method	--		
Year of Construction	1959		

USGS Well Number	2301-38	**Aquifer**	30203
Well Name	Hoaeae P5	**Elevation of Ground Surface (ft amsl)**	126
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	276
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-150
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	Rotary		
Year of Construction	1974		

USGS Well Number	2301-39	**Aquifer**	30203
Well Name	Hoaeae P6	**Elevation of Ground Surface (ft amsl)**	123
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	273
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-150
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	Rotary		
Year of Construction	1974		

USGS Well Number	2302-01	**Aquifer**	30203
Well Name	Kunia I P1	**Elevation of Ground Surface (ft amsl)**	201
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	350
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-149
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	20.8
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	--		
Year of Construction	1957		



Oahu Sugar Dump 4 - Waipahu

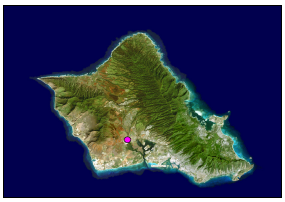
Category 1

USGS Well Number	2401-06	**Aquifer**	
Well Name	Kunia III-3	**Elevation of Ground Surface (ft amsl)**	315
Well Owner	C&C DHCD	**Well Depth (feet bgs)**	460
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-145
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	18.54
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	Rotary		
Year of Construction	1995		

USGS Well Number	2302-02	**Aquifer**	30203
Well Name	Kunia I P2	**Elevation of Ground Surface (ft amsl)**	201
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	338
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-137
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	20.9
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	--		
Year of Construction	1957		

USGS Well Number	2302-04	**Aquifer**	30203
Well Name	Kunia I P4	**Elevation of Ground Surface (ft amsl)**	201
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	420
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-219
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	Rotary		
Year of Construction	1972		

USGS Well Number	2302-03	**Aquifer**	30203
Well Name	Kunia I P3	**Elevation of Ground Surface (ft amsl)**	206
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	427
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-221
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	Rotary		
Year of Construction	1972		



Oahu Sugar Dump 4 - Waipahu

Category 1

USGS Well Number	2401-05	**Aquifer**	
Well Name	Kunia III-2	**Elevation of Ground Surface (ft amsl)**	316
Well Owner	C&C DHCD	**Well Depth (feet bgs)**	454
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-138
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	19.77
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	Rotary		
Year of Construction	1995		

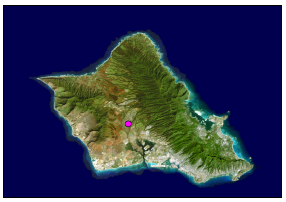
Photo 1. **Looking south in the direction of the access road leading to the area where the Oahu Sugar 4 dump is suspected to have been located.**

Photo 2. **Looking to the northeast of the access road. There is evidence of dumping, such as this drum that lies on the hillside overlooking the suspected location of the Oahu Sugar 4 dump.**

Photo 3. Located on the same incline, but south of the drum shown in Photo 2, signs of recent dumping and burning of waste were noted during the site visit.

Photo 4. An abandoned lot to the west of the access road. This lot may be the former dumpsite.

Oahu Sugar Dump 5



Oahu Sugar Dump 5

Category 1

Site Description

According to a historic map (Young, 1993; Map 9), the Oahu Sugar Dump 5 was located to the west of Kamehameha Highway between the Waikele and Kipapa Streams in what is currently the southern portion of Mililani. The area has been redeveloped into a residential community with dual-family homes surrounding a park.

Oahu Sugar Dump 5, operated by Oahu Sugar Company, was used to dispose of plantation refuse. Although no records on the period of operation were located, the dump probably operated during the 1940s-1950s. There was no documentation found to indicate that the dump was permitted, lined, capped, or properly closed. The dump was probably small and was likely located at the edge of an agricultural field in a gulch not useable for farming. The former dump was probably a burn and dump operation. The parcel on which the dump is suspected to have been located is currently owned by Lanikuhana Patio Homes. No visible indications of current or former dumping activities were observed during a recent site visit.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	9-4-079:001
2370647.88733	602082.11116	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Waipio
158 00 53	21 26 07	**Plat:**	Not Designated
Address:	435 Lanikuhana Place	**Quadrangle:**	Waipahu

Ownership

Current Owner: Lanikuhana Patio Homes

Previous Operator: Oahu Sugar Company

Site Operation and History

Landfill Type: Agricultural

Type of Waste: Plantation refuse

Monitoring Well Network? No wells documented

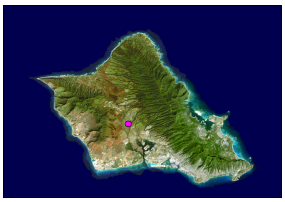
Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940s-1950s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka



Oahu Sugar Dump 5

Category 1

Population and Land Use

Type of Development in the Surronding Area?	Agricultural
City and County Zoning:	R-5
State Land Use District:	Urban
Facilities:	unknown at present
TMK Separation:	Remnant land
Flood Zone:	D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province:	Schofield Plateau
Elevation Range (ft):	520 **to** 560
Approximate Landfill Acreage:	1-5
Parcel Acreage:	9.542

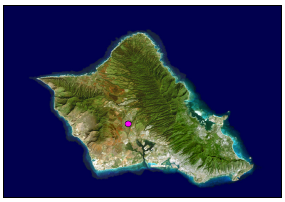
Climate

Annual Precipitation (cm):	49.40
Precipitation Days Per Year	30
Average Temperature (°F):	76.0
Temperature Range (° F):	67.4 **to** 84.5

Soils

Soil Map Symbol:	WaA	**Bulk Density (gm/cc):**	1.20-1.45
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Wahiawa	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	0-3
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High



Oahu Sugar Dump 5

Category 1

Geology

Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

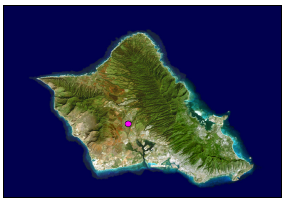
Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.

Hydrogeology

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Aquifer Status Code:	3020311111111
Aquifer Sector:	Pearl Harbor
Aquifer System:	Waipahu
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

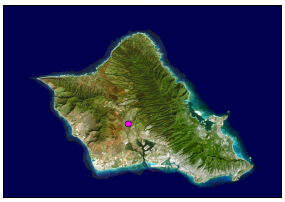


Oahu Sugar Dump 5

Category 1

Site Reconnaissance

Site Description:	The area in which Oahu Sugar Dump 5 was formerly located has been redeveloped into a residential community with dual-family homes. No visible indications of current or former dumping activities were observed during the site visit.
Type of Property:	Residential community.
Current Site Operations:	The site is a residential community with dual-family homes surrounding a park.
Age of Development:	Unknown.
Onsite Building Information:	Dual-family homes (approximately 30' x 50').
Was There a Recognizable Dump/Landfill?	No.
Institutional Controls:	None observed.
Number of MonitoringWells:	None observed.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	None observed.
Odors, Staining, Distressed Vegetation:	None observed.
Drainage Features:	Municipal stormwater drainage system.
Areas of Ponded Water Onsite:	None observed.



Oahu Sugar Dump 5

Category 1

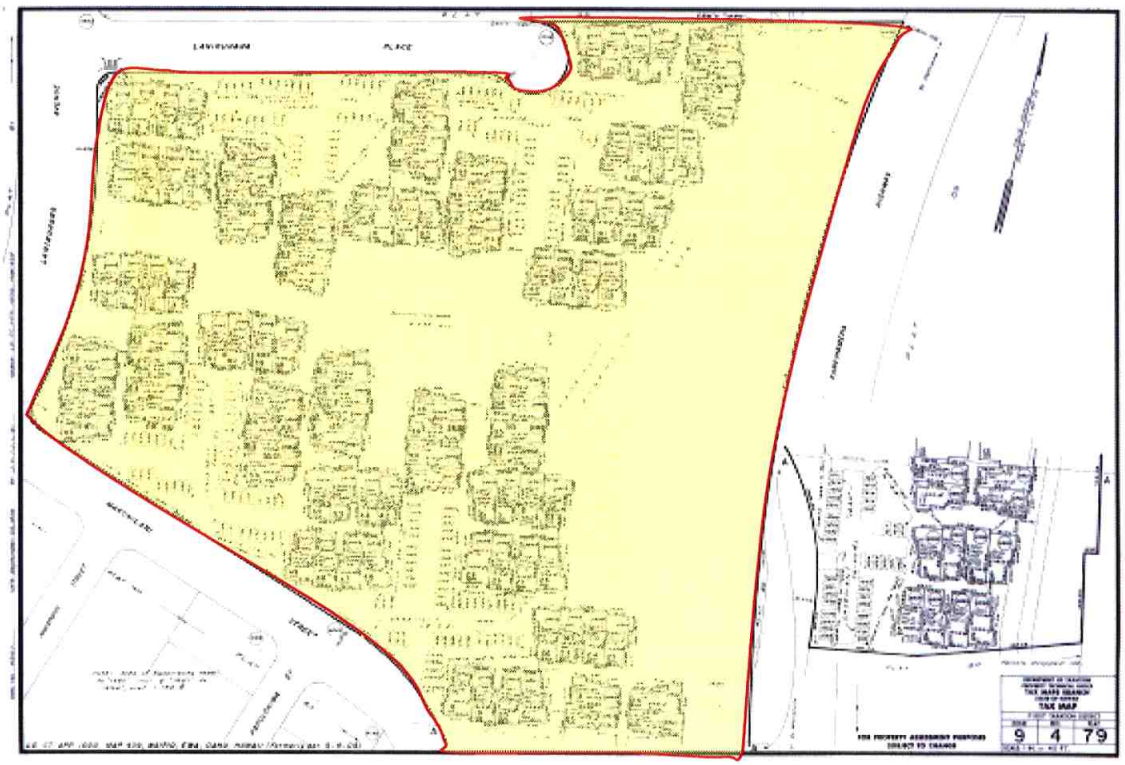
Site Reconnaissance (cont.)

Storm Water Retention Pond:	None observed.
House and Schools in the Vicinity:	Yes.
Distance to Nearest Residence, School, or Businesses:	Houses are located onsite. Mililani Uka Elementary School is approximately 1000 ft north of the site.
How is Drinking Water in the Area Supplied?	Municipal water supply.
Natural Resources, Agriculture, Aquaculture Near the Site?	No.
Name of Surface Water Within 1-mile of Dump/Landfill:	Kipapa Stream.
Distance to Surface Water:	Approximately 0.5 miles.
Proximal Direction of Surface Water:	East.
Where Does Surface Water Flow?	Municipal stormwater system.
Surface Water Used for Drinking?	No.
Surface Water Used for Recreation?	Unknown.
Wetlands:	None observed.
Off-site Sources of Contamination:	None observed.
Does Run-off from other Sites Flow onto Subject Property:	None observed.
Adjacent Property-North:	Mililani Uka Elementary School.
Adjacent Property-South:	Residential neighborhood.
Adjacent Property-East:	Residential neighborhood.
Adjacent Property-West:	Residential neighborhood.

Oahu Sugar Dump 5

Category 1

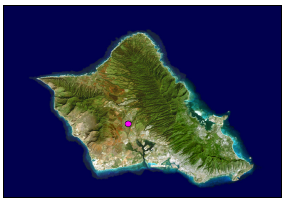
TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	9		
Municipal Well(s)within one mile	1	**Observation Well(s)within one mile**	5
BWS Well(s) within one mile	1	**Sealed Well(s)within one mile**	0
Domestic Well(s)within one mile	1	**Unused Well(s) within one mile**	1
Irrigation Well(s)within one mile	0	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	0



Oahu Sugar Dump 5

Category 1

Well Details

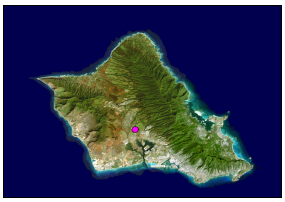
USGS Well Number	2600-02	**Aquifer**	30203
Well Name	Kipapa Gulch	**Elevation of Ground Surface (ft amsl)**	297
Well Owner	Dairy Co Inc	**Well Depth (feet bgs)**	401
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-104
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	22.93
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	240
Drilling Method	--		
Year of Construction	1957		

USGS Well Number	2600-04	**Aquifer**	30203
Well Name	Mililani III-2	**Elevation of Ground Surface (ft amsl)**	665
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	815
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-150
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1400
Drilling Method	Rotary		
Year of Construction	1979		

Photo 1. **Looking east from the park area of Lanikuhana Patio Homes in which Oahu Sugar Dump 1 is presumed to have been located. No distinct indications of the specific dump location were noted during the site visit.**

Photo 2. **Looking south over the Lanikuhana Patio Homes park area.**

Oahu Sugar Dump 6



Oahu Sugar Dump 6

Category 1

Site Description

According to a historic map (Young, 1993; Map 9), the Oahu Sugar Dump 6 was reportedly located north of Waipahu, south of Mililani town, east of Kipapa Stream, and to the west of Panakauahi Gulch and the H-2 Freeway in Waipio. The area in the vicinity of the former dump is currently residential and is on the eastern edge of a parcel formerly used by Dole.

Oahu Sugar Dump 6, operated by Oahu Sugar Company, was used to dispose of plantation refuse. Although no records on the period of operation were located, the dump probably operated during the 1940s-1950s. There was no documentation found to indicate that the dump was permitted, lined, capped, or properly closed. The dump was probably small and was likely located at the edge of an agricultural field in a gulch not useable for farming. The former dump was probably a burn and dump operation. The parcel on which the dump is suspected to have been located is currently owned by Waumalu Grace Brethren Church.

Mr. Nick Dezan, of Waimalu Grace Brethren Church, indicated that extensive grading was done to the east of his property during the construction of the highway and he speculated that the former landfill might have been graded away as a result (Dezan, 2004). The area in which Oahu Sugar Dump 6 was formerly located is currently under construction; property owners are building a church. URS was able to observe sidewalls from excavation activities during a recent site visit. Excavations down to approximately four feet below grade did not reveal indications of former dumping activities.

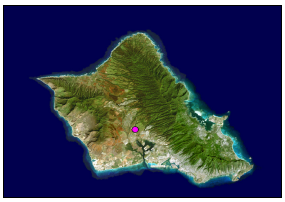
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	9-4-128:007
2368808.20812	604199.08090	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Waipio
157 59 40	21 25 06	**Plat:**	Not Designated
Address:	Unknown at present	**Quadrangle:**	Waipahu

Ownership

Current Owner: Waumalu Grace Brethren Church

Previous Operator: Oahu Sugar Company



Oahu Sugar Dump 6

Category 1

Site Operation and History

Landfill Type: Agricultural

Type of Waste: Plantation refuse

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940s-1950s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Agricultural

City and County Zoning: I-2

State Land Use District: Urban

Facilities: unknown at present

TMK Separation: Subdivided vacant land

Flood Zone: D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province: Schofield Plateau

Elevation Range (ft): 300 **to** 380

Approximate Landfill Acreage: 1-5

Parcel Acreage: 2.0003

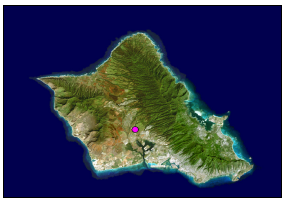
Climate

Annual Precipitation (cm): 49.40

Precipitation Days Per Year 30

Average Temperature (°F): 76.0

Temperature Range (° F): 67.4 **to** 84.5



Oahu Sugar Dump 6

Category 1

Soils

Soil Map Symbol:	MuB	**Bulk Density (gm/cc):**	1.10-1.35
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Molokai	**Organic Carbon (%):**	1.0-4.0
Engineering Classification:	Silty Clay Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	3-7
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.8
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Geology

Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

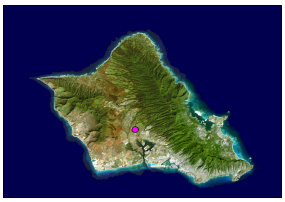
Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.

Hydrogeology

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Aquifer Status Code:	3020211111111
Aquifer Sector:	Pearl Harbor
Aquifer System:	Waiawa
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

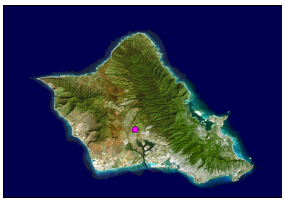


Oahu Sugar Dump 6

Category 1

Site Reconnaissance

Site Description:	The area in which Oahu Sugar Dump 6 was formerly located is currently under construction. No visible indications of current or former dumping activities were observed during the site visit. URS was able to observe sidewalls from recent excavation activites during the site visit. According to Mr. Nick Dezan, of the Waimalu Grace Brethren Church, contruction related excavations, which were as deep as four feet below grade, did not reveal indications of former dumping activites.
Type of Property:	Residential church.
Current Site Operations:	The site is currently undergoing construction. Property owners are building a church.
Age of Development:	Currently under construction.
Onsite Building Information:	Church building (still under construction at the time of the site visit.) approximately 150 ft by 50 ft.
Was There a Recognizable Dump/Landfill?	No.
Institutional Controls:	Fencing surrounds the site which is currently under construction.
Number of MonitoringWells:	None observed.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	None onserved.
Odors, Staining, Distressed Vegetation:	None observed.
Drainage Features:	Municipal stormwater drainage system.
Areas of Ponded Water Onsite:	A temporary artificial ponding area was observed. However, it is only used to control stormwater during construction. The pond will be filled in at the end of the construction period.



Oahu Sugar Dump 6

Category 1

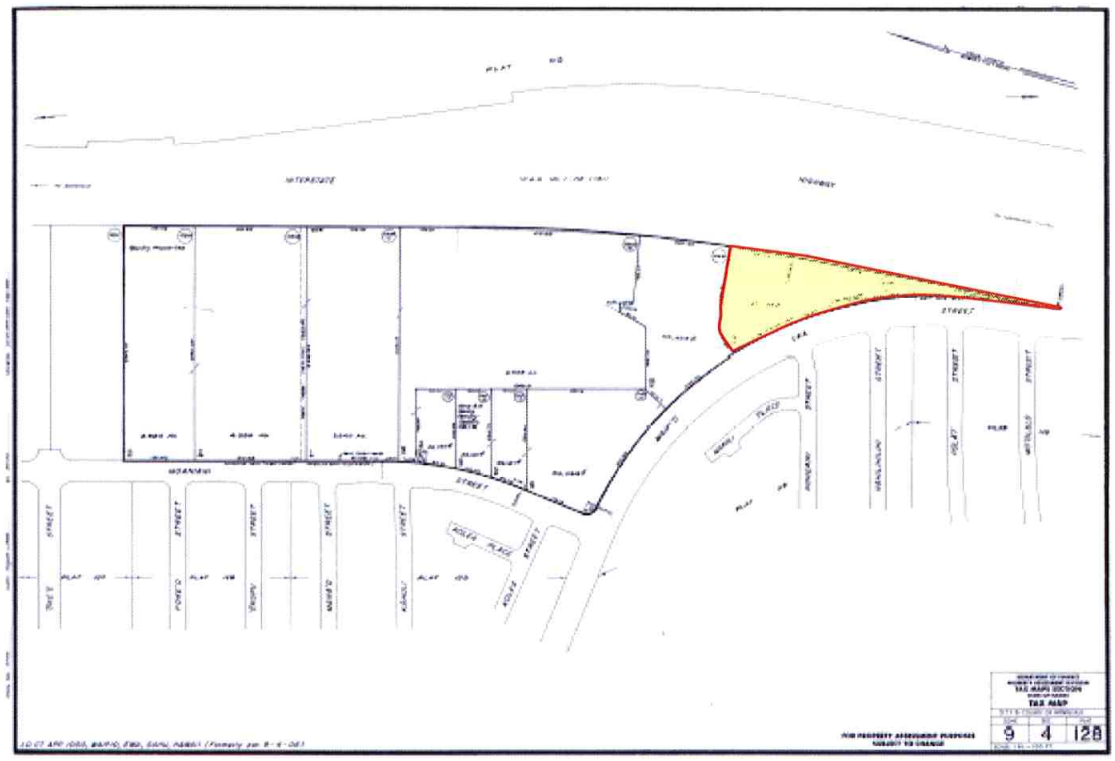
Site Reconnaissance (cont.)

Storm Water Retention Pond:	A temporary stormwater catch pond was observed onsite. It is used to control stormwater during construction activities. The pond is located on the western corner of the site.
House and Schools in the Vicinity:	Yes.
Distance to Nearest Residence, School, or Businesses:	Houses are located less than 100 feet to the west (across the street). Kanoelani Elementary School is located approximately 0.1 miles southwest of the site.
How is Drinking Water in the Area Supplied?	Municipal water supply.
Natural Resources, Agriculture, Aquaculture Near the Site?	No.
Name of Surface Water Within 1-mile of Dump/Landfill:	Panaikauahi Stream.
Distance to Surface Water:	Approximately 0.2 miles.
Proximal Direction of Surface Water:	East.
Where Does Surface Water Flow?	Municipal stormwater system.
Surface Water Used for Drinking?	No.
Surface Water Used for Recreation?	Unknown.
Wetlands:	None observed.
Off-site Sources of Contamination:	None observed.
Does Run-off from other Sites Flow onto Subject Property:	None observed.
Adjacent Property-North:	Undeveloped property.
Adjacent Property-South:	Unused land.
Adjacent Property-East:	H2 Freeway.
Adjacent Property-West:	Waipio Uka St. and Waipoi neighborhood.

Oahu Sugar Dump 6

Category 1

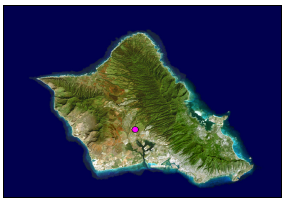
TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	12		
Municipal Well(s)within one mile	10	**Observation Well(s)within one mile**	2
BWS Well(s) within one mile	10	**Sealed Well(s)within one mile**	0
Domestic Well(s)within one mile	0	**Unused Well(s) within one mile**	0
Irrigation Well(s)within one mile	0	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	0



Oahu Sugar Dump 6

Category 1

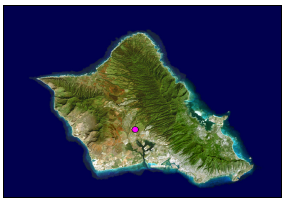
Well Details

USGS Well Number	2400-12	**Aquifer**	
Well Name	Waipahu III-5	**Elevation of Ground Surface (ft amsl)**	314
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	456
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-142
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	19.2
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1050
Drilling Method	Rotary		
Year of Construction	1994		

USGS Well Number	2400-11	**Aquifer**	
Well Name	Waipahu III-3	**Elevation of Ground Surface (ft amsl)**	312
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	455
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-143
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	20.4
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1050
Drilling Method	Rotary		
Year of Construction	1994		

USGS Well Number	2400-10	**Aquifer**	
Well Name	Waipahu III-2	**Elevation of Ground Surface (ft amsl)**	317
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	457
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-140
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	18.88
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1050
Drilling Method	Rotary		
Year of Construction	1994		

USGS Well Number	2400-09	**Aquifer**	
Well Name	Waipahu III-1	**Elevation of Ground Surface (ft amsl)**	318
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	458
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-140
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	18.83
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1050
Drilling Method	Rotary		
Year of Construction	1994		



Oahu Sugar Dump 6

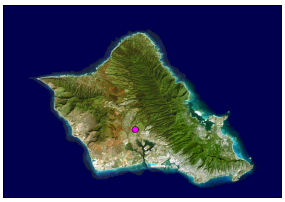
Category 1

USGS Well Number	2500-02	**Aquifer**	30203
Well Name	Waipio Hts II-2	**Elevation of Ground Surface (ft amsl)**	419
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	560
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-141
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	18
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1050
Drilling Method	Rotary		
Year of Construction	1978		

USGS Well Number	2500-01	**Aquifer**	30203
Well Name	Waipio Hts II-1	**Elevation of Ground Surface (ft amsl)**	416
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	546
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-130
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	17.95
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1050
Drilling Method	Rotary		
Year of Construction	1978		

USGS Well Number	2459-23	**Aquifer**	30202
Well Name	Waipio Hts. I-3	**Elevation of Ground Surface (ft amsl)**	200
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	325
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-125
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	14.56
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1050
Drilling Method	Percussion		
Year of Construction	1977		

USGS Well Number	2459-20	**Aquifer**	30202
Well Name	Waipio Hts 1	**Elevation of Ground Surface (ft amsl)**	202
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	337
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-135
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	16.9
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1500
Drilling Method	Rotary		
Year of Construction	1964		



Oahu Sugar Dump 6

Category 1

USGS Well Number	2459-19	**Aquifer**	30202
Well Name	Waipio Hts 2	**Elevation of Ground Surface (ft amsl)**	202
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	337
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-135
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	16.9
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1500
Drilling Method	Rotary		
Year of Construction	1964		

USGS Well Number	2400-13	**Aquifer**	
Well Name	Waipahu III-4	**Elevation of Ground Surface (ft amsl)**	314
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	453
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-139
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	16
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1050
Drilling Method	Rotary		
Year of Construction	1995		

Photo 1. **Looking north at on-going construction activity in the area in which the dump is thought to have been formerly located.**

Photo 2. **Looking north at the adjacent property. Mr. Dezan, of Waimalu Grace Brethren Church (the current property owner), stated that this is indicative of the condition of the Site prior to construction activity.**

Photo 3. **Looking north at the cuttings and excavated materials from the construction activity.**

Photo 4. **Looking at the southern portion of the Site. Excavation activity done during construction allowed for URS to observe along the sidewall below grade. No visible indications of dumping activities were observed.**

Olomana Ltd. Dump - Kalihi

Source: R.M. Towill Corporation

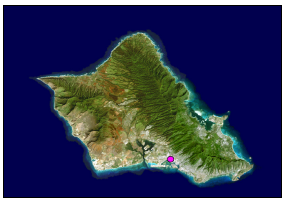
07-20-70

URS

Title **Aerial Photograph – Vicinity of Olomana Limited Dump**

Project **Oahu Inactive Landfills Relative Risk Evaluation**

Project No. 26536686.00300



Olomana Ltd. Dump - Kalihi

Category 3

Picture Not Available

Site Description

The former Olomana Limited Dump in Kalihi was reportedly located to the southwest of Hoonee Place, to the south of Kalihi Stream, to the east of Keehi Lagoon, and to the northwest of the Pahouhui subdivision. Tax map key (TMK) parcel 1-2-023:034 is only a portion of the former dump site and dumping may have also occurred on TMK parcels 1-2-023:41, 42, 47, 48, and 78. The remainder of the site that is located to the northwest of TMK parcel 1-2-023:034 does not have a TMK number and was formerly submerged. The fill material brought into the dump is probably what built up the area above mean sea level, emerging the remainder of the dump site. The area in the vicinity of the former dump is currently residential, commercial, and industrial.

Olomana Limited Dump was operated by a private engineering firm from 1955-1961 and believed to contain primarily demolition and construction wastes (Bagaoisan, 1997). According to an April 19, 1960 article in the Honolulu Advertiser, ashes from a city incinerator were used to fill a "Keehi Lagoon waterfront property" owned by the Harbor Board and leased by the Olomana group. This property was likely the Olomana Limited Dump. While the date of the Olomana Limited Dump operation is considered to be from 1955-1961, a July 20, 1970 aerial photograph shows what appear to be of remnants of dumping activity on the subject site. According to Young (1993), operators other than Olomana Limited included Engineered Services and John Latimore.

While the date of the Olomana Limited Dump operation is considered to be from 1955-1961, a July 20, 1970 aerial photograph shows what appears to be of remnants of dumping activity on the subject site.

The former dump was reportedly located to the south of Kalihi Stream, to the east of Keehi Lagoon, and to the southwest of Hoonee Place. The area in the vicinity of the former dump is currently residential, commercial, and industrial.

Tax map key parcel 1-2-023:034 is only a portion of the former dump site. Dumping may have occurred on 1-2-023:41,42,42,47,48, and 78 as well. The remainder of the site, which is located to the northwest of parcel 1-2-023:034, does not have a tax map key number and was formerly submerged. The fill material brought in to the dump is likely the material that built up the site above mean sea level. Essentially, the dump and the now emerged property are one in the same.

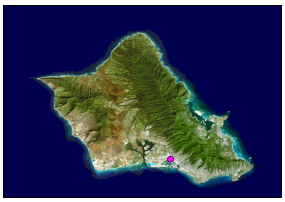
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	1-2-023:034
2358765.64783	614965.95528	**Zone:**	Honolulu
Longitude	**Latitude**	**Section:**	Kalihi-Kai
157 53 29	21 19 37	**Plat:**	Not Designated
Address:		**Quadrangle:**	Honolulu

Ownership

Current Owner: State of Hawaii (Island Recycling, Inc-lessee)

Previous Operator: Engineered Services



Olomana Ltd. Dump - Kalihi

Category 3

Picture Not Available

Site Operation and History

Landfill Type: Private

Type of Waste: Construction and demolition

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1955-1961	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Population and Land Use

Type of Development in the Surronding Area? Urban/Residential

City and County Zoning: I-2

State Land Use District: Urban

Facilities: unknown at present

TMK Separation: Unsubdivided vacant land

Flood Zone: X - 500-year Flood Plain

Geography and Topography

Physiographic Province: Coastal Plain

Elevation Range (ft): 0 **to** 10

Approximate Landfill Acreage: 15-29

Parcel Acreage: 1.476

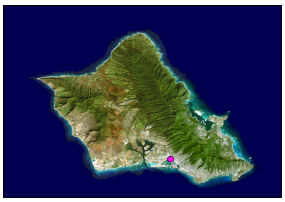
Climate

Annual Precipitation (cm): 52.20

Precipitation Days Per Year 31

Average Temperature (°F): 77.1

Temperature Range (° F): 70.2 **to** 84.0



Olomana Ltd. Dump - Kalihi

Category 3

Picture Not Available

Soils

Soil Map Symbol:	FL	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.06-0.12
Soil Series:	Fill Land, Mixed	**Organic Carbon (%):**	0.1-5.0
Engineering Classification:	Fill Land, Mixed	**Permeability (in/hr):**	0.1-2
Drainage Characterisitics:	Poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

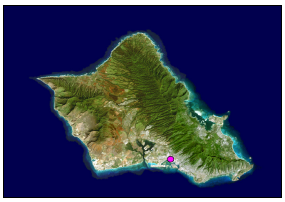
Geologic Symbol(s): Rf

Geologic Unit(s): Artificial fill composed of marine deposits

Geologic Description: Brown to white permeable marine mud containing shells, coral, and other calcareous marine organisms dredged from the ocean floor and used to fill up salt marshes and other lowlands.

Hydrogeology

Rock Type:	Sand-unconsolidated
GW Occurrance-Principal:	Basal
GW Occurrance-Secondary:	--
Permeability:	Moderate to high
Hydraulic Conductivity (ft/d):	100 - 1,000



Olomana Ltd. Dump - Kalihi

Category 3

Picture Not Available

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3010411623321
Aquifer Sector:	Honolulu
Aquifer System:	Moanalua
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Potential use
Utility:	Neither
Salinity (mg/L Cl-):	Moderate (1,000-5,000)
Uniqueness:	Replaceable
Vulnerability:	High

Lower Aquifer

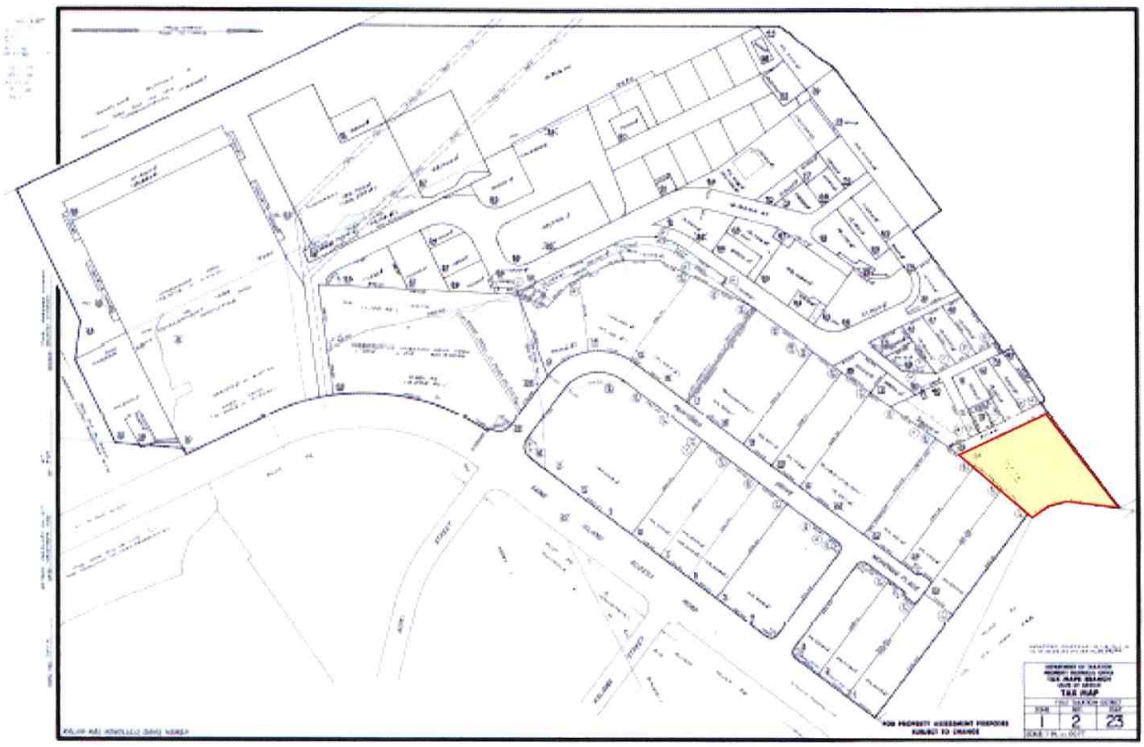
Aquifer Status Code:	3010412111113
Aquifer Sector:	Honolulu
Aquifer System:	Moanalua
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	Low

Olomana Ltd. Dump - Kalihi

Category 3

Picture Not Available

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	19		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	13
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	4
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	2

Well Details

Pahounui Dump

Source: R.M. Towill Corporation

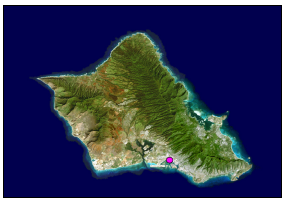
07-20-70

URS

Title **Aerial Photograph – Vicinity of Pahounui Dump**

Project **Oahu Inactive Landfills Relative Risk Evaluation**

Project No. 26536686.00300



Pahounui Dump

Category 3

Site Description

The former Pahounui Dump was reportedly located in the Kapalama Basin area, northwest of the Kapalama Military Reservation (0.2 miles), one block west of Puuhale Road, south of Queen Street, east of Keehi Lagoon (0.2 mile), in the vicinity of the current intersection of Pahounui Drive and Auiki Street, and on the former location of the Pahounui and Pahouiki fish ponds. Tax map key parcel 1-2-023:009 is only a portion of the former dump site and dumping may have occurred on adjacent parcels as well. The area where the dump was located is flat and may lie beneath a subdivision.

Pahounui Dump was operated by the City and County of Honolulu (C&C), but according to Young (1993), it may previously have been owned by the Damon Estate. The waste stream that had previously gone to Kalihi-Kai Dump (repossessed by the Army), Keawaula (closed because of World War II blackouts), and Kapalama Dump was directed to the Pahounui Dump beginning around September 1942. While the date of the Pahounui Dump operation is considered to be from 1942-1946, a July 20, 1970 aerial photograph shows what appear to be dumping activities on a portion of that same parcel, located to the northwest of the current intersection between Pahounui Drive and Sand Island Access Road.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	1-2-023:009
2358458.07594	614887.89684	**Zone:**	Honolulu
Longitude	**Latitude**	**Section:**	Kalihi-Kai
157 53 31	21 19 27	**Plat:**	Not Designated
Address:	120 Sand Island Access Road	**Quadrangle:**	Honolulu

Ownership

Current Owner: Pahounui DP LLC

Previous Operator: City and County of Honolulu

Site Operation and History

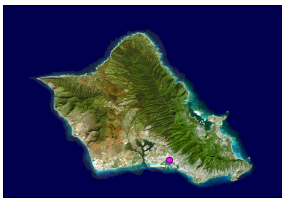
Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1942-1946	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		



Pahounui Dump

Category 3

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line?	Makai
Mauka or Makai of UIC Line?	Makai

Population and Land Use

Type of Development in the Surronding Area?	Industrial
City and County Zoning:	I-2
State Land Use District:	Urban
Facilities:	Warehouse (1957), office (1951)
TMK Separation:	Warehousing and yard storage
Flood Zone:	X - 500-year Flood Plain

Geography and Topography

Physiographic Province:	Coastal Plain
Elevation Range (ft):	0 **to** 10
Approximate Landfill Acreage:	Approximately 40
Parcel Acreage:	2.997

Climate

Annual Precipitation (cm):	52.20
Precipitation Days Per Year	31
Average Temperature (°F):	77.1
Temperature Range (° F):	70.2 **to** 84.0

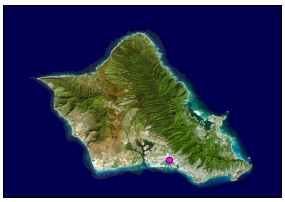
Soils

Soil Map Symbol:	FL	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.06-0.12
Soil Series:	Fill Land, Mixed	**Organic Carbon (%):**	0.1-5.0
Engineering Classification:	Fill Land, Mixed	**Permeability (in/hr):**	0.1-2
Drainage Characterisitics:	Poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

Geologic Symbol(s):	Rf
Geologic Unit(s):	Artificial fill composed of marine deposits

Geologic Description: Brown to white permeable marine mud containing shells, coral, and other calcareous marine organisms dredged from the ocean floor and used to fill up salt marshes and other lowlands.



Pahounui Dump

Category 3

Hydrogeology

Rock Type:	Sand-unconsolidated
GW Occurrance-Principal:	Basal
GW Occurrance-Secondary:	--
Permeability:	Moderate to high
Hydraulic Conductivity (ft/d):	100 - 1,000

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3010311613321
Aquifer Sector:	Honolulu
Aquifer System:	Kalihi
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Currently used
Utility:	Neither
Salinity (mg/L Cl-):	Moderate (1,000-5,000)
Uniqueness:	Replaceable
Vulnerability:	High

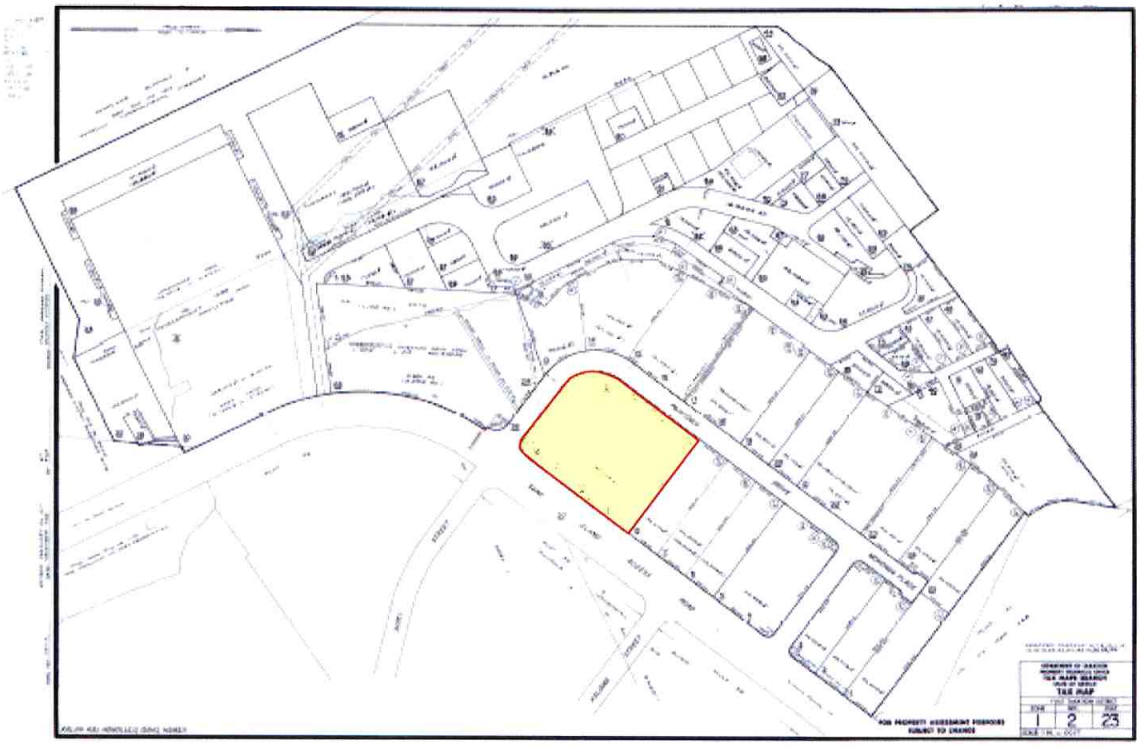
Lower Aquifer

Aquifer Status Code:	3010312111113
Aquifer Sector:	Honolulu
Aquifer System:	Kalihi
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	Low

Pahounui Dump

Category 3

TMK Map



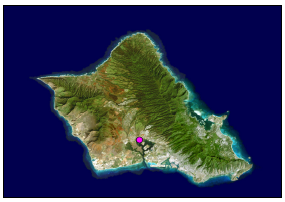
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	17		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	11
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	4
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	2

Well Details

Pearl City Peninsula Landfill/Dump - (Navy)



Pearl City Peninsula Landfill/Dump - (Navy)

Category 2

Site Description

The Pearl City Landfill is located on the western side of the Pearl City Peninsula between the Middle and East Lochs of Pearl Harbor. The landfill is bounded by the Waiawa Stream to the east and the Waiawa Unit of the Pearl Harbor National Wildlife Refuge to the west. The Pearl City Sewage Treatment Plant is located to the south of the landfill. Along the northern boundary of the site is a former railway easement, which is currently a bike path. The area in the vicinity of the former landfill is now military and industrial.

Unofficial dumping, burning, and ash disposal reportedly occurred on the site as early as the 1940s. The area was originally the location of a rice field contained by berms constructed along the boundaries with Waiawa Stream and Pearl Harbor. The landfill covers approximately 67 acres of land, of which 10 acres comprised the Burn Disposal Area located in the southeast corner of the landfill. The Burn Disposal Area contains a layer of ash that reportedly originated from waste burning operations within the burn area site east of the Waiawa Stream (Shaw Environmental, 2003). Refuse and incinerator ash were also diverted to the landfill during the renovation of Kapalama and Kewalo incinerators in the 1960s.

The Navy officially operated the unlined sanitary landfill from 1965 through 1976. The landfill received domestic refuse, digested sewage sludge, hazardous wastes, security-classified wastes, and possibly illegal wastes. No complete documentation of material disposed of at the site is presently available (National Oceanic and Atmospheric Administration (NOAA), 1984), though the Navy acknowledged that the landfill had received "items such as paint, solvents, thinners, polychlorinated biphenyls (PCB)-contaminated rags, and out-of-date photographic chemicals." Additional materials known to have been dumped at the site include asbestos scrap, various hazardous materials whose "shelf life" was exceeded, pesticides, dry cleaning fluids, and metal residues from the open burning of ordnance (Environment Hawaii, 1991). Along the railroad right-of-way “hundreds of corroded drums containing assorted chemicals such as oils, pesticides, paints and solvents" were dumped in 1972 (Luechen, 1986). These drums had been included in lots sold by the Navy as surplus goods. The purchaser evidently took what they wanted and dumped the rest in the general vicinity of the landfill. Besides the chemicals in the drums, discarded items included decontaminating agents, car bodies, scrap metal, and ovens (Environment Hawaii, 1991).

The landfill was closed in 1976, and a landfill cover was installed. Two feet of coral, with some earth, covers the majority of the site and the remainder is covered with a one to two foot thick layer of dense, crushed basalt. In 1987, approximately 120,000 gallons of jet aviation fuel were released from a Navy fuel pipeline located along the bike path north and up gradient of the landfill. In February of 1999, a small pipeline leak from the same Navy fuel pipeline was discovered.

According to the United States Environmental Protection Agency (EPA)'s Archived Sites database, the landfill's "Discovery" and Preliminary Assessment were completed during November of 1979. An EPA Site Inspection and Hazard Ranking System Package was completed in August 1982. A 1983 Navy Energy and Environmental Support Activity (NEESA) report concluded that the "primary potable water source, the basalt aquifer, is not threatened by contaminant migration." Still, the NEESA report recommended further study of the site, "primarily to determine the levels of chlorinated organic compounds present." (Environment Hawaii, 1991).

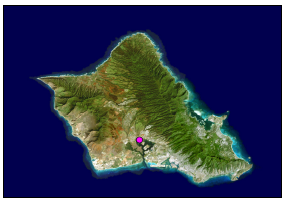
The Navy participated in the Installation Restoration Program (IRP), a specially funded program established by the Department of Defense (DoD) to identify, investigate, and control the migration of hazardous contaminants at military and other DoD facilities. As part of the IRP process a Preliminary Assessment/Site Investigation was performed at the Pearl City Peninsula landfill in 1990. A final EPA Site Inspection was completed during February of 1993 and determined that no further action was necessary; therefore, the landfill became an EPA "Archived Site". A DoD IRP Remedial Investigation was completed in 1995. According to the State of Hawaii Department of Health (DOH) (1998), dioxin, PCBs, semi-volatile organic compounds, trichloroethylene, and fuel products

had been detected at the site. The Navy planned an IRP removal action and developed an Engineering Evaluation/Cost Analysis from 1997 to 2000.

According to State of Hawaii DOH, IRP removal action fieldwork by the Navy started in 1999. This involved repairing large cracks in the landfill cap, covering black sand that was on the surface of the landfill, and capping asbestos material that was recently discovered on the border of the landfill. The removal action was completed in 2000.

From 2001 to 2002 the Navy worked on an ecological risk assessment for the Waiawa Unit of the National Wildlife Refuge, which is adjacent to the landfill.

The Navy is currently conducting the fourth year of its 5-year landfill long-term monitoring (LTM) program to monitor levels of soil gas and evaluate groundwater quality groundwater impacted by landfill and fuel spills. The LTM program was initiated in December of 2001. The program also includes periodic maintenance of the landfill cap to control erosion and fix cracks due to differential settlement. A report that discusses the first two years of monitoring results was completed in March 2004. Data presented in the report show trends in the behavior of the landfill systems that will help to determine if adjustments to the monitoring plans for the site are needed. The Navy has also developed a draft final work plan for an integrated baseline human health and ecological risk assessment for the landfill (Navy Region Hawaii, 2004b). The monitoring plan is being revised to re-evaluate the approach to monitoring and maintenance. Groundwater, soil gas monitoring, and cap maintenance will continue on a semi-annual basis (Navy Region Hawaii, 2004b).



Pearl City Peninsula Landfill/Dump - (Navy)

Category 2

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	9-6-001:001
2365161.46350	605602.50095	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Waiawa
157 58 16	21 23 27	**Plat:**	Not Designated
Address:	Waipuna Avenue	**Quadrangle:**	Waipahu

Ownership

Current Owner: United States government (U.S. Navy)

Previous Operator: Navy

Site Operation and History

Landfill Type: Military

Type of Waste: Municipal solid waste, metal scraps, sewage sludge, construction debris, incinerator ash, and Jet A fuel

Monitoring Well Network? Yes

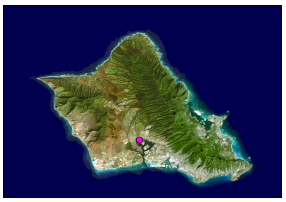
Monitoring Well Identification 31 monitoring wells, 4 piezometers, 10 landfill gas probes

Status:	Closed	**Analytical Data Available?**	Yes
Active Period:	1940s-1976 (unofficially operated before 1965)	**EPA ID No.:**	HID980585178
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Long-term Monitoring of Groundwater and Soil Gas
Capped?	Two feet coral, with some earth from Nanakuli (PVT) Landfill covers the majority of the site; the remainder is covered with a 1-2 foot thick layer of dense, crushed basalt	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai



Pearl City Peninsula Landfill/Dump - (Navy)

Category 2

Population and Land Use

Type of Development in the Surronding Area?	Military
City and County Zoning:	F-1
State Land Use District:	Urban
Facilities:	Restricted Land (Pearl Harbor National Wildlife Refuge)
TMK Separation:	Restricted land (forest reserve, wildlife refuge, etc)
Flood Zone:	A - 100-year Flood Plain, D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province:	Coastal Plain
Elevation Range (ft):	0 **to** 5
Approximate Landfill Acreage:	67
Parcel Acreage:	148.328, 67

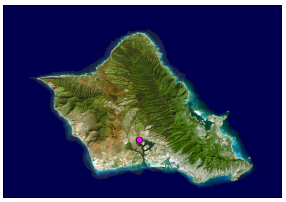
Climate

Annual Precipitation (cm):	49.40
Precipitation Days Per Year	30
Average Temperature (°F):	76.0
Temperature Range (° F):	67.4 **to** 84.5

Soils

Soil Map Symbol:	Ph	**Bulk Density (gm/cc):**	1.10-1.30
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Pearl Harbor	**Organic Carbon (%):**	10-15
Engineering Classification:	Clay	**Permeability (in/hr):**	0.0000-0.1
Drainage Characterisitics:	Very poor	**Slope (%):**	>15
Thickness of Surface Soil (in):	0-31	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	W	**Bulk Density (gm/cc):**	Not available
Soil Association:	Not Applicable	**Moisture Retention (%):**	Not available
Soil Series:	Water	**Organic Carbon (%):**	Not available
Engineering Classification:	Water	**Permeability (in/hr):**	Not available
Drainage Characterisitics:	Not available	**Slope (%):**	--
Thickness of Surface Soil (in):	Not available	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Not available



Pearl City Peninsula Landfill/Dump - (Navy)

Category 2

Geology

Geologic Symbol(s): Pa

Geologic Unit(s): Consolidated noncalcareous deposits

Geologic Description: Chiefly older alluvium, generally consisting of mottled brown to red-brown, deeply weathered, poorly-assorted, and nearly impermeable friable conglomerates, in places cemented with limonite or hematite and usually forming conspicuous terraces along the principal streams. Near the mouths of the valleys and especially around Pearl Harbor and near Waialua the older alluvium grades into partly consolidated sands and silts that are emerged delta deposits. The degree of consolidation is largely dependent upon the amount of rainfall, for in dry regions the material is much better cemented than in wet regions. Near the heads of valleys the older alluvium grades into coarse angular talus and landslide deposits which, in places, carry considerable water. In the large semiarid valleys in the Waianae Range these deposits are firmly cemented breccias. They are poorly permeable in wet areas and hold up perched water in the Honolulu volcanic series, but in the dry areas they yield small supplies of potable water.

Hydrogeology

Rock Type:	Alluvium-older-consolidated
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

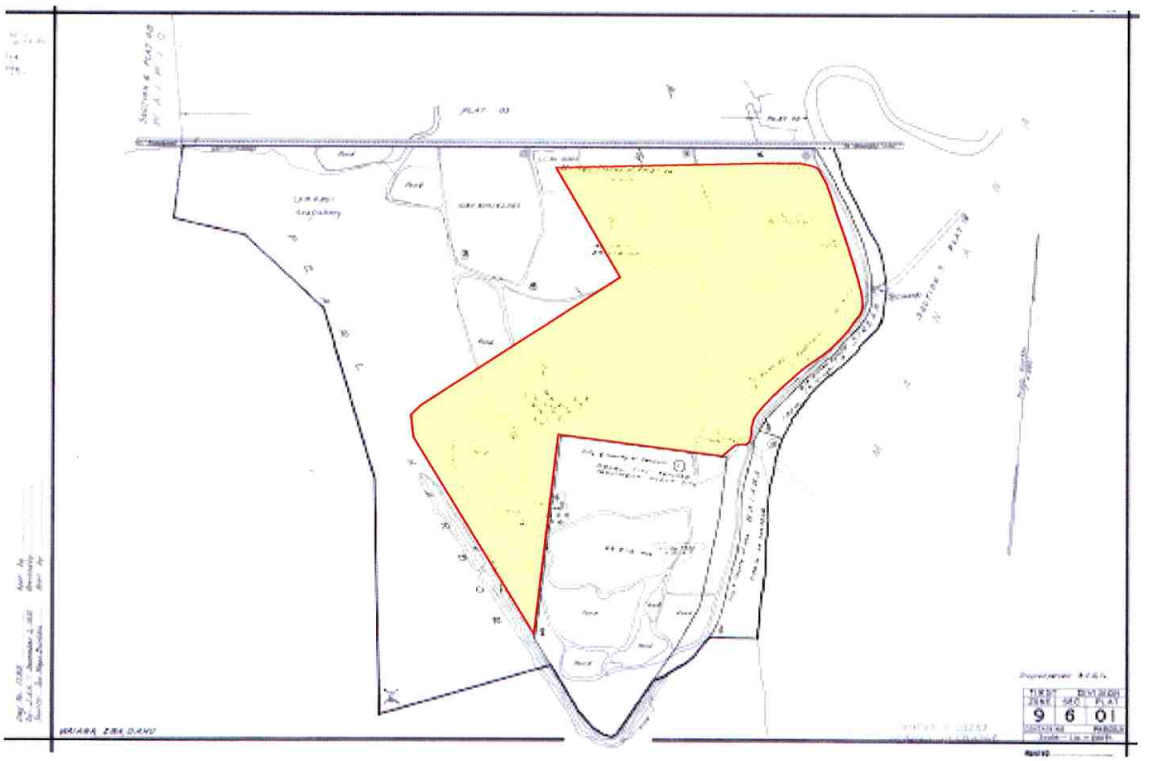
Aquifer(s)

Aquifer Status Code:	3020211111111
Aquifer Sector:	Pearl Harbor
Aquifer System:	Waiawa
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

Pearl City Peninsula Landfill/Dump - (Navy)

Category 2

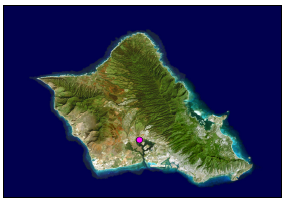
TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	83		
Municipal Well(s)within one mile	0	**Observation Well(s)within one mile**	1
BWS Well(s) within one mile	0	**Sealed Well(s)within one mile**	24
Domestic Well(s)within one mile	21	**Unused Well(s) within one mile**	8
Irrigation Well(s)within one mile	25	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	1



Pearl City Peninsula Landfill/Dump - (Navy)

Category 2

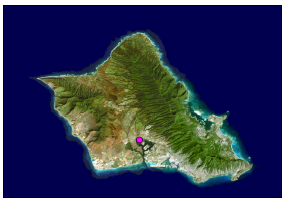
Well Details

USGS Well Number	2459-22	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	
Well Owner	Alipio S A	**Well Depth (feet bgs)**	114
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1979		

USGS Well Number	2359-10	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	23
Well Owner	Gora G	**Well Depth (feet bgs)**	100
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-77
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	14.28
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1954		

USGS Well Number	2359-09	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	8
Well Owner	Koshimizu	**Well Depth (feet bgs)**	102
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-94
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	15.6
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1953		

USGS Well Number	2358-52	**Aquifer**	30202
Well Name	Waiawa-Gendrano	**Elevation of Ground Surface (ft amsl)**	15
Well Owner	Crabbe F & J	**Well Depth (feet bgs)**	75
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-60
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	20
Drilling Method	Percussion		
Year of Construction	1990		



Pearl City Peninsula Landfill/Dump - (Navy)

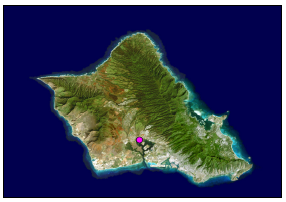
Category 2

USGS Well Number	2358-50	**Aquifer**	30202
Well Name	Waiawa	**Elevation of Ground Surface (ft amsl)**	38
Well Owner	Young K P	**Well Depth (feet bgs)**	80
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-42
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	Percussion		
Year of Construction	1985		

USGS Well Number	2358-49	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	21
Well Owner	Nazarene Chrch	**Well Depth (feet bgs)**	125
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-104
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	14.3
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	45
Drilling Method	Rotary		
Year of Construction	1976		

USGS Well Number	2358-47	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	35
Well Owner	Alipio Sos	**Well Depth (feet bgs)**	141
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-106
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1967		

USGS Well Number	2358-45	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	38
Well Owner	Gora G	**Well Depth (feet bgs)**	101
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-63
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	16
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1967		



Pearl City Peninsula Landfill/Dump - (Navy)

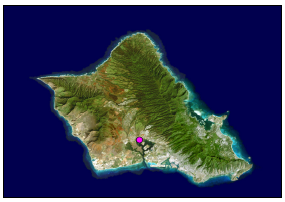
Category 2

USGS Well Number	2359-12	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	25
Well Owner	Brown G I	**Well Depth (feet bgs)**	276
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-251
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	16
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	25
Drilling Method	--		
Year of Construction	1954		

USGS Well Number	2359-11	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	30
Well Owner	Kobashigawa K	**Well Depth (feet bgs)**	130
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-100
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	19.8
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1954		

USGS Well Number	2459-25	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	21
Well Owner	Cabitac R M	**Well Depth (feet bgs)**	100
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-79
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	0
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	30
Drilling Method	--		
Year of Construction	1977		

USGS Well Number	2358-43	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	25
Well Owner	Kini A	**Well Depth (feet bgs)**	30
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-5
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1959		



Pearl City Peninsula Landfill/Dump - (Navy)

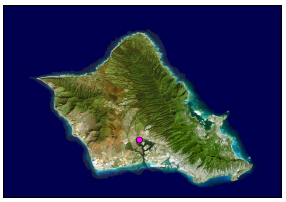
Category 2

USGS Well Number	2459-18	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	22
Well Owner	Kawano H T	**Well Depth (feet bgs)**	185
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-163
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1963		

USGS Well Number	2459-17	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	19
Well Owner	Gora G	**Well Depth (feet bgs)**	142
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-123
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	22
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1957		

USGS Well Number	2359-18	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	24
Well Owner	Jiminez E	**Well Depth (feet bgs)**	126
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-102
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1959		

USGS Well Number	2358-24	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	23
Well Owner	Taba S	**Well Depth (feet bgs)**	120
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-97
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	16.7
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1949		



Pearl City Peninsula Landfill/Dump - (Navy)

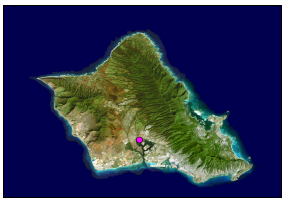
Category 2

USGS Well Number	2358-30	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	11
Well Owner	Sakamoto E M	**Well Depth (feet bgs)**	103
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-92
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	15.2
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	19
Drilling Method	--		
Year of Construction	1953		

USGS Well Number	2358-36	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	13
Well Owner	Sakai K	**Well Depth (feet bgs)**	102
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-89
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	15.08
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	20
Drilling Method	--		
Year of Construction	1954		

USGS Well Number	2358-38	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	12
Well Owner	Gora G	**Well Depth (feet bgs)**	100
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-88
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	17.64
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1955		

USGS Well Number	2358-40	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	18
Well Owner	Nakama W T	**Well Depth (feet bgs)**	119
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-101
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	14.34
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1957		

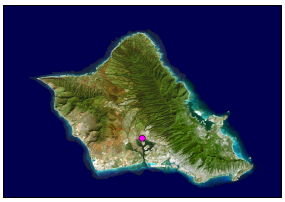


Pearl City Peninsula Landfill/Dump - (Navy)

Category 2

USGS Well Number	2359-13	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	8
Well Owner	Nishida I	**Well Depth (feet bgs)**	130
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-122
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	19
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1955		

Pearl City Dump - Second Street



Pearl City Dump - Second Street

Category 1

Site Description

The Pearl City Dump is shown as a 2.4 acre "Garbage Disposal Site" located in the southwest quadrant of the intersection of Second and Hugh Streets to the east of Waiawa Stream on a Department of Public Works, Division of Land Survey and Acquisition map (Young, 1993; Map 29). According to Bagaoisan (1997) the dumping area was formerly swampy. The site is currently located under the H-1 Freeway, to the east of Waiawa Stream, and to the north of the Pearl City Peninsula.

The Pearl City Dump was operated by the City and County of Honolulu (C&C) for household wastes from 1948-1960. Evidence of recent surficial dumping including cans, bottles, an empty unmarked 55-gallon drum, and discarded tires was observed during the site visit.

The map that accompanied the article is titled "Refuse-Disposal Facilities" and is Young's (1993) map number 10.

The Site is currently located under the H-1 Freeway, to the east of Waiawa Stream, and to the north of Pearl City Peninsula. Evidence of recent surficial dumping that included cans, bottles, an empty unmarked 55-gallon drum, and discarded tires was observed during the site visit.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	9-7-023:013
2365795.54837	606316.77027	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Waiawa-Manana
157 58 27	21 23 28	**Plat:**	Not Designated
Address:	Second Street and Hugh Street Junction	**Quadrangle:**	Waipahu

Ownership

Current Owner: University of Hawaii

Previous Operator: City and County of Honolulu

Site Operation and History

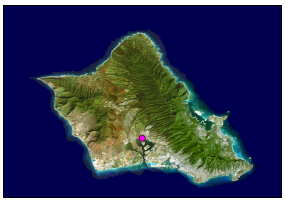
Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1948-1960	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	No Further Response Action Planned
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		



Pearl City Dump - Second Street

Category 1

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line?	Mauka
Mauka or Makai of UIC Line?	Mauka

Population and Land Use

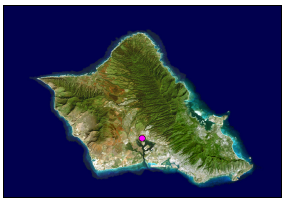
Type of Development in the Surronding Area?	Residential
City and County Zoning:	R-5
State Land Use District:	Urban
Facilities:	unknown at present
TMK Separation:	Subdivided vacant land
Flood Zone:	A - 100-year Flood Plain

Geography and Topography

Physiographic Province:	Coastal Plain
Elevation Range (ft):	20 **to** 30
Approximate Landfill Acreage:	1-5
Parcel Acreage:	Approximately 1

Climate

Annual Precipitation (cm):	49.40
Precipitation Days Per Year	30
Average Temperature (° F):	76.0
Temperature Range (° F):	67.4 **to** 84.5



Pearl City Dump - Second Street

Category 1

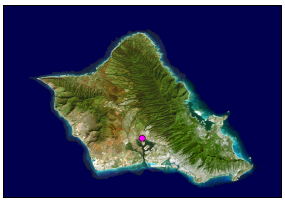
Soils

Soil Map Symbol:	KlA	**Bulk Density (gm/cc):**	1.10-1.40
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.12-0.15
Soil Series:	Kawaihapai	**Organic Carbon (%):**	1.0-2.0
Engineering Classification:	Clay Loam; Stony or Very Stony	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	0-2
Thickness of Surface Soil (in):	0-54	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	KlC	**Bulk Density (gm/cc):**	1.10-1.40
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.12-0.15
Soil Series:	Kawaihapai	**Organic Carbon (%):**	1.0-2.0
Engineering Classification:	Clay Loam; Stony or Very Stony	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	6-15
Thickness of Surface Soil (in):	0-54	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	W	**Bulk Density (gm/cc):**	Not available
Soil Association:	Not Applicable	**Moisture Retention (%):**	Not available
Soil Series:	Water	**Organic Carbon (%):**	Not available
Engineering Classification:	Water	**Permeability (in/hr):**	Not available
Drainage Characterisitics:	Not available	**Slope (%):**	--
Thickness of Surface Soil (in):	Not available	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Not available

Soil Map Symbol:	HxA	**Bulk Density (gm/cc):**	1.40-1.50
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.14
Soil Series:	Honouliuli	**Organic Carbon (%):**	2.0-3.0
Engineering Classification:	Clay	**Permeability (in/hr):**	0.1-0.6
Drainage Characterisitics:	Very poor	**Slope (%):**	0-2
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate



Pearl City Dump - Second Street

Category 1

Geology

Geologic Symbol(s): Ra

Geologic Unit(s): Unconsolidated noncalcareous deposits

Geologic Description: Chiefly younger alluvium, a black to brown fluviatile deposit generally consisting of coarse permeable detritus only slightly weathered and in many places subangular. In the valley bottoms near the sea it usually consists of nearly impermeable black, sticky mud called taro-patch clay. Much of the younger alluvium is reworked older alluvium. Included also is talus composed of angular blocks, usually with brown interstitial soil, forming aprons on the steep slopes at the base of cliffs. In the mountain areas much of the younger alluvium resembles, includes, and is often inseparable from landslide deposits, because of the torrential character of the streams and the precipitous valley walls. Extensive mantles of hill wash are included. Wells develop water from it in small quantities.

Hydrogeology

Rock Type:	Alluvium-younger
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to low
Hydraulic Conductivity (ft/d):	1 - 500

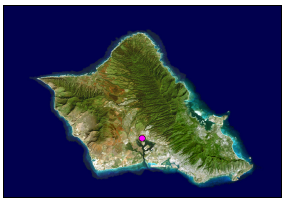
Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3020211612211
Aquifer Sector:	Pearl Harbor
Aquifer System:	Waiawa
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Currently used
Utility:	Ecologically important
Salinity (mg/L Cl-):	Low (250-1000)
Uniqueness:	Irreplaceable
Vulnerability:	High

Lower Aquifer

Aquifer Status Code:	3020212112212
Aquifer Sector:	Pearl Harbor
Aquifer System:	Waiawa
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Ecologically important
Salinity (mg/L Cl-):	Low (250-1000)
Uniqueness:	Irreplaceable
Vulnerability:	Moderate

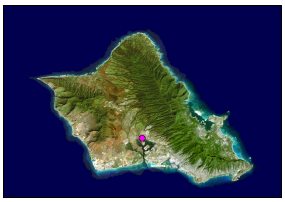


Pearl City Dump - Second Street

Category 1

Site Reconnaissance

Site Description:	The site is located under the H1 Freeway. Evidence of recent surficial dumping that included cans, bottles, an empty unmarked 55-gallon drum, and discarded tires was observed during the site visit.
Type of Property:	Open area under the H1 Freeway.
Current Site Operations:	No current active operations. Big rig trucks and chassis were observed parked on the northwestern portion of the site.
Age of Development:	Unknown.
Onsite Building Information:	Trailer, which is occupied by City & County personnel.
Was There a Recognizable Dump/Landfill?	No.
Institutional Controls:	None.
Number of MonitoringWells:	None observed.
Stability (signs of erosion, etc):	Signs of erosion were observed along the sidewalls of the open-ditch stormwater channel.
Leachate, Seeps:	None observed.
Odors, Staining, Distressed Vegetation:	Several oil stains were observed on the ground in the area where vehicles were parked.
Drainage Features:	A stormwater channel (open ditch) was observed along the eastern border of the site. The channel appears to direct flow to the south towards Pearl Harbor.
Areas of Ponded Water Onsite:	None observed.



Pearl City Dump - Second Street

Category 1

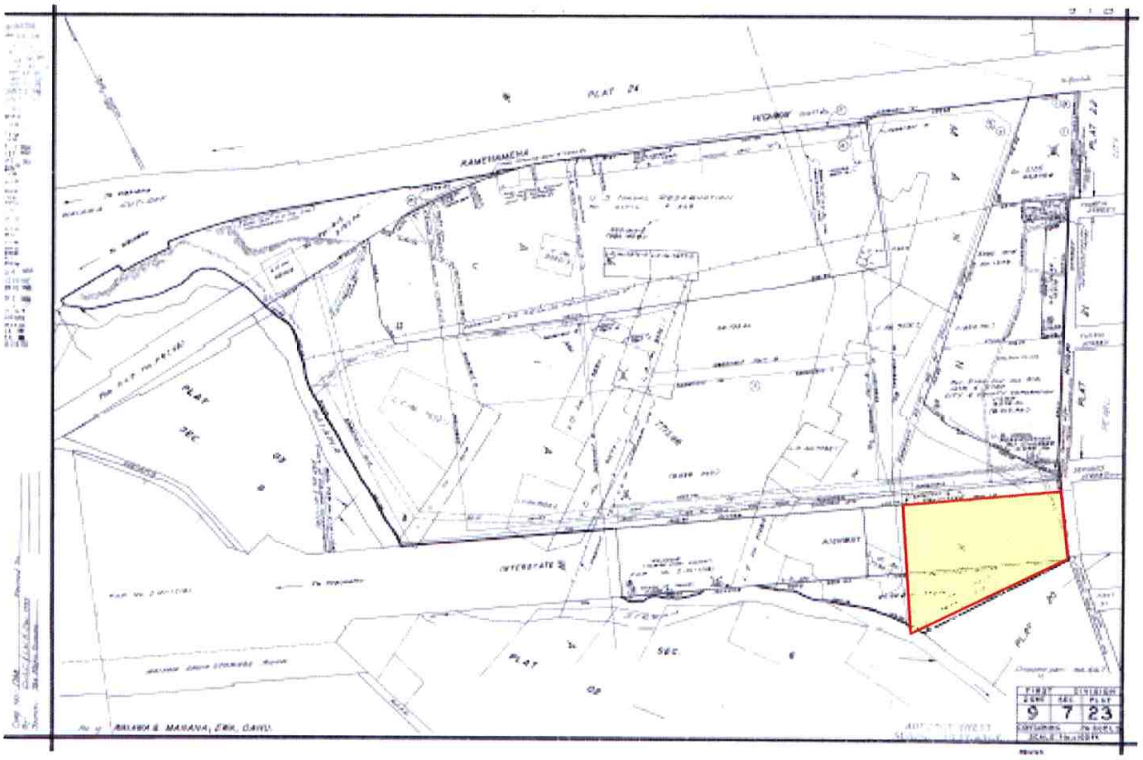
Site Reconnaissance (cont.)

Storm Water Retention Pond:	None observed.
House and Schools in the Vicinity:	Yes. A residential neighborhood is located adjacent to the southern border of the site.
Distance to Nearest Residence, School, or Businesses:	A residential neighborhood is located adjacent to the southern border of the site. Pearl City Elementary School is located approximately 0.5 miles north of the site. Lehua Elementary School is located approximately 0.5 miles southeast of the site.
How is Drinking Water in the Area Supplied?	Municipal water supply.
Natural Resources, Agriculture, Aquaculture Near the Site?	None.
Name of Surface Water Within 1-mile of Dump/Landfill:	Pearl Harbor.
Distance to Surface Water:	Pearl Harbor is located approximately 0.75 miles to the southwest and 0.5 miles to the southeast.
Proximal Direction of Surface Water:	Southwest and Southeast.
Where Does Surface Water Flow?	The stormwater channel drains toward the south. The field team was unable to determine its final destination. Assumed it flows toward Pearl Harbor.
Surface Water Used for Drinking?	No.
Surface Water Used for Recreation?	Yes.
Wetlands:	None observed.
Off-site Sources of Contamination:	The garden center may use pesticides and herbicides. Motor oils from the trucking company.
Does Run-off from other Sites Flow onto Subject Property:	Yes. Topography indicates that runoff from areas immediately northeast of the site will flow through the site and toward the stormwater channel.
Adjacent Property-North:	Second Street. Urban Garden Center.
Adjacent Property-South:	Residential neighborhood.
Adjacent Property-East:	Hugh Street. Similar open areas under the H1 Freeway.
Adjacent Property-West:	Lee Trucking Co.

Pearl City Dump - Second Street

Category 1

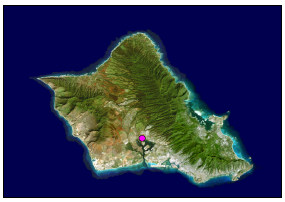
TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	97		
Municipal Well(s)within one mile	3	**Observation Well(s)within one mile**	2
BWS Well(s) within one mile	3	**Sealed Well(s)within one mile**	28
Domestic Well(s)within one mile	19	**Unused Well(s) within one mile**	9
Irrigation Well(s)within one mile	26	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	3	**Other Well(s)within one mile**	3



Pearl City Dump - Second Street

Category 1

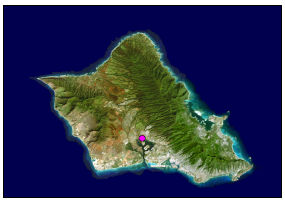
Well Details

USGS Well Number	2459-25	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	21
Well Owner	Cabitac R M	**Well Depth (feet bgs)**	100
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-79
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	0
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	30
Drilling Method	--		
Year of Construction	1977		

USGS Well Number	2358-50	**Aquifer**	30202
Well Name	Waiawa	**Elevation of Ground Surface (ft amsl)**	38
Well Owner	Young K P	**Well Depth (feet bgs)**	80
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-42
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	Percussion		
Year of Construction	1985		

USGS Well Number	2358-49	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	21
Well Owner	Nazarene Chrch	**Well Depth (feet bgs)**	125
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-104
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	14.3
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	45
Drilling Method	Rotary		
Year of Construction	1976		

USGS Well Number	2358-47	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	35
Well Owner	Alipio Sos	**Well Depth (feet bgs)**	141
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-106
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1967		



Pearl City Dump - Second Street

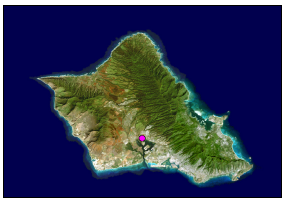
Category 1

USGS Well Number	2358-45	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	38
Well Owner	Gora G	**Well Depth (feet bgs)**	101
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-63
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	16
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1967		

USGS Well Number	2358-43	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	25
Well Owner	Kini A	**Well Depth (feet bgs)**	30
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-5
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1959		

USGS Well Number	2358-40	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	18
Well Owner	Nakama W T	**Well Depth (feet bgs)**	119
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-101
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	14.34
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1957		

USGS Well Number	2358-38	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	12
Well Owner	Gora G	**Well Depth (feet bgs)**	100
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-88
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	17.64
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1955		



Pearl City Dump - Second Street

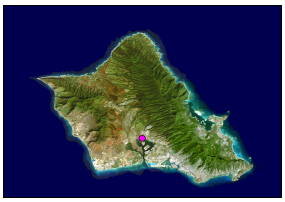
Category 1

USGS Well Number	2358-36	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	13
Well Owner	Sakai K	**Well Depth (feet bgs)**	102
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-89
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	15.08
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	20
Drilling Method	--		
Year of Construction	1954		

USGS Well Number	2358-52	**Aquifer**	30202
Well Name	Waiawa-Gendrano	**Elevation of Ground Surface (ft amsl)**	15
Well Owner	Crabbe F & J	**Well Depth (feet bgs)**	75
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-60
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	20
Drilling Method	Percussion		
Year of Construction	1990		

USGS Well Number	2458-01	**Aquifer**	30202
Well Name	Pearl City Shaft	**Elevation of Ground Surface (ft amsl)**	111
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	151
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-40
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	18.9
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1600
Drilling Method	SHF		
Year of Construction	1940		

USGS Well Number	2358-24	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	23
Well Owner	Taba S	**Well Depth (feet bgs)**	120
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-97
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	16.7
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1949		



Pearl City Dump - Second Street

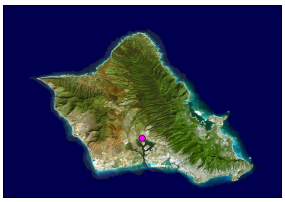
Category 1

USGS Well Number	2459-18	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	22
Well Owner	Kawano H T	**Well Depth (feet bgs)**	185
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-163
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1963		

USGS Well Number	2459-17	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	19
Well Owner	Gora G	**Well Depth (feet bgs)**	142
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-123
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	22
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1957		

USGS Well Number	2458-04	**Aquifer**	30202
Well Name	Pearl City I-2	**Elevation of Ground Surface (ft amsl)**	120
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	140
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-20
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	17.5
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	700
Drilling Method	--		
Year of Construction	1953		

USGS Well Number	2359-18	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	24
Well Owner	Jiminez E	**Well Depth (feet bgs)**	126
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-102
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1959		



Pearl City Dump - Second Street

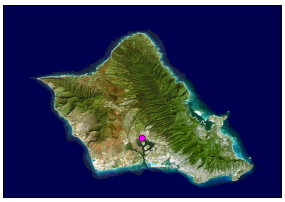
Category 1

USGS Well Number	2359-13	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	8
Well Owner	Nishida I	**Well Depth (feet bgs)**	130
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-122
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	19
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1955		

USGS Well Number	2359-11	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	30
Well Owner	Kobashigawa K	**Well Depth (feet bgs)**	130
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-100
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	19.8
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1954		

USGS Well Number	2359-10	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	23
Well Owner	Gora G	**Well Depth (feet bgs)**	100
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-77
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	14.28
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1954		

USGS Well Number	2458-03	**Aquifer**	30202
Well Name	Pearl City I-1	**Elevation of Ground Surface (ft amsl)**	120
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	150
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-30
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	18.7
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	700
Drilling Method	--		
Year of Construction	1953		



Pearl City Dump - Second Street

Category 1

USGS Well Number	2358-30	**Aquifer**	30202
Well Name	Pearl City	**Elevation of Ground Surface (ft amsl)**	11
Well Owner	Sakamoto E M	**Well Depth (feet bgs)**	103
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-92
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	15.2
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	19
Drilling Method	--		
Year of Construction	1953		

USGS Well Number	2459-22	**Aquifer**	30202
Well Name	Waipahu	**Elevation of Ground Surface (ft amsl)**	
Well Owner	Alipio S A	**Well Depth (feet bgs)**	114
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1979		

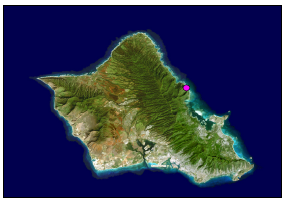
Photo 1. Looking east towards Hugh Street and under an H-1 overpass at the area where the Pearl City 2nd Street Dump is suspected to have been located.

Photo 2. An empty drum, with no marking to indicate its former contents, was observed on the southwestern corner of the Site. The inside of the drum appeared oily.

Photo 3. Tires and other debris were observed on the surface along the south-central border of the Site.

Photo 4. Metal debris and tires were observed on the surface along the north-central border of the Site.

Punaluu Dump



Punaluu Dump

Category 3

Picture Not Available

Site Description

The former Punaluu Dump was reportedly located to the south of Kaaawa Stream and to the west of Kamehameha Highway at the mouth of the Kaaawa Valley. According to Young (1993, Map 11), the dump was formerly owned by the E.A.S. Williams Estate and may have been operated by the City and County of Honolulu (C&C) for household wastes from 1940-1948. The area in the vicinity of the former dump is currently residential.

In a July 14, 1942 Honolulu Advertiser article, it was reported that tons of refuse accumulated at various points throughout the island following the December 7, 1941 bombing. Refuse disposal centers were established across the island and were marked by signs that read, "Official Rubbish Dump-by Order of the Military Governor". The refuse disposal centers were divided into four classes: C&C sites, Navy sites, Army sites, and plantation sites. According to the plan adopted by the United States Surgeon's Office, the Corp of Engineers, and the C&C Public Works Department, refuse was to be burned at these specially designated dumps. The map that accompanied the Honolulu Advertiser article is the same as Young's (1993) map number 10 and is entitled "Refuse-Disposal Facilities". According that map, a dump called "Kaaawa Dump" was located in the general vicinity of the Kualoa Ranch. Though the map is not of an appropriate scale to definitively determine that the site was on that property, it does indicate that there was a rural rubbish dump in the area during the early 1940's. It appears from the lack of information found on many of the sites depicted on this map (one of which is the Punaluu Dump), that many of these special rubbish disposal centers were not used again after the accumulated refuse was burned.

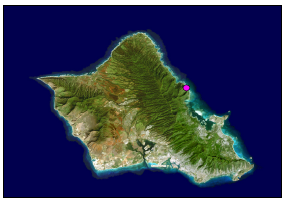
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	5-1-001:018, 019, 020, 021, 022
2382688.40244	619673.77242	**Zone:**	Koolauloa
Longitude	**Latitude**	**Section:**	Kaaawa
157 50 39	21 32 34	**Plat:**	Not Designated
Address:	192, 192A, 196, 196A Kamehameha Hwy	**Quadrangle:**	Kahana

Ownership

Current Owner: Various; including Kaniho and Chum families

Previous Operator: City and County of Honolulu



Punaluu Dump

Category 3

Picture Not Available

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940-1948	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Population and Land Use

Type of Development in the Surronding Area? Residential

City and County Zoning: Country

State Land Use District: Agricultural

Facilities: Detached dwellings (1965, 1967, 1969, 1971)

TMK Separation: Household dwellings, right-of-way

Flood Zone: AE - 100-year Flood Plain

Geography and Topography

Physiographic Province: Koolau Range

Elevation Range (ft): 0 **to** 20

Approximate Landfill Acreage: <1

Parcel Acreage: 0.6

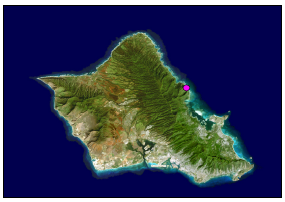
Climate

Annual Precipitation (cm): 193.80

Precipitation Days Per Year 133

Average Temperature (°F): 74.3

Temperature Range (° F): 68.8 **to** 79.8



Punaluu Dump

Category 3

Picture Not Available

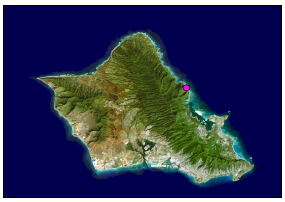
Soils

Soil Map Symbol:	Ms	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.09-0.12
Soil Series:	Mokuleia	**Organic Carbon (%):**	1.0-2.0
Engineering Classification:	Clay Loam, Loam, or Fine Sandy Loam	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	--
Thickness of Surface Soil (in):	0-50	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	Mt	**Bulk Density (gm/cc):**	1.10-1.30
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.13-0.15
Soil Series:	Mokuleia	**Organic Carbon (%):**	1.0-2.0
Engineering Classification:	Clay Loam, Loam, or Fine Sandy Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	--
Thickness of Surface Soil (in):	0-50	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	MZ	**Bulk Density (gm/cc):**	Not available
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.24-0.30
Soil Series:	Marsh	**Organic Carbon (%):**	60-99
Engineering Classification:	Marsh	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Very poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	JaC	**Bulk Density (gm/cc):**	1.55-1.60
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.04-0.05
Soil Series:	Jaucas	**Organic Carbon (%):**	0.5-1.0
Engineering Classification:	Sand	**Permeability (in/hr):**	6-20
Drainage Characterisitics:	well	**Slope (%):**	0-15
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.3
Topsoil Rating:	Fair	**Corrosivity:**	Moderate



Punaluu Dump

Category 3

Picture Not Available

Geology

Geologic Symbol(s): Ra

Geologic Unit(s): Unconsolidated noncalcareous deposits

Geologic Description: Chiefly younger alluvium, a black to brown fluviatile deposit generally consisting of coarse permeable detritus only slightly weathered and in many places subangular. In the valley bottoms near the sea it usually consists of nearly impermeable black, sticky mud called taro-patch clay. Much of the younger alluvium is reworked older alluvium. Included also is talus composed of angular blocks, usually with brown interstitial soil, forming aprons on the steep slopes at the base of cliffs. In the mountain areas much of the younger alluvium resembles, includes, and is often inseparable from landslide deposits, because of the torrential character of the streams and the precipitous valley walls. Extensive mantles of hill wash are included. Wells develop water from it in small quantities.

Geologic Symbol(s): Rs

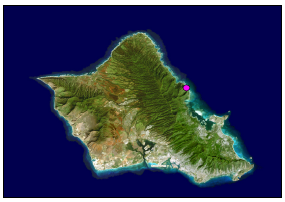
Geologic Unit(s): Unconsolidated marine calcareous sediments

Geologic Description: Chiefly cream-colored and light-tan, very permeable beach sand consisting of grains of worn coral, coralline algae, and shells with appreciable amounts of foraminifers and other calcareous marine organisms. Abundant water in this sand, but it is either brackish or ocean water.

Hydrogeology

Rock Type:	Alluvium-younger
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to low
Hydraulic Conductivity (ft/d):	1 - 500

Rock Type:	Sand-unconsolidated
GW Occurrance-Principal:	Basal
GW Occurrance-Secondary:	--
Permeability:	Moderate to high
Hydraulic Conductivity (ft/d):	100 - 1,000



Punaluu Dump

Category 3

Picture Not Available

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3060211612211
Aquifer Sector:	Windward
Aquifer System:	Kahana
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Currently used
Utility:	Ecologically important
Salinity (mg/L Cl-):	Low (250-1000)
Uniqueness:	Irreplaceable
Vulnerability:	High

Lower Aquifer

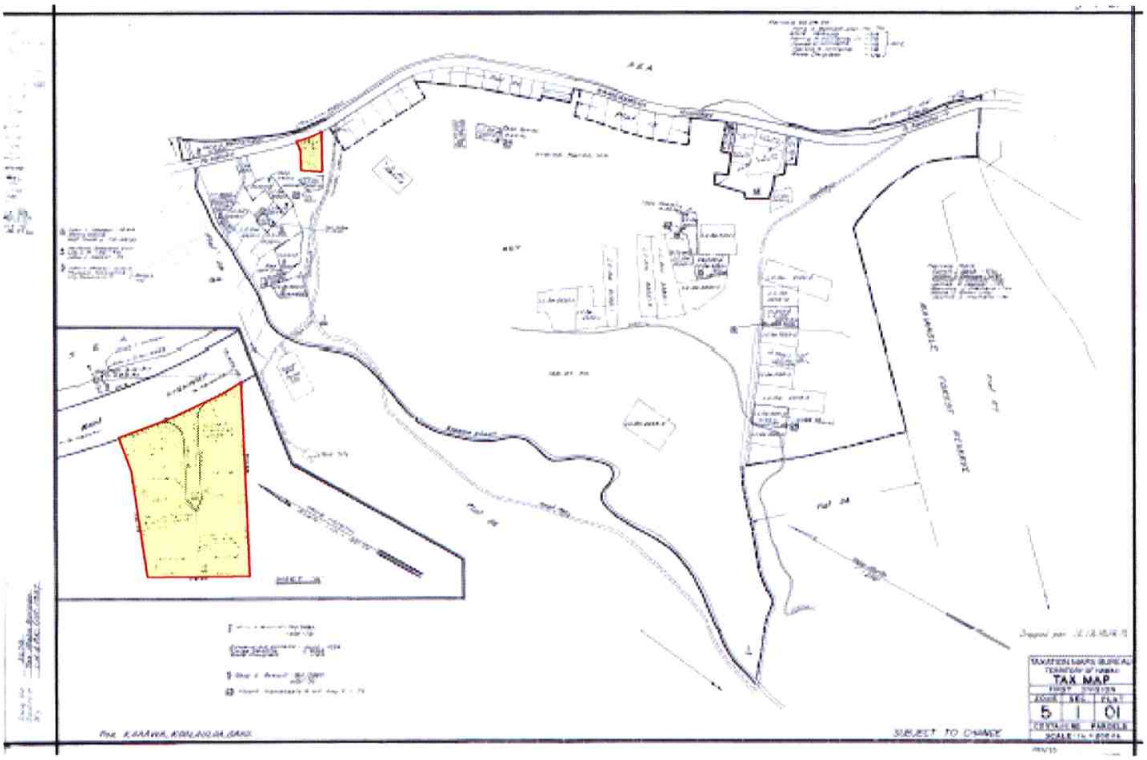
Aquifer Status Code:	3060212211113
Aquifer Sector:	Windward
Aquifer System:	Kahana
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Dike
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	Low

Punaluu Dump

Category 3

Picture Not Available

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	8		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	1
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	4
Irrigation Well(s)within one mile	2	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	1

Well Details

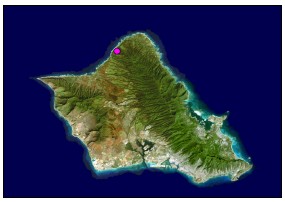
Pupukea Dump

Source: R.M. Towill Corporation
11-10-90; photograph 8715-166

URS

Title **Aerial Photograph – Vicinity of Pupukea Dump**

Project **Oahu Inactive Landfills Relative Risk Evaluation**
Project No. 26536686.00300



Pupukea Dump

Category 2

Site Description

The Pupukea Dump was likely located in an area to the northeast of Waimea Bay (1.5 miles), to the south of Sunset Beach (0.9 miles), and between Kalunawaikaala and Pakulena Streams. According to a historic map (Young, 1993; Map 10), a dump maintained by the military was located in the Pupukea area during the early 1940's, but the map is not of an appropriate scale to definitively determine where the site was located. The area in the vicinity of the former dump is currently residential and agricultural.

The Pupukea Dump was probably a land disposal operation along unimproved military-controlled access roads used to dispose of wastes generated during military exercise training operations. In a July 14, 1942 Honolulu Advertiser article, it was reported that tons of refuse accumulated at various points throughout the island following the December 7, 1941 bombing. Refuse disposal centers were established across the island and were marked by signs that read, "Official Rubbish Dump-by Order of the Military Governor". The refuse disposal centers were divided into four classes: C&C sites, Navy sites, Army sites, and plantation sites. According to the plan adopted by the United States Surgeon's Office, the Corp of Engineers, and the C&C Public Works Department, refuse was to be burned at these specially designated dumps. The map that accompanied the Honolulu Advertiser article is the same as Young's (1993) map number 10 and is entitled "Refuse-Disposal Facilities". It appears from the lack of information found on many of the sites depicted on this map (one of which is the Pupukea Dump), that many of these special rubbish disposal centers were not used again after the accumulated refuse was burned.

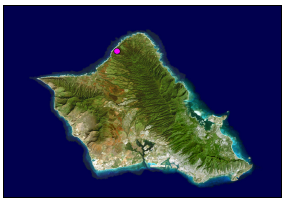
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	5-9-005:038
2395076.13473	598745.64552	**Zone:**	Koolauloa
Longitude	**Latitude**	**Section:**	Loa
158 02 44	21 39 22	**Plat:**	Pupukea
Address:	Undeveloped military lands off Pupukea Rd. past Boy Scout camp	**Quadrangle:**	Waimea

Ownership

Current Owner: Ohbayashi Corporation/Possibly linked to or converted to United States ownership

Previous Operator: U.S. Army



Pupukea Dump

Category 2

Site Operation and History

Landfill Type: Military

Type of Waste: Mixed wastes from military operations

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Dump and cover with burning
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Military

City and County Zoning: Agricultural

State Land Use District: Agricultural

Facilities: unknown at present

TMK Separation: Unsubdivided vacant land

Flood Zone: D - Undetermined but possible flood hazards, X - 500-year Flood Plain

Geography and Topography

Physiographic Province: Schofield Plateau

Elevation Range (ft): 620 **to** 660

Approximate Landfill Acreage: 1-5

Parcel Acreage: 518.845

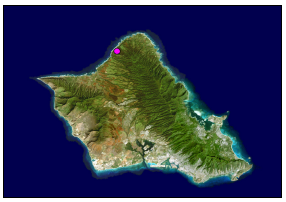
Climate

Annual Precipitation (cm): 138.53

Precipitation Days Per Year 120

Average Temperature (°F): 74.4

Temperature Range (° F): 65.2 **to** 83.5



Pupukea Dump

Category 2

Soils

Soil Map Symbol:	WaB	**Bulk Density (gm/cc):**	1.20-1.45
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Wahiawa	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	3-8
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	MpD2	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Lolekaa-Waikane	**Moisture Retention (%):**	0.09-0.11
Soil Series:	Manana	**Organic Carbon (%):**	3.0-6.0
Engineering Classification:	Silty Clay Loam and Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	12-25
Thickness of Surface Soil (in):	0-60	**pH:**	4.5-5.5
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

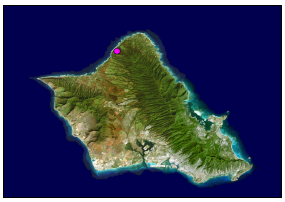
Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.

Hydrogeology

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

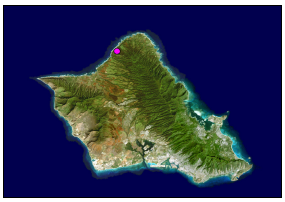


Pupukea Dump

Category 2

Aquifer(s)

Aquifer Status Code:	3040311111111
Aquifer Sector:	North
Aquifer System:	Kawailoa
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

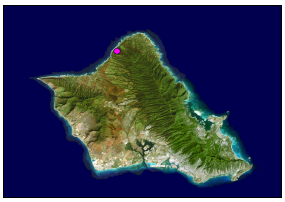


Pupukea Dump

Category 2

Site Reconnaissance

Site Description:	The site formerly known as the Pupukea Dump is currently an inactive agricultural area. The site was formerly part of the Kahuku Ranch and then was later used as a tree farm. Tree farming operations were suspended approximately 10 years ago. There are no current activities on the site. Two horses are allowed to roam the area freely. There are no visual indications of the former Pupukea Dump.
Type of Property:	Inactive ranch/agricultural property.
Current Site Operations:	None.
Age of Development:	At least 20 years.
Onsite Building Information:	Unused warehouse.
Was There a Recognizable Dump/Landfill?	No.
Institutional Controls:	Gates with padlocks.
Number of MonitoringWells:	Mr. Ortiz indicated that there were two monitoring wells, approximately 1300-1400 feet deep, within Obayashi property. He believes that wells may have been installed by the BWS. URS was unable to observe the monitoring wells due to the wet site conditions.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	None observed.
Odors, Staining, Distressed Vegetation:	None related to landfill or farming activities. However, odors from the horses' manure was observed.
Drainage Features:	None observed.
Areas of Ponded Water Onsite:	None observed.

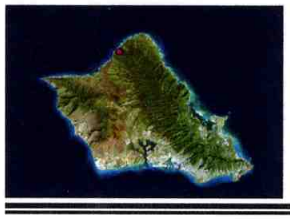


Pupukea Dump

Category 2

Site Reconnaissance (cont.)

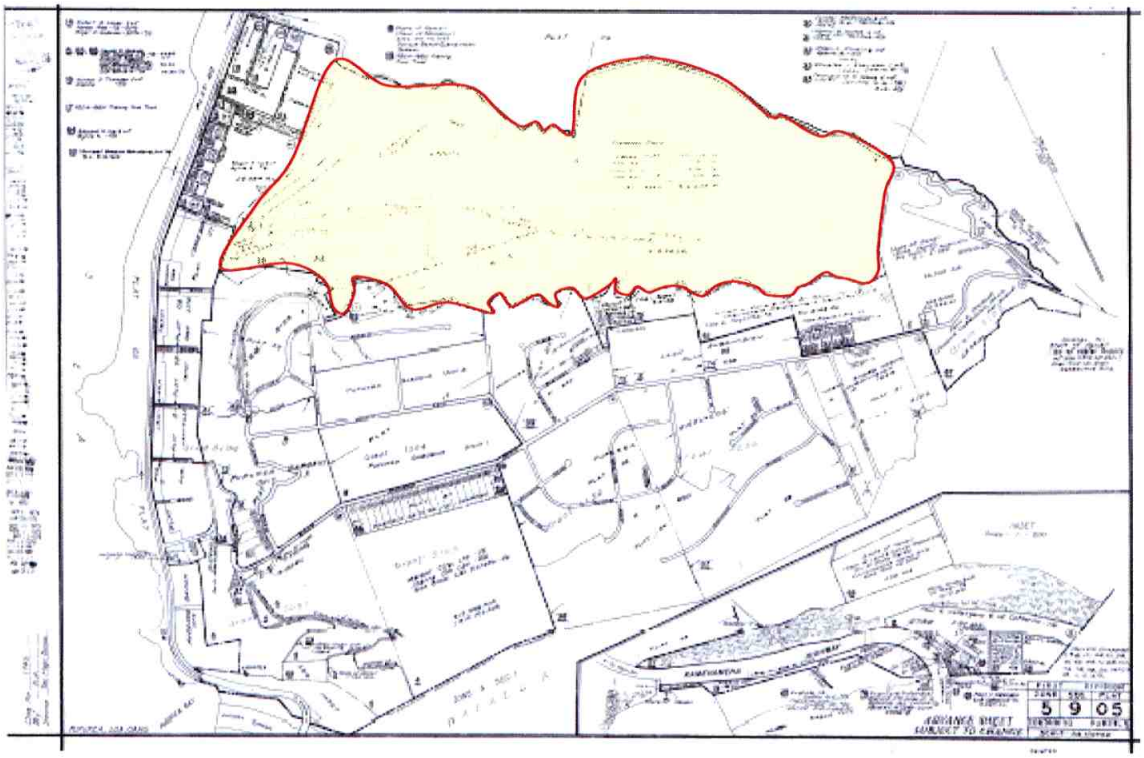
Storm Water Retention Pond:	None observed.
House and Schools in the Vicinity:	Yes. A residential neighborhood, boy scout camp and two schools are located within a mile of the site.
Distance to Nearest Residence, School, or Businesses:	The Pupukea neighborhood is located approximately 0.5 miles southwest of the site. The Pupukea Boy Scout Camp is located approximately 1 mile southwest of the site. Two schools, Sunset Beach Elementary and Sunset Beach Christian, and located approximately 0.6 miles northeast and 0.9 miles west of the site, respectively.
How is Drinking Water in the Area Supplied?	Municipal water supply.
Natural Resources, Agriculture, Aquaculture Near the Site?	None.
Name of Surface Water Within 1-mile of Dump/Landfill:	Pacific Ocean
Distance to Surface Water:	The Pacific Ocean is located approximately 0.9 miles northwest of the site.
Proximal Direction of Surface Water:	Northwest.
Where Does Surface Water Flow?	Topography indicates that runoff would flow towards the Pakulena Stream, which flows into the Pacific Ocean.
Surface Water Used for Drinking?	No.
Surface Water Used for Recreation?	Yes.
Wetlands:	None observed.
Off-site Sources of Contamination:	None observed.
Does Run-off from other Sites Flow onto Subject Property:	Topography indicates that runoff from unused Obayashi properties to the southeast may flow though the site toward the stream.
Adjacent Property-North:	Undeveloped property owned by Obayashi Corporation.
Adjacent Property-South:	Undeveloped property owned by Obayashi Corporation.
Adjacent Property-East:	Undeveloped property owned by Obayashi Corporation.
Adjacent Property-West:	Undeveloped property owned by Obayashi Corporation.



Pupukea Dump

Category 2

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	8		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	1
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	6
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Photo 1. **Looking south at an abandoned tree farm in which the former dump is presumed to have been located. No distinct indications of the specific dump location were noted during the site visit.**

Photo 2. **Looking east over the former tree farm.**

Puu Palailai Dump

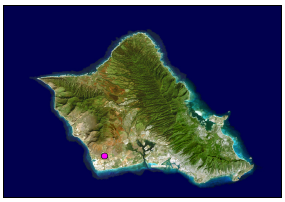
Source: R.M. Towill Corporation

URS

Title **Aerial Photograph – Vicinity of Puu Palailai Landfill**

Project **Oahu Inactive Landfills Relative Risk Evaluation**

Project No. 26536686.00300



Puu Palailai Landfill

Category 1

Site Description

Puu Palailai is 42-acre former landfill approximately 1.5 miles north of Barbers Point Naval Air Station, just north of the intersection of interstate H-1, Farrington Highway, and Kalaeloa Boulevard. The site is bounded to the northeast by a buffer zone 60-200 feet wide and a residential neighborhood (Makakilo City), to the south by an abandoned irrigation canal, to the south and west by a water park and satellite dish farm, and to the north by the Puu Palailai cinder cone.

Pacific Concrete and Rock Company (PCR) originally operated the site as a basalt quarry from 1950 through 1974. The quarry was as deep as 90 to 100 feet below ground surface before the landfill operation began accepting municipal solid waste in 1974. The State of Hawaii issued a landfill permit in 1978 and renewed it in 1983. The 1983-issued Solid Waste Management Permit stipulated that hazardous waste was prohibited from the site and only mixed municipal solid waste was allowed. PCR predominately accepted mixed municipal wastes but some industrial and military wastes were also accepted at the landfill prior to 1983. However, there is no documentation regarding possible types and quantities of hazardous wastes deposited at the landfill.

Grace Pacific operated the site from 1984 until its closure on May 31, 1989, and currently conducts post-closure maintenance and monitoring. The land is under lease to Grace Pacific from the Campbell Estate. Data from January 1986 through July 1987 indicated that the landfill had an average disposal rate of 22,500 tons per month or 270,000 tons per year. The average depth of waste is 50 feet and the landfill contains approximately 4.6 million cubic yards of waste.

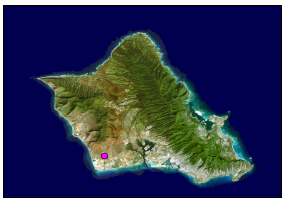
On August 29, 1990, the landfill was inspected for final closure under Hawaii Administrative Rules, Title 11, Chapter 58 (effective from November 1981-October 1993). Since that date, Grace Pacific has worked with consultants Parametrix Inc. to maintain the surface water system, landfill gas monitoring and control system (activated in 1991), and landfill fire monitoring and suppression system in accordance with applicable laws and regulations. Data have been gathered and compiled into annual reports.

Groundwater is about 75 feet or more below the bottom of the former quarry and monitoring was conducted at two downgradient wells from 1987-1995. Monitoring was discontinued in 1996 because the landfill had been closed since 1990 and the historical data of landfill leachate indicator parameters were stable.

A desalinization plant built by the Water and Land Development Branch of the Hawaii Department of Land and Natural Resources is located south and down gradient of the landfill, and treated water from 1990-1995 before closing due to lack of funding. A gas collection system that collects landfill gas generated by decomposing refuse consists of 5 horizontal trenches, an observation manhole, an aboveground manifold, and a flare facility where complete gas combustion takes place. It is thought that porous volcanic rock beneath and surrounding the landfill allows air to infiltrate into the refuse, thereby promoting subsurface refuse fires. After a review of data from deep temperature probes, a water injection system has been installed to decrease localized high temperatures.

The Puu Palailai Landfill is listed in the United States Environmental Protection Agency (EPA) Archived Sites database as “Pacific Concrete and Rock Landfill”. According to the United States EPA database, the landfill’s “Discovery” was during November 1979. A Preliminary Assessment was completed during January 1980. Site Inspections were completed during March 1982 and May 1990. The site was archived May 14, 1990. According to the State of Hawaii Department of Health (DOH), 2003 report, the State of Hawaii Department of Health's Hazard Evaluation and Emergency Response (HEER) Initial Site Screening Team screened the site on January 20, 2004 and the ranking process was ongoing (State of Hawaii DOH, 2003).

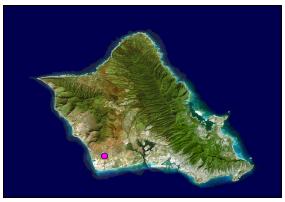
According to the State of Hawaii Department of Health-Solid and Hazardous Waste Branch 1) groundwater monitoring at the site did not include a background well; therefore, statistical analysis



Puu Palailai Landfill

Category 1

comparing background water quality to downgradient water quality was not possible, 2) one or more of the existing groundwater monitoring wells is obstructed, and 3) there have been complaints about the landfill regarding odors and fires.



Puu Palailai Landfill

Category 1

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	9-1-016:006
2359874.88229	594780.42802	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Honouliuli
158 05 09	21 20 18	**Plat:**	Not Designated
Address:	340 and 342 Farrington Highway	**Quadrangle:**	Ewa

Ownership

Current Owner: James Campbell Trust Estate

Previous Operator: Grace Pacific Corporation (Pacific Rock and Concrete)

Site Operation and History

Landfill Type: Private

Type of Waste: Predominately mixed municipal solid waste (industrial and military wastes prior to 1984)

Monitoring Well Network? Yes

Monitoring Well Identification MW-1, MW-2, MW-3, and MW-4

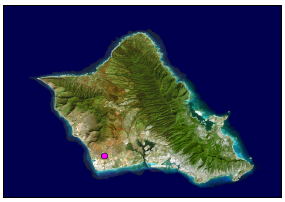
Status:	Active Closure	**Analytical Data Available?**	Yes
Active Period:	1974-1988	**EPA ID No.:**	HID980637508
Lined?	Although eighteen inches of clay may line the quarry's bottom, DOH does not consider Puu Palailai a lined landfill because quality assurance/quality control was not documented during installation of the liner	**Non-NPL status:**	Long-term Monitoring of Groundwater and Soil Gas
Capped?	Yes. The site was covered in 1988 with a flexible membrane liner and several feet of unimpacted soil.	**Method of Operation:**	Dump and cover (clay)

Permit Info: Permit numbers SW051007 (Jun. 27, 1975-Apr. 17, 1978), SW-085088 (May 4, 1978-Apr. 14, 1983), SW-161163 (May 2, 1983-May 1, 1988), and SW-243257 (Apr. 26, 1988-May 1, 1990). The landfill was issued permits under Chapter 46 of the Public Health Regulations (effective Jul. 1974-Nov. 1981) and Chapter 58 of the Hawaii Administrative Rule (effective Nov. 1981-Oct. 1993).

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka



Puu Palailai Landfill

Category 1

Population and Land Use

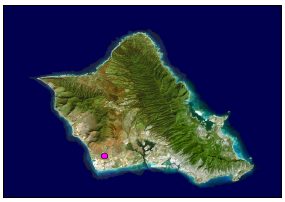
Type of Development in the Surronding Area?	Commercial
City and County Zoning:	Ag-2
State Land Use District:	Agricultural, Urban
Facilities:	Buffer zone at present; development for residential/commercial use of the land is planned
TMK Separation:	Unsubdivided vacant land
Flood Zone:	D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province:	Waianae Range
Elevation Range (ft):	120 **to** 380
Approximate Landfill Acreage:	41.5
Parcel Acreage:	121.93

Climate

Annual Precipitation (cm):	49.40
Precipitation Days Per Year	30
Average Temperature (°F):	76.0
Temperature Range (° F):	67.4 **to** 84.5



Puu Palailai Landfill

Category 1

Soils

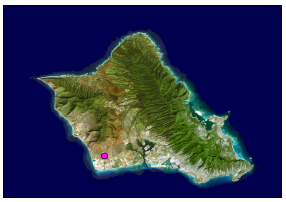
Soil Map Symbol:	Quarry	**Bulk Density (gm/cc):**	Not available
Soil Association:	Rock Land	**Moisture Retention (%):**	Not available
Soil Series:	Quarry	**Organic Carbon (%):**	Not available
Engineering Classification:	Quarry Rock	**Permeability (in/hr):**	Not available
Drainage Characterisitics:	Not available	**Slope (%):**	--
Thickness of Surface Soil (in):	Not available	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Not available

Soil Map Symbol:	QU	**Bulk Density (gm/cc):**	Not available
Soil Association:	Rock Land-Stony steep	**Moisture Retention (%):**	Not available
Soil Series:	Quarry	**Organic Carbon (%):**	Not available
Engineering Classification:	Quarry Rock	**Permeability (in/hr):**	Not available
Drainage Characterisitics:	Not available	**Slope (%):**	--
Thickness of Surface Soil (in):	Not available	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Not available

Soil Map Symbol:	EaB	**Bulk Density (gm/cc):**	1.10-1.30
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Ewa	**Organic Carbon (%):**	1.0-4.0
Engineering Classification:	Silty Clay Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	3-6
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.3
Topsoil Rating:	Fair	**Corrosivity:**	Moderate

Soil Map Symbol:	MuD	**Bulk Density (gm/cc):**	1.10-1.35
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Molokai	**Organic Carbon (%):**	1.0-4.0
Engineering Classification:	Silty Clay Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	15-25
Thickness of Surface Soil (in):	0-72	**pH:**	6.6-7.8
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	MuC	**Bulk Density (gm/cc):**	1.10-1.35
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13



Puu Palailai Landfill

Category 1

Soil Series:	Molokai	**Organic Carbon (%):**	1.0-4.0
Engineering Classification:	Silty Clay Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	7-15
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.8
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	rRK	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Rock land	**Moisture Retention (%):**	0.12-0.16
Soil Series:	Rock Land	**Organic Carbon (%):**	3.0-6.0
Engineering Classification:	Silty Clay Loam, Unweathered Bedrock	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Very poor	**Slope (%):**	>15
Thickness of Surface Soil (in):	0-8	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	LPE	**Bulk Density (gm/cc):**	1.20-1.56
Soil Association:	Rock land-Stony steep	**Moisture Retention (%):**	0.08-0.10
Soil Series:	Lualualei	**Organic Carbon (%):**	0.5-2.0
Engineering Classification:	Extremely Stony Clay	**Permeability (in/hr):**	0.0000-0.1
Drainage Characterisitics:	Very poor	**Slope (%):**	3-35
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Geology

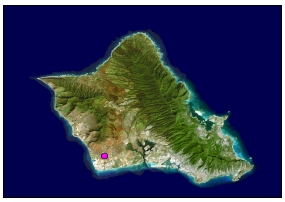
Geologic Symbol(s): Twb

Geologic Unit(s): Waianae volcanic series

Geologic Description: Consists chiefly of undifferentiated lower, middle, and upper basalt members. The lower basalt member includes one thick trachyte flow with the remainder chiefly effusive aphanitic and porphyritic pahoehoe basalts, with small amounts of aa, varying from 10 to 200 feet in thickness and having a total thickness of over 2,000 feet. The middle member consists of both aa and pahoehoe in nearly equal amounts, and the upper member comprises chiefly massive aa flows; the total thickness of the flow lavas exceeds 4,000 feet. The conspicuous phenocrysts are olivine and feldspar; the three basalt members are all very permeable and are the important aquifers of the Waianae Range.

Hydrogeology

Rock Type:	Waianae Volcanics-Lava flows-dike free
GW Occurrance-Principal:	Basal
GW Occurrance-Secondary:	--
Permeability:	Moderate to very high
Hydraulic Conductivity (ft/d):	500 - 5,000

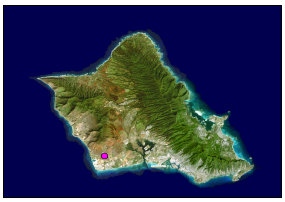


Puu Palailai Landfill

Category 1

Aquifer(s)

Aquifer Status Code:	3020411111111
Aquifer Sector:	Pearl Harbor
Aquifer System:	Ewa
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High



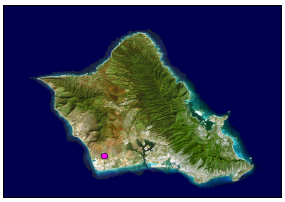
Puu Palailai Landfill

Category 1

Site Reconnaissance

Site Description: The Puu Palailai Landfill has no current onsite activities except for the monitoring of landfill gases and temperature monitoring of the fire in the landfill. The site is approximately 30 acres in size and is currently managed by Grace Pacific. Grace Pacific will be managing the site until at least 2017. The landfill area is sinking at an average rate of about 0.25 inches per month. In order to keep areas from ponding, Grace Pacific backfills sunken areas with fine material from their nearby quarry operation.

Type of Property:	Closed Landfill (active closure).
Current Site Operations:	Landfill Gas Monitoring.
Age of Development:	30 years (since landfill operations began); 54 years (since quarry operations began)
Onsite Building Information:	None.
Was There a Recognizable Dump/Landfill?	None other than the Puu Palailai landfill onsite.
Institutional Controls:	The site is surrounded by a fence. Access to the site is controlled by a gate near the water park's employee parking.
Number of MonitoringWells:	11-Landfill gas wells. Four (4) groundwater monitoring wells. However, one monitoring well was covered over when the water park was constructed. URS was only able to locate 2 of the 3 remaining wells.
Stability (signs of erosion, etc):	No signs of erosion. However, according to B. Adair, the landfill is sinking at an average rate of about 0.25 inches per month. Grace Pacific backfills sunken areas with fill material.
Leachate, Seeps:	Not observed.
Odors, Staining, Distressed Vegetation:	Distressed vegetation was noted throughout the site. Patches of barren areas were noted in heavily vegetated portions of the site, some due to placement of new fill.
Drainage Features:	An engineered stormwater drainage system is located on-site to direct stormwater to a retention pond located southeast of the landfill.
Areas of Ponded Water Onsite:	Grace Pacific actively tries to keep ponding areas from forming by adding fill material into areas that are sinking.



Puu Palailai Landfill

Category 1

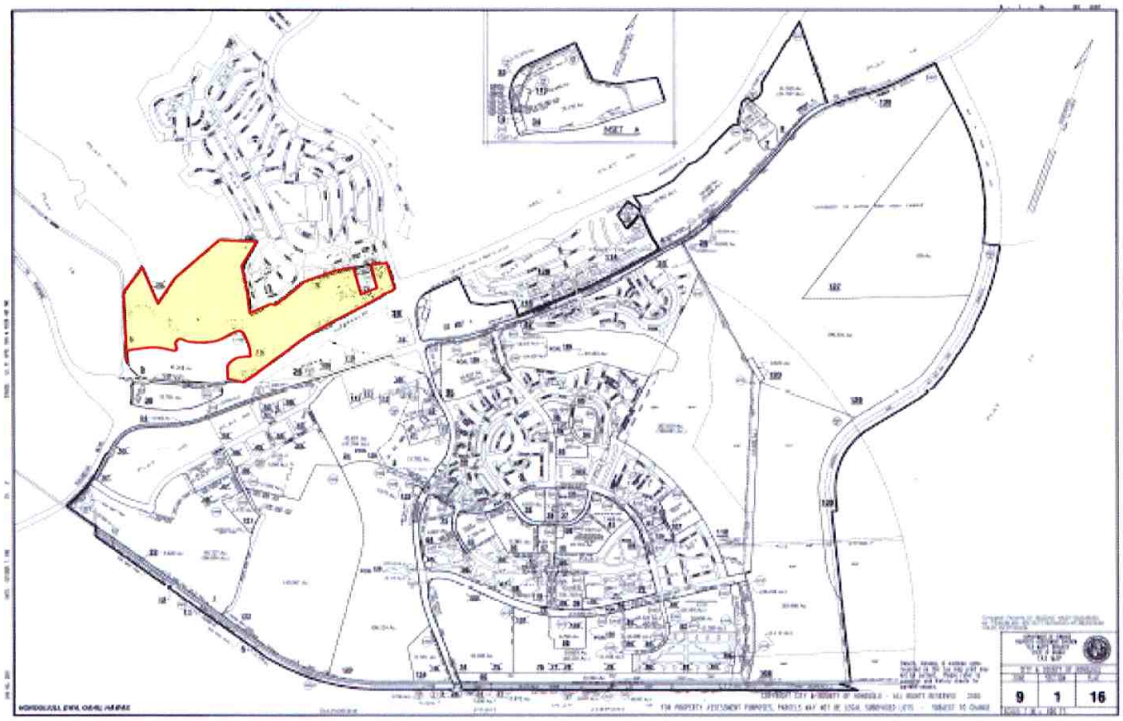
Site Reconnaissance (cont.)

Storm Water Retention Pond:	Yes.
House and Schools in the Vicinity:	A housing subdivision borders the east side of the property.
Distance to Nearest Residence, School, or Businesses:	The housing subdivision is adjacent to the property boundary and approximately 150 feet from the eastern edge of the landfill.
How is Drinking Water in the Area Supplied?	Water is not supplied to the site.
Natural Resources, Agriculture, Aquaculture Near the Site?	Cattle ranch borders the north and west sides of the property.
Name of Surface Water Within 1-mile of Dump/Landfill:	Pacific Ocean
Distance to Surface Water:	Pacific Ocean is located approximately 2.5 miles west and 3 miles south of the site.
Proximal Direction of Surface Water:	West and south.
Where Does Surface Water Flow?	Stormwater retention basin located on the property.
Surface Water Used for Drinking?	No.
Surface Water Used for Recreation?	Yes.
Wetlands:	None observed.
Off-site Sources of Contamination:	None observed.
Does Run-off from other Sites Flow onto Subject Property:	None observed.
Adjacent Property-North:	Cattle ranch.
Adjacent Property-South:	Hawaiian Adventures Water Park.
Adjacent Property-East:	Housing subdivision.
Adjacent Property-West:	Cattle ranch.

Puu Palailai Landfill

Category 1

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	12		
Municipal Well(s)within one mile	1	**Observation Well(s)within one mile**	0
BWS Well(s) within one mile	1	**Sealed Well(s)within one mile**	1
Domestic Well(s)within one mile	0	**Unused Well(s) within one mile**	6
Irrigation Well(s)within one mile	2	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	2

Well Details

USGS Well Number	2004-04	**Aquifer**	30204
Well Name	Makakilo	**Elevation of Ground Surface (ft amsl)**	141
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	268
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-127
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	14.9
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	Percussion		
Year of Construction	1981		

Photo 1. **Looking east at monitoring well MW-2, which is located to the southwest of the site at the base of the landfill.**

Photo 2. **Looking north at the landfill gas pump station on the north-central portion of the landfill.**

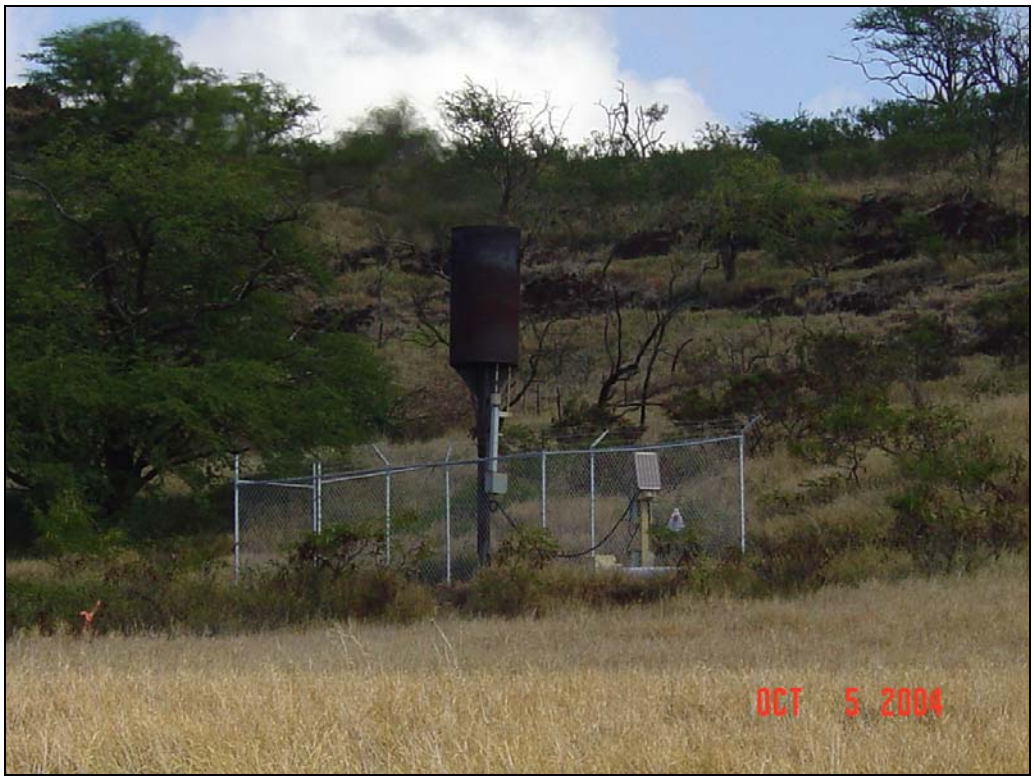


Photo 3. Looking northeast at the landfill gas flare located on the northern portion of the landfill.

Photo 4. Looking at T-West-2, which is one of eleven landfill gas probes.

Photo 5. **Looking northeast from the central portion of the site. Note the landfill gas pump station on the left hand portion of the photo.**

Photo 6. **40,000-gallon water storage tank used to control subsurface landfill fires. The tank feeds injection lines via gravity drainage.**

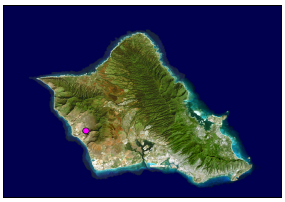
Photo 7. Looking at water injection lines located on the southern portion of the site.

Photo 8. Looking at one of seventy-six temperature gauges.

Photo 9. **Looking at the concrete drainage channel, which runs parallel to the access road along the eastern portion of the site.**

Photo 10. **Looking at the dry retention basin into which the drainage channels empty (when applicable). The basin is located on the southeastern portion of the site.**

Saki Moru Dump



Saki Moru Dump

Category 3

Site Description

The former Saki Moru Dump is located in Waianae to the west of Ulehawa Stream (0.2 miles) and Hakimo Road and to the south of the Lualualei Naval Radio Transmitting Facility. The Saki Moru Dump was active for an unknown period of time before a Department of Health violation citation was issued in 1980, at which time Mr. Saki applied for and was granted a landfill permit and operated legally until 1991. The dump was a private farm lot operation in which demolition wastes were dumped, compacted, and filled on an as-needed basis. Wastes consisted of rocks, soil, coral, concrete, metal, lumber, and brush. Approximately 11,300 cubic yards of demolition wastes were reportedly placed at the dump. The area in the vicinity of the former dump is currently residential.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	8-7-019:001
2368217.11224	588732.92157	**Zone:**	Waianae
Longitude	**Latitude**	**Section:**	Lualualei
158 08 16	21 24 53	**Plat:**	Not Designated
Address:	87-1665 Paakea Road	**Quadrangle:**	Schofield Barracks

Ownership

Current Owner: Eugene P Lapina

Previous Operator: Minoru Saki

Site Operation and History

Landfill Type: Private

Type of Waste: Construction demolition

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

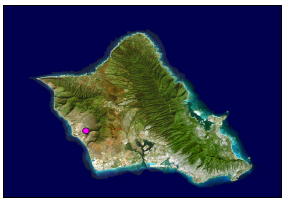
Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1980-1991	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	Yes	**Method of Operation:**	Dump and fill

Permit Info: Permit number SW-121127 (Sept. 29, 1980-Aug. 31,1985). The landfill was issued a permit under Chapter 46 of the Hawaii Administrative Rule (effective Jul. 1974-Nov. 1981).

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Mauka



Saki Moru Dump

Category 3

Population and Land Use

Type of Development in the Surronding Area?	Agricultural/Residential
City and County Zoning:	Ag-2, Ag-1
State Land Use District:	Agricultural
Facilities:	Detached dwelling (1958)
TMK Separation:	Household dwelling
Flood Zone:	D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province:	Waianae Range
Elevation Range (ft):	60 **to** 70
Approximate Landfill Acreage:	14.4
Parcel Acreage:	originally 14.4, now 8.4

Climate

Annual Precipitation (cm):	49.40
Precipitation Days Per Year	30
Average Temperature (°F):	76.0
Temperature Range (° F):	67.4 **to** 84.5

Soils

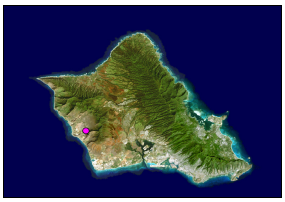
Soil Map Symbol:	LuA	**Bulk Density (gm/cc):**	1.20-1.35
Soil Association:	Rock land-Stony steep	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Lualualei	**Organic Carbon (%):**	0.5-2.0
Engineering Classification:	Clay	**Permeability (in/hr):**	0.0000-0.1
Drainage Characterisitics:	Very poor	**Slope (%):**	0-2
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Geology

Geologic Symbol(s): Pa

Geologic Unit(s): Consolidated noncalcareous deposits

Geologic Description: Chiefly older alluvium, generally consisting of mottled brown to red-brown, deeply weathered, poorly-assorted, and nearly impermeable friable conglomerates, in places cemented with limonite or hematite and usually forming conspicuous terraces along the principal streams. Near the mouths of the valleys and especially around Pearl Harbor and near Waialua the older alluvium grades into partly consolidated sands and silts that are emerged delta deposits. The degree of consolidation is largely dependent upon the amount of rainfall, for in dry regions the material is much better cemented than in wet regions. Near the heads of valleys the older alluvium grades into coarse angular talus and landslide deposits which, in places, carry considerable water. In the large semiarid valleys in the Waianae Range these deposits are firmly cemented breccias. They are poorly permeable in wet areas and hold up perched water in the Honolulu volcanic series, but in the dry areas they yield small supplies of potable water.



Saki Moru Dump

Category 3

Hydrogeology

Rock Type:	Alluvium-older-consolidated
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3030211613311
Aquifer Sector:	Waianae
Aquifer System:	Lualualei
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Currently used
Utility:	Neither
Salinity (mg/L Cl-):	Moderate (1,000-5,000)
Uniqueness:	Irreplaceable
Vulnerability:	High

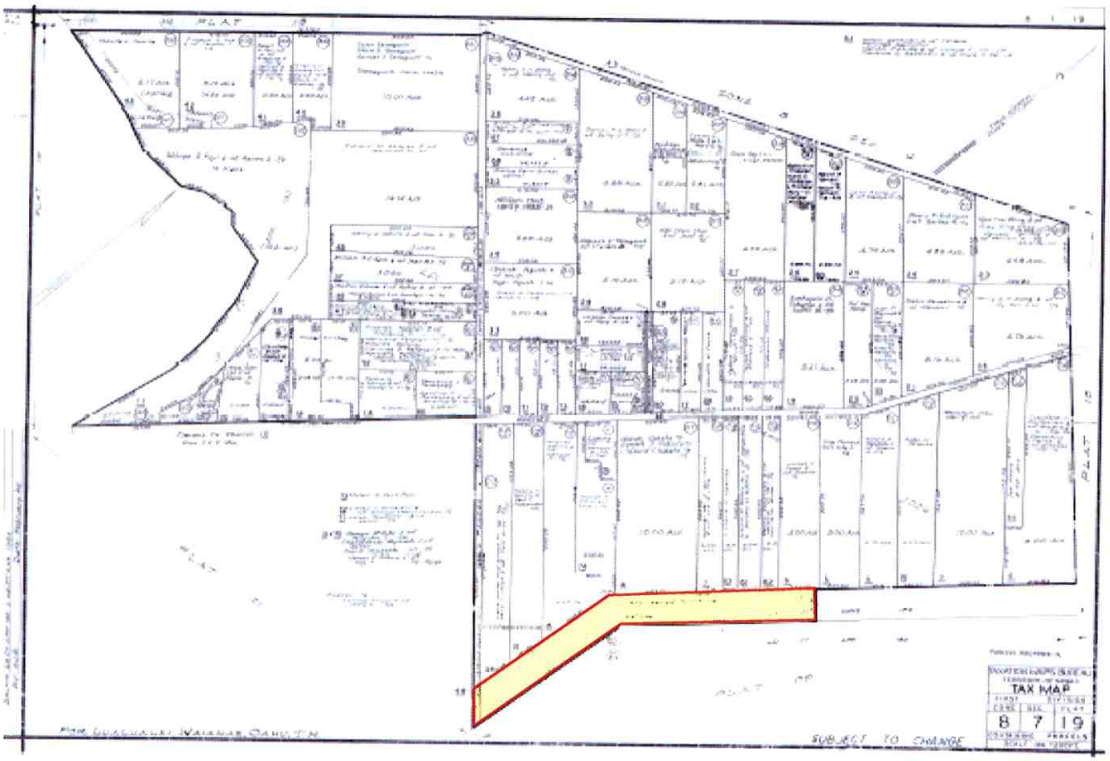
Lower Aquifer

Aquifer Status Code:	3030212223323
Aquifer Sector:	Waianae
Aquifer System:	Lualualei
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Dike
Development State:	Potential use
Utility:	Neither
Salinity (mg/L Cl-):	Moderate (1,000-5,000)
Uniqueness:	Replaceable
Vulnerability:	Low

Saki Moru Dump

Category 3

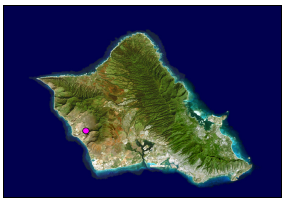
TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	47		
Municipal Well(s)within one mile	0	**Observation Well(s)within one mile**	0
BWS Well(s) within one mile	0	**Sealed Well(s)within one mile**	5
Domestic Well(s)within one mile	1	**Unused Well(s) within one mile**	21
Irrigation Well(s)within one mile	14	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	2	**Other Well(s)within one mile**	4



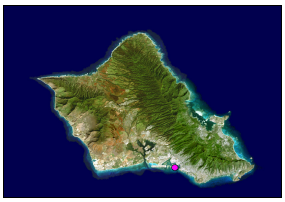
Saki Moru Dump

Category 3

Well Details

USGS Well Number	2509-05	**Aquifer**	30302
Well Name	Maili	**Elevation of Ground Surface (ft amsl)**	57
Well Owner	Tokuda H	**Well Depth (feet bgs)**	66
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	-9
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	1.7
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	--		
Year of Construction	1955		

Sand Island Ash Dump



Sand Island Ash Dump

Category 3

Site Description

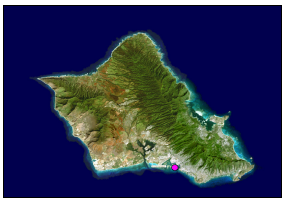
Sand Island is located to the south of Kapalama Basin and to the west of the Honolulu Harbor and is mostly composed of fill from dredging activities in the early to mid 1900s. The multi-use Sand Island dumping area is located on the southern portion of Sand Island south of the sewage treatment plant and associated disposal pond, and is now a portion of Sand Island State Park. The site is approximately 173.7 acres and is controlled, operated, and maintained by the State of Hawaii Department of Land and Natural Resources. The site is surrounded by the Pacific Ocean to the south, the Honolulu Channel to the southeast, the Kalihi Channel to the northwest, and the Honolulu Harbor and Kapalama Basin to the north. The dumping area is currently flat and within the floodplain.

During the early 1900s, the central and northern portions of the island were used for an immigration quarantine station, a military reservation, and for communications support. Open solid waste dumping areas have been in existence since 1934. During World War II, the island was used by the military to support the Pacific theater. A salvage yard is shown on a 1949 aerial photograph of the site. According to an article in the Honolulu Star-Bulletin, Olomana Limited, a reclamation firm, engaged in dumping operations at Sand Island in 1957. The federal government managed the site prior to 1965 and the City and County of Honolulu (C&C) utilized a parcel of land on Sand Island as an ash only dump facility starting in 1965. The ash came from an incinerator so was likely mixed with non-combustible waste. A 1974 aerial photograph showed abundant open dumping of solid waste and vehicles, with much of this debris emanating from an industrial park adjacent to the east side of the site. An aerial photograph from 1984 shows that the area was developed into what is now a State Recreational Area and that the solid wastes and vehicles were removed. However, review of a 1999 aerial photograph revealed open dumping on the west side of the site. During site reconnaissance by Ecology and Environment, areas west of the baseball fields were noted to have evidence of household garbage, discarded scrap metal, cars, tires, refrigerators, burn areas, and other assorted solid wastes. In addition, garbage piles are shown to the southwest of the wastewater treatment plant in a 1999 aerial photograph (Ecology and Environment, 2000a, b). Historical uses of Sand Island that may have impacted the island include a motor pool, laundry and dry cleaning facilities, paint and repair shops, oil storage areas, and an electrical transformer bank. In more recent years, the undeveloped portions of the island have been used for baseyard activities and open dumping (Department of Business, Economic Development, and Tourism (DBEDT), 2001b). The State of Hawaii Hazard Evaluation and Emergency Response (HEER) office has been involved in removing hazardous materials that were dumped on the island.

Under the Environmental Protection Agency (EPA)'s Brownfield's Targeted Site Assessment Program, a Phase I Environmental Assessment and sampling plan for the approximately 86-acre undeveloped portion of the site was conducted in November 2000. The draft Phase II Environmental Assessment report confirmed the presence of soil contamination (arsenic, lead, antimony, nickel, acetophenone, benzopyrene, dieldrin, and methylene chloride) in excess of screening action levels in samples from the site. Other suspect contaminants include metals, semivolatiles, pesticides, and PCBs.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	1-5-041:006
2356013.88695	616053.43138	**Zone:**	Honolulu
Longitude	**Latitude**	**Section:**	Sand Island
157 52 52	21 18 08	**Plat:**	Not Designated
Address:	1640 Sand Island Parkway	**Quadrangle:**	Honolulu



Sand Island Ash Dump

Category 3

Ownership

Current Owner: State of Hawaii

Previous Operator: City and County of Honolulu

Site Operation and History

Landfill Type: Municipal

Type of Waste: Ash and municipal solid waste

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	Yes
Active Period:	1934-1999	**EPA ID No.:**	H09HI032400
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	Yes	**Method of Operation:**	Dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Population and Land Use

Type of Development in the Surronding Area? Industrial

City and County Zoning: P-2, I-3

State Land Use District: Urban

Facilities: Detached dwelling, utility substation

TMK Separation: Public recreation

Flood Zone: A - 100-year Flood Plain, X - 500-year Flood Plain

Geography and Topography

Physiographic Province: Coastal Plain

Elevation Range (ft): 0 **to** 10

Approximate Landfill Acreage: 173.7

Parcel Acreage: 173.7

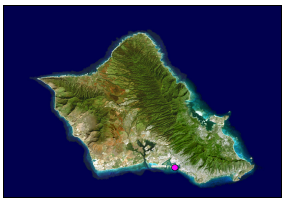
Climate

Annual Precipitation (cm): 52.20

Precipitation Days Per Year 31

Average Temperature (°F): 77.1

Temperature Range (° F): 70.2 **to** 84.0



Sand Island Ash Dump

Category 3

Soils

Soil Map Symbol:	FL	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.06-0.12
Soil Series:	Fill Land, Mixed	**Organic Carbon (%):**	0.1-5.0
Engineering Classification:	Fill Land, Mixed	**Permeability (in/hr):**	0.1-2
Drainage Characterisitics:	Poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

Geologic Symbol(s): Rf

Geologic Unit(s): Artificial fill composed of marine deposits

Geologic Description: Brown to white permeable marine mud containing shells, coral, and other calcareous marine organisms dredged from the ocean floor and used to fill up salt marshes and other lowlands.

Hydrogeology

Rock Type:	Sand-unconsolidated
GW Occurrance-Principal:	Basal
GW Occurrance-Secondary:	--
Permeability:	Moderate to high
Hydraulic Conductivity (ft/d):	100 - 1,000

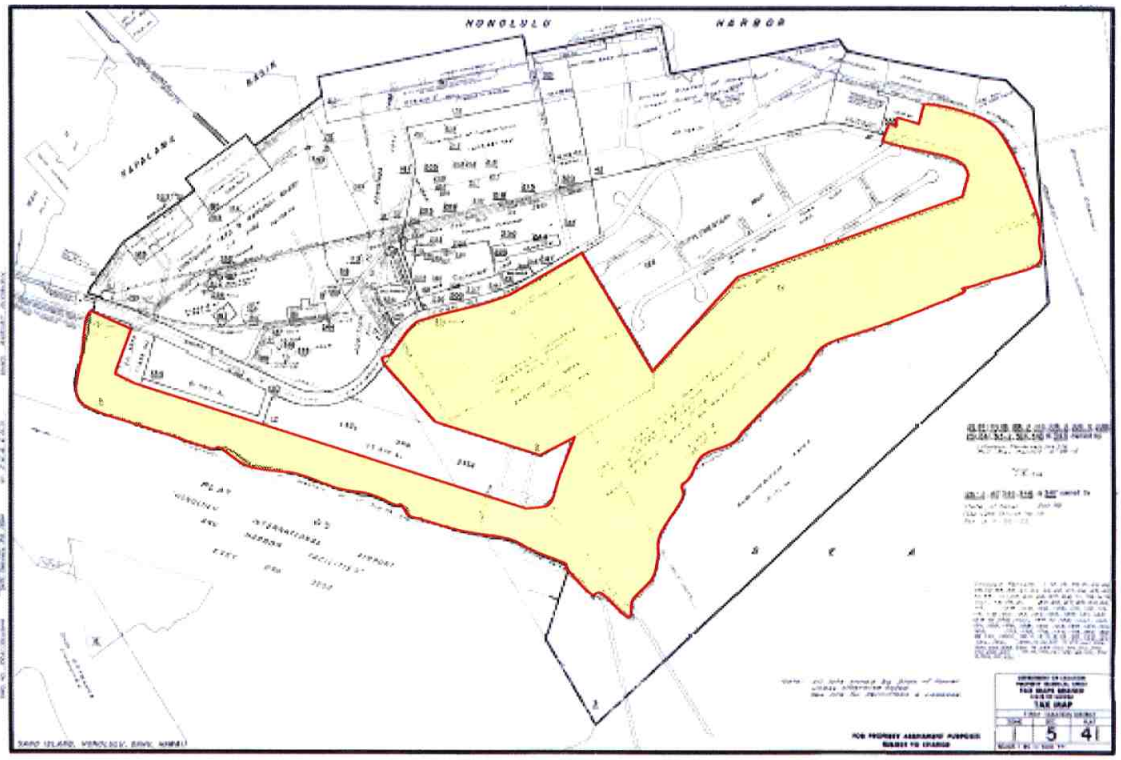
Aquifer(s)

Aquifer Status Code:	Not Applicable
Aquifer Sector:	--
Aquifer System:	--
Aquifer Type 1:	--
Aquifer Type 2:	--
Aquifer Type Geol.:	--
Development State:	--
Utility:	--
Salinity (mg/L Cl-):	--
Uniqueness:	--
Vulnerability:	--

Sand Island Ash Dump

Category 3

TMK Map



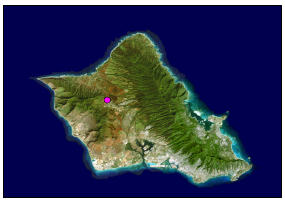
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	4		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	1
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	2

Well Details

Schofield Landfill/Dump



Schofield Landfill/Dump

Category 2

Site Description

The United States Army Garrison Schofield Barracks (Schofield) is a 17,725-acre site established in 1908 as a base for the Army's mobile defense of Oahu. Schofield is an active military installation with a residential community. Previous light industrial operations on the base included maintenance, repair, painting, and degreasing, all of which required use of organic solvents. The Schofield Dump was located in the eastern part of the installation next to McMahon Road and Kahoolawe Street, and consisted of two adjacent dumping areas referred to as "A" and "B" sites. The landfill covers approximately 35 acres and is bordered on the west and northwest by firing ranges and training areas, and to the southeast by a pistol practice range. The topography to the north and east of the landfill is steep but to the south and west is relatively flat.

The Army used the landfill as an open burn dump from 1942 to 1967, and then as a sanitary landfill thereafter (Harding Lawson Associates, 1996). Prior to 1980, the landfill was not permitted by the State of Hawaii. The landfill handled roughly 50 tons of waste per day. The operation received mixed waste, including domestic, construction, medical, and infectious wastes. Solvents, unusable paints, and acids were also reportedly dumped at the site (Harding Lawson Associates, 1996).

The medical waste, which came from the Tripler Army Medical Center, included excess drugs, equipment, dead animals, etc. Disposal of infectious medical waste at the landfill ceased on October 1, 1980. While historically the landfill had received sludge, the landfill's first permit (issued in 1980) no longer allowed it. However, in 1982 the Army accepted sewage sludge for a short period of time while the primary digester was being upgraded. The site was closed in September of 1983 and capped with 2-2.5 feet of compacted silty-clay fill.

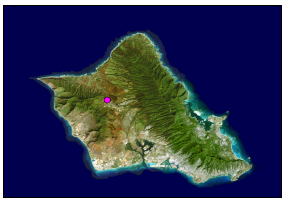
The Schofield Dump is listed in the United States Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database as the "Schofield Barracks Sanitary Landfill". According to the United States EPA database, the landfill's "Discovery" and the Preliminary Assessment were completed in January of 1980 and the landfill was assigned a priority of low. A Site Inspection and Hazard Ranking System Package was completed in August of 1982 (State of Hawaii DOH, 2002).

In 1985, the DOH informed the Army that high levels of volatile organic compounds (VOCs) including trichloroethene (TCE) had been detected in wells that supplied drinking water to 25,000 people at Schofield. In 1986, the Army began removing the contaminants from the water by using an air stripping facility. As a result of the 1985 TCE discovery, the United States EPA re-evaluated the installation in July of 1989 and eventually proposed Schofield for the National Priorities List (NPL). Schofield was listed on the NPL in August of 1990 (Harding Lawson Associates, 1996).

A remedial investigation (RI) was performed between February of 1993 and December of 1995. A total of four operable units (OUs) were designated on the base to facilitate the orderly investigation of the source(s), nature, and extent of contamination at the installation, and to enable the design of necessary cleanup measures. The former landfill was designated as OU 4. The RI determined that the Schofield Dump, referred to as the "Former Landfill", was the source of one of the TCE groundwater plumes at Schofield. The plume emanated from under the landfill, lies within the Main Post, and is separate from the plume that contaminated groundwater wells (Harding Lawson Associates, 1996).

To ensure that no further groundwater contamination would occur, the Record of Decision for the former landfill called for re-grading and re-vegetating the cap and monitoring the groundwater (Harding Lawson Associates, 1996). The Record of Decision was approved in September of 1996. Cracks in the landfill's cap were repaired in June of 1997 and soil cover replacements were performed in 1997 and 1998.

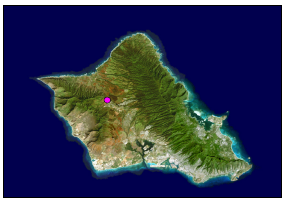
The Army resubmitted a request to the United States EPA to have the site de-listed from the NPL,



Schofield Landfill/Dump

Category 2

and the site was removed from the list on August 10, 2000, following United States EPA's review of the request (State of Hawaii DOH, 2000). Regular monitoring of the groundwater in the area has shown the concentration of TCE to be fairly constant. A five-year review was completed by the Army, which has found that the TCE contamination in the groundwater has not migrated "very far" and that aeration treatment is working to remove TCE from the drinking water (State of Hawaii DOH, 2002). According to a Defense Environmental Restoration Program (DERP) website, long-term groundwater monitoring and maintenance at the landfill is ongoing. In addition, cracks in the northwest and southeastern portion were repaired by the Army during 2003-2004.



Schofield Landfill/Dump

Category 2

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	7-7-001:001
2378312.453441	595775.353486	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Waianae-Uka
158 04 31	21 30 18	**Plat:**	Not Designated
Address:	Schofield Barracks, 96786	**Quadrangle:**	Haleiwa

Ownership

Current Owner: United States government

Previous Operator: U.S. Army

Site Operation and History

Landfill Type: Military

Type of Waste: Municipal solid waste, hazardous waste, and infectious medical waste until Oct 1980, sewage sludge temporarily in May 1982 (hazardous materials, i.e., organic solvents, asbestos, pesticide containers, unusable paints, metallic debris)

Monitoring Well Network? Yes

Monitoring Well Identification MW-4-1, MW-4-2/2A, MW-4-3, and MW-4-4

Status:	Closed	**Analytical Data Available?**	Yes
Active Period:	1942-1983	**EPA ID No.:**	HI3210022239, HI921452223900
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Placed on NPL in 1990 (see ATSDR report)
Capped?	2-2.5 feet of compacted silty-clay soil	**Method of Operation:**	Burn and dump/dig and fill

Permit Info: SW-108097 (Jun. 9, 1980-Dec. 31, 1981). The landfill was issued a permit under Chapter 58 of the Hawaii Administrative Rule (effective Nov. 1981-Oct. 1993).

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Military Restricted

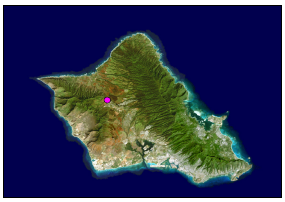
City and County Zoning: F-1, P-1

State Land Use District: Agricultural, conservation, urban

Facilities: unknown at present

TMK Separation: Military, right-of-way

Flood Zone: D - Undetermined but possible flood hazards



Schofield Landfill/Dump

Category 2

Geography and Topography

Physiographic Province:	Schofield Plateau
Elevation Range (ft):	600 **to** 800
Approximate Landfill Acreage:	approximately 35 acres
Parcel Acreage:	10,098.6801

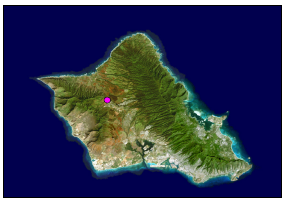
Climate

Annual Precipitation (cm):	142.70
Precipitation Days Per Year	99
Average Temperature (°F):	70.7
Temperature Range (° F):	63.2 **to** 78.1

Soils

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	KyA	**Bulk Density (gm/cc):**	1.10-1.40
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.12-0.14
Soil Series:	Kunia	**Organic Carbon (%):**	1.0-4.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	0-3
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate



Schofield Landfill/Dump

Category 2

Geology

Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.

Geologic Symbol(s): Pa

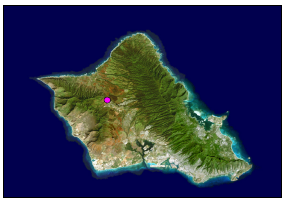
Geologic Unit(s): Consolidated noncalcareous deposits

Geologic Description: Chiefly older alluvium, generally consisting of mottled brown to red-brown, deeply weathered, poorly-assorted, and nearly impermeable friable conglomerates, in places cemented with limonite or hematite and usually forming conspicuous terraces along the principal streams. Near the mouths of the valleys and especially around Pearl Harbor and near Waialua the older alluvium grades into partly consolidated sands and silts that are emerged delta deposits. The degree of consolidation is largely dependent upon the amount of rainfall, for in dry regions the material is much better cemented than in wet regions. Near the heads of valleys the older alluvium grades into coarse angular talus and landslide deposits which, in places, carry considerable water. In the large semiarid valleys in the Waianae Range these deposits are firmly cemented breccias. They are poorly permeable in wet areas and hold up perched water in the Honolulu volcanic series, but in the dry areas they yield small supplies of potable water.

Hydrogeology

Rock Type:	Alluvium-older-consolidated
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1



Schofield Landfill/Dump

Category 2

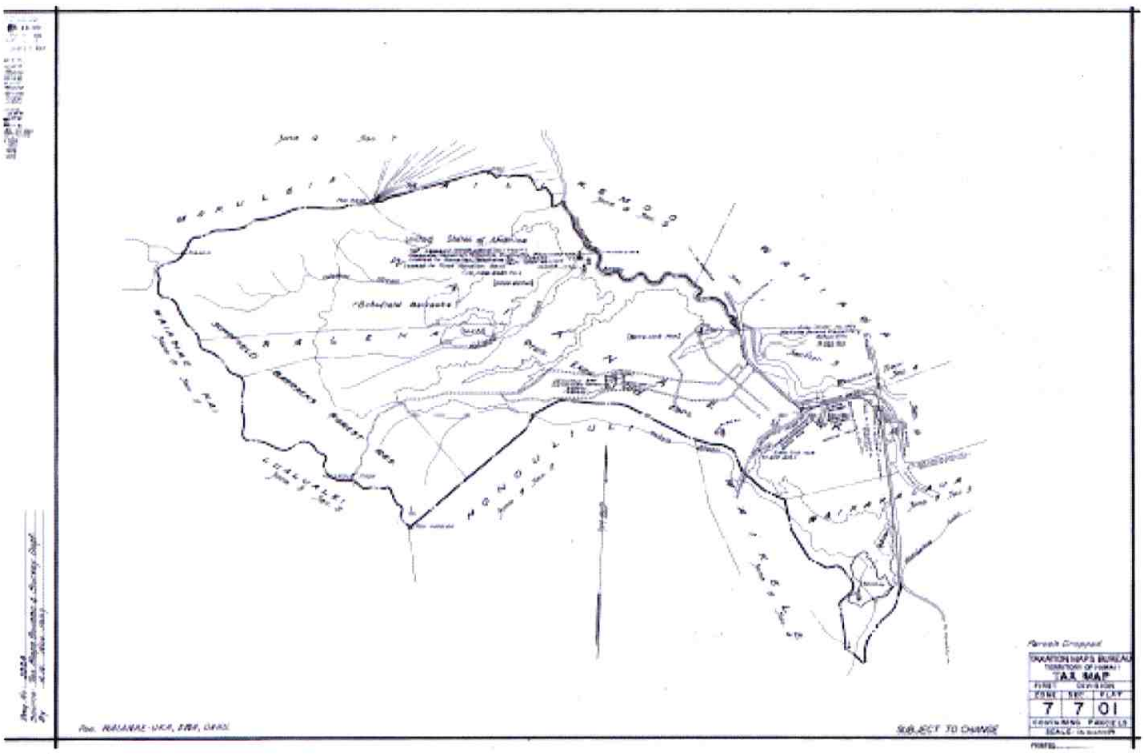
Aquifer(s)

Aquifer Status Code:	3050121211111
Aquifer Sector:	Central
Aquifer System:	Wahiawa
Aquifer Type 1:	High Level
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Dike
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

Schofield Landfill/Dump

Category 2

TMK Map



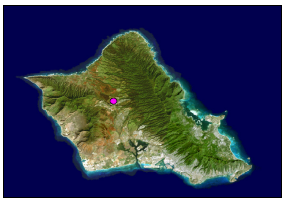
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	6		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	5
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	1	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Wahiawa Dump A



Wahiawa Dump A

Category 1

Site Description

Wahiawa Dump A was likely located to the north of the Wahiawa Homesteads and the Wahiawa Reservoir and south of the intersection of Whitmore Avenue and Kamehameha Highway (0.2 miles). A historic map (Young, 1993; Map 17) shows the location for a "Proposed Garbage Dump" at the top of a bend in the North Fork of the Kaukonahua Stream/Wahiawa Reservoir to the west of the Kamehameha Highway bridge over the stream (Karsten Thot Bridge). The presumed former location of Wahiawa Dump A is currently being operated as a pineapple plantation. According to the tax map of the area, the property to the north of the dump was leased by Del Monte Corporation. At the time of the site visit there were no visible indications of the presence of a former dump site.

According to a January 23, 1971 article in the Honolulu Advertiser, the City and County of Honolulu (C&C) Refuse Division considered the Wahiawa dump to be "officially closed" but Del Monte was still using it to dispose of pineapple waste. The dump was described as being located in the middle of Del Monte pineapple fields more than a mile beyond the Kemoo Farm restaurant. Apparently the site was also used to temporarily store abandoned cars. According to the article, the land was owned by Del Monte and leased to the C&C as a dump.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	7-1-001:008
2378096.42080	600119.69987	**Zone:**	Wahiawa
Longitude	**Latitude**	**Section:**	Not Designated
158 02 00	21 30 10	**Plat:**	Not Designated
Address:		**Quadrangle:**	

Ownership

Current Owner: George Galbraith Trust (PPI Del Monte Fresh Produce-lessee)

Previous Operator: Del Monte

Site Operation and History

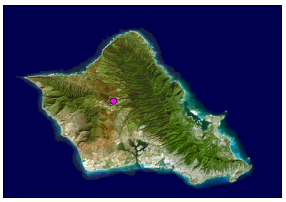
Landfill Type:

Type of Waste:

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:		**Analytical Data Available?**	No data was located
Active Period:		**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	
Permit Info:	None documented		



Wahiawa Dump A

Category 1

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line?	Mauka
Mauka or Makai of UIC Line?	Mauka

Population and Land Use

Type of Development in the Surronding Area?	Agricultural
City and County Zoning:	Ag-1
State Land Use District:	Agricultural
Facilities:	--
TMK Separation:	Pineapple field
Flood Zone:	D - Undetermined but possible flood hazards

Geography and Topography

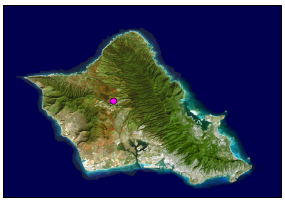
Physiographic Province:	Schofield Plateau
Elevation Range (ft):	900 **to** 920
Approximate Landfill Acreage:	
Parcel Acreage:	320.8215

Climate

Annual Precipitation (cm):	142.70
Precipitation Days Per Year	99
Average Temperature (°F):	70.7
Temperature Range (° F):	63.2 **to** 78.1

Soils

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High



Wahiawa Dump A

Category 1

Geology

Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

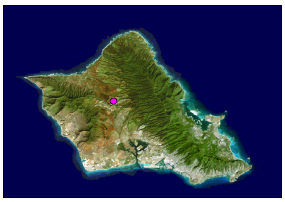
Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.

Hydrogeology

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Aquifer Status Code:	3050121211111
Aquifer Sector:	Central
Aquifer System:	Wahiawa
Aquifer Type 1:	High Level
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Dike
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

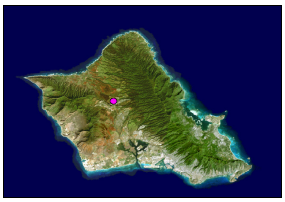


Wahiawa Dump A

Category 1

Site Reconnaissance

Site Description:	The presumed former location of Wahiawa Dump A is currently being operated as a pineapple plantation. At the time of the site visit, the pineapple field appeared to have been recently harvested. There were no visible indications of the presence of a former dumpsite.
Type of Property:	Pineapple plantation.
Current Site Operations:	Pineapple plantation.
Age of Development:	Unknown.
Onsite Building Information:	None.
Was There a Recognizable Dump/Landfill?	No.
Institutional Controls:	A chain prevents vehicles from entering through the plantation road. However, foot traffic can gain access around the chain and from Kamehameha Highway.
Number of MonitoringWells:	None observed.
Stability (signs of erosion, etc):	None observed.
Leachate, Seeps:	None observed.
Odors, Staining, Distressed Vegetation:	No.
Drainage Features:	None observed.
Areas of Ponded Water Onsite:	None observed.



Wahiawa Dump A

Category 1

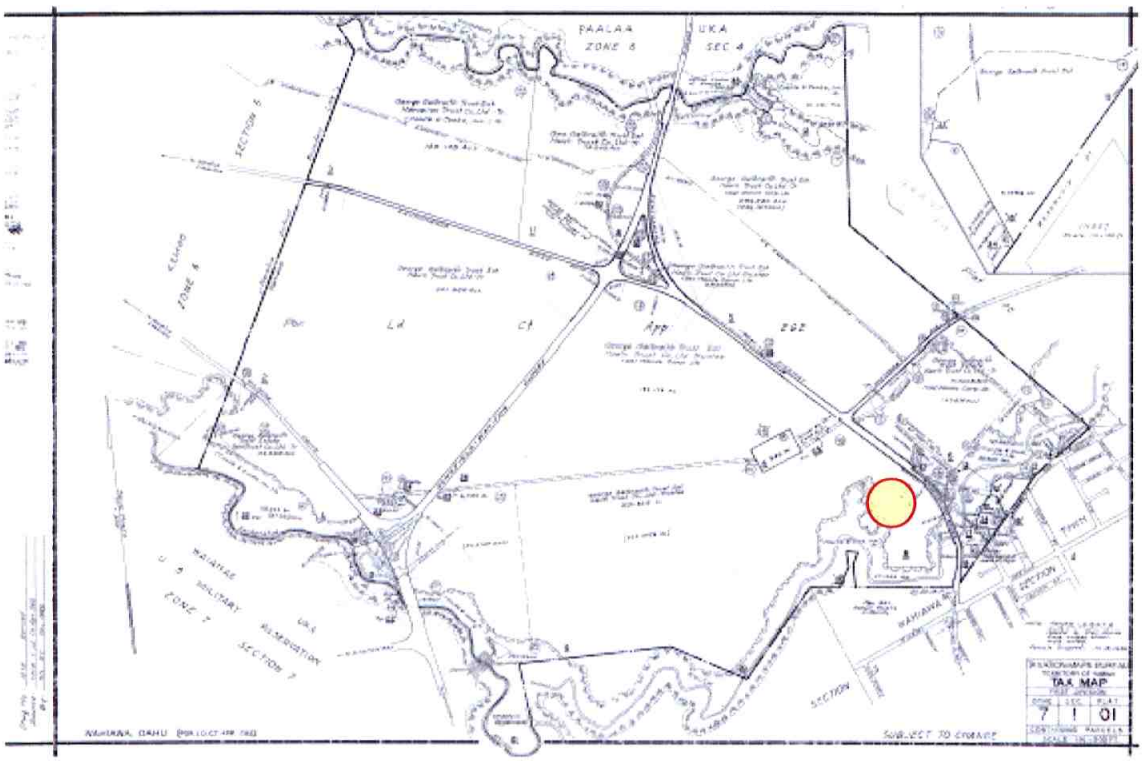
Site Reconnaissance (cont.)

Storm Water Retention Pond:	None observed.
House and Schools in the Vicinity:	Yes.
Distance to Nearest Residence, School, or Businesses:	A residential neighborhood is located approximately 1,500 feet south of the site, across the Wahiawa Reservoir Stream.
How is Drinking Water in the Area Supplied?	Unknown.
Natural Resources, Agriculture, Aquaculture Near the Site?	The site is a pineapple plantation.
Name of Surface Water Within 1-mile of Dump/Landfill:	Wahiawa Reservoir.
Distance to Surface Water:	Less than 50 feet.
Proximal Direction of Surface Water:	South.
Where Does Surface Water Flow?	Topography indicates that runoff would flow towards the Wahiawa Reservoir.
Surface Water Used for Drinking?	Unknown. Assume no.
Surface Water Used for Recreation?	Unknown. Assume Yes.
Wetlands:	None observed.
Off-site Sources of Contamination:	The adjacent plantation may be using pesticides and herbicides.
Does Run-off from other Sites Flow onto Subject Property:	Runoff from Kamehameha Highway may run on to the site.
Adjacent Property-North:	Plantation road and pineapple plantation.
Adjacent Property-South:	Wahiawa Reservoir Stream.
Adjacent Property-East:	Kamehameha Highway and pineapple plantation.
Adjacent Property-West:	Kukaniloko Birthstones State Historical site and pineapple plantation.

Wahiawa Dump A

Category 1

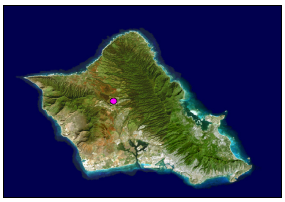
TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	6		
Municipal Well(s)within one mile	5	**Observation Well(s)within one mile**	0
BWS Well(s) within one mile	5	**Sealed Well(s)within one mile**	0
Domestic Well(s)within one mile	0	**Unused Well(s) within one mile**	1
Irrigation Well(s)within one mile	0	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	0



Wahiawa Dump A

Category 1

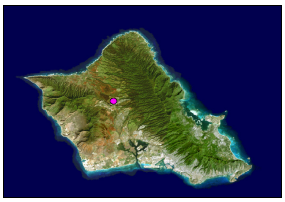
Well Details

USGS Well Number	2901-08	**Aquifer**	30501
Well Name	Wahiawa I	**Elevation of Ground Surface (ft amsl)**	870
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	880
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-10
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	275.4
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1500
Drilling Method	--		
Year of Construction	1941		

USGS Well Number	2902-02	**Aquifer**	
Well Name	Wahiawa II-2	**Elevation of Ground Surface (ft amsl)**	868
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	861
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	6
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	272.34
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	1750
Drilling Method	Rotary		
Year of Construction	1996		

USGS Well Number	2901-11	**Aquifer**	30501
Well Name	Wahiawa I	**Elevation of Ground Surface (ft amsl)**	873
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	821
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	52
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	272.9
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	2400
Drilling Method	Rotary		
Year of Construction	1962		

USGS Well Number	2901-12	**Aquifer**	30501
Well Name	Wahiawa I	**Elevation of Ground Surface (ft amsl)**	874
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	858
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	16
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	279
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	2400
Drilling Method	Rotary		
Year of Construction	1983		



Wahiawa Dump A

Category 1

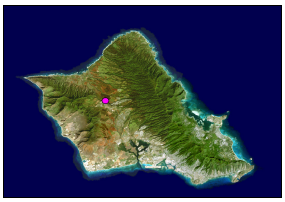
USGS Well Number	2902-01	**Aquifer**	30501
Well Name	Wahiawa II	**Elevation of Ground Surface (ft amsl)**	866
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	986
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-120
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	275.86
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	2100
Drilling Method	Rotary		
Year of Construction	1974		

Photo 1. Looking north from a plantation road over the area designated as "originally proposed garbage dump" on Map 17 of Young (1993). No distinct indications of the specific dump location were noted during the site visit.

Photo 2. Looking east from a plantation road, over the area believed to be the location of the former Wahiawa Dump A. The area is now a pineapple plantation.

Photo 3. Standing at the same location as in photo 2 but facing west, looking toward the Wahiawa Reservoir Stream.

Wahiawa Dump B



Wahiawa Dump B

Category 2

Site Description

Del Monte's 6,000-acre Oahu pineapple plantation has been heavily investigated due to its status as a Superfund Site. The plantation is located on the western side of the central plain (or Schofield Plateau) of Oahu and is divided into two areas known as Kunia and Poamoho, separated by the United States Army's Schofield Barracks. In December of 1994, the United States Environmental Protection Agency (EPA) listed the plantation on the National Priorities List (NPL), primarily due to concerns over contaminated drinking water in the Kunia section. In August of 2002, two Potential Source Areas were identified for investigation: a Former Fumigant Mixing Area near the Karsten Warehouse, and the Poamoho Rag Disposal Area near the southern end of Field 202A. The Poamoho Rag Disposal Area may have been within the Wahiawa B Dump (United States EPA, 2003b).

The open-space Wahiawa Dump B dumping area was likely located in the midst of a pineapple field to the northwest of the intersection of Wilikina Drive and Kamananui Road, to the north of Schofield Barracks, and at the northern edge of or within the Kaukonahua Stream Valley. This dump may be the same dump identified as the City and County of Honolulu (C&C)'s "Wahiawa" open disposal site on historic maps (Young, 1993; Map 31). The land on which the dump is situated may have been owned in the past by Castle and Cooke. The area in the vicinity of the former dump is agricultural.

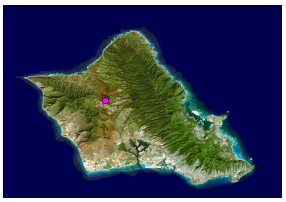
Wahiawa Dump B was reportedly operated as a municipal solid waste dump by the C&C from 1942-1972. Due to its proximity to Schofield Barracks and Wahiawa, wastes likely came from these communities. Rags used in fumigant mixing by Del Monte may have been discarded in a debris and burn area of the dump. According to Bagaoisan (1997), this dump and burn site received 800 tons of refuse a month. A bulldozer was used to push the burned material into a gully once every two weeks. According to Young (1993) many cars were disposed of at this dump. "Recently dumped" refuse was noted in the gully at the time of Bagaoisan's site visit in 1997.

Sampling in the dump area was conducted in September and October of 2002. The most critical samples were the soil samples beneath the disposal area. Core samples were collected within the burn debris to a depth of approximately 3-5 feet beneath the bottom of the debris for visual observation and field screening for the potential presence of chemicals. Test pits identified the boundaries of the refuse disposal and burn site as an oblong area approximately 100 feet wide by 130 feet long. Nineteen samples were analyzed for volatile organic compounds (VOCs), total petroleum hydrocarbons (TPH) -diesel, Lindane, Toxaphene, and Heptachlor. No compounds were detected at concentrations above United States EPA's health-based guidelines. Three of the 19 soil samples contained detectable concentrations of benzene, bromomethane, and toluene (United States EPA, 2003b).

Based on the results of the Del Monte site investigation, the United States EPA and Department of Health (DOH) determined that cleanup measures on the Poamoho Section were not necessary. Therefore, the United States EPA proposed removing the Poamoho Area of the Del Monte site from the NPL (United States EPA, 2003b).

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	6-5-002:001
2378285.60416	597646.92011	**Zone:**	Wahiawa
Longitude	**Latitude**	**Section:**	Kaheeka
158 03 26	21 30 16	**Plat:**	Kemoo
Address:	Wilikina Drive at the Schofield-Wahiawa Cutoff Road	**Quadrangle:**	Haleiwa



Wahiawa Dump B

Category 2

Ownership

Current Owner: Dole Food Company Incorporated (Waialua Sugar Co, Wahiawa Water Co - lessees)

Previous Operator: City and County of Honolulu

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Transfer Station	**Analytical Data Available?**	No data was located
Active Period:	1942-1972	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Agricultural

City and County Zoning: Ag-1

State Land Use District: Agricultural

Facilities: --

TMK Separation: Pineapple field, steep land

Flood Zone: D - Undetermined but possible flood hazards

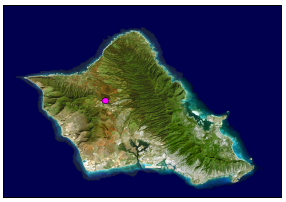
Geography and Topography

Physiographic Province: Schofield Plateau

Elevation Range (ft): 720 **to** 800

Approximate Landfill Acreage: 2.5

Parcel Acreage: 73.44



Wahiawa Dump B

Category 2

Climate

Annual Precipitation (cm):	142.70
Precipitation Days Per Year	99
Average Temperature (°F):	70.7
Temperature Range (° F):	63.2 **to** 78.1

Soils

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

Geologic Symbol(s): Tkb

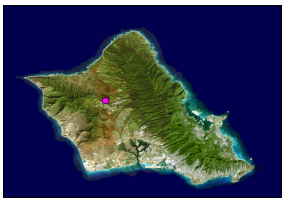
Geologic Unit(s): Koolau volcanic series

Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.

Geologic Symbol(s): Pa

Geologic Unit(s): Consolidated noncalcareous deposits

Geologic Description: Chiefly older alluvium, generally consisting of mottled brown to red-brown, deeply weathered, poorly-assorted, and nearly impermeable friable conglomerates, in places cemented with limonite or hematite and usually forming conspicuous terraces along the principal streams. Near the mouths of the valleys and especially around Pearl Harbor and near Waialua the older alluvium grades into partly consolidated sands and silts that are emerged delta deposits. The degree of consolidation is largely dependent upon the amount of rainfall, for in dry regions the material is much better cemented than in wet regions. Near the heads of valleys the older alluvium grades into coarse angular talus and landslide deposits which, in places, carry considerable water. In the large semiarid valleys in the Waianae Range these deposits are firmly cemented breccias. They are poorly permeable in wet areas and hold up perched water in the Honolulu volcanic series, but in the dry areas they yield small supplies of potable water.



Wahiawa Dump B

Category 2

Hydrogeology

Rock Type:	Alluvium-older-consolidated
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3050121211111
Aquifer Sector:	Central
Aquifer System:	Wahiawa
Aquifer Type 1:	High Level
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Dike
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

Aquifer Status Code:	3050121211111
Aquifer Sector:	Central
Aquifer System:	Wahiawa
Aquifer Type 1:	High Level
Aquifer Type 2:	Unconfined
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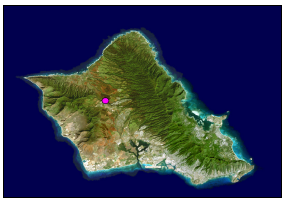
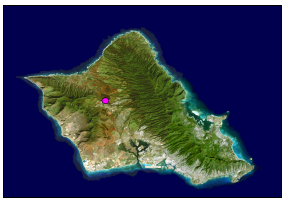


Wahiawa Dump B

Category 2

Site Reconnaissance

Site Description:	The site is located inside Kaukonahua Gulch, south of Dole plantation lands. It appears that the plantation land is currently inactive. The area the dump is believed to be located is a flat area in the gulch vegetated with tall grass and trees. Rusted and abandoned items (truck, shipping container, and building) were observed onsite.
Type of Property:	Undeveloped land in a gully.
Current Site Operations:	None.
Age of Development:	
Onsite Building Information:	A rusted, abandoned building (approximately 10'x20') was observed onsite.
Was There a Recognizable Dump/Landfill?	No.
Institutional Controls:	Mounds of soil create a wall between the plantation land and the public highway. Chain fences control access into the plantation.
Number of MonitoringWells:	None observed.
Stability (signs of erosion, etc):	Signs of erosion were observed along the side walls of the gully opposite of the plantation road.
Leachate, Seeps:	None observed.
Odors, Staining, Distressed Vegetation:	No.
Drainage Features:	None observed.
Areas of Ponded Water Onsite:	None observed.



Wahiawa Dump B

Category 2

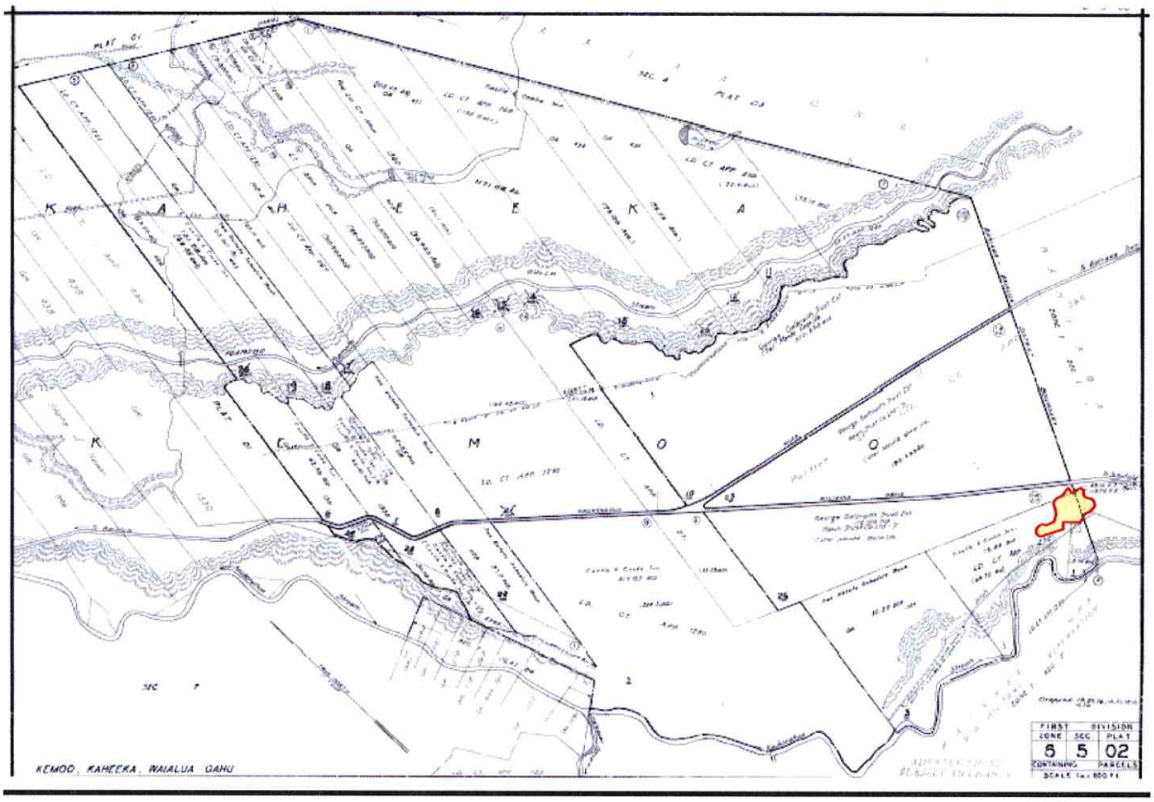
Site Reconnaissance (cont.)

Storm Water Retention Pond:	None observed.
House and Schools in the Vicinity:	No.
Distance to Nearest Residence, School, or Businesses:	Unknown.
How is Drinking Water in the Area Supplied?	???
Natural Resources, Agriculture, Aquaculture Near the Site?	An unused pineapple plantation is located above the gully to the north.
Name of Surface Water Within 1-mile of Dump/Landfill:	Kaukonahua Stream.
Distance to Surface Water:	Approximately 100 feet.
Proximal Direction of Surface Water:	South.
Where Does Surface Water Flow?	Topography indicates that runoff would flow towards the Kaukonahua Stream.
Surface Water Used for Drinking?	Unknown. Assume no.
Surface Water Used for Recreation?	Unknown. Assume No.
Wetlands:	None observed.
Off-site Sources of Contamination:	The adjacent plantation lands may have previously used pesticides and herbicides.
Does Run-off from other Sites Flow onto Subject Property:	Topography indicates that runoff from the plantation lands to the north may flow onto the site.
Adjacent Property-North:	Plantation road and unused plantation land.
Adjacent Property-South:	Kaukonahua Gulch and Kaukonahua Stream.
Adjacent Property-East:	Kaukonahua Gulch.
Adjacent Property-West:	Kaukonahua Gulch.

Wahiawa Dump B

Category 2

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	4		
Municipal Well(s)within one mile	0	**Observation Well(s)within one mile**	3
BWS Well(s) within one mile	0	**Sealed Well(s)within one mile**	0
Domestic Well(s)within one mile	0	**Unused Well(s) within one mile**	0
Irrigation Well(s)within one mile	1	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	0

Well Details

Photo 1. **Looking west-southwest, from atop a gully, down into the area where Wahiawa Dump B is presumed to have been located. No distinct indications of the specific dump location were noted during the site visit.**

Photo 2. **Looking west-southwest at what appears to be an abandoned truck and shipping container in the gully near Wahiawa Dump B.**

Photo 3. Looking west-southwest at an abandoned building in the gully near Wahiawa Dump B.

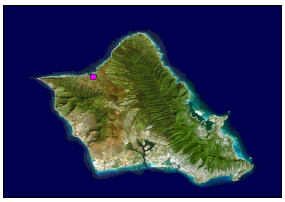
Waialua Dump

Source: R.M. Towill Corporation
01-18-53; photograph DACE 1-91

URS

Title **Aerial Photograph – Vicinity of Waialua Dump**

Project **Oahu Inactive Landfills Relative Risk Evaluation**
Project No. 26536686.00300



Waialua Dump

Category 3

Site Description

The Waialua Dump was reportedly located to the northwest of the intersection of Waialua Beach Road and Haleiwa Road, and to the south of the confluence of Paukauila and Kiilai Streams and Kaiaka Bay. The Waialua Dump was noted as a rural rubbish dump site on a 1940's era map (Young, 1993; Map 10). The dump was located on Aiau & Sylva Estate land and operated from 1943 to 1954 (Young, 1993). According to Bagaoisan (1997) the dump was commercial. The area in the vicinity of the former dump is currently residential.

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	6-6-021:007, 008, 021
2386414.08382	591347.12574	**Zone:**	Waialua
Longitude	**Latitude**	**Section:**	Paukauila
158 07 03	21 34 41	**Plat:**	Not Designated
Address:	769A, 769, 777, 779B,C,D,E,F,H Haleiwa Road	**Quadrangle:**	Haleiwa

Ownership

Current Owner: Hawaii Assemblies of God (66021007), Gertrude Tyau (66021008), Andrew Lee and Godfrey SW Lee Trust

Previous Operator: City and County of Honolulu

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? No wells documented

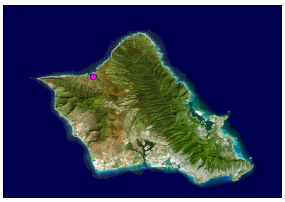
Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1943-1954	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai



Waialua Dump

Category 3

Population and Land Use

Type of Development in the Surronding Area? Residential

City and County Zoning: Country district

State Land Use District: Urban

Facilities: Detached dwellings (1936, 1938, 1939 x5, 1940, 1942 x3, 1943, 1947)

TMK Separation: Household dwellings

Flood Zone: AE - 100-year Flood Plain, VE - 100-year Flood Plain with velocity hazard (wave action)

Geography and Topography

Physiographic Province: Coastal Plain

Elevation Range (ft): 0 **to** 10

Approximate Landfill Acreage: 2.3

Parcel Acreage: 2.281(66021007), 2.526(66021008), 1.785(66021021)

Climate

Annual Precipitation (cm): 77.09

Precipitation Days Per Year 46

Average Temperature (°F): 73.2

Temperature Range (° F): 64.2 **to** 82.1

Soils

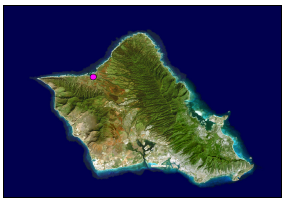
Soil Map Symbol:	HeA	**Bulk Density (gm/cc):**	1.10-1.30
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.13-0.15
Soil Series:	Haleiwa	**Organic Carbon (%):**	1.0-3.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	0-2
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-6.5
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Geology

Geologic Symbol(s): Ra

Geologic Unit(s): Unconsolidated noncalcareous deposits

Geologic Description: Chiefly younger alluvium, a black to brown fluviatile deposit generally consisting of coarse permeable detritus only slightly weathered and in many places subangular. In the valley bottoms near the sea it usually consists of nearly impermeable black, sticky mud called taro-patch clay. Much of the younger alluvium is reworked older alluvium. Included also is talus composed of angular blocks, usually with brown interstitial soil, forming aprons on the steep slopes at the base of cliffs. In the mountain areas much of the younger alluvium resembles, includes, and is often inseparable from landslide deposits, because of the torrential character of the streams and the precipitous valley walls. Extensive mantles of hill wash are included. Wells develop water from it in small quantities.



Waialua Dump

Category 3

Hydrogeology

Rock Type:	Alluvium-younger
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to low
Hydraulic Conductivity (ft/d):	1 - 500

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3040211612211
Aquifer Sector:	North
Aquifer System:	Waialua
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Currently used
Utility:	Ecologically important
Salinity (mg/L Cl-):	Low (250-1000)
Uniqueness:	Irreplaceable
Vulnerability:	High

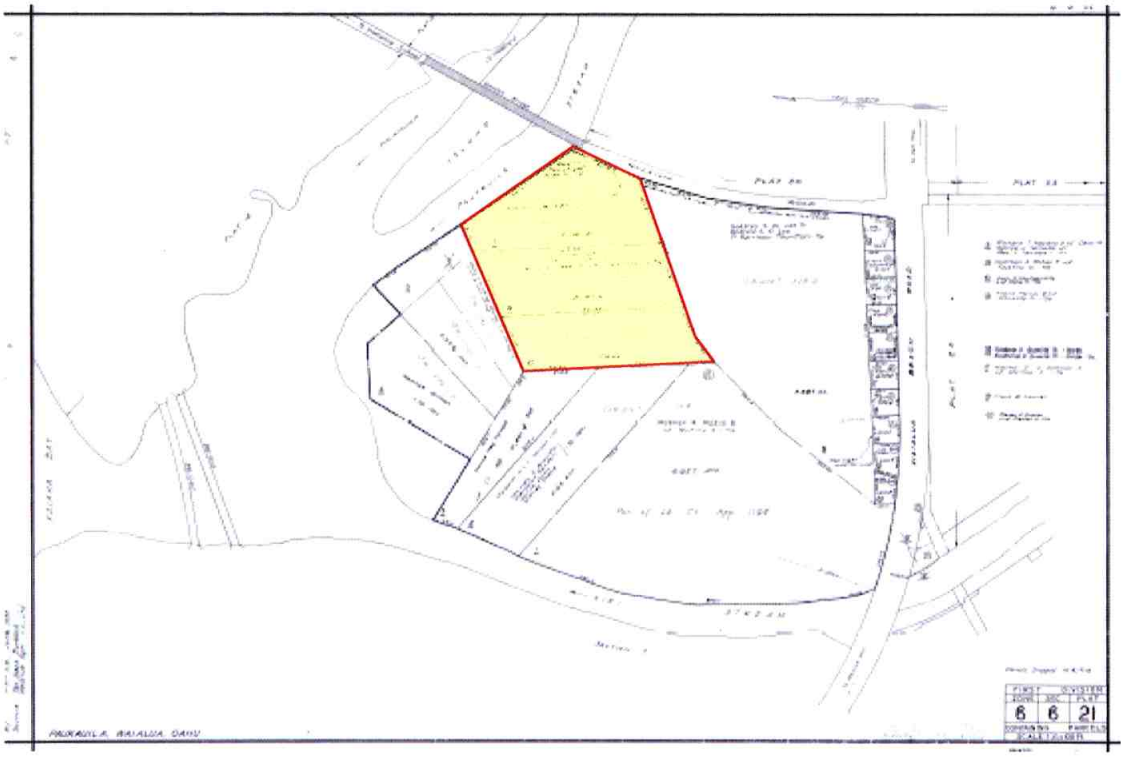
Lower Aquifer

Aquifer Status Code:	3040212111213
Aquifer Sector:	North
Aquifer System:	Waialua
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Low (250-1000)
Uniqueness:	Irreplaceable
Vulnerability:	Low

Waialua Dump

Category 3

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	48		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	9
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	14
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	3
Irrigation Well(s)within one mile	14	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	1	Other Well(s)within one mile	2

Well Details

Waianae Landfill

Waianae Landfill

Category 3

Picture Not Available

Site Description

The Waianae Landfill is located at the base of the Kamaileunu Ridge to the west of Kawiwi Stream (0.2 miles), to the northwest of Pokai Bay (0.7 miles) and Waianae Intermediate School (0.2 miles), and to the south of the Mikilua Flume (0.4 miles) along Old Government Road.

The landfill was originally an open dump and burn site that began operation in 1942. The City and County of Honolulu (C&C) operated the unlined landfill from 1952 to 1989. The dump accepted mixed wastes including household wastes, feedlot and yard wastes, and construction debris. The method of operation until the early 1970s was dump and burn then trench and cover. The dump was converted to a sanitary landfill in 1969 or 1971 (depending on the source). According to Bagaoisan (1997) the landfill received an average of 10,000 tons of waste per year between 1972 and 1981, and a 1984 Abandonment Plan indicates that the landfill received approximately 40 tons of waste per day. The site was converted into a solid waste transfer station in 1989. The landfill stopped accepting waste on September 5, 1989. The landfill contains approximately 774,400 cubic yards of municipal solid waste.

According to the United States Environmental Protection Agency (EPA)'s Archived Sites database, the landfill's "Discovery" was completed in July of 1979. A Preliminary Assessment was completed in September of 1984 and determined that no further action was necessary; therefore, the landfill became an "Archived Site". The State of Hawaii Hazard Evaluation and Emergency Response (HEER) Initial Site Screening Team screened the site on April 15, 1996 and determined that no further action was necessary. (State of Hawaii Department of Health (DOH), 2002).

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	8-5-003:001
2372785.01690	584185.43736	**Zone:**	Waianae
Longitude	**Latitude**	**Section:**	Not Designated
158 11 14(158 11	21 27 20	**Plat:**	Not Designated
Address:	572 Waianae Valley Road	**Quadrangle:**	Waianae

Ownership

Current Owner: City and County of Honolulu

Previous Operator: City and County of Honolulu

Waianae Landfill

Category 3

Picture Not Available

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal solid waste, dead animals, municipal and household refuse from household, county, state, and federal agencies, empty asphalt drums, marble company empty and punctured drums, waste oil from restaurants, manure

Monitoring Well Network? Unknown

Monitoring Well Identification None documented

Status:	Closed, Inactive	**Analytical Data Available?**	No data was located
Active Period:	1942-1989	**EPA ID No.:**	HID980818561, HID000853267
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	No Further Response Action Planned
Capped?	Yes	**Method of Operation:**	Burn, dump, cover; Trench and cover

Permit Info: Permit numbers SW-020018 (Dec. 3, 1975-Feb. 15, 1980), SW-107110 (Apr. 15, 1980-Feb. 15, 1985), and SW-214219 (Jun. 26, 1986-Jun. 1, 1991). The landfill was issued permits under Chapter 46 of the Public Health Regulations (effective Jul. 1974-Nov. 1981) and Chapter 58 of the Hawaii Administrative Rule (effective Nov. 1981-Oct. 1993).

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Population and Land Use

Type of Development in the Surronding Area? Agricultural

City and County Zoning: Ag-2

State Land Use District: Agricultural

Facilities: Power, sanitary, refuse plant, solid waste transfer station

TMK Separation: Refuse

Flood Zone: D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province: Waianae Range

Elevation Range (ft): 5 **to** 25

Approximate Landfill Acreage: 30

Parcel Acreage: 30.683

Waianae Landfill

Category 3

Picture Not Available

Climate

Annual Precipitation (cm):	77.09
Precipitation Days Per Year	46
Average Temperature (°F):	73.2
Temperature Range (° F):	64.2 **to** 82.1

Soils

Soil Map Symbol:	CR	**Bulk Density (gm/cc):**	Not available
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	Not available
Soil Series:	Coral Outcrop	**Organic Carbon (%):**	Not available
Engineering Classification:	Coral Outcrop	**Permeability (in/hr):**	Not available
Drainage Characterisitics:	Very poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Not available

Soil Map Symbol:	HnA	**Bulk Density (gm/cc):**	0.70-1.10
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.16-0.18
Soil Series:	Hanalei	**Organic Carbon (%):**	3.0-6.0
Engineering Classification:	Silty Clay and Silty Clay Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Poor	**Slope (%):**	0-2
Thickness of Surface Soil (in):	0-26	**pH:**	4.5-6.5
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

Geologic Symbol(s): Pls

Geologic Unit(s): Consolidated calcareous marine sediments

Geologic Description: Chiefly emerged coral reefs but in places, especially near Pearl Harbor, finely laminated lagoon limestone. Beach deposits resembling the various types of present calcareous beaches in lithified form are included, as well as a few inextensive consolidated beach deposits that may have been formed at the present stand of the sea. Extremely permeable because of primary and secondary cavities and yields water copiously, but the water is apt to be brackish.

Hydrogeology

Rock Type:	Coral-in situ reef limestone
GW Occurrance-Principal:	Basal
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to very high
Hydraulic Conductivity (ft/d):	100 - 20,000

Waianae Landfill

Category 3

Picture Not Available

Aquifer(s)

Uppermost Aquifer

Aquifer Status Code:	3030311613311
Aquifer Sector:	Waianae
Aquifer System:	Waianae
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Sedimentary
Development State:	Currently used
Utility:	Neither
Salinity (mg/L Cl-):	Moderate (1,000-5,000)
Uniqueness:	Irreplaceable
Vulnerability:	High

Lower Aquifer

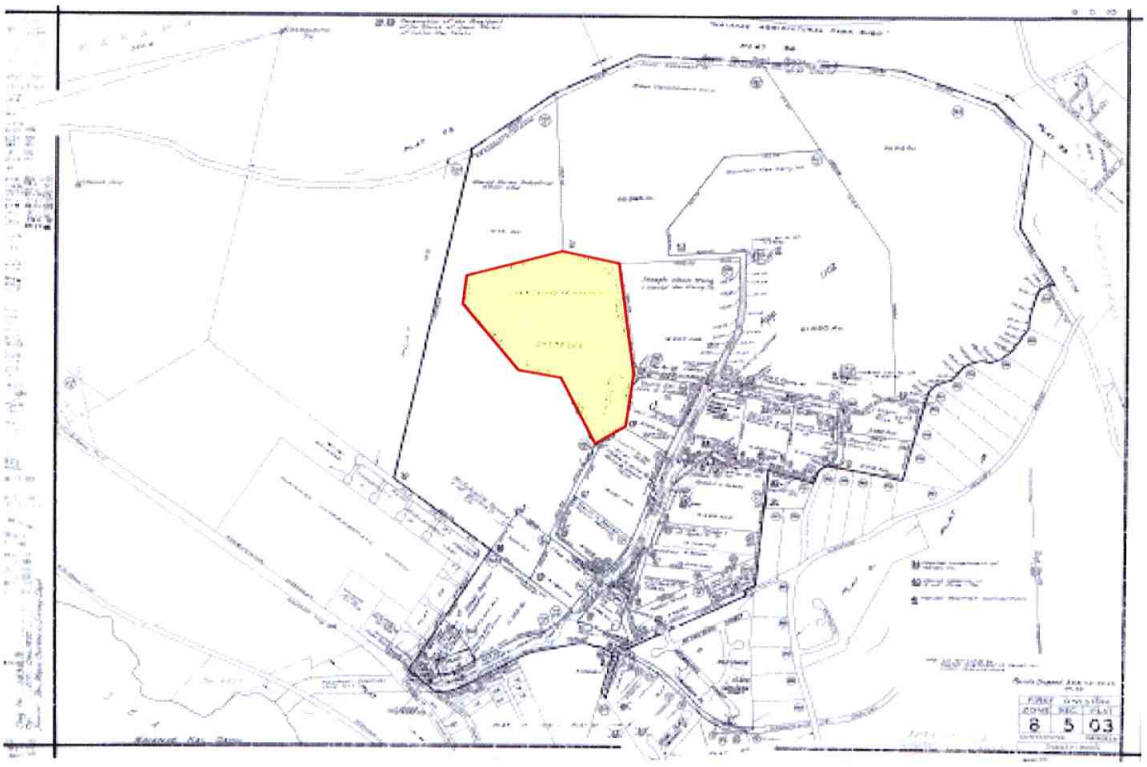
Aquifer Status Code:	3030312223223
Aquifer Sector:	Waianae
Aquifer System:	Waianae
Aquifer Type 1:	Basal
Aquifer Type 2:	Confined
Aquifer Type Geol.:	Dike
Development State:	Potential use
Utility:	Neither
Salinity (mg/L Cl-):	Low (250-1000)
Uniqueness:	Replaceable
Vulnerability:	Low

Waianae Landfill

Category 3

Picture Not Available

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	47		
Municipal Well(s)within one mile	2	**Observation Well(s)within one mile**	2
BWS Well(s) within one mile	2	**Sealed Well(s)within one mile**	0
Domestic Well(s)within one mile	1	**Unused Well(s) within one mile**	7
Irrigation Well(s)within one mile	5	**Lost Well(s)within one mile**	0
Industrial Well(s)within one mile	0	**Other Well(s)within one mile**	2

Waianae Landfill

Category 3

Picture Not Available

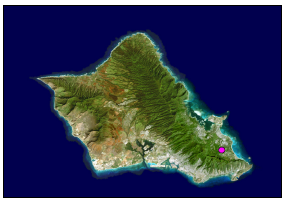
Well Details

USGS Well Number	2710-05	**Aquifer**	
Well Name	Toledo Dairy	**Elevation of Ground Surface (ft amsl)**	
Well Owner	Toledo Dairy	**Well Depth (feet bgs)**	
Type of Well	Domestic	**Elevation of Bottom of Boring (ft amsl)**	
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	150
Drilling Method	Dug		
Year of Construction	1946		

USGS Well Number	2712-31	**Aquifer**	30304
Well Name	Kamaile 1	**Elevation of Ground Surface (ft amsl)**	51
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	182
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-131
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	9.53
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	Percussion		
Year of Construction	1976		

USGS Well Number	2712-30	**Aquifer**	30304
Well Name	Kamaile 2	**Elevation of Ground Surface (ft amsl)**	34
Well Owner	Honolulu BWS	**Well Depth (feet bgs)**	164
Type of Well	Municipal	**Elevation of Bottom of Boring (ft amsl)**	-130
Latitude of the Well	**xxx (confidential)**	**Initial Water Level Elevation (ft amsl)**	11.95
Longitude of the Well	**xxx (confidential)**	**Pump capacity (mgd)**	
Drilling Method	Percussion		
Year of Construction	1976		

Waimanalo Dump - North



Waimanalo Dump - North

Category 3

Site Description

In a July 14, 1942 Honolulu Advertiser article, it was reported that tons of refuse accumulated at various points throughout the island following the December 7, 1941 bombing. Refuse disposal centers were established across the island and were marked by signs that read, "Official Rubbish Dump-by Order of the Military Governor". The refuse disposal centers were divided into four classes: City and County of Honolulu (C&C) sites, Navy sites, Army sites, and plantation sites. According to the plan adopted by the United States Surgeon's Office, the Corp of Engineers, and the C&C Public Works Department, refuse was to be burned at these specially designated dumps. The map that accompanied the Honolulu Advertiser article is the same as Young's (1993) map number 10 and is entitled "Refuse-Disposal Facilities". It appears from the lack of information found on many of the sites depicted on this map (one of which is the Waimanalo North Dump), that many of these special rubbish disposal centers were not used again after the accumulated refuse was burned.

In 1977, the C&C commissioned a comprehensive inventory study of potential landfill sites on the island entitled "Inventory of Potential Sanitary and Demolition Landfill Sites on the Island of Oahu" (Stanley S. Shimabukuro and Associates, Inc. 1977). The report identified thirty-three potential sites and a supplementary study in 1979 identified ten additional sites. The C&C then systematically investigated and pursued the identified sites. Competing factors such as groundwater resources, private versus governmental land uses, and the proximity of residential areas eliminated all but a few of the potential sites. It is not clear whether the Waimanalo North Dump ever existed, or was perhaps instead only considered for landfill development in the 1977 Shimabukuro and Associates report, and subsequently in the Pacific Waste Consulting Group's 2002 report entitled "Alternatives Analysis for Disposal of Municipal Refuse", which became Appendix H of the Waimanalo Gulch Sanitary Landfill Expansion Environmental Impact Statement (RM Towill, 2002).

A rural rubbish dump site identified as "Waimanalo" on a 1940's era map (Young, 1993; Map 10) is likely one of the Waimanalo Dumps, though the map is not of an appropriate scale to definitively determine the site's exact location. The former dump was likely located to the west of Kalamanaole Highway and the Olomana Golf course and to the north of Kailua Ditch and Waimanalo Stream. If the Waimanalo Dump did exist, based on its location, the dump would likely have been used to dispose of household wastes and would have been operated by the C&C. The area in the vicinity is undeveloped.

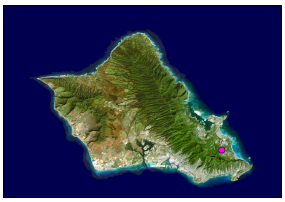
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	4-1-008:013
2361812.15166	630749.37044	**Zone:**	Koolaupoko
Longitude	**Latitude**	**Section:**	Waimanalo
157 44 20	21 21 13	**Plat:**	Not Designated
Address:	Kumuhau Street and Kalanianoaole Highway	**Quadrangle:**	Koko Head

Ownership

Current Owner: State of Hawaii

Previous Operator: City and County of Honolulu



Waimanalo Dump - North

Category 3

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Unknown	**Analytical Data Available?**	No data was located
Active Period:	1940s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Population and Land Use

Type of Development in the Surronding Area? Agricultural

City and County Zoning: Ag-2, P-1

State Land Use District: Agricultural, Conservation

Facilities: unknown at present

TMK Separation: Unsubdivided vacant land

Flood Zone: D - Undetermined but possible flood hazards, X - 500-year Flood Plain

Geography and Topography

Physiographic Province: Koolau Range

Elevation Range (ft): 200 **to** 400

Approximate Landfill Acreage: 5+

Parcel Acreage: 362.192

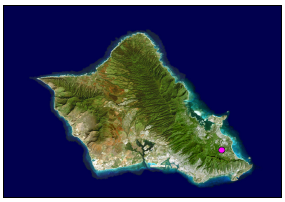
Climate

Annual Precipitation (cm): 193.80

Precipitation Days Per Year 133

Average Temperature (°F): 74.3

Temperature Range (° F): 68.8 **to** 79.8



Waimanalo Dump - North

Category 3

Soils

Soil Map Symbol:	ALF	**Bulk Density (gm/cc):**	1.00-1.40
Soil Association:	Lolekaa-Waikane	**Moisture Retention (%):**	0.12-0.14
Soil Series:	Alaeloa	**Organic Carbon (%):**	4.0-7.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	40-70
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	High

Geology

Geologic Symbol(s): Tkadc

Geologic Unit(s): Kailua volcanic series

Geologic Description: A denuded rift zone consisting of greenish-gray to black, usually vertical single and multiple basalt dikes, a few inches to 6 feet thick, usually microcrystalline, a few with olivine phenocrysts, chiefly cross-jointed, some platy and amygdalodial, intruded into the basalt flows and filling fissures through which the basalt flows issued, the amount of extrusive basalt present is negligible; the joint cracks in the dikes are nearly all filled with secondary minerals, chiefly quartz, and water does not occur in them; the dikes outside the rift zone are not differentiated on the map from the dikes of the Koolau volcanic series. It is believed that the Kailua volcanic series was formed in and under the caldera of the Koolau volcano.

Hydrogeology

Rock Type:	Koolau Basalt-Lava flows-dike complex
GW Occurrance-Principal:	Dike impounded
GW Occurrance-Secondary:	Perched
Permeability:	Low to moderate
Hydraulic Conductivity (ft/d):	1 - 500

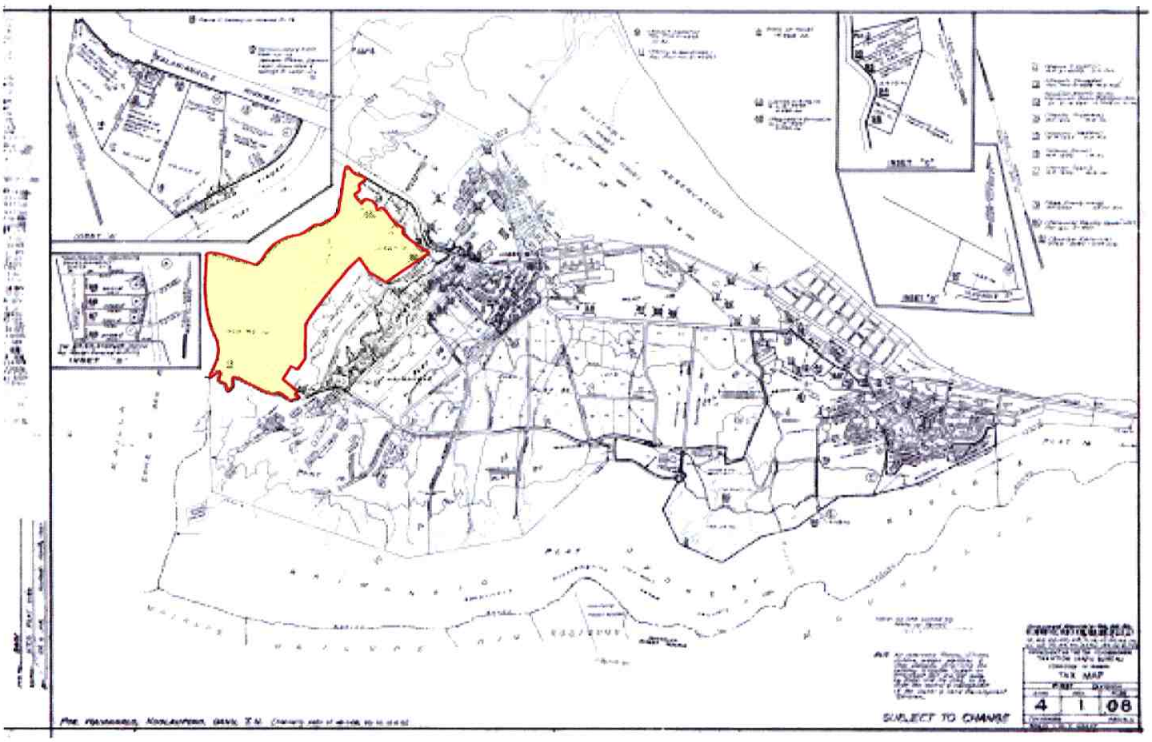
Aquifer(s)

Aquifer Status Code:	3060421211111
Aquifer Sector:	Windward
Aquifer System:	Waimanalo
Aquifer Type 1:	High Level
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Dike
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

Waimanalo Dump - North

Category 3

TMK Map



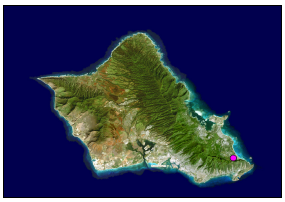
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	1		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	1
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Waimanalo Dump - South



Waimanalo Dump - South

Category 3

Site Description

In a July 14, 1942 Honolulu Advertiser article, it was reported that tons of refuse accumulated at various points throughout the island following the December 7, 1941 bombing. Refuse disposal centers were established across the island and were marked by signs that read, "Official Rubbish Dump-by Order of the Military Governor". The refuse disposal centers were divided into four classes: City and County of Honolulu (C&C) sites, Navy sites, Army sites, and plantation sites. According to the plan adopted by the United States Surgeon's Office, the Corp of Engineers, and the C&C Public Works Department, refuse was to be burned at these specially designated dumps. The map that accompanied the Honolulu Advertiser article is the same as Young's (1993) map number 10 and is entitled "Refuse-Disposal Facilities". It appears from the lack of information found on many of the sites depicted on this map (one of which is the Waimanalo North Dump), that many of these special rubbish disposal centers were not used again after the accumulated refuse was burned.

In 1977, the C&C commissioned a comprehensive inventory study of potential landfill sites on the island entitled "Inventory of Potential Sanitary and Demolition Landfill Sites on the Island of Oahu" (Stanley S. Shimabukuro and Associates, Inc. 1977). The report identified thirty-three potential sites and a supplementary study in 1979 identified ten additional sites. The C&C then systematically investigated and pursued the identified sites. Competing factors such as groundwater resources, private versus governmental land uses, and the proximity of residential areas eliminated all but a few of the potential sites. It is not clear whether the Waimanalo South Dump ever existed, or was perhaps instead only considered for landfill development in the 1977 Shimabukuro and Associates report, and subsequently in the Pacific Waste Consulting Group's 2002 report entitled "Alternatives Analysis for Disposal of Municipal Refuse", which became Appendix H of the Waimanalo Gulch Sanitary Landfill Expansion Environmental Impact Statement (RM Towill, 2002).

A rural rubbish dump site identified as "Waimanalo" on a 1940's era map (Young, 1993; Map 10) is likely one of the Waimanalo Dumps, though the map is not of an appropriate scale to definitively determine the site's exact location. The former dump was likely located to the west of Kalamanaole Highway and the Olomana Golf course and to the north of Kailua Ditch and Waimanalo Stream. If the Waimanalo Dump did exist, based on its location, the dump would likely have been used to dispose of household wastes and would have been operated by the C&C. The area in the vicinity is undeveloped.

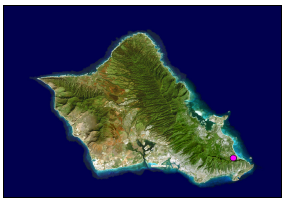
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	4-1-008:080
2359163.93140	633978.13148	**Zone:**	Koolaupoko
Longitude	**Latitude**	**Section:**	Waimanalo
157 42 29	21 19 46	**Plat:**	Not Designated
Address:	360 Kulaiwi Street, 330 Waikupanaha Street	**Quadrangle:**	Koko Head

Ownership

Current Owner: State of Hawaii (Southern Food Groups LP-lessee)

Previous Operator: City and County of Honolulu



Waimanalo Dump - South

Category 3

Site Operation and History

Landfill Type: Municipal

Type of Waste: Municipal

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1940s	**EPA ID No.:**	Not documented
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	Not applicable
Capped?	No documentation found to indicate that the dump was capped	**Method of Operation:**	Burn and dump
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Agricultural

City and County Zoning: Ag-1

State Land Use District: Agricultural

Facilities: Detached dwellings (1941-1948 x 19)

TMK Separation: Household dwellings, livestock farm

Flood Zone: D - Undetermined but possible flood hazards, X - 500-year Flood Plain

Geography and Topography

Physiographic Province: Koolau Range

Elevation Range (ft): 80 **to** 100

Approximate Landfill Acreage: 5+

Parcel Acreage: 174.56

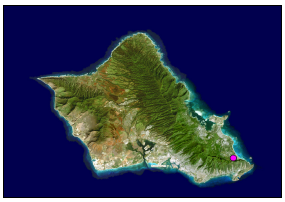
Climate

Annual Precipitation (cm): 60.22

Precipitation Days Per Year 40

Average Temperature (°F): 76.9

Temperature Range (° F): 69.1 **to** 84.6



Waimanalo Dump - South

Category 3

Soils

Soil Map Symbol:	PkB	**Bulk Density (gm/cc):**	0.90-1.10
Soil Association:	Lolekaa-Waikane	**Moisture Retention (%):**	0.12-0.14
Soil Series:	Pohakupu	**Organic Carbon (%):**	4.0-6.0
Engineering Classification:	Silty Clay Loam	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	0-8
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-6.5
Topsoil Rating:	Fair	**Corrosivity:**	Moderate

Soil Map Symbol:	KlaB	**Bulk Density (gm/cc):**	1.10-1.40
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.10-0.13
Soil Series:	Kawaihapai	**Organic Carbon (%):**	1.0-2.0
Engineering Classification:	Clay Loam; Stony or Very Stony	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	2-6
Thickness of Surface Soil (in):	0-54	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

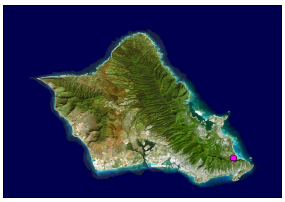
Soil Map Symbol:	HeB	**Bulk Density (gm/cc):**	1.10-1.30
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.13-0.15
Soil Series:	Haleiwa	**Organic Carbon (%):**	1.0-3.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Moderately well	**Slope (%):**	2-6
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-6.5
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Geology

Geologic Symbol(s): Ra

Geologic Unit(s): Unconsolidated noncalcareous deposits

Geologic Description: Chiefly younger alluvium, a black to brown fluviatile deposit generally consisting of coarse permeable detritus only slightly weathered and in many places subangular. In the valley bottoms near the sea it usually consists of nearly impermeable black, sticky mud called taro-patch clay. Much of the younger alluvium is reworked older alluvium. Included also is talus composed of angular blocks, usually with brown interstitial soil, forming aprons on the steep slopes at the base of cliffs. In the mountain areas much of the younger alluvium resembles, includes, and is often inseparable from landslide deposits, because of the torrential character of the streams and the precipitous valley walls. Extensive mantles of hill wash are included. Wells develop water from it in small quantities.



Waimanalo Dump - South

Category 3

Hydrogeology

Rock Type:	Alluvium-younger
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to low
Hydraulic Conductivity (ft/d):	1 - 500

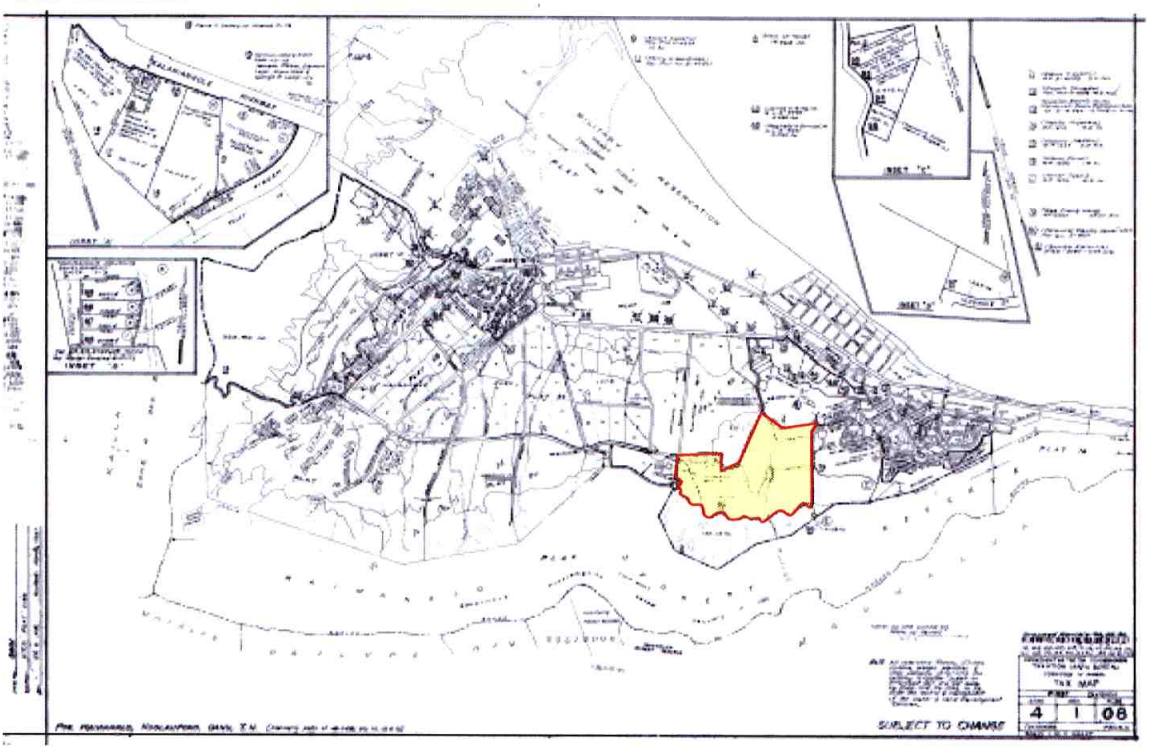
Aquifer(s)

Aquifer Status Code:	3060421211111
Aquifer Sector:	Windward
Aquifer System:	Waimanalo
Aquifer Type 1:	High Level
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Dike
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

Waimanalo Dump - South

Category 3

TMK Map



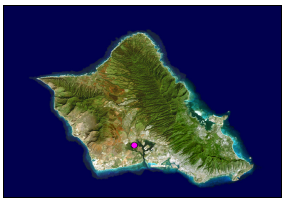
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	18		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	7
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	5
Irrigation Well(s)within one mile	1	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	1	Other Well(s)within one mile	4

Well Details

Waipahu Incinerator Ash Landfill/Dump



Waipahu Incinerator Ash Landfill/Dump

Category 3

Site Description

The Waipahu Ash Landfill and Waipahu Incinerator properties occupy an area of approximately 80 acres and are located on the northwestern portion of the Waipio Peninsula. The site abuts the West Loch of Pearl Harbor on its west and south perimeter. Kapakahi Stream is northwest of the landfill and a bird sanctuary is planned for the area across the stream. Former Oahu Sugar irrigation ponds are present along the east side of the site. Bordering the property to the south and southeast is the Waipio Peninsula Soccer Complex, and to the northeast are the Ted Makalena Golf Course and the City and County of Honolulu's (C&C) Police Training Academy. With the exception of the Waipahu Incinerator, all the land directly south and east of the site is located on Naval reservation land.

The site was the location of uncontrolled refuse dumping from 1943-1960. The unlined, uncapped dump was originally situated at the former location of Ulumoku Fish Pond and expanded in several increments across former mud and tidal flats. In the early 1960s the C&C operated the site as a municipal solid waste dump and open burn facility. Some dumping occurred directly into the waters of West Loch of Pearl Harbor. According to Bagaoisan (1997) the types of waste deposited included incinerated household waste, commercial solid waste, non-hazardous sludge, industrial solid waste, sewage sludge, and also included "foreign"-generated wastes from cruise ships and airplanes. Some unburned solids were also deposited. Ash from the Kewalo, Kapalama, and Waipahu incinerators, which were used to reduce the volume of refuse, was also dumped at the site. In 1972 the facility was closed to disposal of domestic refuse and the site was used exclusively as an ash landfill from 1972 to November 1991.

A major concern at this site has been the potential for groundwater pollution. The site is located above unconsolidated sediments that overlie older consolidated marine and non-marine sediments that are part of the caprock formation. Groundwater flows through the caprock locally and is used for irrigation, cooling water, and cement manufacture but is not potable and is seaward of the Underground Injection Control (UIC) Line. In addition to caprock water, significant quantities of fresh water are available through a series of breaks in the caprock that provide water to five major springs: the Kuauao, Waiau, Waimano, Waiawa, and Waikele springs. Leachate from the Waipahu Ash Landfill may contain constituents that have the potential to contaminate groundwater aquifers, soil, and the near shore waters and sediments of Pearl Harbor. Four groundwater monitoring wells were installed to study possible leachate migration: well B is located on the landfill, wells A and D are located up gradient, and well C-2 is located down gradient.

According to the United States Environmental Protection Agency (EPA)'s Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database, the landfill's "Discovery" was during November 1979. A Preliminary Assessment was completed on November 1980. A Site Inspection was completed during March 1985 and determined that no further action was necessary; therefore, the landfill became an "Archived Site". The Hazard Evaluation and Emergency Response (HEER) Initial Site Screening Team screened the site on January 29, 1996 and determined that no further action was necessary (State of Hawaii Department of Health (DOH), 2003).

According to the State of Hawaii DOH, 1999 report the Waipahu Ash Landfill was never officially closed and is contaminated with many hazardous substances (dioxins, furans, lead, cadmium, chromium, mercury). A toxicologist worked in coordination with the DOH Office of Solid Waste Management to ensure protection of public health and a nearby wildlife refuge. According to the State of Hawaii DOH, 2000 report, the Hazard Evaluation section worked with the Department's Office of Solid Waste Management to evaluate the landfill, which is heavily contaminated with lead, cadmium, chromium, arsenic, and mercury and which may affect Pearl Harbor, naval property, a shoreline wildlife refuge, or the new Central Oahu Regional Park that contains many soccer fields. The C&C built the Waipio Soccer Complex that covers and caps the former areas of the incinerator and landfill as well as portions of United States Navy land. The soccer park's irrigation water was also evaluated, since its source, Waipio Heights Wells II, contains trace levels of pesticides (1,2-Dibromo-

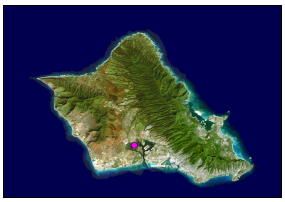
3-chloropropane (DBCP), ethylene dibromide (EDB), trichloropropane (TCP)) but still complies with drinking-water standards.

The Waipahu Incinerator closed in September of 1994 because it lacked proper pollution controls. In February of 2003, a citizen's environmental group reported that a large number of household appliances had been illegally buried in an area just north of the Waipahu Incinerator. Also in 2003, tests by Edward K. Noda and Associates (EKNA) determined that significantly elevated concentrations of arsenic, cadmium, chromium, and lead exist in soils at the site of the former Waipahu Incinerator. Many of the concentrations of metals in the soils at the site are high enough that it is unlikely that soils would pass Toxicity Characteristics Leaching Procedure (TCLP) testing for disposal at a permitted landfill. As such, much of the soil could be considered to be hazardous waste and would require special handling and disposal. In addition, EKNA concluded that there is a significant exposure risk at the site for children using the Waipio Soccer Complex unless the elevated levels of metals are properly addressed.

According to the State of Hawaii DOH, 2003 report, an environmental risk assessment document for the Waipahu Incinerator and Landfill was submitted to the DOH Solid and Hazardous Waste Branch (SHWB) and was reviewed by the HEER office. High levels of lead were found in ash or dust on the landfill and incinerator site. The risk assessment evaluated the health risks to workers and people living or playing offsite from exposure to ash or dust. The assessment indicated that given current land use, the incinerator and landfill does not pose a risk. The HEER office concurred with the conclusions of the risk assessment.

The C&C has completed a draft Environmental Assessment (EA) for the construction a landfill cap (proposed) to help secure the required permits. Because three quarters of the Waipahu Ash Landfill is on Navy property, the Navy is working with the C&C to develop an Administrative Order of Consent (formerly a Memorandum of Agreement) to address the C&C's obligations under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) after the C&C caps and closes the landfill (in accordance with applicable landfill regulations). These obligations may include additional investigation and cleanup to address potential off-site contamination that may have migrated from the landfill.

The landfill was scheduled to be capped beginning in November 2004, in accordance with the Resource Conservation and Recovery Act (RCRA) and Hawaii Administrative Rule. The Navy is currently working with its legal office and the Environmental Protection Agency (EPA) to determine the C&C's obligations under CERCLA for dealing with the landfill. The C&C and Navy have agreed to follow a RCRA-CERCLA hybrid approach to address environmental issues at the landfill. Per RCRA, the C&C should have already capped the landfill in 1993 and be conducting ongoing post-closure activities (including monitoring and maintenance). Since the site is located within the Pearl Harbor Naval Complex (PHNC) National Priorities List facility, the C&C must conduct the work in accordance with CERCLA regulations. The cap itself will remain and be maintained in perpetuity and have land-use restrictions imposed on it. RCRA requires that landfill monitoring (groundwater and soil vapors) and maintenance be conducted for 30 years. After this period, monitoring may be discontinued if there is no evidence of chemical releases to the environment at the landfill (Navy Region Hawaii, 2004b).



Waipahu Incinerator Ash Landfill/Dump

Category 3

Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	9-3-001:002, 012; 9-3-002:002 ,009, 027
2363424.91605	603934.63282	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Waikele
157 59 50	21 22 11	**Plat:**	Not Designated
Address:	59 Waipio Point Access Road, 93-071 Waipahu Depot Street	**Quadrangle:**	Waipahu

Ownership

Current Owner: United States government, City and County, State of Hawaii (C&C-lessee)

Previous Operator: City and County of Honolulu

Site Operation and History

Landfill Type: Municipal

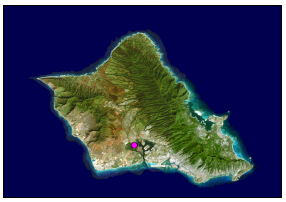
Type of Waste: Municipal solid waste until 1972, industrial, ash, sewage, sludge

Monitoring Well Network? Yes

Monitoring Well Identification A, B, C-2, D

Status:	Active Closure	**Analytical Data Available?**	Yes
Active Period:	1943-1972, early 1960s-Nov 1991	**EPA ID No.:**	HID980818629, HID000853283
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	No Further Response Action Planned (Due to the landfill being partially located within the PHNC, which is on the EPA's NPL, closure of the landfill must also comply with CERCLA.)
Capped?	No, several areas of the site have a thin layer of soil cover, but most of the site has not been covered or is covered with soil that is insufficiently thick to warrant salvaging for use in the closure construction	**Method of Operation:**	Open burn until 1970, dump, cover (1970-1972 unburned municipal waste placed at site;1972-1991 used exclusively as an ash landfill)

Permit Info: Permit numbers SW-183106 (1985-1990); SW-282301 (1990-1996). The landfill was issued permits under Chapter 58 of the Hawaii Administrative Rule (effective Nov. 1981-Oct. 1993).



Waipahu Incinerator Ash Landfill/Dump

Category 3

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Makai

Mauka or Makai of UIC Line? Makai

Population and Land Use

Type of Development in the Surronding Area? Recreation

City and County Zoning: P-1, P-2

State Land Use District: Agricultural, Conservation, Urban

Facilities: Offices (1989 x4), limited repair and maintenance facility (1997 x 5), power, sanitary and refuse plant

TMK Separation: Military, public order and safety, sewer, unsubdivided vacant land

Flood Zone: D - Undetermined but possible flood hazards, X - 500-year Flood Plain, A/AE - 100-year Flood Plain

Geography and Topography

Physiographic Province: Coastal Plain

Elevation Range (ft): 10 **to** 20

Approximate Landfill Acreage: 80

Parcel Acreage: various

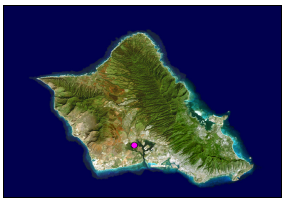
Climate

Annual Precipitation (cm): 49.40

Precipitation Days Per Year 30

Average Temperature (°F): 76.0

Temperature Range (° F): 67.4 **to** 84.5



Waipahu Incinerator Ash Landfill/Dump

Category 3

Soils

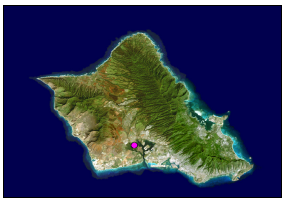
Soil Map Symbol:	KmA	**Bulk Density (gm/cc):**	1.10-1.30
Soil Association:	Kaena-Waialua	**Moisture Retention (%):**	0.12-0.14
Soil Series:	Keaau	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Clay and Silty Clay	**Permeability (in/hr):**	0.0000-0.1
Drainage Characterisitics:	Very poor	**Slope (%):**	0-2
Thickness of Surface Soil (in):	0-57	**pH:**	7.4-7.8
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	Fd	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.14-0.16
Soil Series:	Fill Land	**Organic Carbon (%):**	10-15
Engineering Classification:	Silty Clay Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Poor	**Slope (%):**	0
Thickness of Surface Soil (in):	0-40	**pH:**	6.1-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	MnC	**Bulk Density (gm/cc):**	1.10-1.33
Soil Association:	Tropohumults-Dystrandepts	**Moisture Retention (%):**	0.16-0.18
Soil Series:	Mamala	**Organic Carbon (%):**	2.0-4.0
Engineering Classification:	Stony Silty Clay Loam	**Permeability (in/hr):**	0.6-2
Drainage Characterisitics:	Very poor	**Slope (%):**	0-12
Thickness of Surface Soil (in):	0-19	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Soil Map Symbol:	W	**Bulk Density (gm/cc):**	Not available
Soil Association:	Not Applicable	**Moisture Retention (%):**	Not available
Soil Series:	Water	**Organic Carbon (%):**	Not available
Engineering Classification:	Water	**Permeability (in/hr):**	Not available
Drainage Characterisitics:	Not available	**Slope (%):**	--
Thickness of Surface Soil (in):	Not available	**pH:**	Not available
Topsoil Rating:	Poor	**Corrosivity:**	Not available

Soil Map Symbol:	HxA	**Bulk Density (gm/cc):**	1.40-1.50
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.14



Waipahu Incinerator Ash Landfill/Dump

Category 3

Soil Series:	Honouliuli	**Organic Carbon (%):**	2.0-3.0
Engineering Classification:	Clay	**Permeability (in/hr):**	0.1-0.6
Drainage Characterisitics:	Very poor	**Slope (%):**	0-2
Thickness of Surface Soil (in):	0-60	**pH:**	6.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Geology

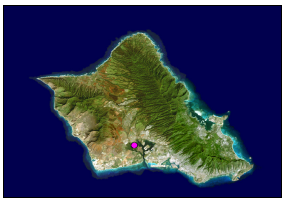
Geologic Symbol(s): Pls

Geologic Unit(s): Consolidated calcareous marine sediments

Geologic Description: Chiefly emerged coral reefs but in places, especially near Pearl Harbor, finely laminated lagoon limestone. Beach deposits resembling the various types of present calcareous beaches in lithified form are included, as well as a few inextensive consolidated beach deposits that may have been formed at the present stand of the sea. Extremely permeable because of primary and secondary cavities and yields water copiously, but the water is apt to be brackish.

Hydrogeology

Rock Type:	Coral-in situ reef limestone
GW Occurrance-Principal:	Basal
GW Occurrance-Secondary:	Perched
Permeability:	Moderate to very high
Hydraulic Conductivity (ft/d):	100 - 20,000



Waipahu Incinerator Ash Landfill/Dump

Category 3

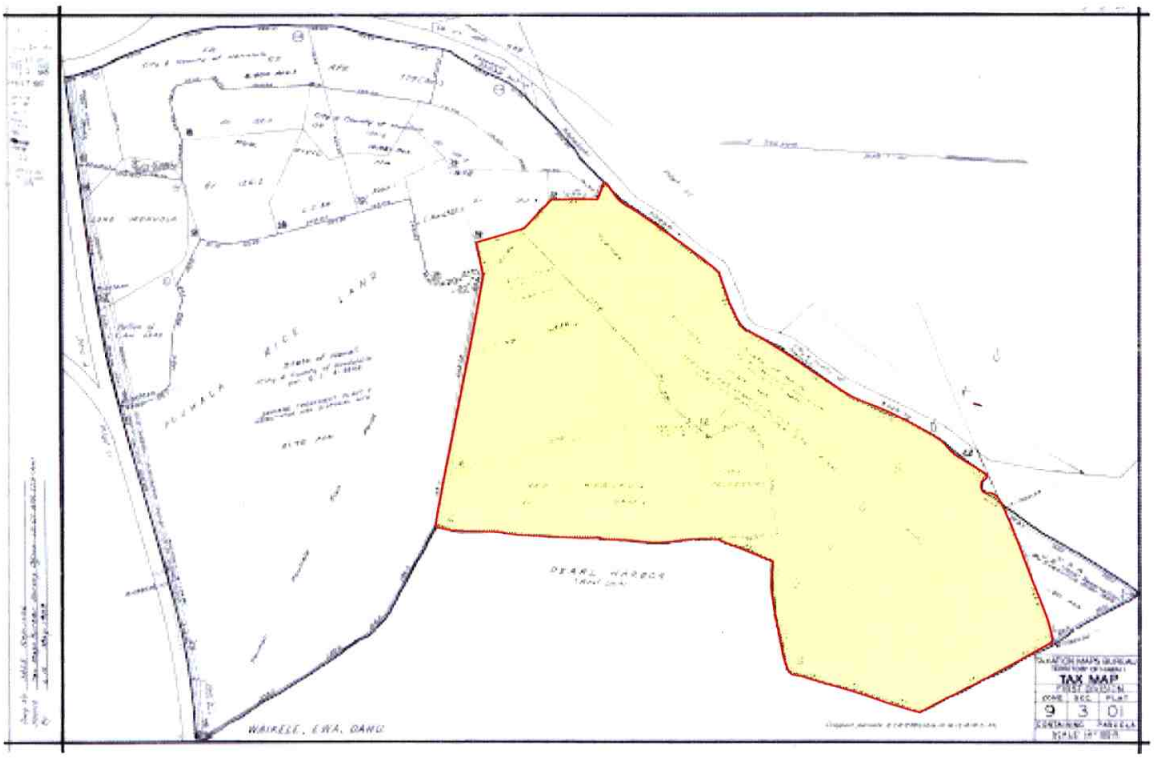
Aquifer(s)

Uppermost Aquifer	**Aquifer Status Code:**	3020311612211
	Aquifer Sector:	Pearl Harbor
	Aquifer System:	Waipahu
	Aquifer Type 1:	Basal
	Aquifer Type 2:	Unconfined
	Aquifer Type Geol.:	Sedimentary
	Development State:	Currently used
	Utility:	Ecologically important
	Salinity (mg/L Cl-):	Low (250-1000)
	Uniqueness:	Irreplaceable
	Vulnerability:	High
Lower Aquifer	**Aquifer Status Code:**	3020312112212
	Aquifer Sector:	Pearl Harbor
	Aquifer System:	Waipahu
	Aquifer Type 1:	Basal
	Aquifer Type 2:	Confined
	Aquifer Type Geol.:	Flank
	Development State:	Currently used
	Utility:	Ecologically important
	Salinity (mg/L Cl-):	Low (250-1000)
	Uniqueness:	Irreplaceable
	Vulnerability:	Moderate

Waipahu Incinerator Ash Landfill/Dump

Category 3

TMK Map



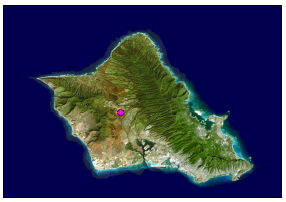
Wells Within One Mile

Summary

Total Number of Well(s)within one mile	6		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	0
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	0
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	6
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

Wheeler Army Airfield - Gulch Runway Dump



Wheeler Army Airfield - Gulch Runway Dump

Category 2

Picture Not Available

Site Description

Wheeler Army Airfield (Wheeler) is located to the west of Kamehameha Highway, to the south of Lake Wilson, and to the northeast of Waikele Stream. The airfield is a 1,389-acre base that was established in 1900. It is part of the United States Army Garrison Schofield Barracks, which was originally split into three different parts: East Range, Schofield Barracks, and Wheeler Army Airfield. The base was formerly an Air Force facility but effective November 1, 1991, the United States Air Force relinquished control of the base to the United States Army. Its name changed from Wheeler Air Force Base to Wheeler Army Airfield, however the Air Force has maintained responsibility for sites that were contaminated prior to the land transfer. The area in the vicinity of the Wheeler landfills is used for military purposes.

There were three distinct areas where refuse was disposed of at Wheeler that include the Kunia Gate Dump, the Area 7 Dump, and the subject site: Gulch Runway Dump (divided in Sites 1 and 2). The Kunia Gate Dump was an open, unregulated disposal site used during the 1950s-1960s and possibly into the 1970s. The Area 7 dump was used until approximately 1970 for unregulated dumping. The Gulch Runway Dump was located adjacent to an unused, mostly paved, runway. In addition, the Air Force's Installation Restoration Program had a project at Wheeler Army Air Field that involved the removal of over 100 drums of material that were improperly disposed of in the early 1970s.
The exact operational dates of these sites have not been well documented but it is likely that dumping occurred as early as the 1950s and continued until the 1970s. Wastes included municipal solid waste and military operations wastes, including solvents and other hazardous chemicals.

The State of Hawaii Hazard Evaluation and Emergency Response (HEER) Office provides oversight to all military site cleanups through the Department of Defense/State Memorandum of Agreement grant. Wheeler Army Airfield is covered by the agreement. According to the United States Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database, "Discovery" of the Gulch Runway Dump was completed during June 1981. A Preliminary Assessment was completed during March 1982. A Site Inspection (SI) and Hazard Ranking System Package was completed in August 1982. During the SI, Air Force representatives said that the sites probably received wastes typical of an Air Force facility - waste oils, paint sludges, solvents, pesticide containers, etc. Records were unavailable on how long the Gulch Runway Dump was used but it appeared to still be active during the SI in 1982. Household refuse was noted across much of the site. Five-gallon paint and insecticide cans, dieldrin emulsifiable concentrate, and drum lids labeled "dry cleaning solvent" were also observed. An Expanded Site inspection was completed May 26, 1992.

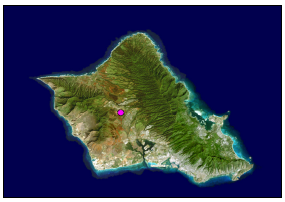
Site Location

UTM-x (m)	**UTM-y (m)**	**TMK:**	7-7-001:001
2374378.95063	599814.09866	**Zone:**	Ewa
Longitude	**Latitude**	**Section:**	Waianae-Uka
158 02 11	21 28 08	**Plat:**	Not Designated
Address:	USAG Wheeler Army Airfield, Schofield Barracks	**Quadrangle:**	Schofield Barracks

Ownership

Current Owner: United States government

Previous Operator: U.S. Army



Wheeler Army Airfield - Gulch Runway Dump

Category 2

Picture Not Available

Site Operation and History

Landfill Type: Military

Type of Waste: Municipal solid waste, hazardous waste, and construction debris

Monitoring Well Network? No wells documented

Monitoring Well Identification None documented

Status:	Closed	**Analytical Data Available?**	No data was located
Active Period:	1950s-1970s	**EPA ID No.:**	HI0570090027, HI3573028732 (base)
Lined?	No documentation found to indicate that the dump was lined	**Non-NPL status:**	No Further Response Action Planned
Capped?	Limited	**Method of Operation:**	Open dumps and dig and fill
Permit Info:	None documented		

No-Pass and UIC Lines

Mauka or Makai of No-Pass Line? Mauka

Mauka or Makai of UIC Line? Mauka

Population and Land Use

Type of Development in the Surronding Area? Military Various

City and County Zoning: F-1, P-1

State Land Use District: Agricultural, conservation, urban

Facilities: unknown at present

TMK Separation: Military, right-of-way

Flood Zone: D - Undetermined but possible flood hazards

Geography and Topography

Physiographic Province: Schofield Plateau

Elevation Range (ft): 640 **to** 760

Approximate Landfill Acreage: 20+

Parcel Acreage: 10,098.6801

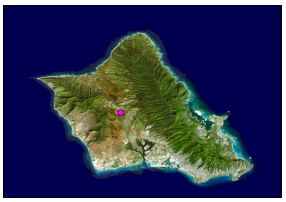
Climate

Annual Precipitation (cm): 142.70

Precipitation Days Per Year 99

Average Temperature (° F): 70.7

Temperature Range (° F): 63.2 **to** 78.1



Wheeler Army Airfield - Gulch Runway Dump

Category 2

Picture Not Available

Soils

Soil Map Symbol:	HLMG	**Bulk Density (gm/cc):**	1.00-1.20
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.10-0.12
Soil Series:	Helemano	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	30-90
Thickness of Surface Soil (in):	0-60	**pH:**	5.6-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

Soil Map Symbol:	FL	**Bulk Density (gm/cc):**	1.20-1.40
Soil Association:	Lualualei-Fill land Ewa	**Moisture Retention (%):**	0.06-0.12
Soil Series:	Fill Land, Mixed	**Organic Carbon (%):**	0.1-5.0
Engineering Classification:	Fill Land, Mixed	**Permeability (in/hr):**	0.1-2
Drainage Characterisitics:	Poor	**Slope (%):**	--
Thickness of Surface Soil (in):	0-60	**pH:**	6.1-7.3
Topsoil Rating:	Poor	**Corrosivity:**	High

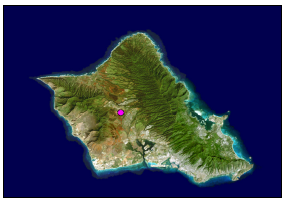
Soil Map Symbol:	WaA	**Bulk Density (gm/cc):**	1.20-1.45
Soil Association:	Helemano-Wahiawa	**Moisture Retention (%):**	0.11-0.13
Soil Series:	Wahiawa	**Organic Carbon (%):**	2.0-5.0
Engineering Classification:	Silty Clay	**Permeability (in/hr):**	2-6
Drainage Characterisitics:	Moderately well	**Slope (%):**	0-3
Thickness of Surface Soil (in):	0-60	**pH:**	5.1-6.0
Topsoil Rating:	Poor	**Corrosivity:**	Moderate

Geology

Geologic Symbol(s): Tkb

Geologic Unit(s): Koolau volcanic series

Geologic Description: Gray, blue, red, and black jointed dense to very vesicular, holocrystalline and microcrystalline, aphanitic and porphyritic permeable effusive basalts. The conspicuous phenocrysts are either olivine or feldspar or both; the basalt was poured out of fissures and vents in rapid succession as short and long pahoehoe and aa flows 10 to 80 feet thick; the pahoehoe flows occur chiefly near the crest of the Koolau Range; aa flows, some platy, with their clinker beds make up about 60 percent of the range; the basalt is deeply weathered except where it forms cliffs; in the lower flanks of the range it is covered with a deep-red lateritic soil, but in the higher areas, where rain is abundant, the soil is brown or black; the basalt exceeds 3,500 feet in thickness, and the individual beds have dips as steep as 15 degrees; it is the great aquifer of Oahu and yields water copiously to wells, tunnels, and springs.



Wheeler Army Airfield - Gulch Runway Dump

Category 2

Picture Not Available

Hydrogeology

Rock Type:	Koolau Basalt-saprolite
GW Occurrance-Principal:	Perched
GW Occurrance-Secondary:	--
Permeability:	Very low
Hydraulic Conductivity (ft/d):	<1

Aquifer(s)

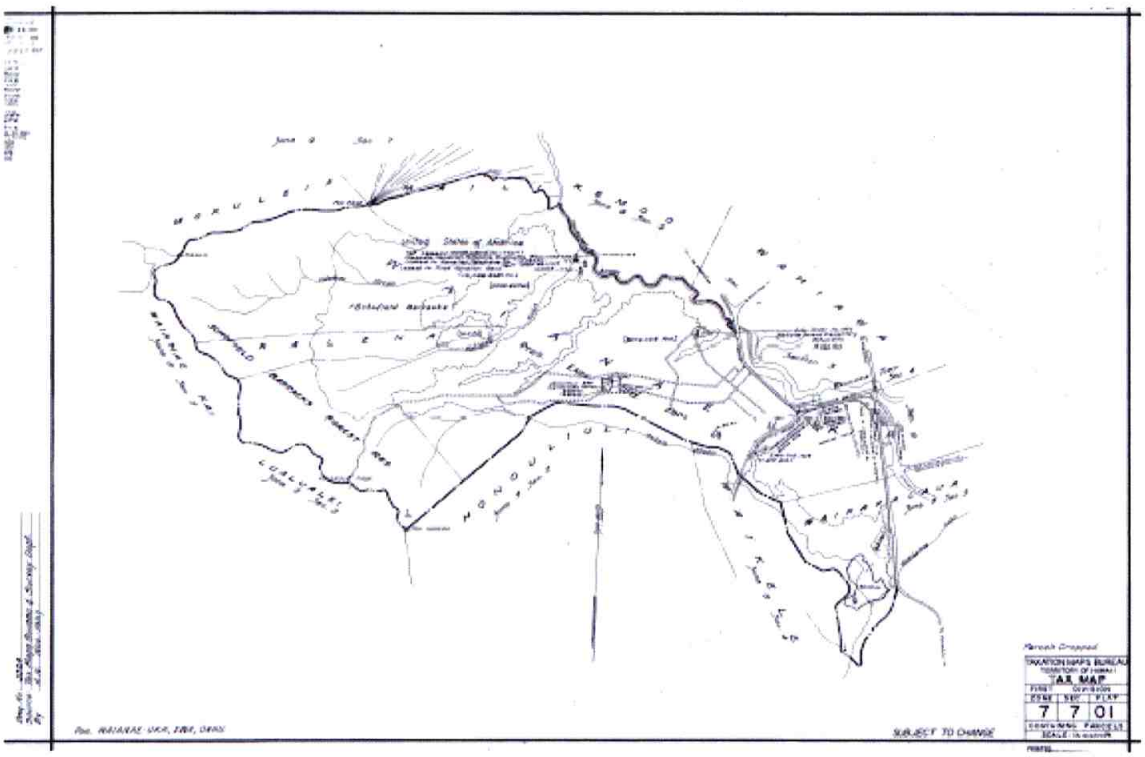
Aquifer Status Code:	3020311111111
Aquifer Sector:	Pearl Harbor
Aquifer System:	Waipahu
Aquifer Type 1:	Basal
Aquifer Type 2:	Unconfined
Aquifer Type Geol.:	Flank
Development State:	Currently used
Utility:	Drinking
Salinity (mg/L Cl-):	Fresh (<250)
Uniqueness:	Irreplaceable
Vulnerability:	High

Wheeler Army Airfield - Gulch Runway Dump

Category 2

Picture Not Available

TMK Map



Wells Within One Mile

Summary

Total Number of Well(s)within one mile	9		
Municipal Well(s)within one mile	0	Observation Well(s)within one mile	8
BWS Well(s) within one mile	0	Sealed Well(s)within one mile	0
Domestic Well(s)within one mile	0	Unused Well(s) within one mile	1
Irrigation Well(s)within one mile	0	Lost Well(s)within one mile	0
Industrial Well(s)within one mile	0	Other Well(s)within one mile	0

Well Details

APPENDIX B - Board of Water Supply Well Details

WELL NO.	WELL NAME	YEAR DRILLED	OWNER/USER	DRILLING METHOD	CASING DIAMETER	GROUND SURFACE ELEVATION	WELL DEPTH	SOLID CASING	PERFORATED CASING	USE	INITIAL DEPTH TO WATER	BOTTOM ELEVATION OF BOREHOLE	BOTTOM ELEVATION OF SOLID CASING	BOTTOM ELEVATION OF PERFORATED CASING	TAX MAP KEY	AQUIFER CODE*
					(inches)	(feet)	(feet)	(feet)	(feet)		(feet bgs)	(feet amsl)	(feet amsl)	(feet amsl)		
1744-04	Pia	1990	Honolulu BWS	Percussion	12	281	315	271	311	Unused	4.4	-34	10	-30	3-7-015:064	30106
1745-01	Wailupe I	1981	Honolulu BWS	Percussion	14	379	440	367	406	Municipal	3.7	-61	12	-27	3-6-019:035	30106
1746-01	Ainakoa	1968	Honolulu BWS	Percussion	12	156	305	163	193	Municipal	9.0	-149	-7	-37	3-5-040:015	30105
1746-02	Waialae Iki	1973	Honolulu BWS	Percussion	12	385	440	383	413	Municipal	2.0	-55	2	-28	3-5-024:005	30106
1746-03	Kapakahi	1992	Honolulu BWS	Percussion	14	267	320	260	320	Unused	8.0	-53	7	-53	3-5-024:001	30105
1747-01	Waialae TH	1935	Honolulu BWS	--	1	152	171	158	168	Unused	10.3	-19	-6	-16	3-5-020:011	30105
1747-02	Waialae Shaft	1937	Honolulu BWS	Shaft	96	160	157	--	--	Unused	10.2	3	--	--	3-3-014:015	30105
1747-03	Waialae Nui	1983	Honolulu BWS	Percussion	14	310	410	327	367	Unused	11.4	-100	-17	-57	3-5-024:001	30105
1747-05	Waialae West	1999	Honolulu BWS	--	10	188	217	203	--	Unused	--	-29	-15	--	3-3-014:016	30105
1748-03	Kaimuki Pump Sta	1898	Honolulu BWS	--	12	25	260	--	--	Municipal	25.2	-235	--	--	2-7-030:012	30101
1748-04	Kaimuki Pump Sta	1898	Honolulu BWS	--	12	26	260	--	--	Municipal	--	-234	--	--	2-7-030:012	30101
1748-05	Kaimuki Pump Sta	1912	Honolulu BWS	--	12	37	250	100	--	Municipal	22.3	-213	-63	--	2-7-030:012	30101
1748-06	Kaimuki Pump Sta	1912	Honolulu BWS	--	12	27	250	100	--	Municipal	24.0	-223	-73	--	2-7-030:012	30101
1748-07	Kaimuki Pump Sta	1925	Honolulu BWS	--	12	29	301	95	--	Municipal	24.9	-272	-66	--	2-7-030:012	30101
1748-08	Kaimuki Pump Sta	1925	Honolulu BWS	--	12	28	304	101	--	Municipal	23.9	-276	-73	--	2-7-030:012	30101
1748-09	Kaimuki Pump Sta	1925	Honolulu BWS	--	12	28	302	101	--	Municipal	24.8	-274	-73	--	2-7-030:012	30101
1748-10	Kaimuki Pump Sta	1928	Honolulu BWS	--	12	32	308	101	--	Municipal	25.0	-276	-69	--	2-7-030:012	30101
1748-11	Kaimuki Deep 1	1960	Honolulu BWS	--	6	29	1404	114	--	Observation	--	-1375	-85	--	2-7-030:012	30101
1748-12	Keanu	1975	Honolulu BWS	Percussion	12	121	368	130	287	Observation	7.9	-247	-9	-166	3-3-005:111	30101
1748-13	Manoa I	1984	Honolulu BWS	Percussion	12	40	100	48	100	Unused	25.0	-60	-8	-60	2-8-029:001	30101
1748-14	Kaimuki Sta Deep	1986	Honolulu BWS	Rotary	9	26	1203	123	--	Observation	--	-1177	-97	--	2-7-030:012	30101
1749-14	Kaimuki High Sch	1891	Honolulu BWS	--	8	13	417	282	--	Observation	24.8	-404	-269	--	2-7-024:001	30101
1749-22	Kaimuki HS Deep	1970	Honolulu BWS	Rotary	8	14	911	305	--	Observation	23.4	-897	-291	--	2-7-024:001	30101
1805-13	Kalaeloa Basalt	2002	Honolulu BWS	Rotary	20	14	1600	1100	--	Unused	--	-1586	-1086	--	9-1-031:028	30204
1805-14	Kalaeloa Caprock	2001	Honolulu BWS	Rotary	17	12	300	50	300	Unused	--	-288	-38	-288	9-1-031:028	30207
1843-01	Kuliouou	1983	Honolulu BWS	Percussion	12	218	268	208	248	Municipal	3.7	-50	10	-30	3-8-011:003	30106
1845-01	Wailupe II	1986	Honolulu BWS	Percussion	12	380	490	375	395	Unused	7.5	-110	5	-15	3-6-004:001	30106
1847-01	Palolo Well	1974	Honolulu BWS	Rotary	12	387	570	420	--	Municipal	21.9	-183	-33	--	2-7-024:001	30101
1847-02	Palolo Addition	1999	Honolulu BWS	Rotary	13	387	575	8	425	Municipal	--	-188	379	-38	3-4-024:044	30101
1848-01	Waahila Deep	1999	Honolulu BWS	Rotary	12	185	1423	180	--	Observation	--	-1238	5	--	3-3-056:001	30101
1849-11	Wilder Ave	1912	Honolulu BWS	Rotary	12	43	304	272	--	Observation	27.7	-261	-229	--	2-8-017:029	30102
1849-12	Wilder Ave	1912	Honolulu BWS	Rotary	12	43	430	300	--	Observation	--	-387	-257	--	2-8-017:029	30102
1849-13	Wilder Ave. P3	1961	Honolulu BWS	Rotary	10	53	475	354	--	Municipal	--	-422	-301	--	2-8-017:029	30102
1849-14	Wilder Ave. P1	1961	Honolulu BWS	Rotary	10	59	460	343	--	Municipal	--	-401	-284	--	2-8-017:029	30102
1849-15	Wilder Ave. P4	1962	Honolulu BWS	Rotary	10	47	445	321	--	Municipal	--	-398	-274	--	2-8-017:029	30102
1849-16	Wilder Ave. P2	1962	Honolulu BWS	Rotary	10	56	466	345	--	Municipal	--	-410	-289	--	2-8-017:029	30102
1850-03	Makiki	1881	Honolulu BWS	--	12	160	900	--	--	Unused	--	-740	--	--	3-9-010:001	30102
1850-21	Makiki	1894	Honolulu BWS	--	8	20	409	312	--	Sealed	29.8	-389	-292	--	--	30102
1850-30	Punchbowl Deep	2001	Honolulu BWS	Rotary	8	175	1500	250	--	Observation	--	-1325	-75	--	2-2-005:005	30102
1851-02	Thomas Square	1882	Honolulu BWS	--	2	27	470	458	--	Observation	27.2	-443	-431	--	2-4-001:001	30102
1851-12	Beretania P Sta	1895	Honolulu BWS	--	10	21	580	499	--	Municipal	32.0	-559	-478	--	2-1-036:004	30102
1851-13	Beretania P Sta	1895	Honolulu BWS	--	10	22	616	499	--	Municipal	--	-594	-477	--	2-1-036:004	30102
1851-24	Beretania P Sta	1910	Honolulu BWS	--	12	20	616	487	--	Sealed	26.9	-596	-467	--	2-1-036:004	30102
1851-25	Beretania P Sta	1910	Honolulu BWS	--	12	17	617	495	--	Sealed	27.7	-600	-478	--	--	30102
1851-31	Beretania P Sta	1924	Honolulu BWS	--	12	20	600	489	--	Municipal	28.0	-580	-469	--	2-1-036:004	30102
1851-32	Beretania P Sta	1924	Honolulu BWS	--	12	20	600	489	--	Sealed	27.8	-580	-469	--	2-1-036:004	30102
1851-33	Beretania P Sta	1926	Honolulu BWS	--	12	14	533	479	--	Municipal	23.6	-519	-465	--	2-1-036:004	30102
1851-34	Beretania P Sta	1926	Honolulu BWS	--	12	14	636	484	--	Municipal	23.6	-622	-470	--	2-1-036:004	30102
1851-35	Beretania P Sta	1926	Honolulu BWS	--	12	15	566	488	--	Municipal	23.3	-551	-473	--	2-1-036:004	30102

Table B-1
BWS WELLS ON THE ISLAND OF OAHU
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

WELL NO.	WELL NAME	YEAR DRILLED	OWNER/USER	DRILLING METHOD	CASING DIAMETER	GROUND SURFACE ELEVATION	WELL DEPTH	SOLID CASING	PERFORATED CASING	USE	INITIAL DEPTH TO WATER	BOTTOM ELEVATION OF BOREHOLE	BOTTOM ELEVATION OF SOLID CASING	BOTTOM ELEVATION OF PERFORATED CASING	TAX MAP KEY	AQUIFER CODE*
1851-57	Beretania Deep	1960	Honolulu BWS	--	6	23	1509	450	--	Observation	26.9	-1486	-427	--	2-1-036:005	30102
1851-67	Beretania Obs	1968	Honolulu BWS	Rotary	20	18	619	484	--	Municipal	3.0	-601	-466	--	2-1-036:004	30102
1851-74	Beretania Sta 1	1988	Honolulu BWS	Rotary	14	19	598	498	--	Municipal	21.0	-579	-479	--	2-1-036:006	30102
1851-75	Beretania Sta 2	1989	Honolulu BWS	Rotary	14	18	625	523	--	Municipal	22.9	-607	-505	--	2-1-036:004	30102
1905-06	Caprock 1	1990	Honolulu BWS	Percussion	12	47	72	44	72	Sealed	--	-25	-3	-25	9-1-015:001	30207
1905-07	Caprock 2	1991	Honolulu BWS	Percussion	12	49	78	48	78	Unused	--	-29	-1	-29	9-1-015:001	30207
1942-01	Waimanalo III	1996	Honolulu BWS	Percussion	12	275	575	476	--	Unused	--	-300	-201	--	4-1-008:005	30604
1943-01	Waimanalo II	1981	Honolulu BWS	Rotary	12	350	520	250	510	Municipal	36.9	-170	100	-160	4-1-027:015	30604
1946-01	Palolo Tunnel	1920	Honolulu BWS	Tunnel	--	987	--	--	--	Municipal	--	--	--	--	3-4-022:001	30105
1947-02	Manoa Tunnel 3	1923	Honolulu BWS	Tunnel	--	760	--	--	--	Municipal	--	--	--	--	2-9-055:003	30102
1948-01	Manoa II	1983	Honolulu BWS	Percussion	12	384	786	484	786	Municipal	74.0	-402	-100	-402	2-9-054:033	30102
1948-02	Manoa III	1985	Honolulu BWS	Percussion	10	182	350	30	230	Unused	158.5	-168	152	-48	2-9-036:003	30102
1948-04	Manoa IV	1994	Honolulu BWS	Percussion	12	160	565	98	497	Unused	--	-405	62	-337	2-9-036:003	30102
1952-06	Kalihi Pump Sta	1900	Honolulu BWS	--	12	21	460	--	--	Municipal	30.4	-439	--	--	1-5-003:020	30103
1952-07	Kalihi Pump Sta	1900	Honolulu BWS	--	12	20	475	229	--	Municipal	28.8	-455	-209	--	1-5-003:020	30103
1952-08	Kalihi Pump Sta	1900	Honolulu BWS	--	12	21	490	--	--	Municipal	29.7	-469	--	--	1-5-003:020	30103
1952-16	Kalihi Pump Sta	1926	Honolulu BWS	--	12	21	430	240	--	Municipal	25.6	-409	-219	--	1-5-003:020	30103
1952-17	Kalihi Pump Sta	1926	Honolulu BWS	--	12	19	401	363	--	Municipal	26.1	-382	-344	--	1-5-003:020	30103
1952-18	Kalihi Pump Sta	1926	Honolulu BWS	--	12	24	442	265	--	Municipal	25.9	-418	-241	--	1-5-003:020	30103
1952-19	Kalihi Pump Sta	1926	Honolulu BWS	--	12	23	414	271	--	Municipal	26.0	-391	-248	--	1-5-003:020	30103
1952-22	Kalihi Pump Sta	1927	Honolulu BWS	--	12	24	360	251	--	Municipal	25.9	-336	-227	--	1-5-003:020	30103
1952-48	Kalihi Sta Deep	2000	Honolulu BWS	Rotary	8	21	1200	260	--	Observation	--	-1179	-239	--	1-5-003:020	30103
2004-04	Makakilo	1981	Honolulu BWS	Percussion	14	141	268	188	--	Municipal	14.9	-127	-47	--	9-1-016:	30204
2006-12	Kahe Point	1938	Honolulu BWS	--	6	138	150	108	--	Observation	17.0	-12	30	--	9-1-015:004	30204
2006-14	BP Non-Potable 1	1988	Honolulu BWS	Percussion	16	179	285	228	--	Irrigation	--	-106	-49	--	9-1-015:005	30204
2006-15	BP Non-Potable 2	1988	Honolulu BWS	Percussion	16	195	300	244	--	Irrigation	14.3	-105	-49	--	9-1-015:005	30204
2007-01	Barbers Point	1938	Honolulu BWS	--	6	80	100	85	--	Sealed	5.5	-20	-5	--	--	30204
2043-01	Waimanalo	1891	Honolulu BWS	--	6	26	730	253	--	Sealed	--	-704	-227	--	--	30604
2043-02	Waimanalo I	1952	Honolulu BWS	--	12	142	280	136	--	Unused	29.0	-138	6	--	4-1-027:003	30604
2044-03	Waimanalo Tun 1	1888	Honolulu BWS	Tunnel	--	415	--	--	--	Municipal	--	--	--	--	4-1-011:001	30604
2044-04	Waimanalo Tun 2	1926	Honolulu BWS	Tunnel	--	425	--	--	--	Municipal	--	--	--	--	4-1-011:001	30604
2045-03	Waimanalo Tun 3	--	Honolulu BWS	Tunnel	--	462	--	--	--	Municipal	--	--	--	--	4-1-011:001	30604
2045-04	Waimanalo	--	Honolulu BWS	Tunnel	--	462	--	--	--	Other	--	--	--	--	--	30604
2045-05	Waimanalo Tun 4	1941	Honolulu BWS	Tunnel	--	620	--	--	--	Municipal	--	--	--	--	4-1-011:001	30604
2046-01	Maunawili	1954	Honolulu BWS	--	1	777	805	784	805	Unused	635.9	-28	-7	-28	4-2-010:001	30604
2046-02	Maunawili	1954	Honolulu BWS	--	1	1008	1036	994	1015	Unused	667.8	-28	14	-7	4-2-010:001	30604
2047-01	Maunawili	1953	Honolulu BWS	--	2	1272	452	60	--	Unused	1012.6	820	1212	--	4-2-010:001	30604
2047-02	Maunawili	1954	Honolulu BWS	--	1	1272	1230	1120	--	Unused	685.3	42	152	--	4-2-010:001	30604
2047-03	Manoa	1968	Honolulu BWS	--	2	549	75	62	67	Unused	--	474	487	482	2-9-054:014	30102
2047-04	Manoa	1968	Honolulu BWS	--	2	526	155	127	--	Unused	540.9	371	399	--	2-9-054:014	30102
2047-05	Manoa	1970	Honolulu BWS	Percussion	16	528	537	138	--	Unused	--	-9	390	--	2-9-054:014	30102
2052-08	Kalihi Shaft	1937	Honolulu BWS	Shaft	99	160	154	--	--	Municipal	29.6	6	--	--	1-3-021:004	30104
2052-10	Kapalama	1959	Honolulu BWS	--	8	80	283	233	--	Observation	24.2	-203	-153	--	1-6-026:022	30103
2052-12	Jonathan Springs	1981	Honolulu BWS	Percussion	14	31	1150	50	--	Observation	21.9	-1119	-19	--	1-6-005:031	30103
2052-13	Kapalama 2	1996	Honolulu BWS	Rotary	14	189	339	239	--	Municipal	--	-150	-50	--	1-6-022:007	30103
2052-14	Kapalama 1	1997	Honolulu BWS	Rotary	14	196	346	246	--	Municipal	--	-150	-50	--	1-6-022:007	30103
2052-15	Kalihi Sh Deep	1999	Honolulu BWS	Rotary	8	154	2035	150	--	Observation	--	-1881	4	--	1-3-021:004	30103
2146-03	Maunawili III	1992	Honolulu BWS	--	--	--	150	--	--	Sealed	--	--	--	--	4-2-063:032	30604
2148-01	Nuuanu C&C Tun 4	--	Honolulu BWS	Tunnel	--	1027	--	--	--	Municipal	--	--	--	--	2-2-054:001	30102
2148-02	Nuuanu C&C Tu 4B	--	Honolulu BWS	Tunnel	--	968	--	--	--	Municipal	--	--	--	--	2-2-054:001	30102

Table B-1
BWS WELLS ON THE ISLAND OF OAHU
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WELL NO.	WELL NAME	YEAR DRILLED	OWNER/USER	DRILLING METHOD	CASING DIAMETER	GROUND SURFACE ELEVATION	WELL DEPTH	SOLID CASING	PERFORATED CASING	USE	INITIAL DEPTH TO WATER	BOTTOM ELEVATION OF BOREHOLE	BOTTOM ELEVATION OF SOLID CASING	BOTTOM ELEVATION OF PERFORATED CASING	TAX MAP KEY	AQUIFER CODE*
2149-01	Nuuanu C&C Tun 3	--	Honolulu BWS	Tunnel	--	810	--	--	--	Municipal	--	--	--	--	1-9-007:001	30102
2149-02	Nuuanu C&C Tu 3A	--	Honolulu BWS	Tunnel	--	900	--	--	--	Municipal	--	--	--	--	1-9-007:001	30103
2149-03	Nuuanu Aerator	1992	Honolulu BWS	Rotary	14	826	398	248	398	Unused	504.0	428	578	428	1-9-007:002	30102
2153-05	Moanalua Deep	1980	Honolulu BWS	Rotary	12	35	1253	65	--	Observation	21.0	-1218	-30	--	1-1-037:006	30104
2153-09	Moanalua	1945	Honolulu BWS	--	12	58	115	66	--	Observation	--	-57	-8	--	1-1-033:035	30104
2153-10	Moanalua 1	1973	Honolulu BWS	Rotary	16	36	300	150	--	Municipal	--	-264	-114	--	1-1-037:005	30104
2153-11	Moanalua 2	1973	Honolulu BWS	Rotary	16	35	300	150	--	Municipal	18.6	-265	-115	--	1-1-037:005	30104
2153-12	Moanalua 3	1974	Honolulu BWS	Rotary	16	35	335	185	--	Municipal	18.4	-300	-150	--	1-1-037:005	30104
2201-09	Waipahu	1945	Honolulu BWS	--	12	83	107	86	--	Sealed	18.5	-24	-3	--	--	30203
2201-10	Kunia T41 Deep	1949	Honolulu BWS	--	12	84	1113	92	--	Observation	20.3	-1029	-8	--	9-1-018:001	30203
2202-21	Ep 15,16	1939	Honolulu BWS	Shaft	72	150	156	--	--	Municipal	22.4	-6	--	--	9-2-001:001	30203
2246-01	Maunawili	1953	Honolulu BWS	--	12	92	349	178	265	Sealed	74.2	-257	-86	-173	--	30604
2247-01	Kamooalii II	1985	Honolulu BWS	Percussion	--	358	525	--	--	Sealed	171.0	-167	--	--	--	30603
2248-01	Kamooalii I	1985	Honolulu BWS	Percussion	14	467	737	615	675	Unused	299.2	-270	-148	-208	4-5-042:001	30603
2249-01	Kalihi C&C Tun 3	--	Honolulu BWS	Tunnel	--	800	--	--	--	Municipal	--	--	--	--	1-4-018:001	30104
2249-02	Kalihi C&C Tun 4	--	Honolulu BWS	Tunnel	--	810	--	--	--	Municipal	--	--	--	--	1-4-018:001	30104
2249-03	Kalihi C&C Tun 5	--	Honolulu BWS	Tunnel	--	835	--	--	--	Municipal	--	--	--	--	1-4-018:001	30104
2249-04	Kalihi C&C Tun 6	--	Honolulu BWS	Tunnel	--	835	--	--	--	Municipal	--	--	--	--	1-4-018:001	30103
2250-01	Kalihi Aerator	1964	Honolulu BWS	--	12	614	150	100	--	Municipal	635.6	464	514	--	1-4-018:001	30104
2250-02	Kalihi II	1991	Honolulu BWS	Percussion	--	560	180	--	--	Sealed	535.0	380	--	--	1-4-018:006	30104
2253-02	Moanalua DH 43	--	Honolulu BWS	--	--	235	--	--	--	Unused	--	--	--	--	1-1-045:026	30104
2255-33	Halawa Obs.	1954	Honolulu BWS	--	12	57	85	60	--	Observation	18.3	-28	-3	--	9-9-010:003	30201
2255-37	Halawa 2	1961	Honolulu BWS	Rot	16	256	345	285	305	Municipal	13.3	-89	-29	-49	9-9-051:054	30201
2255-38	Halawa 3	1961	Honolulu BWS	Rotary	16	270	359	314	--	Municipal	16.5	-89	-44	--	9-9-051:054	30201
2255-39	Halawa 1	1961	Honolulu BWS	Rotary	16	258	399	276	296	Municipal	15.8	-141	-18	-38	9-9-051:054	30201
2258-10	Pearl City Pen	1940	Honolulu BWS	--	6	3	181	91	--	Sealed	17.4	-178	-88	--	--	30203
2301-34	Hoaeae P1	1959	Honolulu BWS	--	16	131	194	107	155	Municipal	17.0	-63	24	-24	9-4-034:074	30203
2301-35	Hoaeae P2	1959	Honolulu BWS	--	16	133	197	113	155	Municipal	18.2	-64	20	-22	9-4-034:074	30203
2301-36	Hoaeae P3	1959	Honolulu BWS	--	16	131	198	107	155	Municipal	19.5	-67	24	-24	9-4-034:074	30203
2301-37	Hoaeae P4	1959	Honolulu BWS	--	16	130	195	108	156	Municipal	19.3	-65	22	-26	9-4-034:074	30203
2301-38	Hoaeae P5	1974	Honolulu BWS	Rotary	16	126	276	176	--	Municipal	--	-150	-50	--	9-4-034:074	30203
2301-39	Hoaeae P6	1974	Honolulu BWS	Rotary	16	123	273	173	--	Municipal	--	-150	-50	--	9-4-034:074	30203
2301-44	Waipahu IV-2	1998	Honolulu BWS	Rotary	14	133	273	173	--	Municipal	--	-140	-40	--	9-4-002:005	30203
2301-45	Waipahu IV-3	1998	Honolulu BWS	Rotary	14	136	276	176	--	Unused	--	-140	-40	--	9-4-002:005	30203
2301-46	Waipahu IV-1	1998	Honolulu BWS	Rotary	14	131	271	171	--	Unused	--	-140	-40	--	9-4-002:005	30203
2301-47	Waipahu IV-4	1999	Honolulu BWS	Percussion	13	134	273	173	--	Municipal	--	-139	-39	--	9-4-002:005	30203
2302-01	Kunia I P1	1957	Honolulu BWS	--	16	201	350	221	--	Municipal	20.8	-149	-20	--	9-4-002:014	30203
2302-02	Kunia I P2	1957	Honolulu BWS	--	16	201	338	221	--	Municipal	20.9	-137	-20	--	9-4-002:014	30203
2302-03	Kunia I P3	1972	Honolulu BWS	Rotary	16	206	427	246	--	Municipal	--	-221	-40	--	9-4-002:014	30203
2302-04	Kunia I P4	1972	Honolulu BWS	Rotary	16	201	420	241	--	Municipal	--	-219	-40	--	9-4-002:014	30203
2303-01	Honouliuli I-1	1987	Honolulu BWS	Percussion	14	412	625	550	--	Unused	16.0	-213	-138	--	9-2-001:001	30204
2303-02	Honouliuli I-2	1987	Honolulu BWS	Percussion	14	411	563	550	--	Municipal	16.0	-199	-139	--	9-2-001:001	30204
2303-03	Honouliuli II-3	1987	Honolulu BWS	Percussion	14	419	534	450	--	Municipal	17.0	-115	-31	--	9-2-001:001	30204
2303-04	Honouliuli II-4	1988	Honolulu BWS	Percussion	14	421	555	455	--	Municipal	12.2	-134	-34	--	9-2-001:001	30204
2303-05	Honouliuli II-5	1989	Honolulu BWS	Percussion	14	432	545	465	--	Municipal	16.0	-113	-33	--	9-2-001:001	30204
2303-06	Honouliuli II-6	1989	Honolulu BWS	Percussion	14	432	535	455	--	Municipal	17.4	-103	-23	--	9-2-001:001	30204
2307-01	Nanakuli	1940	Honolulu BWS	--	1	479	489	469	489	Observation	2.7	-10	10	-10	8-9-008:003	30301
2347-04	Halekou Irr 1	1983	Honolulu BWS	Rotary	--	213	64	--	--	Unused	210.6	149	--	--	4-5-035:001	30603
2347-05	Halekou Irr 2	1983	Honolulu BWS	Rotary	10	214	63	30	50	--	--	151	184	164	4-5-035:001	30603
2347-06	Halekou Irr 3	1983	Honolulu BWS	Rotary	--	211	63	--	--	Sealed	--	148	--	--	4-5-035:001	30603
2347-07	Halekou Irr 4	1983	Honolulu BWS	Rotary	--	208	62	--	--	Unused	--	146	--	--	4-5-035:001	30603

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WELL NO.	WELL NAME	YEAR DRILLED	OWNER/USER	DRILLING METHOD	CASING DIAMETER	GROUND SURFACE ELEVATION	WELL DEPTH	SOLID CASING	PERFORATED CASING	USE	INITIAL DEPTH TO WATER	BOTTOM ELEVATION OF BOREHOLE	BOTTOM ELEVATION OF SOLID CASING	BOTTOM ELEVATION OF PERFORATED CASING	TAX MAP KEY	AQUIFER CODE*
2347-08	Halekou Irr 5	1983	Honolulu BWS	Rotary	--	208	62	--	--	Irrigation	--	146	--	--	4-5-035:001	30603
2347-09	Halekou Irr 6	1983	Honolulu BWS	Rotary	10	209	62	35	55	Irrigation	--	147	174	154	4-5-035:001	30603
2348-01	Kuou TH	1954	Honolulu BWS	--	2	290	273	85	--	Unused	298.6	17	205	--	4-5-041:008	30603
2348-02	Kuou I-1	1955	Honolulu BWS	--	16	274	418	366	--	Unused	310.4	-144	-92	--	4-5-041:008	30603
2348-03	Kuou I-2	1955	Honolulu BWS	--	16	293	280	113	--	Municipal	289.9	13	180	--	4-5-041:008	30603
2348-04	Kuou TH	1955	Honolulu BWS	--	3	309	182	85	--	Observation	308.9	127	224	--	4-5-041:008	30603
2348-05	Kuou II	1986	Honolulu BWS	Percussion	12	342	550	428	--	Municipal	257.5	-208	-86	--	4-5-041:009	30603
2348-06	Kuou III	1995	Honolulu BWS	Percussion	12	329	566	230	--	Unused	--	-237	-99	--	4-5-041:012	30603
2349-01	Luluku Tunnel	1948	Honolulu BWS	Tunnel	--	570	--	--	--	Municipal	--	--	--	--	4-5-041:004	30603
2349-02	Luluku	1984	Honolulu BWS	Percussion	14	412	460	282	297	Municipal	362.0	-48	130	115	4-5-041:013	30603
2354-01	Halawa Shaft	1944	Honolulu BWS	Shaft	--	165	183	--	--	Municipal	--	-18	--	--	9-9-010:008	30201
2355-03	Aiea Gulch 1	1947	Honolulu BWS	--	14	304	342	288	--	Municipal	17.7	-38	16	--	9-9-009:106	30201
2355-04	Aiea Gulch B	1947	Honolulu BWS	--	18	304	289	--	--	Sealed	--	15	--	--	9-9-009:106	30201
2355-05	Aiea Gulch 2	1947	Honolulu BWS	--	14	304	344	286	--	Municipal	18.5	-40	18	--	9-9-009:106	30201
2355-06	Aiea 1	1955	Honolulu BWS	--	14	258	360	290	--	Municipal	20.8	-102	-32	--	9-9-024:005	30201
2355-07	Aiea 2	1955	Honolulu BWS	--	14	258	358	288	--	Municipal	22.0	-100	-30	--	9-9-024:005	30201
2355-08	Kalauao	1963	Honolulu BWS	--	12	158	390	202	--	Observation	81.0	-232	-44	--	9-8-011:032	30201
2355-09	Kalauao 1	1965	Honolulu BWS	--	18	160	413	221	--	Municipal	74.6	-253	-61	--	9-8-011:032	30201
2355-10	Kalauao 2	1965	Honolulu BWS	--	18	159	413	222	--	Municipal	--	-254	-63	--	9-8-011:032	30201
2355-11	Kalauao 3	1965	Honolulu BWS	--	18	159	413	219	--	Municipal	--	-254	-60	--	9-8-011:032	30201
2355-12	Kalauao 4	1965	Honolulu BWS	--	18	160	413	221	--	Municipal	--	-253	-61	--	9-8-011:032	30201
2355-13	Kalauao 5	1969	Honolulu BWS	Rotary	18	159	413	227	--	Municipal	20.8	-254	-68	--	9-8-011:032	30201
2355-14	Kalauao 6	1969	Honolulu BWS	Rotary	18	160	413	230	--	Municipal	21.0	-253	-70	--	9-8-011:032	30201
2355-15	Kaamilo Deep	2001	Honolulu BWS	Rotary	8	491	1617	480	--	Observation	--	-1126	11	--	9-8-035:043	30201
2356-45	Aiea	1945	Honolulu BWS	--	12	25	177	42	--	Sealed	15.8	-152	-17	--	--	30201
2356-49	Waimalu I-1	1954	Honolulu BWS	--	12	102	327	129	--	Municipal	--	-225	-27	--	9-8-026:012	30201
2356-50	Waimalu I-2	1955	Honolulu BWS	--	12	102	327	127	--	Municipal	--	-225	-25	--	9-8-026:012	30201
2356-52	Pearl Harbor	1959	Honolulu BWS	--	16	87	172	101	--	Sealed	16.2	-85	-14	--	--	30201
2356-53	Aiea	1959	Honolulu BWS	--	6	26	250	75	--	Observation	17.3	-224	-49	--	--	30201
2356-55	Kaonohi I-1	1966	Honolulu BWS	Rot	16	252	542	289	--	Municipal	--	-290	-37	--	9-8-040:001	30201
2356-56	Kaonohi I-2	1966	Honolulu BWS	Rot	16	252	549	296	--	Municipal	8.6	-297	-44	--	9-8-040:001	30201
2356-57	Waimalu	1971	Honolulu BWS	Percussion	10	22	250	77	--	Observation	--	-228	-55	--	9-8-026:002	30201
2356-58	Kaamilo 1	1973	Honolulu BWS	Percussion	16	147	340	190	--	Municipal	--	-193	-43	--	9-8-031:020	30201
2356-59	Kaamilo 2	1973	Honolulu BWS	Percussion	16	148	340	190	--	Municipal	--	-192	-42	--	9-8-031:020	30201
2356-60	Waimalu II-1	1975	Honolulu BWS	Rotary	16	23	240	100	--	Municipal	18.4	-217	-77	--	9-8-026:012	30201
2356-61	Kaonohi II-1	1975	Honolulu BWS	Rotary	16	112	330	190	--	Municipal	18.0	-218	-78	--	9-8-039:010	30201
2356-62	Kaonohi II-2	1975	Honolulu BWS	Rotary	16	117	340	200	--	Municipal	15.3	-223	-83	--	9-8-039:010	30201
2356-63	Waimalu II-2	1975	Honolulu BWS	Percussion	16	26	240	100	--	Municipal	15.1	-214	-74	--	9-8-026:012	30201
2356-64	Waimalu II-3	1975	Honolulu BWS	Percussion	16	20	240	163	--	Municipal	14.0	-220	-143	--	9-8-026:012	30201
2356-65	Kaonohi II-3	1975	Honolulu BWS	Rotary	16	112	335	195	--	Unused	--	-223	-83	--	9-8-039:010	30201
2357-23	Kaahumanu I-1	1975	Honolulu BWS	Rotary	16	49	230	90	--	Municipal	17.3	-181	-41	--	9-8-008:001	30201
2357-24	Kaahumanu I-2	1975	Honolulu BWS	Rotary	16	45	265	125	--	Municipal	14.0	-220	-80	--	9-8-008:001	30201
2358-20	Pearl City Obs	1946	Honolulu BWS	--	12	47	71	60	--	Observation	17.5	-24	-13	--	9-7-024:002	30203
2400-01	Waipahu I P2	1954	Honolulu BWS	--	16	200	355	231	--	Municipal	17.4	-155	-31	--	9-4-007:016	30203
2400-02	Waipahu I P1	1954	Honolulu BWS	--	16	200	355	231	--	Municipal	18.2	-155	-31	--	9-4-007:016	30203
2400-03	Waipahu I P3	1969	Honolulu BWS	--	16	203	386	254	--	Municipal	24.3	-183	-51	--	9-4-007:016	30203
2400-04	Waipahu I P4	1969	Honolulu BWS	--	16	203	386	254	--	Municipal	24.0	-183	-51	--	9-4-007:016	30203
2400-05	Waipahu II-2	1983	Honolulu BWS	Percussion	12	207	342	239	--	Municipal	--	-135	-32	--	9-4-007:037	30203
2400-06	Waipahu II-1	1983	Honolulu BWS	Percussion	12	211	344	241	--	Municipal	20.6	-133	-30	--	9-4-007:037	30203
2400-08	Waipahu II-3	1993	Honolulu BWS	Rotary	12	206	340	240	--	Municipal	15.2	-134	-34	--	9-4-007:037	30203

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2400-09	Waipahu III-1	1994	Honolulu BWS	Rotary	15	318	458	358	--	Municipal	18.8	-140	-40	--	9-4-005:074	30203
2400-10	Waipahu III-2	1994	Honolulu BWS	Rotary	15	317	457	357	--	Municipal	--	-140	-40	--	9-4-005:074	30203
2400-11	Waipahu III-3	1994	Honolulu BWS	Rotary	15	312	455	355	--	Municipal	--	-143	-43	--	9-4-005:074	30203
2400-12	Waipahu III-5	1994	Honolulu BWS	Rotary	15	314	456	356	--	Municipal	--	-142	-42	--	9-4-005:074	30203
2400-13	Waipahu III-4	1995	Honolulu BWS	Rotary	15	314	453	353	--	Municipal	--	-139	-39	--	9-4-005:074	30203
2400-14	Waipahu II-4	1999	Honolulu BWS	Rotary	14	208	360	240	--	Unused	--	-152	-32	--	9-4-007:037	30203
2402-01	Kunia II P1	1969	Honolulu BWS	Percussion	16	430	575	460	--	Municipal	20.6	-145	-30	--	9-4-002:017	30203
2402-02	Kunia II P2	1969	Honolulu BWS	--	16	430	575	465	--	Municipal	24.8	-145	-35	--	9-4-002:017	30203
2402-03	Kunia II P3	1990	Honolulu BWS	Percussion	16	417	610	460	--	Municipal	17.0	-193	-43	--	9-4-002:027	30203
2402-05	Kunia II P4	1996	Honolulu BWS	Rotary	16	420	559	459	--	Municipal	--	-139	-39	--	9-4-002:051	30203
2450-01	Haiku Tunnel	1940	Honolulu BWS	Tunnel	--	550	1300	--	--	Municipal	--	--	--	--	4-6-015:001	30603
2450-02	Haiku	1981	Honolulu BWS	Percussion	12	497	600	400	--	Municipal	326.7	-103	97	--	4-6-015:001	30603
2455-01	Upper Waimalu	1955	Honolulu BWS	--	16	168	321	170	180	Observation	22.1	-153	-2	-12	9-8-011:015	30201
2456-01	Newtown 1	1972	Honolulu BWS	Rotary	16	263	500	300	--	Municipal	42.0	-237	-37	--	9-8-054:010	30201
2456-02	Newtown 2	1972	Honolulu BWS	Rotary	16	263	500	300	--	Municipal	34.0	-237	-37	--	9-8-054:010	30201
2456-03	Newtown 3	1972	Honolulu BWS	Rotary	16	263	500	300	--	Municipal	16.2	-237	-37	--	9-8-054:010	30201
2456-04	Newtown Deep	2000	Honolulu BWS	Rotary	12	447	1469	469	--	Observation	--	-1022	-22	--	9-8-073:003	30201
2457-01	Pearl City II-1	1957	Honolulu BWS	--	16	267	398	281	--	Municipal	19.7	-131	-14	--	9-7-070:111	30203
2457-02	Pearl City II-2	1957	Honolulu BWS	--	16	267	415	281	--	Municipal	18.6	-148	-14	--	9-7-070:111	30203
2457-03	Pearl City II-3	1968	Honolulu BWS	--	16	272	423	283	304	Municipal	16.3	-151	-11	-32	9-7-070:111	30203
2457-04	Punanani Deep	1968	Honolulu BWS	Rotary	12	155	1458	924	--	Observation	20.0	-1303	-769	--	9-8-002:012	30201
2457-05	Punanani 6	1970	Honolulu BWS	Rotary	16	145	444	289	304	Municipal	13.6	-299	-144	-159	9-8-002:012	30201
2457-06	Punanani 1	1970	Honolulu BWS	Rotary	16	151	458	312	--	Municipal	13.5	-307	-161	--	9-8-002:012	30201
2457-07	Punanani	1970	Honolulu BWS	Rotary	16	--	455	--	--	Sealed	--	--	--	--	9-8-002:012	30201
2457-08	Punanani	1970	Honolulu BWS	Rotary	10	--	338	--	--	Sealed	--	--	--	--	9-8-002:012	30201
2457-09	Punanani 2	1970	Honolulu BWS	Rotary	16	153	461	312	--	Municipal	--	-308	-159	--	9-8-002:012	30201
2457-10	Punanani 4	1970	Honolulu BWS	Rotary	16	146	368	217	--	Municipal	--	-222	-71	--	9-8-002:012	30201
2457-11	Punanani 3B	1970	Honolulu BWS	Rotary	16	141	363	211	--	Municipal	--	-222	-70	--	9-8-002:012	30201
2457-12	Punanani 5B	1970	Honolulu BWS	Rotary	16	140	367	210	--	Municipal	--	-227	-70	--	9-8-002:012	30201
2457-13	Waiau 2	1971	Honolulu BWS	Rotary	16	263	504	300	--	Municipal	--	-241	-37	--	9-8-052:001	30201
2457-14	Waiau 1	1971	Honolulu BWS	Rotary	16	263	503	300	--	Municipal	--	-240	-37	--	9-8-052:001	30201
2457-15	Waiau 3	1971	Honolulu BWS	Rotary	16	263	503	300	--	Municipal	--	-240	-37	--	9-8-052:001	30201
2458-01	Pearl City Shaft	1940	Honolulu BWS	Shaft	96	111	151	27	--	Municipal	18.9	-40	84	--	9-7-024:004	30203
2458-03	Pearl City I-1	1953	Honolulu BWS	--	14	120	150	56	--	Municipal	18.7	-30	64	--	9-7-033:134	30203
2458-04	Pearl City I-2	1953	Honolulu BWS	--	14	120	140	58	--	Municipal	17.5	-20	62	--	9-7-033:134	30203
2458-05	Manana 1	1998	Honolulu BWS	Percussion	14	137	277	177	--	Municipal	--	-140	-40	--	9-7-024:004	30203
2458-06	Manana Deep	2000	Honolulu BWS	Rotary	8	--	1316	126	--	Observation	--	--	--	--	9-7-024:004	30203
2459-19	Waipio Hts 2	1964	Honolulu BWS	Rotary	16	202	337	234	--	Municipal	16.9	-135	-32	--	9-4-045:035	30203
2459-20	Waipio Hts 1	1964	Honolulu BWS	Rotary	16	202	337	234	--	Municipal	16.9	-135	-32	--	9-4-045:035	30203
2459-23	Waipio Hts. I-3	1977	Honolulu BWS	Percussion	16	200	325	235	--	Municipal	14.6	-125	-35	--	9-4-044:036	30203
2459-24	Waipio Hts. I-4	1977	Honolulu BWS	Percussion	16	200	315	235	--	Municipal	15.6	-115	-35	--	9-4-044:036	30203
2459-26	Waiawa Deep	2001	Honolulu BWS	Rotary	10	86	1080	80	--	Observation	--	-994	6	--	9-4-007:004	30203
2500-01	Waipio Hts II-1	1978	Honolulu BWS	Rotary	16	416	546	446	--	Municipal	18.0	-130	-30	--	9-4-099:043	30203
2500-02	Waipio Hts II-2	1978	Honolulu BWS	Rotary	16	419	560	450	--	Municipal	18.0	-141	-31	--	9-4-099:043	30203
2500-03	Waiola Deep	2000	Honolulu BWS	Rotary	8	376	1358	363	--	Observation	--	--	13	--	9-4-005:075	30203
2508-01	Lualualei	1935	Honolulu BWS	Tunnel	--	142	145	--	--	Unused	--	-3	--	--	--	30302
2508-02	Lualualei	1939	Honolulu BWS	Tunnel	84	170	175	--	--	Unused	11.7	-5	--	--	8-7-019:009	30302
2549-01	Iolekaa	1966	Honolulu BWS	--	12	485	423	307	--	Municipal	--	62	178	--	4-6-015:003	30603
2557-03	Pearl City III	1977	Honolulu BWS	Rotary	12	620	750	650	--	Municipal	15.2	-130	-30	--	9-7-052:063	30203
2557-04	Waimano Deep	2001	Honolulu BWS	Rotary	14	212	1244	210	--	Observation	--	-1032	2	--	9-7-025:010	30201

Table B-1
BWS WELLS ON THE ISLAND OF OAHU
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WELL NO.	WELL NAME	YEAR DRILLED	OWNER/USER	DRILLING METHOD	CASING DIAMETER	GROUND SURFACE ELEVATION	WELL DEPTH	SOLID CASING	PERFORATED CASING	USE	INITIAL DEPTH TO WATER	BOTTOM ELEVATION OF BOREHOLE	BOTTOM ELEVATION OF SOLID CASING	BOTTOM ELEVATION OF PERFORATED CASING	TAX MAP KEY	AQUIFER CODE*
2600-03	Mililani III-1	1980	Honolulu BWS	Rotary	16	664	814	704	--	Unused	--	-150	-40	--	9-4-005:020	30203
2600-04	Mililani III-2	1979	Honolulu BWS	Rotary	16	665	815	705	--	Municipal	--	-150	-40	--	9-4-005:020	30203
2602-02	Poliwai Deep	2000	Honolulu BWS	Rotary	8	612	1895	587	--	Observation	--	-1283	25	--	9-4-003:001	30203
2651-01	Kahaluu Tunnel	1947	Honolulu BWS	Tunnel	--	585	--	--	--	Municipal	--	--	--	--	4-7-008:002	30603
2651-02	Waihee Tunnel	1955	Honolulu BWS	Tunnel	--	218	--	--	--	Municipal	--	--	--	--	4-7-008:002	30603
2651-03	Kahaluu	1980	Honolulu BWS	Percussion	12	419	450	253	--	Unused	333.0	-31	166	--	4-7-008:002	30603
2652-01	Waihee Incl 3	1971	Honolulu BWS	Rotary	4	690	366	87	--	Municipal	--	324	603	--	4-7-008:002	30603
2652-02	Waihee Incl 1	1976	Honolulu BWS	Rotary	4	690	355	95	--	Municipal	--	335	595	--	4-7-008:002	30603
2652-03	Waihee Incl 2	1976	Honolulu BWS	Rotary	4	690	310	93	--	Municipal	--	380	597	--	4-7-008:002	30603
2652-04	Waihee Incl 4	1976	Honolulu BWS	Rotary	4	690	278	108	--	Municipal	--	412	582	--	4-7-008:002	30603
2658-03	Waiawa 575Ft-1	1995	Honolulu BWS	Rotary	18	591	761	611	--	Municipal	--	-170	-20	--	9-6-004:004	30203
2658-04	Waiawa 765Ft-1	1995	Honolulu BWS	Rotary	20	764	896	796	--	Unused	--	-132	-32	--	9-6-005:003	30203
2658-05	Waiawa 765Ft-2	1996	Honolulu BWS	Rotary	20	771	901	801	--	Municipal	--	-130	-30	--	9-6-005:003	30203
2659-02	Waipio Hts III-1	1987	Honolulu BWS	Rotary	14	571	710	604	--	Municipal	16.8	-139	-33	--	9-4-006:014	30203
2659-03	Waipio Hts III-2	1988	Honolulu BWS	Rotary	14	572	700	601	--	Municipal	21.8	-128	-29	--	9-4-006:014	30203
2659-04	Waiawa 575Ft-2	1995	Honolulu BWS	Rotary	18	578	738	598	--	Municipal	--	-160	-20	--	9-6-004:004	30203
2712-30	Kamaile 2	1976	Honolulu BWS	Percussion	12	34	164	44	64	Municipal	9.0	-130	-10	-30	8-5-002:023	30304
2712-31	Kamaile 1	1976	Honolulu BWS	Percussion	12	51	182	61	81	Municipal	9.5	-131	-10	-30	8-5-002:023	30304
2751-02	Waihee I-1	1972	Honolulu BWS	Percussion	12	192	348	62	--	Unused	9.7	-156	130	--	4-7-006:023	30603
2751-03	Waihee I-2	1972	Honolulu BWS	Percussion	12	198	343	144	--	Unused	10.3	-145	54	--	4-7-006:023	30603
2751-04	Waihee Obs	1960	Honolulu BWS	DUG	16	205	31	--	26	Observation	191.3	174	--	179	4-7-006:023	30603
2800-01	Mililani I P1	1968	Honolulu BWS	Rotary	20	762	1012	802	--	Municipal	35.1	-250	-40	--	9-5-001:036	30203
2800-02	Mililani I P2	1968	Honolulu BWS	Rotary	20	758	1008	798	--	Municipal	37.1	-250	-40	--	9-5-001:036	30203
2800-03	Mililani I P3	1972	Honolulu BWS	Rotary	20	760	1022	802	--	Municipal	--	-262	-42	--	9-5-001:036	30203
2800-04	Mililani I P4	1975	Honolulu BWS	Rotary	20	757	1008	797	--	Municipal	20.6	-251	-40	--	9-5-001:036	30203
2809-01	Waianae Valley	1941	Honolulu BWS	--	10	353	400	51	--	Unused	218.1	-47	302	--	8-5-005:038	30303
2809-02	Waianae Valley	1942	Honolulu BWS	--	8	681	365	10	--	Observation	621.7	316	671	--	8-5-006:004	30303
2809-03	Waianae Valley	1942	Honolulu BWS	--	8	664	400	53	--	Unused	547.6	264	611	--	8-5-006:004	30303
2809-04	Waianae Valley	1942	Honolulu BWS	--	--	664	258	--	--	Unused	557.0	406	--	--	8-5-006:004	30303
2809-06	Waianae Tunnel	1950	Honolulu BWS	Tunnel	--	418	--	--	--	Municipal	--	--	--	--	8-5-005:032	30303
2810-02	Waianae 1	1980	Honolulu BWS	Percussion	12	412	670	440	--	Municipal	12.0	-258	-28	--	8-5-006:004	30303
2810-03	Waianae 2	1990	Honolulu BWS	Percussion	12	414	782	450	--	Municipal	17.9	-368	-36	--	8-5-006:004	30303
2811-02	Makaha Well V	1968	Honolulu BWS	Rotary	16	378	544	429	--	Municipal	24.3	-166	-51	--	8-4-002:014	30304
2812-01	Makaha Shaft	1938	Honolulu BWS	Shaft	72	140	168	--	--	Domestic	16.7	-28	--	--	8-4-002:011	30304
2858-01	Mililani IV	1984	Honolulu BWS	Rotary	18	960	1160	1030	--	Municipal	22.8	-200	-70	--	9-5-003:001	30203
2858-02	Mililani IV	1985	Honolulu BWS	Rotary	18	960	1160	1000	--	Municipal	22.8	-200	-40	--	9-5-003:001	30203
2858-03	Mililani IV	1985	Honolulu BWS	Rotary	18	960	1160	1000	--	Municipal	22.8	-200	-40	--	9-5-003:001	30203
2859-01	Mililani II P1	1978	Honolulu BWS	Rotary	16	835	995	875	--	Municipal	17.9	-160	-40	--	9-5-002:018	30203
2859-02	Mililani II P2	1979	Honolulu BWS	Rotary	16	835	985	875	--	Municipal	--	-150	-40	--	9-5-002:013	30203
2901-08	Wahiawa I	1941	Honolulu BWS	--	16	870	880	650	--	Municipal	275.4	-10	220	--	7-4-002:007	30501
2901-09	Wahiawa I	1947	Honolulu BWS	--	18	873	990	633	--	Unused	275.0	-117	240	--	7-4-002:007	30501
2901-11	Wahiawa I	1962	Honolulu BWS	Rotary	20	873	821	652	--	Municipal	272.9	52	221	--	7-4-002:007	30501
2901-12	Wahiawa I	1983	Honolulu BWS	Rotary	20	874	858	700	--	Municipal	279.0	16	174	--	7-4-002:007	30501
2902-01	Wahiawa II	1974	Honolulu BWS	Rotary	20	866	986	786	836	Municipal	275.8	-120	80	30	7-3-007:006	30501
2902-02	Wahiawa II-2	1996	Honolulu BWS	Rotary	16	868	861	762	--	Municipal	--	6	104	--	7-3-007:009	30501
2908-01	Waianae Tunnel 1	--	Honolulu BWS	Tunnel	--	1425	--	--	--	Unused	--	--	--	--	8-5-006:001	30303
2908-02	Waianae Tunnel 2	--	Honolulu BWS	Tunnel	--	1426	--	--	--	Unused	--	--	--	--	8-5-006:001	30303
2908-03	Waianae Tunnel 6	--	Honolulu BWS	Tunnel	--	1525	--	--	--	Irrigation	--	--	--	--	8-5-006:001	30303
2908-04	Waianae Tun 6A	--	Honolulu BWS	Tunnel	--	1485	--	--	--	Unused	--	--	--	--	8-5-006:001	30303
2908-05	Waianae Tunnel 7	--	Honolulu BWS	Tunnel	--	1409	--	--	--	Unused	--	--	--	--	8-5-006:001	30303

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WELL NO.	WELL NAME	YEAR DRILLED	OWNER/USER	DRILLING METHOD	CASING DIAMETER	GROUND SURFACE ELEVATION	WELL DEPTH	SOLID CASING	PERFORATED CASING	USE	INITIAL DEPTH TO WATER	BOTTOM ELEVATION OF BOREHOLE	BOTTOM ELEVATION OF SOLID CASING	BOTTOM ELEVATION OF PERFORATED CASING	TAX MAP KEY	AQUIFER CODE*
2908-06	Waianae Tunnel 8	--	Honolulu BWS	Tunnel	--	1385	--	--	--	Unused	--	--	--	--	8-5-006:001	30303
2908-07	Waianae Tunnel 9	--	Honolulu BWS	Tunnel	--	--	--	--	--	Unused	--	--	--	--	8-5-006:001	30303
2908-08	Waianae Tun 11	--	Honolulu BWS	Tunnel	--	1764	--	--	--	Unused	--	--	--	--	8-5-006:001	30303
2908-09	Waianae Tun 14	--	Honolulu BWS	Tunnel	--	1709	--	--	--	Unused	--	--	--	--	8-5-006:001	30303
2908-10	Waianae Tun 15	--	Honolulu BWS	Tunnel	--	--	--	--	--	Municipal	--	--	--	--	8-5-006:001	30303
2908-11	Waianae Tun 19	1933	Honolulu BWS	Tunnel	--	1515	--	--	--	Municipal	--	--	--	--	8-5-006:001	30303
2909-01	Waianae Tun 16	--	Honolulu BWS	Tunnel	--	1075	--	--	--	Unused	--	--	--	--	8-5-006:001	30303
2909-02	Waianae I	1981	Honolulu BWS	Percussion	14	1152	980	429	--	Municipal	1182.0	172	723	--	8-5-006:008	30303
2909-03	Waianae II	1985	Honolulu BWS	Rotary	14	1339	1000	400	1000	Municipal	1209.9	339	939	339	8-5-006:001	30303
2911-02	Makaha Glover	1945	Honolulu BWS	Tunnel	--	--	--	--	--	Irrigation	--	--	--	--	8-4-002:013	30304
2911-03	Makaha I	1976	Honolulu BWS	Rotary	12	491	640	541	--	Municipal	83.5	-149	-50	--	8-4-002:014	30304
2911-04	Makaha VI	1988	Honolulu BWS	Percussion	14	690	797	588	797	Municipal	--	-107	102	-107	8-4-002:014	30304
3010-11	Makaha III	1981	Honolulu BWS	Rotary	14	1042	1000	100	1000	Municipal	1100.0	42	942	42	8-4-002:001	30304
3010-12	Makaha IV	1983	Honolulu BWS	Rotary	18	1088	560	309	--	Unused	1185.0	528	779	--	8-4-002:001	30304
3011-03	Makaha II	1981	Honolulu BWS	Rotary	14	970	1001	404	--	Municipal	959.4	-31	566	--	8-4-002:014	30304
3251-02	Kaaawa Shaft	1940	Honolulu BWS	Shaft	--	18	14	--	--	Unused	--	4	--	--	5-1-004:003	30602
3353-01	Kahana I A	1973	Honolulu BWS	Percussion	16	35	520	274	--	Municipal	18.0	-485	-239	--	5-2-004:001	30602
3353-02	Kahana I D	1975	Honolulu BWS	Percussion	16	94	521	321	--	Municipal	24.6	-428	-227	--	5-2-004:001	30602
3353-03	Kahana I-3	1975	Honolulu BWS	Percussion	16	174	600	240	--	Unused	123.6	-426	-66	--	5-2-004:001	30602
3353-04	Kahana I-2	1975	Honolulu BWS	Percussion	16	102	600	220	300	Municipal	87.5	-498	-118	-198	5-2-004:001	30602
3405-01	Waialua	1955	Honolulu BWS	--	16	196	337	219	--	Municipal	12.2	-141	-23	--	6-4-001:008	30402
3405-02	Waialua	1955	Honolulu BWS	--	16	197	343	221	--	Municipal	12.2	-146	-24	--	6-4-001:008	30402
3405-03	Haleiwa 1	1979	Honolulu BWS	Rotary	12	207	336	236	--	Municipal	10.0	-129	-29	--	6-4-001:001	30402
3405-04	Haleiwa 2	1979	Honolulu BWS	Rotary	12	208	336	236	--	Municipal	10.1	-128	-28	--	6-4-001:001	30402
3405-05	Helemano Deep	2002	Honolulu BWS	Rotary	8	406	1100	400	--	Observation	--	-694	6	--	6-4-001:006	30402
3453-06	Punaluu III-1	1974	Honolulu BWS	Percussion	16	66	560	433	--	Municipal	29.5	-494	-367	--	5-3-007:014	30601
3453-07	Punaluu III-2	1974	Honolulu BWS	Rotary	16	62	560	180	--	Municipal	17.7	-498	-118	--	5-3-007:014	30601
3453-09	Punaluu IV	1981	Honolulu BWS	Rotary	12	67	410	110	300	Unused	--	-343	-43	-233	5-3-007:014	30601
3453-10	Punaluu VB	1982	Honolulu BWS	Percussion	14	--	445	158	--	Unused	--	--	--	--	5-3-003:008	30601
3453-15	Punaluu III	1995	Honolulu BWS	Percussion	10	65	402	210	400	Unused	--	-337	-145	-335	5-3-007:014	30601
3454-01	Punaluu VA	1982	Honolulu BWS	Percussion	14	165	567	418	--	Unused	20.7	-402	-253	--	5-3-011:001	30601
3506-05	Haleiwa	1925	Honolulu BWS	--	12	20	163	68	--	Unused	16.0	-143	-48	--	6-6-009:023	30402
3553-02	Punaluu I	1958	Honolulu BWS	--	12	7	305	158	--	Municipal	20.7	-298	-151	--	5-3-006:070	30601
3553-03	Punaluu II-4	1965	Honolulu BWS	Rotary	16	71	369	94	--	Sealed	22.4	-298	-23	--	5-3-009:003	30601
3553-04	Punaluu II-3	1966	Honolulu BWS	Percussion	16	81	380	106	--	Municipal	23.8	-299	-25	--	5-3-009:003	30601
3553-05	Punaluu Deep	1967	Honolulu BWS	Rotary	5	7	1007	147	--	Observation	--	-1001	-140	--	5-3-009:051	30601
3553-06	Punaluu II-2	1967	Honolulu BWS	Rotary	16	88	378	140	--	Municipal	19.5	-290	-52	--	5-3-009:003	30601
3553-07	Punaluu II-1	1967	Honolulu BWS	Rotary	16	89	378	104	--	Municipal	23.4	-289	-15	--	5-3-009:003	30601
3553-08	Punaluu II-5	1967	Honolulu BWS	Rotary	16	--	380	104	--	Municipal	--	--	--	--	5-3-009:003	30601
3554-03	Punaluu II-6	1967	Honolulu BWS	Rotary	16	90	378	142	--	Municipal	--	-288	-52	--	5-3-012:041	30601
3554-04	Kaluanui 1	1982	Honolulu BWS	Percussion	14	134	315	165	--	Municipal	20.0	-181	-31	--	5-3-011:009	30601
3554-05	Kaluanui 2 Mon	1987	Honolulu BWS	Percussion	14	108	1025	152	--	Observation	17.6	-917	-44	--	5-3-009:002	30601
3554-06	Kaluanui 3	1996	Honolulu BWS	Percussion	12	92	343	193	--	Unused	--	-251	-101	--	5-3-011:009	30601
3655-01	Hauula	--	Honolulu BWS	--	12	20	253	75	--	Municipal	--	-233	-55	--	5-4-015:030	30601
3655-02	Maakua	1990	Honolulu BWS	Percussion	14	162	350	215	--	Unused	17.8	-188	-53	--	5-4-005:001	30601
3655-03	Kaipapau	1993	Honolulu BWS	Percussion	12	206	370	270	370	Unused	17.9	-164	-64	-164	5-5-006:001	30601
3755-10	Hauula Deep	2001	Honolulu BWS	Rotary	8	160	1053	153	--	Observation	--	-893	7	--	5-4-004:035	30601
3856-08	Laie	1982	Honolulu BWS	Percussion	14	185	392	215	--	Unused	19.2	-207	-30	--	5-5-007:001	30601
3856-09	Wailele	1982	Honolulu BWS	--	14	109	281	160	--	Unused	17.4	-172	-51	--	5-5-007:001	30601
3957-08	Malaekahana 1	1997	Honolulu BWS	Rotary	12	108	300	208	--	Unused	--	-192	-100	--	5-6-007:001	30601

Table B-1
BWS WELLS ON THE ISLAND OF OAHU
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

WELL NO.	WELL NAME	YEAR DRILLED	OWNER/USER	DRILLING METHOD	CASING DIAMETER	GROUND SURFACE ELEVATION	WELL DEPTH	SOLID CASING	PERFORATED CASING	USE	INITIAL DEPTH TO WATER	BOTTOM ELEVATION OF BOREHOLE	BOTTOM ELEVATION OF SOLID CASING	BOTTOM ELEVATION OF PERFORATED CASING	TAX MAP KEY	AQUIFER CODE*
3957-09	Malaekahana 2	1999	Honolulu BWS	Percussion	12	104	300	190	--	Unused	--	-196	-86	--	5-6-007:001	30601
4002-04	Sunset Bch	1948	Honolulu BWS	--	7	66	125	72	--	Unused	2.7	-59	-6	--	5-9-006:010	30403
4002-05	Sunset Bch	1949	Honolulu BWS	--	10	70	140	102	--	Unused	2.5	-70	-32	--	5-9-006:010	30403
4057-15	Kahuku 1	1979	Honolulu BWS	Percussion	12	211	418	241	--	Municipal	13.3	-207	-30	--	5-6-008:005	30601
4057-16	Kahuku 2	1980	Honolulu BWS	Percussion	12	210	365	240	--	Municipal	11.2	-155	-30	--	5-6-008:005	30601
4057-17	Kahuku Deep Mon	2003	Honolulu BWS	Rotary	8	122	960	80	--	Observation	--	-838	42	--	5-6-006:030	30601
4100-03	Opana 2	1969	Honolulu BWS	Percussion	16	140	307	159	--	Unused	10.0	-167	-19	--	5-7-002:001	30601
4100-04	Opana 1	1986	Honolulu BWS	Percussion	12	131	263	160	--	Other	--	-132	-29	--	5-7-002:001	30601
4100-05	Opana 3	1990	Honolulu BWS	Percussion	12	125	298	154	--	Unused	13.5	-173	-29	--	5-7-002:001	30601
4101-07	Waialee I	1945	Honolulu BWS	--	14	81	151	94	--	Municipal	17.1	-70	-13	--	5-8-001:046	30403
4101-08	Waialee II	1957	Honolulu BWS	--	10	63	141	74	--	Municipal	19.6	-78	-11	--	5-8-001:053	30403
4101-11	Waialee	1970	Honolulu BWS	Percussion	12	82	127	112	--	Unused	18.8	-45	-30	--	5-8-001:046	30403

* = after Mink, J.F., and L.S. Lau, 1990. Aquifer Identification and Classification for the Island of Oahu: Groundwater Protection Strategy for Hawaii.
amsl = above mean sea level
bgs = below ground surface
This table is based on information from a shape file provide by the Department of Land and Natural Resources.

Table B-1
BWS WELLS ON THE ISLAND OF OAHU
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

WELL NO.	WELL NAME	YEAR DRILLED	OWNER/USER	DRILLING METHOD	CASING DIAMETER	GROUND SURFACE ELEVATION	WELL DEPTH	SOLID CASING	PERFORATED CASING	USE	INITIAL DEPTH TO WATER	BOTTOM ELEVATION OF BOREHOLE	BOTTOM ELEVATION OF SOLID CASING	BOTTOM ELEVATION OF PERFORATED CASING	TAX MAP KEY	AQUIFER CODE*
					(inches)	(feet)	(feet)	(feet)	(feet)		(feet bgs)	(feet amsl)	(feet amsl)	(feet amsl)		
2100-01	Pearl Harbor	1931	U S Navy	--	2	16	362	--	--	Lost	--	-346	--	--	--	30203
2101-01	Honouliuli	--	Kahua Meat Co	--	8	20	325	208	--	Industrial	18.6	-305	-188	--	9-1-017:010	30203
2101-02	Honouliuli	--	Ewa Plantn	--	--	25	--	--	--	Sealed	--	--	--	--	--	30203
2101-03	Honouliuli	1981	Highways	--	10	13	355	165	--	Observation	22.3	-342	-152	--	9-1-017:010	30203
2101-04	Honouliuli	1879	C&C Honolulu	--	7	15	273	250	--	Sealed	--	-258	-235	--	--	30203
2101-05	Honouliuli B	1890	Ewa Plantn	--	10	30	456	320	--	Sealed	--	-426	-290	--	--	30203
2101-06	Honouliuli C	1890	Ewa Plantn	--	10	30	451	310	--	Sealed	--	-421	-280	--	--	30203
2101-07	Honouliuli D	1890	Ewa Plantn	--	10	30	468	302	--	Sealed	--	-438	-272	--	--	30203
2101-08	Honouliuli E	1890	Ewa Plantn	--	10	30	462	310	--	Sealed	--	-432	-280	--	--	30203
2101-09	Honouliuli F	1890	Ewa Plantn	--	10	31	448	432	448	Observation	31.5	-417	-401	-417	--	30203
2101-10	Honouliuli G	1899	Ewa Plantn	--	12	30	462	304	--	Sealed	--	-432	-274	--	--	30203
2101-11	Honouliuli	1899		--	12	30	450	316	--		--	-420	-286	--	--	30203
2101-12	Honouliuli A	1901	Ewa Plantn	--	10	30	452	298	--	Sealed	--	-422	-268	--	--	30203
2101-13	Honouliuli	1955	Wood K	--	2	3	225	131	--	Domestic	22.6	-222	-128	--	9-1-017:014	30203
2101-14	Honouliuli	1978	U S Fish&Wildlf	Dug	96	6	12	4	8	Other	--	-6	2	-2	9-1-017:012	--
2102-01	Honouliuli	1880	Ewa Plantn	--	8	--	--	--	--	Sealed	--	--	--	--	--	30203
2102-02	Ep 18 Battery	1890	Campbell Est	--	10	44	332	--	--	Irrigation	31.2	-288	--	--	9-1-017:014	30203
2102-03	Honouliuli	1891	Campbell Est	Dug	--	--	--	--	--	Sealed	--	--	--	--	9-1-017:014	30203
2102-04	Ep 18 Battery	1891	Campbell Est	--	10	44	326		--	Irrigation	31.2	-282	--	--	9-1-017:014	30203
2102-05	Ep 18 Battery	1891	Campbell Est	--	10	44	369		--	Irrigation	31.2	-325	--	--	9-1-017:014	30203
2102-06	Ep 18 Battery	1891	Campbell Est	--	10	44	405	208	--	Irrigation	31.2	-361	-164	--	9-1-017:014	30203
2102-07	Ep 18 Battery	1891	Campbell Est	--	10	44	410	214	--	Irrigation	31.2	-366	-170	--	9-1-017:014	30203
2102-08	Ep 18 Battery	1891	Campbell Est	--	10	44	410		--	Irrigation	31.2	-366	--	--	9-1-017:014	30203
2102-09	Ep 18 Battery	1891	Campbell Est	--	10	44	410		--	Irrigation	31.2	-366	--	--	9-1-017:014	30203
2102-10	Ep 18 Battery	1891	Campbell Est	--	10	44	413		--	Irrigation	31.2	-369	--	--	9-1-017:014	30203
2102-11	Ep 18 Battery	1891	Campbell Est	--	10	44	433		--	Irrigation	25.7	-389	--	--	9-1-017:014	30203
2102-12	Ep 18 Battery	1891	Campbell Est	--	10	44	432	--	--	Irrigation	31.2	-388	--	--	9-1-017:014	30203
2102-13	Ep 18 Battery	1891	Campbell Est	--	10	44	436	--	--	Irrigation	31.2	-392	--	--	9-1-017:014	30203
2102-14	Ep 18 Battery	1891	Campbell Est	--	10	44	430	--	--	Irrigation	31.2	-386	--	--	9-1-017:014	30203
2102-15	Ep 18 Battery	1899	Campbell Est	--	12	44	441	218	--	Irrigation	31.2	-397	-174	--	9-1-017:014	30203
2102-16	Ep 18 Battery	1899	Campbell Est	--	12	44	435	223	--	Irrigation	25.7	-391	-179	--	9-1-017:014	30203
2102-17	Ep 18 Battery	1899	Campbell Est	--	12	44	442	212	--	Irrigation	25.7	-398	-168	--	9-1-017:014	30203
2102-18	Ep 18 Battery	1899	Campbell Est	--	12	44	444	223	--	Irrigation	25.7	-400	-179	--	9-1-017:014	30203
2102-19	Ep 18 Battery	1921	Campbell Est	--	12	44	416	212	--	Irrigation	25.7	-372	-168	--	9-1-017:014	30203
2102-20	Ep 18 Battery	1921	Campbell Est	--	12	44	419	222	--	Irrigation	25.7	-375	-178	--	9-1-017:014	30203
2102-21	Ep 18 Battery	1921	Campbell Est	--	12	44	425	217	--	Irrigation	25.7	-381	-173	--	9-1-017:014	30203
2102-22	Ep 18 Battery	1921	Campbell Est	--	12	44	420	240	--	Irrigation	25.7	-376	-196	--	9-1-017:014	30203
2103-01	Puu Makakilo	1942	U S Navy	--	6	210	206	17	--	Observation	16.6	4	193	--	9-1-016:007	30204
2103-02	Puu Makakilo	1942	U S Navy	--	6	140	137	9	--	Observation	16.9	3	131	--	9-1-016:025	30204
2103-03	Barbers Pt Shaft	1943	U S Navy	Shaft	72	200	204	--	--	Domestic	14.1	-4	--	--	9-1-016:007	30204
2103-04	Barbers Pt. Mon	1992	U S Navy	Rotary	8	146	490	225	490	Observation	--	-344	-79	-344	9-1-016:227	--
2103-05	Barbers Pt Shall	1999	U S Navy	Rotary	2	148	300	120	300	Observation	--	-152	28	-152	9-1-016:227	--
2104-01	Makakilo Quarry	1976	Grace Pacific	Percussion	12	125	176	140	160	Industrial	--	-51	-15	-35	9-1-016:004	30204
2155-01	Makalapa	--	Oahu Sugar	--	12	21	740	500	--	Sealed	23.3	-719	-479	--	--	30201
2155-02	Makalapa	--	U S Navy	--	12	22	800	431	--	Sealed	23.6	-778	-409	--	--	30201
2155-03	Makalapa	--	U S Navy	--	12	23	930	486	--	Sealed	--	-907	-463	--	--	30201
2155-04	Makalapa	1941	U S Army	--	12	91	288	148	--	Sealed	23.2	-197	-57	--	1-1-011:001	30104
2155-05	Makalapa	1948	Aiea Dairy	--	8	62	682	499	--	Sealed	20.5	-620	-437	--	--	30201
2156-01	Makalapa	--	Oahu Sugar	--	12	25	608	520	--	Sealed	21.7	-583	-495	--	--	30201

Table B-2
ALL WELL TYPES IN THE SCHOFIELD PLATEAU
Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

WELL NO.	WELL NAME	YEAR DRILLED	OWNER/USER	DRILLING METHOD	CASING DIAMETER	GROUND SURFACE ELEVATION	WELL DEPTH	SOLID CASING	PERFORATED CASING	USE	INITIAL DEPTH TO WATER	BOTTOM ELEVATION OF BOREHOLE	BOTTOM ELEVATION OF SOLID CASING	BOTTOM ELEVATION OF PERFORATED CASING	TAX MAP KEY	AQUIFER CODE*
2156-02	Makalapa	--	--	--	12	33	730	521	--	Sealed	23	-697	-488	--	--	30201
2156-03	Makalapa	--	U S Navy	--	12	10	623	475	--	Sealed	19.9	-613	-465	--	--	30201
2156-04	Makalapa	1941	U S Navy	--	6	8	186	--	--	Lost	1	-178	--	--	--	30201
2157-01	Pearl Harbor	--	U S Navy	--	4	19	683	629	--	Sealed	23.9	-664	-610	--	--	30201
2157-02	Pearl Harbor	--	U S Navy	--	12	18	646	559	--	Industrial	23.7	-628	-541	--	9-9-001:008	30201
2157-03	Pearl Harbor	--	U S Navy	--	12	20	441	353	--	Sealed	--	-421	-333	--	--	30201
2157-04	Pearl Harbor	1938	U S Navy	--	3	87	192	40	--	Unused	101.8	-105	47	--	9-9-001:013	30201
2158-01	Waipio Peninsula	--		--	12	15	109	--	--	Unused	22.2	-94		--	9-3-002:001	30201
2158-02	Waipio Peninsula	--	U S Navy	--	12	14	629	513	--	Sealed	18.2	-615	-499	--	--	30201
2200-01	Waipio Peninsula	--	U S Navy	--	--	20	--	--	--	Lost	--	--	--	--	9-3-002:001	30203
2200-02	Waipio Peninsula	--	U S Navy	--	--	20	--	--	--	Lost	--	--	--		9-3-002:001	30203
2200-03	Waipio Peninsula	--	U S Navy	--	2	11	362	352	362	Lost	18.4	-351	-341	-351	9-3-002:001	30203
2200-04	Laulaunui	1928	U S Navy	--	2	--	233	130	--	Other	21.5	--	--	--	9-1-017:015	30203
2201-01	Pearl Harbor	--	Foster M	--	12	20	175	112	--	Sealed	20.2	-155	-92	--		30203
2201-02	Honouliuli	--	Takiguchi G	--	10	17	356	77	--	Domestic	16.4	-339	-60	--	9-1-020:022	30203
2201-03	Ep 2	1891	C&C Ent Serv	--	10	40	230	50	--	Irrigation	16.6	-190	-10	--	9-1-010:007	30203
2201-04	Ep 2	1891	C&C Ent Serv	--	10	40	226	50	--	Irrigation	16.6	-186	-10	--	9-1-010:007	30203
2201-05	Pearl Harbor	1892	B Mau & Assn	--	10	11	170	98	--	Sealed	20	-159	-87	--	--	30203
2201-06	Waipahu	1893	Robinson Est	--	10	25	436	400	--	Sealed	23.7	-411	-375	--	--	30203
2201-07	Ep 2	1921	C&C Ent Serv	--	12	40	282	62	--	Irrigation	16.6	-242	-22	--	9-1-010:007	30203
2201-08	Pearl Harbor B	1923	B Mau & Assn	--	12	12	154	60	--	Sealed	20	-142	-48	--	--	30203
2201-09	Waipahu	1945	Honolulu BWS	--	12	83	107	86	--	Sealed	18.5	-24	-3	--	--	30203
2201-10	Kunia T41 Deep	1949	Honolulu BWS	--	12	84	1113	92	--	Observation	20.3	-1029	-8	--	9-1-018:001	30203
2201-11	Pearl Harbor	1954	Asato H	--	2	4	175	114	--	Domestic	17.5	-171	-110	--	9-4-048:002	30203
2201-12	Waipahu	1955	Gora G	--	8	32	145	64	--	Sealed	25.6	-113	-32	--	--	30203
2201-13	Pearl Harbor	1959	Nakata S	Rotary	4	5	200	60	--	Domestic	18.6	-195	-55	--	9-4-048:003	30203
2201-14	Pearl Harbor	1969	Harris Rug Cl	Percussion	8	18	185	114	--	Unused	20	-167	-96	--	9-4-049:044	30203
2202-01	Honouliuli	--	Loo R	--	10	23	500		--	Domestic	18.4	-477	--	--	9-1-019:015	30203
2202-02	Honouliuli	--	Murata W & Abe	--	8	16	395	96	--	Irrigation	21.3	-379	-80	--	9-1-020:021	30203
2202-03	Ep 18 Battery	1896	Campbell Est	--	12	50	304	70	--	Irrigation	22.1	-254	-20	--	9-1-017:004	30203
2202-04	Ep 18 Battery	1896	Campbell Est	--	12	50	305	70	--	Irrigation	22.1	-255	-20	--	9-1-017:004	30203
2202-05	Ep 18 Battery	1896	Campbell Est	--	12	50	310	70	--	Irrigation	22.1	-260	-20	--	9-1-017:004	30203
2202-06	Ep 18 Battery	1896	Campbell Est	--	12	50	304	70	--	Irrigation	22.1	-254	-20	--	9-1-017:004	30203
2202-07	Ep 18 Battery	1896	Campbell Est	--	12	50	306	70	--	Irrigation	22.1	-256	-20	--	9-1-017:004	30203
2202-08	Ep 18 Battery	1896	Campbell Est	--	12	50	303	70	--	Irrigation	--	-253	-20	--	9-1-017:004	30203
2202-09	Ep 18 Battery	1896	Campbell Est	--	12	50	312	70	--	Irrigation	18.8	-262	-20	--	9-1-017:004	30203
2202-10	Ep 18 Battery	1897	Campbell Est	--	12	50	307	70	--	Irrigation	18.8	-257	-20	--	9-1-017:004	30203
2202-11	Ep 18 Battery	1897	Campbell Est	--	12	50	306	70	--	Irrigation	18.8	-256	-20	--	9-1-017:004	30203
2202-12	Ep 18 Battery	1897	Campbell Est	--	12	50	308	70	--	Irrigation	18.8	-258	-20	--	9-1-017:004	30203
2202-13	Ep 18 Battery	1897	Campbell Est	--	12	50	308	70	--	Irrigation	18.8	-258	-20	--	9-1-017:004	30203
2202-14	Ep 18 Battery	1897	Campbell Est	--	12	50	308	70	--	Irrigation	18.8	-258	-20	--	9-1-017:004	30203
2202-15	Ep 18 Battery	1899	Campbell Est	--	12	46	468	107	--	Irrigation	26.3	-422	-61	--	9-1-017:005	30203
2202-16	Ep 18 Battery	1900	Campbell Est	--	12	46	476	116	--	Irrigation	26.3	-430	-70	--	9-1-017:004	30203
2202-17	Ep 18 Battery	1900	Campbell Est	--	12	46	475	116	--	Irrigation	26.3	-429	-70	--	9-1-017:004	30203
2202-18	Ep 18 Battery	1900	Campbell Est	--	12	46	475	116	--	Irrigation	26.3	-429	-70	--	9-1-017:004	30203
2202-19	Ep 18 Battery	1900	Campbell Est	--	12	46	481	107	--	Irrigation	26.3	-435	-61	--	9-1-017:004	30203
2202-20	Ep 18 Battery	1900	Campbell Est	--	12	46	475	108	--	Irrigation	26.3	-429	-62	--	9-1-017:004	30203
2202-21	Ep 15,16	1939	Honolulu BWS	Shaft	72	150	156	--	--	Municipal	22.4	-6	--	--	9-2-001:001	30203
2202-22	Honouliuli	1945	Hokama Y	--	6	20	122	100	--	Unused	13.3	-102	-80	--	9-1-017:006	30203
2203-01	Waipahu Wp5	1900	Campbell Est	Shaft	12	19	213	88	--	Unused	19.6	-194	-69	--	9-2-002:001	30204

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2203-02	Waipahu Wp5	1900	Campbell Est	--	12	19	158	88	--	Unused	19.6	-139	-69	--	9-2-002:001	30204
2203-03	Waipahu Wp5	1900	Campbell Est	--	12	19	263	88	--	Unused	19.6	-244	-69	--	9-2-002:001	30204
2203-04	Waipahu Wp5	1900	Campbell Est	--	12	19	233	88	--	Unused	19.6	-214	-69	--	9-2-002:001	30204
2203-05	Waipahu Wp5	1900	Campbell Est	--	12	19	246	88	--	Unused	19.6	-227	-69	--	9-2-002:001	30204
2203-06	Waipahu Wp5	1900	Campbell Est	--	12	19	197	88	--	Unused	19.6	-178	-69	--	9-2-002:001	30204
2255-01	Halawa	--	U S Army	--	6	15	474	333	--	Sealed	23.1	-459	-318	--	--	30201
2255-02	Halawa	--	Oahu Sugar	--	12	18	326	--	--	Sealed	--	-308	--	--	--	30201
2255-03	Halawa	--	Oahu Sugar	--	6	20	--	--	--	Sealed	--	--	--	--	--	30201
2255-04	Halawa	--	Oahu Sugar	--	8	23	234	86	--	Sealed	--	-211	-63	--	--	30201
2255-05	Halawa	1900	Amfac Comm Haw	--	6	33	555	363	--	Unused	--	-524	-330	--	9-9-002:016	30201
2255-06	Halawa	1900	Oahu Sugar	--	12	25	521	247	--	Sealed		-496	-222	--	--	30201
2255-07	Halawa	1900	Oahu Sugar	--	12	21	391	150	--	Sealed	24.9	-370	-129	--	--	30201
2255-08	Halawa	1900	Oahu Sugar	--	12	19	173	127	--	Sealed	24.9	-154	-108	--	--	30201
2255-09	Halawa	1900	Oahu Sugar	--	12	23	399	160	--	Sealed	24.9	-376	-137	--	--	30201
2255-10	Halawa	1900	Oahu Sugar	--	12	25	500	--	--	Other	24.9	-475	--	--	--	30201
2255-11	Halawa	1900	Oahu Sugar	--	12	25	500	--	--	Other	24.9	-475	--	--	--	30201
2255-12	Halawa	1900	Oahu Sugar	--	12	19	205	155	--	Sealed	24.9	-186	-136	--	--	30201
2255-13	Halawa	1900	Oahu Sugar	--	12	22	288	150	--	Sealed	24.9	-266	-128	--	--	30201
2255-14	Halawa	1900	Oahu Sugar	--	12	20	236	134	--	Sealed	24.9	-216	-114	--	--	30201
2255-15	Halawa	1900	Oahu Sugar	--	12	23	431	135	--	Sealed	24.9	-408	-112	--	--	30201
2255-16	Halawa	1900	Oahu Sugar	--	12	22	422	132	--	Sealed	24.9	-400	-110	--	--	30201
2255-17	Halawa	1900	Oahu Sugar	--	12	25	450	152	--	Sealed	24.9	-425	-127	--	--	30201
2255-18	Halawa	1900	Oahu Sugar	--	12	26	457	157	--	Sealed	24.9	-431	-131	--	--	30201
2255-19	Halawa	1900	Oahu Sugar	--	12	22	426	130	--	Sealed	24.9	-404	-108	--	--	30201
2255-20	Halawa	1900	Oahu Sugar	--	12	21	421	120	--	Sealed	24.9	-400	-99	--	--	30201
2255-21	Halawa	1900	--	--	2	31	394	225	--	Observation	22.9	-363	-194	--	--	30201
2255-22	Halawa	1900	--	--	2	32	403	400	--	Observation	22.9	-371	-368	--	--	30201
2255-23	Halawa	1900	Oahu Sugar	--	12	23	404	118	--	Sealed	22.9	-381	-95	--	--	30201
2255-24	Halawa	1900	Oahu Sugar	--	12	26	220	150	--	Sealed	22.9	-194	-124	--	--	30201
2255-25	Halawa	1900	Oahu Sugar	--	12	23	388	96	--	Sealed	22.9	-365	-73	--	--	30201
2255-26	Halawa	1900	--	--	2	33	365	350	--	Observation	22.9	-332	-317	--	--	30201
2255-27	Halawa	1900	--	--	2	20	303	300	--	Observation	22.9	-283	-280	--	--	30201
2255-28	Halawa	1900	Oahu Sugar	--	12	22	128	103	--	Sealed	22.9	-106	-81	--	--	30201
2255-29	Halawa	1930	Oahu Sugar	--	12	26	440	149	--	Sealed	24.9	-414	-123	--	--	30201
2255-30	Halawa	1930	Oahu Sugar	--	12	20	427	195	--	Sealed	24.9	-407	-175	--	--	30201
2255-31	Halawa	1930	Oahu Sugar	--	12	20	423	190	--	Sealed	24.9	-403	-170	--	--	30201
2255-32	Aiea Halawa Shft	1937	U S Navy	Shaft	96	95	99		--	Domestic	--	-4	--	--	9-9-010:014	30201
2255-33	Halawa Obs.	1954	Honolulu BWS	--	12	57	85	60	--	Observation	18.3	-28	-3	--	9-9-010:003	30201
2255-34	Aiea TH	1955	C & H Sugar	--	1	120	121		--	Unused	21.5	-1	--	--	9-9-005:010	30201
2255-35	Aiea Refinery 1	1956	A&B	Rotary	16	119	196	151	--	Unused	21.1	-77	-32	--	9-9-005:010	30201
2255-36	Aiea Refinery 2	1956	A&B	Rotary	16	119	240	151	--	Unused	20.5	-121	-32	--	9-9-005:010	30201
2255-37	Halawa 2	1961	Honolulu BWS	Rotary	16	256	345	285	305	Municipal	13.3	-89	-29	-49	9-9-051:054	30201
2255-38	Halawa 3	1961	Honolulu BWS	Rotary	16	270	359	314	--	Municipal	16.5	-89	-44	--	9-9-051:054	30201
2255-39	Halawa 1	1961	Honolulu BWS	Rotary	16	258	399	276	296	Municipal	15.8	-141	-18	-38	9-9-051:054	30201
2255-40	Halawa-USGS	1997	U S G S	Rotary	8	59	804	59	--	Observation	--	-745	0	--	9-9-010:042	--
2256-01	Salt Lake Blvd	--	Oahu Sugar	--	6	17	272	180	--	Sealed	19.1	-255	-163	--	--	30201
2256-02	Salt Lake Blvd	--	Oahu Sugar	--	10	19	--	--	--	Other	22.8	--	--	--	--	30201
2256-03	Aiea	--	Oahu Sugar	--	--	10	275	--	--	Other	--	-265	--	--	--	30201
2256-04	Pearl Harbor	1889	U S Navy	--	6	23	290	200	--	Sealed	24	-267	-177	--	--	30201
2256-05	Aiea	1908	Oahu Sugar	--	12	38	344	87	--	Sealed	--	-306	-49	--	--	30201

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WELL NO.	WELL NAME	YEAR DRILLED	OWNER/USER	DRILLING METHOD	CASING DIAMETER	GROUND SURFACE ELEVATION	WELL DEPTH	SOLID CASING	PERFORATED CASING	USE	INITIAL DEPTH TO WATER	BOTTOM ELEVATION OF BOREHOLE	BOTTOM ELEVATION OF SOLID CASING	BOTTOM ELEVATION OF PERFORATED CASING	TAX MAP KEY	AQUIFER CODE*
2256-06	Aiea	1908	Oahu Sugar	--	12	38	338	93	--	Sealed	--	-300	-55	--	--	30201
2256-07	Aiea	1908	Oahu Sugar	--	12	38	345	71	--	Sealed	--	-307	-33	--	--	30201
2256-08	Aiea	1908	Oahu Sugar	--	12	38	359	98	--	Sealed	--	-321	-60	--	--	30201
2256-09	Aiea	1908	Oahu Sugar	--	12	45		80	98	Sealed	--	--	-35	-53	--	30201
2256-10	Aiea	1922	U S Navy	--	12	11	173	143	--	Observation	23	-162	-132	--	--	30201
2256-11	Aiea	1923	U S Navy	--	12	14	210	144	--	Observation	23	-196	-130	--	9-9-003:029	30201
2256-12	Aiea	1923	U S Navy	--	12	11	182	139	--	Observation	23	-171	-128	--	--	30201
2256-13	Aiea	1943	U S Navy	--	16	16	275	154	--	Sealed	22.6	-259	-138	--	--	30201
2257-01	Ford Island	--	U S Navy	--	12	21	507	421	--	Sealed	25.6	-486	-400	--	--	30201
2257-02	Ford Island	--	U S Navy	--	12	21	474	422	--	Sealed	25.6	-453	-401	--	--	30201
2257-03	Ford Island	--	U S Navy	--	12	18	503	417	--	Sealed	--	-485	-399	--	--	30201
2257-04	Ford Island	--	U S Navy	--	12	18	484	433	--	Sealed	--	-466	-415	--	--	30201
2257-05	Ford Island	--	U S Navy	--	10	12	391	335	--	Sealed	--	-379	-323	--	--	30201
2258-01	Pearl City Pen	--	U S Navy	--	2	4	--	77	--	Sealed	19		-73	--	--	30203
2258-02	Pearl City Pen	--	Unit Chin Trs	--	8	14	310	218	--	Sealed	--	-296	-204	--	--	30203
2258-03	Pearl City Pen	1906	U S Navy	--	10	12	264	186	--	Sealed	20.2	-252	-174	--	--	30203
2258-04	Pearl City Pen	1920	U S Navy	--	2	15	163	122	--	Sealed	17.5	-148	-107	--	--	30203
2258-05	Pearl City Pen	1921	U S Navy	--	2	15	134	103	--	Sealed	21.1	-119	-88	--	--	30203
2258-06	Pearl City Pen	1923	U S Navy	--	2	14	89	78	--	Sealed	17.3	-75	-64	--	--	30203
2258-07	Pearl City Pen	1928	U S Navy	--	1	9	126	94	104	Sealed	19.7	-117	-85	-95	--	30203
2258-08	Pearl City Pen	1934	U S Navy	--	2	3	148	134	--	Sealed	11.3	-145	-131	--	--	30203
2258-09	Pearl City Pen	1939	U S Navy	--	6	11	158	56	--	Sealed	18	-147	-45	--	--	30203
2258-10	Pearl City Pen	1940	Honolulu BWS	--	6	3	181	91	--	Sealed	17.4	-178	-88	--	--	30203
2258-11	Pearl City Pen	1940	U S Navy	--	6	12	167	128	--	Sealed	17.2	-155	-116	--	--	30203
2259-01	Waipio Pen	--	U S Navy	--	--	17	--	--	--	Lost	--	--	--	--	9-3-002:001	30203
2259-02	Waipio Pen	--	U S Navy	--	12	10	--	--	--	Lost	--	--	--	--	9-3-002:001	30203
2259-03	Waipio Pen	1889	U S Navy	--	12	2	510		--	Lost	--	-508	--	--	--	30203
2300-01	Waipahu	--	Ii Estate	--	10	14	423	177	--	Sealed	--	-409	-163	--	--	30203
2300-02	Waipahu	--	Ii Estate	--	8	10	214	133	--	Sealed	--	-204	-123	--	9-4-017:001	30203
2300-03	Waipahu P6	--	Oahu Sugar	--	10	18	188	62	--	Sealed	25	-170	-44	--	--	30203
2300-04	Waipahu P6	--	Oahu Sugar	--	10	15	395	48	--	Sealed	24.5	-380	-33	--	--	30203
2300-05	Waipahu	--	A Chee & Assoc	--	--	14	197	122	--	Unused	16.9	-183	-108	--	9-4-013:004	30203
2300-06	C & C 65	1898	C&C Faci Maint	--	10	12	241	170	--	Sealed	20.8	-229	-158	--	9-4-011:065	30203
2300-07	Waipahu P7A	1900	Oahu Sugar	--	12	60	--	--	--	Sealed	--	--	--	--	9-4-002:004	30203
2300-08	Waipahu P7B	1900	Oahu Sugar	--	12	60	--	--	--	Sealed	--	--	--	--	9-4-002:004	30203
2300-09	Waipahu P7C	1900	Oahu Sugar	--	12	60	--	--	--	Sealed	--	--	--	--	9-4-002:004	30203
2300-10	Waipahu P6	1909	Bishop Estate	--	1	13	224	194	214	Observation	21.6	-211	-181	-201	--	30203
2300-11	Waipahu	1913	Watanabe A	--	12	18	202	56	--	Irrigation	24.6	-184	-38	--	9-4-009:124	30203
2300-12	Waipahu P7D	1917	Oahu Sugar	--	12	60	400	92	--	Sealed	--	-340	-32	--	--	30203
2300-13	Waipahu P7E	1917	Oahu Sugar	--	12	60	400	102	--	Sealed	--	-340	-42	--	--	30203
2300-14	Waipahu P7F	1917	Oahu Sugar	--	12	60	402	128	--	Sealed	--	-342	-68	--	--	30203
2300-15	Waipahu	1921	Oahu Sugar	--	8	21	221	59	--	Sealed	25	-200	-38	--	--	30203
2300-16	Waipahu P7G	1924	Oahu Sugar	--	12	60	412	98	--	Sealed	--	-352	-38	--	--	30203
2300-17	Waipahu P7H	1924	Oahu Sugar	--	12	60	430	92	--	Sealed	--	-370	-32	--	--	30203
2300-18	Waipahu Deep	1980	State Cwrm	Rotary	12	26	1100	38	--	Observation	26.3	-1074	-12	--	9-4-009:007	30203
2300-19	St Josephs Sch	1956	St Joseph Ch	--	8	22	131	70	--	Unused	20.7	-109	-48	--	9-4-011:056	30203
2300-20	Waipahu	1959	Watanabe A	--	10	13	204	56	--	Irrigation	18.9	-191	-43	--	9-4-009:124	30203
2300-21	Waipahu P7A	1962	--	--	20	64	320	101	--	Unused	19.9	-256	-37	--	9-4-002:004	30203
2300-22	Waipahu P7B	1962	--	--	20	64	364	101	--	Unused	19	-300	-37	--	9-4-002:004	30203
2300-23	Waipahu P7C	1962	--	--	20	64	378	102	--	Unused	18.8	-314	-38	--	9-4-002:004	30203

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2301-01	Waipahu WP1	--	Waikele Golf LLC	--	12	21	425	--	--	Unused	23.3	-404	--	--	9-4-002:008	30203
2301-02	Waipahu WP1	--	Waikele Golf LLC	--	12	30	--	--	--	Unused	23.3	--	--	--	9-4-002:008	30203
2301-03	Waipahu WP1	--	Waikele Golf LLC	--	12	30	400	--	--	Unused	23.3	-370	--	--	9-4-002:008	30203
2301-04	Waipahu WP1	--	Waikele Golf LLC	--	12	30	400	--	--	Unused	23.3	-370	--	--	9-4-002:008	30203
2301-05	Waipahu WP1	--	Waikele Golf LLC	--	12	43	410	--	--	Irrigation	23.3	-367	--	--	9-4-002:008	30203
2301-06	Waipahu WP1	--	Waikele Golf LLC	--	12	30	400	--	--	Unused	23.3	-370	--	--	9-4-002:008	30203
2301-07	Waipahu WP1	--	Waikele Golf LLC	--	12	29	400	--	--	Unused	23.3	-371	--	--	9-4-002:008	30203
2301-08	Waipahu WP1	--	Waikele Golf LLC	--	12	30	412	--	--	Unused	23.3	-382	--	--	9-4-002:008	30203
2301-09	Waipahu WP1	--	Waikele Golf LLC	--	12	31	490	--	--	Unused	23.3	-459	--	--	9-4-002:008	30203
2301-10	Waipahu WP1	--	Waikele Golf LLC	--	12	31	498	--	--	Unused	23.3	-467	--	--	9-4-002:008	30203
2301-11	Waipahu WP4B	1898	Oahu Sugar	--	12	19	500	--	--	Sealed	--	-481	--	--	9-4-002:008	30203
2301-12	Waipahu WP4B	1898	Oahu Sugar	--	12	19	500	--	--	Sealed	--	-481	--	--	9-4-002:008	30203
2301-13	Waipahu WP4B	1898	Oahu Sugar	--	12	19	500	--	--	Sealed	--	-481	--	--	9-4-002:008	30203
2301-14	Waipahu WP4B	1898	Oahu Sugar	--	12	19	500	--	--	Sealed	--	-481	--	--	9-4-002:008	30203
2301-15	Waipahu WP4B	1898	Oahu Sugar	--	12	19	500	--	--	Sealed	--	-481	--	--	9-4-002:008	30203
2301-16	Waipahu WP4B	1898	Oahu Sugar	--	12	19	500	--	--	Sealed	--	-481	--	--	9-4-002:008	30203
2301-17	Waipahu WP4B	1898	Oahu Sugar	--	12	19	500	--	--	Sealed	--	-481	--	--	9-4-002:008	30203
2301-18	Waipahu WP4A	1898	Oahu Sugar	--	12	19	500	--	--	Other	--	-481	--	--	9-4-002:008	30203
2301-19	Waipahu WP4A	1898	Oahu Sugar	--	12	19	500	--	--	Other	--	-481	--	--	9-4-002:008	30203
2301-20	Waipahu WP4A	1898	Oahu Sugar	--	12	19	500	--	--	Other	--	-481	--	--	9-4-002:008	30203
2301-21	Waipahu WP2A2B	1898	Oahu Sugar	--	12	20	425	--	--	Unused	22.4	-405	--	--	9-4-002:008	30203
2301-22	Waipahu WP2A2B	1898	Oahu Sugar	--	12	20	425	--	--	Unused	22.4	-405	--	--	9-4-002:008	30203
2301-23	Waipahu WP2A2B	1898	Oahu Sugar	--	12	20	400	--	--	Unused	22.4	-380	--	--	9-4-002:008	30203
2301-24	Waipahu WP2A2B	1898	Oahu Sugar	--	12	20	410	--	--	Unused	22.4	-390	--	--	9-4-002:008	30203
2301-25	Waipahu WP2A2B	1898	Oahu Sugar	--	12	20	414	--	--	Unused	22.4	-394	--	--	9-4-002:008	30203
2301-26	Waipahu WP2A2B	1898	Oahu Sugar	--	12	20	410	--	--	Unused	22.4	-390	--	--	9-4-002:008	30203
2301-27	Waipahu WP2C2D	1898	Oahu Sugar	--	12	20	400	--	--	Irrigation	22.4	-380	--	--	9-4-002:008	30203
2301-28	Waipahu WP2C2D	1898	Oahu Sugar	--	12	20	400	--	--	Unused	22.4	-380	--	--	9-4-002:008	30203
2301-29	Waipahu WP2C2D	1898	Oahu Sugar	--	12	20	410	--	--	Unused	22.4	-390	--	--	9-4-002:008	30203
2301-30	Waipahu WP2C2D	1898	Oahu Sugar	--	12	20	420	--	--	Unused	22.4	-400	--	--	9-4-002:008	30203
2301-31	Waipahu WP2C2D	1898	Oahu Sugar	--	12	20	429	--	--	Unused	22.4	-409	--	--	9-4-002:008	30203
2301-32	Waipahu WP2C2D	1898	Oahu Sugar	--	12	20	439	--	--	Unused	22.4	-419	--	--	9-4-002:008	30203
2301-33	Waipahu	--	Oahu Sugar	--	10	16	232	53	--	Sealed	--	-216	-37	--	--	30203
2301-34	Hoaeae P1	1959	Honolulu BWS	--	16	131	194	107	155	Municipal	17	-63	24	-24	9-4-034:074	30203
2301-35	Hoaeae P2	1959	Honolulu BWS	--	16	133	197	113	155	Municipal	18.2	-64	20	-22	9-4-034:074	30203
2301-36	Hoaeae P3	1959	Honolulu BWS	--	16	131	198	107	155	Municipal	19.5	-67	24	-24	9-4-034:074	30203
2301-37	Hoaeae P4	1959	Honolulu BWS	--	16	130	195	108	156	Municipal	19.3	-65	22	-26	9-4-034:074	30203
2301-38	Hoaeae P5	1974	Honolulu BWS	Rotary	16	126	276	176	--	Municipal	--	-150	-50		9-4-034:074	30203
2301-39	Hoaeae P6	1974	Honolulu BWS	Rotary	16	123	273	173	--	Municipal	--	-150	-50	--	9-4-034:074	30203
2301-43	Pump 8	--	Amfac	Tunnel	--	--	--	--	--	Sealed	--		--	--	9-4-002:022	--
2301-44	Waipahu IV-2	1998	Honolulu BWS	Rotary	14	133	273	173	--	Municipal	--	-140	-40	--	9-4-002:005	--
2301-45	Waipahu IV-3	1998	Honolulu BWS	Rotary	14	136	276	176	--	Unused	--	-140	-40	--	9-4-002:005	--
2301-46	Waipahu IV-1	1998	Honolulu BWS	Rotary	14	131	271	171	--	Unused	--	-140	-40	--	9-4-002:005	--
2301-47	Waipahu IV-4	1999	Honolulu BWS	Percussion	13	134	273	173	--	Municipal	--	-139	-39	--	9-4-002:005	--
2301-48	Waiawa Expl.	2001	State Land Division	Percussion	16	108	447	364	--	Unused	--	-339	-256	--	9-4-002:008	--
2302-01	Kunia I P1	1957	Honolulu BWS	--	16	201	350	221	--	Municipal	20.8	-149	-20	--	9-4-002:014	30203
2302-02	Kunia I P2	1957	Honolulu BWS	--	16	201	338	221	--	Municipal	20.9	-137	-20	--	9-4-002:014	30203
2302-03	Kunia I P3	1972	Honolulu BWS	Rotary	16	206	427	246	--	Municipal	--	-221	-40	--	9-4-002:014	30203
2302-04	Kunia I P4	1972	Honolulu BWS	Rotary	16	201	420	241	--	Municipal	--	-219	-40	--	9-4-002:014	30203
2303-01	Honouliuli I-1	1987	Honolulu BWS	Percussion	14	412	625	550	--	Unused	16	-213	-138	--	9-2-001:001	30204

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2303-02	Honouliuli I-2	1987	Honolulu BWS	Percussion	14	411	563	550	--	Municipal	16	-199	-139	--	9-2-001:001	30204
2303-03	Honouliuli II-3	1987	Honolulu BWS	Percussion	14	419	534	450	--	Municipal	17	-115	-31	--	9-2-001:001	30204
2303-04	Honouliuli II-4	1988	Honolulu BWS	Percussion	14	421	555	455	--	Municipal	12.2	-134	-34	--	9-2-001:001	30204
2303-05	Honouliuli II-5	1989	Honolulu BWS	Percussion	14	432	545	465	--	Municipal	16	-113	-33	--	9-2-001:001	30204
2303-06	Honouliuli II-6	1989	Honolulu BWS	Percussion	14	432	535	455	--	Municipal	17.4	-103	-23	--	9-2-001:001	30204
2303-07	Honouliuli Deep	1992	Ewa Wtr Dev	Percussion	4	299	1055	280	1030	Observation	--	-756	-19	-731	9-2-001:001	30204
2354-01	Halawa Shaft	1944	Honolulu BWS	Shaft	--	165	183	--	--	Municipal	--	-18	--	--	9-9-010:008	30201
2355-01	Aiea	1938		--	1	218	218	208	218	Observation	26	0	10	0	9-9-010:004	30201
2355-02	Aiea	1945	Oahu Sugar	Tunnel	96	195	200	--	--	Sealed	--	-5	--	--	9-9-010:005	30201
2355-03	Aiea Gulch 1	1947	Honolulu BWS	--	14	304	342	288	--	Municipal	17.7	-38	16	--	9-9-009:106	30201
2355-04	Aiea Gulch B	1947	Honolulu BWS	--	18	304	289	--	--	Sealed	--	15	--	--	9-9-009:106	30201
2355-05	Aiea Gulch 2	1947	Honolulu BWS	--	14	304	344	286	--	Municipal	18.5	-40	18	--	9-9-009:106	30201
2355-06	Aiea 1	1955	Honolulu BWS	--	14	258	360	290	--	Municipal	20.8	-102	-32	--	9-9-024:005	30201
2355-07	Aiea 2	1955	Honolulu BWS	--	14	258	358	288	--	Municipal	22	-100	-30	--	9-9-024:005	30201
2355-08	Kalauao	1963	Honolulu BWS	--	12	158	390	202	--	Observation	81	-232	-44	--	9-8-011:032	30201
2355-09	Kalauao 1	1965	Honolulu BWS	--	18	160	413	221	--	Municipal	74.6	-253	-61	--	9-8-011:032	30201
2355-10	Kalauao 2	1965	Honolulu BWS	--	18	159	413	222	--	Municipal	--	-254	-63	--	9-8-011:032	30201
2355-11	Kalauao 3	1965	Honolulu BWS	--	18	159	413	219	--	Municipal	--	-254	-60	--	9-8-011:032	30201
2355-12	Kalauao 4	1965	Honolulu BWS	--	18	160	413	221	--	Municipal	--	-253	-61	--	9-8-011:032	30201
2355-13	Kalauao 5	1969	Honolulu BWS	Rotary	18	159	413	227	--	Municipal	20.8	-254	-68	--	9-8-011:032	30201
2355-14	Kalauao 6	1969	Honolulu BWS	Rotary	18	160	413	230	--	Municipal	21	-253	-70	--	9-8-011:032	30201
2355-15	Kaamilo Deep	2001	Honolulu BWS	Rotary	8	491	1617	480	--	Observation	--	-1126	11	--	9-8-035:043	
2356-01	Aiea	--	Oahu Sugar	--	--	--	--	--	--	Other	--	--	--	--	--	30201
2356-02	Aiea	--	You & Shimizu	--	10	23	399	69	--	Sealed	22.8	-376	-46		--	30201
2356-03	Aiea	--	Nakata H	--	1	30	356	337	347	Sealed	17.4	-326	-307	-317	--	30201
2356-04	Pearl Harbor	--	U S Navy	--	--	18	100	--	--	--	--	-82	--	--	9-8-014:005	30201
2356-05	Pearl Harbor	--	U S Navy	--	--	6	62	--	--	--	--	-56	--	--	9-8-014:010	30201
2356-06	Pearl Harbor	--	U S Navy	--	--	6	65	--	--	--	--	-59	--	--	9-8-014:020	30201
2356-07	Pearl Harbor	--	U S Navy	--	--	6	73	--	--	--	--	-67	--	--	9-8-014:021	30201
2356-08	Pearl Harbor	--	U S Navy	--	--	6	79	--	--	--	--	-73	--	--	9-8-014:030	30201
2356-09	Pearl Harbor	--	U S Navy	--	--	6	75	--	--	--	--	-69	--	--	9-8-014:006	30201
2356-10	Pearl Harbor	--	U S Navy	--	--	6	55	--	--	--	--	-49	--	--	9-8-014:024	30201
2356-11	Pearl Harbor	--	U S Navy	--	--	6	70	--	--	--	--	-64	--	--	9-8-014:008	30201
2356-12	Pearl Harbor	--	U S Navy	--	--	8	65	--	--	--	--	-57	--	--	9-8-014:015	30201
2356-13	Aiea	1895	You & Shimizu	--	6	24	257	79	--	Sealed	21	-233	-55	--	--	30201
2356-14	Aiea	1899	Oahu Sugar	--	12	46	550	--	--	Sealed	23.8	-504	--	--	9-8-002:033	30201
2356-15	Aiea	1899	Oahu Sugar	--	12	46	550	--	--	Sealed	--	-504	--	--	9-8-002:033	30201
2356-16	Aiea	1899	Oahu Sugar	--	12	46	550	--	--	Sealed	--	-504	--	--	9-8-002:033	30201
2356-17	Aiea	1899	Oahu Sugar	--	12	46	550	--	--	Sealed	--	-504	--	--	9-8-002:033	30201
2356-18	Aiea	1899	Oahu Sugar	--	12	46	550	--	--	Sealed	--	-504	--	--	9-8-002:033	30201
2356-19	Aiea	1899	Venture 15 Inc	--	12	46	550	--	--	Sealed	--	-504	--	--	9-8-060:013	30201
2356-20	Aiea	1899	Venture 15 Inc	--	12	46	985	--	--	Sealed	--	-939	--	--	9-8-060:013	30201
2356-21	Aiea	1899	Venture 15 Inc	--	12	46	464	--	--	Sealed	--	-418	--	--	9-8-060:013	30201
2356-22	Aiea	1899	Venture 15 Inc	--	12	46	470	--	--	Sealed	--	-424	--	--	9-8-060:013	30201
2356-23	Aiea	1899	Venture 15 Inc	--	12	46	550	--	--	Sealed	--	-504	--	--	9-8-060:013	30201
2356-24	Aiea	1899	Venture 15 Inc	--	12	46	550	--	--	Sealed	--	-504	--	--	9-8-060:013	30201
2356-25	Aiea	1899	Venture 15 Inc	--	12	46	550	--	--	Sealed	--	-504	--	--	9-8-060:013	30201
2356-26	Aiea	1899	Venture 15 Inc	--	12	46	550	--	--	Sealed	--	-504	--	--	9-8-060:013	30201
2356-27	Aiea	1899	Venture 15 Inc	--	12	46	620	--	--	Sealed	--	-574	--	--	9-8-060:013	30201
2356-28	Aiea	1899	Venture 15 Inc	--	12	46	550	--	--	Sealed	--	-504	--	--	9-8-060:013	30201
2356-29	Aiea	1899	Venture 15 Inc	--	12	46	550	--	--	Sealed	--	-504	--	--	9-8-060:013	30201

Table B-2
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Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

WELL NO.	WELL NAME	YEAR DRILLED	OWNER/USER	DRILLING METHOD	CASING DIAMETER	GROUND SURFACE ELEVATION	WELL DEPTH	SOLID CASING	PERFORATED CASING	USE	INITIAL DEPTH TO WATER	BOTTOM ELEVATION OF BOREHOLE	BOTTOM ELEVATION OF SOLID CASING	BOTTOM ELEVATION OF PERFORATED CASING	TAX MAP KEY	AQUIFER CODE*
2356-30	Aiea	1899	Venture 15 Inc	--	12	46	550	--	--	Sealed	--	-504	--	--	9-8-060:013	30201
2356-31	Aiea	1899	Venture 15 Inc	--	12	46	550	--	--	Sealed	--	-504	--	--	9-8-060:013	30201
2356-32	Aiea	1899	Venture 15 Inc	--	12	46	550	--	--	Sealed	--	-504	--	--	9-8-060:013	30201
2356-33	Aiea	1899	Venture 15 Inc	--	12	46	550	--	--	Sealed	--	-504	--	--	9-8-060:013	30201
2356-34	Aiea	1904	Venture 15 Inc	--	12	56	955	200	--	Sealed	22.8	-899	-144	--	9-8-011:005	30201
2356-35	Aiea	1904	Venture 15 Inc	--	12	56	--	--	--	Sealed	--	--	--	--	9-8-011:005	30201
2356-36	Aiea	1904	Venture 15 Inc	--	12	56	--	--	--	Sealed	--	--	--	--	9-8-011:005	30201
2356-37	Aiea	1904	Venture 15 Inc	--	12	56	707	206	--	Sealed	--	-651	-150	--	9-8-011:005	30201
2356-38	Aiea	1904	Venture 15 Inc	--	12	56	405	58	--	Sealed	--	-349	-2	--	9-8-011:005	30201
2356-39	Aiea	1904	Venture 15 Inc	--	12	56	503	88	--	Sealed	--	-447	-32	--	9-8-011:005	30201
2356-40	Aiea	1904	Venture 15 Inc	--	12	56	510	130	--	Sealed	--	-454	-74	--	9-8-011:005	30201
2356-41	Aiea	1904	Venture 15 Inc	--	12	56	504	76	--	Sealed	--	-448	-20	--	9-8-011:005	30201
2356-42	Aiea	1904	Venture 15 Inc	--	12	56	484	40	--	Sealed	--	-428	16	--	9-8-011:005	30201
2356-43	Aiea	1941	Ridley W	--	12	81	100	--	--	Sealed	22.3	-19	--	--	--	30201
2356-44	Aiea	1941	Ridley W	--	8	81	100	34	--	Sealed	21.4	-19	47	--	--	30201
2356-45	Aiea	1945	Honolulu BWS	--	12	25	177	42	--	Sealed	15.8	-152	-17	--	--	30201
2356-46	Aiea	1948	U S Navy	--	--	33	61	--	--	--	14.5	-28	--	--	9-8-013:014	30201
2356-47	Aiea	1948	U S Navy	--	--	42	73	--	--	Sealed	15	-31	--	--	--	30201
2356-48	Aiea	1948	U S Navy	--	--	21	51	--	--	Sealed	12.5	-30	--	--	--	30201
2356-49	Waimalu I-1	1954	Honolulu BWS	--	12	102	327	129	--	Municipal	--	-225	-27	--	9-8-026:012	30201
2356-50	Waimalu I-2	1955	Honolulu BWS	--	12	102	327	127	--	Municipal	--	-225	-25	--	9-8-026:012	30201
2356-51	Pearl Harbor	1958	U S G S	--	6	5	1308	91	--	Observation	1.5	-1303	-86	--	9-8-014:029	30201
2356-52	Pearl Harbor	1959	Honolulu BWS	--	16	87	172	101	--	Sealed	16.2	-85	-14	--		30201
2356-53	Aiea	1959	Honolulu BWS	--	6	26	250	75	--	Observation	17.3	-224	-49	--		30201
2356-54	Pearl C C Golf	1966	Pearl C C	--	12	374	552	395	--	Irrigation		-178	-21	--	9-8-011:034	30201
2356-55	Kaonohi I-1	1966	Honolulu BWS	Rotary	16	252	542	289	--	Municipal		-290	-37	--	9-8-040:001	30201
2356-56	Kaonohi I-2	1966	Honolulu BWS	Rotary	16	252	549	296	--	Municipal	8.6	-297	-44	--	9-8-040:001	30201
2356-57	Waimalu	1971	Honolulu BWS	Percussion	10	22	250	77	--	Observation		-228	-55	--	9-8-026:002	30201
2356-58	Kaamilo 1	1973	Honolulu BWS	Percussion	16	147	340	190	--	Municipal		-193	-43	--	9-8-031:020	30201
2356-59	Kaamilo 2	1973	Honolulu BWS	Percussion	16	148	340	190	--	Municipal		-192	-42	--	9-8-031:020	30201
2356-60	Waimalu II-1	1975	Honolulu BWS	Rotary	16	23	240	100	--	Municipal	18.4	-217	-77	--	9-8-026:012	30201
2356-61	Kaonohi II-1	1975	Honolulu BWS	Rotary	16	112	330	190	--	Municipal	18	-218	-78	--	9-8-039:010	30201
2356-62	Kaonohi II-2	1975	Honolulu BWS	Rotary	16	117	340	200	--	Municipal	15.3	-223	-83	--	9-8-039:010	30201
2356-63	Waimalu II-2	1975	Honolulu BWS	Percussion	16	26	240	100	--	Municipal	15.1	-214	-74	--	9-8-026:012	30201
2356-64	Waimalu II-3	1975	Honolulu BWS	Percussion	16	20	240	163	--	Municipal	14	-220	-143	--	9-8-026:012	30201
2356-65	Kaonohi II-3	1975	Honolulu BWS	Rotary	16	112	335	195	--	Unused	--	-223	-83	--	9-8-039:010	30201
2356-66	Pearlridge B	1977	JC Penney	Percussion	--	--	--	--	--	--	--	--	--	--	9-8-013:010	30201
2356-67	Pearlridge J	1977	JC Penney	Percussion	8					Sealed	--	--	--	--	9-8-013:010	30201
2356-68	Pearlridge K	1977	JC Penney	Percussion	8	--	--	--	--	Sealed	--	--	--	--	9-8-013:010	30201
2356-69	Pearlridge K1	1978	JC Penney	Percussion	--	--	--	--	--	--	--	--	--	--	9-8-013:010	30201
2356-70	Kalauao	1987	Lau Taro Farm	Percussion	12		261	170	220	Irrigation	11.5	--	--	--	9-8-016:048	30201
2357-01	Pearl Harbor	--	U S Navy	--	--	8	90	--	--	--	--	--	--	--	9-8-009:010	30201
2357-02	Waiau	--	Heco	--	8	20	194	54	--	Sealed	--	-174	-34	--	--	30201
2357-03	Kalauao	1887	Waimalu Dev	--	10	25	314	47	--	Sealed	21.5	-289	-22	--	--	30201
2357-04	Waiau	1900	Okuda C	--	10	23	425		--	Irrigation	20.3	-402	--	--	9-8-020:059	30201
2357-05	Waiau	1932	Heco	--	2	7	65	15	--	Sealed	--	-58	-8	--	--	30201
2357-06	Waiau	1934	Oahu Sugar	--	6	12	239	92	--	Sealed	--	-227	-80	--	--	30201
2357-07	Waiau	1938	Chun K C	--	6	22	212	124	--	Irrigation	14.5	-190	-102	--	9-8-006:019	30201
2357-08	Waiau	1938	Lee M C	--	6	22	72	20	--	Irrigation	--	-50	2	--	9-8-006:021	30201
2357-09	Waiau 4	1938	Heco	--	12	10	64	26	--	Unused	--	-54	-16	--	9-8-003:010	30201

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WELL NO.	WELL NAME	YEAR DRILLED	OWNER/USER	DRILLING METHOD	CASING DIAMETER	GROUND SURFACE ELEVATION	WELL DEPTH	SOLID CASING	PERFORATED CASING	USE	INITIAL DEPTH TO WATER	BOTTOM ELEVATION OF BOREHOLE	BOTTOM ELEVATION OF SOLID CASING	BOTTOM ELEVATION OF PERFORATED CASING	TAX MAP KEY	AQUIFER CODE*
2357-10	Waiau 1	1938	Heco	--	14	15	90	40	--	Industrial	18.1	-75	-25	--	9-8-003:010	30201
2357-11	Waiau 2	1938	Heco	--	20	32	107	48	--	Industrial	17.3	-75	-16	--	9-8-003:010	30201
2357-12	Waiau 3	1938	Heco	--	20	36	83	48	--	Industrial	10.8	-47	-12	--	9-8-003:010	30201
2357-13	Waiau	1939	Heco	Tunnel	--	3	96	--	--	Other	--	-93		--	9-8-052:001	30201
2357-14	Waiau 5	1940	Heco	--	8	6	95	56	--	Sealed	13.9	-89	-50	--	9-8-052:001	30201
2357-15	Waiau	1940	Heco	--	6	6	50	9	--	Other	--	-44	-3	--	9-8-052:001	30201
2357-16	Waiau 6	1940	Heco	--	16	25	198	95	--	Sealed	15.6	-173	-70	--	9-8-003:010	30201
2357-17	Waiau 7	1940	Heco	--	20	23	115	55	--	Sealed	17.1	-92	-32	--	9-8-003:010	30201
2357-18	Waiau 8	1940	Heco	--	20	25	103	48	--	Sealed	16.8	-78	-23	--	9-8-003:010	30201
2357-19	Waiau	1950	Inafuku J	--	6	9	444	96	--	Sealed	20	-435	-87	--	--	30201
2357-20	Waiau	1956	Ho C	--	5	14	420	80	--	Sealed	19.1	-406	-66	--	--	30201
2357-21	Waiau	1963	Suyetani W	--	8	11	167	67	--	Unused	17.3	-156	-56	--	9-8-021:059	30201

* = after Mink, J.F., and L.S. Lau, 1990. Aquifer Identification and Classification for the Island of Oahu: Groundwater Protection Strategy for Hawaii.
amsl = above mean sea level
bgs = below ground surface
This table is based on information from a shape file provide by the Department of Land and Natural Resources.

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ALL WELL TYPES IN THE SCHOFIELD PLATEAU
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December 2006

WELL NO.	WELL NAME	YEAR DRILLED	OWNER/USER	DRILLING METHOD	CASING DIAMETER	GROUND SURFACE ELEVATION	WELL DEPTH	SOLID CASING	PERFORATED CASING	USE	INITIAL DEPTH TO WATER	BOTTOM ELEVATION OF BOREHOLE	BOTTOM ELEVATION OF SOLID CASING	BOTTOM ELEVATION OF PERFORATED CASING	TAX MAP KEY	AQUIFER CODE*
					(inches)	(feet)	(feet)	(feet)	(feet)		(feet bgs)	(feet amsl)	(feet amsl)	(feet amsl)		
2101-13	Honouliuli	1955	Wood K	--	2	3	225	131	--	Domestic	22.6	-222	-128	--	9-1-017:014	30203
2103-03	Barbers Pt Shaft	1943	U S Navy	Shaft	72	200	204	--	--	Domestic	14.1	-4	--	--	9-1-016:007	30204
2201-02	Honouliuli	--	Takiguchi G	--	10	17	356	77	--	Domestic	16.4	-339	-60	--	9-1-020:022	30203
2201-11	Pearl Harbor	1954	Asato H	--	2	4	175	114	--	Domestic	17.5	-171	-110	--	9-4-048:002	30203
2201-13	Pearl Harbor	1959	Nakata S	Rotary	4	5	200	60	--	Domestic	18.6	-195	-55	--	9-4-048:003	30203
2202-01	Honouliuli	--	Loo R	--	10	23	500	--	--	Domestic	18.4	-477	--	--	9-1-019:015	30203
2202-21	Ep 15,16	1939	Honolulu BWS	Shaft	72	150	156	--	--	Municipal	22.4	-6	--	--	9-2-001:001	30203
2255-32	Aiea Halawa Shft	1937	U S Navy	Shaft	96	95	99	--	--	Domestic	--	-4	--	--	9-9-010:014	30201
2255-37	Halawa 2	1961	Honolulu BWS	Rotary	16	256	345	285	305	Municipal	13.3	-89	-29	-49	9-9-051:054	30201
2255-38	Halawa 3	1961	Honolulu BWS	Rotary	16	270	359	314	--	Municipal	16.5	-89	-44		9-9-051:054	30201
2255-39	Halawa 1	1961	Honolulu BWS	Rotary	16	258	399	276	296	Municipal	15.8	-141	-18	-38	9-9-051:054	30201
2301-34	Hoaeae P1	1959	Honolulu BWS	--	16	131	194	107	155	Municipal	17	-63	24	-24	9-4-034:074	30203
2301-35	Hoaeae P2	1959	Honolulu BWS	--	16	133	197	113	155	Municipal	18.2	-64	20	-22	9-4-034:074	30203
2301-36	Hoaeae P3	1959	Honolulu BWS	--	16	131	198	107	155	Municipal	19.5	-67	24	-24	9-4-034:074	30203
2301-37	Hoaeae P4	1959	Honolulu BWS	--	16	130	195	108	156	Municipal	19.3	-65	22	-26	9-4-034:074	30203
2301-38	Hoaeae P5	1974	Honolulu BWS	Rotary	16	126	276	176	--	Municipal	--	-150	-50	--	9-4-034:074	30203
2301-39	Hoaeae P6	1974	Honolulu BWS	Rotary	16	123	273	173	--	Municipal	--	-150	-50	--	9-4-034:074	30203
2302-01	Kunia I P1	1957	Honolulu BWS	--	16	201	350	221	--	Municipal	20.8	-149	-20	--	9-4-002:014	30203
2302-02	Kunia I P2	1957	Honolulu BWS	--	16	201	338	221	--	Municipal	20.9	-137	-20	--	9-4-002:014	30203
2302-03	Kunia I P3	1972	Honolulu BWS	Rotary	16	206	427	246	--	Municipal	--	-221	-40	--	9-4-002:014	30203
2302-04	Kunia I P4	1972	Honolulu BWS	Rotary	16	201	420	241	--	Municipal	--	-219	-40	--	9-4-002:014	30203
2303-02	Honouliuli I-2	1987	Honolulu BWS	Percussion	14	411	563	550	--	Municipal	16	-199	-139	--	9-2-001:001	30204
2303-03	Honouliuli II-3	1987	Honolulu BWS	Percussion	14	419	534	450	--	Municipal	17	-115	-31	--	9-2-001:001	30204
2303-04	Honouliuli II-4	1988	Honolulu BWS	Percussion	14	421	555	455	--	Municipal	12.2	-134	-34	--	9-2-001:001	30204
2303-05	Honouliuli II-5	1989	Honolulu BWS	Percussion	14	432	545	465	--	Municipal	16	-113	-33	--	9-2-001:001	30204
2303-06	Honouliuli II-6	1989	Honolulu BWS	Percussion	14	432	535	455	--	Municipal	17.4	-103	-23	--	9-2-001:001	30204
2354-01	Halawa Shaft	1944	Honolulu BWS	Shaft	--	165	183	--	--	Municipal	--	-18	--	--	9-9-010:008	30201
2355-03	Aiea Gulch 1	1947	Honolulu BWS	--	14	304	342	288	--	Municipal	17.7	-38	16	--	9-9-009:106	30201
2355-05	Aiea Gulch 2	1947	Honolulu BWS	--	14	304	344	286	--	Municipal	18.5	-40	18	--	9-9-009:106	30201
2355-06	Aiea 1	1955	Honolulu BWS	--	14	258	360	290	--	Municipal	20.8	-102	-32	--	9-9-024:005	30201
2355-07	Aiea 2	1955	Honolulu BWS	--	14	258	358	288	--	Municipal	22	-100	-30	--	9-9-024:005	30201
2355-09	Kalauao 1	1965	Honolulu BWS	--	18	160	413	221	--	Municipal	74.6	-253	-61	--	9-8-011:032	30201
2355-10	Kalauao 2	1965	Honolulu BWS	--	18	159	413	222	--	Municipal	--	-254	-63	--	9-8-011:032	30201
2355-11	Kalauao 3	1965	Honolulu BWS	--	18	159	413	219	--	Municipal	--	-254	-60	--	9-8-011:032	30201
2355-12	Kalauao 4	1965	Honolulu BWS	--	18	160	413	221	--	Municipal	--	-253	-61	--	9-8-011:032	30201
2355-13	Kalauao 5	1969	Honolulu BWS	Rotary	18	159	413	227	--	Municipal	20.8	-254	-68	--	9-8-011:032	30201
2355-14	Kalauao 6	1969	Honolulu BWS	Rotary	18	160	413	230	--	Municipal	21	-253	-70	--	9-8-011:032	30201
2356-49	Waimalu I-1	1954	Honolulu BWS	--	12	102	327	129	--	Municipal	--	-225	-27	--	9-8-026:012	30201
2356-50	Waimalu I-2	1955	Honolulu BWS	--	12	102	327	127	--	Municipal	--	-225	-25	--	9-8-026:012	30201
2356-55	Kaonohi I-1	1966	Honolulu BWS	Rotary	16	252	542	289	--	Municipal	--	-290	-37	--	9-8-040:001	30201
2356-56	Kaonohi I-2	1966	Honolulu BWS	Rotary	16	252	549	296	--	Municipal	8.6	-297	-44	--	9-8-040:001	30201
2356-58	Kaamilo 1	1973	Honolulu BWS	Percussion	16	147	340	190	--	Municipal	--	-193	-43	--	9-8-031:020	30201
2356-59	Kaamilo 2	1973	Honolulu BWS	Percussion	16	148	340	190	--	Municipal	--	-192	-42	--	9-8-031:020	30201
2356-60	Waimalu II-1	1975	Honolulu BWS	Rotary	16	23	240	100	--	Municipal	18.4	-217	-77	--	9-8-026:012	30201
2356-61	Kaonohi II-1	1975	Honolulu BWS	Rotary	16	112	330	190	--	Municipal	18	-218	-78	--	9-8-039:010	30201
2356-62	Kaonohi II-2	1975	Honolulu BWS	Rotary	16	117	340	200	--	Municipal	15.3	-223	-83	--	9-8-039:010	30201
2356-63	Waimalu II-2	1975	Honolulu BWS	Percussion	16	26	240	100	--	Municipal	15.1	-214	-74	--	9-8-026:012	30201
2356-64	Waimalu II-3	1975	Honolulu BWS	Percussion	16	20	240	163	--	Municipal	14	-220	-143	--	9-8-026:012	30201
2357-23	Kaahumanu I-1	1975	Honolulu BWS	Rotary	16	49	230	90	--	Municipal	17.3	-181	-41	--	9-8-008:001	30201
2357-24	Kaahumanu I-2	1975	Honolulu BWS	Rotary	16	45	265	125	--	Municipal	14	-220	-80	--	9-8-008:001	30201

Table B-3
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Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

WELL NO.	WELL NAME	YEAR DRILLED	OWNER/USER	DRILLING METHOD	CASING DIAMETER	GROUND SURFACE ELEVATION	WELL DEPTH	SOLID CASING	PERFORATED CASING	USE	INITIAL DEPTH TO WATER	BOTTOM ELEVATION OF BOREHOLE	BOTTOM ELEVATION OF SOLID CASING	BOTTOM ELEVATION OF PERFORATED CASING	TAX MAP KEY	AQUIFER CODE*
2358-24	Pearl City	1949	Taba S	--	8	23	120	67	--	Domestic	16.7	-97	-44	--	9-6-003:033	30203
2358-30	Pearl City	1953	Sakamoto E M	--	2	11	103	31	--	Domestic	15.2	-92	-20	--	9-6-002:007	30203
2358-36	Pearl City	1954	Sakai K	--	2	13	102	52	--	Domestic	15.1	-89	-39	--	9-6-003:008	30203
2358-38	Pearl City	1955	Gora G	--	8	12	100	50	--	Domestic	17.6	-88	-38	--	9-6-002:008	30203
2358-40	Pearl City	1957	Nakama W T	--	4	18	119	62	--	Domestic	14.3	-101	-44	--	9-6-002:034	30203
2358-43	Pearl City	1959	Kini A	--	2	25	30	25	--	Domestic	--	-5	0	--	9-6-002:017	30203
2358-45	Pearl City	1967	Gora G	--	4	38	101	71	--	Domestic	16	-63	-33	--	9-6-002:018	30203
2358-47	Pearl City	1967	Alipio Sos	--	4	35	141	96	--	Domestic	--	-106	-61	--	9-6-002:023	30203
2358-49	Pearl City	1976	Nazarene Chrch	Rotary	4	21	125	76	--	Domestic	14.3	-104	-55	--	9-6-002:031	30203
2358-50	Waiawa	1985	Young K P	Percussion	8	38	80	--	--	Domestic	--	-42	--	--	9-6-002:017	30203
2358-52	Waiawa-Gendrano	1990	Crabbe F & J	Percussion	8	15	75	50	70	Domestic	--	-60	-35	-55	9-6-002:006	30203
2359-09	Waipahu	1953	Koshimizu	--	2	8	102	74	--	Domestic	15.6	-94	-66	--	--	30203
2359-10	Waipahu	1954	Gora G	--	4	23	100	43	--	Domestic	14.3	-77	-20	--	9-6-002:001	30203
2359-11	Waipahu	1954	Kobashigawa K	--	2	30	130	37	--	Domestic	19.8	-100	-7	--	9-6-003:022	30203
2359-12	Waipahu	1954	Brown G I	--	8	25	276	140	--	Domestic	16	-251	-115	--	9-4-038:083	30203
2359-13	Waipahu	1955	Nishida I	--	2	8	130	50	--	Domestic	19	-122	-42	--	9-6-003:005	30203
2359-18	Waipahu	1959	Jiminez E	--	2	24	126	67	--	Domestic	--	-102	-43	--	9-6-003:035	30203
2400-01	Waipahu I P2	1954	Honolulu BWS	--	16	200	355	231	--	Municipal	17.4	-155	-31	--	9-4-007:016	30203
2400-02	Waipahu I P1	1954	Honolulu BWS	--	16	200	355	231	--	Municipal	18.2	-155	-31	--	9-4-007:016	30203
2400-03	Waipahu I P3	1969	Honolulu BWS	--	16	203	386	254	--	Municipal	24.3	-183	-51	--	9-4-007:016	30203
2400-04	Waipahu I P4	1969	Honolulu BWS	--	16	203	386	254	--	Municipal	24	-183	-51	--	9-4-007:016	30203
2400-05	Waipahu II-2	1983	Honolulu BWS	Percussion	12	207	342	239	--	Municipal	--	-135	-32	--	9-4-007:037	30203
2400-06	Waipahu II-1	1983	Honolulu BWS	Percussion	12	211	344	241	--	Municipal	20.6	-133	-30	--	9-4-007:037	30203
2400-08	Waipahu II-3	1993	Honolulu BWS	Rotary	12	206	340	240	--	Municipal	15.2	-134	-34	--	9-4-007:037	30203
2400-09	Waipahu III-1	1994	Honolulu BWS	Rotary	15	318	458	358	--	Municipal	18.8	-140	-40	--	9-4-005:074	30203
2400-10	Waipahu III-2	1994	Honolulu BWS	Rotary	15	317	457	357	--	Municipal	--	-140	-40	--	9-4-005:074	30203
2400-11	Waipahu III-3	1994	Honolulu BWS	Rotary	15	312	455	355	--	Municipal	--	-143	-43	--	9-4-005:074	30203
2400-12	Waipahu III-5	1994	Honolulu BWS	Rotary	15	314	456	356	--	Municipal	--	-142	-42	--	9-4-005:074	30203
2400-13	Waipahu III-4	1995	Honolulu BWS	Rotary	15	314	453	353	--	Municipal	--	-139	-39	--	9-4-005:074	30203
2401-04	Kunia III-1	1995	C&C DHCD	Rotary	16	317	452	352	--	Municipal	--	-135	-35	--	9-4-137:138	30203
2401-05	Kunia III-2	1995	C&C DHCD	Rotary	16	316	454	357	--	Municipal	--	-138	-41	--	9-4-137:138	30203
2401-06	Kunia III-3	1995	C&C DHCD	Rotary	16	315	460	356	--	Municipal	--	-145	-41	--	9-4-137:138	30203
2402-01	Kunia II P1	1969	Honolulu BWS	Percussion	16	430	575	460	--	Municipal	20.6	-145	-30	--	9-4-002:017	30203
2402-02	Kunia II P2	1969	Honolulu BWS	--	16	430	575	465	--	Municipal	24.8	-145	-35	--	9-4-002:017	30203
2402-03	Kunia II P3	1990	Honolulu BWS	Percussion	16	417	610	460	--	Municipal	17	-193	-43	--	9-4-002:027	30203
2402-05	Kunia II P4	1996	Honolulu BWS	Rotary	16	420	559	459	--	Municipal	--	-139	-39	--	9-4-002:051	30203
2456-01	Newtown 1	1972	Honolulu BWS	Rotary	16	263	500	300	--	Municipal	42	-237	-37	--	9-8-054:010	30201
2456-02	Newtown 2	1972	Honolulu BWS	Rotary	16	263	500	300	--	Municipal	34	-237	-37	--	9-8-054:010	30201
2456-03	Newtown 3	1972	Honolulu BWS	Rotary	16	263	500	300	--	Municipal	16.2	-237	-37	--	9-8-054:010	30201
2457-01	Pearl City II-1	1957	Honolulu BWS	--	16	267	398	281	--	Municipal	19.7	-131	-14	--	9-7-070:111	30203
2457-02	Pearl City II-2	1957	Honolulu BWS	--	16	267	415	281	--	Municipal	18.6	-148	-14	--	9-7-070:111	30203
2457-03	Pearl City II-3	1968	Honolulu BWS	--	16	272	423	283	304	Municipal	16.3	-151	-11	-32	9-7-070:111	30203
2457-05	Punanani 6	1970	Honolulu BWS	Rotary	16	145	444	289	304	Municipal	13.6	-299	-144	-159	9-8-002:012	30201
2457-06	Punanani 1	1970	Honolulu BWS	Rotary	16	151	458	312	--	Municipal	13.5	-307	-161	--	9-8-002:012	30201
2457-09	Punanani 2	1970	Honolulu BWS	Rotary	16	153	461	312	--	Municipal	--	-308	-159	--	9-8-002:012	30201
2457-10	Punanani 4	1970	Honolulu BWS	Rotary	16	146	368	217	--	Municipal	--	-222	-71	--	9-8-002:012	30201
2457-11	Punanani 3B	1970	Honolulu BWS	Rotary	16	141	363	211	--	Municipal	--	-222	-70	--	9-8-002:012	30201
2457-12	Punanani 5B	1970	Honolulu BWS	Rotary	16	140	367	210	--	Municipal	--	-227	-70	--	9-8-002:012	30201
2457-13	Waiau 2	1971	Honolulu BWS	Rotary	16	263	504	300	--	Municipal	--	-241	-37	--	9-8-052:001	30201
2457-14	Waiau 1	1971	Honolulu BWS	Rotary	16	263	503	300	--	Municipal	--	-240	-37	--	9-8-052:001	30201

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December 2006

WELL NO.	WELL NAME	YEAR DRILLED	OWNER/USER	DRILLING METHOD	CASING DIAMETER	GROUND SURFACE ELEVATION	WELL DEPTH	SOLID CASING	PERFORATED CASING	USE	INITIAL DEPTH TO WATER	BOTTOM ELEVATION OF BOREHOLE	BOTTOM ELEVATION OF SOLID CASING	BOTTOM ELEVATION OF PERFORATED CASING	TAX MAP KEY	AQUIFER CODE*
2457-15	Waiau 3	1971	Honolulu BWS	Rotary	16	263	503	300	--	Municipal	--	-240	-37	--	9-8-052:001	30201
2458-01	Pearl City Shaft	1940	Honolulu BWS	Shaft	96	111	151	27	--	Municipal	18.9	-40	84	--	9-7-024:004	30203
2458-03	Pearl City I-1	1953	Honolulu BWS	--	14	120	150	56	--	Municipal	18.7	-30	64	--	9-7-033:134	30203
2458-04	Pearl City I-2	1953	Honolulu BWS	--	14	120	140	58	--	Municipal	17.5	-20	62	--	9-7-033:134	30203
2459-17	Waipahu	1957	Gora G	--	6	19	142	104	--	Domestic	22	-123	-85	--	9-6-003:017	30203
2459-18	Waipahu	1963	Kawano H T	--	4	22	185	48	--	Domestic	--	-163	-26	--	9-6-004:002	30203
2459-19	Waipio Hts 2	1964	Honolulu BWS	Rotary	16	202	337	234	--	Municipal	16.9	-135	-32	--	9-4-045:035	30203
2459-20	Waipio Hts 1	1964	Honolulu BWS	Rotary	16	202	337	234	--	Municipal	16.9	-135	-32	--	9-4-045:035	30203
2459-22	Waipahu	1979	Alipio S A	--	4	--	114	--	--	Domestic	--	--	--	--	9-6-003:018	30203
2459-23	Waipio Hts. I-3	1977	Honolulu BWS	Percussion	16	200	325	235	--	Municipal	14.6	-125	-35	--	9-4-044:036	30203
2459-24	Waipio Hts. I-4	1977	Honolulu BWS	Percussion	16	200	315	235	--	Municipal	15.6	-115	-35	--	9-4-044:036	30203
2459-25	Pearl City	1977	Cabitac R M	--	4	21	100	84	--	Domestic	14.3	-79	-63	--	9-6-003:013	30203
2500-01	Waipio Hts II-1	1978	Honolulu BWS	Rotary	16	416	546	446	--	Municipal	18	-130	-30	--	9-4-099:043	30203
2500-02	Waipio Hts II-2	1978	Honolulu BWS	Rotary	16	419	560	450	--	Municipal	18	-141	-31	--	9-4-099:043	30203
2557-01	Waimano Trng Sch	1941	State Of Haw	--	10	495	512	472	512	Domestic	21.1	-17	23	-17	9-7-025:001	30201
2557-02	Waimano Trng Sch	1950	State Of Haw	--	14	495	592	479	526	Domestic	21.1	-97	16	-31	9-7-025:001	30201
2557-03	Pearl City III	1977	Honolulu BWS	Rotary	12	620	750	650	--	Municipal	15.2	-130	-30		9-7-052:063	30203
2558-10	Waiawa Shaft	1951	U S Navy	Shaft	--	150	170	--	--	Domestic	--	-20	--	--	9-6-004:008	30203
2600-02	Kipapa Gulch	1957	Dairy Co Inc	--	10	297	401	299	--	Domestic	22.9	-104	-2	--	9-4-005:052	30203
2600-04	Mililani III-2	1979	Honolulu BWS	Rotary	16	665	815	705	--	Municipal		-150	-40	--	9-4-005:020	30203
2800-01	Mililani I P1	1968	Honolulu BWS	Rotary	20	762	1012	802	--	Municipal	35.1	-250	-40	--	9-5-001:036	30203
2800-02	Mililani I P2	1968	Honolulu BWS	Rotary	20	758	1008	798	--	Municipal	37.1	-250	-40	--	9-5-001:036	30203
2800-03	Mililani I P3	1972	Honolulu BWS	Rotary	20	760	1022	802	--	Municipal	--	-262	-42	--	9-5-001:036	30203
2800-04	Mililani I P4	1975	Honolulu BWS	Rotary	20	757	1008	797	--	Municipal	20.6	-251	-40	--	9-5-001:036	30203
2803-05	Del Monte Pump 3	1959	Del Monte Corp	--	16	857	1020	661	887	Domestic	277.4	-163	196	-30	9-2-005:002	30501
2858-01	Mililani IV	1984	Honolulu BWS	Rotary	18	960	1160	1030	--	Municipal	22.8	-200	-70	--	9-5-003:001	30203
2858-02	Mililani IV	1985	Honolulu BWS	Rotary	18	960	1160	1000	--	Municipal	22.8	-200	-40	--	9-5-003:001	30203
2858-03	Mililani IV	1985	Honolulu BWS	Rotary	18	960	1160	1000	--	Municipal	22.8	-200	-40	--	9-5-003:001	30203
2859-01	Mililani II P1	1978	Honolulu BWS	Rotary	16	835	995	875	--	Municipal	17.9	-160	-40	--	9-5-002:018	30203
2859-02	Mililani II P2	1979	Honolulu BWS	Rotary	16	835	985	875	--	Municipal	--	-150	-40	--	9-5-002:013	30203
2901-02	Schofield Batt	1936	U S Army	--	17	287	150	--	--	Domestic	284	137	--	--	7-6-001:001	30501
2901-03	Schofield Batt	1936	U S Army	--	17	287	140	86	--	Domestic	--	147	201	--	7-6-001:001	30501
2901-04	Schofield Batt	1936	U S Army	--	17	287	264	203	--	Domestic	--	23	84	--	7-6-001:001	30501
2901-06	Schofield Batt	1938	U S Army	--	17	276	264	80	--	Domestic	--	12	196	--	7-6-001:001	30501
2901-07	Schofield	1938	U S Army	Tunnel	90	850	1080	--	--	Municipal	550.1	-230	--	--	7-6-001:001	30501
2901-08	Wahiawa I	1941	Honolulu BWS	--	16	870	880	650	--	Municipal	275.4	-10	220	--	7-4-002:007	30501
2901-10	Schofield Batt	1956	U S Army	--	16	287	287	278	--	Domestic		0	9	--	7-6-001:001	30501
2901-11	Wahiawa I	1962	Honolulu BWS	Rotary	20	873	821	652	--	Municipal	272.9	52	221	--	7-4-002:007	30501
2901-12	Wahiawa I	1983	Honolulu BWS	Rotary	20	874	858	700	--	Municipal	279	16	174	--	7-4-002:007	30501
2902-01	Wahiawa II	1974	Honolulu BWS	Rotary	20	866	986	786	836	Municipal	275.8	-120	80	30	7-3-007:006	30501
2902-02	Wahiawa II-2	1996	Honolulu BWS	Rotary	16	868	861	762	--	Municipal	--	6	104	--	7-3-007:009	30501
3100-02	Wahiawa	1942	U S Navy	Rotary	14	1145	970	928	968	Municipal	288	175	217	177	7-1-002:007	30501
3307-19	Waialua-Mauka	1984	Waialua Ranch	Percussion	16	202	302	184	245	Domestic	23.4	-100	18	-43	6-7-002:004	30401
3405-01	Waialua	1955	Honolulu BWS	--	16	196	337	219	--	Municipal	12.2	-141	-23	--	6-4-001:008	30402
3405-02	Waialua	1955	Honolulu BWS	--	16	197	343	221	--	Municipal	12.2	-146	-24	--	6-4-001:008	30402
3405-03	Haleiwa 1	1979	Honolulu BWS	Rotary	12	207	336	236	--	Municipal	10	-129	-29	--	6-4-001:001	30402
3405-04	Haleiwa 2	1979	Honolulu BWS	Rotary	12	208	336	236	--	Municipal	10.1	-128	-28	--	6-4-001:001	30402

* = after Mink, J.F., and L.S. Lau, 1990. Aquifer Identification and Classification for the Island of Oahu: Groundwater Protection Strategy for Hawaii.
amsl = above mean sea level
bgs = below ground surface
This table is based on information from a shape file provide by the Department of Land and Natural Resources.
A drinking water well is defined as being a well designated for municipal or domestic use.

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Oahu Inactive Landfills - Relative Risk Evaluation
December 2006

WELL NO.	WELL NAME	YEAR DRILLED	OWNER/USER	DRILLING METHOD	CASING DIAMETER	GROUND SURFACE ELEVATION	WELL DEPTH	SOLID CASING	PERFORATED CASING	USE	INITIAL DEPTH TO WATER	BOTTOM ELEVATION OF BOREHOLE	BOTTOM ELEVATION OF SOLID CASING	BOTTOM ELEVATION OF PERFORATED CASING	TAX MAP KEY	AQUIFER CODE*
					(inches)	(feet)	(feet)	(feet)	(feet)		(feet bgs)	(feet amsl)	(feet amsl)	(feet amsl)		
2201-09	Waipahu	1945	Honolulu BWS	--	12	83	107	86	--	Sealed	18.5	-24	-3	--	--	30203
2201-10	Kunia T41 Deep	1949	Honolulu BWS	--	12	84	1113	92	--	Observation	20.3	-1029	-8	--	9-1-018:001	30203
2202-21	Ep 15,16	1939	Honolulu BWS	Shaft	72	150	156	--	--	Municipal	22.4	-6	--	--	9-2-001:001	30203
2255-33	Halawa Obs.	1954	Honolulu BWS	--	12	57	85	60	--	Observation	18.3	-28	-3	--	9-9-010:003	30201
2255-37	Halawa 2	1961	Honolulu BWS	Rotary	16	256	345	285	305	Municipal	13.3	-89	-29	-49	9-9-051:054	30201
2255-38	Halawa 3	1961	Honolulu BWS	Rotary	16	270	359	314	--	Municipal	16.5	-89	-44	--	9-9-051:054	30201
2255-39	Halawa 1	1961	Honolulu BWS	Rotary	16	258	399	276	296	Municipal	15.8	-141	-18	-38	9-9-051:054	30201
2258-10	Pearl City Pen	1940	Honolulu BWS	--	6	3	181	91	--	Sealed	17.4	-178	-88	--	--	30203
2301-34	Hoaeae P1	1959	Honolulu BWS	--	16	131	194	107	155	Municipal	17	-63	24	-24	9-4-034:074	30203
2301-35	Hoaeae P2	1959	Honolulu BWS	--	16	133	197	113	155	Municipal	18.2	-64	20	-22	9-4-034:074	30203
2301-36	Hoaeae P3	1959	Honolulu BWS	--	16	131	198	107	155	Municipal	19.5	-67	24	-24	9-4-034:074	30203
2301-37	Hoaeae P4	1959	Honolulu BWS	--	16	130	195	108	156	Municipal	19.3	-65	22	-26	9-4-034:074	30203
2301-38	Hoaeae P5	1974	Honolulu BWS	Rotary	16	126	276	176	--	Municipal	--	-150	-50	--	9-4-034:074	30203
2301-39	Hoaeae P6	1974	Honolulu BWS	Rotary	16	123	273	173	--	Municipal	--	-150	-50	--	9-4-034:074	30203
2301-44	Waipahu IV-2	1998	Honolulu BWS	Rotary	14	133	273	173	--	Municipal	--	-140	-40	--	9-4-002:005	30203
2301-45	Waipahu IV-3	1998	Honolulu BWS	Rotary	14	136	276	176	--	Unused	--	-140	-40	--	9-4-002:005	30203
2301-46	Waipahu IV-1	1998	Honolulu BWS	Rotary	14	131	271	171	--	Unused	--	-140	-40	--	9-4-002:005	30203
2301-47	Waipahu IV-4	1999	Honolulu BWS	Percussion	13	134	273	173	--	Municipal	--	-139	-39	--	9-4-002:005	30203
2302-01	Kunia I P1	1957	Honolulu BWS	--	16	201	350	221	--	Municipal	20.8	-149	-20	--	9-4-002:014	30203
2302-02	Kunia I P2	1957	Honolulu BWS	--	16	201	338	221	--	Municipal	20.9	-137	-20	--	9-4-002:014	30203
2302-03	Kunia I P3	1972	Honolulu BWS	Rotary	16	206	427	246	--	Municipal	--	-221	-40	--	9-4-002:014	30203
2302-04	Kunia I P4	1972	Honolulu BWS	Rotary	16	201	420	241	--	Municipal	--	-219	-40	--	9-4-002:014	30203
2303-01	Honouliuli I-1	1987	Honolulu BWS	Percussion	14	412	625	550	--	Unused	16	-213	-138	--	9-2-001:001	30204
2303-02	Honouliuli I-2	1987	Honolulu BWS	Percussion	14	411	563	550	--	Municipal	16	-199	-139	--	9-2-001:001	30204
2303-03	Honouliuli II-3	1987	Honolulu BWS	Percussion	14	419	534	450	--	Municipal	17	-115	-31	--	9-2-001:001	30204
2303-04	Honouliuli II-4	1988	Honolulu BWS	Percussion	14	421	555	455	--	Municipal	12.2	-134	-34	--	9-2-001:001	30204
2303-05	Honouliuli II-5	1989	Honolulu BWS	Percussion	14	432	545	465	--	Municipal	16	-113	-33	--	9-2-001:001	30204
2303-06	Honouliuli II-6	1989	Honolulu BWS	Percussion	14	432	535	455	--	Municipal	17.4	-103	-23	--	9-2-001:001	30204
2355-03	Aiea Gulch 1	1947	Honolulu BWS	--	14	304	342	288	--	Municipal	17.7	-38	16	--	9-9-009:106	30201
2355-04	Aiea Gulch B	1947	Honolulu BWS	--	18	304	289	--	--	Sealed	--	15	--	--	9-9-009:106	30201
2355-05	Aiea Gulch 2	1947	Honolulu BWS	--	14	304	344	286	--	Municipal	18.5	-40	18	--	9-9-009:106	30201
2355-06	Aiea 1	1955	Honolulu BWS	--	14	258	360	290	--	Municipal	20.8	-102	-32	--	9-9-024:005	30201
2355-07	Aiea 2	1955	Honolulu BWS	--	14	258	358	288	--	Municipal	22	-100	-30	--	9-9-024:005	30201
2355-08	Kalauao	1963	Honolulu BWS	--	12	158	390	202	--	Observation	81	-232	-44	--	9-8-011:032	30201
2355-09	Kalauao 1	1965	Honolulu BWS	--	18	160	413	221	--	Municipal	74.6	-253	-61	--	9-8-011:032	30201
2355-10	Kalauao 2	1965	Honolulu BWS	--	18	159	413	222	--	Municipal	--	-254	-63	--	9-8-011:032	30201
2355-11	Kalauao 3	1965	Honolulu BWS	--	18	159	413	219	--	Municipal	--	-254	-60	--	9-8-011:032	30201
2355-12	Kalauao 4	1965	Honolulu BWS	--	18	160	413	221	--	Municipal	--	-253	-61	--	9-8-011:032	30201
2355-13	Kalauao 5	1969	Honolulu BWS	Rotary	18	159	413	227	--	Municipal	20.8	-254	-68	--	9-8-011:032	30201
2355-14	Kalauao 6	1969	Honolulu BWS	Rotary	18	160	413	230	--	Municipal	21	-253	-70	--	9-8-011:032	30201
2355-15	Kaamilo Deep	2001	Honolulu BWS	Rotary	8	491	1617	480	--	Observation	--	-1126	11	--	9-8-035:043	30201
2356-45	Aiea	1945	Honolulu BWS	--	12	25	177	42	--	Sealed	15.8	-152	-17	--	--	30201
2356-49	Waimalu I-1	1954	Honolulu BWS	--	12	102	327	129	--	Municipal	--	-225	-27	--	9-8-026:012	30201
2356-50	Waimalu I-2	1955	Honolulu BWS	--	12	102	327	127	--	Municipal	--	-225	-25	--	9-8-026:012	30201
2356-52	Pearl Harbor	1959	Honolulu BWS	--	16	87	172	101	--	Sealed	16.2	-85	-14	--	--	30201
2356-53	Aiea	1959	Honolulu BWS	--	6	26	250	75	--	Observation	17.3	-224	-49	--	--	30201
2356-55	Kaonohi I-1	1966	Honolulu BWS	Rotary	16	252	542	289	--	Municipal	--	-290	-37	--	9-8-040:001	30201
2356-56	Kaonohi I-2	1966	Honolulu BWS	Rotary	16	252	549	296	--	Municipal	8.6	-297	-44	--	9-8-040:001	30201
2356-57	Waimalu	1971	Honolulu BWS	Percussion	10	22	250	77	--	Observation	--	-228	-55	--	9-8-026:002	30201
2356-58	Kaamilo 1	1973	Honolulu BWS	Percussion	16	147	340	190	--	Municipal	--	-193	-43	--	9-8-031:020	30201

Table B-4
ALL BWS WELLS IN THE
SCHOFIELD PLATEAU
Oahu Inactive Landfills - Relative Risk Evaluation
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WELL NO.	WELL NAME	YEAR DRILLED	OWNER/USER	DRILLING METHOD	CASING DIAMETER	GROUND SURFACE ELEVATION	WELL DEPTH	SOLID CASING	PERFORATED CASING	USE	INITIAL DEPTH TO WATER	BOTTOM ELEVATION OF BOREHOLE	BOTTOM ELEVATION OF SOLID CASING	BOTTOM ELEVATION OF PERFORATED CASING	TAX MAP KEY	AQUIFER CODE*
2356-59	Kaamilo 2	1973	Honolulu BWS	Percussion	16	148	340	190	--	Municipal	--	-192	-42	--	9-8-031:020	30201
2356-60	Waimalu II-1	1975	Honolulu BWS	Rotary	16	23	240	100	--	Municipal	18.4	-217	-77	--	9-8-026:012	30201
2356-61	Kaonohi II-1	1975	Honolulu BWS	Rotary	16	112	330	190	--	Municipal	18	-218	-78	--	9-8-039:010	30201
2356-62	Kaonohi II-2	1975	Honolulu BWS	Rotary	16	117	340	200	--	Municipal	15.3	-223	-83	--	9-8-039:010	30201
2356-63	Waimalu II-2	1975	Honolulu BWS	Percussion	16	26	240	100	--	Municipal	15.1	-214	-74	--	9-8-026:012	30201
2356-64	Waimalu II-3	1975	Honolulu BWS	Percussion	16	20	240	163	--	Municipal	14	-220	-143	--	9-8-026:012	30201
2356-65	Kaonohi II-3	1975	Honolulu BWS	Rotary	16	112	335	195	--	Unused	--	-223	-83	--	9-8-039:010	30201
2357-23	Kaahumanu I-1	1975	Honolulu BWS	Rotary	16	49	230	90	--	Municipal	17.3	-181	-41	--	9-8-008:001	30201
2357-24	Kaahumanu I-2	1975	Honolulu BWS	Rotary	16	45	265	125	--	Municipal	14	-220	-80	--	9-8-008:001	30201
2358-20	Pearl City Obs	1946	Honolulu BWS	--	12	47	71	60	--	Observation	17.5	-24	-13	--	9-7-024:002	30203
2400-01	Waipahu I P2	1954	Honolulu BWS	--	16	200	355	231	--	Municipal	17.4	-155	-31	--	9-4-007:016	30203
2400-02	Waipahu I P1	1954	Honolulu BWS	--	16	200	355	231	--	Municipal	18.2	-155	-31	--	9-4-007:016	30203
2400-03	Waipahu I P3	1969	Honolulu BWS	--	16	203	386	254	--	Municipal	24.3	-183	-51	--	9-4-007:016	30203
2400-04	Waipahu I P4	1969	Honolulu BWS	--	16	203	386	254	--	Municipal	24	-183	-51	--	9-4-007:016	30203
2400-05	Waipahu II-2	1983	Honolulu BWS	Percussion	12	207	342	239	--	Municipal	--	-135	-32	--	9-4-007:037	30203
2400-06	Waipahu II-1	1983	Honolulu BWS	Percussion	12	211	344	241	--	Municipal	20.6	-133	-30	--	9-4-007:037	30203
2400-08	Waipahu II-3	1993	Honolulu BWS	Rotary	12	206	340	240	--	Municipal	15.2	-134	-34	--	9-4-007:037	30203
2400-09	Waipahu III-1	1994	Honolulu BWS	Rotary	15	318	458	358	--	Municipal	18.8	-140	-40	--	9-4-005:074	30203
2400-10	Waipahu III-2	1994	Honolulu BWS	Rotary	15	317	457	357	--	Municipal	--	-140	-40	--	9-4-005:074	30203
2400-11	Waipahu III-3	1994	Honolulu BWS	Rotary	15	312	455	355	--	Municipal	--	-143	-43	--	9-4-005:074	30203
2400-12	Waipahu III-5	1994	Honolulu BWS	Rotary	15	314	456	356	--	Municipal	--	-142	-42	--	9-4-005:074	30203
2400-13	Waipahu III-4	1995	Honolulu BWS	Rotary	15	314	453	353	--	Municipal	--	-139	-39	--	9-4-005:074	30203
2400-14	Waipahu II-4	1999	Honolulu BWS	Rotary	14	208	360	240	--	Unused	--	-152	-32	--	9-4-007:037	30203
2402-01	Kunia II P1	1969	Honolulu BWS	Percussion	16	430	575	460	--	Municipal	20.6	-145	-30	--	9-4-002:017	30203
2402-02	Kunia II P2	1969	Honolulu BWS	--	16	430	575	465	--	Municipal	24.8	-145	-35	--	9-4-002:017	30203
2402-03	Kunia II P3	1990	Honolulu BWS	Percussion	16	417	610	460	--	Municipal	17	-193	-43	--	9-4-002:027	30203
2402-05	Kunia II P4	1996	Honolulu BWS	Rotary	16	420	559	459	--	Municipal	--	-139	-39	--	9-4-002:051	30203
2455-01	Upper Waimalu	1955	Honolulu BWS	--	16	168	321	170	180	Observation	22.1	-153	-2	-12	9-8-011:015	30201
2456-01	Newtown 1	1972	Honolulu BWS	Rotary	16	263	500	300	--	Municipal	42	-237	-37	--	9-8-054:010	30201
2456-02	Newtown 2	1972	Honolulu BWS	Rotary	16	263	500	300	--	Municipal	34	-237	-37	--	9-8-054:010	30201
2456-03	Newtown 3	1972	Honolulu BWS	Rotary	16	263	500	300	--	Municipal	16.2	-237	-37	--	9-8-054:010	30201
2456-04	Newtown Deep	2000	Honolulu BWS	Rotary	12	447	1469	469	--	Observation	--	-1022	-22	--	9-8-073:003	30201
2457-01	Pearl City II-1	1957	Honolulu BWS	--	16	267	398	281	--	Municipal	19.7	-131	-14	--	9-7-070:111	30203
2457-02	Pearl City II-2	1957	Honolulu BWS	--	16	267	415	281	--	Municipal	18.6	-148	-14	--	9-7-070:111	30203
2457-03	Pearl City II-3	1968	Honolulu BWS	--	16	272	423	283	304	Municipal	16.3	-151	-11	-32	9-7-070:111	30203
2457-04	Punanani Deep	1968	Honolulu BWS	Rotary	12	155	1458	924	--	Observation	20	-1303	-769	--	9-8-002:012	30201
2457-05	Punanani 6	1970	Honolulu BWS	Rotary	16	145	444	289	304	Municipal	13.6	-299	-144	-159	9-8-002:012	30201
2457-06	Punanani 1	1970	Honolulu BWS	Rotary	16	151	458	312	--	Municipal	13.5	-307	-161	--	9-8-002:012	30201
2457-07	Punanani	1970	Honolulu BWS	Rotary	16	--	455	--	--	Sealed	--	--	--	--	9-8-002:012	30201
2457-08	Punanani	1970	Honolulu BWS	Rotary	10	--	338	--	--	Sealed	--	--	--	--	9-8-002:012	30201
2457-09	Punanani 2	1970	Honolulu BWS	Rotary	16	153	461	312	--	Municipal	--	-308	-159	--	9-8-002:012	30201
2457-10	Punanani 4	1970	Honolulu BWS	Rotary	16	146	368	217	--	Municipal	--	-222	-71	--	9-8-002:012	30201
2457-11	Punanani 3B	1970	Honolulu BWS	Rotary	16	141	363	211	--	Municipal	--	-222	-70	--	9-8-002:012	30201
2457-12	Punanani 5B	1970	Honolulu BWS	Rotary	16	140	367	210	--	Municipal	--	-227	-70	--	9-8-002:012	30201
2457-13	Waiau 2	1971	Honolulu BWS	Rotary	16	263	504	300	--	Municipal	--	-241	-37	--	9-8-052:001	30201
2457-14	Waiau 1	1971	Honolulu BWS	Rotary	16	263	503	300	--	Municipal	--	-240	-37	--	9-8-052:001	30201
2457-15	Waiau 3	1971	Honolulu BWS	Rotary	16	263	503	300	--	Municipal	--	-240	-37	--	9-8-052:001	30201
2458-01	Pearl City Shaft	1940	Honolulu BWS	Shaft	96	111	151	27	--	Municipal	18.9	-40	84	--	9-7-024:004	30203
2458-03	Pearl City I-1	1953	Honolulu BWS	--	14	120	150	56	--	Municipal	18.7	-30	64	--	9-7-033:134	30203
2458-04	Pearl City I-2	1953	Honolulu BWS	--	14	120	140	58	--	Municipal	17.5	-20	62	--	9-7-033:134	30203

Table B-4
ALL BWS WELLS IN THE
SCHOFIELD PLATEAU
Oahu Inactive Landfills - Relative Risk Evaluation
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WELL NO.	WELL NAME	YEAR DRILLED	OWNER/USER	DRILLING METHOD	CASING DIAMETER	GROUND SURFACE ELEVATION	WELL DEPTH	SOLID CASING	PERFORATED CASING	USE	INITIAL DEPTH TO WATER	BOTTOM ELEVATION OF BOREHOLE	BOTTOM ELEVATION OF SOLID CASING	BOTTOM ELEVATION OF PERFORATED CASING	TAX MAP KEY	AQUIFER CODE*
2458-05	Manana 1	1998	Honolulu BWS	Percussion	14	137	277	177	--	Municipal	--	-140	-40	--	9-7-024:004	30203
2458-06	Manana Deep	2000	Honolulu BWS	Rotary	8		1316	126	--	Observation	--	--	--	--	9-7-024:004	30203
2459-19	Waipio Hts 2	1964	Honolulu BWS	Rotary	16	202	337	234	--	Municipal	16.9	-135	-32	--	9-4-045:035	30203
2459-20	Waipio Hts 1	1964	Honolulu BWS	Rotary	16	202	337	234	--	Municipal	16.9	-135	-32	--	9-4-045:035	30203
2459-23	Waipio Hts. I-3	1977	Honolulu BWS	Percussion	16	200	325	235	--	Municipal	14.6	-125	-35	--	9-4-044:036	30203
2459-24	Waipio Hts. I-4	1977	Honolulu BWS	Percussion	16	200	315	235	--	Municipal	15.6	-115	-35	--	9-4-044:036	30203
2459-26	Waiawa Deep	2001	Honolulu BWS	Rotary	10	86	1080	80	--	Observation	--	-994	6	--	9-4-007:004	30203
2500-01	Waipio Hts II-1	1978	Honolulu BWS	Rotary	16	416	546	446	--	Municipal	18	-130	-30	--	9-4-099:043	30203
2500-02	Waipio Hts II-2	1978	Honolulu BWS	Rotary	16	419	560	450	--	Municipal	18	-141	-31	--	9-4-099:043	30203
2500-03	Waiola Deep	2000	Honolulu BWS	Rotary	8	376	1358	363	--	Observation	--	--	13	--	9-4-005:075	30203
2354-01	Halawa Shaft	1944	Honolulu BWS	Shaft	--	165	183	--	--	Municipal	--	-18	--	--	9-9-010:008	30201
2557-03	Pearl City III	1977	Honolulu BWS	Rotary	12	620	750	650	--	Municipal	15.2	-130	-30	--	9-7-052:063	30203
2557-04	Waimano Deep	2001	Honolulu BWS	Rotary	14	212	1244	210	--	Observation	--	-1032	2	--	9-7-025:010	30201
2600-03	Mililani III-1	1980	Honolulu BWS	Rotary	16	664	814	704	--	Unused	--	-150	-40	--	9-4-005:020	30203
2600-04	Mililani III-2	1979	Honolulu BWS	Rotary	16	665	815	705	--	Municipal	--	-150	-40	--	9-4-005:020	30203
2602-02	Poliwai Deep	2000	Honolulu BWS	Rotary	8	612	1895	587	--	Observation	--	-1283	25	--	9-4-003:001	30203
2658-03	Waiawa 575Ft-1	1995	Honolulu BWS	Rotary	18	591	761	611	--	Municipal	--	-170	-20	--	9-6-004:004	30203
2658-04	Waiawa 765Ft-1	1995	Honolulu BWS	Rotary	20	764	896	796	--	Unused	--	-132	-32	--	9-6-005:003	30203
2658-05	Waiawa 765Ft-2	1996	Honolulu BWS	Rotary	20	771	901	801	--	Municipal	--	-130	-30	--	9-6-005:003	30203
2659-02	Waipio Hts III-1	1987	Honolulu BWS	Rotary	14	571	710	604	--	Municipal	16.8	-139	-33	--	9-4-006:014	30203
2659-03	Waipio Hts III-2	1988	Honolulu BWS	Rotary	14	572	700	601	--	Municipal	21.8	-128	-29	--	9-4-006:014	30203
2659-04	Waiawa 575Ft-2	1995	Honolulu BWS	Rotary	18	578	738	598	--	Municipal	--	-160	-20	--	9-6-004:004	30203
2800-01	Mililani I P1	1968	Honolulu BWS	Rotary	20	762	1012	802	--	Municipal	35.1	-250	-40	--	9-5-001:036	30203
2800-02	Mililani I P2	1968	Honolulu BWS	Rotary	20	758	1008	798	--	Municipal	37.1	-250	-40	--	9-5-001:036	30203
2800-03	Mililani I P3	1972	Honolulu BWS	Rotary	20	760	1022	802	--	Municipal	--	-262	-42	--	9-5-001:036	30203
2800-04	Mililani I P4	1975	Honolulu BWS	Rotary	20	757	1008	797	--	Municipal	20.6	-251	-40	--	9-5-001:036	30203
2858-01	Mililani IV	1984	Honolulu BWS	Rotary	18	960	1160	1030	--	Municipal	22.8	-200	-70	--	9-5-003:001	30203
2858-02	Mililani IV	1985	Honolulu BWS	Rotary	18	960	1160	1000	--	Municipal	22.8	-200	-40	--	9-5-003:001	30203
2858-03	Mililani IV	1985	Honolulu BWS	Rotary	18	960	1160	1000	--	Municipal	22.8	-200	-40	--	9-5-003:001	30203
2859-01	Mililani II P1	1978	Honolulu BWS	Rotary	16	835	995	875	--	Municipal	17.9	-160	-40	--	9-5-002:018	30203
2859-02	Mililani II P2	1979	Honolulu BWS	Rotary	16	835	985	875	--	Municipal	--	-150	-40	--	9-5-002:013	30203
2901-08	Wahiawa I	1941	Honolulu BWS	--	16	870	880	650	--	Municipal	275.4	-10	220	--	7-4-002:007	30501
2901-09	Wahiawa I	1947	Honolulu BWS	--	18	873	990	633	--	Unused	275	-117	240	--	7-4-002:007	30501
2901-11	Wahiawa I	1962	Honolulu BWS	Rotary	20	873	821	652	--	Municipal	272.9	52	221	--	7-4-002:007	30501
2901-12	Wahiawa I	1983	Honolulu BWS	Rotary	20	874	858	700	--	Municipal	279	16	174	--	7-4-002:007	30501
2902-01	Wahiawa II	1974	Honolulu BWS	Rotary	20	866	986	786	836	Municipal	275.8	-120	80	30	7-3-007:006	30501
2902-02	Wahiawa II-2	1996	Honolulu BWS	Rotary	16	868	861	762	--	Municipal	--	6	104	--	7-3-007:009	30501
3405-01	Waialua	1955	Honolulu BWS	--	16	196	337	219	--	Municipal	12.2	-141	-23	--	6-4-001:008	30402
3405-02	Waialua	1955	Honolulu BWS	--	16	197	343	221	--	Municipal	12.2	-146	-24	--	6-4-001:008	30402
3405-03	Haleiwa 1	1979	Honolulu BWS	Rotary	12	207	336	236	--	Municipal	10	-129	-29	--	6-4-001:001	30402
3405-04	Haleiwa 2	1979	Honolulu BWS	Rotary	12	208	336	236	--	Municipal	10.1	-128	-28	--	6-4-001:001	30402
3405-05	Helemano Deep	2002	Honolulu BWS	Rotary	8	406	1100	400	--	Observation	--	-694	6	--	6-4-001:006	30402
3506-05	Haleiwa	1925	Honolulu BWS	--	12	20	163	68	--	Unused	16	-143	-48	--	6-6-009:023	30402

* = after Mink, J.F., and L.S. Lau, 1990. Aquifer Identification and Classification for the Island of Oahu: Groundwater Protection Strategy for Hawaii.
amsl = above mean sea level
bgs = below ground surface
This table is based on information from a shape file provide by the Department of Land and Natural Resources.

Table B-4
ALL BWS WELLS IN THE SCHOFIELD PLATEAU
Oahu Inactive Landfills - Relative Risk Evaluation
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WELL NO.	WELL NAME	YEAR DRILLED	OWNER/USER	DRILLING METHOD	CASING DIAMETER	GROUND SURFACE ELEVATION	WELL DEPTH	SOLID CASING	PERFORATED CASING	USE	INITIAL DEPTH TO WATER	BOTTOM ELEVATION OF BOREHOLE	BOTTOM ELEVATION OF SOLID CASING	BOTTOM ELEVATION OF PERFORATED CASING	TAX MAP KEY	AQUIFER CODE*
					(inches)	(feet)	(feet)	(feet)	(feet)		(feet bgs)	(feet amsl)	(feet amsl)	(feet amsl)		
2202-21	Ep 15,16	1939	Honolulu BWS	Shaft	72	150	156	--	--	Municipal	22.4	-6	--	--	9-2-001:001	30203
2255-37	Halawa 2	1961	Honolulu BWS	Rotary	16	256	345	285	305	Municipal	13.3	-89	-29	-49	9-9-051:054	30201
2255-38	Halawa 3	1961	Honolulu BWS	Rotary	16	270	359	314	--	Municipal	16.5	-89	-44	--	9-9-051:054	30201
2255-39	Halawa 1	1961	Honolulu BWS	Rotary	16	258	399	276	296	Municipal	15.8	-141	-18	-38	9-9-051:054	30201
2301-34	Hoaeae P1	1959	Honolulu BWS	--	16	131	194	107	155	Municipal	17	-63	24	-24	9-4-034:074	30203
2301-35	Hoaeae P2	1959	Honolulu BWS	--	16	133	197	113	155	Municipal	18.2	-64	20	-22	9-4-034:074	30203
2301-36	Hoaeae P3	1959	Honolulu BWS	--	16	131	198	107	155	Municipal	19.5	-67	24	-24	9-4-034:074	30203
2301-37	Hoaeae P4	1959	Honolulu BWS	--	16	130	195	108	156	Municipal	19.3	-65	22	-26	9-4-034:074	30203
2301-38	Hoaeae P5	1974	Honolulu BWS	Rotary	16	126	276	176	--	Municipal		-150	-50	--	9-4-034:074	30203
2301-39	Hoaeae P6	1974	Honolulu BWS	Rotary	16	123	273	173	--	Municipal		-150	-50	--	9-4-034:074	30203
2301-44	Waipahu IV-2	1998	Honolulu BWS	Rotary	14	133	273	173	--	Municipal	--	-140	-40	--	9-4-002:005	30203
2301-47	Waipahu IV-4	1999	Honolulu BWS	Percussion	13	134	273	173	--	Municipal	--	-139	-39	--	9-4-002:005	30203
2302-01	Kunia I P1	1957	Honolulu BWS	--	16	201	350	221	--	Municipal	20.8	-149	-20	--	9-4-002:014	30203
2302-02	Kunia I P2	1957	Honolulu BWS	--	16	201	338	221	--	Municipal	20.9	-137	-20	--	9-4-002:014	30203
2302-03	Kunia I P3	1972	Honolulu BWS	Rotary	16	206	427	246	--	Municipal		-221	-40	--	9-4-002:014	30203
2302-04	Kunia I P4	1972	Honolulu BWS	Rotary	16	201	420	241	--	Municipal		-219	-40	--	9-4-002:014	30203
2303-02	Honouliuli I-2	1987	Honolulu BWS	Percussion	14	411	563	550	--	Municipal	16	-199	-139	--	9-2-001:001	30204
2303-03	Honouliuli II-3	1987	Honolulu BWS	Percussion	14	419	534	450	--	Municipal	17	-115	-31	--	9-2-001:001	30204
2303-04	Honouliuli II-4	1988	Honolulu BWS	Percussion	14	421	555	455	--	Municipal	12.2	-134	-34	--	9-2-001:001	30204
2303-05	Honouliuli II-5	1989	Honolulu BWS	Percussion	14	432	545	465	--	Municipal	16	-113	-33	--	9-2-001:001	30204
2303-06	Honouliuli II-6	1989	Honolulu BWS	Percussion	14	432	535	455	--	Municipal	17.4	-103	-23	--	9-2-001:001	30204
2354-01	Halawa Shaft	1944	Honolulu BWS	Shaft	--	165	183	--	--	Municipal	--	-18	--	--	9-9-010:008	30201
2355-03	Aiea Gulch 1	1947	Honolulu BWS	--	14	304	342	288	--	Municipal	17.7	-38	16	--	9-9-009:106	30201
2355-05	Aiea Gulch 2	1947	Honolulu BWS	--	14	304	344	286	--	Municipal	18.5	-40	18	--	9-9-009:106	30201
2355-06	Aiea 1	1955	Honolulu BWS	--	14	258	360	290	--	Municipal	20.8	-102	-32	--	9-9-024:005	30201
2355-07	Aiea 2	1955	Honolulu BWS	--	14	258	358	288	--	Municipal	22	-100	-30	--	9-9-024:005	30201
2355-09	Kalauao 1	1965	Honolulu BWS	--	18	160	413	221	--	Municipal	74.6	-253	-61	--	9-8-011:032	30201
2355-10	Kalauao 2	1965	Honolulu BWS	--	18	159	413	222	--	Municipal	--	-254	-63	--	9-8-011:032	30201
2355-11	Kalauao 3	1965	Honolulu BWS	--	18	159	413	219	--	Municipal	--	-254	-60	--	9-8-011:032	30201
2355-12	Kalauao 4	1965	Honolulu BWS	--	18	160	413	221	--	Municipal	--	-253	-61	--	9-8-011:032	30201
2355-13	Kalauao 5	1969	Honolulu BWS	Rotary	18	159	413	227	--	Municipal	20.8	-254	-68	--	9-8-011:032	30201
2355-14	Kalauao 6	1969	Honolulu BWS	Rotary	18	160	413	230	--	Municipal	21	-253	-70	--	9-8-011:032	30201
2356-49	Waimalu I-1	1954	Honolulu BWS	--	12	102	327	129	--	Municipal	--	-225	-27	--	9-8-026:012	30201
2356-50	Waimalu I-2	1955	Honolulu BWS	--	12	102	327	127	--	Municipal	--	-225	-25	--	9-8-026:012	30201
2356-55	Kaonohi I-1	1966	Honolulu BWS	Rotary	16	252	542	289	--	Municipal	--	-290	-37	--	9-8-040:001	30201
2356-56	Kaonohi I-2	1966	Honolulu BWS	Rotary	16	252	549	296	--	Municipal	8.6	-297	-44	--	9-8-040:001	30201
2356-58	Kaamilo 1	1973	Honolulu BWS	Percussion	16	147	340	190	--	Municipal	--	-193	-43	--	9-8-031:020	30201
2356-59	Kaamilo 2	1973	Honolulu BWS	Percussion	16	148	340	190	--	Municipal	--	-192	-42	--	9-8-031:020	30201
2356-60	Waimalu II-1	1975	Honolulu BWS	Rotary	16	23	240	100	--	Municipal	18.4	-217	-77	--	9-8-026:012	30201
2356-61	Kaonohi II-1	1975	Honolulu BWS	Rotary	16	112	330	190	--	Municipal	18	-218	-78	--	9-8-039:010	30201
2356-62	Kaonohi II-2	1975	Honolulu BWS	Rotary	16	117	340	200	--	Municipal	15.3	-223	-83	--	9-8-039:010	30201
2356-63	Waimalu II-2	1975	Honolulu BWS	Percussion	16	26	240	100	--	Municipal	15.1	-214	-74	--	9-8-026:012	30201
2356-64	Waimalu II-3	1975	Honolulu BWS	Percussion	16	20	240	163	--	Municipal	14	-220	-143	--	9-8-026:012	30201
2357-23	Kaahumanu I-1	1975	Honolulu BWS	Rotary	16	49	230	90	--	Municipal	17.3	-181	-41	--	9-8-008:001	30201
2357-24	Kaahumanu I-2	1975	Honolulu BWS	Rotary	16	45	265	125	--	Municipal	14	-220	-80	--	9-8-008:001	30201
2400-01	Waipahu I P2	1954	Honolulu BWS	--	16	200	355	231	--	Municipal	17.4	-155	-31	--	9-4-007:016	30203
2400-02	Waipahu I P1	1954	Honolulu BWS	--	16	200	355	231	--	Municipal	18.2	-155	-31	--	9-4-007:016	30203
2400-03	Waipahu I P3	1969	Honolulu BWS	--	16	203	386	254	--	Municipal	24.3	-183	-51	--	9-4-007:016	30203
2400-04	Waipahu I P4	1969	Honolulu BWS	--	16	203	386	254	--	Municipal	24	-183	-51	--	9-4-007:016	30203
2400-05	Waipahu II-2	1983	Honolulu BWS	Percussion	12	207	342	239	--	Municipal	--	-135	-32	--	9-4-007:037	30203
2400-06	Waipahu II-1	1983	Honolulu BWS	Percussion	12	211	344	241	--	Municipal	20.6	-133	-30	--	9-4-007:037	30203
2400-08	Waipahu II-3	1993	Honolulu BWS	Rotary	12	206	340	240	--	Municipal	15.2	-134	-34	--	9-4-007:037	30203
2400-09	Waipahu III-1	1994	Honolulu BWS	Rotary	15	318	458	358	--	Municipal	18.8	-140	-40	--	9-4-005:074	30203
2400-10	Waipahu III-2	1994	Honolulu BWS	Rotary	15	317	457	357	--	Municipal	--	-140	-40	--	9-4-005:074	30203
2400-11	Waipahu III-3	1994	Honolulu BWS	Rotary	15	312	455	355	--	Municipal	--	-143	-43	--	9-4-005:074	30203

Table B-5
BWS WELLS IN THE SCHOFIELD PLATEAU
DESIGNATED FOR MUNICIPAL USE
Oahu Inactive Landfills - Relative Risk Evaluation
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WELL NO.	WELL NAME	YEAR DRILLED	OWNER/USER	DRILLING METHOD	CASING DIAMETER	GROUND SURFACE ELEVATION	WELL DEPTH	SOLID CASING	PERFORATED CASING	USE	INITIAL DEPTH TO WATER	BOTTOM ELEVATION OF BOREHOLE	BOTTOM ELEVATION OF SOLID CASING	BOTTOM ELEVATION OF PERFORATED CASING	TAX MAP KEY	AQUIFER CODE*
2400-12	Waipahu III-5	1994	Honolulu BWS	Rotary	15	314	456	356	--	Municipal	--	-142	-42	--	9-4-005:074	30203
2400-13	Waipahu III-4	1995	Honolulu BWS	Rotary	15	314	453	353	--	Municipal	--	-139	-39	--	9-4-005:074	30203
2402-01	Kunia II P1	1969	Honolulu BWS	Percussion	16	430	575	460	--	Municipal	20.6	-145	-30	--	9-4-002:017	30203
2402-02	Kunia II P2	1969	Honolulu BWS	--	16	430	575	465	--	Municipal	24.8	-145	-35	--	9-4-002:017	30203
2402-03	Kunia II P3	1990	Honolulu BWS	Percussion	16	417	610	460	--	Municipal	17	-193	-43	--	9-4-002:027	30203
2402-05	Kunia II P4	1996	Honolulu BWS	Rotary	16	420	559	459	--	Municipal	--	-139	-39	--	9-4-002:051	30203
2456-01	Newtown 1	1972	Honolulu BWS	Rotary	16	263	500	300	--	Municipal	42	-237	-37	--	9-8-054:010	30201
2456-02	Newtown 2	1972	Honolulu BWS	Rotary	16	263	500	300	--	Municipal	34	-237	-37	--	9-8-054:010	30201
2456-03	Newtown 3	1972	Honolulu BWS	Rotary	16	263	500	300	--	Municipal	16.2	-237	-37	--	9-8-054:010	30201
2457-01	Pearl City II-1	1957	Honolulu BWS	--	16	267	398	281	--	Municipal	19.7	-131	-14	--	9-7-070:111	30203
2457-02	Pearl City II-2	1957	Honolulu BWS	--	16	267	415	281	--	Municipal	18.6	-148	-14	--	9-7-070:111	30203
2457-03	Pearl City II-3	1968	Honolulu BWS	--	16	272	423	283	304	Municipal	16.3	-151	-11	-32	9-7-070:111	30203
2457-05	Punanani 6	1970	Honolulu BWS	Rotary	16	145	444	289	304	Municipal	13.6	-299	-144	-159	9-8-002:012	30201
2457-06	Punanani 1	1970	Honolulu BWS	Rotary	16	151	458	312	--	Municipal	13.5	-307	-161	--	9-8-002:012	30201
2457-09	Punanani 2	1970	Honolulu BWS	Rotary	16	153	461	312	--	Municipal	--	-308	-159	--	9-8-002:012	30201
2457-10	Punanani 4	1970	Honolulu BWS	Rotary	16	146	368	217	--	Municipal	--	-222	-71	--	9-8-002:012	30201
2457-11	Punanani 3B	1970	Honolulu BWS	Rotary	16	141	363	211	--	Municipal	--	-222	-70	--	9-8-002:012	30201
2457-12	Punanani 5B	1970	Honolulu BWS	Rotary	16	140	367	210	--	Municipal	--	-227	-70	--	9-8-002:012	30201
2457-13	Waiau 2	1971	Honolulu BWS	Rotary	16	263	504	300	--	Municipal	--	-241	-37	--	9-8-052:001	30201
2457-14	Waiau 1	1971	Honolulu BWS	Rotary	16	263	503	300	--	Municipal	--	-240	-37	--	9-8-052:001	30201
2457-15	Waiau 3	1971	Honolulu BWS	Rotary	16	263	503	300	--	Municipal	--	-240	-37	--	9-8-052:001	30201
2458-01	Pearl City Shaft	1940	Honolulu BWS	Shaft	96	111	151	27	--	Municipal	18.9	-40	84	--	9-7-024:004	30203
2458-03	Pearl City I-1	1953	Honolulu BWS	--	14	120	150	56	--	Municipal	18.7	-30	64	--	9-7-033:134	30203
2458-04	Pearl City I-2	1953	Honolulu BWS	--	14	120	140	58	--	Municipal	17.5	-20	62	--	9-7-033:134	30203
2458-05	Manana 1	1998	Honolulu BWS	Percussion	14	137	277	177	--	Municipal	--	-140	-40	--	9-7-024:004	30203
2459-19	Waipio Hts 2	1964	Honolulu BWS	Rotary	16	202	337	234	--	Municipal	16.9	-135	-32	--	9-4-045:035	30203
2459-20	Waipio Hts 1	1964	Honolulu BWS	Rotary	16	202	337	234	--	Municipal	16.9	-135	-32	--	9-4-045:035	30203
2459-23	Waipio Hts. I-3	1977	Honolulu BWS	Percussion	16	200	325	235	--	Municipal	14.6	-125	-35	--	9-4-044:036	30203
2459-24	Waipio Hts. I-4	1977	Honolulu BWS	Percussion	16	200	315	235	--	Municipal	15.6	-115	-35	--	9-4-044:036	30203
2500-01	Waipio Hts II-1	1978	Honolulu BWS	Rotary	16	416	546	446	--	Municipal	18	-130	-30	--	9-4-099:043	30203
2500-02	Waipio Hts II-2	1978	Honolulu BWS	Rotary	16	419	560	450	--	Municipal	18	-141	-31	--	9-4-099:043	30203
2557-03	Pearl City III	1977	Honolulu BWS	Rotary	12	620	750	650	--	Municipal	15.2	-130	-30	--	9-7-052:063	30203
2600-04	Mililani III-2	1979	Honolulu BWS	Rotary	16	665	815	705	--	Municipal	--	-150	-40	--	9-4-005:020	30203
2658-03	Waiawa 575Ft-1	1995	Honolulu BWS	Rotary	18	591	761	611	--	Municipal	--	-170	-20	--	9-6-004:004	30203
2658-05	Waiawa 765Ft-2	1996	Honolulu BWS	Rotary	20	771	901	801	--	Municipal	--	-130	-30	--	9-6-005:003	30203
2659-02	Waipio Hts III-1	1987	Honolulu BWS	Rotary	14	571	710	604	--	Municipal	16.8	-139	-33	--	9-4-006:014	30203
2659-03	Waipio Hts III-2	1988	Honolulu BWS	Rotary	14	572	700	601	--	Municipal	21.8	-128	-29	--	9-4-006:014	30203
2659-04	Waiawa 575Ft-2	1995	Honolulu BWS	Rotary	18	578	738	598	--	Municipal	--	-160	-20	--	9-6-004:004	30203
2800-01	Mililani I P1	1968	Honolulu BWS	Rotary	20	762	1012	802	--	Municipal	35.1	-250	-40	--	9-5-001:036	30203
2800-02	Mililani I P2	1968	Honolulu BWS	Rotary	20	758	1008	798	--	Municipal	37.1	-250	-40	--	9-5-001:036	30203
2800-03	Mililani I P3	1972	Honolulu BWS	Rotary	20	760	1022	802	--	Municipal	--	-262	-42	--	9-5-001:036	30203
2800-04	Mililani I P4	1975	Honolulu BWS	Rotary	20	757	1008	797	--	Municipal	20.6	-251	-40	--	9-5-001:036	30203
2858-01	Mililani IV	1984	Honolulu BWS	Rotary	18	960	1160	1030	--	Municipal	22.8	-200	-70	--	9-5-003:001	30203
2858-02	Mililani IV	1985	Honolulu BWS	Rotary	18	960	1160	1000	--	Municipal	22.8	-200	-40	--	9-5-003:001	30203
2858-03	Mililani IV	1985	Honolulu BWS	Rotary	18	960	1160	1000	--	Municipal	22.8	-200	-40	--	9-5-003:001	30203
2859-01	Mililani II P1	1978	Honolulu BWS	Rotary	16	835	995	875	--	Municipal	17.9	-160	-40	--	9-5-002:018	30203
2859-02	Mililani II P2	1979	Honolulu BWS	Rotary	16	835	985	875	--	Municipal	--	-150	-40	--	9-5-002:013	30203
2901-08	Wahiawa I	1941	Honolulu BWS	--	16	870	880	650	--	Municipal	275.4	-10	220	--	7-4-002:007	30501
2901-11	Wahiawa I	1962	Honolulu BWS	Rotary	20	873	821	652	--	Municipal	272.9	52	221	--	7-4-002:007	30501
2901-12	Wahiawa I	1983	Honolulu BWS	Rotary	20	874	858	700	--	Municipal	279	16	174	--	7-4-002:007	30501
2902-01	Wahiawa II	1974	Honolulu BWS	Rotary	20	866	986	786	836	Municipal	275.8	-120	80	30	7-3-007:006	30501
2902-02	Wahiawa II-2	1996	Honolulu BWS	Rotary	16	868	861	762	--	Municipal	--	6	104	--	7-3-007:009	30501
3405-01	Waialua	1955	Honolulu BWS	--	16	196	337	219	--	Municipal	12.2	-141	-23	--	6-4-001:008	30402
3405-02	Waialua	1955	Honolulu BWS	--	16	197	343	221	--	Municipal	12.2	-146	-24	--	6-4-001:008	30402
3405-03	Haleiwa 1	1979	Honolulu BWS	Rotary	12	207	336	236	--	Municipal	10	-129	-29	--	6-4-001:001	30402
3405-04	Haleiwa 2	1979	Honolulu BWS	Rotary	12	208	336	236	--	Municipal	10.1	-128	-28	--	6-4-001:001	30402

* = after Mink, J.F., and L.S. Lau, 1990. Aquifer Identification and Classification for the Island of Oahu: Groundwater Protection Strategy for Hawaii.
amsl = above mean sea level
bgs = below ground surface
This table is based on information from a shape file provide by the Department of Land and Natural Resources

Table B-5
BWS WELLS IN THE SCHOFIELD PLATEAU
DESIGNATED FOR MUNICIPAL USE
Oahu Inactive Landfills - Relative Risk Evaluation
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APPENDIX C – Hawaii Source Water Assessment Program Impacted Well Data

Hawaii Source Water Assessment Program Well Contamination Data Associated with Category 1 Landfills

Well Contamination Data

331-086	2153-10	TCE	Moanalua Well Pump	3/11/1992	<	0.5	

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PRELIMINARY RESULTS

Well Contamination Data

334-007	2500-01	DCP	Walpole Heights II P-1	7/14/2000	<	0.3	
334-007	2500-01	DCP	Walpole Hts II P-1	5/25/2000	<	1	
334-007	2500-01	TCE	Walpole Hts II P-1	2/22/2001	<	0.5	
334-007	2500-01	TCE	Walpole Hts II P-1	8/11/1999	<	0.5	
334-007	2500-01	TCE	Walpole Hts II P-1	11/16/1993	<	0.6	
334-007	2500-01	TCE	Walpole Heights II P-1	2/28/2000	<	0.5	
334-007	2500-01	TCE	Walpole Hts II P-1	3/7/2002	<	0.5	
334-007	2500-01	TCE	Walpole Hts II P-1	5/1/1995	<	0.6	
334-007	2500-01	TCE	Walpole Hts II P-1	2/5/1992	<	0.5	
334-007	2500-01	TCE	Walpole Hts II P-1	10/18/1994	<	0.6	
334-007	2500-01	TCE	Walpole Heights II P-1	7/14/2000	<	1.1	
334-007	2500-01	TCE	Walpole Hts II P-1	8/10/1994	<	0.6	
334-007	2500-01	TCE	Walpole Hts II P-1	3/16/1994	<	0.6	
334-007	2500-01	TCE	Walpole Hts II P-1	5/25/2000	<	0.5	
334-007	2500-01	TCE	Walpole Hts II P-1	7/29/1991	<	0.5	
334-007	2500-01	TCE	Walpole Hts II P-1	1/10/1995	<	0.5	
334-007	2500-01	TCE	Walpole Hts II P-1	8/8/2000	<	0.5	
334-007	2500-01	TCE	Walpole Heights II P-1	11/28/2001	<	0.5	

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PRELIMINARY RESULTS

334-007	2500-01	TCE	Walpio Hts II P-1	6/18/2002		0.5	
334-007	2500-01	TCE	Walpio Heights II P-1	7/12/2001	<	0.5	
334-007	2500-01	TCE	Walpio Hts II P-1	11/13/1998	<	0.5	
334-007	2500-01	TCE	Walpio Hts II P-1	10/20/1999	<	0.5	
334-007	2500-01	TCE	Walpio Hts II P-1	6/29/1992	<	0.5	
334-007	2500-01	TCE	Walpio Hts II P-1	3/7/1997		0.5	
334-007	2500-01	TCE	Walpio Hts II P-1	5/25/1993		0.6	
334-007	2500-01	TCE	Walpio Hts II P-1	10/13/2000	<	0.5	
334-007	2500-01	TCE	Walpio Heights II P-1	5/9/2001		0.5	
334-007	2500-01	TCE	Walpio Hts II P-1	1/9/1996	<	0.5	
334-007	2500-01	TCE	Walpio Hts II P-1	10/31/2002		0.6	
334-007	2500-01	TCP	Walpio Hts II P-1	5/25/1993		0.5	
334-007	2500-01	TCP	Walpio Hts II P-1	11/16/1993	<	0.5	
334-007	2500-01	TCP	Walpio Heights II P-1	2/28/2000		0.6	
334-007	2500-01	TCP	Walpio Hts II P-1	1/10/1995		0.5	
334-007	2500-01	TCP	Walpio Hts II P-1	6/18/2002		0.53	
334-007	2500-01	TCP	Walpio Hts II P-1	5/1/1995	<	0.5	
334-007	2500-01	TCP	Walpio Heights II P-1	2/22/2001		0.65	

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334-007	2500-01	TCP	Walpio Hts II P-1	10/20/1999		0.5	
334-007	2500-01	TCP	Walpio Heights II P-1	7/12/2001		0.57	
334-007	2500-01	TCP	Walpio Hts II P-1	3/16/1994	<	0.5	
334-007	2500-01	TCP	Walpio Hts II P-1	10/31/2002		0.58	
334-007	2500-01	TCP	Walpio Hts II P-1	2/5/1992	<	0.5	
334-007	2500-01	TCP	Walpio Hts II P-1	1/9/1996	<	0.5	
334-007	2500-01	TCP	Walpio Heights II P-1	5/9/2001		0.54	
334-007	2500-01	TCP	Walpio Hts II P-1	6/29/1992		0.5	
334-007	2500-01	TCP	Walpio Hts II P-1	8/10/1994	<	0.5	
334-007	2500-01	TCP	Walpio Hts II P-1	8/11/1999		0.6	
334-007	2500-01	TCP	Walpio Hts II P-1	8/8/2000		0.61	
334-007	2500-01	TCP	Walpio Hts II P-1	3/7/2002		0.67	
334-007	2500-01	TCP	Walpio Hts II P-1	5/25/2000		0.71	
334-007	2500-01	TCP	Walpio Hts II P-1	11/13/1998		0.8	
334-007	2500-01	TCP	Walpio Hts II P-1	7/29/1991	<	0.5	
334-007	2500-01	TCP	Walpio Hts II P-1	3/7/1997		0.7	
334-007	2500-01	TCP	Walpio Heights II P-1	11/28/2001		0.61	
334-007	2500-01	TCP	Walpio Hts II P-1	10/18/1994	<	0.5	

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334-007	2500-01	TCP	Walpole Hts II P-1	10/13/2000	0	0.65	
334-007	2500-01	TCP	Walpole Hts II P-1	7/20/2002	0	0.63	

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Well Contamination Data

334-008	2500-02	EDB	Walpole Hts II P-2	10/30/1996	<	0.04	
334-008	2500-02	TCE	Walpole Hts II P-2	6/17/1994		0.7	
334-008	2500-02	TCE	Walpole Hts II P-2	2/5/1993		0.6	
334-008	2500-02	TCE	Walpole Hts II P-2	9/1/1992	<	0.5	
334-008	2500-02	TCE	Walpole Hts II P-2	10/14/1992	<	0.5	
334-008	2500-02	TCE	Walpole Hts II P-2	8/5/1991		0.5	
334-008	2500-02	TCP	Walpole Hts II P-2	10/30/1996	<	0.5	
334-008	2500-02	TCP	Walpole Hts II P-2	9/1/1992	<	0.5	
334-008	2500-02	TCP	Walpole Hts II P-2	6/17/1994		0.6	
334-008	2500-02	TCP	Walpole Hts II P-2	2/5/1993	<	0.5	
334-008	2500-02	TCP	Walpole Hts II P-2	10/14/1992	<	0.5	

Well Contamination Data

367-014	2600-04	DBCP	Millani Well III P-8	6/3/1996	6	0.059	X
367-014	2600-04	DBCP	Millani Wells III P-8	10/25/2001	6	0.09	
367-014	2600-04	DBCP	Millani Wells III P-8	7/18/2002	6	0.09	
367-014	2600-04	DBCP	Millani Well III P-8	10/18/1996	6	0.06	X
367-014	2600-04	DBCP	Millani Well III P-8	1/23/1996	6	0.07	X
367-014	2600-04	DBCP	Millani Well III P-8	6/25/1996	6	0.066	X
367-014	2600-04	DBCP	Millani Wells III P-8	6/13/2002	6	0.1	
367-014	2600-04	DBCP	Millani Wells III P-8	2/13/2002	6	0.09	
367-014	2600-04	DCP	Millani Wells III P-8	2/13/2002	2	1	
367-014	2600-04	DCP	Millani Well III P-8	10/18/1996	2	1	
367-015	2600-04	DCP	Millani Wells III P-8	12/3/2001	2	1	
367-014	2600-04	TCP	Millani Wells III P-8	7/18/2002	0	2.29	
367-014	2600-04	TCP	Millani Wells III P-8	6/13/2002	0	2.17	
367-014	2600-04	TCP	Millani Wells III P-8	2/13/2002	0	2.03	
367-014	2600-04	TCP	Millani Wells III P-8	10/25/2001	0	2.37	
367-014	2600-04	TCP	Millani Well III P-8	10/18/1996	0	1.9	X

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Well Contamination Data

333-003	2901-08	CTC	Wahiawa Wells I P-3	2/28/1995	<2	0.5	
333-003	2901-08	CTC	Wahiawa Wells I P-3	7/24/2001	<2	0.5	
333-003	2901-08	CTC	Wahiawa Wells I P-3	6/13/1994	<2	0.5	
333-003	2901-08	CTC	Wahiawa Wells I P-3	3/4/1997	<2	0.5	
333-003	2901-08	CTC	Wahiawa Wells I P-3	7/15/1999	<2	0.5	
333-003	2901-08	CTC	Wahiawa Wells I P-3	11/18/1997	<2	0.5	
333-003	2901-08	CTC	Wahiawa Wells I P-3	4/15/1999	<2	0.5	
333-003	2901-08	CTC	Wahiawa Wells I P-3	9/4/1992	<2	0.5	
333-003	2901-08	CTC	Wahiawa Wells I P-3	1/9/1996	<2	0.5	
333-003	2901-08	CTC	Wahiawa Wells I P-3	8/21/1996	<2	0.5	
333-003	2901-08	CTC	Wahiawa Wells I P-3	2/26/2001	<2	0.5	
333-003	2901-08	CTC	Wahiawa Wells I P-3	7/29/1991	<2	0.6	
333-003	2901-08	CTC	Wahiawa Wells I P-3	3/16/1999	<2	0.5	
333-003	2901-08	CTC	Wahiawa Wells I P-3	12/3/2002	<2	0.5	
333-003	2901-08	CTC	Wahiawa Wells I P-3	8/25/1998	<2	0.6	
333-003	2901-08	CTC	Wahiawa Wells I P-3	4/16/1998	<2	0.5	
333-003	2901-08	CTC	Wahiawa Wells I P-3	1/28/1991	<2	0.6	
333-003	2901-08	CTC	Wahiawa Wells I P-3	7/22/1997	<2	0.5	

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333-003	2901-08	CTC	Wahlawa Wells I P-3	10/10/1994	<	0.5	
333-003	2901-08	CTC	Wahlawa Wells I P-3	2/29/2000	<	0.5	
333-003	2901-08	CTC	Wahlawa Wells I P-3	11/16/2001	<	0.5	
333-003	2901-08	CTC	Wahlawa Wells I P-3	5/31/2000	<	0.5	
333-003	2901-08	CTC	Wahlawa Wells I P-3	7/16/2002	<	0.5	
333-003	2901-08	CTC	Wahlawa Wells I P-3	12/21/1994	<	0.5	
333-003	2901-08	CTC	Wahlawa Wells I P-3	10/18/1996		0.5	
333-003	2901-08	CTC	Wahlawa Wells I P-3	6/25/1992		0.5	
333-003	2901-08	CTC	Wahlawa Wells I P-3	7/27/1994	<	0.5	
333-003	2901-08	CTC	Wahlawa Wells I P-3	4/17/1997	<	0.5	
333-003	2901-08	CTC	Wahlawa Wells I P-3	8/3/2000	<	0.5	
333-003	2901-08	CTC	Wahlawa Wells I P-3	2/19/2002	<	0.5	
333-003	2901-08	CTC	Wahlawa Wells I P-3	1/31/1994	<	0.5	
333-003	2901-08	CTC	Wahlawa Wells I P-3	8/5/1991	<	0.5	
333-003	2901-08	CTC	Wahlawa Wells I P-3	10/20/2000	<	0.5	
333-003	2901-08	CTC	Wahlawa Wells I P-3	4/18/2001	<	0.5	
333-003	2901-08	CTC	Wahlawa Wells I P-3	10/26/1999	<	0.5	
333-003	2901-08	CTC	Wahlawa Wells I P-3	2/6/1992	<	0.5	

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333-003	2901-08	CTC	Wahlawa Wells I P-3	6/19/2002	<	0.5	
333-003	2901-08	PCE	Wahlawa Wells I P-3	8/3/2000		1.2	
333-003	2901-08	PCE	Wahlawa Wells I P-3	2/28/1995		0.7	
333-003	2901-08	PCE	Wahlawa Wells I P-3	7/24/2001		0.8	
333-003	2901-08	PCE	Wahlawa Wells I P-3	12/3/2002		1.4	
333-003	2901-08	PCE	Wahlawa Wells I P-3	11/16/2001		1.2	
333-003	2901-08	PCE	Wahlawa Wells I P-3	10/10/1994		0.7	
333-003	2901-08	PCE	Wahlawa Wells I P-3	7/27/1994		0.7	
333-003	2901-08	PCE	Wahlawa Wells I P-3	7/22/1997		1.2	
333-003	2901-08	PCE	Wahlawa Wells I P-3	4/16/1998		0.7	
333-003	2901-08	PCE	Wahlawa Wells I P-3	2/19/2002		0.9	
333-003	2901-08	PCE	Wahlawa Wells I P-3	3/4/1997		1.4	
333-003	2901-08	PCE	Wahlawa Wells I P-3	10/26/1999		1.1	
333-003	2901-08	PCE	Wahlawa Wells I P-3	7/15/1999		1	
333-003	2901-08	PCE	Wahlawa Wells I P-3	6/19/2002		1.4	
333-003	2901-08	PCE	Wahlawa Wells I P-3	8/25/1998		1.3	
333-003	2901-08	PCE	Wahlawa Wells I P-3	4/18/2001		1.2	
333-003	2901-08	PCE	Wahlawa Wells I P-3	6/13/1994		0.7	

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333-003	2901-08	PCE	Wahlawa Wells I P-3	4/17/1997	0	1.2	
333-003	2901-08	PCE	Wahlawa Wells I P-3	2/26/2001	0	1.3	
333-003	2901-08	PCE	Wahlawa Wells I P-3	5/31/2000	0	1.3	
333-003	2901-08	PCE	Wahlawa Wells I P-3	10/18/1996	0	1.2	
333-003	2901-08	PCE	Wahlawa Wells I P-3	12/21/1994	0	0.8	
333-003	2901-08	PCE	Wahlawa Wells I P-3	11/18/1997	0	1.2	
333-003	2901-08	PCE	Wahlawa Wells I P-3	10/20/2000	0	1.3	
333-003	2901-08	PCE	Wahlawa Wells I P-3	2/29/2000	0	0.9	
333-003	2901-08	PCE	Wahlawa Wells I P-3	11/23/1998	0	0.9	
333-003	2901-08	PCE	Wahlawa Wells I P-3	7/16/2002	0	1.3	
333-003	2901-08	PCE	Wahlawa Wells I P-3	1/9/1996	0	0.7	
333-003	2901-08	PCE	Wahlawa Wells I P-3	8/21/1996	0	1	
333-003	2901-08	PCE	Wahlawa Wells I P-3	4/15/1999	0	0.9	
333-003	2901-08	PCE	Wahlawa Wells I P-3	1/31/1994	0	0.6	
333-003	2901-08	PCE	Wahlawa Wells I P-3	3/16/1999	0	0.8	
333-003	2901-08	Tetrachloroethene	Wahlawa Wells I P-3	1/28/1991	0	0.8	
333-003	2901-08	Tetrachloroethene	Wahlawa Wells I P-3	7/29/1991	0	0.8	
333-003	2901-08	Tetrachloroethene	Wahlawa Wells I P-3	4/8/1991	0	0.4	

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333-003	2901-08	Tetrachloroethene	Wahlawa Wells I P-3	8/5/1991	0	0.6	
333-003	2901-08	Tetrachloroethene	Wahlawa Wells I P-3	9/4/1992	0	0.6	
333-003	2901-08	Tetrachloroethene	Wahlawa Wells I P-3	6/25/1992	0	0.5	
333-003	2901-08	Tetrachloroethene	Wahlawa Wells I P-3	2/6/1992	0	0.6	

Well Contamination Data

333-001	2901-11	CTC	Wahiawa Wells I P-1	9/4/1992	<	0.5	
333-001	2901-11	CTC	Wahiawa Wells I P-1	6/7/1994	<	0.5	
333-001	2901-11	CTC	Wahiawa Wells I P-1	1/28/1991	<	0.5	
333-001	2901-11	CTC	Wahiawa Wells I P-1	12/3/2002	<	0.5	
333-005	2901-11	CTC	Wahiawa Wells II P-1	12/1/1994	<	0.5	
333-001	2901-11	CTC	Wahiawa Wells I P-1	2/26/2001	<	0.5	
333-001	2901-11	CTC	Wahiawa Wells I P-1	5/31/2000	<	0.5	
333-001	2901-11	CTC	Wahiawa Wells I P-1	4/15/1999	<	0.5	
333-001	2901-11	CTC	Wahiawa Wells I P-1	4/17/1997	<	0.5	
333-001	2901-11	CTC	Wahiawa Wells I P-1	2/8/2000	<	0.5	
333-001	2901-11	CTC	Wahiawa Wells I P-1	1/31/1994	<	0.5	
333-001	2901-11	CTC	Wahiawa Wells I P-1	7/15/1999	<	0.5	
333-001	2901-11	CTC	Wahiawa Wells I P-1	8/10/2000	<	0.5	
333-001	2901-11	CTC	Wahiawa Wells I P-1	6/25/1992	<	0.5	
333-001	2901-11	CTC	Wahiawa Wells I P-1	10/26/1999	<	0.5	
333-001	2901-11	CTC	Wahiawa Wells I P-1	10/20/2000	<	0.5	
333-001	2901-11	CTC	Wahiawa Wells I P-1	7/16/2002	<	0.5	
333-001	2901-11	CTC	Wahiawa Wells I P-1	7/24/2001	<	0.5	

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333-001	2901-11	CTC	Wahlawa Wells I P-1	6/19/2002		0.5	
333-001	2901-11	CTC	Wahlawa Wells I P-1	2/19/2002	<	0.5	
333-001	2901-11	CTC	Wahlawa Wells I P-1	10/27/1993	<	0.5	
333-001	2901-11	CTC	Wahlawa Wells I P-1	12/7/1998	<	0.5	
333-001	2901-11	CTC	Wahlawa Wells I P-1	8/25/1998		0.6	
333-001	2901-11	CTC	Wahlawa Wells I P-1	3/16/1999	<	0.5	
333-001	2901-11	CTC	Wahlawa Wells I P-1	4/18/2001	<	0.5	
333-001	2901-11	CTC	Wahlawa Wells I P-1	8/3/2000	<	0.5	
333-001	2901-11	CTC	Wahlawa Wells I P-1	11/16/2001	<	0.5	
333-001	2901-11	CTC	Wahlawa Wells I P-1	3/4/1997	<	0.5	
333-001	2901-11	CTC	Wahlawa Wells I P-1	7/22/1997	<	0.5	
333-001	2901-11	CTC	Wahlawa Wells I P-1	1/22/1993	<	0.5	
333-001	2901-11	CTC	Wahlawa Wells I P-1	11/18/1997	<	0.5	
333-001	2901-11	CTC	Wahlawa Wells I P-1	10/18/1996	<	0.5	
333-001	2901-11	CTC	Wahlawa Wells I P-1	8/13/1991	<	0.5	
333-001	2901-11	CTC	Wahlawa Wells I P-1	8/21/1996	<	0.5	
333-001	2901-11	CTC	Wahlawa Wells I P-1	4/16/1998	<	0.5	
333-001	2901-11	CTC	Wahlawa Wells I P-1	6/13/1994	<	0.5	

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333-001	2901-11	CTC	Wahlawa Wells I P-1	1/22/1998	<	0.5	
333-001	2901-11	DBCP	Wahlawa Wells I P-1	11/19/1992	<	0.04	
333-001	2901-11	DBCP	Wahlawa Wells I P-1	1/31/1994	<	0.04	
333-001	2901-11	DBCP	Wahlawa Wells I P-1	4/17/1997	<	0.04	
333-001	2901-11	DBCP	Wahlawa Wells I P-1	8/25/1998	<	0.04	
333-001	2901-11	DBCP	Wahlawa Wells I P-1	11/18/1997	<	0.04	
333-001	2901-11	DBCP	Wahlawa Wells I P-1	10/10/1991		0.04	x
333-001	2901-11	DBCP	Wahlawa Wells I P-1	6/26/1996	<	0.04	
333-001	2901-11	DBCP	Wahlawa Wells I P-1	2/12/1992		0.04	x
333-001	2901-11	DBCP	Wahlawa Wells I P-1	8/13/1992	<	0.04	
333-001	2901-11	PCE	Wahlawa Wells I P-1	12/3/2002		0.8	
333-001	2901-11	PCE	Wahlawa Wells I P-1	2/26/2001	<	0.5	
333-001	2901-11	PCE	Wahlawa Wells I P-1	1/31/1994	<	0.5	
333-001	2901-11	PCE	Wahlawa Wells I P-1	4/16/1998	<	0.5	
333-001	2901-11	PCE	Wahlawa Wells I P-1	8/21/1996	<	0.5	
333-001	2901-11	PCE	Wahlawa Wells I P-1	8/25/1998	<	0.5	
333-001	2901-11	PCE	Wahlawa Wells I P-1	10/27/1993	<	0.5	
333-001	2901-11	PCE	Wahlawa Wells I P-1	11/16/2001		0.5	

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333-001	2901-11	PCE	Wahiawa Wells I P-1	7/24/2001	<	0.5	
333-001	2901-11	PCE	Wahiawa Wells I P-1	2/19/2002	<	0.5	
333-001	2901-11	PCE	Wahiawa Wells I P-1	3/16/1999	<	0.5	
333-001	2901-11	PCE	Wahiawa Wells I P-1	6/13/1994	<	0.5	
333-001	2901-11	PCE	Wahiawa Wells I P-1	6/7/1994	<	0.5	
333-001	2901-11	PCE	Wahiawa Wells I P-1	7/15/1999	<	0.5	
333-001	2901-11	PCE	Wahiawa Wells I P-1	6/19/2002		0.9	
333-001	2901-11	PCE	Wahiawa Wells I P-1	10/18/1996	<	0.5	
333-001	2901-11	PCE	Wahiawa Wells I P-1	7/16/2002		0.7	
333-005	2901-11	PCE	Wahiawa Wells II P-1	12/1/1994		0.6	
333-001	2901-11	PCE	Wahiawa Wells I P-1	4/17/1997	<	0.5	
333-001	2901-11	PCE	Wahiawa Wells I P-1	4/15/1999	<	0.5	
333-001	2901-11	PCE	Wahiawa Wells I P-1	10/20/2000	<	0.5	
333-001	2901-11	PCE	Wahiawa Wells I P-1	11/18/1997	<	0.5	
333-001	2901-11	PCE	Wahiawa Wells I P-1	12/7/1998	<	0.5	
333-001	2901-11	PCE	Wahiawa Wells P-1	5/31/2000	<	0.5	
333-001	2901-11	PCE	Wahiawa Wells I P-1	1/22/1998	<	0.5	
333-001	2901-11	PCE	Wahiawa Wells I P-1	7/22/1997	<	0.5	

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333-001	2901-11	PCE	Wahlawa Wells I P-1	8/3/2000	<	0.5	
333-001	2901-11	PCE	Wahlawa Wells I P-1	3/4/1997		0.6	
333-001	2901-11	PCE	Wahlawa Wells I P-1	2/8/2000	<	0.5	
333-001	2901-11	PCE	Wahlawa Wells I P-1	4/18/2001		0.5	
333-001	2901-11	PCE	Wahlawa Wells I P-1	8/10/2000	<	0.5	
333-001	2901-11	PCE	Wahlawa Wells I P-1	10/26/1999	<	0.5	
333-001	2901-11	TCE	Wahlawa Wells I P-1	12/3/2002	<	0.5	
333-001	2901-11	TCE	Wahlawa Wells I P-1	7/24/2001	<	0.5	
333-001	2901-11	TCE	Wahlawa Wells I P-1	11/16/2001	<	0.5	
333-001	2901-11	TCE	Wahlawa Wells I P-1	8/3/2000	<	0.5	
333-001	2901-11	TCE	Wahlawa Wells I P-1	8/10/2000	<	0.2	
333-001	2901-11	TCE	Wahlawa Wells I P-1	4/18/2001	<	0.5	
333-001	2901-11	TCE	Wahlawa Wells I P-1	10/20/2000	<	0.5	
333-005	2901-11	TCP	Wahlawa Wells II P-1	12/1/1994	<	0.5	

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333-002	2901-12	CTC	Wahiawa Wells I P-2	4/7/1997	D	0.5	
333-002	2901-12	CTC	Wahiawa Wells I P-2	12/1/1994	<	0.5	
333-002	2901-12	CTC	Wahiawa Wells I P-2	11/13/1996	<	0.5	
333-002	2901-12	CTC	Wahiawa Wells I P-2	10/14/1992	<	0.5	
333-002	2901-12	CTC	Wahiawa Wells I P-2	2/16/1995	<	0.5	
333-002	2901-12	CTC	Wahiawa Wells I P-2	8/5/1991	D	0.6	
333-002	2901-12	CTC	Wahiawa Wells I P-2	1/9/1996	<	0.5	
333-002	2901-12	CTC	Wahiawa Wells I P-2	7/29/1996	<	0.5	
333-002	2901-12	CTC	Wahiawa Wells I P-2	1/22/1993	<	0.5	
333-002	2901-12	CTC	Wahiawa Wells I P-2	4/17/1997	D	0.6	
333-002	2901-12	CTC	Wahiawa Wells I P-2	10/27/1993	<	0.5	
333-002	2901-12	CTC	Wahiawa Wells I P-2	7/27/1994	<	0.5	
333-002	2901-12	CTC	Wahiawa Wells I P-2	5/25/1993	<	0.5	
333-002	2901-12	CTC	Wahiawa Wells I P-2	7/29/1991	D	0.6	
333-002	2901-12	CTC	Wahiawa Wells I P-2	6/25/1992	<	0.5	
333-002	2901-12	CTC	Wahiawa Wells I P-2	10/10/1994	<	0.5	
333-002	2901-12	CTC	Wahiawa Wells I P-2	6/13/1994	<	0.5	
333-002	2901-12	DBCP	Wahiawa Wells I P-2	3/21/1995	<	0.04	

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333-002	2901-12	DBCP	Wahlawa Wells I P-2	8/13/1992	<	0.04	
333-002	2901-12	PCE	Wahlawa Wells I P-2	1/9/1996	<	0.5	
333-002	2901-12	PCE	Wahlawa Wells I P-2	7/29/1996	<	0.5	
333-002	2901-12	PCE	Wahlawa Wells I P-2	5/25/1993	0	0.5	
333-002	2901-12	PCE	Wahlawa Wells I P-2	2/16/1995	<	0.5	
333-002	2901-12	PCE	Wahlawa Wells I P-2	4/7/1997	0	0.6	
333-002	2901-12	PCE	Wahlawa Wells I P-2	10/10/1994	<	0.5	
333-002	2901-12	PCE	Wahlawa Wells I P-2	11/13/1996	<	0.5	
333-002	2901-12	PCE	Wahlawa Wells I P-2	7/27/1994	<	0.5	
333-002	2901-12	PCE	Wahlawa Wells I P-2	12/1/1994	<	0.5	
333-002	2901-12	PCE	Wahlawa Wells I P-2	4/17/1997	0	0.6	
333-002	2901-12	PCE	Wahlawa Wells I P-2	10/27/1993	<	0.5	
333-002	2901-12	PCE	Wahlawa Wells I P-2	6/13/1994	<	0.5	
333-002	2901-12	Tetrachloroethene	Wahlawa Wells I P-2	8/5/1991	0	0.4	
333-002	2901-12	Tetrachloroethene	Wahlawa Wells I P-2	10/14/1992	<	0.5	
333-002	2901-12	Tetrachloroethene	Wahlawa Wells I P-2	1/22/1993	<	0.5	
333-002	2901-12	Tetrachloroethene	Wahlawa Wells I P-2	1/22/1993	<	0.5	
333-002	2901-12	Tetrachloroethene	Wahlawa Wells I P-2	7/29/1991	0	0.4	

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Well Contamination Data

335-002	2301134	Atrazine	Hoaeae Wells P-1	8/28/1996		0.063	
335-002	2301134	TCP	Hoaeae Wells P-1	1/27/1998	<	0.5	
335-002	2301134	TCP	Hoaeae Wells P-1	7/7/1999	<	0.5	
335-002	2301134	TCP	Hoaeae Wells P-1	12/10/1998	<	0.5	
335-002	2301134	TCP	Hoaeae Wells P-1	5/22/1997	<	0.5	
335-002	2301134	TCP	Hoaeae Wells P-1	4/30/1999	<	0.5	
335-002	2301134	TCP	Hoaeae Wells P-1	2/5/1993	<	0.5	
335-002	2301134	TCP	Hoaeae Wells P-1	11/10/1997	<	0.5	
335-002	2301134	TCP	Hoaeae Wells P-1	5/5/1998	<	0.5	

Well Contamination Data

335-003	2301-35	TCP	Hoaeae Wells P-2	10/31/2002		0.42	
335-003	2301-35	TCP	Hoaeae Wells P-2	7/7/2000		0.4	
335-003	2301-35	TCP	Hoaeae Wells P-2	4/16/1999	<	0.5	
335-003	2301-35	TCP	Hoaeae Well P-2	8/31/1998	<	0.5	
335-003	2301-35	TCP	Hoaeae Well P-2	5/21/2002		0.39	
335-003	2301-35	TCP	Hoaeae Wells P-2	7/11/2001		0.42	
335-003	2301-35	TCP	Hoaeae Wells P-2	4/16/1998	<	0.5	
335-003	2301-35	TCP	Hoaeae Wells P-2	5/10/2000		0.35	
335-003	2301-35	TCP	Hoaeae Wells P-2	7/20/2000		0.38	
335-003	2301-35	TCP	Hoaeae Wells P-2	11/7/2001		0.43	
335-003	2301-35	TCP	Hoaeae Wells P-2	10/22/1999	<	0.5	
335-003	2301-35	TCP	Hoaeae Wells P-2	3/4/1997	<	0.5	
335-003	2301-35	TCP	Hoaeae Wells P-2	2/21/2001		0.34	
335-003	2301-35	TCP	Hoaeae Wells P-2	2/21/2002		0.44	
335-003	2301-35	TCP	Hoaeae Wells P-2	7/23/1997	<	0.5	
335-003	2301-35	TCP	Hoaeae Wells P-2	4/23/2001		0.41	
335-003	2301-35	TCP	Hoaeae Wells P-2	2/22/2000	<	0.5	
335-003	2301-35	TCP	Hoaeae Wells P-2	7/14/1999	<	0.5	

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335-003	2301-35	TCP	Hoaeae Wells P-2	12/2/1998	<	0.5	
335-003	2301-35	TCP	Hoaeae Wells P-2	4/17/1997	<	0.5	
335-003	2301-35	TCP	Hoaeae Wells P-2	1/27/1998	<	0.5	

Well Contamination Data

335-005	2301136	Atrazine	Hoaeae Wells P-4	5/21/2002		0.051	
335-005	2301136	Atrazine	Hoaeae Wells P-4	10/7/1998		0.067	
335-005	2301136	Atrazine	Hoaeae Wells P-4	11/25/2002		0.093	
335-005	2301136	Atrazine	Hoaeae Wells P-4	3/1/2000		0.092	
335-005	2301136	Atrazine	Hoaeae Wells P-4	11/5/1998	<	0.05	
335-005	2301136	Atrazine	Hoaeae Wells P-4	6/5/2002		0.062	
335-005	2301136	Atrazine	Hoaeae Wells P-4	4/21/1999		0.056	
335-005	2301136	Atrazine	Hoaeae Wells P-4	11/3/2000		0.052	
335-005	2301136	Dieldrin	Hoaeae Wells P-4	6/5/2002		0.013	
335-005	2301136	Dieldrin	Hoaeae Wells P-4	5/21/2002		0.014	
335-005	2301136	TCP	Hoaeae Wells P-4	11/1/2001		0.48	
335-005	2301136	TCP	Hoaeae Wells P-4	4/23/2001		0.48	
335-005	2301136	TCP	Hoaeae Wells P-4	7/7/2000		0.54	
335-005	2301136	TCP	Hoaeae Wells P-4	7/10/2001		0.42	
335-005	2301136	TCP	Hoaeae Wells P-4	1/22/1998	<	0.5	
335-005	2301136	TCP	Hoaeae Well P-4	5/21/2002		0.52	
335-005	2301136	TCP	Hoaeae Wells P-4	8/31/1998	<	0.5	
335-005	2301136	TCP	Hoaeae Wells P-4	2/13/1992	<	0.5	

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335-005	2301-36	TCP	Hoaeae Wells P-4	2/22/2002		0.6	
335-005	2301-36	TCP	Hoaeae Wells P-4	7/7/1999	<	0.5	
335-005	2301-36	TCP	Hoaeae Wells P-4	5/10/2000		0.48	
335-005	2301-36	TCP	Hoaeae Wells P-4	12/2/1998	<	0.5	
335-005	2301-36	TCP	Hoaeae Wells P-4	1/9/1996	<	0.5	
335-005	2301-36	TCP	Hoaeae Wells P-4	5/21/1997	<	0.5	
335-005	2301-36	TCP	Hoaeae Wells P-4	11/25/2002		0.57	
335-005	2301-36	TCP	Hoaeae Wells P-4	10/12/2000		0.52	
335-005	2301-36	TCP	Hoaeae Wells P-4	10/20/1999	<	0.5	
335-005	2301-36	TCP	Hoaeae Wells P-4	7/20/2000		0.52	
335-005	2301-36	TCP	Hoaeae Wells P-4	4/30/1999	<	0.5	
335-005	2301-36	TCP	Hoaeae Wells P-4	7/23/1997	<	0.5	
335-005	2301-36	TCP	Hoaeae Wells P-4	4/16/1998	<	0.5	
335-005	2301-36	TCP	Hoaeae Wells P-4	3/23/1999	<	0.5	
335-005	2301-36	TCP	Hoaeae Wells P-4	2/21/2001		0.53	
335-005	2301-36	TCP	Hoaeae Wells P-4	11/10/1997	<	0.5	
335-005	2301-36	TCP	Hoaeae Wells P-4	2/10/2000	<	0.5	

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335-004	2301137	Atrazine	Hoaeae Wells P-3	5/6/1996		0.094	
335-004	2301137	TCP	Hoaeae Wells P-3	7/11/2001		0.41	
335-004	2301137	TCP	Hoaeae Wells P-3	1/31/1994	<	0.5	
335-004	2301137	TCP	Hoaeae Wells P-3	1/9/1996	<	0.5	
335-004	2301137	TCP	Hoaeae Wells P-3	4/23/2001		0.39	
335-004	2301137	TCP	Hoaeae Wells P-3	2/22/2002		0.41	
335-004	2301137	TCP	Hoaeae Wells P-3	10/14/1992	<	0.5	
335-004	2301137	TCP	Hoaeae Wells P-3	3/23/1999	<	0.5	
335-004	2301137	TCP	Hoaeae Wells P-3	3/4/1997	<	0.5	
335-004	2301137	TCP	Hoaeae Wells P-3	11/14/2002		0.36	
335-004	2301137	TCP	Hoaeae Wells P-3	11/7/2001		0.35	
335-004	2301137	TCP	Hoaeae Wells P-3	12/2/1998	<	0.5	
335-004	2301137	TCP	Hoaeae Wells P-3	7/25/1996	<	0.5	
335-004	2301137	TCP	Hoaeae Wells P-3	2/21/2001		0.34	
335-004	2301137	TCP	Hoaeae Wells P-3	4/16/1998	<	0.5	
335-004	2301137	TCP	Hoaeae Well P-3	5/21/2002		0.34	
335-004	2301137	TCP	Hoaeae Wells P-3	7/20/2000		0.32	
335-004	2301137	TCP	Hoaeae Wells P-3	10/12/2000		0.37	

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335-004	2301-37	TCP	Hoaeae Wells P-3	7/7/2000		0.39	
335-004	2301-37	TCP	Hoaeae Wells P-3	10/20/1999	<	0.5	
335-004	2301-37	TCP	Hoaeae Wells P-3	5/10/2000		0.35	
335-004	2301-37	TCP	Hoaeae Wells P-3	2/7/2000	<	0.5	
335-004	2301-37	TCP	Hoaeae Wells P-3	7/7/1999	<	0.5	
335-004	2301-37	TCP	Hoaeae Wells P-3	4/16/1999	<	0.5	

Well Contamination Data

335-006	2301-38	TCP	Hoaeae Wells P-5	7/20/2000		0.3	
335-006	2301-38	TCP	Hoaeae Wells P-5	6/15/1993	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	2/16/1995	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	7/10/2001		0.37	
335-006	2301-38	TCP	Hoaeae Wells P-5	3/23/1999	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	10/30/1996	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	4/30/1999	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	1/9/1996	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	8/8/1994	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	12/20/1994	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	6/28/1994	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	2/21/2001		0.33	
335-006	2301-38	TCP	Hoaeae Wells P-5	2/7/2000	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	10/20/1999	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	8/31/1998	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	12/7/1998	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	7/7/1999	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	11/1/2001		0.4	

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335-006	2301-38	TCP	Hoaeae Wells P-5	7/25/1996	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	8/12/1997	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	2/21/2002		0.39	
335-006	2301-38	TCP	Hoaeae Wells P-5	1/14/1993	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	12/26/1996	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	4/12/2001		0.42	
335-006	2301-38	TCP	Hoaeae Wells P-5	10/10/1994	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	5/10/2000		0.31	
335-006	2301-38	TCP	Hoaeae Wells P-5	4/22/1998	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	1/22/1998	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	11/10/1997	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	10/12/2000		0.36	
335-006	2301-38	TCP	Hoaeae Wells P-5	4/1/1997	<	0.5	
335-006	2301-38	TCP	Hoaeae Wells P-5	7/7/2000		0.37	

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335-007	2301-39	TCP	Hoaeae Wells P-6	10/20/1999	<	0.5	
335-007	2301-39	TCP	Hoaeae Wells P-6	1/9/1996	<	0.5	
335-007	2301-39	TCP	Hoaeae Wells P-6	2/7/2000	<	0.5	
335-007	2301-39	TCP	Hoaeae Wells P-6	10/12/2000		0.26	
335-007	2301-39	TCP	Hoaeae Wells P-6	11/10/1997	<	0.5	
335-007	2301-39	TCP	Hoaeae Wells P-6	4/16/1999	<	0.5	
335-007	2301-39	TCP	Hoaeae Wells P-6	8/31/1998	<	0.5	
335-007	2301-39	TCP	Hoaeae Wells P-6	2/21/2001		0.28	
335-007	2301-39	TCP	Hoaeae Wells P-6	3/23/1999	<	0.5	
335-007	2301-39	TCP	Hoaeae Wells P-6	12/20/1994	<	0.5	
335-007	2301-39	TCP	Hoaeae Wells P-6	4/16/1998	<	0.5	
335-007	2301-39	TCP	Hoaeae Wells P-6	11/1/2001		0.32	
335-007	2301-39	TCP	Hoaeae Wells P-6	8/8/1994	<	0.5	
335-007	2301-39	TCP	Hoaeae Wells P-6	6/15/1993	<	0.5	
335-007	2301-39	TCP	Hoaeae Wells P-6	7/25/1996	<	0.5	
335-007	2301-39	TCP	Hoaeae Wells P-6	3/13/1997	<	0.5	
335-007	2301-39	TCP	Hoaeae Wells P-6	11/14/2002		0.3	
335-007	2301-39	TCP	Hoaeae Wells P-6	6/7/1994	<	0.5	

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335-007	2301-39	TCP	Hoaeae Well P-6	5/21/2002		0.35	
335-007	2301-39	TCP	Hoaeae Wells P-6	4/12/2001		0.32	
335-007	2301-39	TCP	Hoaeae Wells P-6	5/10/2000		0.27	
335-007	2301-39	TCP	Hoaeae Wells P-6	7/10/2001		0.32	
335-007	2301-39	TCP	Hoaeae Wells P-6	7/7/2000		0.3	
335-007	2301-39	TCP	Hoaeae Wells P-6	7/16/1999	<	0.5	
335-007	2301-39	TCP	Hoaeae Wells P-6	12/26/1996	<	0.5	
335-007	2301-39	TCP	Hoaeae Wells P-6	2/21/2002		0.33	
335-007	2301-39	TCP	Hoaeae Wells P-6	2/16/1995	<	0.5	
335-007	2301-39	TCP	Hoaeae Wells P-6	7/20/2000		0.29	
335-007	2301-39	TCP	Hoaeae Wells P-6	10/10/1994	<	0.5	
335-007	2301-39	TCP	Hoaeae Wells P-6	5/22/1997	<	0.5	
335-007	2301-39	TCP	Hoaeae Wells P-6	12/2/1998	<	0.5	

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335-011	2302-01	Atrazine	Kuhla Wells I P-1	11/6/1998		0.068	
335-011	2302-01	Atrazine	Kuhla Wells I P-1	5/14/2001		0.05	
335-011	2302-01	Atrazine	Kuhla Wells I P-1	2/27/2001		0.053	
335-011	2302-01	Atrazine	Kuhla Wells I P-1	3/10/1999		0.053	
335-011	2302-01	Atrazine	Kuhla Wells I P-1	10/7/1998		0.058	
335-011	2302-01	TCE	Kuhla Wells I P-1	8/8/1994	<	0.5	
335-011	2302-01	TCE	Kuhla Wells I P-1	10/11/1994	<	0.5	
335-011	2302-01	TCE	Kuhla Wells I P-1	8/13/2001	<	0.5	
335-011	2302-01	TCE	Kuhla Wells I P-1	11/7/2001	<	0.5	
335-011	2302-01	TCE	Kuhla Wells I P-1	2/12/2002	<	0.5	
335-011	2302-01	TCE	Kuhla Wells I P-1	8/4/2000	<	0.5	
335-011	2302-01	TCP	Kuhla Wells I P-1	2/12/2002		1.17	
335-011	2302-01	TCP	Kuhla Wells I P-1	12/1/1994	<	0.5	
335-011	2302-01	TCP	Kuhla Wells I P-1	8/8/1994		0.5	
335-011	2302-01	TCP	Kuhla Wells I P-1	8/31/1999		0.7	
335-011	2302-01	TCP	Kuhla Wells I P-1	3/3/1997		0.6	
335-011	2302-01	TCP	Kuhla Wells I P-1	10/13/2000		0.86	
335-011	2302-01	TCP	Kuhla Wells I P-1	11/1/2001		0.82	

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335-011	2302-01	TCP	Kunia Wells I P-1	4/1/1997		0.6	
335-011	2302-01	TCP	Kunia Wells I P-1	5/25/1993	<	0.5	
335-011	2302-01	TCP	Kunia Wells I P-1	1/22/1991	<	.1	
335-011	2302-01	TCP	Kunia Wells I P-1	4/11/2001		1	
335-011	2302-01	TCP	Kunia Wells I P-1	12/1/1998		0.6	
335-011	2302-01	TCP	Kunia Wells I P-1	2/10/2000		0.7	
335-011	2302-01	TCP	Kunia Wells I P-1	8/31/1998		0.8	
335-011	2302-01	TCP	Kunia Wells I P-1	2/13/1992	<	0.5	
335-011	2302-01	TCP	Kunia Wells I P-1	4/20/1999		1	
335-011	2302-01	TCP	Kunia Wells I P-1	8/4/2000		0.81	
335-011	2302-01	TCP	Kunia Wells I P-1	10/23/1996		0.7	
335-011	2302-01	TCP	Kunia Wells I P-1	5/23/1994		0.7	
335-011	2302-01	TCP	Kunia Wells I P-1	1/22/1998	<	0.5	
335-011	2302-01	TCP	Kunia Wells I P-1	10/11/1994		0.6	
335-011	2302-01	TCP	Kunia Wells I P-1	6/13/2000		0.75	
335-011	2302-01	TCP	Kunia Wells I P-1	3/23/1999		0.9	
335-011	2302-01	TCP	Kunia Wells I P-1	2/27/2001		0.81	
335-011	2302-01	TCP	Kunia Wells I P-1	7/13/2000		0.79	

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335-011	2302-01	TCP	Kunia Wells I P-1	10/20/1999		0.6	
335-011	2302-01	TCP	Kunia Wells I P-1	2/16/1995		0.6	
335-011	2302-01	TCP	Kunia Wells I P-1	4/20/1998	<	0.5	
335-011	2302-01	TCP	Kunia Wells I P-1	8/13/2001		0.72	

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335-012	2302-02	Atrazine	Kunia Wells I P-2	4/21/1999		0.055	
335-012	2302-02	Atrazine	Kunia Wells I P-2	10/19/2000		0.051	
335-012	2302-02	Atrazine	Kunia Wells I P-2	6/6/1996		0.059	
335-012	2302-02	DBCP	Kunia I P-2	9/14/1998		0.02	
335-012	2302-02	TCE	Kunia Wells I P-2	2/12/2002		0.5	
335-012	2302-02	TCE	Kunia Wells I P-2	10/18/2002		0.5	
335-012	2302-02	TCE	Kunia Wells I P-2	5/23/1994		0.5	
335-012	2302-02	TCE	Kunia Wells I P-2	7/11/2001		0.5	
335-012	2302-02	TCP	Kunia Wells I P-2	7/7/2000		0.9	
335-012	2302-02	TCP	Kunia Wells I P-2	2/12/2002		1.02	
335-012	2302-02	TCP	Kunia Wells I P-2	7/30/1996		0.5	
335-012	2302-02	TCP	Kunia Wells I P-2	11/27/1998		0.6	
335-012	2302-02	TCP	Kunia Wells I P-2	10/25/1999		0.6	
335-012	2302-02	TCP	Kunia Wells I P-2	5/5/1998		0.5	
335-012	2302-02	TCP	Kunia Wells I P-2	5/10/2000		0.74	
335-012	2302-02	TCP	Kunia Wells I P-2	7/22/1999		0.8	
335-012	2302-02	TCP	Kunia Wells I P-2	1/22/1998		0.5	
335-012	2302-02	TCP	Kunia Wells I P-2	2/7/2000		0.9	

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335-012	2302-02	TCP	Kunia Wells I P-2	11/10/1997	0	0.7	
335-012	2302-02	TCP	Kunia Wells I P-2	10/18/2002	0	0.85	
335-012	2302-02	TCP	Kunia Wells I P-2	10/4/2000	0	0.73	
335-012	2302-02	TCP	Kunia Wells I P-2	8/2/2000	0	0.87	
335-012	2302-02	TCP	Kunia Wells I P-2	4/11/2001	0	0.96	
335-012	2302-02	TCP	Kunia Wells I P-2	4/16/1997	0	0.6	
335-012	2302-02	TCP	Kunia Wells I P-2	5/24/2002	0	0.83	
335-012	2302-02	TCP	Kunia Wells I P-2	3/15/1999	0	0.9	
335-012	2302-02	TCP	Kunia Wells I P-2	3/1/2001	0	0.84	
335-012	2302-02	TCP	Kunia Wells I P-2	11/1/2001	0	0.71	
335-012	2302-02	TCP	Kunia Wells I P-2	4/16/1999	0	0.9	
335-012	2302-02	TCP	Kunia Wells I P-2	8/31/1998	0	0.8	
335-012	2302-02	TCP	Kunia Wells I P-2	5/23/1994	<	0.5	
335-012	2302-02	TCP	Kunia Wells I P-2	7/11/2001	0	0.89	

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335-013	2302-03	Atrazine	Kunia Wells I P-3	10/31/1996		0.067	
335-013	2302-03	Atrazine	Kunia Wells I P-3	5/6/1996		0.087	
335-013	2302-03	Atrazine	Kunia Wells I P-3	1/23/1997		0.085	
335-013	2302-03	TCP	Kunia Wells I P-3	9/16/1993		0.7	
335-013	2302-03	TCP	Kunia Wells I P-3	8/2/2000		0.79	
335-013	2302-03	TCP	Kunia Wells I P-3	10/11/1994		0.5	
335-013	2302-03	TCP	Kunia Wells I P-3	5/25/1993		0.5	
335-013	2302-03	TCP	Kunia Wells I P-3	7/30/1996		0.5	
335-013	2302-03	TCP	Kunia Wells I P-3	7/23/1997		0.53	
335-013	2302-03	TCP	Kunia Wells I P-3	10/22/1999		0.5	
335-013	2302-03	TCP	Kunia Wells I P-3	4/16/1998		0.5	
335-013	2302-03	TCP	Kunia Wells I P-3	11/27/1998		0.6	
335-013	2302-03	TCP	Kunia Wells I P-3	10/27/1993		0.5	
335-013	2302-03	TCP	Kunia Wells I P-3	8/8/1994		0.5	
335-013	2302-03	TCP	Kunia Wells I P-3	4/21/1999		1	
335-013	2302-03	TCP	Kunia Wells I P-3	11/7/2001		0.73	
335-013	2302-03	TCP	Kunia Wells I P-3	12/1/1994		0.5	
335-013	2302-03	TCP	Kunia Wells I P-3	1/13/1993		0.5	

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335-013	2302-03	TCP	Kunia Wells I P-3	1/22/1991	<	1	
335-013	2302-03	TCP	Kunia Wells I P-3	2/12/2002		0.9	
335-013	2302-03	TCP	Kunia Wells I P-3	10/18/2002		0.78	
335-013	2302-03	TCP	Kunia Wells I P-3	3/15/1999		0.8	
335-013	2302-03	TCP	Kunia Wells I P-3	5/24/2002		0.73	
335-013	2302-03	TCP	Kunia Wells I P-3	5/24/2000		0.77	
335-013	2302-03	TCP	Kunia Wells I P-3	2/13/1992		0.5	
335-013	2302-03	TCP	Kunia Wells I P-3	2/16/1995		0.6	
335-013	2302-03	TCP	Kunia Wells I P-3	7/7/2000		0.83	
335-013	2302-03	TCP	Kunia Wells I P-3	9/17/1992		0.7	
335-013	2302-03	TCP	Kunia Wells I P-3	11/10/1997		0.7	
335-013	2302-03	TCP	Kunia Wells I P-3	9/27/1994	<	0.5	
335-013	2302-03	TCP	Kunia Wells I P-3	5/23/1994		0.6	
335-013	2302-03	TCP	Kunia Wells I P-3	2/17/2000		0.6	
335-013	2302-03	TCP	Kunia Wells I P-3	5/21/1997		0.7	
335-013	2302-03	TCP	Kunia Wells I P-3	10/19/2000		0.72	
335-013	2302-03	TCP	Kunia Wells I P-3	10/30/1996		0.5	
335-013	2302-03	TCP	Kunia Wells I P-3	7/11/2001		0.79	

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335-013	2302-03	TCP	Kunia Wells I P-3	10/20/1992	G	0.5	

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335-014	2302-04	Atrazine	Kunia Wells I P-4	1/22/1997		0.081	
335-014	2302-04	TCP	Kunia Wells I P-4	1/13/1993		0.5	
335-014	2302-04	TCP	Kunia Wells I P-4	7/6/1999		0.8	
335-014	2302-04	TCP	Kunia Wells I P-4	3/23/1999		0.9	
335-014	2302-04	TCP	Kunia Wells I P-4	9/16/1993		0.5	
335-014	2302-04	TCP	Kunia Wells I P-4	11/10/1997		0.7	
335-014	2302-04	TCP	Kunia Wells I P-4	7/13/2000		0.78	
335-014	2302-04	TCP	Kunia Wells I P-4	10/4/2000		0.73	
335-014	2302-04	TCP	Kunia Wells I P-4	12/1/1998		0.8	
335-014	2302-04	TCP	Kunia Wells I P-4	1/31/1994		0.5	
335-014	2302-04	TCP	Kunia Wells I P-4	11/25/2002		0.85	
335-014	2302-04	TCP	Kunia Wells I P-4	10/23/1996		0.7	
335-014	2302-04	TCP	Kunia Wells I P-4	3/12/1997		0.7	
335-014	2302-04	TCP	Kunia Wells I P-4	4/16/1998		0.5	
335-014	2302-04	TCP	Kunia Wells I P-4	7/23/1997		0.54	
335-014	2302-04	TCP	Kunia Wells I P-4	2/7/2000		0.8	
335-014	2302-04	TCP	Kunia Wells I P-4	2/22/2001		0.8	
335-014	2302-04	TCP	Kunia Wells I P-4	4/16/1997		0.6	

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335-014	2302-04	TCP	Kunia Wells I P-4	9/27/1994	0	0.5	
335-014	2302-04	TCP	Kunia Wells I P-4	1/27/1998	0	0.5	
335-014	2302-04	TCP	Kunia Wells I P-4	8/1/700	0	0.82	
335-014	2302-04	TCP	Kunia Wells I P-4	4/16/1999	0	0.9	
335-014	2302-04	TCP	Kunia Wells I P-4	10/20/1992	0	0.6	
335-014	2302-04	TCP	Kunia Wells I P-4	8/20/2001	0	0.82	
335-014	2302-04	TCP	Kunia Wells I P-4	5/23/1994	0	0.6	
335-014	2302-04	TCP	Kunia Wells I P-4	5/10/2000	0	0.74	

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335-042	2400-05	EDB	Waipahu Wells II P-1	6/19/1996	<	0.04	
335-042	2400-05	EDB	Waipahu Wells II P-1	3/7/1997	<	0.04	
335-042	2400-05	EDB	Waipahu Wells II P-1	11/27/1995	<	0.04	
335-042	2400-05	EDB	Waipahu Wells II P-1	11/13/1997	<	0.04	
335-042	2400-05	EDB	Waipahu Wells II P-1	4/14/1999	<	0.04	
335-042	2400-05	EDB	Waipahu Wells II P-1	6/12/2002	<	0.04	
335-042	2400-05	EDB	Waipahu Wells II P-1	1/22/1998	<	0.04	
335-042	2400-05	EDB	Waipahu Wells II P-1	10/25/2001	<	0.04	
335-042	2400-05	EDB	Waipahu Wells II P-1	10/12/2000	<	0.04	
335-042	2400-05	EDB	Waipahu Well II P-1	8/19/1998	<	0.04	
335-042	2400-05	EDB	Waipahu Wells II P-1	7/24/1997	<	0.04	
335-042	2400-05	EDB	Waipahu Wells II P-1	3/6/2001	<	0.04	
335-042	2400-05	EDB	Waipahu II P-1	3/15/1999	<	0.04	
335-042	2400-05	EDB	Waipahu Wells II P-1	7/16/2001	<	0.04	
335-042	2400-05	EDB	Waipahu Wells II P-1	10/22/1999	<	0.04	
335-042	2400-05	EDB	Waipahu Wells II P-1	1/18/1996	<	0.04	
335-042	2400-05	EDB	Waipahu Wells II P-1	4/17/1997	<	0.04	
335-042	2400-05	EDB	Waipahu Wells II P-1	4/18/2001	<	0.04	

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335-042	2400-05	TCP	Waipahu Wells II P-1	5/18/1993	<	0.5	
335-042	2400-05	TCP	Waipahu Wells II P-1	10/12/2000		0.59	
335-042	2400-05	TCP	Waipahu Wells II P-1	11/13/1997	<	0.5	
335-042	2400-05	TCP	Waipahu Wells II P-1	10/25/2002		0.56	
335-042	2400-05	TCP	Waipahu Wells II P-1	8/26/1998		0.6	
335-042	2400-05	TCP	Waipahu Wells II P-1	2/5/1992	<	0.5	
335-042	2400-05	TCP	Waipahu II P-1	3/15/1999		0.6	
335-042	2400-05	TCP	Waipahu Wells II P-1	1/22/1998	<	0.5	
335-042	2400-05	TCP	Waipahu II P-1	4/14/1999		0.7	
335-042	2400-05	TCP	Waipahu Wells II P-1	4/16/1998	<	0.5	
335-042	2400-05	TCP	Waipahu Wells II P-1	10/26/1993	<	0.5	
335-042	2400-05	TCP	Waipahu Wells II P-1	10/25/2001		0.49	
335-042	2400-05	TCP	Waipahu Wells II P-1	8/19/1998		0.7	
335-042	2400-05	TCP	Waipahu Wells II P-1	7/24/1997	<	0.5	
335-042	2400-05	TCP	Waipahu Wells II P-1	7/20/2000		0.54	
335-042	2400-05	TCP	Waipahu Wells II P-1	11/10/1998		0.6	
335-042	2400-05	TCP	Waipahu Wells II P-1	5/11/1992	<	0.5	
335-042	2400-05	TCP	Waipahu Wells II P-1	2/28/2000	<	0.5	

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335-042	2400-05	TCP	Waipahu Wells II P-1	4/17/1997	<	0.5	
335-042	2400-05	TCP	Waipahu Wells II P-1	7/6/1999		0.6	
335-042	2400-05	TCP	Waipahu Wells II P-1	4/18/2001		0.64	
335-042	2400-05	TCP	Waipahu Wells II P-1	10/20/1992	<	0.5	
335-042	2400-05	TCP	Waipahu Wells II P-1	5/10/2000		0.59	
335-042	2400-05	TCP	Waipahu Wells II P-1	3/6/2001		0.66	
335-042	2400-05	TCP	Waipahu Wells II P-1	10/22/1999	<	0.5	
335-042	2400-05	TCP	Waipahu Wells II P-1	7/16/2001		0.48	
335-042	2400-05	TCP	Waipahu Wells II P-1	2/12/2002		0.67	
335-042	2400-05	TCP	Waipahu Wells II P-1	6/12/2002		0.55	

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335-043	2400-06	EDB	Waipahu Wells II P-2	10/19/2000	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	2/17/2000	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	4/20/1999	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	4/7/1997	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	4/12/2001	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	3/6/2001	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	3/8/1994	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	4/13/2000	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	5/21/1997	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	12/2/1998	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	5/31/1996	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	3/24/1999	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	7/31/1997	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	7/29/1996	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	11/19/1997	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	7/10/2001	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	1/23/1996	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	9/22/1998	<	0.04	

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335-043	2400-06	EDB	Waipahu Wells II P-2	10/25/1999	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	5/14/1998	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	10/17/1996	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	10/25/2001	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	7/14/1999	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	6/10/1993	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	7/6/2000	<	0.04	
335-043	2400-06	EDB	Waipahu Wells II P-2	10/31/2002	<	0.04	
335-043	2400-06	TCP	Waipahu Wells II-P-2	5/14/1998	<	0.5	
335-043	2400-06	TCP	Waipahu Wells II P-2	10/25/1999	<	0.5	
335-043	2400-06	TCP	Waipahu Wells II P-2	5/21/1997	<	0.5	
335-043	2400-06	TCP	Waipahu Wells II P-2	1/22/1993	<	0.5	
335-043	2400-06	TCP	Waipahu Wells II P-2	11/19/1997	<	0.5	
335-043	2400-06	TCP	Waipahu Wells II P-2	7/10/2001		0.48	
335-043	2400-06	TCP	Waipahu Wells II P-2	4/12/2001		0.59	
335-043	2400-06	TCP	Waipahu Wells II P-2	9/1/1992	<	0.5	
335-043	2400-06	TCP	Waipahu Wells II P-2	10/19/2000		0.56	
335-043	2400-06	TCP	Waipahu Wells II-P-2	3/8/1994	<	0.5	

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335-043	2400-06	TCP	Waipahu Wells II P-2	10/25/2001		0.42	
335-043	2400-06	TCP	Waipahu Wells II P-2	7/29/1996	<	0.5	
335-043	2400-06	TCP	Waipahu Wells II P-2	6/29/1992		0.5	
335-043	2400-06	TCP	Waipahu Wells II P-2	2/12/2002		0.49	
335-043	2400-06	TCP	Waipahu Wells II P-2	12/2/1998	<	0.5	
335-043	2400-06	TCP	Waipahu Wells II P-2	10/31/2002		0.57	
335-043	2400-06	TCP	Waipahu Wells II P-2	10/30/1996	<	0.5	
335-043	2400-06	TCP	Waipahu Wells II P-2	7/14/1999		0.6	
335-043	2400-06	TCP	Waipahu Wells II P-2	4/20/1999		0.5	
335-043	2400-06	TCP	Waipahu Wells II P-2	2/17/2000	<	0.5	
335-043	2400-06	TCP	Waipahu Wells II P-2	3/6/2001		0.54	
335-043	2400-06	TCP	Waipahu Wells II P-2	7/15/2002		0.46	
335-043	2400-06	TCP	Waipahu Wells II P-2	5/15/2000		0.53	
335-043	2400-06	TCP	Waipahu Wells II P-2	4/7/1997	<	0.5	
335-043	2400-06	TCP	Waipahu Wells II P-2	6/13/2002		0.49	
335-043	2400-06	TCP	Waipahu Wells II P-2	7/6/2000		0.61	
335-043	2400-06	TCP	Waipahu Wells II P-2	3/22/1999		0.5	

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335-066	2400-08	EDB	Waipahu Wells II P-3	6/12/2002	<	0.04	
335-066	2400-08	EDB	Waipahu Wells II P-3	10/31/2002	<	0.04	
335-066	2400-08	TCP	Waipahu Wells II P-3	6/12/2002		0.5	
335-066	2400-08	TCP	Waipahu Wells II P-3	10/31/2002		0.53	

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335-015	2402-01	DBCP	Kunia Wells II P-1	4/12/1990	<	0.04	
335-015	2402-01	DBCP	Kunia Wells II P-1	7/14/1999	<	0.04	
335-015	2402-01	DBCP	Kunia Wells II P-1	10/18/1996	<	0.04	
335-015	2402-01	DBCP	Kunia Wells II P-1	11/13/1997	<	0.04	
335-015	2402-01	DBCP	Kunia Wells II P-1	4/12/2001	<	0.04	
335-015	2402-01	DBCP	Kunia Wells II P-1	7/20/2001	<	0.04	
335-015	2402-01	DBCP	Kunia Wells II P-1	8/25/1998	<	0.04	
335-015	2402-01	DBCP	Kunia Wells II P-1	5/5/1998	<	0.04	
335-015	2402-01	DBCP	Kunia Wells II P-1	8/12/1997	<	0.04	
335-015	2402-01	DBCP	Kunia Wells II P-1	3/12/1997	<	0.04	
335-015	2402-01	DCP	Kunia Wells II P-1	2/22/2001	<	1	
335-015	2402-01	TCE	Kunia Wells II P-1	2/22/2001	<	0.5	
335-015	2402-01	TCE	Kunia Wells II P-1	4/12/2001	<	0.5	
335-015	2402-01	TCE	Kunia Wells II P-1	7/20/2001	<	0.5	
335-015	2402-01	TCP	Kunia Wells II P-1	4/12/2001		0.89	
335-016	2402-01	TCP	Kunia Wells II P-2	4/16/1999		1.1	
335-015	2402-01	TCP	Kunia Wells II P-1	5/5/1998		0.67	
335-015	2402-01	TCP	Kunia Wells II P-1	8/6/1992		1	

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335-015	2402-01	TCP	Kunla Wells II P-1	7/20/2001	0	1.02	
335-017	2402-01	TCP	Kunla Wells II P-3	1/13/1995	0	0.7	
335-015	2402-01	TCP	Kunla Wells II P-1	10/18/1996	0	0.9	X
335-015	2402-01	TCP	Kunla Wells II P-1	10/20/1992	0	0.7	
335-015	2402-01	TCP	Kunla Wells II P-1	7/14/1999	0	1	X
335-015	2402-01	TCP	Kunla Wells II P-1	2/22/2001	0	0.89	
335-015	2402-01	TCP	Kunla Wells II P-1	3/7/1994	0	0.6	
335-015	2402-01	TCP	Kunla Wells II P-1	11/10/1999	0	0.9	X
335-015	2402-01	TCP	Kunla Wells II P-1	11/13/1997	0	1	X
335-015	2402-01	TCP	Kunla Wells II P-1	2/7/2000	0	1.2	
335-015	2402-01	TCP	Kunla Wells II P-1	3/12/1997	0	0.9	X
335-015	2402-01	TCP	Kunla Wells II P-1	11/9/1998	0	1.2	
335-015	2402-01	TCP	Kunla Wells II P-1	8/12/1997	0	0.9	X
335-015	2402-01	TCP	Kunla Wells II P-1	8/25/1998	0	1.1	

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335-016	2402-02	DBCP	Kunia Wells II P-2	3/16/1999	<	0.04	
335-016	2402-02	DBCP	Kunia Wells II P-2	12/7/1998	<	0.04	
335-016	2402-02	DBCP	Kunia Wells II P-2	1/23/1998	<	0.04	
335-016	2402-02	DBCP	Kunia Wells II P-2	10/11/1995	<	0.04	
335-016	2402-02	DBCP	Kunia Wells II P-2	11/24/1997	<	0.04	
335-016	2402-02	DBCP	Kunia Wells II P-2	4/16/1998	<	0.04	
335-016	2402-02	DBCP	Kunia Wells II P-2	10/18/2002	<	0.04	
335-016	2402-02	DBCP	Kunia Wells II P-2	7/17/1990	<	0.04	
335-016	2402-02	DBCP	Kunia Wells II P-2	5/24/2002	<	0.04	
335-016	2402-02	DBCP	Kunia Wells II P-2	4/16/1999	<	0.04	
335-016	2402-02	DCP	Kunia Wells II P-2	2/22/2001	<	1	
335-016	2402-02	TCE	Kunia Wells II P-2	2/22/2001	<	0.5	
335-016	2402-02	TCE	Kunia Wells II P-2	11/28/2001	<	0.5	
335-016	2402-02	TCE	Kunia Wells II P-2	7/12/2002	<	0.5	
335-016	2402-02	TCE	Kunia Wells II P-2	11/2/1999	<	0.2	
335-016	2402-02	TCE	Kunia Wells II P-2	11/9/2001	<	0.5	
335-016	2402-02	TCE	Kunia Wells II P-2	10/27/1999	<	0.5	
335-016	2402-02	TCE	Kunia Wells II P-2	5/24/2002	<	0.5	

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335-016	2402-02	TCE	Kunia Wells II P-2	2/20/2002	<	0.5	
335-016	2402-02	TCE	Kunia Wells II P-2	10/18/2002	<	0.5	
335-016	2402-02	TCP	Kunia Wells II P-2	5/11/2000		1.1	
335-016	2402-02	TCP	Kunia Wells II P-2	1/23/1998		0.8	x
335-016	2402-02	TCP	Kunia Wells II P-2	12/7/1998		1	
335-016	2402-02	TCP	Kunia Wells II P-2	1/23/1995		0.8	x
335-016	2402-02	TCP	Kunia Wells II P-2	5/15/1995	<	0.5	
335-016	2402-02	TCP	Kunia Wells II P-2	2/22/2001		0.9	
335-016	2402-02	TCP	Kunia Wells II P-2	4/16/1998		0.7	
335-016	2402-02	TCP	Kunia II P-2	3/2/2000		0.7	
335-016	2402-02	TCP	Kunia Wells II P-2	11/24/1997		0.6	
335-016	2402-02	TCP	Kunia Wells II P-2	6/2/1994		0.6	
335-016	2402-02	TCP	Kunia Wells II P-2	7/16/1999		0.9	X
335-016	2402-02	TCP	Kunia Wells II P-2	5/25/1993		0.6	
335-016	2402-02	TCP	Kunia Wells II P-2	10/27/1999		0.8	
335-016	2402-02	TCP	Kunia Wells II P-2	2/20/2002		1.02	
335-016	2402-02	TCP	Kunia Wells II P-2	10/27/1993	<	0.5	
335-016	2402-02	TCP	Kunia Wells II P-2	11/2/1999		0.8	

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335-016	2402-02	TCP	Kunia Wells II P-2	11/9/2001	0	0.92	
335-016	2402-02	TCP	Kunia Wells II P-2	10/11/1994	0	0.5	
335-016	2402-02	TCP	Kunia Wells II P-2	3/23/1999	0	1.1	
335-016	2402-02	TCP	Kunia Wells II P-2	10/18/2002	0	1.11	
335-016	2402-02	TCP	Kunia Wells II P-2	5/24/2002	0	1.05	
335-016	2402-02	TCP	Kunia Wells II P-2	5/11/1992	0	1	x
335-017	2402-02	TCP	Kunia Wells II P-3	8/8/1994	0	0.6	
335-016	2402-02	TCP	Kunia Wells II P-2	1/13/1993	0	0.6	

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335-017	2402-03	DBCP	Kunia Wells II P-3	5/22/1997	<	0.04	
335-017	2402-03	DBCP	Kunia Wells II P-3	8/19/1998	<	0.04	
335-017	2402-03	DBCP	Kunia Wells II P-3	7/13/2000	<	0.04	
335-017	2402-03	DBCP	Kunia Wells II P-3	1/27/1998	<	0.04	
335-017	2402-03	DBCP	Kunia Wells II P-3	7/12/2001	<	0.04	
335-017	2402-03	DBCP	Kunia Wells II P-3	3/15/1995	<	0.04	
335-017	2402-03	DBCP	Kunia Wells II P-3	7/18/2002	<	0.04	
335-017	2402-03	DBCP	Kunia Wells II P-3	7/29/1996	<	0.04	
335-017	2402-03	DBCP	Kunia Wells II P-3	8/28/1991	<	0.04	
335-017	2402-03	DBCP	Kunia Wells II P-3	8/6/1990	<	0.04	
335-017	2402-03	DBCP	Kunia Wells II P-3	5/24/2000	<	0.04	
335-017	2402-03	DBCP	Kunia Wells II P-3	7/31/1997	<	0.04	
335-017	2402-03	DBCP	Kunia Wells II P-3	1/18/1996	<	0.04	
335-017	2402-03	DCP	Kunia Wells II P-3	7/14/2000	<	0.3	
335-017	2402-03	DCP	Kunia Wells II P-3	6/13/2000	<	1	
335-017	2402-03	DCP	Kunia Wells II P-3	2/22/2001	<	1	
335-017	2402-03	TCE	Kunia Wells II P-3	7/12/2001	<	0.5	
335-017	2402-03	TCE	Kunia Wells II P-3	8/31/1999	<	0.5	

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335-017	2402-03	TCE	Kunia Wells II P-3	10/31/2002	<	0.5	
335-017	2402-03	TCE	Kunia Wells II P-3	12/21/1998	<	0.5	
335-017	2402-03	TCE	Kunia Wells II P-3	5/22/1997	<	0.5	
335-017	2402-03	TCE	Kunia Wells II P-3	10/4/2000	<	0.5	
335-017	2402-03	TCE	Kunia Wells II P-3	4/23/2001	<	0.5	
335-017	2402-03	TCE	Kunia Wells II P-3	7/12/2002	<	0.5	
335-017	2402-03	TCE	Kunia Wells II P-3	6/13/2000	<	0.5	
335-017	2402-03	TCE	Kunia Wells II P-3	8/2/2000	<	0.5	
335-017	2402-03	TCE	Kunia Wells II P-3	7/14/2000	<	0.5	
335-017	2402-03	TCE	Kunia Wells II P-3	11/26/2001	<	0.5	
335-017	2402-03	TCE	Kunia Wells II P-3	2/14/2002	<	0.5	
335-017	2402-03	TCE	Kunia Wells II P-3	5/24/2002	<	0.5	
335-017	2402-03	TCE	Kunia Wells II P-3	2/22/2001	<	0.5	
335-017	2402-03	TCE	Kunia Wells II P-3	1/27/1998	<	0.5	
335-017	2402-03	TCP	Kunia Wells II P-3	7/18/2002		1.14	
335-017	2402-03	TCP	Kunia Wells II P-3	7/12/2001		1.14	
335-017	2402-03	TCP	Kunia Wells II P-3	8/19/1998		1.3	
335-017	2402-03	TCP	Kunia Wells II P-3	2/17/2000		1	

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335-017	2402-03	TCP	Kunia Wells II P-3	1/27/1998	0	0.7	
335-017	2402-03	TCP	Kunia Wells II P-3	4/20/1999	0	1.4	
335-016	2402-03	TCP	Kunia Wells II P-2	12/9/1998	0	1	
335-017	2402-03	TCP	Kunia Wells II P-3	12/21/1998	0	1.1	
335-017	2402-03	TCP	Kunia Wells II P-3	2/14/2002	0	0.89	
335-017	2402-03	TCP	Kunia Wells II P-3	2/22/2001	0	1.07	
335-017	2402-03	TCP	Kunia Wells II P-3	5/24/2000	0	1.1	
335-017	2402-03	TCP	Kunia Wells II P-3	1/9/1996	0	0.6	
335-017	2402-03	TCP	Kunia Wells II P-3	8/1/1996	0	1	x
335-017	2402-03	TCP	Kunia Wells II P-3	3/4/1997	0	0.8	x
335-017	2402-03	TCP	Kunia Wells II P-3	10/31/2002	0	1.23	
335-017	2402-03	TCP	Kunia Wells II P-3	4/27/1995	0	0.6	
335-017	2402-03	TCP	Kunia Wells II P-3	3/16/1999	0	1.2	
335-017	2402-03	TCP	Kunia Wells II P-3	11/2/2001	0	0.97	
335-017	2402-03	TCP	Kunia Wells II P-3	8/31/1999	0	0.9	X
335-017	2402-03	TCP	Kunia Wells II P-3	11/3/1999	0	1	X
335-017	2402-03	TCP	Kunia Wells II P-3	4/23/2001	0	0.93	
335-017	2402-03	TCP	Kunia Wells II P-3	7/13/2000	0	0.93	

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335-017	2402-03	TCP	Kunia Wells II P-3	5/22/1997	0	1	x
335-017	2402-03	TCP	Kunia Wells II P-3	8/5/1996	0	1	x
335-017	2402-03	TCP	Kunia Wells II P-3	5/24/2002	0	1.16	
335-017	2402-03	TCP	Kunia Wells II P-3	10/4/2000	0	0.94	
335-017	2402-03	TCP	Kunia Wells II P-3	7/29/1996	0	1	x

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334-002	2459-19	TCP	Walpole Heights P-2	10/19/2000	0	0.25	
334-002	2459-19	TCP	Walpole Heights P-2	10/20/2000	0	0.21	
334-002	2459-19	TCP	Walpole Heights P-2	10/11/2000	0	0.26	
334-002	2459-19	TCP	Walpole Heights P-2	10/23/2001	0	0.1	
334-002	2459-19	TCP	Walpole Heights P-2	4/20/2001	0	0.17	
334-002	2459-19	TCP	Walpole Heights P-2	6/18/2002	0	0.22	
334-002	2459-19	TCP	Walpole Heights P-2	7/10/2001	0	0.18	
334-002	2459-19	TCP	Walpole Heights P-2	2/21/2002		0.083	
334-002	2459-19	TCP	Walpole Heights P-2	7/27/2001	0	0.18	
334-002	2459-19	TCP	Walpole Heights P-2	2/22/2001	0	0.28	

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334-001	2459-20	EDB	Waipio Heights P-1	12/1/1998	<	0.04	
334-001	2459-20	EDB	Waipio Heights P-1	6/18/2002	<	0.04	
334-001	2459-20	TCP	Waipio Heights P-1	10/23/2001		0.25	
334-001	2459-20	TCP	Waipio Heights P-1	2/21/2002		0.32	
334-001	2459-20	TCP	Waipio Heights P-1	7/20/2000		0.25	
334-001	2459-20	TCP	Waipio Heights P-1	2/20/2001		0.37	
334-001	2459-20	TCP	Waipio Heights P-1	10/18/2002		0.32	
334-001	2459-20	TCP	Waipio Heights P-1	5/9/2001		0.26	
334-001	2459-20	TCP	Waipio Heights P-1	7/20/2001		0.24	
334-001	2459-20	TCP	Waipio Heights P-1	7/30/2001		0.28	
334-001	2459-20	TCP	Waipio Heights P-1	7/15/2002		0.3	
334-001	2459-20	TCP	Waipio Heights P-1	12/1/1998	<	0.5	
334-002	2459-20	TCP	Waipio Heights P-2	10/25/2002		0.23	
334-001	2459-20	TCP	Waipio Heights P-1	3/16/1999	<	0.5	
334-001	2459-20	TCP	Waipio Heights P-1	6/18/2002		0.41	
334-001	2459-20	TCP	Waipio Heights P-1	7/6/2000		0.27	
334-001	2459-20	TCP	Waipio Heights P-1	3/1/2000	<	0.5	
334-001	2459-20	TCP	Waipio Heights P-1	5/11/2000		0.3	

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334-005	2459-23	TCP	Walpole Heights I P-1	7/30/2001	0	0.06	
334-005	2459-23	TCP	Walpole Hts I P-1	10/18/2002	0	0.09	
334-005	2459-23	TCP	Walpole Heights I P-1	10/23/2001	0	0.05	
334-005	2459-23	TCP	Walpole Hts I P-1	7/17/2002	0	0.06	
334-005	2459-23	TCP	Walpole Hts I P-1	2/26/2002	0	0.08	
334-005	2459-23	TCP	Walpole Heights I P-1	10/20/2000	0	0.12	
334-005	2459-23	TCP	Walpole Heights I P-1	5/11/2000	0	0.08	
334-005	2459-23	TCP	Walpole Hts I P-1	8/8/2000	0	0.05	
334-005	2459-23	TCP	Walpole Heights I P-1	2/22/2001	0	0.07	
334-005	2459-23	TCP	Walpole Heights I P-1	5/9/2001	0	0.08	
334-005	2459-23	TCP	Walpole Hts I P-1	5/25/2000	0	0.07	
334-005	2459-23	TCP	Walpole Heights I P-1	7/20/2001	0	0.06	
334-005	2459-23	TCP	Walpole Heights I P-1	7/20/2000	0	0.04	

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334-006	2459-24	TCP	Walpole Heights I P-2	7/10/2001		0.16	
334-006	2459-24	TCP	Walpole Heights I P-2	4/20/2001		0.17	
334-026	2459-24	TCP	Walpole Heights I P-2	3/1/2001		0.17	
334-006	2459-24	TCP	Walpole Heights I P-2	7/27/2001		0.16	
334-006	2459-24	TCP	Walpole Hts I P-2	6/18/2002		0.19	
334-006	2459-24	TCP	Walpole Hts I P-2	10/25/2002		0.19	
334-006	2459-24	TCP	Walpole Heights I P-2	6/15/2000		0.11	
334-006	2459-24	TCP	Walpole Hts I P-2	8/10/2000		0.11	
334-006	2459-24	TCP	Walpole Heights I P-2	12/5/2001		0.16	
334-006	2459-24	TCP	Walpole Heights I P-2	2/21/2002		0.14	
334-006	2459-24	TCP	Walpole Heights I P-2	10/20/2000		0.16	

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333-005	2902-01	CTC	Wahiawa Wells II P-1	3/4/1997	<	0.5	
333-005	2902-01	CTC	Wahiawa Wells II P-1	1/9/1996	<	0.5	
333-005	2902-01	CTC	Wahiawa Wells II P-1	6/15/1993	<	0.5	
333-005	2902-01	CTC	Wahiawa Wells II P-1	11/17/1993	<	0.5	
333-005	2902-01	CTC	Wahiawa Wells II P-1	2/8/2000	<	0.5	
333-005	2902-01	CTC	Wahiawa Wells II P-1	2/27/2001	<	0.5	
333-005	2902-01	CTC	Wahiawa Wells II P-1	4/20/2001	<	0.5	
333-005	2902-01	CTC	Wahiawa Wells II P-1	2/11/1992	<	0.5	
333-005	2902-01	CTC	Wahiawa Wells II P-1	9/17/1992	<	0.5	
333-005	2902-01	CTC	Wahiawa Wells II P-1	4/23/1997	<	0.5	
333-005	2902-01	CTC	Wahiawa Wells II P-1	7/25/1996	<	0.5	
333-005	2902-01	CTC	Wahiawa Wells II P-1	2/5/1993	<	0.5	
333-005	2902-01	CTC	Wahiawa Wells II P-1	5/31/2000	<	0.5	
333-005	2902-01	CTC	Wahiawa Wells II P-1	10/20/2000	<	0.5	
333-005	2902-01	CTC	Wahiawa Wells II P-1	6/25/1992	<	0.5	
333-005	2902-01	CTC	Wahiawa Wells II P-1	8/16/1994	<	0.5	
333-005	2902-01	CTC	Wahiawa Wells II P-1	2/6/1992	<	0.5	
333-005	2902-01	CTC	Wahiawa Wells II P-1	11/16/2001	<	0.5	

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333-005	2902-01	CTC	Wahlawa Wells II P-1	2/17/1994	<	0.5	
333-005	2902-01	CTC	Wahlawa Wells II P-1	7/15/1999	<	0.5	
333-005	2902-01	CTC	Wahlawa Wells II P-1	2/19/2002	<	0.5	
333-005	2902-01	CTC	Wahlawa Wells II P-1	10/26/1999	<	0.5	
333-005	2902-01	CTC	Wahlawa Wells II P-1	10/10/1994	<	0.5	
333-005	2902-01	CTC	Wahlawa Wells II P-1	8/8/2000	<	0.5	
333-005	2902-01	CTC	Wahlawa Wells II P-1	1/22/1998	<	0.5	
333-005	2902-01	CTC	Wahlawa Wells II P-1	4/15/1999	<	0.5	
333-005	2902-01	CTC	Wahlawa Wells II P-1	12/8/1998	<	0.05	
333-005	2902-01	CTC	Wahlawa Wells II P-1	2/28/1995	<	0.5	
333-005	2902-01	CTC	Wahlawa Wells II P-1	6/19/2002	<	0.5	
333-005	2902-01	CTC	Wahlawa Wells II P-1	7/16/2002	<	0.5	
333-005	2902-01	CTC	Wahlawa Wells II P-1	4/16/1998	<	0.5	
333-005	2902-01	CTC	Wahlawa Wells II P-1	12/4/2002	<	0.5	
333-005	2902-01	CTC	Wahlawa Wells II P-1	8/27/1998	<	0.5	
333-005	2902-01	CTC	Wahlawa Wells II P-1	11/18/1997	<	0.5	
333-005	2902-01	PCE	Wahlawa Wells II P-1	2/27/2001		0.7	
333-005	2902-01	PCE	Wahlawa Wells II P-1	4/20/2001		0.6	

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333-005	2902-01	PCE	Wahlawa Wells II P-1	8/27/1998		0.8	
333-005	2902-01	PCE	Wahlawa Wells II P-1	8/12/1997	<	0.5	
333-005	2902-01	PCE	Wahlawa Wells II P-1	2/8/2000	<	0.5	
333-005	2902-01	PCE	Wahlawa Wells II P-1	11/16/2001		0.5	
333-005	2902-01	PCE	Wahlawa Wells II P-1	10/20/2000	<	0.5	
333-005	2902-01	PCE	Wahlawa Wells II P-1	7/16/2002		0.6	
333-005	2902-01	PCE	Wahlawa Wells II P-1	1/9/1996	<	0.5	
333-005	2902-01	PCE	Wahlawa Wells II P-1	4/23/1997	<	0.5	
333-005	2902-01	PCE	Wahlawa Wells II P-1	8/8/2000	<	0.5	
333-005	2902-01	PCE	Wahlawa Wells II P-1	1/22/1998	<	0.5	
333-005	2902-01	PCE	Wahlawa Wells II P-1	8/16/1994		0.5	
333-005	2902-01	PCE	Wahlawa Wells II P-1	6/19/2002		0.7	
333-005	2902-01	PCE	Wahlawa Wells II P-1	2/28/1995	<	0.5	
333-005	2902-01	PCE	Wahlawa Wells II P-1	3/17/1999	<	0.5	
333-005	2902-01	PCE	Wahlawa Wells II P-1	11/17/1993		0.6	
333-005	2902-01	PCE	Wahlawa Wells II P-1	7/25/1996	<	0.5	
333-005	2902-01	PCE	Wahlawa Wells II P-1	10/26/1999		0.6	
333-005	2902-01	PCE	Wahlawa Wells II P-1	6/15/1993	<	0.5	

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333-005	2902-01	PCE	Wahlawa Wells II P-1	5/31/2000		0.7	
333-005	2902-01	PCE	Wahlawa Wells II P-1	12/8/1998		0.05	
333-005	2902-01	PCE	Wahlawa Wells II P-1	10/10/1994		0.6	
333-005	2902-01	PCE	Wahlawa Wells II P-1	4/16/1998	<	0.5	
333-005	2902-01	PCE	Wahlawa Wells II P-1	12/4/2002		0.6	
333-005	2902-01	PCE	Wahlawa Wells II P-1	3/4/1997		0.6	
333-005	2902-01	PCE	Wahlawa Wells II P-1	2/19/2002	<	0.5	
333-005	2902-01	PCE	Wahlawa Wells II P-1	11/18/1997	<	0.5	
333-005	2902-01	PCE	Wahlawa Wells II P-1	4/15/1999	<	0.5	
333-005	2902-01	PCE	Wahlawa Wells II P-1	7/15/1999	<	0.5	
333-005	2902-01	TCP	Wahlawa Wells II P-1	11/16/2001		0.14	
333-005	2902-01	TCP	Wahlawa Wells II P-1	11/18/1997	<	0.5	
333-005	2902-01	TCP	Wahlawa Wells II P-1	12/4/2002		0.13	
333-005	2902-01	TCP	Wahlawa Wells II P-1	7/26/2001		0.14	
333-005	2902-01	TCP	Wahlawa Wells II P-1	8/12/1997	<	0.5	
333-005	2902-01	TCP	Wahlawa Wells II P-1	2/27/2001		0.16	
333-005	2902-01	TCP	Wahlawa Wells II P-1	4/20/2001		0.16	
333-005	2902-01	TCP	Wahlawa Wells II P-1	2/5/1993	<	0.5	

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333-005	2902-01	TCP	Wahlawa Wells II P-1	7/16/2002	0	0.13	
333-005	2902-01	TCP	Wahlawa Wells II P-1	11/17/1993	<	0.5	
333-005	2902-01	TCP	Wahlawa Wells II P-1	2/19/2002	0	0.11	
333-005	2902-01	TCP	Wahlawa Wells II P-1	6/19/2002	0	0.12	
333-005	2902-01	TCP	Wahlawa Wells II P-1	8/8/2000	0	0.15	
333-005	2902-01	TCP	Wahlawa Wells II P-1	10/20/2000	0	0.16	
333-005	2902-01	TCP	Wahlawa Wells II P-1	8/27/1998	<	0.5	
333-005	2902-01	TCP	Wahlwaw Wells II P-1	2/11/1992	<	0.5	
333-005	2902-01	TCP	Wahlawa Wells II P-1	2/28/1995	<	0.5	
333-005	2902-01	TCP	Wahlawa Wells II P-1	9/17/1992	<	0.5	
333-005	2902-01	TCP	Wahlawa Wells II P-1	3/4/1997	<	0.5	
333-005	2902-01	TCP	Wahlawa Wells II P-1	2/6/1992	<	0.5	
333-005	2902-01	TCP	Wahlawa Wells II P-1	5/12/2000	0	0.23	
333-005	2902-01	Tetrachloroethene	Wahlawa Wells II P-1	2/6/1992	0	0.6	
333-005	2902-01	Tetrachloroethene	Wahlawa Wells II P-1	2/5/1993	0	0.5	
333-005	2902-01	Tetrachloroethene	Wahlawa Wells II P-1	2/11/1992	<	0.5	
333-005	2902-01	Tetrachloroethene	Wahlawa Wells II P-1	7/30/1991	0	0.4	
333-005	2902-01	Tetrachloroethene	Wahlawa Wells II P-1	8/13/1991	0	0.4	

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333-005	2902-01	Tetrachloroethene	Wahlawa Wells II P-1	6/25/1992	0	0.6	
333-005	2902-01	Tetrachloroethene	Wahlawa Wells II P-1	9/17/1992	0	0.5	

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332-003	3405-01	TCE	Waialua Wells P-1	6/13/2002	<	0.5	
332-003	3405-01	TCE	Waialua Wells P-1	11/16/2001	<	0.5	
332-003	3405-01	TCE	Waialua Wells P-1	7/16/2002	<	0.5	
332-003	3405-01	TCE	Waialua Wells P-1	2/14/2002	<	0.5	
332-003	3405-01	TCE	Waialua Wells P-1	12/3/2002	<	0.5	
332-003	3405-01	TCP	Waialua Wells P-1	7/16/2002	0	0.5	
332-003	3405-01	TCP	Waialua Wells P-1	6/13/2002	0	0.5	
332-003	3405-01	TCP	Waialua Wells P-1	2/14/2002	0	0.62	
332-003	3405-01	TCP	Waialua Wells P-1	11/16/2001	0	0.57	
332-003	3405-01	TCP	Waialua Wells P-1	12/3/2002	0	0.62	
332-003	3405-01	TCP	Waialua Wells P-1	1/17/2003	0	0.53	

Well Contamination Data

332-004	3405-02	DBCP	Waialua Wells P-2	1/17/2003	<	0.04	
332-004	3405-02	TCE	Waialua Wells P-2	7/16/2002	<	0.5	
332-004	3405-02	TCE	Waialua Wells P-2	12/3/2002		0.5	
332-004	3405-02	TCE	Waialua Wells P-2	11/16/2001	<	0.5	
332-004	3405-02	TCE	Waialua Wells P-2	6/13/2002	<	0.5	
332-004	3405-02	TCE	Waialua Wells P-2	2/14/2002	<	0.5	
332-004	3405-02	TCP	Waialua Wells P-2	2/14/2002		0.67	
332-004	3405-02	TCP	Waialua Wells P-2	12/3/2002		0.67	
332-004	3405-02	TCP	Waialua Wells P-2	1/17/2003		0.61	
332-004	3405-02	TCP	Waialua Wells P-2	7/16/2002		0.54	
332-004	3405-02	TCP	Waialua Wells P-2	6/13/2002		0.59	
332-004	3405-02	TCP	Waialua Wells P-2	11/16/2001		0.53	

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PRELIMINARY RESULTS