

Existing Data Summary and Evaluation Report for Groundwater Flow and Contaminant Fate and Transport Modeling, Red Hill Bulk Fuel Storage Facility JOINT BASE PEARL HARBOR-HICKAM, O‘AHU, HAWAI‘I

Administrative Order on Consent in the Matter of Red Hill Bulk Fuel Storage Facility, EPA Docket Number RCRA 7003-R9-2015-01 and DOH Docket Number 15-UST-EA-01, Attachment A, Statement of Work Section 6.2, Section 7.1.2, Section 7.2.2, and Section 7.3.2

**March 5, 2017
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**Comprehensive Long-Term Environmental Action Navy
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1 **Existing-Data Summary and**
2 **Evaluation Report for Groundwater**
3 **Flow and Contaminant Fate and**
4 **Transport Modeling,**
5 **Red Hill Bulk Fuel Storage Facility**
6 **JOINT BASE PEARL HARBOR-HICKAM, O‘AHU, HAWAI‘I**

7 **Administrative Order on Consent in the Matter of Red Hill Bulk Fuel Storage**
8 **Facility, EPA Docket Number RCRA 7003-R9-2015-01 and**
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10 **Section 6.2, Section 7.1.2, Section 7.2.2, and Section 7.3.2**

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13 Prepared for:

14 **Defense Logistics Agency Energy**
15 **8725 John J Kingman Rd Suite 4950**
16 **Fort Belvoir, VA 22060-6222**

17 Prepared by:

18 **AECOM Technical Services, Inc.**
19 **1001 Bishop Street, Suite 1600**
20 **Honolulu, HI 96813-3698**

21 Prepared under:



22 **Comprehensive Long-Term Environmental Action Navy**
23 **Contract Number N62742-12-D-1829, CTO 0053**
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ACRONYMS AND ABBREVIATIONS

1		
2	°	degree
3	µg/L	micrograms per liter
4	AASHTO	American Association of State Highway and Transportation Officials
5	ALS	Analytical Laboratory Services
6	ALSE	Accutest Laboratories Southeast
7	AOC	Administrative Order on Consent
8	APPL	Agriculture and Priority Pollutants Laboratories Inc.
9	ASTM	American Society for Testing and Materials
10	ATSDR	Agency for Toxic Substances and Disease Registry
11	AVGAS	aviation gasoline
12	bgs	below ground surface
13	BTEX	benzene, toluene, ethylbenzene, and xylenes
14	BWS	Board of Water Supply, City and County of Honolulu
15	C	Celsius
16	CAMEO	Computer-Aided Management of Emergency Operations
17	CAS	Columbia Analytical Services
18	CEL	Calscience Environmental Laboratories, Inc.
19	CF&T	contaminant fate and transport
20	CLP	Contract Laboratory Program
21	COPC	chemical of potential concern
22	CSM	conceptual site model
23	CTD	conductivity, temperature, and depth
24	CWRM	Commission on Water Resource Management, State of Hawai‘i
25		Department of Land and Natural Resources
26	DLA	Defense Logistics Agency
27	DLNR	Department of Land and Natural Resources, State of Hawai‘i
28	DoD	Department of Defense
29	DOH	Department of Health, State of Hawai‘i
30	DON	Department of the Navy, United States
31	EAL	Environmental Action Level
32	EC	equivalent carbon
33	EDB	ethylene dibromide
34	ELAP	Environmental Laboratory Accreditation Program
35	EPA	Environmental Protection Agency, United States
36	ESI	Environmental Science International, Inc.
37	FIPS	Federal Information Processing Standards
38	ft	foot/feet
39	ft/d	foot/feet per day
40	ft ⁻¹	per foot
41	g/L	gram per liter
42	gal/min	gallons per minute
43	GIS	geographic information system
44	HDOT	State of Hawai‘i Department of Transportation
45	HEER	Hazard Evaluation and Emergency Response, State of Hawai‘i Department
46		of Health
47	HGGRC	Hawai‘i Groundwater and Geothermal Resources Center
48	HGU	hydrogeologic unit
49	ID	identification

1	IEC	International Electrotechnical Commission
2	in	inch
3	ISO	International Organization for Standards
4	JBPHH	Joint Base Pearl Harbor-Hickam
5	JP	Jet Fuel Propellant
6	K	hydraulic conductivity
7	K _h	horizontal hydraulic conductivity
8	K _v	vertical hydraulic conductivity
9	LDC	Laboratory Data Consultants, Inc.
10	LUST	leaking underground storage tank
11	m	meter
12	MCAWW	Methods for the Chemical Analysis of Water and Wastes
13	mg/L	milligrams per liter
14	mgd	million gallons per day
15	MOGAS	motor gasoline
16	MRL	method reporting limit
17	msl	mean sea level
18	MtBE	methyl tertiary-butyl ether
19	NAD	North American Datum
20	NAP	natural attenuation parameter
21	NAPL	non-aqueous-phase liquid
22	NATO	North Atlantic Treaty Organization
23	NAVFAC	Naval Facilities Engineering Command
24	NELAC	National Environmental Laboratory Accreditation Conference
25	NELAP	National Environmental Laboratory Accreditation Program
26	NFA	no further action
27	NFG	National Functional Guidelines
28	NIOSH	National Institute for Occupational Safety and Health
29	NOAA	National Oceanic and Atmospheric Administration
30	NSFO	Navy Special Fuel Oil
31	NTU	nephelometric turbidity unit
32	OWDF	Oily Waste Disposal Facility
33	PAH	polynuclear aromatic hydrocarbon
34	PARCC	precision, accuracy, representativeness, completeness, and comparability
35	PCB	polychlorinated biphenyl
36	PEST	Parameter Estimation
37	PID	photoionization detector
38	ppt	parts per trillion
39	QA/QC	quality assurance/quality control
40	QAP	quality assurance plan
41	QSM	Quality Systems Manual
42	RCRA	Resource Conservation and Recovery Act
43	RHMW	Red Hill Monitoring Well
44	RQD	rock quality designation
45	RSL	regional screening level
46	SAL	soil action level
47	SAP	sampling and analysis plan
48	SDWB	Safe Drinking Water Branch, State of Hawai'i Department of Health
49	SHWB	Solid and Hazardous Waste Branch, State of Hawai'i Department of Health

1	SHWS	State Hazardous Waste Sites
2	SME	subject matter expert
3	SOW	scope of work
4	SWF/LF	Solid Waste Disposal Facilities
5	TAMC	Tripler Army Medical Center
6	TDS	total dissolved solids
7	TEC	The Environmental Company
8	TPH	total petroleum hydrocarbons
9	TPH-d	total petroleum hydrocarbons – diesel range organics
10	TPH-g	total petroleum hydrocarbons – gasoline range organics
11	TPH-o	total petroleum hydrocarbons – residual range organics (i.e., TPH-oil)
12	U.S.	United States
13	USGS	United States Geological Survey
14	UST	underground storage tank
15	VOC	volatile organic compound
16	WP	work plan
17	WRRC	Water Resources Research Center, University of Hawai'i

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1. Introduction

This report presents currently compiled existing data and other relevant information pertaining to the groundwater flow modeling area for the Investigation and Remediation of Petroleum Product Releases and Groundwater Protection and Evaluation project at the Red Hill Bulk Fuel Storage Facility ("Facility"), Joint Base Pearl Harbor-Hickam (JBPHH), O'ahu, Hawai'i. The data are summarized in Section 2 and evaluated for their applicability and limitations in achieving the project objectives in Section 3. The data are presented in tabular format as Excel files in the first three appendixes.

The project Work Plan/Scope of Work (WP/SOW) (DON 2017) presents the process, tasks, and deliverables that address the goals and requirements of the *Administrative Order on Consent (AOC) In the Matter of Red Hill Bulk Fuel Storage Facility* (EPA Docket No: RCRA 7003-R9-2015-01; DOH Docket No: 15-UST-EA-01). The AOC was issued by the United States (U.S.) Environmental Protection Agency (EPA) Region 9 and State of Hawai'i Department of Health (DOH) (EPA Region 9 and DOH 2015) to the U.S. Department of the Navy (DON; Navy) / Defense Logistics Agency (DLA) in response to a release of an estimated 27,000 gallons of Jet Fuel Propellant (JP)-8 from one of the Facility's 12.5-million-gallon underground fuel storage tanks (Tank 5) that was confirmed and verbally reported to DOH and EPA on January 16, 2014. The bottoms of the Facility's 20 tanks are located approximately 100 feet (ft) above a major groundwater aquifer, which feeds both Navy and the City and County of Honolulu drinking water sources.

The planning activities described in the WP/SOW include preparing ten documents, referred to as derivative deliverables, which will address specific aspects of the planning process for the investigation. This existing data report (referred to as the *Existing-Data Evaluation/Summary Report* in the WP/SOW) is one of the first three derivative deliverables being prepared after submittal of the WP/SOW (Revision 02) on January 4, 2016. It supports the investigation that specifically addresses AOC Statement of Work Section 6 (Investigation and Remediation of Releases) and Section 7 (Groundwater Protection and Evaluation). A flowchart showing the sequencing of derivative deliverables is presented on Figure 1, and additional information on each of the other derivative deliverables is provided in the WP/SOW (DON 2017). (Report figures are compiled at the end of each section.)

One of the seven project tasks identified in the WP/SOW is Update the Existing Groundwater Flow Model. This report is the first of four project deliverables to be generated in support of that task; the subsequent deliverables are the *Data Gap Analysis Report*, *Conceptual Site Model Development and Update Plan*, *Groundwater Model Evaluation Plan*, and *Sentinel Well Network Development Plan*.

The data review and analysis activities summarized in this report are intended to support the project's groundwater flow and contaminant fate and transport (CF&T) modeling effort, and to evaluate the compiled data's usability for inclusion in that effort. The majority of data referenced in this report have been compiled from previous efforts in obtaining background information, a literature review, and primary data from studies and investigations in the modeling area. In some instances, an existing data set is known, but access to that data has not yet been obtained (e.g., logs to borings along South Hālawā Stream), and it is presumed there are instances where data may have not yet been discovered. Data obtained subsequent to publication of this report will be evaluated in future derivative deliverables for inclusion in the modeling effort, but will not be incorporated in further revisions to this report.

1 A future deliverable (*Data Gap Analysis Report*) will focus on identifying possible data gaps critical
2 to the modeling effort. Additionally, selection of exact values and parameters for the groundwater
3 flow and CF&T modeling are not included in this report, but rather will be discussed further in a
4 subsequent project deliverable, *Groundwater Model Evaluation Plan* (see (DON 2017)).

5 **1.1 PHYSICAL BOUNDARIES OF THE STUDY**

6 This project involves three principal types of physical boundaries:

- 7 • *Facility boundary*: As shown on Figure 2, the Facility is located on federal government
8 land (zoned F1-Military and Federal) in Hālawā Heights, approximately 2.5 miles
9 northeast of Pearl Harbor. It is situated on a low ridge on the western edge of the
10 Ko'olau Mountain Range that divides Hālawā Valley from Moanalua Valley. The
11 Facility is bordered on the north by Hālawā Correctional Facility and private businesses,
12 on the southwest by the U.S. Coast Guard reservation, on the south by residential
13 neighborhoods, and on the east by Moanalua Valley. The private Halawa Quarry is
14 located less than one-quarter mile away to the northwest. The Facility occupies
15 144 acres of land, and the majority of the site's surface is at an elevation ranging from
16 approximately 200 to 500 ft above mean sea level (msl).
- 17 • *Study area boundary*: The current project study area extends beyond the Facility
18 boundaries to include the entire area depicted on the main panel of Figure 2. This area is
19 bounded on the northeast by the upper slopes of Red Hill, on the southeast by Moanalua
20 Valley, on the southwest by residential housing, and on the northwest by Hālawā Valley.
21 The study area is the area where the collection of physical (e.g., geologic data, water
22 level data) and chemical data will be focused. Data acquired during the investigation will
23 be reviewed in coordination with the Regulatory Agencies to determine whether the
24 study area boundaries should be expanded and/or modified (e.g., additional monitoring
25 wells may be installed at locations outside the current study area, if necessary, to fill data
26 gaps and ensure that the Red Hill monitoring well network is adequate to achieve the
27 project objectives).
- 28 • *Modeling domain boundary*: As depicted on the inset map of Figure 2, the current extent
29 of the local modeling domain (based on the original DON 2007b model) is bounded to
30 the northwest by the center of Waimalu Valley, to the southeast by the middle of Kalihi
31 Valley, and to the west by the caprock aquifer and Pearl Harbor shore. The
32 appropriateness of these boundaries will be evaluated collaboratively with the
33 Regulatory Agencies and AOC SMEs based on all available data. The evaluation of the
34 modeling boundaries will be included in the first *Groundwater Flow Model Progress*
35 *Report*, which will be submitted in April 2017. Input parameters and assumptions will be
36 reviewed to verify appropriateness due to the additional data that have been collected
37 since 2007. The overall approach for the groundwater modeling task is presented in the
38 WP/SOW (DON 2017, Section 3.4) and will be further discussed in the forthcoming
39 *Groundwater Model Evaluation Plan*.

40 **1.2 DATA SOURCES**

41 The Facility has been the subject of multiple investigations. Consequently, a large body of regional,
42 local, and site-specific data (summarized in Section 2) already exists. The key agencies and sources
43 of data and information for the groundwater flow and CF&T modeling area include, but are not
44 limited to, the following:

- 1 • Agency for Toxic Substances and Disease Registry (ATSDR)
- 2 • State of Hawai'i Department of Land and Natural Resources (DLNR)
- 3 • State of Hawai'i Department of Transportation (HDOT)
- 4 • City and County of Honolulu Board of Water Supply (BWS)
- 5 • Idaho National Engineering and Environmental Laboratory
- 6 • Lawrence Berkeley National Laboratory
- 7 • Peer-reviewed academic journals (e.g., *Journal of Hydrology*)
- 8 • State of Hawai'i Department of Health (DOH)
- 9 • U.S. Department of the Navy (DON)
- 10 • U.S. Environmental Protection Agency (EPA)
- 11 • U.S. Geological Survey (USGS)
- 12 • University of Hawai'i Water Resources Research Center (WRRC)

13 **1.3 REPORT ORGANIZATION**

14 The compiled data are summarized in Section 2, which also presents summary narratives regarding
15 climate, geology, hydrogeology, site characteristics, the Red Hill groundwater monitoring network,
16 and other pertinent information. A detailed discussion of the applicability and limitations of the data
17 is presented in Section 3. References cited in the main report are listed in Section 4; references
18 specific to the appendixes are presented therein. The forthcoming *Data Gap Analysis Report* will
19 identify possible data gaps critical to the modeling effort.

20 The compiled data are presented as Excel files in Appendix A. Appendix B and Appendix C present
21 charts of depth to groundwater time-series and historical groundwater concentration trends for Red
22 Hill groundwater monitoring wells, respectively; the data used to generate these charts are similarly
23 presented as attached Excel files. Appendix D presents boring logs from locations within the
24 modeling area.

25 The appendix Excel files are presented on CD-ROM in hard-copy reports, and as file attachments in
26 PDF copies of the report (view the PDF program's Attachments pane to access).

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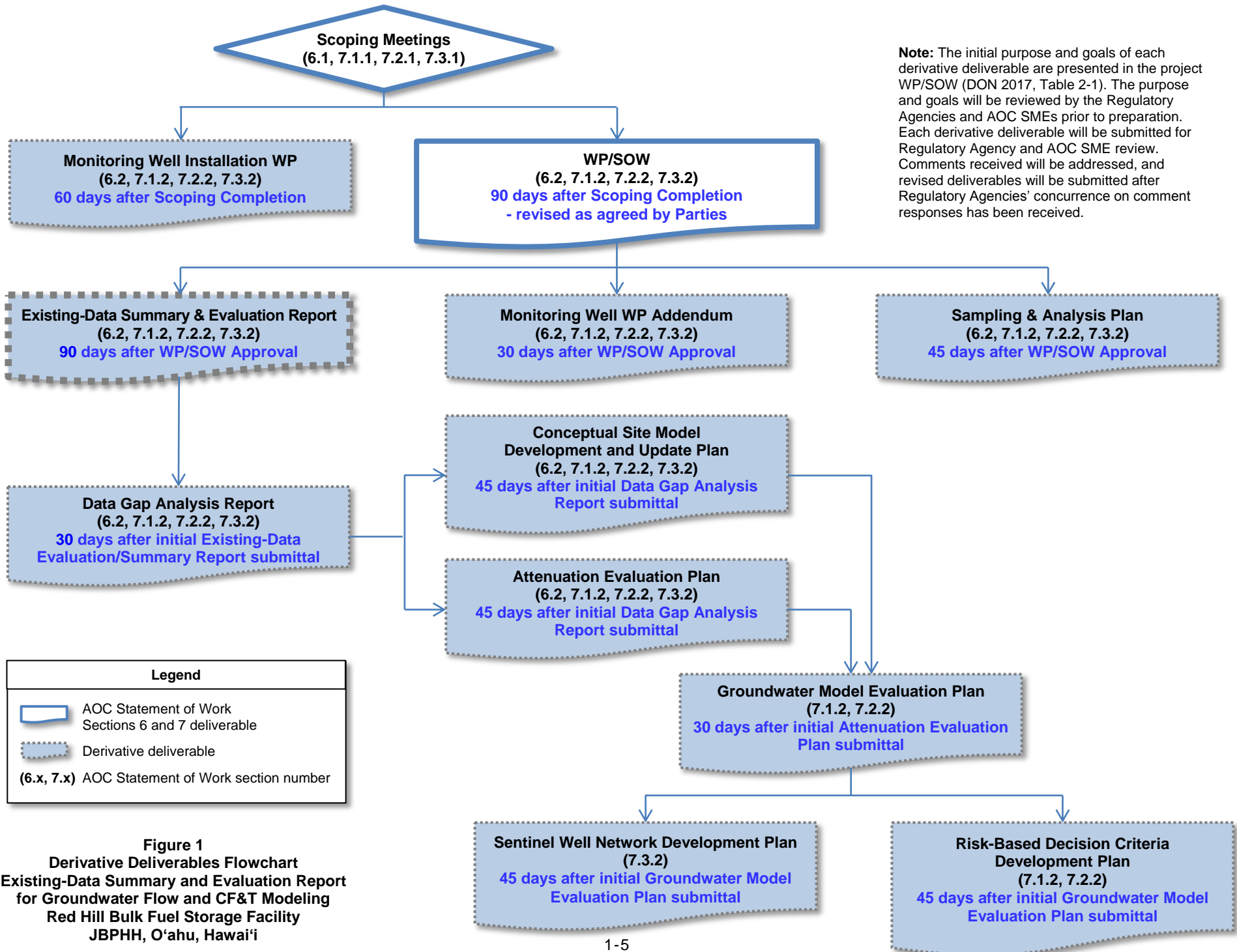
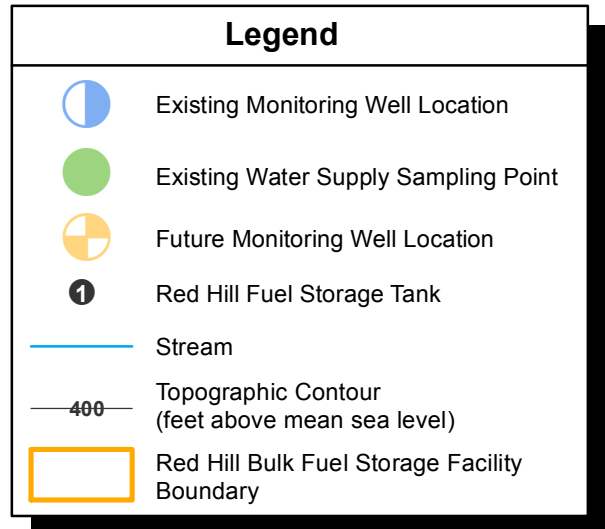
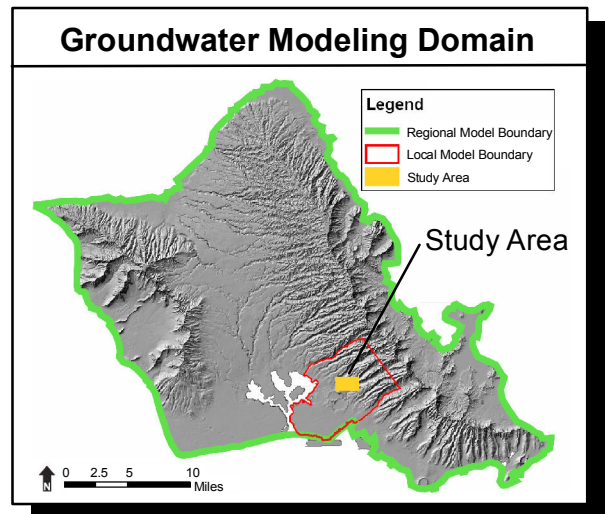
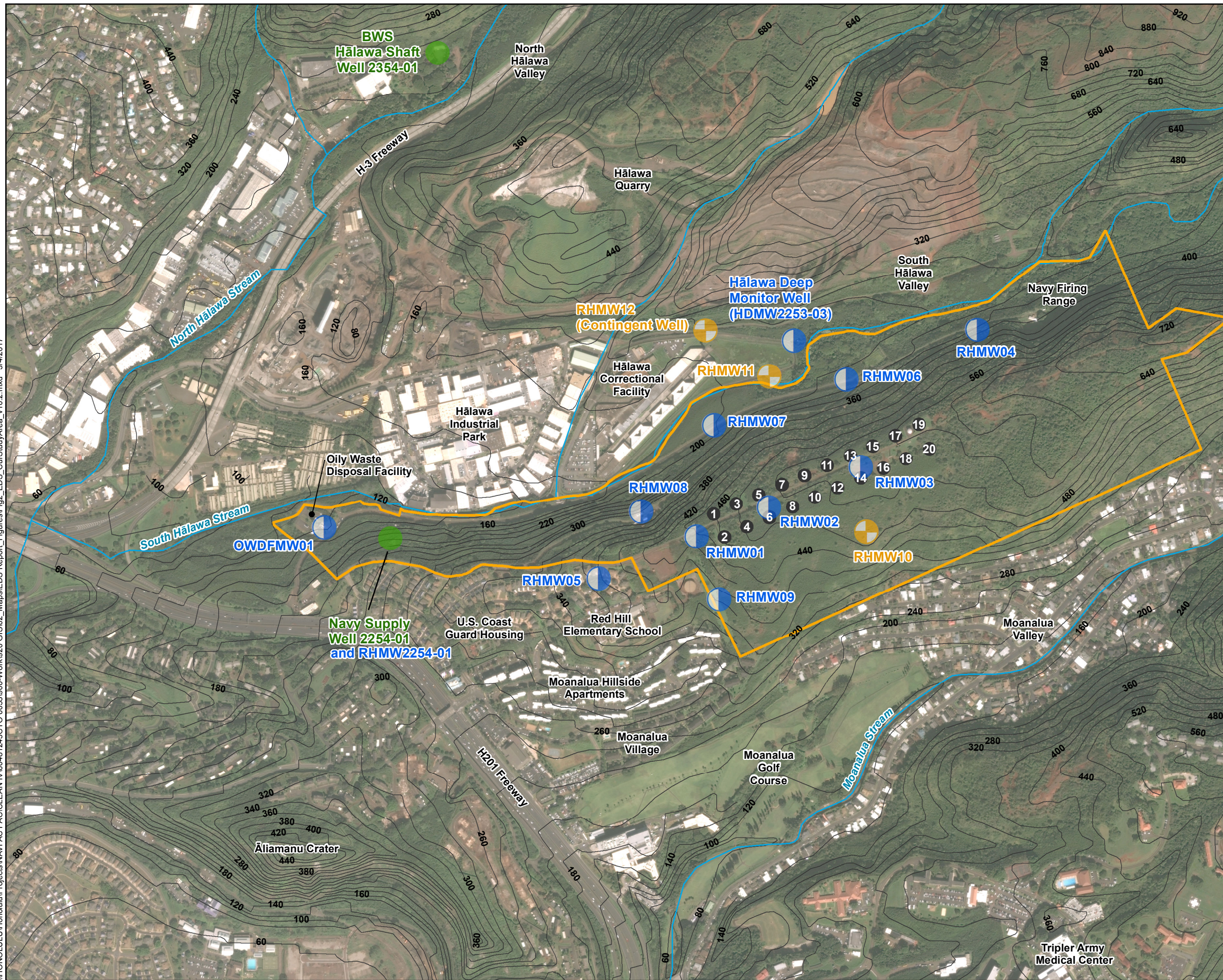


Figure 1
Derivative Deliverables Flowchart
Existing-Data Summary and Evaluation Report
for Groundwater Flow and CF&T Modeling
Red Hill Bulk Fuel Storage Facility
JBPHH, O'ahu, Hawai'i

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Notes

1. Map projection: NAD 1983 UTM Zone 4N
2. Base Map: DigitalGlobe, Inc. (DG) and NRCS. Publication Date: 2015
3. Installation of monitoring well RHMW12 is contingent pending subsurface conditions encountered during installation of RHMW11.

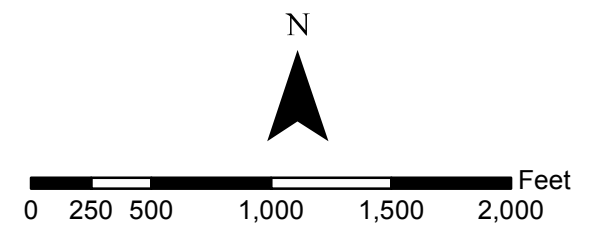


Figure 2
Current Study Area and Modeling Domain
Existing-Data Summary and Evaluation Report
for Groundwater Flow and CF&T Modeling
Red Hill Bulk Fuel Storage Facility
JBPHH, O'ahu, Hawai'i

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2. Summary of Compiled Existing Data

This section summarizes the available existing geologic, hydrogeologic, facilities, and chemical data for the groundwater flow and CF&T modeling area, which includes the Facility and surrounding areas (Figure 3). Each subsection contains a summary of the type(s) of data compiled, the references consulted, and a narrative summarizing the available data. The entirety of the compiled data is presented in Appendix A.

Although this section summarizes all available compiled existing data pertinent to the groundwater flow and CF&T modeling area, not all such data will necessarily be selected for inclusion in the updated groundwater flow model. Selection of exact values and parameters for the updated groundwater flow model will be presented in the subsequent derivative deliverable, *Groundwater Model Evaluation Plan* (DON 2017).

Table 2-1 presents a condensed assessment of the applicability and limitations of the data that are summarized in this section. Detailed discussion of the applicability and limitations of the data is presented in Section 3.

2.1 GEOLOGIC AND HYDROGEOLOGIC DATA

This subsection provides a description of the geology and aquifer within the modeling area (Figure 3); hydrogeologic units (HGUs) (e.g., Caprock), and associated properties (e.g., vertical thickness, hydraulic conductivity); monitoring well and water supply well locations; groundwater levels, and physical and chemical properties; groundwater recharge sources (e.g., precipitation); characteristics of the Facility; and additional information deemed pertinent to the groundwater flow model (e.g., land use within the modeling area).

2.1.1 Geologic Data

Geologic data have been collected from available boring logs, previous reports, and agency files regarding the vertical and lateral extent of geologic units and layers beneath the modeling area, as well as the geologic history of the area (Appendix A.1, Geology Data Tables GEO-1 and GEO-4). These data include:

- Approximate boring locations plotted on Figure 4 – Figure 7
- Reference datum for each boring location
- Geologic boring logs
- Geologic material (e.g., sand, tuff, basalt) and physical characteristics
- Boring surface elevation, depth, and diameter
- Geologic cross sections (Figure 8 and Figure 9)
- Geologic surface maps (Figure 10 – Figure 12)
- Site-specific, local, and regional geologic histories

Table 2-2 summarizes the geologic data references compiled for the modeling area, and the types of data they provide. Table 2-3 summarizes the soil and boring logs presented in Appendix D, and the type of data they provide.

1 **Table 2-1: Assessment of Data's Applicability and Limitations**

Application to Groundwater Flow and Fate and Transport Model	Data Type	Applicability	Limitations ^a
2.1 Geologic and Hydrogeological Data			
<i>2.1.1 Geologic Data</i>			
Defining the model layer geometry throughout the model domain, and refining the groundwater flow model	Boring logs	All logs are applicable to defining subsurface layers and features that may affect chemical of potential concern (COPC) transport in both the vadose and saturated zones.	Boring logs vary in quality, location, and detail within the modeling boundaries. Driller's logs based on drill cuttings provide some limited information; logs based on samples and continuous cores provide better information. Geolocation data is lacking for some sets of borings.
	Cross sections	Cross sections are applicable. Generally, the vadose zone is better defined in the vicinity of the tank farm based on barrel logs and recent Navy investigations. All logs are applicable to defining subsurface layers and features that may affect transport in both the vadose and saturated zones.	Cross sections are limited by the spatial distribution of the bore logs they are based on.
	Regional, local, and site-specific studies	The subsurface extent and configurations of the Caprock and Basalt Hydrogeologic Units (HGUs) have been further defined throughout the modeling area by the subsurface maps available in the recent USGS report by Izuka et al. (2016), which are applicable and useful.	Site-specific information is confined to borings and cross sections.
<i>2.1.2 Hydrogeological Data</i>			
Applicable for refining aquifer hydraulic properties in the model, including: <ul style="list-style-type: none"> • Transmissivity • Hydraulic conductivity • Heterogeneity and anisotropy • Storativity • Specific yield • Effective porosity 	Hydraulic properties	The USGS report by Izuka et al. (2016) provides an updated and detailed summary of the available hydrogeology information for the island of O'ahu. There does not appear to be any additional hydraulic property data available for the modeling area other than those available for the 2007 model report. Since 2007, the only new information for hydraulic properties collected in the modeling area are the data from the USGS pumping test of the BWS Hālawā Shaft in May 2015.	Within the current compiled data set, variable pumping rates create uncertainties in evaluating the data. For example, flow rate data for Red Hill Shaft do not include the entire pumping test period. Pumping rates are not shown in the records for Red Hill Shaft prior to May 22, 2015. It is also not known whether other un-monitored pumping wells may have created drawdown in the wells monitored during this test. Current data do not include site-specific values for effective porosity. Geologic information is too sparse to define the subsurface spatial distribution and continuity of high-permeability clinker zones.
<i>2.1.3 Groundwater Characteristics</i>			
Unusually high degrees of accuracy and precision needed for defining the hydraulic gradients at in this site area because the high aquifer permeability causes relatively flat gradients	Groundwater elevations	At present, only one set of synoptic groundwater level measurements is available, which were collected on November 18, 2016 from the Facility wells. Those measurements are from a period in which Red Hill Shaft was not pumping and thus will be useful for developing the conceptual site model (CSM). However, even these synoptic data are of limited usefulness for calibrating the numerical flow model because water levels and pumping rates in other nearby wells, including Hālawā Shaft, are not known during that period.	Inconsistent datum elevations may have been used for different groups of wells. This uncertainty prompted the planned resurveying of the surface elevations at all of the monitoring wells at the Facility in the primary area of interest for modeling to a high standard, which is a Second-Order, Class I geodetic level survey.

Application to Groundwater Flow and Fate and Transport Model	Data Type	Applicability	Limitations ^a
<p>Estimating recharge and discharge rates into the model to define the areal distribution of groundwater recharge rates</p>	<p>Groundwater recharge and discharge</p>	<p>Recent USGS reports provide maps of estimated mean annual recharge rates for the model area. One report (Izuka et al. 2016) presents a map of recharge rates for recent conditions (2010 land cover, 1978–2007 rainfall). Another USGS report (Engott et al. 2015) provides a comprehensive water budget analysis and estimates of the spatial distribution of groundwater recharge rate. Results of the USGS analyses include maps covering the entire modeling area that show recharge rates estimate for average climate and drought conditions. Information on these maps will be useful and applicable for refining the groundwater flow and CF&T model.</p>	<p>There is some uncertainty in the assumptions applied by the USGS for analyzing groundwater recharge rates. If the USGS recharge rate maps are available as geographic information system (GIS) shapefiles, it will be possible to directly import the recharge rates into the model to define the areal distribution of groundwater recharge rates.</p>
<p>2.2 Monitoring Well and Water Supply Data</p>			
<p>Estimating recharge and pumping effects (pumping and non-pumping) in the model</p>	<p>Monitoring / water supply well and infiltration tunnel data</p>	<p>The primary groundwater flow modeling area contains seven groundwater monitoring wells, and the remaining groundwater flow modeling area contains 185 documented wells. Additionally, nine water supply wells and infiltration galleries were identified within the groundwater flow modeling area. Data from all these wells are applicable, but the water supply and infiltration galleries in the primary area of interest are anticipated to have the most influence on the model results. Synoptic water level and pumping rate data from these wells with more accurate surveyed elevations in the area of interest are needed, to calibrate the model and then conduct simulations to evaluate pumping effects.</p>	<p>Inconsistent datum elevations may have been used for different groups of primary wells. Past and future pumping times and rates will be required. For example, flow rate data for Red Hill Shaft do not include the entire pumping test period. Pumping rates are not shown in the records for Red Hill Shaft prior to May 22, 2015.</p>
<p>2.3 Facilities and Land Use Data</p>			
<p>Release location, volumes, nature of fuel type to support CF&T scenarios</p>	<p>Facility fuel storage tank capacity, dimensions, past and current status, and releases</p>	<p>Database contains locations, construction, volume, fuel storage history, and documented releases for the Red Hill Tank Farm and area sites. Data are relevant and applicable.</p>	<p>Uncertainty of the exact timing and volume estimate of the 2014 Tank 5 release.</p>

Application to Groundwater Flow and Fate and Transport Model	Data Type	Applicability	Limitations ^a
2.3.3 Chemical Data			
Groundwater COPC concentrations (spatial and temporal) trends at monitoring points are required input for the CF&T model.	Red Hill COPC chemical data	Data from February 2005 to October 2016 are suitable for consideration for inclusion in the groundwater flow and CF&T modeling efforts.	<p>February 2005 – September 2007 data quality assessments were not conducted as part of the reporting process. In some cases, EPA Level II data packages were provided and limited data reviews are possible; in other cases, EPA Level III data packages were provided, and data have been considered usable based on data reviews performed.</p> <p>September 2005 and July 2006 groundwater sample data underwent third-party validation following EPA National Functional Guidelines for organic and inorganic data. The flagging protocol used has inconsistencies from the current Department of Defense (DoD) <i>Quality Systems Manual</i> (QSM) and Navy <i>Project Procedures Manual</i>, but January 2008 – July 2010 data quality assessments were not conducted as part the reporting process. However, EPA Level II data packages were provided, and limited data reviews are possible.</p> <p>Reported results are impacted by several factors, which include laboratory-specific protocols for defining the carbon range for total petroleum hydrocarbons (TPH), an analyst's interpretation of TPH patterns, and how a TPH result is reported. While TPH data have been considered usable based on data reviews performed, if anomalies are identified upon modeling groundwater flow or CF&T, TPH data should undergo further review.</p> <p>Data had inconsistent use of flagging conventions (i.e., application of data qualifiers).</p>
Groundwater natural attenuation parameter (NAP) concentrations are needed to provide biodegradation inputs for the CF&T model.	Red Hill NAP data	NAP concentrations in groundwater samples collected at the site are applicable and relevant.	<p>Monitoring data include the following NAPs:</p> <ul style="list-style-type: none"> • Methane • Ferrous iron • Nitrate • Sulfate • Chloride • Alkalinity • Dissolved oxygen

Application to Groundwater Flow and Fate and Transport Model	Data Type	Applicability	Limitations ^a
COPC and NAP transport characteristics to support the contaminant fate and transport model: <ul style="list-style-type: none"> • Molecular weight • Density • Solubility • Partition coefficient • Soil mobility • Degradation rate(s) 	Risk assessment reports and various reference materials (e.g., Merck Index)	Literature and reference sources are applicable and relevant for the CF&T model, and meet the current industry standard.	No limitations identified with current data set based on identified literature references.

^a The limitations identified in this table are based on an assessment of the currently compiled data set to satisfy the objectives of AOC Statement of Work Sections 6 and 7.

1 **Table 2-2: Geologic Data References**

Reference	Geologic Data ^a				
	Boring / Excavation Logs	Cross Sections	Surface Maps	Geologic History	Structural Geology
<i>Site Characterization, Halawa Medium Security Facility, Halawa Valley, Oahu, Hawaii</i> (Dames & Moore 1991)	—	L	—	—	—
<i>Initial Phase II Site Characterization Report, Fleet Industrial Supply Center Bulk Fuel Storage Facility at Red Hill</i> (DON 1999)	L, R	—	—	R	—
<i>Phase II Remedial Investigation, Red Hill Oily Waste Disposal Facility</i> (DON 2000)	S	S	S	—	L
<i>Red Hill Bulk Fuel Storage Facility Investigation Report (Final) for Fleet Industrial Supply Center</i> (DON 2002b)	S, L	S	—	R	—
<i>8,000-Gallon AST Area Total Petroleum Hydrocarbon-Diesel Characterization Report</i> (DON 2003)	S, L	—	—	—	—
<i>Red Hill Bulk Fuel Storage Facility Work Plan</i> (DON 2005)	S, L	S	—	—	—
<i>Red Hill Bulk Fuel Storage Facility Final Technical Report</i> (DON 2007b)	S	S	S	S, L, R	S
<i>Red Hill Bulk Fuel Storage Facility Final Groundwater Protection Plan</i> (DON 2008)	—	S	—	—	S
<i>2011 Biennial Leak Detection Testing Report of Bulk Field Constructed Underground Storage Tank 15</i> (DON 2011)	—	S, L	—	R	—
<i>2011 Biennial Leak Detection Testing Report of Bulk Field Constructed Underground Storage Tank 18</i> (DON 2011)	S, L	S, L	S, L	—	S, L
<i>FY11SRM Repair of Red Hill Fuel Tunnel, Geotechnical Data Report</i> (DON 2012o)	L	—	—	—	—
<i>Plans for Construction of a Portion of Interstate Route H-3, Halawa Quarry Viaduct Makai Section</i> (HDOT 1988)	S, L	S, L, R	—	—	L
<i>Volcanic Aquifers of Hawai'i—Hydrogeology, Water Budgets, and Conceptual Models</i> (Izuka et al. 2016)	—	—	R	R	—
<i>Geohydrology of the Central Oahu, Hawaii, Ground-Water Flow System and Numerical Simulation of the Effects of Additional Pumping</i> (Oki 1998)	—	—	L, R	—	L
<i>Numerical Simulation of the Effects of Low-Permeability Valley-Fill Barriers and the Redistribution of Ground-Water Withdrawals in the Pearl Harbor Area</i> (Oki 2005)	—	R	R	L, R	L, R
<i>Numerical Analysis of Ground-Water Flow and Salinity in the Ewa Area, Oahu, Hawaii</i> (Oki et al. 1996)	R	R	R	—	—
<i>Water Resources of North-Central Oahu, Hawaii</i> (Rosenau, Lubke, and Nakahara 1971)	—	R	—	—	—
<i>Halawa Deep Monitoring Well Log</i> (URS Group 2000)	S	—	—	—	—
<i>Final Summary of Drilling and Hydrogeologic Conditions for Waimalu Deep Monitor Well No. 2456-05</i> (URS 2006)	S	—	—	—	—
<i>FY11 SRM Repair of Red Hill Fuel Tunnel, Surface Boring Abandonment Reports</i> (DON 2013b)	S, L	—	—	—	—

2 — no data

3 ^a Abbreviations:

4 L local data (within 5 miles of the Facility)

5 R regional data (i.e., island- or state-wide data)

6 S site-specific data

1 **Table 2-3: Soil and Boring Log References**

Description/Reference	Location	Vadose Zone Covered in Logs	Saturated Zone Covered in Logs	Saprolite Noted in Logs	Valley Fill Alluvium Noted in Logs	Tuffs Noted in Logs	Massive Basalts Noted in Logs	A'ā Lava Noted in Logs	Pāhoehoe Lava Noted in Logs	Clinker Beds Noted in Logs	Physical Cores in Storage	Remarks
Red Hill Area ^a												
Log of Red Hill Water-Development Tunnel (Stearns 1943)	Red Hill Shaft Tunnel	•	•	—	—	—	•	•	•	•	—	Detailed log of Red Hill water-development tunnel showing lateral definition of basalt types and notations regarding groundwater discharge rates.
Geologic Sections and Test Borings for Red Hill, Waimalu Valley (Macdonald 1941)	Red Hill Ridge	•	—	—	—	—	•	•	•	•	—	Exploration borings along Red Hill ridge top. Features cross-section correlations from borings through to Hālawā and Moanalua valley walls.
Barrel Logs for Tanks 1–20 (DON 1943)	Red Hill Ridge and Tank Farm	•	—	—	—	—	•	—	—	•	—	Tank barrel logs for side walls of tank excavations. Shows lateral extent and geometry of rock types, lava domes, and tubes.
Angle and Vertical Borings (including RHMW01) from Initial Red Hill Investigations (DON 1999) (DON 2002b)	Red Hill Facility Tank Farm	•	•	—	•	—	•	—	—	•	—	In-tunnel borings for monitoring well installation and angle borings for soil vapor. Vesicle size and grout seams are noted on logs. Logs contain rock quality designations (RQDs) and describe voids, vesicle size and percentage, and occurrence of phenocrysts. Boring log for installation of RHMW01 (installed as B-V1D).
Borings for RHMW02, RHMW03, and RHMW04 (DON 2007b)	Red Hill Ridge and Tank Farm	•	—	—	—	—	•	—	—	•	—	Cross-section constructed from 1941–43 Tank Barrel Logs 1–20. Lava domes noted.
Boring for Monitoring Wells RHMW05–RHMW07 (DON 2015a)	Red Hill Facility Tank Farm, and Existing Red Hill Monitoring Wells	•	•	—	•	—	•	—	—	•	•	Physical cores are in storage for RHMW05, RHMW06, RHMW07, RHMW08, and RHMW09.
Red Hill Tunnel Repair Borings (DON 2012o)	Red Hill Tunnel Repair Project Pearl Harbor	•	—	—	—	•	•	•	•	•	—	Fifteen borings; logs contain fracture drawings with notes regarding mineralogical infilling and aperture size.

Description/Reference	Location	Vadose Zone Covered in Logs	Saturated Zone Covered in Logs	Saprolite Noted in Logs	Valley Fill Alluvium Noted in Logs	Tuffs Noted in Logs	Massive Basalts Noted in Logs	A'ā Lava Noted in Logs	Pāhoehoe Lava Noted in Logs	Clinker Beds Noted in Logs	Physical Cores in Storage	Remarks
Oily Waste Disposal Facility (OWDF)												
Phase I RI Borings (DON 1996)	OWDF Site	•	•	•	•	•	•	—	—	—	—	Shallow and deep borings. Perched groundwater.
Phase II RI Borings (DON 2000)	OWDF Site	•	•	•	•	•	•	—	—	—	—	Shallow and deep borings. Perched groundwater.
AST Characterization Borings (DON 2003)	OWDF Site	•	—	•	•	—	•	—	—	—	—	Shallow borings.
Hālawā, Waimalu Deep Monitor Wells												
Hālawā Deep Monitor Well 2253-03 Boring (CWRM 2001)	No address in record, but plotted on site map	•	•	•	—	—	•	•	•	—	—	Boring drilled to depth of 1,450 ft. Contains conductivity, temperature, and depth (CTD) profile defining fresh/saltwater interface.
Waimalu Deep Monitor Well 2456-05 Boring (URS 2006)	Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006	•	•	•	—	—	•	—	—	—	—	Single deep monitoring well. Basalts with clays, vesicles, and phenocrysts are noted in the log. Depth of boring up to 1,100 ft below ground surface.
Hālawā Correctional Facility, Hālawā Bus Facility												
Borings 1–14, Hālawā Medium Security Facility (Fewell 1982)	Hālawā Medium Security Facility	•	•	•	•	—	—	—	—	—	—	Shallow borings with groundwater encountered at the 200–220 ft msl elevation.
Borings 1–16 and B20–B26, Hālawā Medium Security Facility (Dames & Moore 1991)	Hālawā Medium Security Facility	•	•	•	•	—	—	—	—	—	—	Shallow borings with groundwater encountered at the 200–220 ft msl elevation.
Borings W-1 to W-6, Hālawā High Security Correctional Facility (MFA 1994)	Hālawā High Security Correctional Facility	•	•	•	•	•	—	—	—	—	—	Shallow borings with groundwater encountered.
Borings 8067-001 to -005, Hālawā Correctional Facility (Unitek 1988)	Hālawā High Security Correctional Facility	•	•	•	•	—	—	—	—	—	—	Shallow borings with groundwater encountered.
Boring for Well F-4, Former Hālawā Bus Facility (MFA 2005)	99-999 Iwaena Street, Aiea, HI	•	•	•	•	—	—	—	—	—	—	Shallow boring.

Description/Reference	Location	Vadose Zone Covered in Logs	Saturated Zone Covered in Logs	Saprolite Noted in Logs	Valley Fill Alluvium Noted in Logs	Tuffs Noted in Logs	Massive Basalts Noted in Logs	A'ā Lava Noted in Logs	Pāhoehoe Lava Noted in Logs	Clinker Beds Noted in Logs	Physical Cores in Storage	Remarks
Hālawā Valley Interstate Route H-3												
Borings 108-1A – 108-09 for Hālawā Quarry Viaduct, Makai Section (HDOT 1988)	H-3 Hālawā Quarry Viaduct, Makai Section	•	—	•	•	—	•	—	—	•	—	Shallow geotechnical borings along H-3 corridor.
Borings for North Hālawā Valley Highway, Unit I, Phase IB (HDOT 1994)	North Hālawā Valley Highway	•	—	•	•	—	•	—	—	•	—	Shallow geotechnical borings along H-3 corridor.
Borings for North Hālawā Valley Highway, Unit II (HDOT 1992)	North Hālawā Valley Highway	•	—	•	•	—	•	—	—	•	—	Shallow geotechnical borings along H-3 corridor.
Pearl Harbor Area												
Former Aiea Laundry Facility 2002 RI/FS Borings (DON 2002a)	Former Aiea Laundry Facility Site	•	•	•	•	•	•	—	—	—	—	Shallow and deep borings.
Former Aiea Laundry Facility 2015 RI/FS Borings (DON 2015c)	Former Aiea Laundry Facility Site	•	•	•	•	•	—	—	—	—	—	Shallow and deep borings.
Upper Pearl Harbor Foundation Investigation Borings (DON 1967) (DON 1971a) (DON 1971b)	Upper Pearl Harbor Area	•	—	—	•	•	—	—	—	—	—	Shallow and medium depth borings.
Halawa Main Gate RAA12 RI/FS Borings (DON 2015d)	Halawa Main Gate	•	•	—	•	—	—	—	—	—	—	Shallow and deep borings.
Makalapa Crater Geographic Study Area Borings (DON 2016b)	Makalapa Crater	•	•	—	—	•	—	—	—	—	—	Shallow borings drilled in Makalapa Crater.

^a Logs for Red Hill area borings are not included in Appendix D, but can be made available for viewing upon request to the Navy.

• data provided
— no data

1 2.1.1.1 REGIONAL GEOLOGY

2 O'ahu is the third largest of the eight major islands of the Hawaiian Archipelago and has a land area
3 of 596 square miles (Shade and Nichols 1996). Stearns and Vaksvik (1935; 1938) and Stearns (1939;
4 1940) published studies concerning the geology and groundwater resources of O'ahu. These studies,
5 published in Hawai'i Division of Hydrography Bulletins, describe the general stratigraphy and
6 structure of O'ahu, illustrate the petrology of the volcanic rocks, discuss groundwater resources, and
7 provide water well records. The Bulletins contain the first comprehensive and detailed studies of the
8 geology and water resources of the (then) Territory of Hawai'i.

9 The Ko'olau Range is composed primarily of Ko'olau volcanic series, which are made up almost
10 entirely of tholeiitic basalts and olivine basalts, and as a result contain little tuff. The few interbedded
11 tuff beds in the Ko'olau Range amount to less than 5 percent of the whole section (Wentworth 1951).
12 Small beds can be found near the crest of the range, and singular deposits have been found at the
13 head of Nu'uuanu Valley, near Honolulu. A vast dike system also makes up part of the Ko'olau
14 Series. Most dikes are vertical or nearly vertical, with some angling as low as 60 degrees (°)
15 (Macdonald, Abbott, and Peterson 1983).

16 Ko'olau lavas are of predominantly two types of extrusive rocks: pāhoehoe and a'ā. Approximately
17 60 percent of the Ko'olau lava flows are composed of a'ā lava (Sherrod et al. 2007). Pāhoehoe lava
18 dominates near the crest of the Ko'olau Range, with a'ā dominating on the periphery of the dome
19 (Stearns and Vaksvik 1935; Wentworth 1951).

20 Pāhoehoe lava flows are characterized as fluid, relatively low-viscosity flows. The cooled rock is
21 vesicular and ropy, and has a smoothly undulating surface. Elongate voids (e.g., lava tubes) can be
22 present that form in the horizontal, longitudinal direction, thereby creating preferential pathways.
23 Pāhoehoe flows form as relatively rapid-flowing basaltic lavas that tend to spread out laterally and
24 are typically thin. These flows contain voids of various sizes, and are often cracked and collapsed in
25 places. Lava tubes are associated with pāhoehoe lava flows.

26 A'ā lava produces jagged, blocky lava flows that contain clinker beds, and is characterized by
27 irregular, stretched, and deflated vesicles; massive beds that may have well-developed columnar or
28 platy jointing; the absence of lava tubes; and clinker layers that typically bound a massive dense core
29 or mid layer (Stearns and Vaksvik 1935). The clinker portions are extremely permeable and,
30 therefore, are subject to more rapid chemical weathering. Clinker zones are similar to layers of
31 coarse, well-sorted gravel, where layered sequences of flows can result in widespread beds with high
32 horizontal permeability. The smaller effective porosity of massive a'ā cores can result in extremely
33 low vertical permeability, especially when the rock is not fractured. The principal vertical
34 permeability of a massive a'ā core is imparted by wide, regularly spaced cooling joints.

35 The northeastern side of the Ko'olau Volcano seems to have been subjected to several large
36 mass-wasting events, while the western (i.e., Central O'ahu) portions of the shield were braced by
37 Wai'anae volcanics, and as a result erosion occurred on a much smaller and slower scale. The
38 western valleys of the Ko'olau Range, such as the Schofield Plateau, are dominated by alluvium
39 deposits (Macdonald, Abbott, and Peterson 1983). Mechanical and chemical erosion of the steep
40 escarpments within valleys produces accumulations of blocky material called colluvium. The steep,
41 cliff-like walls, which are similar to those found in many Ko'olau Range valleys, form due to the
42 presence of nearly horizontal beds of alternately greater and lesser resistance to erosion; more rapid
43 erosion of the less-resistant beds (usually a'ā clinker) results in undercutting of the more resistant
44 layers (usually pāhoehoe) (Macdonald, Abbott, and Peterson 1983). Over time, the valley walls

1 retreat, but the cliff slopes remain steep. Colluvium accumulates at the base of valley slopes due to
2 repeated rockfall and landslide events.

3 After cessation of the Ko'olau volcanics, there was a period of volcanic quiet that lasted
4 approximately 2 million years. During this post-eruption period, O'ahu's volcanoes underwent
5 substantial modification by secondary geologic processes, including subsidence due to gravitational
6 loading, weathering, and sedimentation. Streams cut deep valleys into the slopes of the volcanoes
7 and the island slowly subsided at least 360 meters (m). Some valleys, such as Mānoa Valley, were
8 eroded to a prior sea level base elevation below the present-day sea level and accumulated coarse
9 detrital sediments. Remnants of the old Ko'olau shield volcano surface take the form of volcanic
10 basalt plateaus limited by converging valleys (Macdonald, Abbott, and Peterson 1983; Rowland and
11 Garcia 2004); these plateaus form as triangular facets between steep-sided stream valleys, have
12 gentle to moderate slopes, and are common along the southern front of the Ko'olau range from
13 behind Honolulu to Hawai'i Kai.

14 The southeastern third of the Ko'olau volcano experienced a rejuvenation stage of volcanism starting
15 approximately 900,000 years ago. Most of the resulting volcanoes lie south of the erosional valleys
16 carved out of the Ko'olau shield and are interbedded with alluvial and marine sediments (Figure 8
17 and Figure 9). These rejuvenation-stage vents, and associated flows and ash deposits compose the
18 Honolulu volcanic series, which include the landmarks of Diamond Head, Punchbowl, the Tantalus
19 group (Roundtop, Sugarloaf, and Mount Tantalus), Hanauma Bay, Ka'au Crater, Koko Crater,
20 Āliamanu, and Salt Lake. The rejuvenation stage eruptions did not occur in rapid succession, but
21 were scattered over the last 900,000 years (Walker 1990).

22 The Salt Lake Tuff, named for Salt Lake Crater which lies east of Pearl Harbor, consists of subaerial
23 gray to brown tuff containing nodules of dunite (Stearns and Vaksvik 1935). The tuff is a maximum
24 of 300 ft thick, contains upright tree molds, and passes beneath sea level. It overlies Āliamanu tuff
25 and, in some areas, unconformably overlies eroded and dissected gravels of Ka'ena marine terraces,
26 which indicate that the Salt Lake Tuff was laid down during a low stand of sea level, relative to
27 today, known as the Waipi'o stand of sea. The Salt Lake tuff is assigned middle and late Pleistocene
28 age (Stearns and Vaksvik 1935).

29 The Āliamanu Tuff, named for Āliamanu Crater east of Pearl Harbor, is composed of water-laid gray
30 to black or grayish-brown tuff, rounded gravel, and large vesicular bombs and spatter (Stearns and
31 Vaksvik 1935). It is separated from overlying Salt Lake tuff by red soil, and typically overlies older
32 alluvium deposits. Āliamanu tuff is assigned to an elevated stand of sea level relative to today known
33 as the Ka'ena stand of sea on the basis of terraces, which correlate to the middle and late Pleistocene
34 age (Stearns and Vaksvik 1935).

35 The Āliamanu basalt occurs in the subsurface between 62 and 93 ft below ground surface (bgs), and
36 is composed of melilite-nepheline basalt. Āliamanu basalt underlies 47 ft of Salt Lake Tuff and
37 overlies 17 ft of older alluvium on lavas of the Ko'olau volcanic series. According to (MacDonald
38 and Davis 1956), the Āliamanu basalt "...appears to be lava erupted at the close of the explosive
39 phase, hence is correlative with the Āliamanu tuff." Āliamanu basalt has not been observed at the
40 ground surface; hence, its extent is unknown.

41 2.1.1.2 GEOLOGIC STRUCTURE

42 Fissure eruptions characterized the building of the Ko'olau dome, as evidenced by the great number
43 of dikes along the rift zones. In the early phases of dome building, lava discharged from the summit

1 area, but this activity eventually ceased and transitioned to discharge from the lower ends of the rift
2 zones, especially the northwest end of the Ko'olau dome (Stearns and Vaksvik 1935).

3 The Ko'olau volcanic series is greater than 3,100 ft thick and composes the bulk of the lava flows
4 and other rock types that make up the Ko'olau Range. Pāhoehoe lava predominates near the crest of
5 the ridge, while a'ā is more prevalent along the periphery. Lava flows were extruded in a very fluid
6 condition, similar to flows observed at Kilauea on the island of Hawai'i. Based on the absence of
7 erosional unconformities and an extensive soil horizon, it is apparent that the Ko'olau volcanic flows
8 occurred in fairly rapid succession.

9 Ko'olau basalt flows dip away from the summit (Pu'u Kōnāhuanui, above Mānoa Valley) and crest
10 of the Ko'olau Range. Lava flow bedding dips approximately 3° near Pu'u Kōnāhuanui, and reaches
11 a maximum dip of approximately 10° near the margin of the range (Stearns and Vaksvik 1935).
12 Ko'olau is a highly asymmetrical volcano due to ponding of lava flows on the west side against the
13 older Wai'anae Volcano. As such, basalt flows dip approximately 3° on the west side of the range, in
14 the Schofield Plateau area, versus approximately 8° on the east side (Stearns and Vaksvik 1935). The
15 Ko'olau range also has north-south asymmetry, with the range's summit being located 28 miles from
16 its north end versus just 9 miles from its south end. The range is so heavily dissected by stream
17 erosion that it is doubtful that any part of the original volcano surface remains. Finally, although the
18 volcano's eruptive center is mostly eroded away, some of its divides appear to have undergone less
19 stripping.

20 2.1.1.3 SITE GEOLOGY

21 The Facility is located on the southwestern side of the Ko'olau Range (approximately 2.5 miles
22 northeast of Pearl Harbor) between the Moanalua and Hālawā Valleys (Figure 2). The valleys on
23 either side of the Facility were formed by fluvial erosion and are filled with sedimentary deposits,
24 including alluvium and colluvium. On the ridge above the Facility, the horizon of soils and residual
25 weathered basalt is approximately 15–25 ft thick. At Red Hill, the Ko'olau formation consists of
26 basaltic lava flows that erupted from a fissure line approximately 30 miles in length, and which
27 trended in a northwest rift zone (Wentworth 1953). The Facility is within the Ko'olau volcanic
28 series, which is composed of both pāhoehoe and a'ā lava flows.

29 The presence of nearly horizontal lava flow beds with alternating zones of greater and less erosion
30 resistance is evident at the Facility, where rapid erosion of the less resistant beds, usually of a'ā
31 clinker, results in undercutting of the more resistant massive dense a'ā and pāhoehoe layers. The lava
32 flows vary from evenly bedded, relatively flat, and continuous to undulating and uneven.

33 A'ā clinker is composed of gravel- and cobble-size rubble that resembles a conglomerate. It is
34 usually loosely held together unless it has been welded together by heat. A'ā clinker is extremely
35 permeable and is therefore subject to rapid chemical weathering. Vertical fractures are also subject to
36 rapid weathering. Similarly, the nearly horizontal contacts between pāhoehoe lava flows are
37 susceptible to erosion, even in the absence of a'ā clinker beds. Rock layers with dense, more closely
38 spaced fracturing are extensively weathered.

39 At the Facility, geologic information is currently available to characterize and illustrate geologic
40 features that are likely to act as NAPL migration pathways or barriers, and develop the geologic
41 conceptual site model (CSM). That CSM will also use the available geologic information to describe
42 the physical characteristics of the basalt layers, intervening clinker beds and mechanisms that affect
43 NAPL movement by integrating the available geologic information, including:

- 1 • Geologic logs of borings drilled below the tanks for soil vapor monitoring and
2 monitoring wells
- 3 • Detailed geologic “barrel logs” of the tank excavations available from Navy archives
- 4 • Geologic maps of excavations and tunnels

5 **Caprock and Valley Fill Deposits**

6 To the west of the Facility are substantial layers of heterogeneous sediments occurring on the coastal
7 plains in southern O'ahu around Pearl Harbor. These terrestrial and marine sediments and reef
8 limestone deposits form a thick wedge of relatively low permeability material, commonly called
9 caprock, which overlies basalt lava flows and other volcanic rocks. These coastal-plain sediments
10 and rejuvenated-stage volcanic rocks are referred to as “caprock” because they act as a semi-
11 confining unit over parts of the high-permeability volcanic-rock aquifer located in the Pearl Harbor
12 area west of the Facility.

13 The most recent pertinent USGS report (Izuka et al. 2016) defines the Caprock HGU to include the
14 valley fill deposits composed of older sediments, sedimentary rocks, and rejuvenated-stage volcanic
15 rocks (Figure 11). This Caprock HGU forms and underlies the extensive coastal plain, which
16 overlies parts of the volcanic-rock aquifer (basalt). The Caprock HGU is thickest along the
17 southwestern coast of O'ahu, where it is more than 1,000 ft thick beneath the present coastline and
18 more than 1,600 ft thick farther offshore. Although the valley fill deposits are generally not referred
19 to as “caprock” in other literature, Izuka et al. 2016 includes those deposits in the Caprock HGU
20 because they have the same low-permeability character as other caprock materials described by
21 previous investigators, and are continuous with the sediments of the coastal plain.

22 **Basalt Hydrogeologic Unit (Volcanic-Rock Aquifer)**

23 The most recent USGS report applicable to the Facility contains a simplified geologic map that
24 shows the 2007 groundwater model area (DON 2007b) is underlain by lava flows of the Ko'olau
25 Basalt (Izuka et al. 2016). These lava flows are described as generally very permeable to extremely
26 permeable. The model area contains basalt flows that are generally free of dike complexes. Dike
27 complexes exist in the area to the east of the model area, several miles east of the Facility. Where the
28 basalt has been intruded by dike complexes, the basalt permeability is considered to be low to
29 moderate (Izuka et al. 2016). To the southwest of the Facility, the area mapped as Honolulu
30 Volcanics contains a variety of rock types and structures, and is described as having very low to very
31 high permeability, depending in part on whether the unit consists of ash, cinder, or lava flows, and
32 whether the rocks are cemented or altered by weathering (Izuka et al. 2016).

33 That recent USGS report also defines the Wai'anae-Ko'olau HGU to include the basalt flows and
34 other volcanic rocks, and provides a structure map of the altitude of the top of this hydrogeologic
35 unit (Izuka et al. 2016). The structure contour map shows that the top of the Basalt HGU dips
36 beneath the coastal plain that surrounds most of the island of O'ahu (Figure 12).

37 **2.1.2 Hydrogeologic Data**

38 Hydrogeological data have been collected from available reports and agency files regarding the
39 physical characteristics and hydraulic properties of the hydrogeologic units in the modeling area
40 (e.g., caprock, valley fill, or basalt), as well as other hydrologic and anthropogenic features that may
41 affect groundwater flow (Appendix A.2, Hydrogeology Data Tables HYDRO-1 to HYDRO-37).
42 These data include:

- 1 • Thickness and extent of each hydrogeologic unit (e.g., caprock and basalt)
- 2 (Appendix A.2, Table HYDRO-1)
- 3 • Hydraulic properties of each hydrogeologic unit (Appendix A.2, Table HYDRO-2),
- 4 including:
- 5 – Hydraulic conductivity
- 6 – Specific yield, and/or specific storage
- 7 – Effective porosity
- 8 – Dispersivity

9 Table 2-4 summarizes the hydrogeologic parameter references and indicates what type(s) of
10 hydrogeologic data each report provides.

11 **Table 2-4: Hydrogeologic Parameter References**

Reference	Hydrogeologic Data ^a						Data Basis
	Hydraulic Conductivity	Dispersivity	Specific Yield	Specific Storage	Effective Porosity	Hydrogeologic Unit Extent	
<i>Relationship of Ground-Water Tides to Ocean Tides: A Digital Simulation Model</i> (Dale 1974)	L, R	—	—	—	—	—	—
<i>A Ground-Water Inventory of the Waialua Basal-Water Body, Island of Oahu, Hawaii</i> (Dale 1978)	R	—	—	—	—	—	Time series analysis
<i>Red Hill Bulk Fuel Storage Facility Final Technical Report</i> (DON 2007b)	R	R	R	R	R	R	Literature search Model
<i>Type 1 Letter Report – Re-Evaluation of the Tier 3 Risk Assessment/Groundwater Model & Proposed Course of Action</i> (DON 2010a)	S	—	—	—	—	—	Field measurements
<i>Summary of the Oahu, Hawaii, Regional Aquifer-System Analysis</i> (Nichols, Shade, and Hunt Jr. 1996)	R	—	—	—	—	—	—
<i>Data Collection Handbook to Support Modeling Impacts of Radioactive Material in Soil, Section 4: Effective Porosity</i> (Yu et al. 1993)	—	—	—	—	R	—	Literature search
<i>Geotechnical Aspects of Pavements Reference Manual, Chapter 5.0 Geotechnical Inputs for Pavement Design, Section 5.5 Thermo-Hydraulic Properties</i> (FHA 2006)	R	—	—	—	—	—	AASHTO T 215 ASTM D-2434 (granular soils) ASTM D-5084 (all soils)
<i>Geohydrology of the Island of Oahu, Hawaii</i> (Hunt Jr. 1996)	L, R	—	—	—	—	—	Aquifer tests

Reference	Hydrogeologic Data ^a						Data Basis
	Hydraulic Conductivity	Dispersivity	Specific Yield	Specific Storage	Effective Porosity	Hydrogeologic Unit Extent	
<i>Effects of Soluble Organics on Flow through Thin Cracks of Basaltic Lava</i> (Ishizaki, Burbank, Jr., and Lau 1967)	R	—	—	—	—	—	(Wentworth 1938)
<i>Volcanic Aquifers of Hawai'i—Hydrogeology, Water Budgets, and Conceptual Models</i> (Izuka et al. 2016) ^b	L, R	—	—	—	—	L, R	Aquifer tests Laboratory tests
<i>Specific Yield—Compilation of Specific Yields for Various Materials</i> (Johnson 1967)	—	—	R	—	—	—	Literature search
<i>Numerical Simulation of a Thick Freshwater Lens: Pearl Harbor Groundwater Model</i> (Liu, Lau, and Mink 1981)	R	—	—	—	—	—	—
<i>Hawaiian Groundwater Geology and Hydrology, and Early Mathematical Models</i> (Mink and Lau 1980)	R	—	—	—	R	—	Laboratory tests
<i>Summary of the Oahu, Hawaii, Regional Aquifer-System Analysis</i> (Nichols, Shade, and Hunt Jr. 1996)	L, R	—	—	—	—	—	Laboratory tests Aquifer tests Models
<i>Geohydrology of the Central Oahu, Hawaii, Ground-Water Flow System and Numerical Simulation of the Effects of Additional Pumping</i> (Oki 1998)	S, L, R	—	—	—	—	—	Aquifer test Darcy's Law Model Tidal Response
<i>Numerical Simulation of the Effects of Low-Permeability Valley-Fill Barriers and the Redistribution of Ground-Water Withdrawals in the Pearl Harbor Area</i> (Oki 2005) ^b	L, R	—	—	—	—	L, R	Model
"Hawaii." In <i>Ground Water Atlas of the United States: Segment 13 - Alaska, Hawaii, Puerto Rico and the U. S. Virgin Islands</i> (Oki, Gingerich, and Whitehead 1999)	R	—	—	—	—	—	Aquifer test Darcy's Law Model Tidal response
<i>Estimating Hydraulic Properties of Volcanic Aquifers Using Constant-Rate and Variable-Rate Aquifer Tests</i> (Rotzoll, El-Kadi, and Gingerich 2007)	R	—	—	—	—	—	Constant-rate test Step-drawdown test Model
<i>Determination of Hydraulic Conductivity of Some Oahu Aquifers with Step-Drawdown Test Data</i> (Soroos 1973)	R	—	—	—	—	—	—

Reference	Hydrogeologic Data ^a						Data Basis
	Hydraulic Conductivity	Dispersivity	Specific Yield	Specific Storage	Effective Porosity	Hydrogeologic Unit Extent	
<i>Analysis of an Anisotropic Coastal Aquifer System Using Variable-Density Flow and Solute Transport Simulation</i> (Souza and Voss 1987)	R	—	—	—	—	—	—
<i>Geology and Ground Water Resources of the Palolo-Waialae District</i> (Wentworth 1938)	R	—	—	—	—	—	Field tests Laboratory studies
<i>Evaluation of Methods of Pumping Test Analyses for Application to Hawaiian Aquifers</i> (Williams and Soroos 1973)	L, R	—	—	—	—	—	Field test

1 — no data

2 AASHTO American Association of State Highway and Transportation Officials

3 ASTM American Society for Testing and Materials

4 ^a Abbreviations:

5 L local data (within 5 miles of the Facility)

6 R regional data (i.e., island- or state-wide data)

7 S site-specific data

8 ^b Summarizes the findings of previous O'ahu geologic investigations, including (Stearns and Vaksvik 1935) and (Stearns
9 1939; Stearns 1940; Stearns 1985)

10 2.1.2.1 REGIONAL HYDROGEOLOGY

11 Groundwater in Hawai'i exists in three principal aquifer types. The most important type, in terms of
12 drinking water resources, is the basal aquifer. Basal aquifers exist as lenses of fresh water floating on
13 top of and displacing seawater within the pore spaces, fractures, and voids of the basalt that forms
14 the underlying mass of each Hawaiian island. In parts of O'ahu groundwater in the basal aquifer is
15 confined by the overlying caprock. Water that flows freely to the surface from wells that tap the
16 basal aquifer is referred to as artesian flow.

17 Dike-impounded aquifer systems occur near eruption centers where low-permeability dikes have
18 intersected more permeable volcanic flows. The dike systems compartmentalize groundwater and
19 occur as much as 1,600 ft above msl on O'ahu. Groundwater within dike-impounded aquifer systems
20 primarily includes freshwater, but in places may include underlying brackish water and saltwater.
21 Groundwater may discharge from the dike-impounded system to downgradient aquifers or water
22 systems; in stream valleys where dike compartments are exposed, the groundwater may discharge
23 directly to streams (Gingerich and Oki 2000).

24 The third type of aquifer is the caprock aquifer, which consists of various kinds of unconfined and
25 semi-confined groundwater. Commonly, the caprock consists of a thick sequence of nearly
26 impermeable clays, coral, and basalt that separates the caprock aquifer from the basal aquifer. The
27 impermeable nature of these materials and the artesian nature of the basal aquifer severely restrict the
28 downward migration of groundwater from the upper caprock aquifer toward the lower basal aquifer.

29 As part of the DOH Safe Drinking Water Branch (SDWB) Groundwater Protection Program, the
30 State of Hawai'i developed an aquifer classification system that is consistent with the EPA's system.

1 For the island of O'ahu, the aquifer classifications are documented in *Aquifer Identification and*
2 *Classification for O'ahu: Groundwater Protection Strategy for Hawai'i* (Mink and Lau 1990).
3 Varied processes and stages, including shield-building volcanism, subsidence, weathering, erosion,
4 sedimentation, and rejuvenated volcanism (Stearns 1946; Mink and Lau 1990; Hunt Jr. 1996) have
5 affected aquifer geometries and produced geohydrologic boundaries that subdivide the regional
6 aquifer system and major watershed areas. The island of O'ahu has been subdivided into seven major
7 groundwater areas based on geohydrologic barriers (Hunt Jr. 1996) (Figure 13).

8 2.1.2.2 SITE HYDROGEOLOGY

9 The Facility is located within the Ko'olau formation, which contains one of the two main volcanic
10 rock aquifers on the island of O'ahu (Figure 14). The site is located in the Southern O'ahu
11 groundwater area, which is further divided into subordinate groundwater areas. The Facility lies
12 within the Pearl Harbor and Moanalua subordinate groundwater areas, and is part of the Waimalu
13 Aquifer system of the Pearl Harbor Aquifer Sector (Figure 15). The groundwater elevation in the
14 site's vicinity is approximately 20 ft msl.

15 The Facility is located on the boundary between the Moanalua Aquifer system, which is part of the
16 Honolulu Aquifer sector, and the Waimalu Aquifer system, which is part of the Pearl Harbor Aquifer
17 Sector (DON 2007b). Both the Moanalua Aquifer and Waimalu Aquifer systems are classified by
18 Mink and Lau as basal, unconfined, flank-type, and currently used as a drinking water source (Mink
19 and Lau 1990). The aquifers are considered fresh, with less than 250 milligrams per liter (mg/L) of
20 chloride, and are considered irreplaceable resources with a high vulnerability to contamination (Mink
21 and Lau 1990).

22 Previous investigators noted that the Red Hill Ridge is not a hydrogeologic boundary, and there are
23 no geochemical or physical attributes that separate the two aquifers at this location (DON 2007b).
24 The likely physical boundary between the Moanalua and Waimalu Aquifer systems is the North
25 Hālawā Valley fill to the northwest of the Facility (DON 2007b).

26 The Facility is located upgradient of the Hawai'i State Underground Injection Control Line, which
27 indicates the shoreward extent of groundwater considered by the State of Hawaii to be a potential
28 source of drinking water. The nearest public drinking water well, the Hālawā Shaft, is located
29 northwestward of the Facility (DON 2007b), approximately 4,400 ft to the northwest of the tank
30 farm, and pumps water from the basal aquifer (Figure 16).

31 Navy Supply Well 2254-01 (Red Hill Shaft) consists of a pumping station located in the lower
32 access tunnel approximately 2,700 ft west of the fuel storage tanks, and an infiltration gallery that
33 extends from the pumping station approximately 1,270 ft along the water table, toward the fuel
34 storage tanks (Figure 16). The infiltration gallery intercepts most of the water that would be affected
35 by releases from the Facility. This well extracts groundwater at an average rate of 4 million gallons
36 per day (mgd) and a maximum of 18 mgd (DON 2007b).

37 2.1.2.3 SURFACE WATER

38 Surface water features in the vicinity of the Facility include the southern segment of the Hālawā
39 Stream (approximately 665 ft to the north) and the northern segment of the Moanalua Stream
40 (approximately 1,760 ft to the south). In the area of Hālawā Valley, streams flow above the basal
41 groundwater table over deeply weathered rock and may exchange water with perched water
42 associated with the alluvial material, known as valley fill. Groundwater that flows beneath the
43 Facility does not intercept surface water inland of the ocean shoreline (DON 2007b). Both Hālawā

1 and Moanalua streams are losing streams that lie at significantly higher elevations than the water
2 table, and are therefore not likely to be impacted by releases at the Facility.

3 2.1.2.4 HYDRAULIC PROPERTIES OF HYDROGEOLOGIC UNITS

4 Groundwater flow and solute transport are controlled by the hydraulic and physical properties of the
5 hydrogeologic units, including hydraulic conductivity, effective porosity, specific yield, specific
6 storage and dispersivity. For sites in O'ahu, estimated parameter values have been reported in
7 Nichols, Shade, and Hunt Jr. (1996), Hunt Jr. (1996), Oki (1998), Oki (2005), and Izuka et al.
8 (2016). The following is a summary of the information provided in those reports.

9 **Caprock**

10 Hydraulic conductivity of the caprock spans several orders of magnitude depending on material type.
11 The older alluvium, including fine-grained muds and saprolite (thoroughly weathered volcanic rock),
12 have hydraulic conductivities ranging from approximately 0.01 to 1 foot per day (ft/d) (Wentworth
13 1938). Sands have an estimated hydraulic conductivity ranging from 1 to 1,000 ft/d (Hutcheson et al.
14 1996). Coral gravels and reef limestone deposits have hydraulic conductivities of several thousands
15 of feet per day (Oki 1998). Souza and Voss 1987 estimated an effective horizontal hydraulic
16 conductivity of 0.15 ft/d for caprock. Although the permeability varies greatly with material type, in
17 general, the caprock acts as a low-permeability confining unit atop the basal aquifer near the
18 coastline (Visher and Mink 1964).

19 The 2005 USGS groundwater model (Oki 2005) used a range of values for hydraulic conductivity for
20 the caprock, depending on location and rock type. For the upper limestone unit in the caprock, the
21 vertical hydraulic conductivity (Kv) was 25 ft/d and the horizontal hydraulic conductivity (Kh) was
22 2,500 ft/d. For the low-permeability units of the caprock, the USGS study used hydraulic
23 conductivity values ranging from 0.01 to 0.6 ft/d (Oki 2005). A more recent USGS groundwater
24 model (Rotzoll 2012) of the Pearl Harbor area distinguished Kh along the general lava-flow direction
25 (longitudinal Kh) from K in perpendicular to the general lava-flow direction (transverse Kh). The
26 model also used the following hydraulic conductivity values for the caprock: 0.3 ft/d, 0.2 ft/d, and
27 0.3 ft/d (Kh longitudinal, Kh transverse, and Kv, respectively).

28 **Valley Fill**

29 Hydraulic conductivity estimates of valley fill deposits range from 0.019 to 0.37 ft/d (Wentworth
30 1938). In the Pearl Harbor area, the 2005 USGS groundwater model (Oki 2005) used 0.058 ft/d for
31 both horizontal and vertical hydraulic conductivity. The valley fill deposits are underlain by
32 weathered basalt (saprolite) of low permeability that also impedes groundwater flow (Oki 2005).

33 According to the most recent pertinent USGS report (Izuka et al. 2016), specific-yield values used in
34 numerical models for the Caprock HGU, which includes valley fill deposits, have ranged between
35 0.04 and 0.2 (Souza and Voss 1987; Oki 1998; Gingerich and Voss 2005; Oki 2005; Rotzoll, El-
36 Kadi, and Gingerich 2007; Rotzoll 2012).

37 **Basalt**

38 In the Facility area, the Basalt HGU lies within the Ko'olau Basalt, which is also called the volcanic-
39 rock aquifer (Oki 2005). The Basalt HGU is composed of igneous rock in various forms, including
40 lava flows, dikes, pyroclastic deposits, and saprolite. The lava flows are composed primarily of
41 either pāhoehoe or a'ā lava. Massive a'ā basalt flow beds typically have low permeability and are

1 interbedded with clinker of higher permeability. This results in the formation of preferential flow
2 paths along interflow boundaries.

3 Northeast of the groundwater modeling area, major rift zones create dike-controlled groundwater
4 flow systems. Dikes are the dominant intrusive rocks associated with the rift zones of the Ko'olau
5 Range. Dikes are thin, near-vertical sheets of massive, low-permeability rock that intrude existing
6 rocks and have cooled beneath the surface. Each dike is generally less than 10 ft wide and can extend
7 vertically and laterally for long distances. Although the hydraulic conductivity of the intrusive dike
8 material was estimated to range from 10^{-5} to 10^{-2} ft/d, the average, effective hydraulic conductivity
9 of a dike complex may range from approximately 0.01 to 0.1 ft/d, reflecting the influence of both the
10 intrusive dikes as well as the lava flows between dikes (Izuka et al. 2016).

11 In the Facility area, dikes have not been reported in the volcanic rocks. The local Facility
12 groundwater flow modeling area lies within the area where the basalt has not been intruded by dikes,
13 as mapped by the USGS (Izuka et al. 2016). The northeast boundary of the model area approximates
14 the mapped edge of the dike-intruded area, which lies to the northeast of the model. Dike-free
15 volcanics have very high permeability because of the physical features created as the lava flowed and
16 cooled, which include: (1) clinker zones associated with a'ā flows, (2) voids along contacts between
17 flows, (3) cooling joints normal to flow surfaces, and (4) lava tubes associated with pāhoehoe flows.

18 For groundwater flow analysis, permeability is also referred to as hydraulic conductivity (K) since no
19 other fluid is considered in the system. In general, the vertical hydraulic conductivity (K_v) of the
20 dike-free volcanic rock may be hundreds of times less than the horizontal hydraulic conductivity
21 (K_h). On the basis of numerical-model analysis of the Pearl Harbor area, Souza and Voss (1987)
22 estimated the ratio of K_h to K_v to be 200 to 1.

23 According to the most recent pertinent USGS report (Izuka et al. 2016), most estimates of K_h for
24 dike-free lava-flow aquifers on O'ahu range between 500 and 5,000 ft/d (Hunt Jr. 1996). Aquifer test
25 results show K_h values of 26 to 5,000 ft/d, with the majority of results between 200 and 1,500 ft/d
26 (Wentworth 1938; Visher and Mink 1964; Takasaki and Valenciano 1969; Izuka et al. 2016;
27 Rosenau, Lubke, and Nakahara 1971; Soroos 1973; Williams and Soroos 1973; Dale 1978; Mink
28 1980; Eyre 1983; Eyre, Ewart, and Shade 1986). Values of K_h used in calibrated numerical models
29 range from approximately 100 to 7,500 ft/d (Eyre, Ewart, and Shade 1986; Souza and Voss 1987;
30 Oki 1998; Gingerich and Voss 2005; Whittier et al. 2004; Rotzoll, El-Kadi, and Gingerich 2007).

31 Dike-free volcanic rocks have K_h values that generally range from hundreds to thousands of feet per
32 day (Soroos 1973; Mink 1980; Hunt Jr. 1996). Souza and Voss (1987) estimated the ratio of vertical
33 to horizontal hydraulic conductivity to be 0.05 ft/d. For the volcanic rock aquifer in the Pearl Harbor
34 area, the 2005 USGS groundwater model (Oki 2005) used a value of 4500 ft/d for K_h along the
35 general lava-flow direction (longitudinal K_h) and 1,500 ft/d for K in perpendicular to the general
36 lava-flow direction (transverse K_h). The same model used 7.5 ft/d for vertical hydraulic conductivity
37 of the volcanic rock aquifer (Oki 2005). A more recent USGS groundwater model of the Pearl
38 Harbor area (Rotzoll 2012) used 1,350 ft/d for longitudinal K_h , 675 ft/d for transverse K_h , and
39 6.8 ft/d for K_v .

40 Weathering reduces the hydraulic conductivity of volcanic rocks (Mink 1980). Saprolite (thoroughly
41 weathered volcanic rock) is soft and rich in clay, may be found in deposits 100–300 ft thick, and has
42 very low hydraulic conductivity (DON 2007b). According to the USGS (Oki 2005), the R.M. Towill
43 Corporation reported a hydraulic conductivity value of 0.058 ft/d for weathered basalt beneath

1 Waiawa Stream valley based on an injection test. Wentworth (1938) estimated the hydraulic
2 conductivity of weathered basalt to be between 0.083 and 0.128 ft/d based on laboratory parameter
3 tests on core samples.

4 The effective porosity and specific storage of an aquifer affect the timing of the water-level response
5 to changes in water inflow or outflow. The total porosity represents all void spaces, which includes
6 vesicles, fractures, space between rock fragments, and lava tubes. However, effective porosity is
7 more important for groundwater flow modeling because it is a measure of the interconnected pore
8 space that allows flow, rather than the total void space. The total porosity of lava on O'ahu ranges
9 between 5 and 50 percent, while effective porosity is typically much lower (as much as an order of
10 magnitude lower) because many of the pores and voids are not hydraulically interconnected and do
11 not provide a pathway for groundwater flow. Commonly used values for effective porosity in
12 Hawaiian aquifers are 0.05 (Oki 1998; Whittier et al. 2004) and 0.04 (Oki 2005; Rotzoll 2012).

13 Specific storage is a measure of the compressive fluids storage of rocks. In the Pearl Harbor area,
14 specific storage was estimated to range from 10^{-4} to 10^{-7} per foot (ft^{-1}) (Williams and Soroos 1973).
15 For unconfined parts of aquifers, specific yield plays a more significant role than specific storage.
16 Specific yield is defined as the volume of water that a saturated rock or soil will yield by gravity
17 drainage divided by the total volume of rock or soil, and is usually expressed as a percentage.
18 Specific yield is less than the effective porosity because some portion of the water is held by
19 capillary tension and will not drain by gravity.

20 Specific yield values used for the volcanic-rock aquifer in regional groundwater models and reported
21 by the USGS (Izuka et al. 2016) range between 0.03 and 0.1 percent (Eyre, Ewart, and Shade 1986;
22 Souza and Voss 1987; Oki et al. 1996; Oki 1998; Gingerich and Voss 2005; Oki 2005; Rotzoll, El-
23 Kadi, and Gingerich 2007; Whittier et al. 2010; Rotzoll 2012). In the Facility area, reported values
24 for specific storage and specific yield values were derived from numerical modeling analysis of the
25 regional aquifer pumping test conducted in May 2006, the results of which are summarized in the
26 following subsection (DON 2007b).

27 2.1.2.5 *AQUIFER TESTING AND DERIVATION OF HYDRAULIC PARAMETERS*

28 Hydraulic conductivity values for the Basalt HGU in the Facility area were derived based on
29 numerical modeling analysis of data collected from a regional aquifer test conducted in May 2006.
30 The aquifer pumping test was conducted by TEC on behalf of the Navy in coordination with the
31 Honolulu BWS, the State of Hawai'i DLNR and its Commission on Water Resource Management
32 (CWRM), and the U.S. Army Corps of Engineers. For the 2006 test, the primary pumping well was
33 U.S. Navy Supply Well 2254-01. Groundwater level monitoring was performed via transducers and
34 data loggers in several wells in the Red Hill area, including the Red Hill monitoring wells and other
35 wells near the Red Hill Shaft and Hālawā Shaft. The collected field data were compared to simulated
36 water levels from corresponding wells to calibrate hydraulic conductivity and other hydrogeologic
37 properties for a local groundwater flow model.

38 The test period covered approximately 1 month, from May 10, 2006 to June 1, 2006, although some
39 data loggers recorded water levels earlier. The main pumping test was initiated by completely
40 shutting off U.S. Navy well 2254-01 between May 12 and May 19, which allowed the water levels
41 near the well to recover from pumping stresses. During this same period, the BWS Hālawā Shaft and
42 Moanalua wells maintained their regular pumping schedules and rates. After the recovery period,
43 U.S. Navy well 2254-01 was subjected to a period of above-average pumping between May 19 and

1 May 26; the 10-year average pumping rate for the well is approximately 4.3 mgd, and during the
2 above-average pumping period the pumping rate alternated between 10 and 18 mgd.

3 The local groundwater flow model for the Facility was calibrated for both steady state and dynamic,
4 or “transient”, conditions (DON 2007b, Appendix L). The steady state calibration was conducted by
5 1) estimating the hydraulic parameters of the major stratigraphic units from literature values,
6 2) simulating water table elevations using average recharge and pumping conditions for the period
7 between 1996 and 2005, and 3) iteratively running the groundwater flow model, using a Parameter
8 Estimation (PEST) algorithm (Doherty 2000), until the differences between the measured and
9 simulated groundwater elevations were minimized. Thirty pumping wells located in the local model
10 area were used to define the steady state water table elevations. Table 2-5 provides the hydraulic
11 parameters derived using this modeling approach with PEST; these hydraulic parameter values are
12 specified in the final calibrated numerical flow model (DON 2007b).

13 **Table 2-5: Hydraulic Parameters Developed from Local Numerical Flow Model Calibration at the Facility**
14 **(DON 2007b)**

Hydrogeologic Unit	Horizontal, Transversal K (ft/d)	Horizontal, Longitudinal K (ft/d)	Vertical K (ft/d)	Effective Porosity	Specific Storage (ft ⁻¹)	Specific Yield
Caprock	115	115	115	0.10	3.05 × 10 ⁻⁵	0.10
Valley Fill	0.066	0.066	0.066	0.15	1.52 × 10 ⁻⁵	0.12
Basalt	1,476	4,428	7.4	0.05	1.07 × 10 ⁻⁵	0.031

15 K hydraulic conductivity
16 ft⁻¹ per foot
17 ft/d feet per day

18 **Dispersivity**

19 According to the USGS, there are few reported dispersivity values available for O'ahu (Oki 2005). In
20 1974, dispersivity was estimated to be approximately 200 ft for the volcanic-rock aquifer in the
21 Honolulu area, and this value likely represents a longitudinal dispersivity. Using a cross-sectional
22 numerical model, Souza and Voss (1987) estimated the longitudinal and transverse dispersivities of
23 the Pearl Harbor area to be 250 and 0.82 ft, respectively. Souza and Voss (1987) also estimated a
24 vertical to longitudinal ratio of 0.004, and stated that transverse dispersivity values vary between
25 0.05 and 0.33 of the longitudinal dispersivity value. The more recent USGS groundwater model
26 (Rotzoll 2012) used the following dispersivity values for basalt: 164 ft, 8.2 ft and 0.8 ft for horizontal
27 longitudinal, horizontal transverse, and vertical dispersivity, respectively. For caprock, Rotzoll 2012
28 used 33 ft, 1.6 ft, and 0.2 for horizontal longitudinal, horizontal transverse, and vertical dispersivity,
29 respectively.

30 For the local modeling area, previous CF&T modeling used longitudinal dispersivity values of 5 m,
31 3 m, and 34 m for caprock, valley fill, and basalt, respectively (DON 2007b, Appendix L). The same
32 model utilized a transverse to longitudinal dispersivity ratio of 0.1, and a vertical to longitudinal
33 dispersivity ratio of 0.01. Table 2-6 summarizes the parameter values used in the CF&T model
34 (DON 2007b).

1 **Table 2-6: Transport Parameters Used in CF&T Model (DON 2007b)**

Hydrogeologic Unit	Longitudinal Dispersivity (m)	Transverse Dispersivity (m)	Vertical Dispersivity (m)	Effective Porosity (unitless)
Caprock	5	0.5	0.05	0.10
Valley Fill	3	0.3	0.03	0.15
Basalt	34	3.4	0.34	0.05

2 **2.1.3 Groundwater Characteristics**

3 Groundwater characteristics (e.g., elevation, temperature, and major ion concentrations) have been
4 collected from available reports and agency files regarding groundwater characteristics and levels
5 (Appendix A.3, Groundwater Data Tables GW-1 to GW-25). These data include:

- 6 • Historical and current groundwater elevations
- 7 • Groundwater temperature records
- 8 • Groundwater salinity, electrical conductivity, total dissolved solids (TDS), turbidity, pH,
9 and dissolved oxygen records
- 10 • Base of fresh groundwater and/or top of saline groundwater (elevation [msl])
- 11 • Major groundwater ion and cation concentrations

12 Table 2-7 summarizes the groundwater elevation, temperature, and general characteristic references
13 and indicates what type(s) of data each one provided.

14 **Table 2-7: Groundwater Levels, and Physical and Chemical Properties References**

(Reference)	Groundwater Characteristics Data							
	Ground-water Elevation	TDS/Turbidity	pH	Dissolved Oxygen	Water Temperature	Specific Conductance	Salinity	Major Ion/Cation Concentrations
<i>Phase II Remedial Investigation, Red Hill Oily Waste Disposal Facility (DON 2000)</i>	•	—	—	—	—	—	—	•
<i>Red Hill Bulk Fuel Storage Facility Final Technical Report (DON 2007b)</i>	•	•	•	—	•	•	—	—
<i>Tank 5 Initial Release Response Report (April 2014) (DON [RH RR reports])</i>	•	—	•	•	•	•	•	—
<i>Final Project Procedures Manual, U.S. Navy Environmental Restoration Program (DON 2015b)</i>	•	—	•	•	•	•	—	—

(Reference)	Groundwater Characteristics Data							
	Ground-water Elevation	TDS/Turbidity	pH	Dissolved Oxygen	Water Temperature	Specific Conductance	Salinity	Major Ion/Cation Concentrations
<i>Quarterly Groundwater Monitoring Report, Outside Tunnel Wells: Fourth Quarter 2014 (DON [RH GM reports])</i>	•	—	•	•	•	•	—	—
<i>Tank 5 Quarterly Release Response Report (January 2015) (DON [RH RR reports])</i>	•	—	•	•	•	•	—	—
<i>Draft Monitoring Well Installation Report, Red Hill Fuel Storage Facility (DON 2015a)</i>	•	—	•	•	•	•	—	—
<i>Quarterly Groundwater Monitoring Report, Outside Tunnel Wells: Fourth Quarter 2015 (DON [RH GM reports])</i>	•	•	•	•	—	•	—	—
<i>Quarterly Groundwater Monitoring Report, Outside Tunnel Wells: First Quarter 2016 (DON [RH GM reports])</i>	•	•	•	•	•	•	•	—
<i>Quarterly Groundwater Monitoring Report: Outside Tunnel Wells: First Quarter 2016 (DON [RH GM reports])</i>	•	•	•	•	•	•	•	—
<i>Quarterly Groundwater Monitoring Report, Outside Tunnel Wells: First Quarter 2016 (DON [RH GM reports])</i>	•	•	•	•	•	•	•	—
<i>Halawa Deep Monitor Well, Oahu (3-2253-003): Fluctuations in the Water Table, Top of Transition Zone (TTZ), and Midpoint of Transition Zone (MPTZ) From August 2000 through October 2016 (CWRM 2016)</i>	•	—	—	—	—	—	—	—
<i>Volcanic Aquifers of Hawai'i—Hydrogeology, Water Budgets, and Conceptual Models (Izuka et al. 2016)</i>	•	—	—	—	—	•	•	—
<i>Specific Yield—Compilation of Specific Yields for Various Materials (Johnson 1967)</i>	•	—	—	—	—	—	—	—

(Reference)	Groundwater Characteristics Data							
	Ground-water Elevation	TDS/Turbidity	pH	Dissolved Oxygen	Water Temperature	Specific Conductance	Salinity	Major Ion/Cation Concentrations
<i>Numerical Simulation of the Effects of Low-Permeability Valley-Fill Barriers and the Redistribution of Ground-Water Withdrawals in the Pearl Harbor Area (Oki 2005)</i>	•	—	—	—	—	•	•	—
<i>Effects of Groundwater Withdrawal on Borehole Flow and Salinity Measured in Deep Monitor Wells in Hawai'i—Implications for Groundwater Management (Rotzoll 2010)</i>	•	—	—	—	—	•	•	—

- 1 • data provided
- 2 — no data

3 2.1.3.1 GROUNDWATER ELEVATION

4 Water levels measured in monitoring wells directly beneath the Facility's fuel storage tank indicate
5 that the water table typically ranges in elevation from 17.0 to 21.9 ft msl. The ground surface at the
6 fuel storage tanks is approximately 420–560 ft msl; thus, the water table lies approximately 400–
7 540 ft bgs. Beneath the fuel storage tanks, the water table lies approximately 100 ft below the bottom
8 of the tanks. The bottoms of the tanks and the groundwater beneath the Facility are deeper than the
9 adjacent valley floors (the low points of which are indicated by the elevations of the streams
10 projected onto Red Hill, as shown on Figure 9).

11 In May 2015, the USGS conducted a pumping test of BWS Hālawā Shaft, which included
12 monitoring of the Red Hill groundwater monitoring network. Due to difficulties in retrieving data
13 from the USGS website, only a partial set of raw data from that test has been obtained by the
14 Navy/DLA. Further coordination with USGS will be required to obtain all relevant data, and once
15 the full data set is compiled, the Navy/DLA plan to perform a full data evaluation and include those
16 data in the updated groundwater flow model.

17 To the northwest of the Facility, the BWS Hālawā Shaft is a major municipal drinking water source
18 for southern O'ahu. The regional groundwater pumping test in May 2006 showed that pumping of
19 Navy Supply Well 2254-01 for approximately 1 week at above-average rates (approximately
20 10-18 mgd) increased the drawdown substantially near the pumping well and created a hydraulic
21 capture zone along the Red Hill Shaft infiltration gallery. This pumping increased the southwesterly
22 gradient in the Facility area, but no response was noted in the Hālawā Deep Monitor Well
23 (HDMW2253-03) located north of the Facility (Figure 2). Other wells monitored near the Facility
24 did show a clear hydraulic response to pumping of Navy Supply Well 2254-01.

25 Since 2007, groundwater level measurements are available from the Red Hill monitoring wells
26 (Appendix B). Beginning in June 2008, quarterly or monthly depth to groundwater data are available
27 for RHMW01 through RHMW05 and RHMW2254-01. Quarterly data are also available for

1 OWDFMW01 and HDMW2253-03 beginning August 2009. Data from the more recent wells
2 RHMW06 and RHMW07 are available beginning in October 2014, and from RHMW08 and
3 RHMW09 beginning in October 2016. Water levels were also measured in these wells on
4 November 18, 2016 after an extended period when the Red Hill Shaft was not pumping. Farther
5 away from the Facility, water levels in other wells in the model domain have also been measured at
6 various times by other agencies, including the USGS and the BWS.

7 During May 2015, the USGS and BWS conducted a pumping test of the BWS Hālawā Shaft while
8 collecting water level elevations in a number of monitoring wells. For that test, the normal BWS
9 Hālawā Shaft pumping of approximately 6 mgd was stopped during the period of May 8–13, 2015.
10 Afterward, the Hālawā Shaft was pumped at a much higher rate, approximately 14 mgd, for the
11 period of May 14–20, 2015. The pumping rate decreased starting on May 21 to approximately
12 9 mgd, held steady at approximately 6 mgd during May 23–28, but then declined on May 30 to
13 approximately 2 mgd. Thereafter, the Hālawā Shaft pumping rate resumed at the rate of
14 approximately 6 mgd through mid-June of 2015.

15 Red Hill Shaft pumping rates are not contained in the data set currently available for the period prior
16 to May 22, 2015. The data recorded starting May 22 show Red Hill Shaft pumped at approximately
17 7–12 mgd until the pump stopped at 08:00 hours on May 22. The pump remained off until 09:30 on
18 May 23, 2015 and then pumping resumed at approximately 6–7 mgd until approximately
19 16:20 hours, until it was stopped again approximately 21:00 on May 23, 2015. After that time on
20 May 23, Red Hill shaft pumping resumed at approximately 7 mgd until approximately 01:20 on
21 May 24, 2015. For the remainder of May, Red Hill Shaft pumping was stopped for periods of
22 3–15 hours on a daily basis with intervening periods of pumping at rates varying from approximately
23 7 to 14 mgd on those days.

24 During May 2015, water levels were measured frequently at a number of monitoring wells in the
25 area, including: BWS Hālawā Valley well, OWDFMW01, RHMW04, RHMW07, BWS DH43
26 2253-02, TAMC MW2, and Moanalua Well 3-2153-05. The Navy/DLA currently has the May 2015
27 data from these wells, but it is not known whether the USGS or BWS has completed an analysis of
28 the data or has prepared a report describing the pumping test and results. Pumping of water supply
29 wells other than the Hālawā Shaft during May 2015, including the Red Hill Shaft, may have affected
30 water levels in the Red Hill monitoring wells.

31 A set of synoptic groundwater level measurements were collected on November 18, 2016 from the
32 Facility wells. The data are presented in Appendix A.3, Groundwater Data Table GW-61. Those
33 measurements are from a period in which Red Hill Shaft was not pumping.

34 2.1.3.2 GROUNDWATER PARAMETERS

35 During 2016, the most recent year in which groundwater parameters were routinely measured, the
36 average groundwater pH across the Red Hill monitoring network ranged from 6.31 to 8.75
37 (Table 2-8). Average groundwater temperature was relatively constant, with the difference between
38 the minimum (21.6° Celsius [C]) and maximum (26.1° C) values being less than 5° C. TDS levels,
39 specific conductance, and salinity were all greatest in well OWDFMW01, while well RHMW01
40 recorded the lowest average values for those same parameters. Finally, dissolved oxygen levels
41 varied from 0.66 mg/L at RHMW02 to 7.86 mg/L at RHMW2254-01.

1 **Table 2-8: Average 2016 Groundwater Parameters**

Well	Water Elevation (ft msl)	Total Dissolved Solids (g/L)	Turbidity (NTU)	pH	Dissolved Oxygen (mg/L)	Water Temperature (°C)	Specific Conductance (µS/cm)	Salinity (ppt)
RHMW01	83.11	0.22	2.03	7.08	4.22	23.72	346.12	0.18
RHMW02	85.74	0.33	0.80	6.43	0.66	23.61	512.20	0.24
RHMW03	102.37	0.50	1.75	6.82	1.27	26.10	779.50	0.38
RHMW04	293.61	0.28	1.02	6.60	7.24	22.99	399.28	0.31
RHMW05	82.41	0.55	3.72	7.66	7.85	23.48	599.25	0.41
RHMW06	240.55	1.04	2.14	6.91	5.58	23.85	1,627.00	0.83
RHMW07	198.13	1.19	1.04	7.34	1.98	23.97	1,835.50	0.94
RHMW08 ^a	292.07	0.54	0.00	8.73	4.53	25.38	837.00	0.40
RHMW09 ^a	376.93	0.23	0.00	7.45	7.06	24.73	355.00	0.20
RHMW2254-01	81.01	0.28	0.38	7.20	7.86	21.61	468.50	0.22
HDMW2253-03	206.35	0.32	30.58	6.31	2.56	22.82	482.48	0.22
OWDFMW01	119.92	2.54	13.50	8.75	3.80	25.13	3,931.00	2.07

2 Source: Red Hill Quarterly Groundwater Monitoring Reports for 2016 (DON [RH GM reports])
 3 µS/cm microsiemens per centimeter
 4 °C degrees Celsius
 5 g/L grams per liter
 6 NTU nephelometric turbidity unit
 7 ppt parts per trillion
 8 ^a Average values are based on only two sampling events because these wells were installed in 2016.

9 Regionally and within the groundwater flow modeling area, groundwater occurs as a freshwater lens
 10 floating on saltwater. According to the USGS, the upper part of this freshwater lens is derived from
 11 local rainfall and irrigation over the past decades, below which is a cooler zone of older freshwater
 12 that overlies a brackish-water transition zone and saltwater (Rotzoll 2010). The thickness of the
 13 freshwater lens, which may be hundreds of feet or less in the Pearl Harbor area, depends on factors
 14 including the amount of recharge, the hydraulic properties of the aquifer, water supply well pumping,
 15 and the effectiveness of the caprock as a confining unit. In 2007, Rotzoll specified the base of the
 16 2007 model as the bottom of the freshwater lens based on salinity data available at that time (DON
 17 2007b; Rotzoll and El-Kadi 2007). Several agencies collect salinity profiles from deep monitoring
 18 wells on a routine basis, including the HBWS, CWRM, and USGS. In 2010, the USGS published a
 19 report evaluating the depth of the freshwater lens using hundreds of salinity profiles from deep
 20 monitoring wells that penetrate through the transition zone between freshwater and saltwater, which
 21 included seven deep monitoring wells located in the modeling area (Rotzoll 2010).

22 In addition to the USGS reports that are now available for the modeling area, quarterly water
 23 sampling and laboratory analyses of the Red Hill monitoring wells conducted since 2007 by the
 24 Navy/DLA have provided data to characterize the physical and chemical characteristics of the
 25 groundwater. Groundwater temperature, pH, and specific conductance measurements are available
 26 for each water sample collected in the field, including those taken from well locations unaffected by
 27 the Facility. Laboratory analyses from the unaffected wells reflect naturally occurring concentrations
 28 of chemical constituents. At some locations, however, additional petroleum-related constituents
 29 contributed by the Facility have been detected at varying concentrations through time, as further
 30 described in Section 2.3.3.

1 **2.1.4 Groundwater Recharge and Discharge**

2 Information on groundwater recharge and discharge rates has been collected from available reports
3 and agency files regarding groundwater flow and recharge models, aquifer characteristics, and
4 meteorological records (Appendix A.3, Groundwater Data Tables GW-26 to GW-61). These data
5 include:

- 6 • Comprehensive recharge studies (e.g., USGS)
- 7 • Precipitation records
- 8 • Additional recharge sources
- 9 • Spring discharge rate(s)
- 10 • Aquifer characteristics
- 11 • Water budget estimates (for average and drought conditions)

12 Table 2-9 summarizes the groundwater recharge and land use references and indicates what type(s)
13 of data each one provided.

14 **Table 2-9: Groundwater Recharge References**

Reference	Groundwater Recharge References					
	Precipitation Records	Stream Flow Records	Spring Discharge Records	Aquifer Characteristics	Water Budget - Estimates - Average Conditions	Water Budget - Estimates - Drought Conditions
<i>Phase II Remedial Investigation, Red Hill Oily Waste Disposal Facility (DON 2000)</i>	—	—	—	S, L	—	—
<i>Red Hill Bulk Fuel Storage Facility Final Technical Report (DON 2007b)</i>	—	—	R	—	—	—
<i>Spatially Distributed Groundwater Recharge for 2010 Land Cover Estimated Using a Water-Budget Model for the Island of O'ahu (Engott et al. 2015)</i>	L, R	—	—	—	L, R	L, R
National Water Information System: Mapper (USGS 2017)	—	L	L	—	—	—
National Water Information System: Web Interface – USGS Water Data for the Nation (NWIS 2017)	L	L	—	—	—	—
Climate Data Online, Station Details for Halawa Shaft 771.2, HI US (NCEI 2017)	L	—	—	—	—	—
<i>Volcanic Aquifers of Hawai'i—Hydrogeology, Water Budgets, and Conceptual Models (Izuka et al. 2016)</i>	R	—	—	—	R	R

Reference	Groundwater Recharge References					
	Precipitation Records	Stream Flow Records	Spring Discharge Records	Aquifer Characteristics	Water Budget - Estimates - Average Conditions	Water Budget - Estimates - Drought Conditions
<i>Geohydrology of the Central Oahu, Hawaii, Ground-Water Flow System and Numerical Simulation of the Effects of Additional Pumping</i> (Oki 1998)	R	—	L	—	R	—
<i>Numerical Simulation of the Effects of Low-Permeability Valley-Fill Barriers and the Redistribution of Ground-Water Withdrawals in the Pearl Harbor Area, Oahu, Hawaii</i> (Oki 2005)	R	—	—	—	R	—

- 1 — no data
- 2 ^a Abbreviations:
- 3 L local data (within 5 miles of the Facility)
- 4 R regional data (i.e., island- or state-wide data)
- 5 S site-specific data

6 2.2 MONITORING WELL AND WATER SUPPLY DATA

7 2.2.1 Monitoring Well Data

8 Monitoring well data have been collected from available reports and agency files regarding such
9 information as well locations, purpose, dimensions, and screening interval (Appendix A.4, Well Data
10 Tables WELL-1 to WELL-6). These data include:

- 11 • Well name
- 12 • Hawaii well index number
- 13 • Well location
- 14 • Reference datum for each well location (e.g., North American Datum of 1983 [NAD83])
- 15 • Well use
- 16 • Date of installation
- 17 • Ground surface elevation (ft msl)
- 18 • Top of casing elevation (ft msl)
- 19 • Bedrock elevation (ft msl)
- 20 • Groundwater elevation (ft msl)
- 21 • Top and bottom of well screen interval (ft msl)
- 22 • Elevation and total depth of boreholes (ft msl)
- 23 • Borehole diameter (inches [in])
- 24 • Well casing diameter (in)
- 25

26 Table 2-10 summarizes the groundwater monitoring well references, and indicates what type(s) of
27 data are provided in each.

1 **Table 2-10: Groundwater Monitoring Well References**

Reference	Groundwater Well Data ^a					
	Well Location	Well Use	Well Depth	Depth to Ground-water	Screened Interval	Well Diameter
<i>Phase II Remedial Investigation, Red Hill Oily Waste Disposal Facility (DON 2000)</i>	—	S	S	S	S	—
<i>Red Hill Bulk Fuel Storage Facility Investigation Report (Final) for Fleet Industrial Supply Center (DON 2002b)</i>	—	—	S	S	S	—
<i>Red Hill Bulk Fuel Storage Facility Work Plan (DON 2005)</i>	—	S	S	S	S	S
<i>Red Hill Bulk Fuel Storage Facility Final – Work Plan Addendum (DON 2006a)</i>	S	—	S	—	—	S
<i>Well Abandonment Technical Memorandum (DON 2006b)</i>	—	—	S	S	—	—
<i>Red Hill Bulk Fuel Storage Facility Draft Groundwater Field Sampling Plan (DON 2007a)</i>	S	—	S	—	S	S
<i>Red Hill Bulk Fuel Storage Facility Final Technical Report (DON 2007b)</i>	S	—	S	S	S	S
<i>Red Hill Bulk Fuel Storage Facility Final Groundwater Protection Plan (DON 2008)</i>	S	—	—	—	—	—
<i>Type 1 Letter Report – Re-Evaluation of the Tier 3 Risk Assessment/Groundwater Model & Proposed Course of Action (DON 2010a)</i>	S	—	—	—	—	—
Hawaii Well Index Table 2014-04-22 (Data.gov 2017)	S, L, R	S, L, R	S, L, R	—	S, L, R	S, L, R
<i>Halawa Deep Monitor Well, Oahu (3-2253-003): Fluctuations in the Water Table, Top of Transition Zone (TTZ), and Midpoint of Transition Zone (MPTZ) From August 2000 through October 2016 (CWRM 2016)</i>	S	S	S	S	S	S
<i>Plans for Construction of a Portion of Interstate Route H-3, Halawa Quarry Viaduct Makai Section (HDOT 1988)</i>	—	S	S	—	S	—
Water Wells in the State of Hawai'i (HIGP 2017)	S, L, R	—	—	—	—	—
<i>Specific Yield—Compilation of Specific Yields for Various Materials (Johnson 1967)</i>	S	—	—	S	S	—
<i>Geohydrology of the Central Oahu, Hawaii, Ground-Water Flow System and Numerical Simulation of the Effects of Additional Pumping (Oki 1998)</i>	S, L, R	—	—	—	—	—
<i>Numerical Simulation of the Effects of Low-Permeability Valley-Fill Barriers and the Redistribution of Ground-Water Withdrawals in the Pearl Harbor Area (Oki 2005)</i>	S, L, R	—	S, L, R	—	—	—

Reference	Groundwater Well Data ^a					
	Well Location	Well Use	Well Depth	Depth to Ground-water	Screened Interval	Well Diameter
Halawa Deep Monitoring Well Log (URS Group 2000)	S	S	S	—	—	S
Final Summary of Drilling and Hydrogeologic Conditions for Waimalu Deep Monitor Well No. 2456-05 (URS 2006)	S	S	S	S	—	S

- 1 — no data
2 ^a Abbreviations:
3 L local well (within 5 miles of, but not within, the Facility)
4 R regional well (> 5 miles from the Facility)
5 S site-specific well (for the Facility)

6 **2.2.1.1 RED HILL GROUNDWATER MONITORING WELLS**

7 Four groundwater monitoring wells (RHMW01, RHMW02, RHMW03, and RHMW05) are located
8 within the Facility's lower access tunnel, and sampling location RHMW2254-01 is located adjacent
9 to U.S. Navy Supply Well 2254-01 (Red Hill Shaft) (Figure 2).

10 Seven groundwater monitoring wells (RHMW04, RHMW06, RHMW07, RHMW08, RHMW09,
11 HDMW2253-03, and OWDFMW01) are located outside of the Facility tunnel system (Figure 2):

- 12 • RHMW04, RHMW06, and RHMW07 are located in the northern portion of the Facility,
13 along the road to the Navy Firing Range.
- 14 • RHMW08 is located to the west of the underground tanks and serves as a monitoring
15 point between the tanks and the supply water infiltration gallery. RHMW09 is located to
16 the southwest of the tanks, and serves as an additional monitoring point between the
17 tanks and the infiltration gallery.
- 18 • HDMW2253-03 is located at the Hālawā Correctional Facility (outside the Facility
19 boundaries).
- 20 • OWDFMW01 is located at the Navy's former Oily Waste Disposal Facility (OWDF)
21 near Adit 3, west of Navy Supply Well 2254-01.

22 RHMW06 and RHMW07 (DON 2015a) and RHMW08 and RHMW09 (DON 2016a) were installed
23 in response to the Tank 5 release. Two additional groundwater monitoring wells are planned to be
24 installed in 2017 to further expand the monitoring network (DON 2016a), and there is an option to
25 install a third contingency well in 2017 or 2018, should it be deemed necessary.

26 **2.2.1.2 MONITORING WELLS IN THE GROUNDWATER FLOW MODELING AREA**

27 The primary groundwater flow modeling area contains seven groundwater monitoring wells
28 (Figure 17). The Honolulu BWS owns and operates wells 2153-05 (Moanalua Deep Monitoring
29 Well), 2153-09 (Moanalua Monitoring Well), 2255-33 (Hālawā Shallow Observation Well), 2255-40
30 (Hālawā Deep Observation Well), and 2355-14 (Ka'amilo Deep Monitor Well). The remaining two
31 wells, 2253-03 (Hālawā Deep Monitor Well) and 2456-05 (Waimalu Deep Monitor Well) are owned
32 by the Hawai'i DLNR CWRM. The deep monitoring wells extend below the basal aquifer into the
33 saltwater lens below, and are used to monitor chloride concentrations in groundwater.

1 2.2.1.3 OTHER WELLS IN THE GROUNDWATER FLOW MODELING AREA

2 The remaining groundwater flow modeling area contains 185 documented wells (Figure 18), which
3 primarily serve, or have served, as either water supply wells or groundwater monitoring wells
4 (Appendix A.4, Well Data Table WELL-3). The most commonly cited well owners are BWS,
5 NAVFAC Hawaii, and the Oahu Sugar Company. Several groundwater wells within the model area
6 were installed prior to 1900, and may no longer be in use.

7 **2.2.2 Water Supply Wells and Infiltration Tunnels**

8 Water supply well and infiltration tunnel data have been collected from available reports and agency
9 files regarding well locations, purpose, dimensions, average pumping rates, and other information
10 (Appendix A.4, Well Data Table WELL-4). These data include:

- 11 • Well name
- 12 • Hawaii well index number
- 13 • Approximate well locations plotted on Figure 4 – Figure 7
- 14 • Reference datum for each well location (e.g., NAD83)
- 15 • Well use
- 16 • Date of installation
- 17 • Ground surface elevation (ft msl)
- 18 • Top of casing elevation (ft msl)
- 19 • Bedrock elevation (ft msl)
- 20 • Groundwater elevation (ft msl)
- 21 • Top and bottom of well screen interval (ft msl)
- 22 • Elevation and total depth of boreholes (ft msl)
- 23 • Borehole diameter (in)
- 24 • Well casing diameter (in)
- 25 • Pump intake elevation (msl)
- 26 • Average pumping rate (mgd)
- 27 • Permitted pumping rate (mgd)
- 28 • Maximum sustainable pumping rate (mgd)
- 29 • Lateral extent of water tunnel (for infiltration galleries only) (ft)
- 30 • Pumping rate records January 2015–present, preferably monthly or more frequently
- 31 • Pump operation schedules January 2015–present, and plans for the foreseeable future
- 32 • Any other available historical pump operation records

33 Table 2-11 summarizes the water supply well references and indicates what type(s) of data each one
34 provided.

1 **Table 2-11: Water Supply Well and Infiltration Gallery References**

Reference	Water Supply Well and Pump Data ^a							Maximum Permitted and/or Sustainable Pumping Rate
	Well Location	Well Use	Well Depth	Depth to Groundwater	Screened Interval	Well Diameter	Average Pumping Rate	
<i>Phase II Remedial Investigation (DON 2000)</i>	—	S	S	S	S	—	—	—
<i>Red Hill Bulk Fuel Storage Facility Investigation Report (Final) for Fleet Industrial Supply Center (FISC) (DON 2002b)</i>	—	—	S	S	S	—	—	—
<i>Red Hill Bulk Fuel Storage Facility Work Plan (DON 2005)</i>	—	S	S	S	S	S	—	—
<i>Red Hill Bulk Fuel Storage Facility Final – Work Plan Addendum (DON 2006a)</i>	S	—	S	—	—	S	—	—
<i>Well Abandonment Technical Memorandum (DON 2006b)</i>	—	—	S	S	—	—	—	—
<i>Red Hill Bulk Fuel Storage Facility Draft Groundwater Field Sampling Plan (DON 2007a)</i>	S	—	S	—	S	S	—	—
<i>Red Hill Bulk Fuel Storage Facility Final Technical Report (DON 2007b)</i>	S	—	S	S	S	S	S	S
<i>Red Hill Bulk Fuel Storage Facility Final Groundwater Protection Plan (DON 2008)</i>	S	—	—	—	—	—	—	—
<i>Type 1 Letter Report – Re-Evaluation of the Tier 3 Risk Assessment/Groundwater Model & Proposed Course of Action (DON 2010a)</i>	S	—	—	—	—	—	—	—
Hawaii Well Index Table 2014-04-22 (Data.gov 2017)	S, L, R	S, L, R	S, L, R	—	S, L, R	S, L, R	S, L, R	—
<i>Halawa Deep Monitor Well, Oahu (3-2253-003): Fluctuations in the Water Table, Top of Transition Zone (TTZ), and Midpoint of Transition Zone (MPTZ) From August 2000 through October 2016 (CWRM 2016)</i>	S	S	S	S	S	S	—	—
<i>Plans for Construction of a Portion of Interstate Route H-3, Halawa Quarry Viaduct Makai Section (HDOT 1988)</i>	—	S	S	—	S	—	—	—
Water Wells in the State of Hawai'i (HIGP 2017)	S, L, R	—	—	—	—	—	—	—
<i>Specific Yield—Compilation of Specific Yields for Various Materials (Johnson 1967)</i>	S	—	—	S	S	—	—	—

Reference	Water Supply Well and Pump Data ^a							Maximum Permitted and/or Sustainable Pumping Rate
	Well Location	Well Use	Well Depth	Depth to Ground-water	Screened Interval	Well Diameter	Average Pumping Rate	
<i>Geohydrology of the Central Oahu, Hawaii, Ground-Water Flow System and Numerical Simulation of the Effects of Additional Pumping (Oki 1998)</i>	S, L, R	—	—	—	—	—	—	—
<i>Numerical Simulation of the Effects of Low-Permeability Valley-Fill Barriers and the Redistribution of Ground-Water Withdrawals in the Pearl Harbor Area (Oki 2005)</i>	S, L, R	—	S, L, R	—	—	—	—	S, L, R
<i>Halawa Deep Monitor Well Log (URS Group 2000)</i>	S	S	S	—	—	S	—	—
<i>Final Summary of Drilling and Hydrogeologic Conditions for Waimalu Deep Monitor Well No. 2456-05 (URS 2006)</i>	S	S	S	S	—	S	—	—

- 1 — no data
- 2 ^a Abbreviations:
- 3 L local well (within 5 miles of, but not within, the Facility)
- 4 R regional well (> 5 miles from the Facility)
- 5 S site-specific well (for the Facility)

6 Nine water supply wells and infiltration galleries were identified within the groundwater flow
7 modeling area (Figure 16). The U.S. Army Garrison's Directorate of Public Works owns wells
8 2153-07 (Tripler Army Medical Center [TAMC]-1) and 2153-08 (TAMC-2); BWS owns and
9 operates wells 2253-02 (Moanalua DH 43), 2354-01 (Hālawa Shaft Well), and 2355-08 (Kalauao
10 T118); and NAVFAC Hawaii owns wells 2254-01 (Red Hill Navy Supply Well, also known as Red
11 Hill Shaft), 2254-02 (Hālawa), and 2256-10 (Navy Aiea), in addition to the Red Hill Navy Supply
12 Well infiltration gallery. All of the water supply wells appear to have been installed during or prior
13 to 1963 (Appendix A.4, Well Data Table WELL-4).

14 Navy Supply Well 2254-01 is located approximately 2,600 ft seaward ("makai") of the Facility's
15 underground fuel storage tanks, and provides potable water to the JBPHH Water System, which
16 serves approximately 65,200 military customers. Naval Facilities Engineering Command
17 (NAVFAC) Hawaii operates Navy Supply Well 2254-01 and its associated infiltration gallery, which
18 extends across the water table to within 1,530 ft of the underground tanks.

19 Details of the construction of the Red Hill Water Tunnel are provided in the *U.S. Navy Red Hill*
20 *Water-Development Tunnel Log* by Harold T. Stearns (Stearns 1943), which is attached to a brief
21 transmittal letter from Mr. Stearns to Mr. O. E. Meinzer of the USGS dated January 18, 1943. The
22 log provides detailed sketches of the volcanic rock materials penetrated by the tunnel, and notations
23 of the groundwater inflows into sections of the tunnel during construction. The log's notations also
24 include groundwater level elevations during pumping and non-pumping periods, but the
25 measurement point(s) for groundwater elevation measurements is not indicated.

1 **2.3 FACILITIES AND LAND USE DATA**

2 **2.3.1 Red Hill Fuel Storage Tanks**

3 This subsection provides a description of Facility characteristics (e.g., the Facility fuel storage tanks)
 4 within the groundwater flow modeling area (Appendix A.5, Facility Data Table FAC-1).

5 Table 2-12 summarizes the Facility fuel storage tank references, and indicates what type(s) of data
 6 each one provided.

7 **Table 2-12: Red Hill Storage Facility Fuel Storage Tank References**

Reference	Fuel Storage Tank Parameter ^a			
	Capacity	Dimensions	Past and Current Contents	Confirmed Releases
<i>Initial Phase II Site Characterization Report, Fleet Industrial Supply Center Bulk Fuel Storage Facility at Red Hill (DON 1999)</i>	—	—	S	—
<i>Phase II Remedial Investigation, Red Hill Oily Waste Disposal Facility (DON 2002b)</i>	—	—	S	—
<i>Red Hill Bulk Fuel Storage Facility Work Plan (DON 2005)</i>	—	—	S	—
<i>2011 Biennial Integrity Testing Reports of Bulk Field Constructed Underground Storage Tanks, Naval Station Pearl Harbor / Red Hill, Hawaii. Tanks 2, 3, 7, 8, 10, 11, 12, 15, 18, 20 (DON 2011)</i>	S	S	S	—
<i>2013 Biennial Leak Detection Testing Report of Bulk Field-Constructed Underground Storage Tanks 2, 7, 8, 15 (DON 2013a)</i>	S	S	S	—
<i>Quarterly Groundwater Monitoring Reports for Inside Tunnel Wells and Outside Tunnel Wells, Red Hill Bulk Fuel Storage Facility 2005–2017 (DON [RH GM reports])</i>	—	—	S	—
<i>Plans for Construction of a Portion of Interstate Route H-3, Halawa Quarry Viaduct Makai Section (HDOT 1988)</i>	S	—	S	S
<i>Summary of Site Information- Hawaiian Cement Halawa Quarry (DOH 2016)</i>	—	—	—	L

8 — no data
 9 ^a Abbreviations:
 10 L local data (within 5 miles of the Facility)
 11 S site-specific data

12 The Facility was constructed by the U.S. Government in the early 1940s to support war efforts in the
 13 Pacific during World War II, and continues to be instrumental in storing and transporting fuel to
 14 support the Navy's mission. Prior to the early 2000s, several tanks stored Navy Special Fuel Oil
 15 (NSFO), Navy Distillate, aviation gasoline (AVGAS), and motor gasoline (MOGAS). Currently, the
 16 Facility's fuel storage tanks currently contain Jet Fuel Propellant (JP)-5, North Atlantic Treaty
 17 Organization (NATO)-grade F-24 jet fuel, and Marine Diesel Fuel (F-76). The fuel storage tanks,
 18 fuel distribution piping, and associated access tunnels were installed in basalt with inter-bedded
 19 volcanic tuff and breccia zones. The fuel storage tanks were constructed in two parallel rows.

20 Construction of the Facility began with excavation and removal of surface soil on the top of Red Hill
 21 to expose the underlying basalt. Each tank pit was then blasted from the basalt, using a central
 22 vertical tunnel and radial blast tubes. The upper dome shell was excavated first, and the upper dome
 23 was field-constructed. The cavity for the tank barrel and lower dome was then blasted and excavated,

1 and the remainder of the tank was field-constructed from the lower dome up. The tank lining was
2 constructed using ¼-inch-thick, 5-ft by 12-ft steel plates welded together. Once the lower dome of
3 each tank was in place, a bed of concrete was placed below the bottom of the dome. A gap of
4 approximately 3.5–4 ft was maintained between the tank lining and the wall of the excavation, and
5 after installing steel reinforcing, concrete was poured into the gap (DON 2005, Appendix C). Upon
6 completion of each tank, small-diameter holes were drilled in the sides of the tank and through the
7 concrete bed. A 10-to-1 grout mixture was then injected into the surrounding bedrock at a pressure of
8 approximately 300 pounds per square inch to close seams and fractures in the tank and the
9 surrounding bedrock (DON 2002b).

10 During Tank 5 refilling operations following scheduled maintenance, a fuel release was discovered
11 on January 13, 2014, and the Navy immediately notified DOH and EPA of a loss of fuel. On
12 January 16, 2014, the Navy verbally notified DOH and EPA of a confirmed release from Tank 5. On
13 January 23, 2014, the Navy provided written notification to DOH. The Navy estimated the fuel loss
14 at 27,000 gallons. It was in response to this release that EPA Region 9 and DOH negotiated the AOC
15 for the Facility with the Navy/DLA (EPA Region 9 and DOH 2015).

16 Following the reported release, water samples were collected from Navy Supply Well 2254-01 and
17 the following BWS wells: Hālawā Shaft, Hālawā Wells, ‘Aiea Wells, ‘Aiea Gulch Wells, and
18 Moanalua Wells. Test results from Navy Supply Well 2254-01 and the BWS well samples indicated
19 that no petroleum constituents at concentrations requiring action had reached the drinking water
20 supply wells in the months following the release (RHSF Task Force 2014).

21 **2.3.2 Historical Records Review of Neighboring Properties**

22 A review of offsite contaminant sources was conducted by searching DOH Solid and Hazardous
23 Waste Branch (SHWB) Underground Storage Tanks (UST) / Leaking Underground Storage Tanks
24 (LUST) and Hazard Evaluation and Emergency Response (HEER) databases for records pertaining
25 to the Facility and neighboring properties. State databases included, but were not limited to: LUST,
26 Registered UST, SHWS (State Hazardous Waste Sites), SWF/LF (Solid Waste Disposal Facilities),
27 and SPILLS (Spills List). Freedom of Information Act inquiries were submitted to the DOH SHWB
28 and HEER Office to obtain the environmental records pertaining to these listings. Referenced
29 information provided in the DOH records is summarized in Table 2-13 (cited references are
30 presented in the table’s notes), and locations are depicted on Figure 21. Available compiled data are
31 presented in Appendix A.5, Facility Data Tables FAC-2 to FAC-4.

1 **Table 2-13: Historical Releases at Properties Neighboring the Red Hill Facility**

Location (DOH Release No.)	Description	Groundwater Monitoring Wells	Chemistry Results	Final Status
Red Hill Mauka Neighborhood (DOH SHWB Release No. 080025)	<p>A release was reported on April 15, 2008 in the Red Hill Mauka Neighborhood on the Āliamanu Military Reservation, immediately north of the intersection of Tampa Drive and Forward Avenue.</p> <p>Approximately 1–2 gallons of an unknown product were released during excavation of a 500-gallon UST, which was discovered during a redevelopment project. There were no existing records of the UST prior to its discovery, and the UST was not leaking. The redevelopment contractor removed the UST, and Tetra Tech was contracted to sample the UST's contents, the excavated soil, and the soil around the tank (Tetra Tech 2008).</p>	No groundwater monitoring wells were installed since the release was most likely a spill from the tank during excavation.	The sludge in the tank did not exceed the soil action levels (SALs) of any RCRA metals. The most contaminated portion of the stockpile soils contained a diesel concentration of 32,500 mg/kg and a gasoline concentration of 96.2 mg/kg. No contaminants were detected in the soil surrounding the tanks (Tetra Tech 2008).	DOH sent a letter on September 16, 2008 for No Further Action (NFA) despite a small volume of petroleum-contaminated soil remaining in the subsurface (DOH 2008c).
Hālawā Correctional Facility – Medium Security Prison: May 1988 UST Leak Release (DOH SHWB Release No. 880020)	<p>A Foster Village resident reported oil contamination and dead fish in Hālawā Stream in May 1988. A UST located in the south end of the Hālawā Correctional Facility medical unit was discovered to be leaking into Hālawā Stream.</p> <p>Approximately 2,000 gallons of diesel fuel were recovered by oil/water separators in the South Hālawā Stream, the North Tributary Stream, and the underground pipeline in 1988. The UST and pipes had been leaking for an unknown period. Two oil/water separators were installed in 1989 and collected approximately 500 gallons of diesel by 1991 (Dames and Moore 1991).</p>	Twenty-three soil borings were drilled in six areas; 16 of those borings were converted into groundwater monitoring wells. Quarterly groundwater monitoring was conducted between August 1992 and May 1993.	During the 1992–1993 rainy season, TPH-g was not detected, but TPH-d ranged from non-detectable concentrations to 59 mg/L in one of the wells. Benzene and total xylenes were also measured at concentrations ranging from non-detectable to 0.22 mg/L and 0.11 mg/L, respectively. DOH did not have any guidelines on TPH-g or TPH-d at the time of publication (Dames and Moore 1993).	In August 1993, monitoring the site was discontinued based on the results of the last Dames and Moore quarterly groundwater monitoring report. Records of this incident are not available after 1993. NFA Status was granted in 2000 according to DOH SHWB records (DOH 2015a).
Hālawā Correctional Facility – Medium Security Prison: April 1999 UST Excavation Release (DOH SHWB Release No. 990204)	<p>A release at the Hālawā Correctional Facility – Medium Security Prison occurred in April 1999. Two gasoline USTs (M-1 and M-2) and a smaller diesel UST (M-3) were located in the parking area adjacent to the prison wall in the western portion of the facility. Another diesel tank was located inside the prison compound adjacent to the prison wall opposite of tanks M-1 to M-3.</p> <p>Petroleum odors in the soil and the piping systems were observed during the excavation of the USTs. A sheen was also observed on the groundwater inside of the pit. USTs and piping were observed after excavation and did not show any sign of damage or leakage despite the odor. Soil samples from the excavations and water samples from the tank pits and one groundwater monitoring well were collected (EKNA 1999).</p>	One existing groundwater monitoring well 10 ft from tank M-1 was inspected after the release was discovered.	<p>Results of chemical analyses following the discovery of the release were as follows (EKNA 1999):</p> <ul style="list-style-type: none"> • TPH-d was detected in concentrations greater than the MRL in most of the soil samples but less than the DOH Tier I Action Level. TPH-d was also found in all of the water samples greater than the MRL. • TPH-g was recorded above the MRL for one soil sample below the action level and two water samples above the action level. • BTEX was encountered in one soil sample. It was encountered in two water samples at a concentration above the MRL, with benzene and toluene above the action level. • Total lead was not detected in any samples. • PAHs were not detected in any soil samples but were detected in four water samples above the MRL, and with two above the action level. • MtBE was encountered in three samples above the MRL and action level. 	The UST closure report recommended that further action should be taken to monitor the site (EKNA 1999). However, since the technique used to test the soil may have caused false positives, DOH deemed the soil contamination negligible. The water contamination was also deemed negligible since the water was perched water and not actually from the water table under the site. Samples from existing groundwater monitoring wells did not have any detects. The contractor, EKNA, wrote a letter to DOH in April 2000 requesting a NFA status. It was accepted in May 2000 (DOH 2000b).

Location (DOH Release No.)	Description	Groundwater Monitoring Wells	Chemistry Results	Final Status
<p>Hālawā Correctional Facility – High Security Prison (DOH SHWB Release No. 000091)</p>	<p>A diesel and a gasoline UST were excavated at the Hālawā Correctional Facility – High Security Prison. The tanks were located approximately 30 ft from the eastern wall of module A. The diesel UST was removed on February 28, 1994, and eight holes were discovered. The gasoline UST was excavated a week later; no holes were visible but minor rusting was observed. Product was noted on the water surface within the excavation. No product was observed after removal of the contaminated backfill material (MFA 1999).</p>	<p>Three wells were installed around both the gasoline UST site and the diesel UST site following the extraction of soil borings. No product was found in any of these wells during subsequent sampling and gauging.</p>	<p>Results of chemical analyses following the discovery of the release and after excavation of the area were as follows (MFA 1999):</p> <ul style="list-style-type: none"> • Initial samples collected from around the gasoline UST had detects of TPH-g and BTEX. Only benzene and ethylbenzene were detected above DOH EALs. Samples from the groundwater showed no TPH-g or BTEX above laboratory MRLs. • Initial samples from the diesel tank indicated the presence of TPH-d, benzene, ethylbenzene, and xylenes. Samples from groundwater indicated the presence of ethylbenzene, xylenes, and fluoranthene. None of the tested analytes was above DOH EALs. • No detects occurred in soil and groundwater samples following the overexcavation. 	<p>Because no detects were found after the overexcavation, NFA was recommended in December 1999. It was accepted by DOH in August 2000 (DOH 2000a).</p>

Location (DOH Release No.)	Description	Groundwater Monitoring Wells	Chemistry Results	Final Status
<p>City and County of Honolulu (CCH) Hālawā Bus Facility is located at 99-999 Iwaena Street, in Hālawā Valley. Between 1998 and 2003, 15 USTs containing diesel, gasoline, waste oil, and mineral spirits were excavated and removed in a series of closure actions. Five releases were reported during these activities; DOH SHWB UST Section, providing facility oversight, assigned these releases the following ID numbers: 980246, 990045, 030020, 030021, and 030024.</p> <ul style="list-style-type: none"> Releases 980246 and 030021 represented an area of petroleum-impacted soil located beneath the former pump islands, originating from leaks in the piping between the islands, a waste oil UST and oil/water separator, and the UST farm immediately to the southwest (Kimura Intl. 1999, 2003c). Release 990045 represented an area of acenaphthene impacted soil believed to have originated from a 250-gallon waste thinner UST to the northeast of the former pump islands (Kimura Intl. 2000). Release 030020 was associated with a waste oil UST and an antifreeze UST. All constituents in the excavation were reportedly below EALs (Kimura Intl. 2003b). Release 030024 was associated with a motor oil UST and torque oil UST that were located just past the northeast corner of the maintenance building (Kimura Intl. 2003a). 	<p>The City and County of Honolulu (CCH) Hālawā Bus Facility is located at 99-999 Iwaena Street, in Hālawā Valley. Between 1998 and 2003, 15 USTs containing diesel, gasoline, waste oil, and mineral spirits were excavated and removed in a series of closure actions. Five releases were reported during these activities; DOH SHWB UST Section, providing facility oversight, assigned these releases the following ID numbers: 980246, 990045, 030020, 030021, and 030024.</p> <ul style="list-style-type: none"> Releases 980246 and 030021 represented an area of petroleum-impacted soil located beneath the former pump islands, originating from leaks in the piping between the islands, a waste oil UST and oil/water separator, and the UST farm immediately to the southwest (Kimura Intl. 1999, 2003c). Release 990045 represented an area of acenaphthene impacted soil believed to have originated from a 250-gallon waste thinner UST to the northeast of the former pump islands (Kimura Intl. 2000). Release 030020 was associated with a waste oil UST and an antifreeze UST. All constituents in the excavation were reportedly below EALs (Kimura Intl. 2003b). Release 030024 was associated with a motor oil UST and torque oil UST that were located just past the northeast corner of the maintenance building (Kimura Intl. 2003a). 	<p>Groundwater Data: Groundwater was believed to be at a depth of approximately 120–150 ft bgs; however, there were concerns about perched aquifers that may be seasonal or transient in nature. During the removal of the waste thinner UST (Release 990045), what was believed to be a perched aquifer was encountered at 6.25 ft bgs. The water exhibited an oily sheen, although a water sample collected from the pit exhibited non-detectable levels of TPH-g and oil (Kimura Intl. 2000). During a second investigation, approximately 700 gallons of water were pumped from the excavation. No recharge was observed. The only other time groundwater was encountered was during a 2004 site investigation of the area near the pump islands (Releases 980246, 990045, and 030021). Of five borings in the area advanced to 30–51.5 ft bgs, only one encountered groundwater, at 38 ft bgs. Recharge was reportedly slow. The boring was converted to a well, and samples obtained from it showed concentrations of MtBE exceeding DOH Tier 1 groundwater action levels (MFA 2007).</p>	<p>Chemistry results by DOH Release ID:</p> <ul style="list-style-type: none"> Release 980246: TPH-d, benzene, ethylbenzene, acenaphthene, and naphthalene were detected above EALs in soil samples collected from the impacted trench area (Kimura Intl. 1999, 2003d). Release 990045: Acenaphthene was detected above the EALs in soil samples collected from the excavation site (Kimura Intl. 1999). TPH-d was later detected at levels above the EALs in soil samples collected from the overexcavation site (MFA 2007). Release 030020: Waste oil and antifreeze constituents were detected in soil samples collected from the excavation site, but all constituents were below EALs (Kimura Intl. 2003b). Release 030021: TPH-d was detected in soil samples collected from the UST site above the EALs after the initial excavation and overexcavation (Kimura Intl. 2003c). Release 030024: TPH-o and fluoranthene were detected above EALs in the soil collected from the Hālawā Bus Facility utility room where UST piping had surfaced (Kimura Intl. 2003a). 	<p>Releases 980246, 990045, 030021, and 030024 are being managed in place by an Environmental Protection Management Plan (MFA 2006). Annual inspections of the concrete pad above the area of contamination are conducted. Release 030020 received a NFA status in 2004 (DOH 2004a).</p>
<p>Hawaiian Cement Concrete and Aggregates: January 1991 UST Excavation Release (DOH SHWB Release No. 910044)</p>	<p>In January 1991, four USTs were excavated from the Hawaiian Cement Company. Staining and petroleum releases were detected below the USTs. Samples were collected from the excavation pits (Unitek 1994).</p>	<p>—</p>	<p>TPH-d, organic lead, and benzene were found in concentrations above the DOH cleanup goals. Excavated soil was stockpiled and sampled, with TPH-d, benzene, toluene, xylene, and ethylbenzene detected in the soil samples. After 15 months of aeration of the stockpiled soil, soil samples had no detects of petroleum constituents (FOPCO 1992).</p>	<p>After September 1992, sampling showed no detects, and NFA was recommended by the contractors, the Fuel Oil Polishing Company of Hawaii and Unitek Environmental Consultants, Inc. A NFA status was granted by DOH in 1995 (DOH 1995).</p>

Location (DOH Release No.)	Description	Groundwater Monitoring Wells	Chemistry Results	Final Status
Hawaiian Cement Concrete and Aggregates: December 2006 UST Release (DOH SHWB Release No. 070013)	On December 5, 2006, an alarm condition relating to a diesel UST was discovered at the Hawaiian Cement Hālawā Valley Quarry. Diesel fuel in the sump above the UST was observed, and the primary and secondary piping was replaced. Excavation activities to remove the petroleum-impacted soil were conducted in March 2007, but visual and olfactory observations noted that petroleum was still present. Additional excavation activities were performed in July 2007, and soil samples confirmed that there were no constituents above DOH SALs (ETC 2007).	—	Initial soil samples indicated detects above the DOH Tier 1 SALs. July 2007 sampling results showed detections of TPH-d at 120 mg/kg, but did not indicate any contamination above DOH SALs (ETC 2007).	The contractor, EnviroServices & Training Center, LLC, recommended NFA in August 2007. DOH granted NFA status in December 2007 (DOH 2007).
Tripler Hospital: October 1991 Building 113 UST Excavation Releases (DOH SHWB Release No. 920056, 920083)	On October 31, 1991, a 550-gallon waste oil UST (Tank 10) and two 1,000-gallon gasoline USTs (Tanks 9A and 9B) were removed in front of Building 113 Motor Pool Fuel Station at Tripler Army Medical Center. A UST closure report was prepared in June 1992. Soil samples collected from under and around Tank 10 indicated petroleum leakage had occurred at the site. Free product was observed floating on water during the excavation of Tanks 9A and 9B (Rubeck 1992a,b).	—	The primary contaminants found in the soil samples at Tank 10 were oil and heavy metals that exceeded DOH cleanup goals at the time of the excavation. Organic lead was found in all samples from Tanks 9A and 9B (Rubeck 1992a,b).	DOH granted NFA status for Tanks 9A and 9B in October 1997 based on the initial tank removal report and two follow-up letters (DOH 1997). DOH granted NFA status for Tank 10 in a February 1999 letter that referred to the June 1992 report as justification (DOH 1999).
Tripler Hospital: October 1998 UST Excavation Release (DOH SHWB Release No. 990036)	Two gasoline USTs (TAMC-145-1 and TAMC 145-2) were excavated from the Tripler Army Medical Center on Krukowski Road during October 20–30, 1998. TAMC-145-2 showed no signs of leakage, but TAMC-145-1 had a hole at the bottom where gasoline had leaked out onto the soil below. Several gallons of gasoline were present beneath TAMC-145-1. Samples were collected from soil around the tanks, and the area of suspected contamination was overexcavated. Contamination around TAMC-145-2 may have been attributed to an adjacent UST that was previously removed (TAMC-145-3), prompting the overexcavation of the area around both former USTs. Excavation of the site was again performed in February 2012 before closure (Weston 2012).	In 2002, 16 boreholes were advanced to determine the extent of contamination at the site. Two plumes of BTEX constituents were identified. In 2008, 26 boreholes (8 of which were converted into monitoring wells) were advanced throughout the site, and groundwater was sampled. In 2010, 20 more soil borings were advanced, and groundwater was sampled. The monitoring wells were abandoned in March 2012 (Weston 2012).	1998 Chemical Analysis: <ul style="list-style-type: none"> • BTEX results were above the DOH Tier 1 criteria for both of the tank confirmation sample results. TPH-g did not exceed DOH criteria. • After overexcavation, TAMC-145-2 met DOH criteria for clean closure, but TAMC-145-1 still had exceedances of BTEX. • Samples collected from the area around the pipeline met criteria for clean closure. 2012 Chemical Analysis (Weston 2012): <ul style="list-style-type: none"> • COPCs were detected well above EALs in excavated soil. • Only one of the soil samples from the excavated pits contained COPCs above EALs. • tert-Butyl alcohol was found at an estimated concentration above EALs in one of the water samples from rainwater accumulated in the pits. No other constituents were detected above EALs. 	The site was designated to be used as a green space, and DOH granted NFA with restrictions status in December 2012. Petroleum remains on the site, but it has been removed to a practicable extent (DOH 2012).

Location (DOH Release No.)	Description	Groundwater Monitoring Wells	Chemistry Results	Final Status
Tripler Hospital: February 2000 Building 137 UST Excavation Release and Spills (DOH SHWB Release No. 000095, 000074)	<p>A former waste oil storage UST (UST-137-4) in front of Building 137 at Tripler Army Medical Center was removed from February to May 2000. A spill occurred in September 2000 at the same site.</p> <p>No visual or olfactory indication of a release was observed during the UST-137-4 removal. Water was observed at 7.6 ft bgs at the bottom of the extraction pit, but there was no evidence of contamination. Soil and water samples were taken for confirmation (ECC 2000). A spill occurred at USTs 137-1 and 137-2 on two separate occasions while being filled (Nexus 2001).</p>	For the UST-137-4 release, the installation of wells was reasoned to be unnecessary due to the low TPH levels and perched water found at the site in the September 2000 report (ECC 2000). However, DOH requested that two wells be installed at the former UST site in order to determine if there is a perched groundwater lens at approximately 7.6 ft bgs and if petroleum contamination exists in the groundwater (Environet 2005). Groundwater was not sampled for the spills.	<p>At UST-137-4, total recoverable petroleum hydrocarbons were detected in two soil samples and a water sample, which indicates that a release has occurred from the tank sometime in the past. All residual hydrocarbons in the soil were below action levels (ECC 2000). Further testing of groundwater and soil in 2004 did not indicate presence of significant petroleum contamination above action levels (Environet 2005).</p> <p>The fuel spill sample results were not above the DOH Tier 1 cleanup levels except for fluoranthene in one. Samples collected a year later in July 2001 indicated that all COPCs were below Tier 1 levels (Nexus 2001).</p>	NFA status was granted for UST 137-4 in June 2005 because laboratory analysis showed that all detects were well below DOH Tier 1 action levels (DOH 2005). UST 137-1 was granted NFA status in December 2002 since there were no detects in the soil samples (DOH 2002). UST 137-2 was granted NFA status in February 2004 because later testing showed that there were no longer any COPCs in the soil (DOH 2004b).
Tripler Hospital: June 2003 Building 125 UST Excavation Release (DOH SHWB Release No. 040034)	<p>On June 19, 2003, a single-walled UST and a 55-gallon drum were removed 125 ft northwest of Building 125 at Tripler Army Medical Center.</p> <p>The contents of the UST were unknown, and the drum was most likely used to store dry cleaning solvent. Confirmation soil samples were collected from the site (Environet 2004).</p>	A NFA letter indicates that a groundwater monitoring well was installed at the site and closed in 2007. No other documentation about this release is available. It is unclear whether or not the NFA letter pertains to this release (DOH 2008b).	TPH concentrations above the method detection limit but below the DOH Tier 1 SAL were detected. Lead was also detected, which exceeded the DOH Tier 1 SAL in two samples (Environet 2004).	A NFA letter for a UST at former Building 125 from July 2008 exists, but no documentation mentioned in the letter is available (DOH 2008b).
Animal Quarantine Station (no release number indicated)	<p>The animal quarantine station is located on Hālawala Valley Road in 'Aiea. The parcel of land where the station is located was previously owned by the Navy during the 1940s and 1950s before the State of Hawai'i acquired it in 1968.</p> <p>An unknown tar-like substance was found at several locations seeping through the asphalt of the DOH Vector Control Parking Lot adjacent to the Hawai'i Department of Agriculture Laboratory/Office Building. An initial investigation of the substance happened in June 2003 where various COPCs were found. Fifteen soil borings were installed around the surface release. Personnel interviews indicated that tar had been leaking from 5 years prior to the investigation (most likely from around 1999) and that the area was once used as a dumping ground (Kimura Intl. 2004a,b).</p>	—	Initial tar samples had detects of acetone, barium, cadmium, chromium, and lead under regulatory standards. Samples taken in 2004 detected TPH-o in three of the soil samples but did not exceed the SAL. The petroleum sample indicated high levels of TPH-o above SALs as well as 1-methylnaphthalene, 2-methylnaphthalene, fluorine, phenanthrene, pyrene, and chrysene, which do not have SALs (Kimura Intl. 2004b).	A NFA status was granted in August 2006 based on the fact that the chemical analyses of the tar substance did not pose a threat to human health, site soil, or groundwater. The final decision was to leave the tar-like substance in place and conduct surface removal or disposal as necessary (DOH 2006).

Location (DOH Release No.)	Description	Groundwater Monitoring Wells	Chemistry Results	Final Status
Grace Pacific Corporation (DOH HEER Case No. 970403-0000)	<p>Three USTs were removed from Grace Pacific's Hālawā location from January through March 1997.</p> <p>Stained soil was observed on the side walls of the excavation, and heavy rains filled the excavation with rainwater. Soil and water (most likely runoff and not groundwater) samples were collected. The pit was overexcavated following receipt of analytical results. A Phase II environmental assessment was conducted in June and November 1997, which involved the construction of boreholes. An additional environmental assessment was conducted in September–October 1998. After a sheen was observed in the monitoring wells, free product recovery was conducted from 1998 to 2000.</p> <p>Four trenches were excavated in the area of the former UST excavation between November 2000 and January 2001. It was discovered that petroleum contamination was only confined to shallow depths. The area of the former tank pit was excavated between January 2001 and February 2001. There were reports of free product in the groundwater that was recovered, but no records of soil or water sampling are available. The excavation was only partially backfilled.</p> <p>In November 2001, the pit was overexcavated, and a well surrounded by petroleum-stained soil was encountered. The pit was backfilled and paved over. In January 2002, a trench was dug near the office building where excavation did not occur, and free product was found floating on groundwater. Quarterly groundwater sampling commenced beginning October 2002 and was reduced to semiannual monitoring starting in November 2003. No contaminants were above the action level since January 2004 (ESI 2010).</p>	<p>Three borings, two of which were turned into groundwater monitoring wells, were constructed as part of the September–October 1998 assessment. In February 2002, seven borings were drilled, and six groundwater monitoring wells were installed at the former pit location and near the area of the shallow trench dug in January 2002. Five wells were abandoned in 2006 after no constituents were detected since 2003. Product recovery continued in MW-1a from 2002 through 2009 (ESI 2010).</p>	<p>TPH-d and TPH-o were detected above DOH Tier 1 Action Levels during initial sampling. During quarterly and semiannual sampling from 2002 to 2006, only PCBs and benzo(a)pyrene were detected at concentrations above DOH action levels on one or two occasions. All constituents were below DOH action levels since January 2004 (ESI 2010).</p>	<p>A NFA status was requested by the contractor, ESI, in their First Quarter 2010 Status Report (ESI 2010). DOH responded with a letter from January 2013 stating that free product recovery efforts are no longer necessary, MW-1 should be closed, and the DOH will require a brief Environmental Hazard Evaluation / Environmental Hazard Management Plan. No subsequent communications or reports are available (DOH 2013).</p>
U.S. Coast Guard Service Station (DOH SHWB Release No. 080033, 920180)	<p>USTs were removed from Kia'i Kai Hale Exchange Station off of Icarus Way in 1998 and 2007.</p> <p>Staining and elevated PID levels were observed in the soil after the 1998 tank removals. The area was tested then overexcavated to remove the contaminated soil. Testing after overexcavation showed that the site did not appear to be impacted by petroleum (WMF 1998).</p> <p>Soil sampling was performed following another UST removal in 2007. There were no signs of staining, and the UST did not show any damage (HIES 2008).</p>	<p>—</p>	<p>In the 1998 excavation, only benzene exceeded DOH EALs in the soil samples from the excavation pit. After the site was excavated once more to remove contaminated soil, all sample results were below DOH EALs (WMF 1998).</p> <p>In the 2007 excavation, xylenes and toluene were detected but not above DOH EALs (HIES 2008).</p>	<p>A NFA status was granted for the 1998 release in October 1999 and for the 2007 closure in May 2008 (DOH 1999, 2008a).</p>

Location (DOH Release No.)	Description	Groundwater Monitoring Wells	Chemistry Results	Final Status
Alert Alarm (DOH SHWB Release No. 000081)	In May 2000, a UST was removed from the Sentinel Silent Alarm Company property located in Hālawā. A 2-inch-diameter hole was discovered at the fill end of the UST, and a black product was observed floating in the groundwater at the bottom of the excavation pit. The petroleum-impacted soil was overexcavated, and soil borings showed that the contaminant plume did not extend beyond the excavation limits. Groundwater was not observed after the initial excavation, which made it unlikely that the groundwater in the area had been impacted by the petroleum (ETC 2000).	—	No chemicals exceeded method detection limits in the soil borings (ETC 2000).	A NFA status was granted in April 2001 according to the DOH SHWB UST database (DOH 2015b).

- 1 — groundwater monitoring not performed
- 2 BTEX benzene, toluene, ethylbenzene, and xylenes
- 3 EAL Environmental Action Level
- 4 ID identification
- 5 MRL method reporting limit
- 6 MtBE methyl tertiary-butyl ether
- 7 NFA no further action
- 8 PAH polynuclear aromatic hydrocarbon
- 9 PCB polychlorinated biphenyl
- 10 PID photoionization detector
- 11 SAL soil action level
- 12 TPH-d total petroleum hydrocarbons – diesel range organics
- 13 TPH-g total petroleum hydrocarbons – gasoline range organics
- 14 TPH-o total petroleum hydrocarbons – residual range organics (i.e., TPH-oil)
- 15

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2.3.3 Joint Base Pearl Harbor-Hickam Water System

This subsection provides information on characteristics of the JBPHH Water System (Appendix A.5, Facility Data Table FAC-5).

Table 2-14 summarizes the JBPHH Water System characteristics references, and indicates what type(s) of data each one provided.

Table 2-14: JBPHH Water System References

Reference	JBPHH Water System Characteristics					
	Population Served	Water Sources	Pumping Information	Water Storage Information	Water Treatment Information	System Demand
<i>Interim Update, Red Hill Bulk Fuel Storage Facility Final Groundwater Protection Plan (DON 2014)</i>	•	•	•	•	•	•

• data provided

2.3.4 Land Use

This subsection provides information on land use, including land cover type and parameters (Appendix A.5, Facility Data Tables FAC-6 and FAC-7).

Table 2-15 summarizes the land use references, and indicates what type(s) of data each one provided.

Table 2-15: Land Use References

Reference	Land Use Parameters					
	Land Cover Categories	Fraction(s) of Aquifer	Irrigation Information	Crop Coefficient	Canopy Capacity	Fog-Catch Efficiency
<i>Spatially Distributed Groundwater Recharge for 2010 Land Cover Estimated Using a Water-Budget Model for the Island of O’ahu, Hawai’i (Engott et al. 2015)</i>	•	•	•	•	•	•
<i>Volcanic Aquifers of Hawai’i-Hydrogeology, Water Budgets, and Conceptual Models (Izuka et al. 2016)</i>	•	•	•	•	•	•

— no data

• data provided

2.4 CHEMICAL DATA

This subsection provides a description of the existing chemical groundwater data available for the groundwater flow and CF&T modeling area: chemical of potential concern (COPC) concentrations, natural attenuation parameter (NAP) concentrations, chemical transport characteristics, and the chemical composition of the fuels, especially JP-8, stored in the underground storage tanks.

1 **2.4.1 Groundwater COPC Concentrations**

2 Groundwater COPC concentrations have been collected from available groundwater monitoring and
3 groundwater protection plan reports going back to 2005 (DON 2010b) (Appendix A.6, Chemistry
4 Data Tables CHEM-1 to CHEM-22). The COPCs for the groundwater flow modeling area include:

- 5 • Benzene, toluene, ethylbenzene, and xylenes (BTEX)
- 6 • Total petroleum hydrocarbons – diesel range organics (TPH-d)
- 7 • Total petroleum hydrocarbons – gasoline range organics (TPH-g)
- 8 • Total petroleum hydrocarbons – residual range organics (i.e., TPH-oil) (TPH-o)
- 9 • Naphthalene
- 10 • 1-Methylnaphthalene
- 11 • 2-Methylnaphthalene
- 12 • 1,2-Dichloroethane
- 13 • 1,2-Dibromoethane (i.e., ethylene dibromide or EDB)
- 14 • Phenol
- 15 • 2-[2-methoxyethoxy]-ethanol

16 The current analytical suite of COPCs for the quarterly groundwater sampling events is TPH-g,
17 TPH-d, TPH-o, BTEX, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, lead scavengers
18 (1,2-dichloroethane and 1,2-dibromoethane), and fuel additives (phenol and 2,[2-methoxyethoxy]-
19 ethanol). Lead scavengers are expected to be analyzed for a minimum of 1 year of sampling events,
20 and may be dropped if not detected, per the February 4, 2016 scoping completion letter (EPA Region
21 9 and DOH 2016).

22 Table 2-16 summarizes the groundwater COPC references, including quarterly groundwater
23 monitoring reports, and indicates which COPCs were included in each reference. Well locations are
24 shown on Figure 2. Concentration charts are presented in Appendix C for the COPCs to be included
25 in the groundwater modeling effort: TPH-g, TPH-d, TPH-o, 1-methylnaphthalene,
26 2-methylnaphthalene, and naphthalene.

27 In 2005, Dawson Group, Inc. began collecting groundwater samples to monitor the groundwater at
28 monitoring well RHMW01 and sampling point RHMW2254-01 (installed adjacent to Navy Supply
29 Well 2254-01). Samples were analyzed for TPH-g, TPH-d, TPH-o, BTEX, methyl tertiary-butyl
30 ether (MtBE), 1,2-dibromoethane, 1,2-dichloroethane, full analyte list polynuclear aromatic
31 hydrocarbons (PAHs), total lead (during the first two quarterly events), and dissolved lead (during
32 the last two quarterly events).

33 During 2005 to 2006, The Environmental Company (TEC) collected groundwater samples during
34 two sampling events as part of a site investigation. Groundwater was collected from monitoring
35 wells RHMW01, RHMW02, RHMW03, and RHMW04, and sampling point RHMW2254-01.
36 Samples were analyzed for TPH-g, TPH-d, full analyte list volatile organic compounds (VOCs), full
37 analyte list PAHs, dissolved lead, and NAPs.

1 During 2006 to 2007, TEC continued the groundwater monitoring during two 2006 semiannual
2 events and three 2007 semiannual events. Groundwater samples were collected from RHMW01 and
3 RHMW2254-01 during the first 2006 semiannual event, and were also collected from RHMW02 and
4 RHMW03 during the subsequent events. Samples were analyzed for TPH-g, TPH-d, VOCs, PAHs,
5 and dissolved lead.

6 In 2008, the groundwater monitoring network at the Facility consisted of three monitoring wells
7 (RHMW01, RHMW02, and RHMW03), which split the underground tank area into three monitoring
8 zones, and the sampling point RHMW2254-01. As part of the contemporary GWPP for the Facility
9 (DON 2008), these three wells plus RHMW2254-01 were sampled quarterly for TPH-d, TPH-g,
10 BTEX, MtBE, PAHs, and dissolved lead.

11 By 2009, the Facility's groundwater monitoring network had expanded to eight monitoring
12 wells/sampling points: RHMW01, RHMW02, RHMW03, RHMW04, RHMW05, RHMW2254-01,
13 HDMW2253-03, and OWDFMW01 (DON 2010b). At this time, the analytical suite for each
14 quarterly sampling event included TPH-d, TPH-g, VOCs, PAHs, and dissolved lead.

15 At present, the Facility's groundwater monitoring network includes 12 groundwater monitoring
16 wells/sampling points: five located within the Facility tunnels (RHMW01, RHMW02, RHMW03,
17 RHMW05, and RHMW2254-01), and seven located outside of the tunnels (RHMW04, RHMW06,
18 RHMW07, RHMW08, RHMW09, HDMW2253-03, and OWDFMW01).

19 As of September 2016, two additional groundwater monitoring wells had been added to the Facility's
20 groundwater monitoring network: RHMW08 and RHMW09, located approximately 500 ft west and
21 south, respectively, of the lower end of the tank farm (Figure 2). Two additional new wells to the
22 south and north of the tank farm (RHMW10 and RHMW11, respectively) are scheduled for
23 installation in the coming months, and a third contingent well (RHMW12) may be installed
24 depending on subsurface conditions encountered during installation of RHMW11.

1 **Table 2-16: Site-Specific Groundwater COPC Concentration References**

Reference	Sampling Period	COPC														Remarks
		Benzene	Toluene	Ethylbenzene	Xylenes	TPH-d	TPH-g	TPH-o	Naphthalene	1-Methylnaphthalene	2-Methylnaphthalene	1,2-Dichloroethane	Ethylene Dibromide	Phenol	2-[2-methoxyethoxy]-ethanol	
<i>Red Hill Bulk Fuel Storage Facility Final Technical Report</i> (DON 2007)	September 2005 and July 2006	•	•	•	•	•	•	—	•	•	•	•	•	—	—	
<i>Red Hill Bulk Fuel Storage Facility Final Groundwater Protection Plan</i> (DON 2008)	September 2005 – March 2007	•	•	•	•	•	•	—	•	•	•	—	—	—	—	
<i>Type 1 Letter Report – Re-evaluation of the Tier 3 Risk Assessment/Groundwater Model & Proposed Course of Action</i> (DON 2010a)	January – March 2010	•	•	•	•	•	•	—	•	•	•	•	—	—	—	
<i>Tank 5 Initial Release Response Report</i> (April 2014) (DON [RH RR reports])	January – March 2013	•	•	•	•	•	•	—	•	•	•	•	—	—	—	Outside-tunnel wells
<i>Final Project Procedures Manual, U.S. Navy Environmental Restoration Program</i> (DON 2015b)	January – March 2015	•	•	•	•	•	•	—	•	•	•	•	—	—	—	Outside-tunnel wells
<i>Tank 5 Quarterly Release Response Report</i> (January 2015) (DON [RH RR reports])	July – September 2015	•	•	•	•	•	•	—	•	•	•	•	—	—	—	Inside-tunnel wells
<i>Draft Monitoring Well Installation Report, Red Hill Fuel Storage Facility, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii</i> (DON 2015a)	July – September 2015	•	•	•	•	•	•	•	•	•	•	•	—	—	—	Outside-tunnel wells
<i>Quarterly Groundwater Monitoring Report, Inside Tunnel Wells</i> (DON [RH GM reports])	2005 – Present	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Inside-tunnel wells; phenol and 2(2-methoxyethoxy)-ethanol were analyzed starting Fourth Quarter 2016
<i>Quarterly Groundwater Monitoring Report, Outside Tunnel Wells</i> (DON [RH GM reports])	2005 – Present	•	•	•	•	•	•	•	•	•	•	•	•	•	•	Outside-tunnel wells; phenol and 2-(2-methoxyethoxy)-ethanol were analyzed starting Fourth Quarter 2016

2 — no COPC data provided
3 • specific COPC data provided

2.4.2 Groundwater NAP Concentrations

Groundwater NAP concentrations have been collected from available groundwater monitoring and groundwater protection plan reports dating back to 2005 (Appendix A.6, Chemistry Data Tables CHEM-23 to CHEM-34). The NAPs for the groundwater flow modeling area include:

- Methane
- Ferrous iron
- Nitrate
- Sulfate
- Chloride
- Alkalinity
- Dissolved Oxygen

Major ion and cation groundwater concentrations, including nitrate, sulfate, and chloride, were analyzed for from perched and basal groundwater samples during the Red Hill OWDF Phase II Remedial Investigation (DON 2000). During a natural attenuation study, the results of which are summarized in the *Red Hill Bulk Fuel Storage Facility Final Technical Report* (DON 2007b), groundwater samples were analyzed for nitrate, ferrous iron, sulfate, methane, chloride, and dissolved oxygen. Finally, groundwater analysis conducted during July and August 2016 measured concentrations of nitrate, sulfate, and chloride (SOEST 2016). Table 2-17 summarizes the groundwater NAP references, including quarterly groundwater monitoring reports, and indicates which NAPs were included in each reference.

Table 2-17: Site-Specific Groundwater NAP Concentration References

Reference	NAP						
	Methane	Ferrous Iron	Nitrate	Sulfate	Chloride	Alkalinity	Dissolved Oxygen
<i>Phase II Remedial Investigation, Red Hill Oily Waste Disposal Facility</i> (DON 2000)	—	—	•	•	•	—	•
<i>Red Hill Bulk Fuel Storage Facility Final Technical Report</i> (DON 2007b)	•	•	•	•	•	•	•
<i>Water Geochemistry Results to Date; RHMW04, RHMW06, RHMW07, DKMW02, and OWDFMW01</i> (SOEST 2016)	—	—	•	•	•	—	•

— no NAP data provided
 • specific NAP data provided
 SOEST School of Ocean and Earth Science and Technology, University of Hawai'i

1 **2.4.3 COPC and NAP Transport Characteristics**

2 COPC and NAP transport characteristics have been collected from risk assessment reports and
3 various reference materials (e.g., Merck Index) (Appendix A.6, Chemistry Data Tables CHEM-35 to
4 CHEM-37). The transport characteristics compiled for the COPCs and NAPs include:

- 5 • Molecular weight
- 6 • Density
- 7 • Solubility
- 8 • Partition coefficient
- 9 • Soil mobility
- 10 • Degradation rate(s)

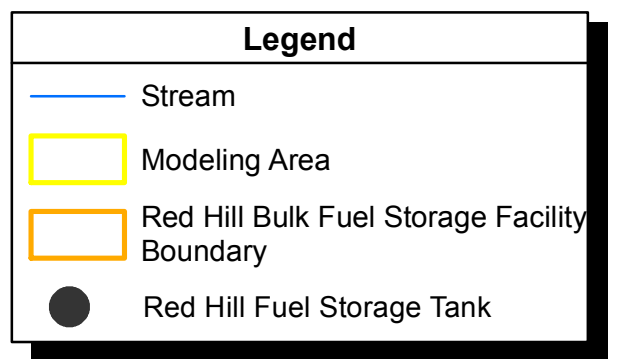
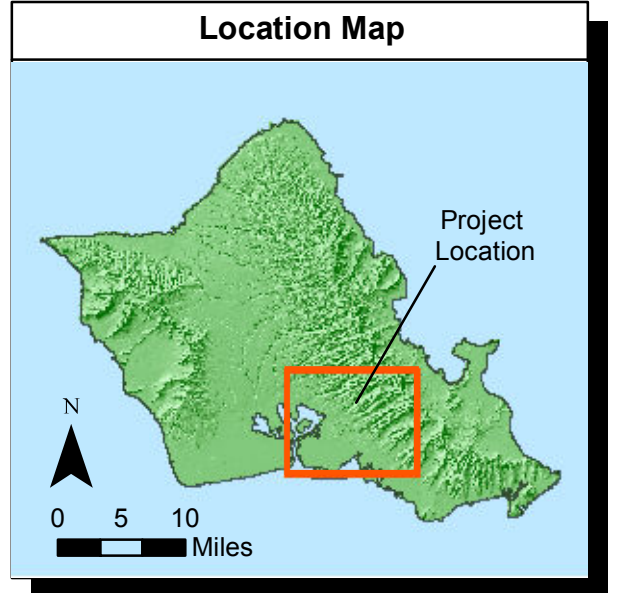
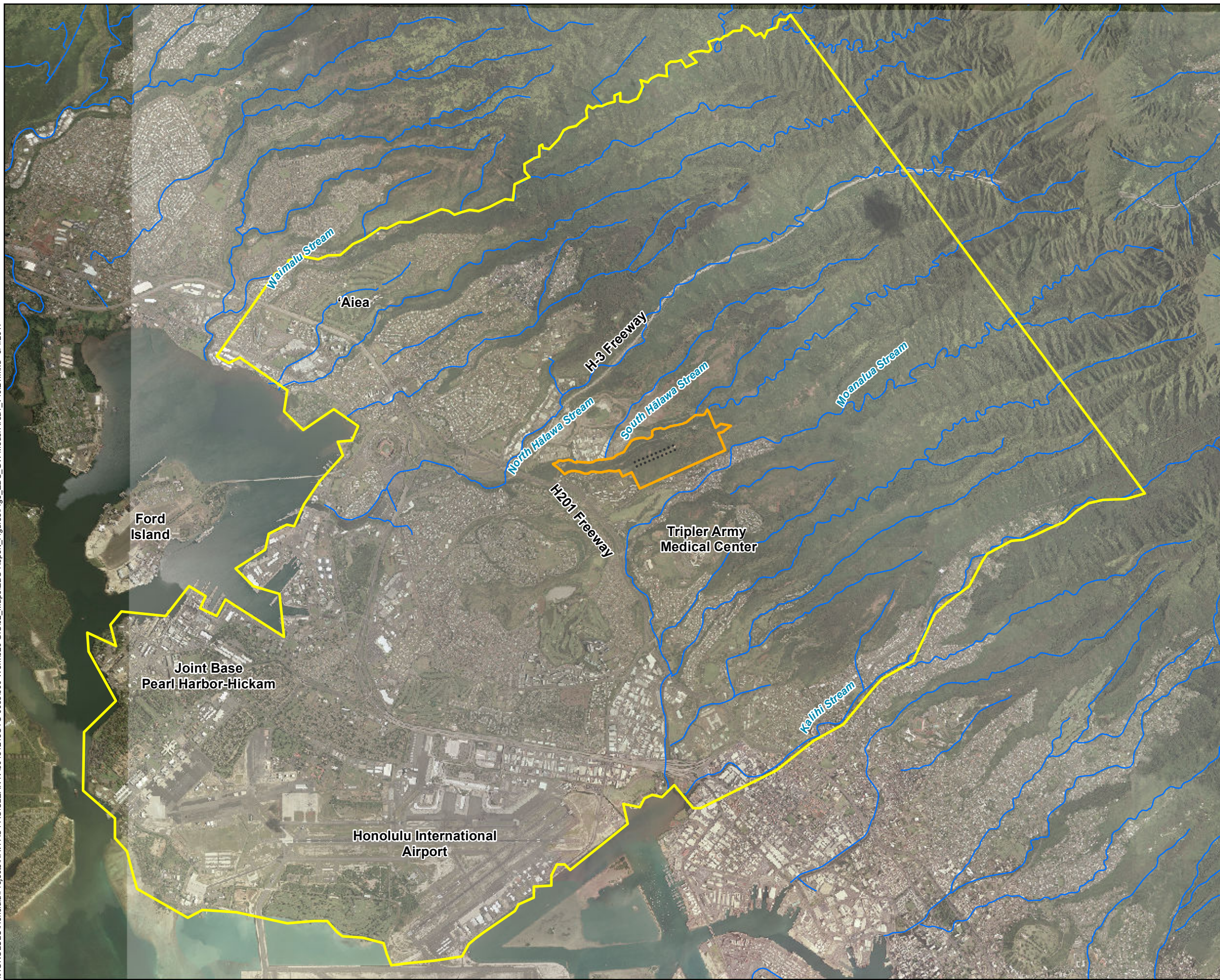
11 Table 2-18 summarizes the COPC and NAP transport characteristic references, and indicates which
12 transport characteristics each one provided.

13 **Table 2-18: COPC and NAP Transport Characteristic References**

Reference	Transport Characteristic						Basis
	Molecular Weight	Density	Solubility	Partition Coefficient	Soil Mobility	Degradation Rate	
<i>Type 1 Letter Report – Re-Evaluation of the Tier 3 Risk Assessment/Groundwater Model & Proposed Course of Action (DON 2010a)</i>	•	—	•	•	—	—	Literature search
International Chemical Safety Cards - Chemical Names (NIOSH 2017)	•	•	•	•	•	•	NIOSH
ChemSpider - Chemical Structure Database (ChemSpider 2017)	•	•	•	•	•	•	Royal Society of Chemistry
Safety Data Sheet (SDS) Search and Product Safety Center (Sigma-Aldrich 2017)	•	•	•	•	•	•	Sigma-Aldrich
CAMEO Chemicals - Database of Hazardous Materials (NOAA 2017)	•	•	•	•	•	•	NOAA CAMEO Chemical Database
PubChem - Bioassay, Substance, and Compound Database (NCBI 2017)	•	•	•	•	•	•	PubChem
The Merck Index Online (RSC 2017)	•	•	•	•	•	•	Merck Manual
Hazardous Wastes: Sources, Pathways, Receptors (Watts 1998)	•	•	•	•	•	—	Literature Search
Agency for Toxic Substances and Disease Registry (ATSDR)	•	•	•	•	•	•	ATSDR
Chemical Parameters, EPA Regional Screening Levels, May 2016 (EPA 2016)	•	•	•	•	•	•	EPA RSLs

- 14 — no specific COPC/NAP transport parameters provided
- 15 • specific COPC/NAP transport parameters provided
- 16 ATSDR Agency for Toxic Substances and Disease Registry
- 17 CAMEO Computer-Aided Management of Emergency Operations
- 18 NIOSH National Institute for Occupational Safety and Health
- 19 NOAA National Oceanic and Atmospheric Administration
- 20 RSL regional screening level

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Notes

1. Map projection: NAD 1983 UTM Zone 4N
2. Base Map: DigitalGlobe, Inc. (DG) and NRCS. Publication_Date: 2015

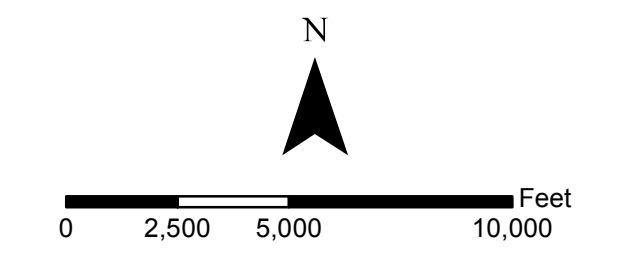


Figure 3
 Red Hill Bulk Fuel Storage Facility Modeling Area
 Existing-Data Summary and Evaluation Report
 for Groundwater Flow and CF&T Modeling
 Red Hill Bulk Fuel Storage Facility
 JBPHH, O'ahu, Hawai'i

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\\HONOLULU\Honolulu\Projects\NAVFAC PAC\CLEAN IV\60481245\CTO 0053900-Work\920 GIS\02_MapstEDS Report_Figures\Fig4_EDS_Borings.mxd 3/4/2017

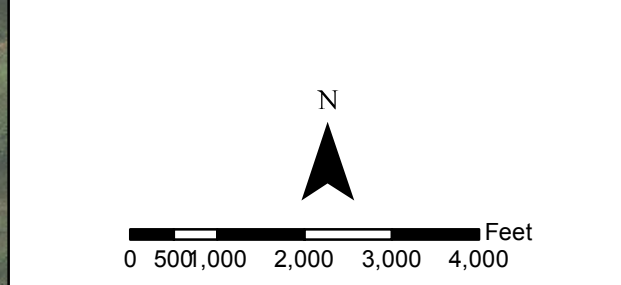
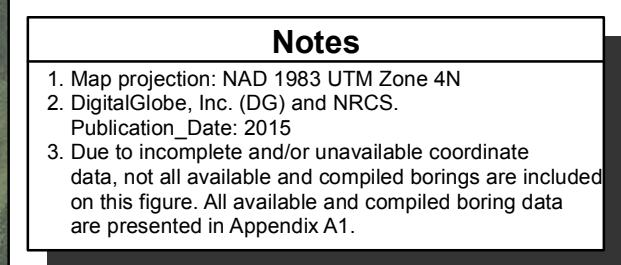
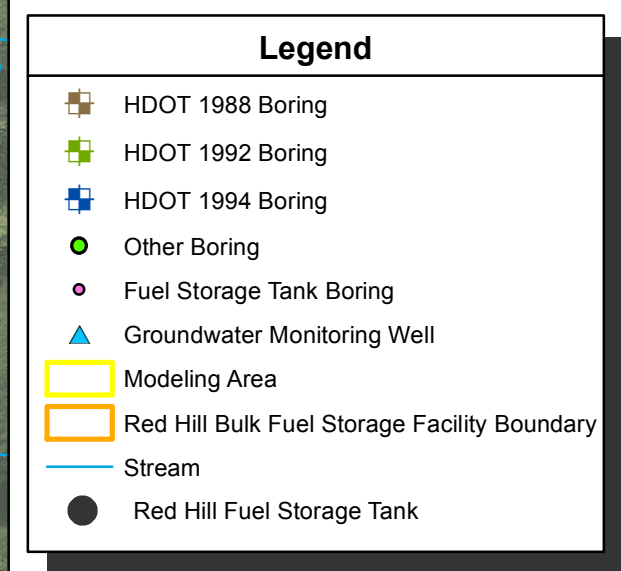
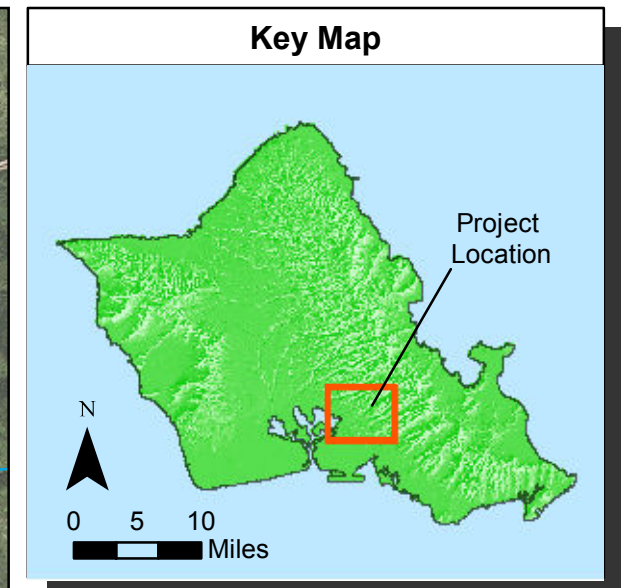
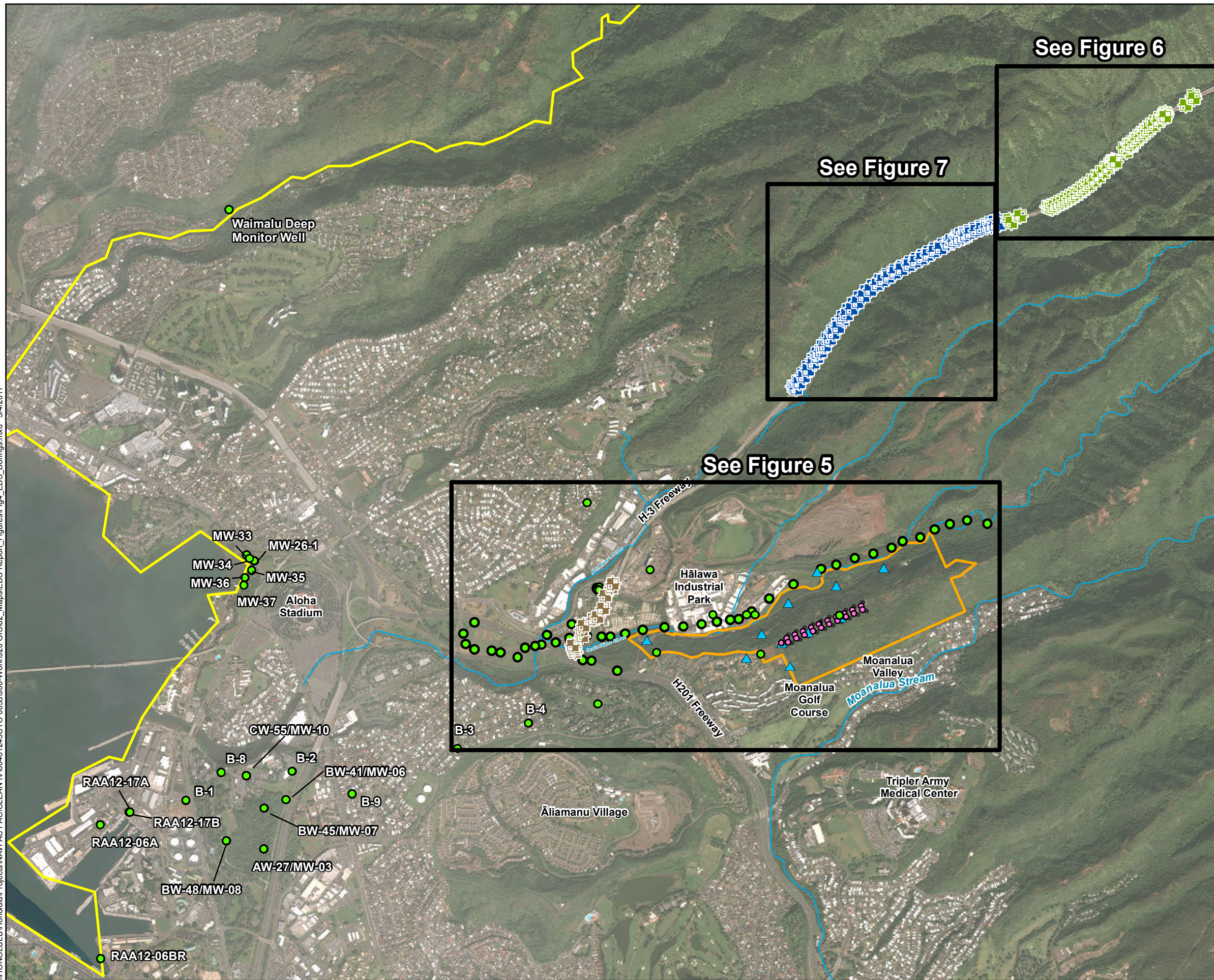


Figure 4
Boring Locations
 Existing-Data Summary and Evaluation Report
 for Groundwater Flow and CF&T Modeling
 Red Hill Bulk Fuel Storage Facility
 JBPHH, O'ahu, Hawai'i

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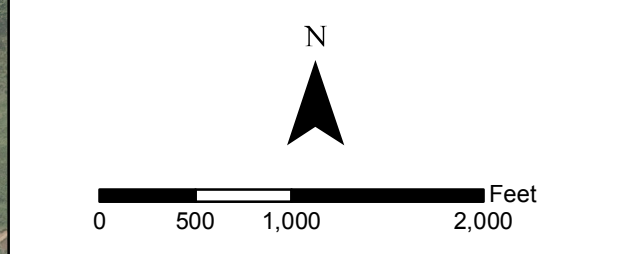
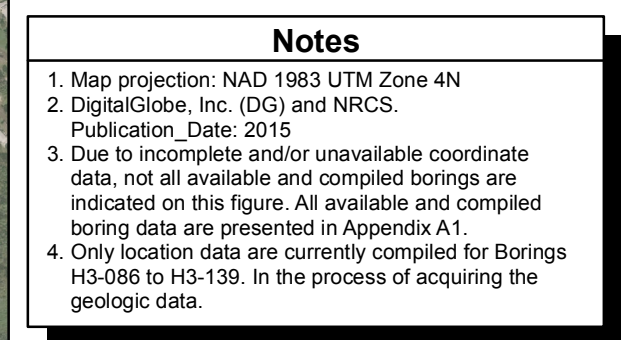
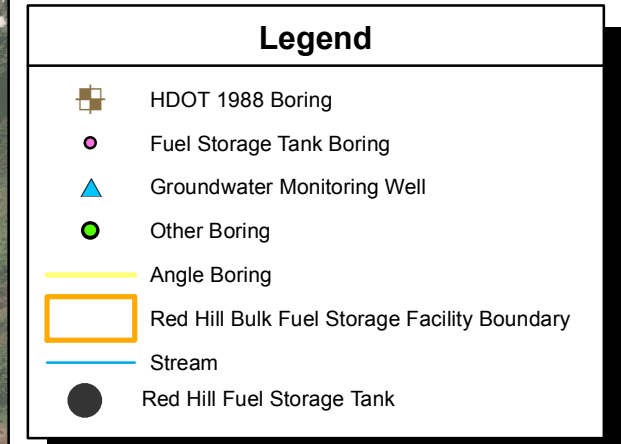
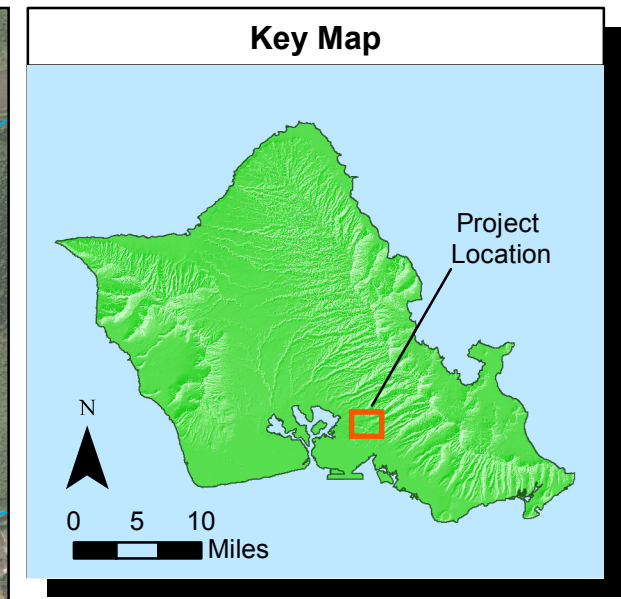
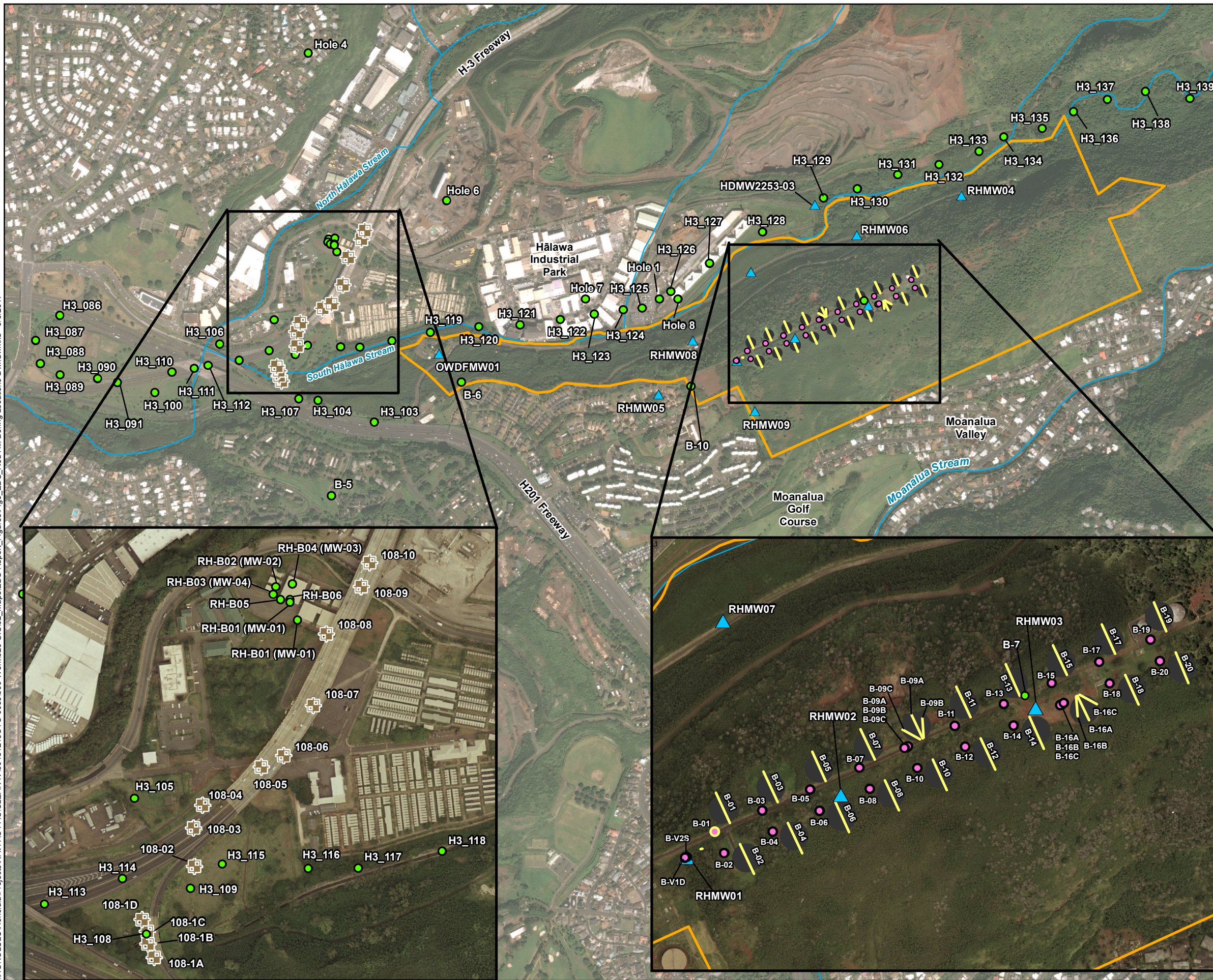
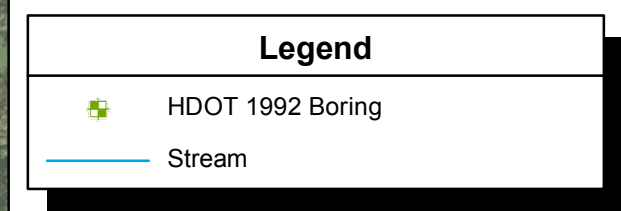
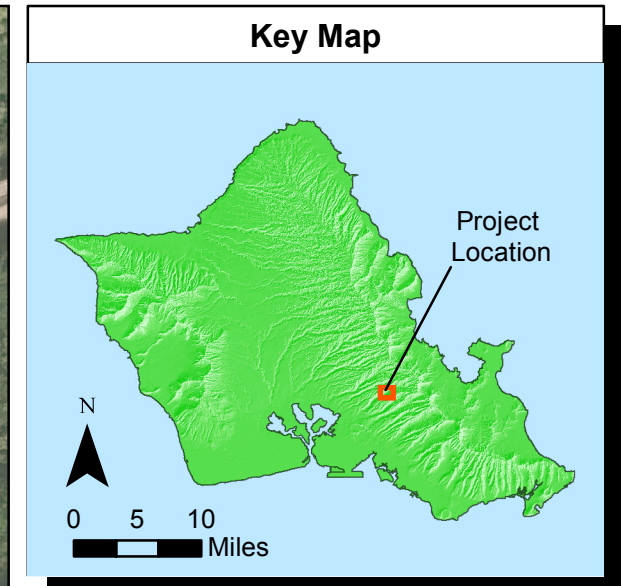


Figure 5
Borings in the Red Hill Bulk Fuel Storage Facility Area
Existing-Data Summary and Evaluation Report for Groundwater Flow and CF&T Modeling
Red Hill Bulk Fuel Storage Facility
JBPHH, O'ahu, Hawai'i

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- ### Notes
1. Map projection: NAD 1983 UTM Zone 4N
 2. DigitalGlobe, Inc. (DG) and NRCS. Publication Date: 2015; HDOT (1992)
 3. All available and compiled boring data are presented in Appendix A1.
 4. Borings from:
 - HDOT 1992. Boring Logs, Interstate Route H-3, F. A. I. Project No. I-H3-I(69) 8 (70)

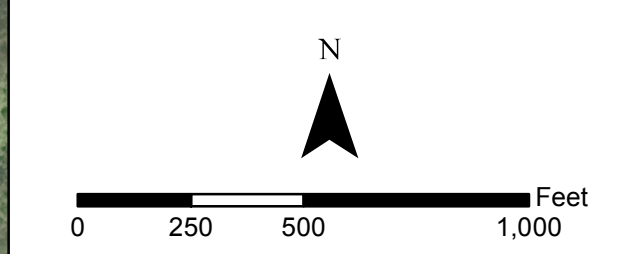
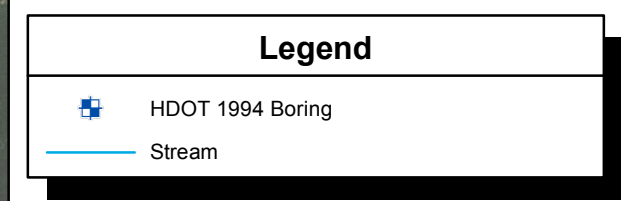
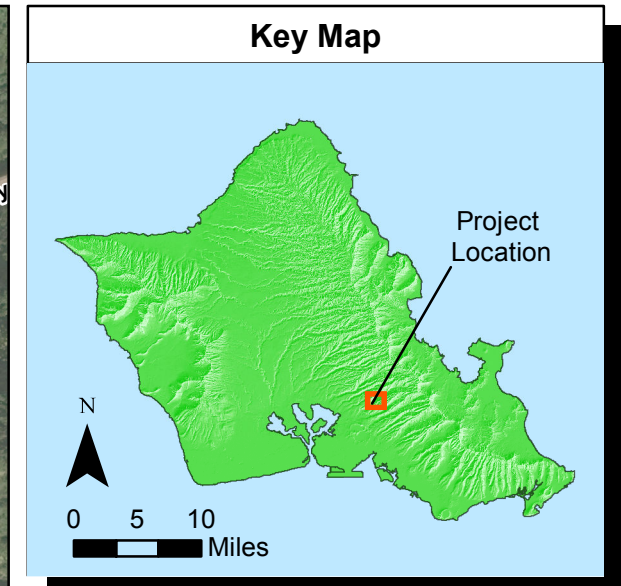
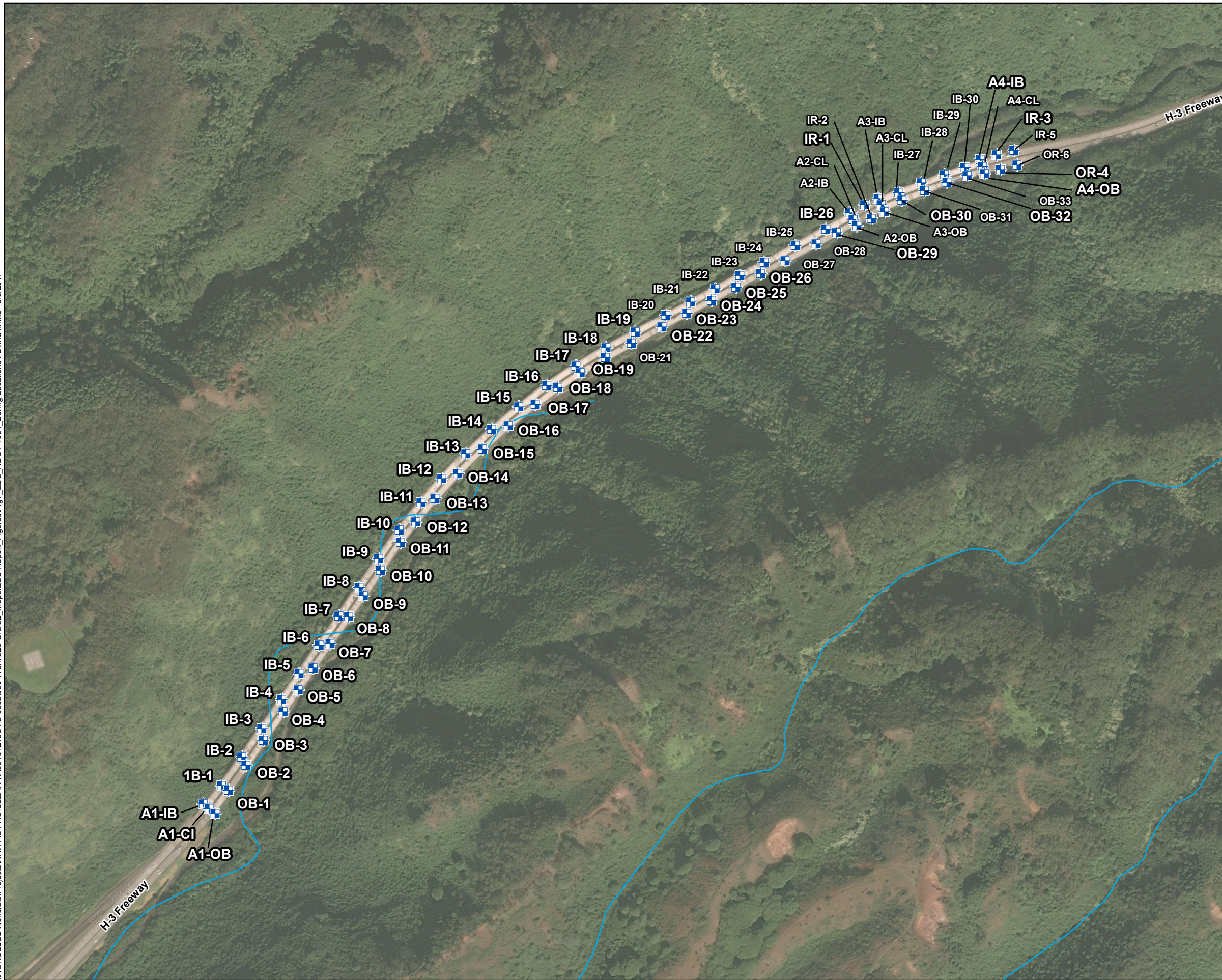


Figure 6
Interstate H-3 Borings, North Hälawa Valley Unit II
Existing-Data Summary and Evaluation Report
for Groundwater Flow and CF&T Modeling
Red Hill Bulk Fuel Storage Facility
JBPHH, O'ahu, Hawai'i

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- ### Notes
1. Map projection: NAD 1983 UTM Zone 4N
 2. DigitalGlobe, Inc. (DG) and NRCS. Publication_Date: 2015
 3. All available and compiled boring data are presented in Appendix A1.
 4. Borings from:
 HDOT 1994. Boring Logs, Interstate Route H-3, North Hālawala Valley Highway, Unit 1, Phase 1B, F. A. I. Project No. I-H3-(68). March.

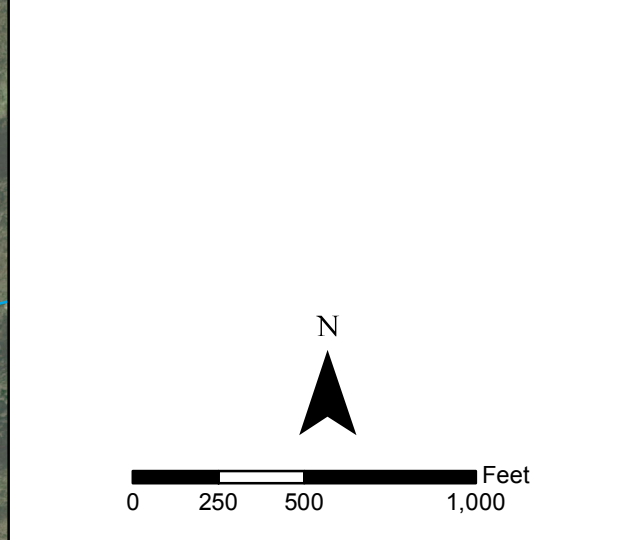








Figure 7
Interstate H-3 Borings, North Hālawala Valley
Unit 1 Phase 1B
Existing-Data Summary and Evaluation Report
for Groundwater Flow and CF&T Modeling
Red Hill Bulk Fuel Storage Facility
JBPHH, O'ahu, Hawai'i

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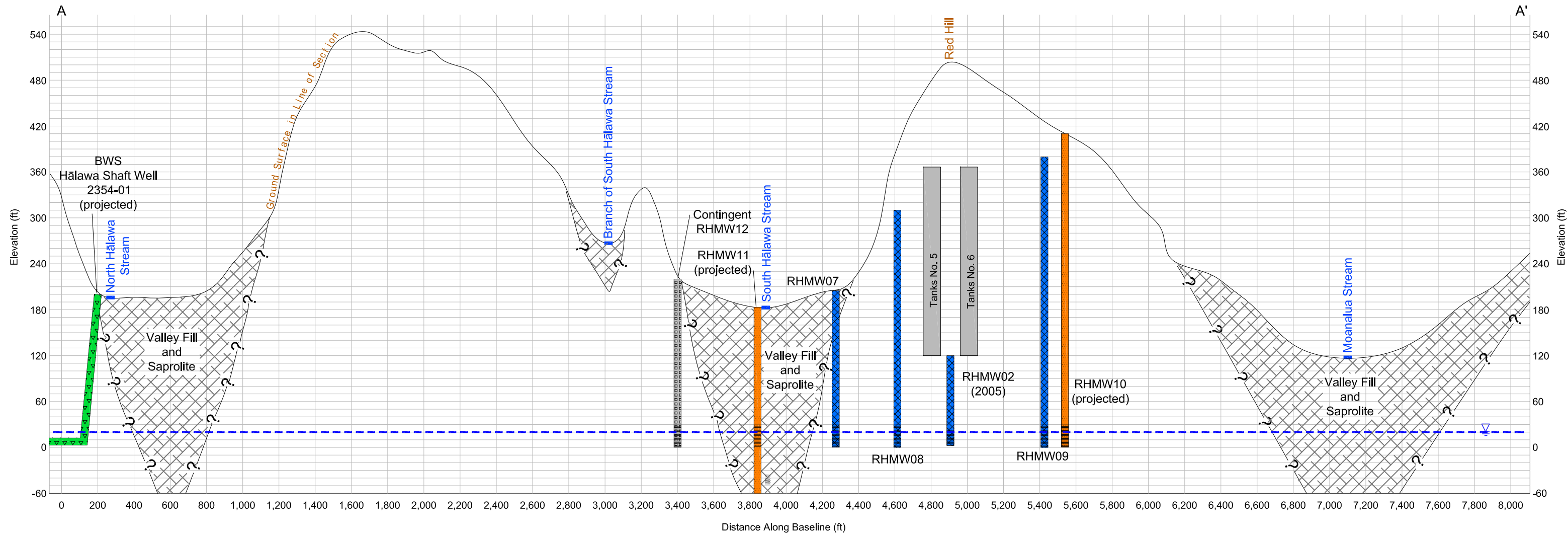
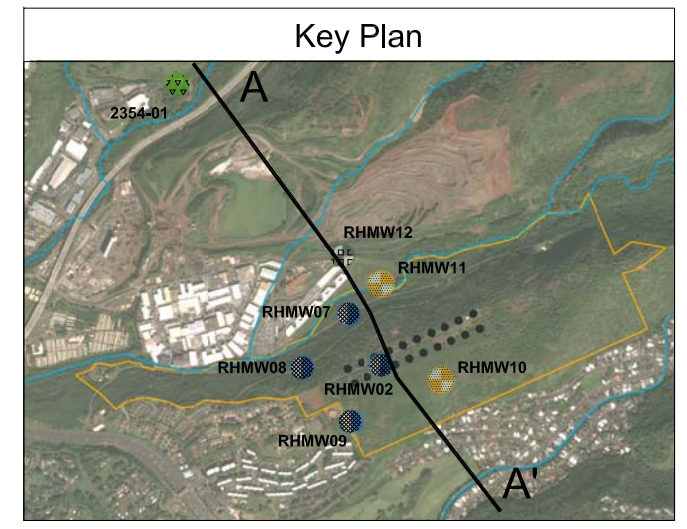
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Legend

-  Groundwater surface (approximate)
-  Assumed approximate boundary between valley fill/saprolite and basalt. Depictions are based on Wentworth (1942) and Izuka (1992).
-  Proposed monitoring well screened interval
-  Contingent monitoring well
-  Existing monitoring well screened interval
-  Existing BWS water supply well

Notes

1. Existing well logs show a complex subsurface composed of alternating pāhoehoe and a'ā lava flows with clinker zones, fractures, and voids.
2. Acronyms and Abbreviations:
ft feet
3. Tops of well casing elevations differ from ground surface in line of section due to projection.
4. Privileged Well Information, 5 U.S.C. 552(b)(9)

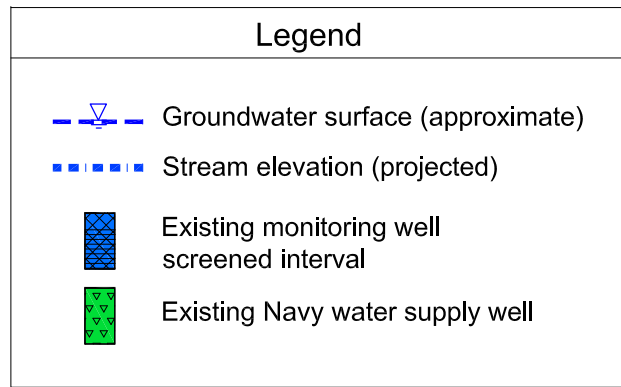


Note: Vertical exaggeration = 1H : 4V (approximate)

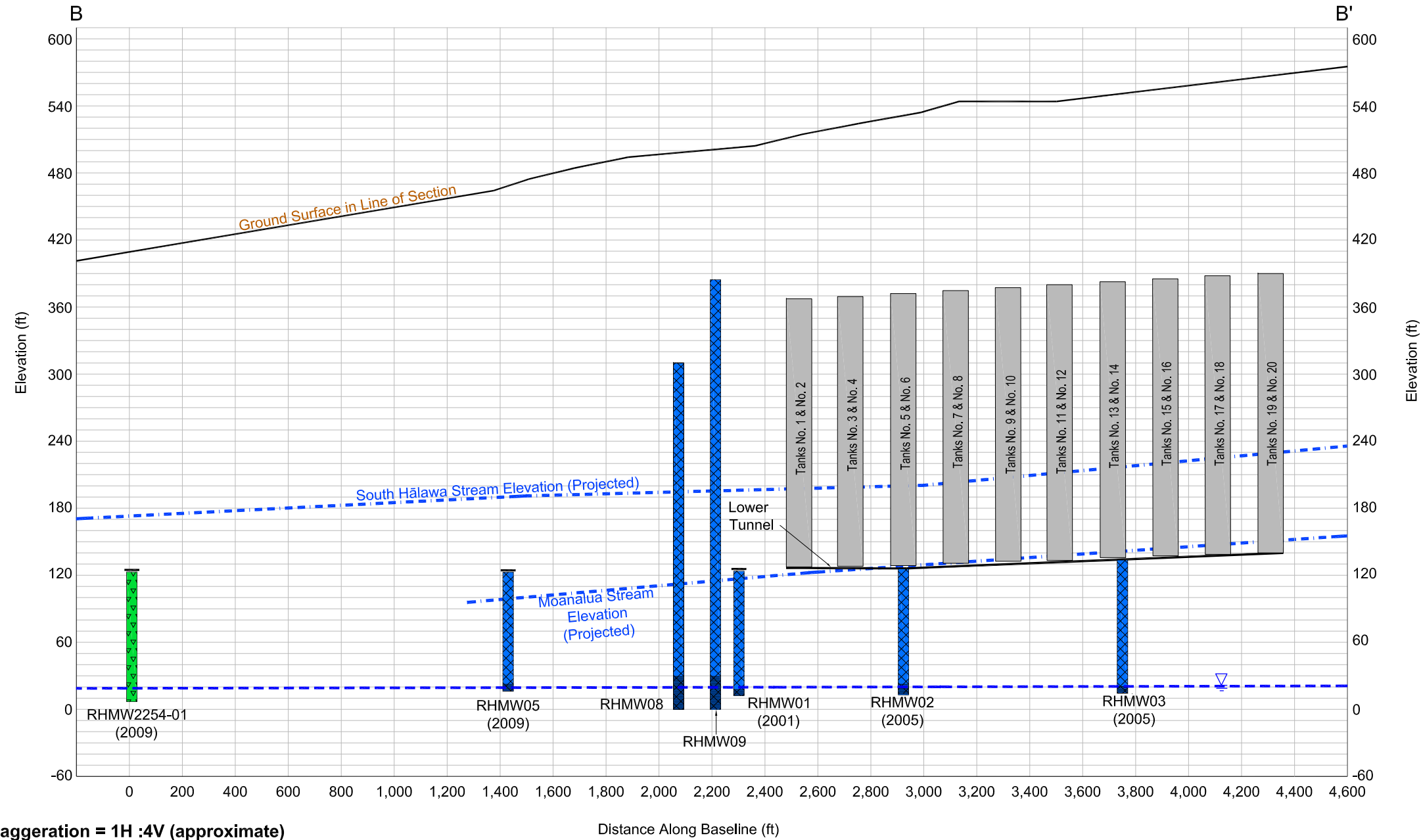
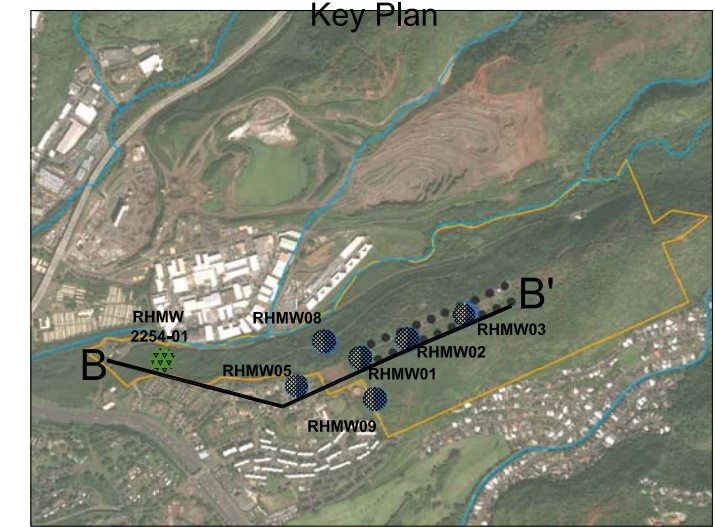
Figure 8
Preliminary Cross Section (Transverse)
Existing-Data Summary and Evaluation Report
for Groundwater Flow and CF&T Modeling
Red Hill Bulk Fuel Storage Facility
JBPHH, O'ahu, Hawai'i

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Notes	
1.	Existing well logs show a complex subsurface composed of alternating pāhoehoe and a'ā lava flow with sporadic clinker zones, fractures, and voids.
2.	Acronyms and Abbreviations: ft feet
3.	Tops of well casing elevations differ from ground surface in line of section due to projection.



Note: Vertical exaggeration = 1H :4V (approximate)

Figure 9
Preliminary Cross Section (Longitudinal)
Existing-Data Summary and Evaluation Report
for Groundwater Flow and CF&T Modeling
Red Hill Bulk Fuel Storage Facility
JBPHH, O'ahu, Hawai'i

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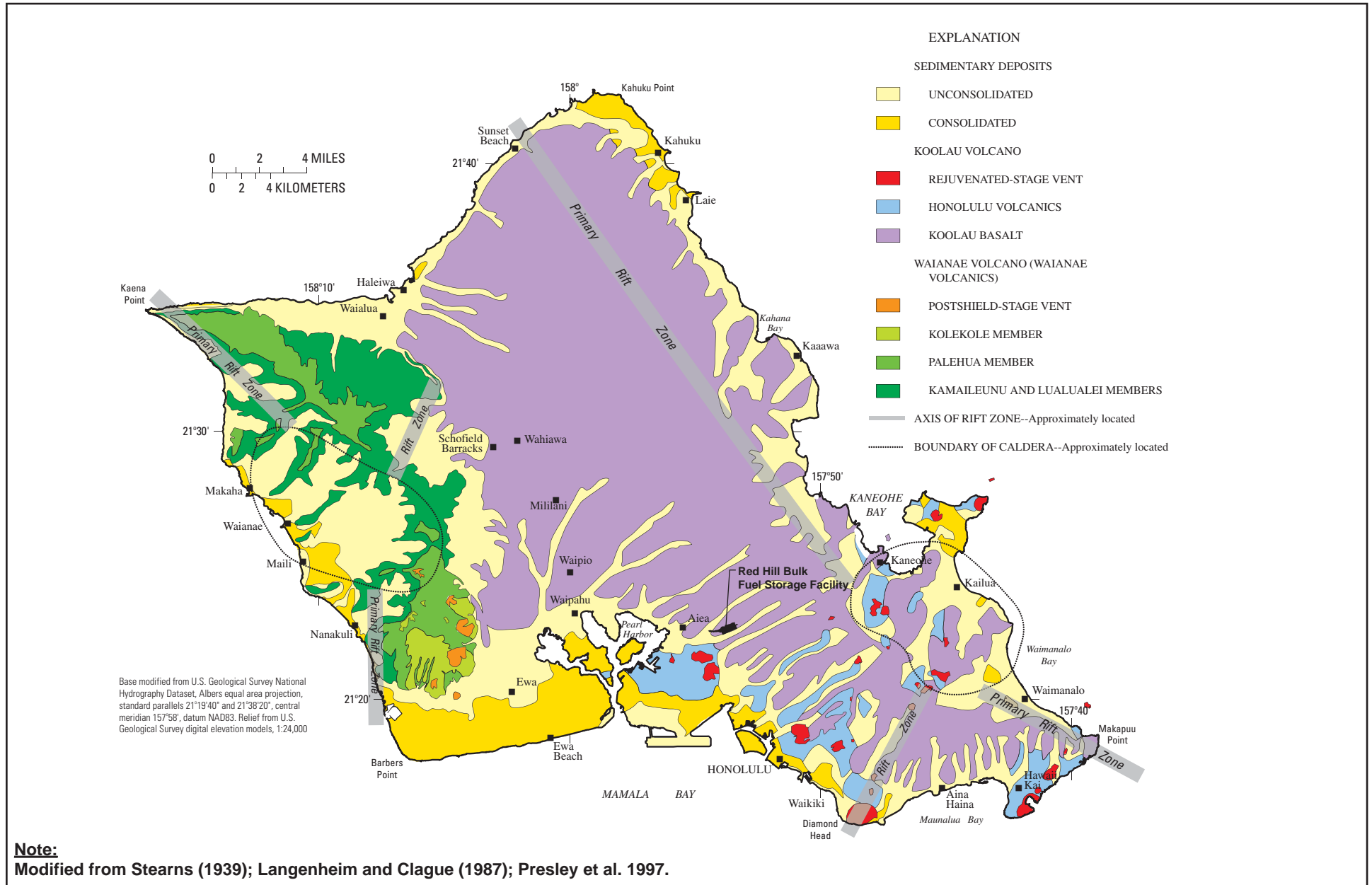


Figure 10
Generalized Surficial Geology, O'ahu, Hawai'i
Existing-Data Summary and Evaluation Report
for Groundwater Flow and CF&T Modeling
Red Hill Bulk Fuel Storage Facility
JBPHH, O'ahu, Hawai'i

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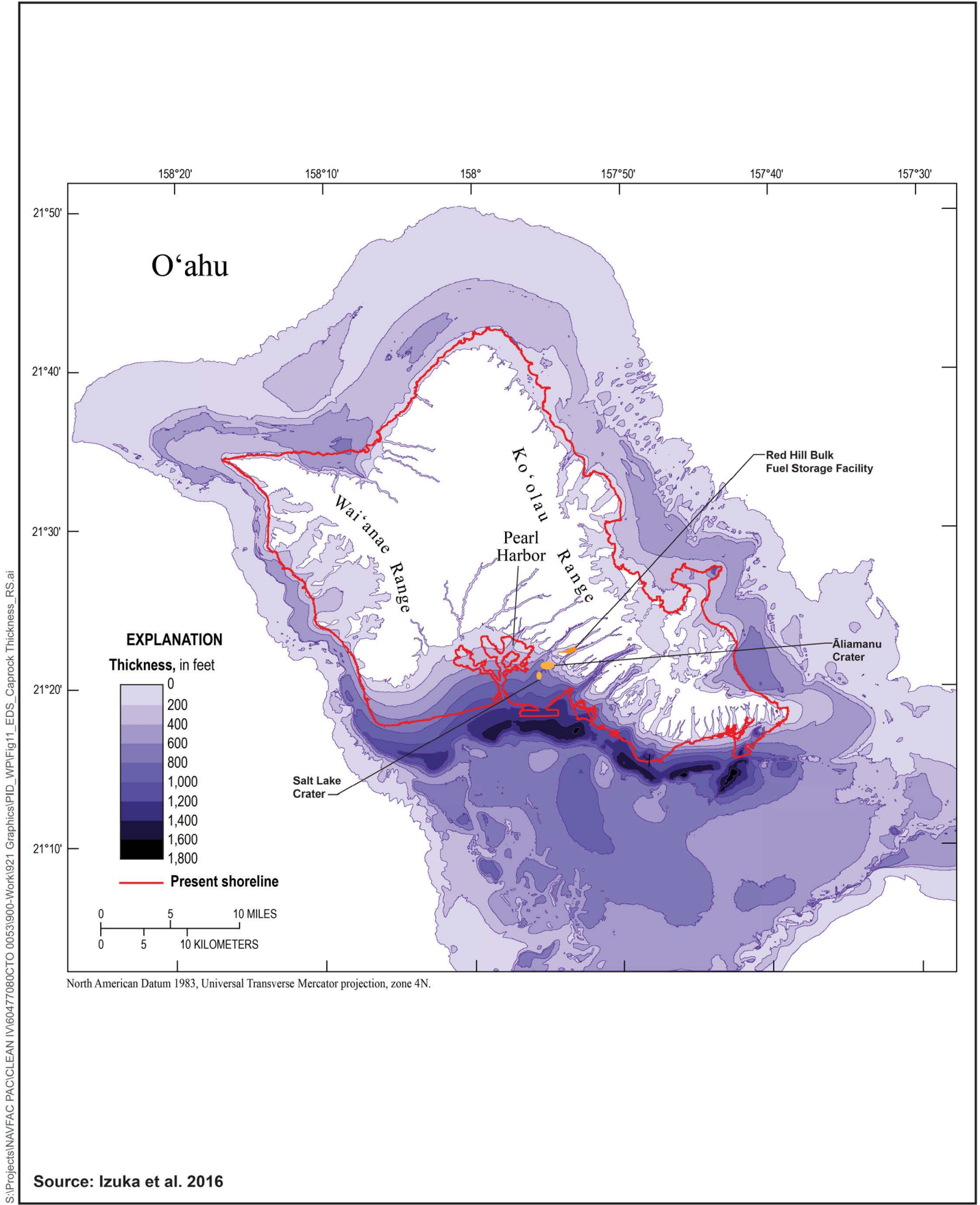


Figure 11
Map of Caprock Hydrogeologic Unit Thickness
Existing-Data Summary and Evaluation Report
for Groundwater Flow and CF&T Modeling
Red Hill Bulk Fuel Storage Facility
JBPHH, O'ahu, Hawai'i

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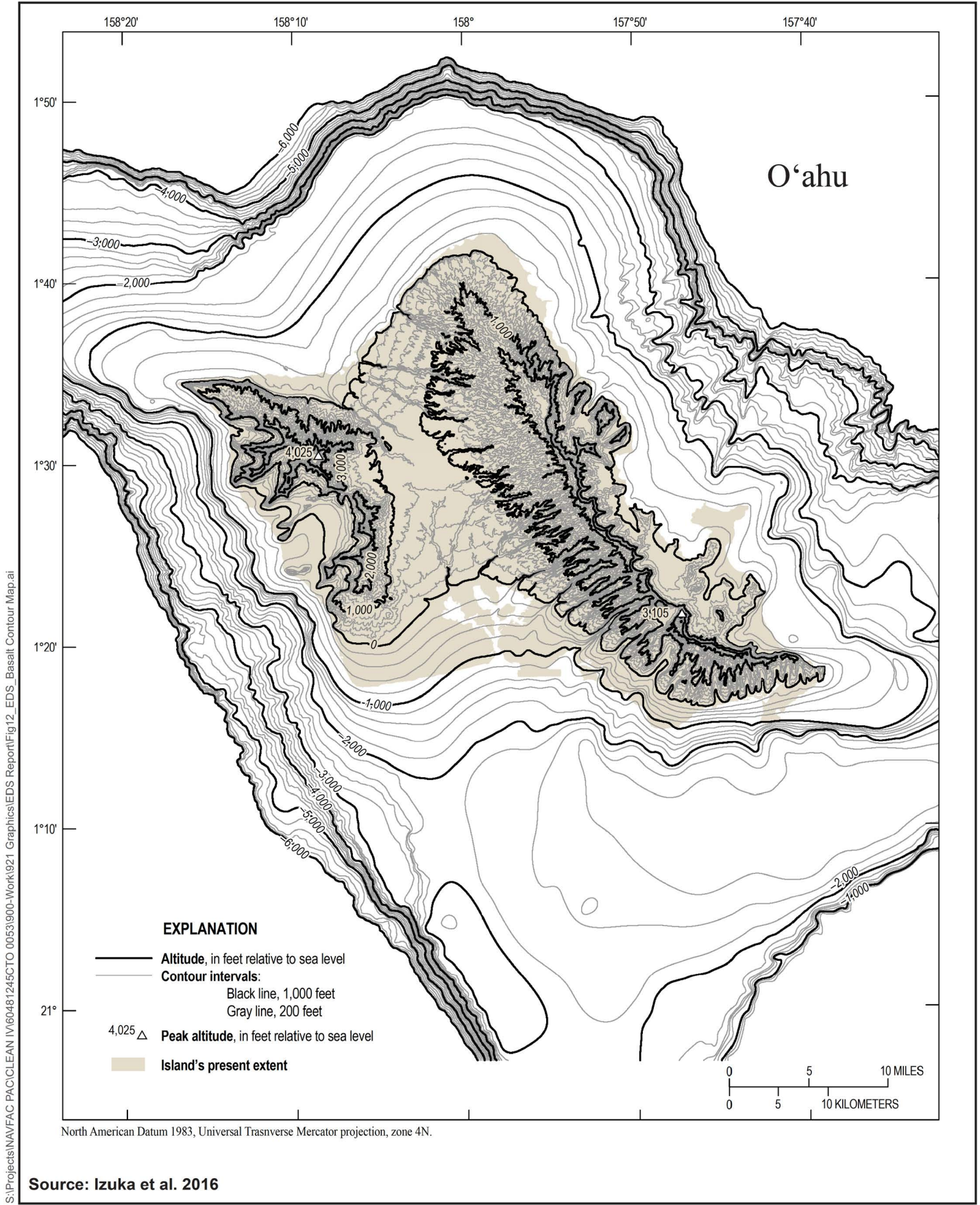
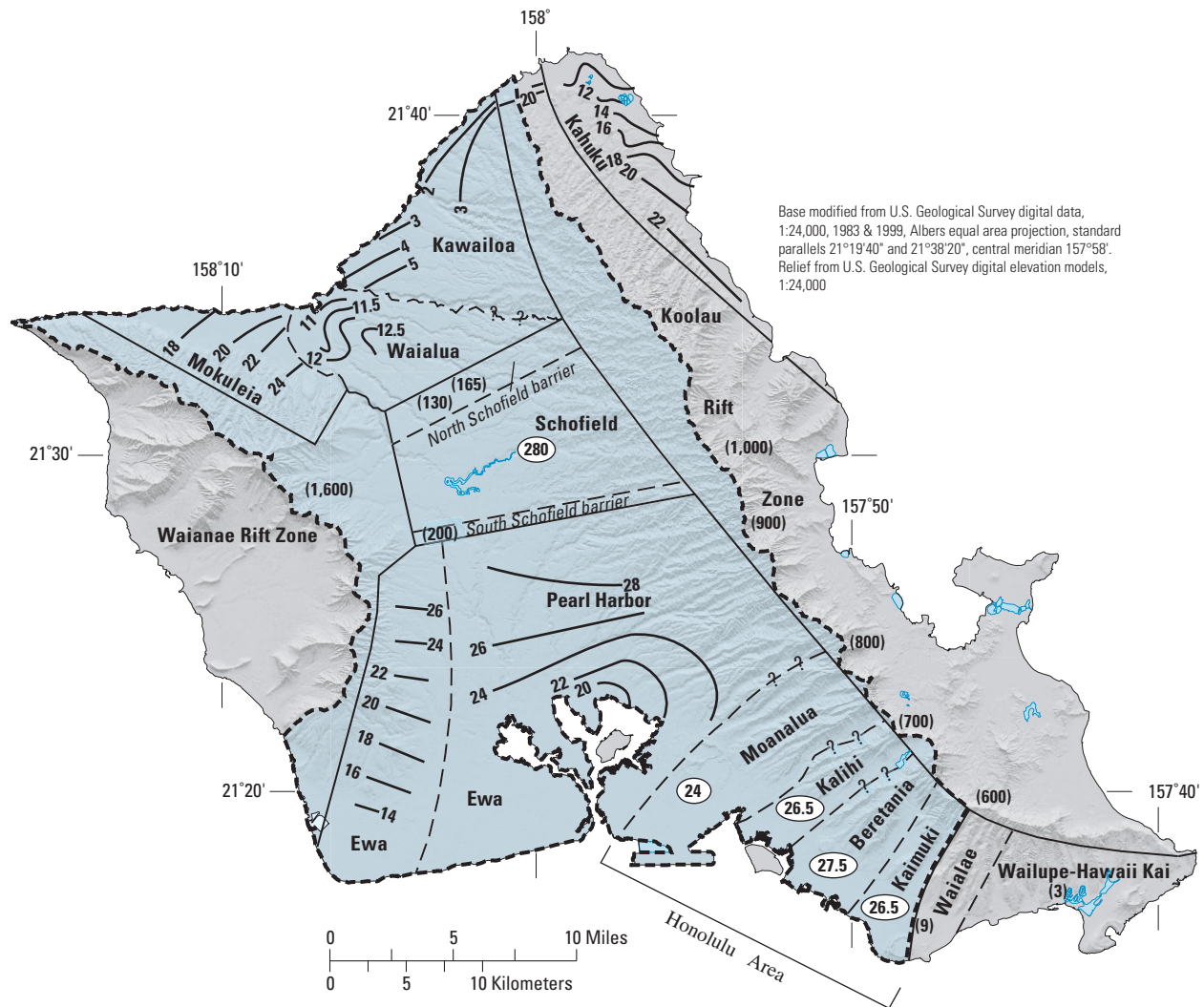


Figure 12
Map of Basalt Hydrogeologic Unit Thickness
Existing-Data Summary and Evaluation Report
for Groundwater Flow and CF&T Modeling
Red Hill Bulk Fuel Storage Facility
JBPHH, O'ahu, Hawai'i







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Base modified from U.S. Geological Survey digital data, 1:24,000, 1983 & 1999, Albers equal area projection, standard parallels 21°19'40" and 21°38'20", central meridian 157°58". Relief from U.S. Geological Survey digital elevation models, 1:24,000

EXPLANATION

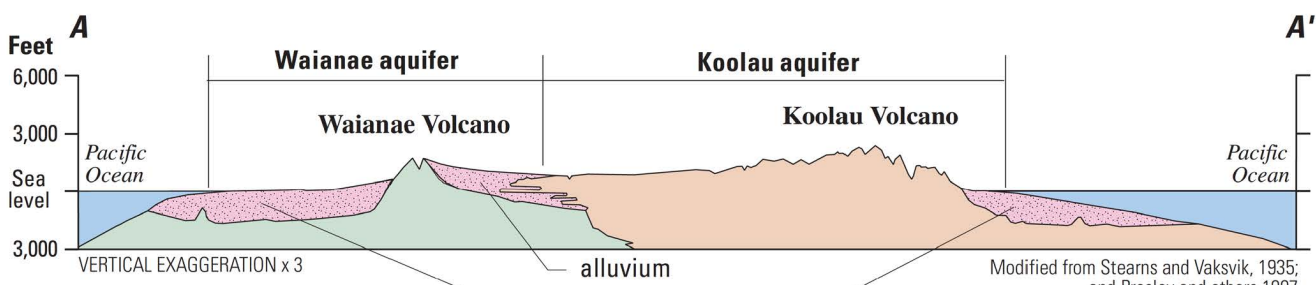
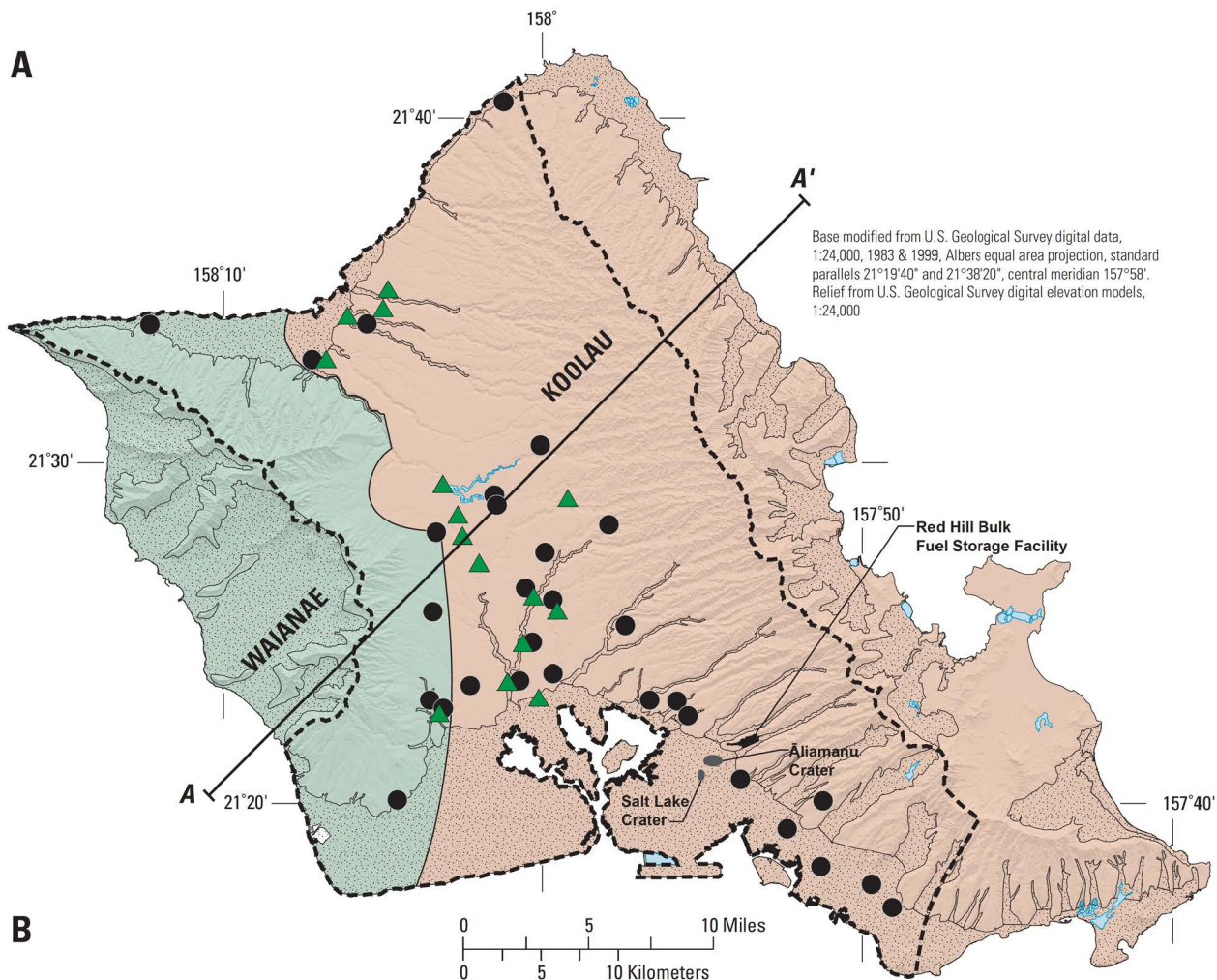
-  CENTRAL OAHU GROUND-WATER FLOW SYSTEM
- Ewa** SUBORDINATE GROUND-WATER AREA
-  MAJOR GEOHYDROLOGIC BOUNDARY
-  SUBORDINATE GEOHYDROLOGIC BOUNDARY -- Queried where uncertain
-  WATER-LEVEL CONTOUR -- Shows altitude of water level in the mid-1950's. Contour interval, in feet, is variable. Datum is mean sea level
-  (165) POINT OBSERVATION OF ALTITUDE OF WATER LEVEL IN THE MID-1950'S, IN FEET ABOVE MEAN SEA LEVEL
-  (24) REPRESENTATIVE MID-1950'S WATER LEVEL WHERE WATER TABLE IS TOO FLAT TO BE CONTOURED, IN FEET ABOVE MEAN SEA LEVEL

Source: Hunt Jr. 1996

Figure 13
Groundwater Areas and Potentiometric Surface in the
Principal Volcanic-Rock Aquifers, O'ahu, Hawai'i
Existing-Data Summary and Evaluation Report
for Groundwater Flow and CF&T Modeling
Red Hill Bulk Fuel Storage Facility
JBPHH, O'ahu, Hawai'i

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- EXPLANATION**
- MAJOR VOLCANIC-ROCK AQUIFERS, UNCONFINED
 - Koolau aquifer
 - Waianae aquifer
 - SEDIMENT OVERLYING AND CONFINING MAJOR VOLCANIC-ROCK AQUIFER
 -
 - LINE OF SECTION
 - A A'
 - NAWQA GROUND-WATER STUDY AREA
 -
 - PUBLIC-SUPPLY WELL
 -
 - MONITORING WELL
 -

Note:
 (A) Areal extent of aquifers within depths tapped by wells (modified from Hunt Jr. 1996); (B) aquifers in cross section (modified from Stearns and Vaksvik 1935; Oki et al. 1997; and Presley et al. 1997).
 Sampled wells are shown for reference.

Figure 14
Wai'anae and Ko'olau Volcanic Rock Aquifers, O'ahu, Hawai'i
Existing-Data Summary and Evaluation Report
for Groundwater Flow and CF&T Modeling
Red Hill Bulk Fuel Storage Facility
JBPHH, O'ahu, Hawai'i

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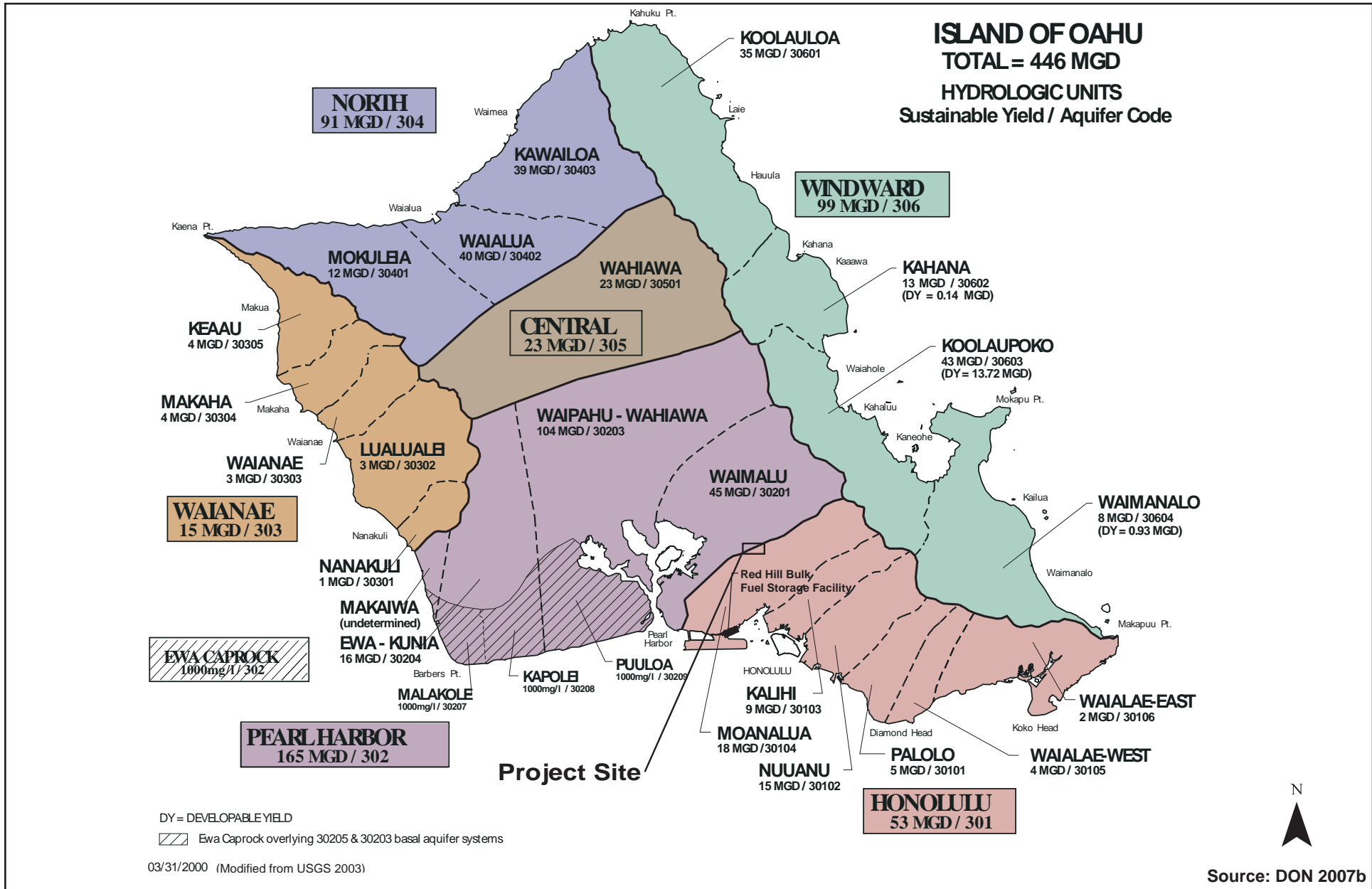
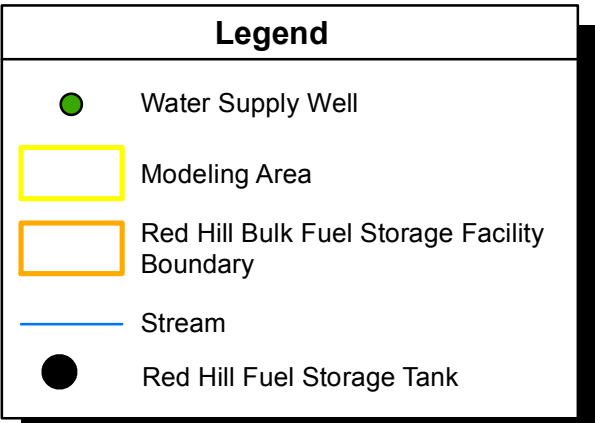
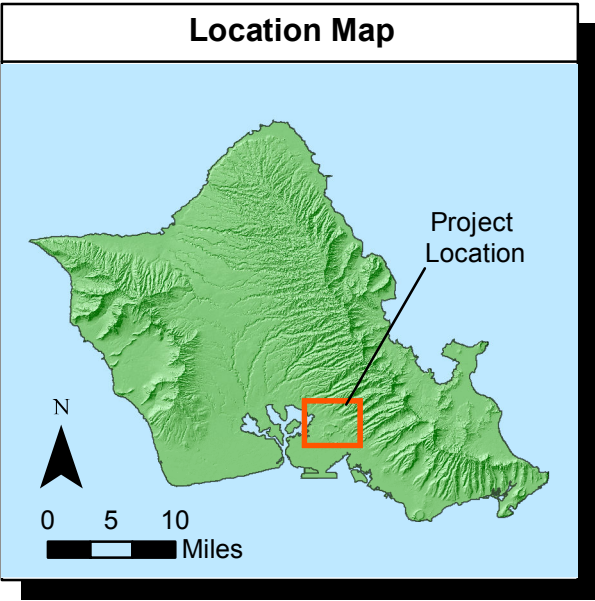
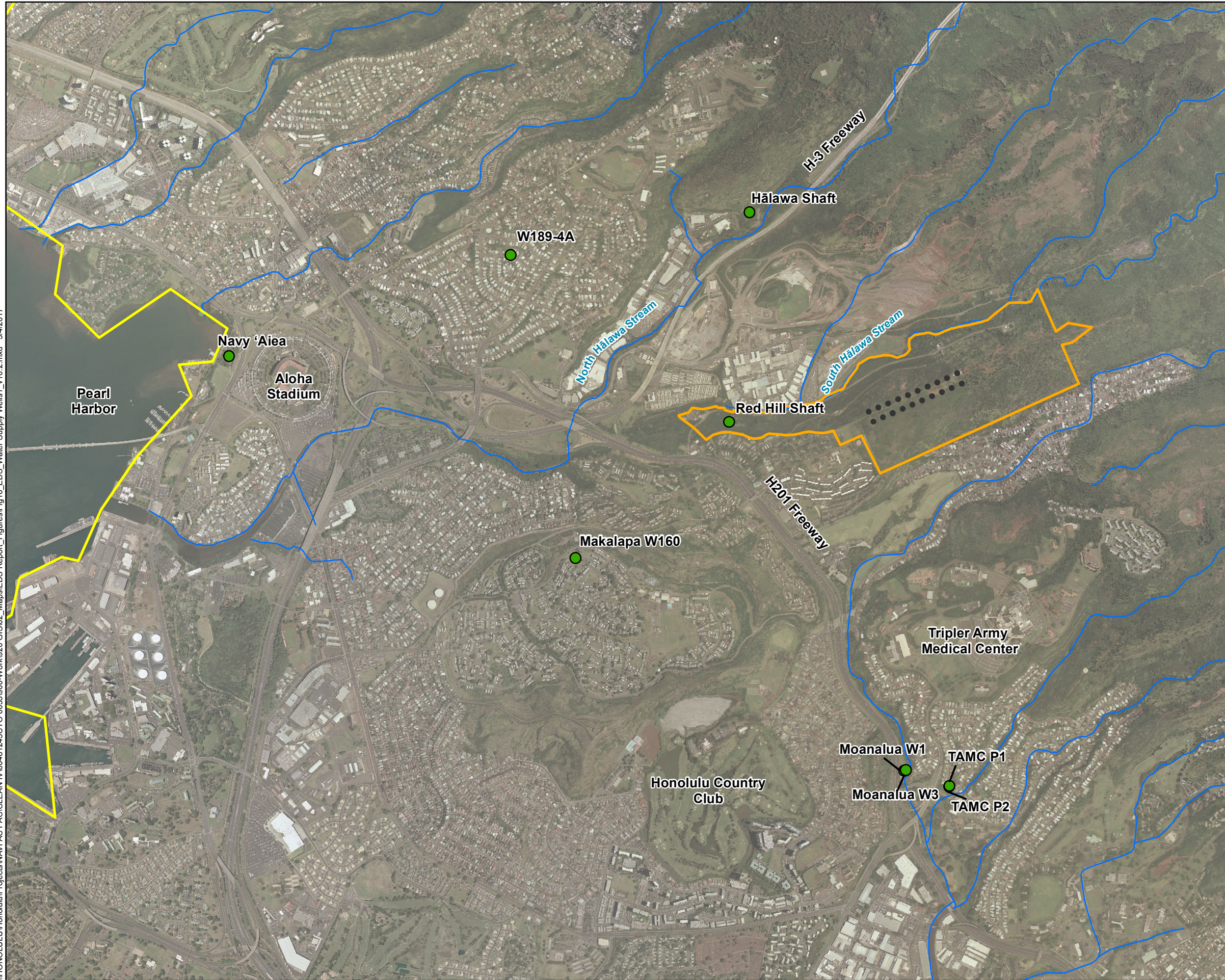


Figure 15
Regional Hydrologic Units and Sustainable Yields
Existing-Data Summary and Evaluation Report
for Groundwater Flow and CF&T Modeling
Red Hill Bulk Fuel Storage Facility
JBPHH, O'ahu, Hawaii

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Notes
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2. DigitalGlobe, Inc. (DG) and NRCS.
Publication_Date: 2015

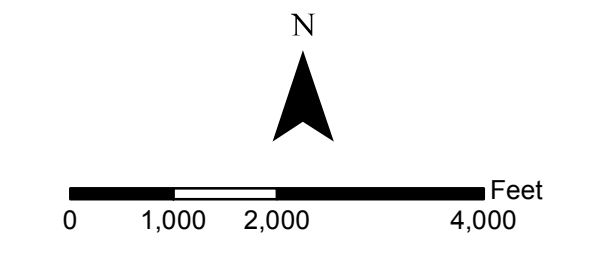


Figure 16
Water Supply Wells within the Modeling Area
Existing-Data Summary and Evaluation Report
for Groundwater Flow and CF&T Modeling
Red Hill Bulk Fuel Storage Facility
JBPBH, O'ahu, Hawai'i

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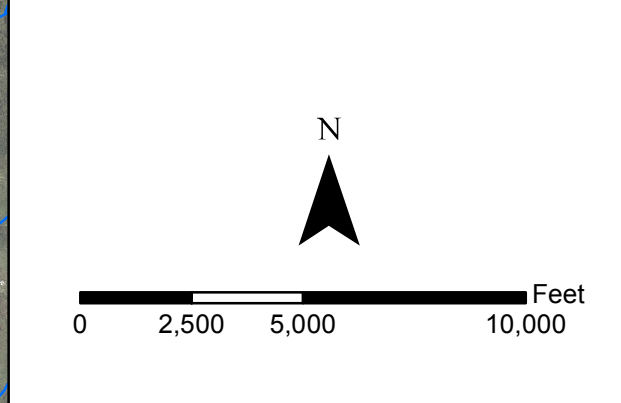
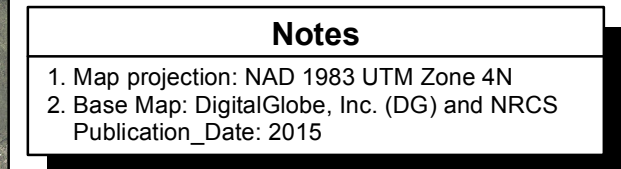
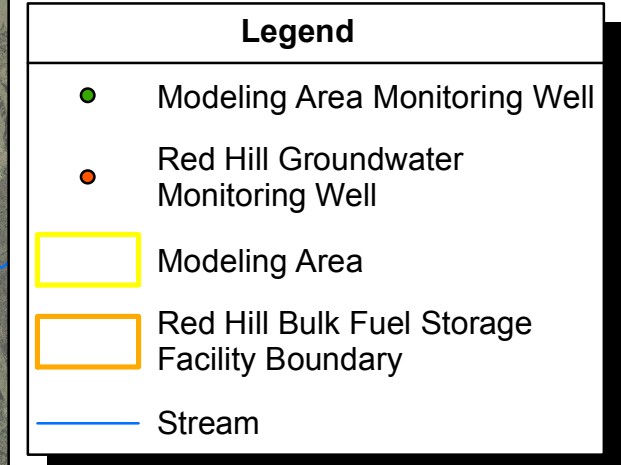
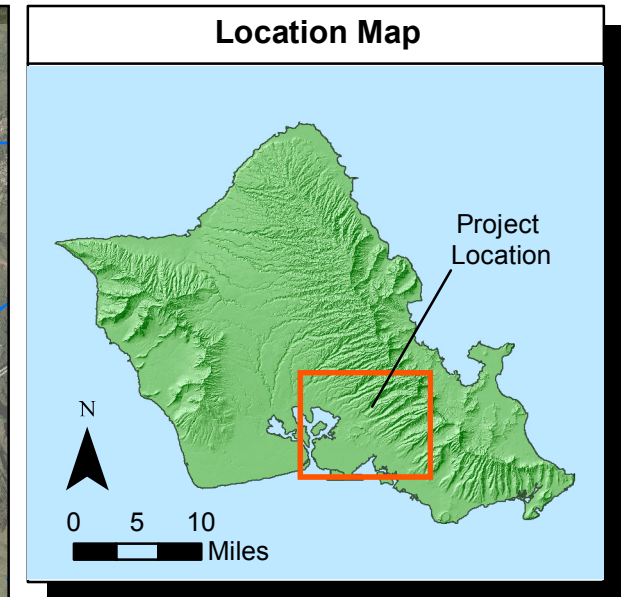
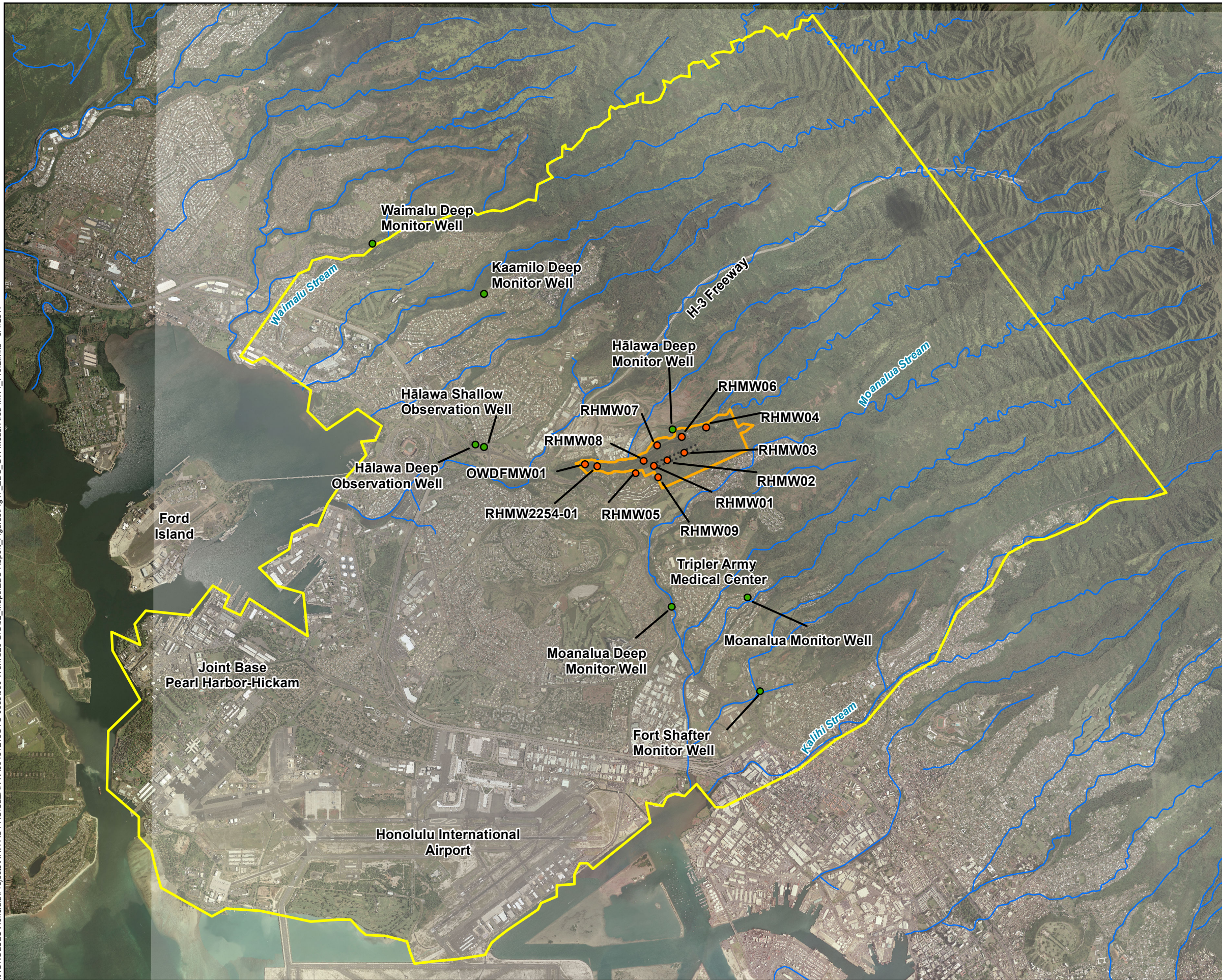
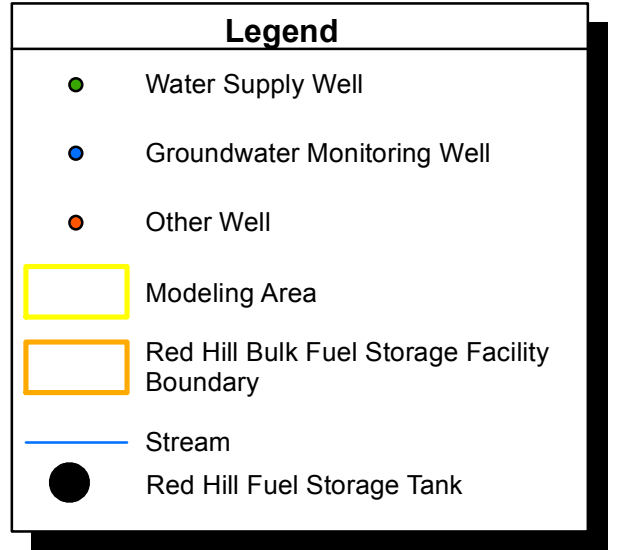
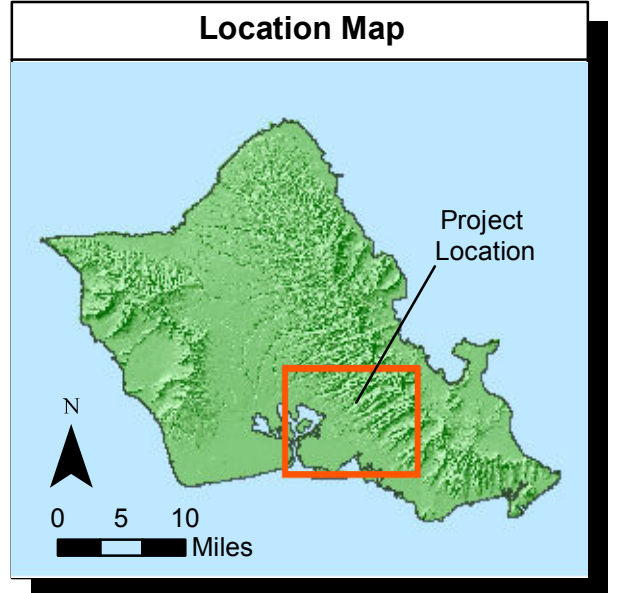
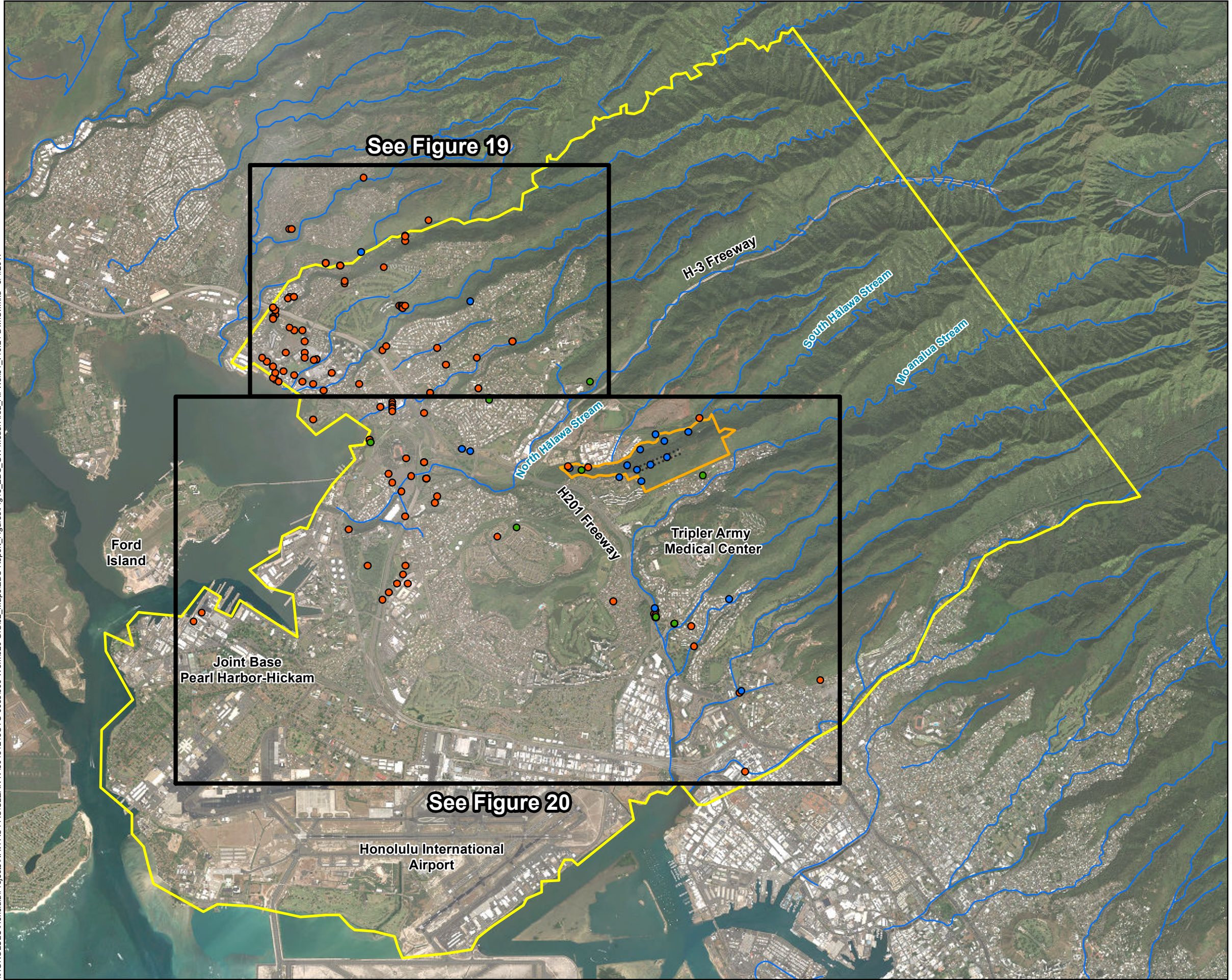


Figure 17
Groundwater Monitoring Wells
within the Modeling Area
Existing-Data Summary and Evaluation Report
for Groundwater Flow and CF&T Modeling
Red Hill Bulk Fuel Storage Facility
JBPBH, O'ahu, Hawai'i

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Notes
1. Map projection: NAD 1983 UTM Zone 4N
2. Base Map: DigitalGlobe, Inc. (DG) and NRCS.
Publication_Date: 2015

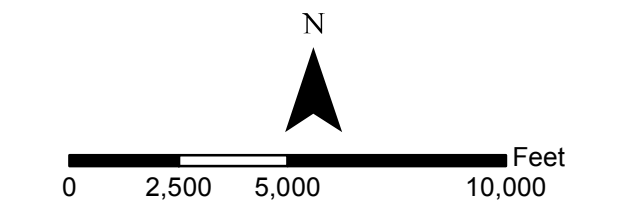
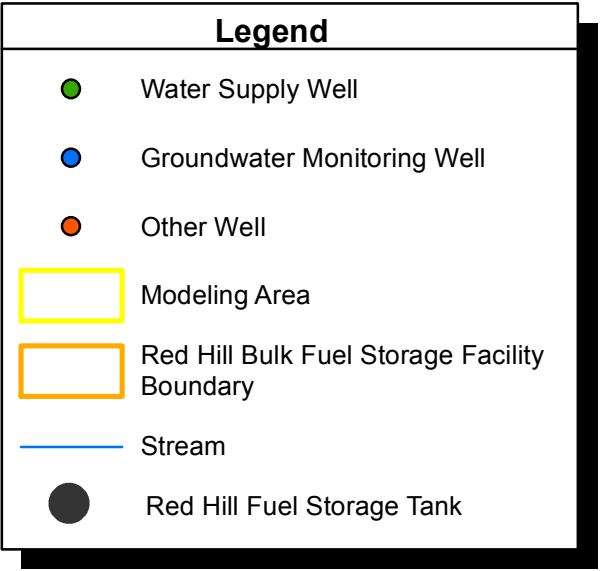
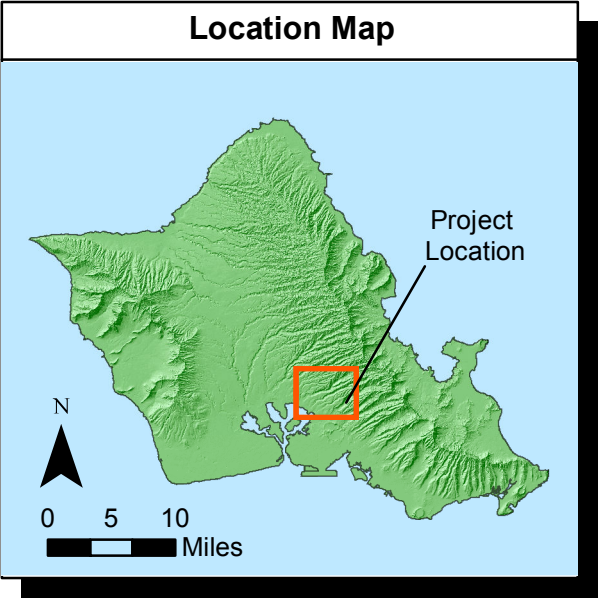
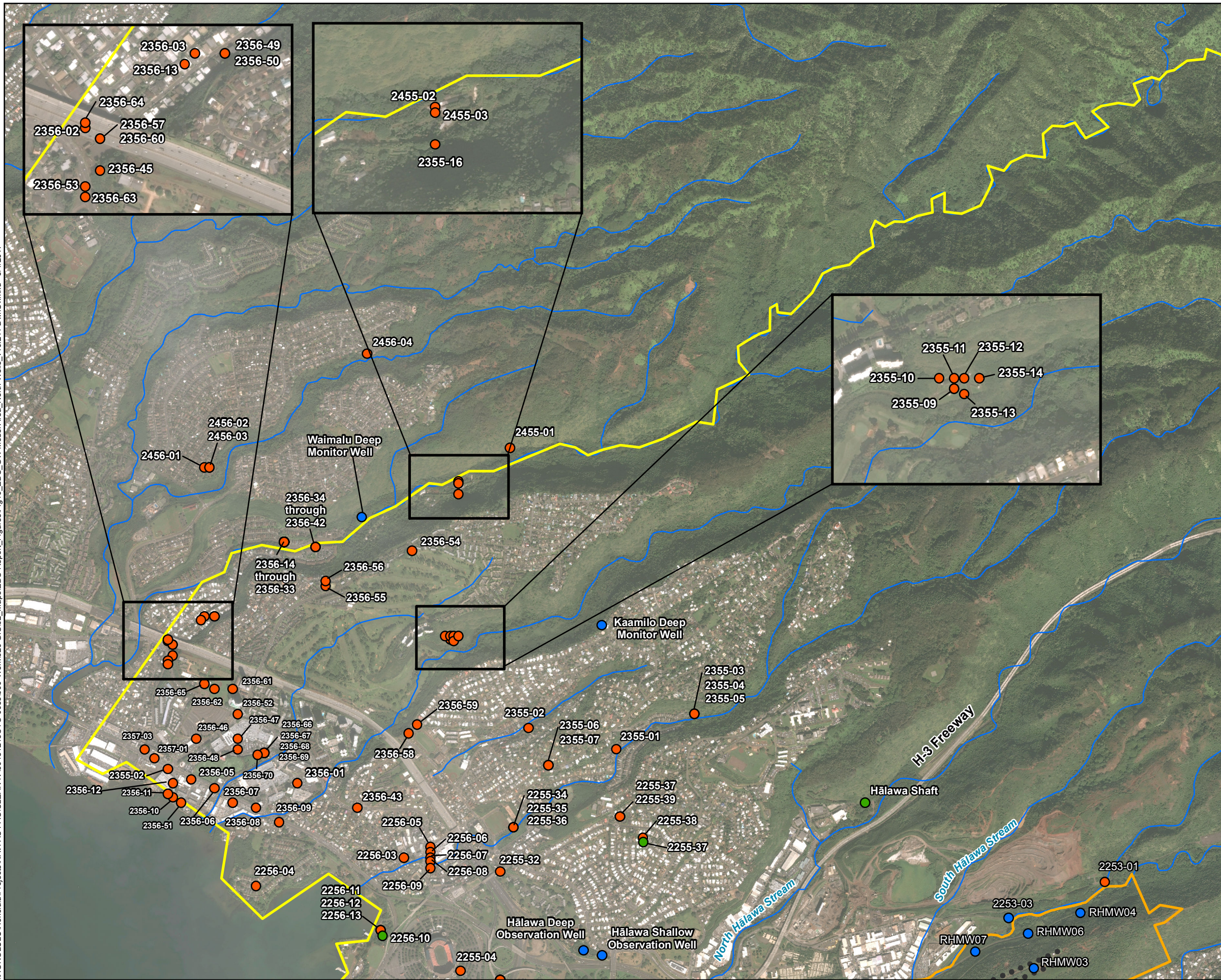


Figure 18
Wells Within the Modeling Area
Existing-Data Summary and Evaluation Report
for Groundwater Flow and CF&T Modeling
Red Hill Bulk Fuel Storage Facility
JBPHH, O'ahu, Hawai'i

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Notes
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2. Base Map: DigitalGlobe, Inc. (DG) and NRCS.
Publication_Date: 2015

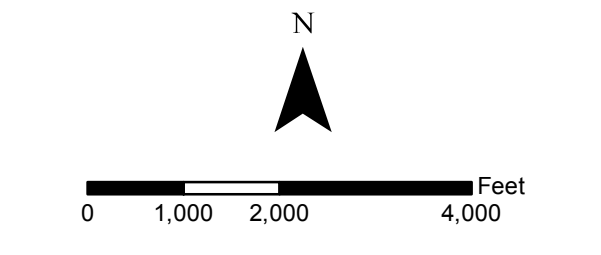
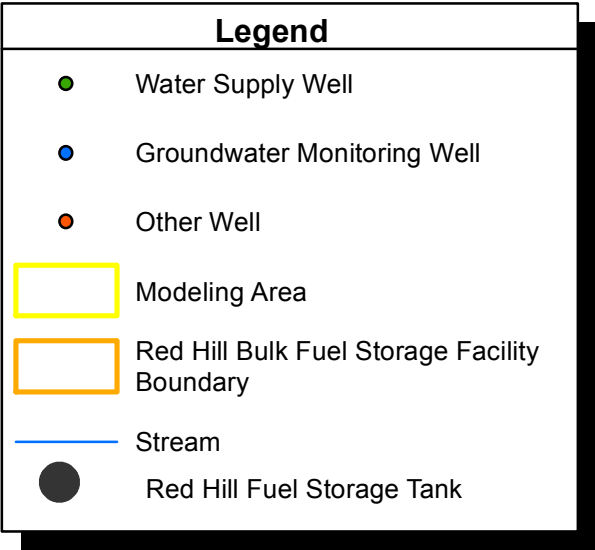


Figure 19
Northern Wells within the Modeling Area
Existing-Data Summary and Evaluation Report
for Groundwater Flow and CF&T Modeling
Red Hill Bulk Fuel Storage Facility
JBPHH, O'ahu, Hawai'i

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Notes

1. Map projection: NAD 1983 UTM Zone 4N
2. Base Map: <http://hawaii.wr.usgs.gov/oahu/earthdata.html> (USGS 1-foot orthoimagery)

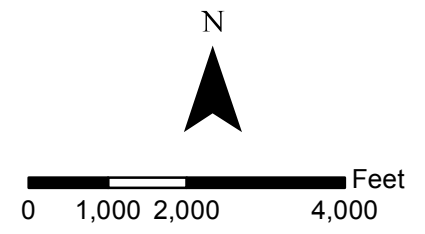
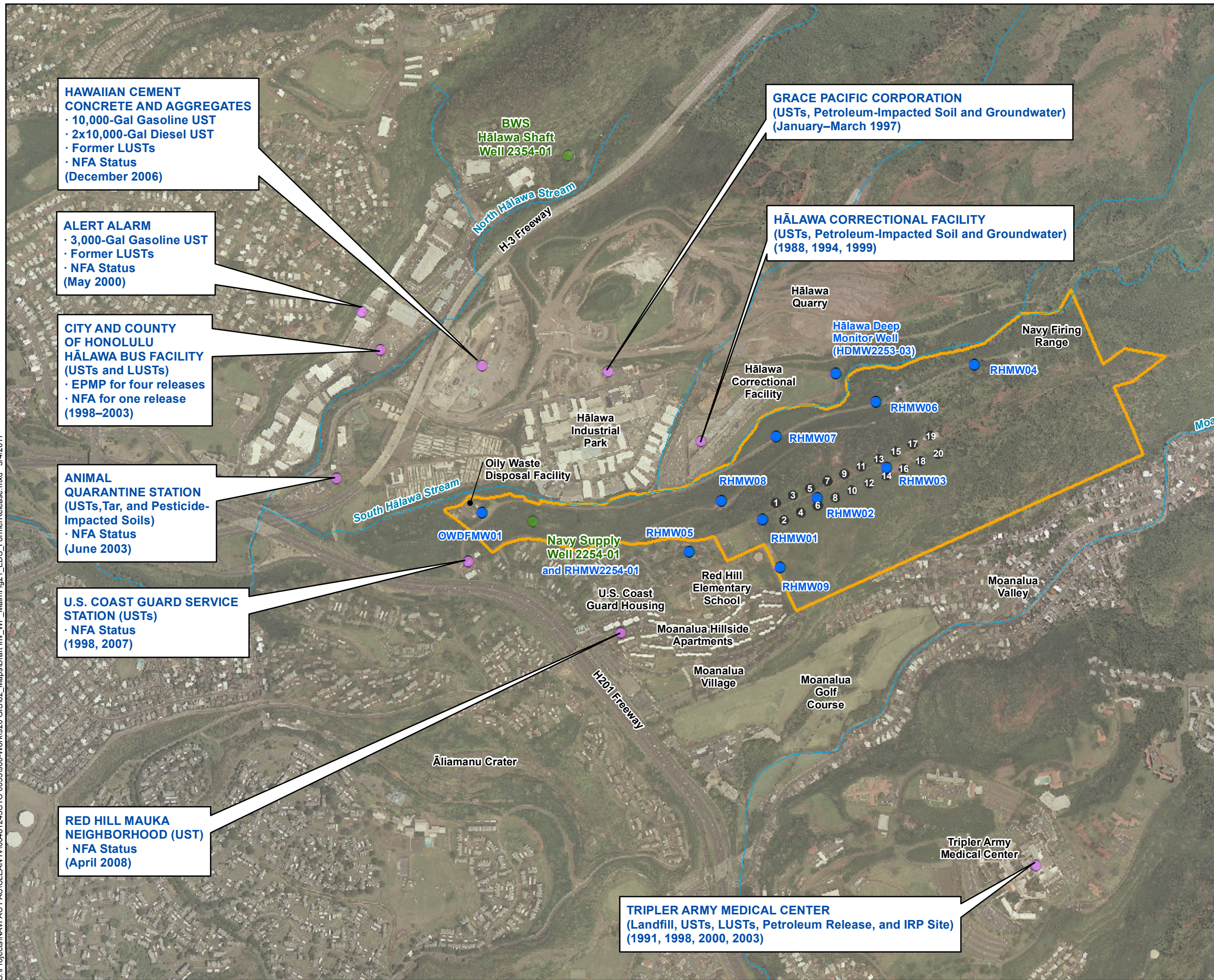


Figure 20
Southern Wells within the Modeling Area
Existing-Data Summary and Evaluation Report
for Groundwater Flow and CF&T Modeling
Red Hill Bulk Fuel Storage Facility
JBPHH, O'ahu, Hawai'i

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HAWAIIAN CEMENT CONCRETE AND AGGREGATES
 · 10,000-Gal Gasoline UST
 · 2x10,000-Gal Diesel UST
 · Former LUSTs
 · NFA Status
 (December 2006)

ALERT ALARM
 · 3,000-Gal Gasoline UST
 · Former LUSTs
 · NFA Status
 (May 2000)

CITY AND COUNTY OF HONOLULU HĀLAWA BUS FACILITY
 (USTs and LUSTs)
 · EPMP for four releases
 · NFA for one release
 (1998–2003)

ANIMAL QUARANTINE STATION
 (USTs, Tar, and Pesticide-Impacted Soils)
 · NFA Status
 (June 2003)

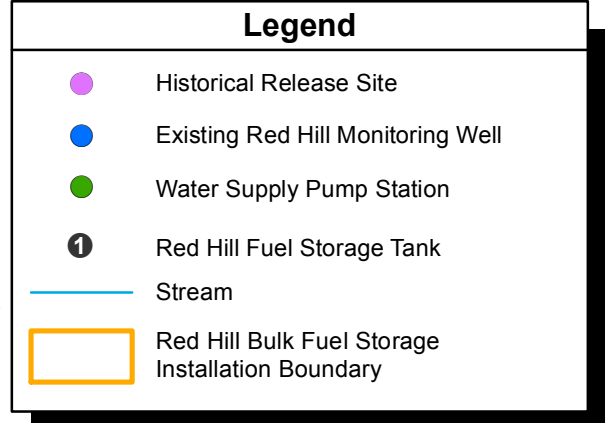
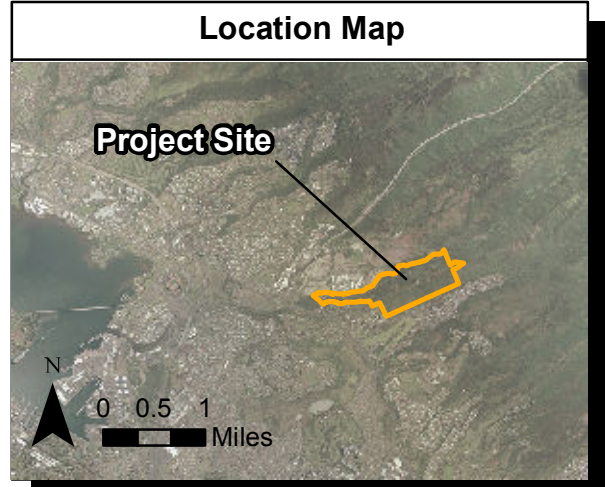
U.S. COAST GUARD SERVICE STATION (USTs)
 · NFA Status
 (1998, 2007)

RED HILL MAUKA NEIGHBORHOOD (UST)
 · NFA Status
 (April 2008)

GRACE PACIFIC CORPORATION
 (USTs, Petroleum-Impacted Soil and Groundwater)
 (January–March 1997)

HĀLAWA CORRECTIONAL FACILITY
 (USTs, Petroleum-Impacted Soil and Groundwater)
 (1988, 1994, 1999)

TRIPLER ARMY MEDICAL CENTER
 (Landfill, USTs, LUSTs, Petroleum Release, and IRP Site)
 (1991, 1998, 2000, 2003)



- Notes**
- Map projection: NAD 1983 UTM Zone 4N
 - Base Map: <http://hawaii.wr.usgs.gov/oahu/earthdata.html> (USGS 1-foot orthoimagery)
 - Acronyms and Abbreviations:

EPMP	Environmental Protection Management Plan
LUST	Leaking Underground Storage Tank
NFA	No Further Action

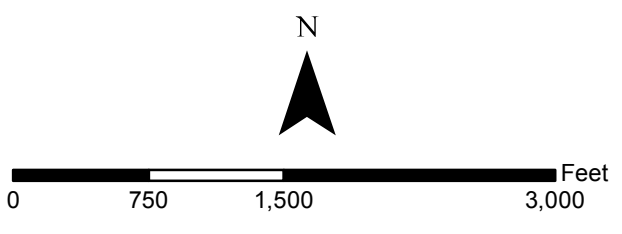


Figure 21
 Historical Release Sites
 in the Vicinity of Red Hill
 Existing-Data Summary and Evaluation Report
 for Groundwater Flow and CF&T Modeling
 Red Hill Bulk Fuel Storage Facility
 JBPHH, O'ahu, Hawai'i

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3. Applicability and Limitations of Compiled Existing Data

The compiled existing data summarized in Section 2 and presented in Appendix A tables are assessed in this section for their applicability and limitations in satisfying the objectives of the AOC.

3.1 GEOLOGIC AND HYDROGEOLOGIC DATA

Available data collected since the 2007 groundwater flow model will be applicable and useful for refining and updating the model, but some data gaps and uncertainties still remain, as described in the following subsections. The data gaps will be further detailed in the forthcoming *Data Gap Analysis Report*.

3.1.1 Geologic Framework in the Groundwater Flow Modeling Area

The available information regarding geologic features that exist along the 2007 local model boundaries is applicable and useful for refining the groundwater flow model. The northeastern boundary of the model is located approximately 2 miles to the northeast of the Facility (Figure 3). This boundary was set just westward (outside) of the area mapped by the USGS (Izuka et al. 2016) as dike intruded basalt. Thus, the model domain extends within the area of dike-free basalt, which has been described as a regionally continuous aquifer that generally has higher permeability than the dike-intruded areas (Izuka et al. 2016). Hydrogeologic information available from the USGS indicates that natural barriers to groundwater flow are present along the northwestern and southeastern 2007 local flow model boundaries (DON 2007b, Appendix L).

The northwestern model boundary is located along the center of the Waimalu Valley, which is approximately 2.5 miles from the Facility and approximately 1.8 miles north of the Hālawa Shaft at the closest point. The USGS regional model (Oki 2005) assigned a valley-fill barrier along the bottom of the Waimalu Valley on the basis of well logs, and extended the valley fill to approximately 200–330 ft below msl beneath the valley from the shore to a point approximately 2.7 miles up-valley from the Pearl Harbor shore.

The southeast boundary of the 2007 local model (DON 2007b) is located along the middle of Kalihi Valley, which is approximately 2.5 miles south of the Facility at the closest point. Similarly, the USGS regional model (Oki 2005) used Kalihi Valley as the southern boundary, and specified it to be a no-flow boundary to reflect the presence of a deep valley fill barrier, which likely exceeds 1,000 ft thickness (Oki 2005). The western boundary of the 2007 model is located along the shore of Pearl Harbor, which is approximately 2.8 miles west of the Facility and approximately 1.4 miles west of Hālawa Shaft at the closest point.

The western boundary of the 2007 local model is located along the shoreline of Pearl Harbor, which lies approximately 3 miles west of the Facility at the closest point. To the east of the shoreline, the modeling area includes the freshwater aquifer that overlies an intermediate transition zone of brackish water and saltwater. Groundwater flow beneath the shoreline is restricted by the higher density of the saline water and low-permeability caprock. The caprock of southern O'ahu extends offshore, beyond the seaward extent of the freshwater lens (Izuka et al. 2016).

The 2010 USGS study (Rotzoll 2010) that evaluated the depth of the freshwater lens is applicable and appears to provide useful information for evaluating and possibly refining the base elevation of the 2007 groundwater flow model. Rotzoll (2010) showed that eight deep monitor wells are located in the model area, and additional information in the report suggests that more recent salinity profiles may be available for checking, and if needed, updating, the bottom elevation of the 2007 model.

1 The subsurface extent and configurations of the Caprock HGU and the Basalt HGU have been
2 further defined throughout the modeling area by the subsurface maps available in the recent USGS
3 report (Izuka et al. 2016), which are applicable and useful for defining the model layer geometry
4 throughout the model domain.

5 Continuous cores obtained from post-2007 Red Hill monitoring well installation borings produced
6 detailed geologic logs of excellent quality that are applicable and useful in characterizing the nature
7 and physical properties of the soil and rock extending down to the bottom of each monitoring well.
8 In general, these logs reveal thick layers of massive, basalts with variable permeability ranges, but at
9 some depths the logs identify fractures and clinker deposits that could provide permeable flow
10 pathways. For the modeling task, the logs will be useful for further refining the CSM, and will
11 provide input for selecting model layer thicknesses and assigning well screen elevations in the model
12 layers. The boring logs are of limited usefulness in defining lateral extent and preferred flow
13 pathways within the model layers because the boring locations are separated by large enough
14 distances that interpolating layer and pathway extent and continuity may result in uncertainties.
15 Boring geolocation data that are not included in the existing data set will be identified as a data gap
16 in the forthcoming *Data Gap Analysis Report*.

17 No new hydrogeologic data have been generated since 2007 in the vicinity of the Facility other than
18 geologic logs of borings and monitoring wells installed by the Navy since 2007. However, the
19 geologic information available for the Facility is applicable and useful in developing a detailed
20 geologic CSM, including defining the strike and dip of the lava beds and interbedded clinker zones
21 and preparing geologic cross sections of the tank farm area. Detailed geologic descriptions can be
22 prepared for each different geologic unit based on the available boring and tunnel logs. To
23 supplement values from published reports of other hydrogeology investigations in basalt, the
24 available geologic data can be used to estimate effective porosity and permeability of each different
25 geologic unit for the CSM. The geologic log of the Red Hill Shaft water tunnel (Stearns 1943) (i.e.,
26 the infiltration gallery) provides important information about the volcanic rock materials penetrated
27 by the tunnel, and includes notations of the groundwater inflows through time during construction.
28 This geologic log clearly indicates that the clinker deposits provide preferred flow pathways and
29 likely have a major effect on groundwater flow at the site. Thus, the general geometric
30 configurations of clinker zones need to be further evaluated and incorporated into the CSM.

31 Updating the detailed geologic CSM of the Facility will improve the understanding of NAPL
32 movement mechanisms and thus previous geologic data are applicable and useful for refining
33 estimates of source area for CF&T modeling. For example, future NAPL releases would likely move
34 from a fuel tank leak point through high-porosity clinker zones along the top of low-porosity, low-
35 permeability lava beds. In such a case, NAPL would likely move in the same direction as the dip of
36 the low-permeability lava beds. The NAPL would be expected to spread laterally in clinker zones,
37 generally down the dip, but the NAPL movement would be restricted by capillary forces created by
38 moisture in smaller pore spaces, which cause the relative permeability of the NAPL to be very low.
39 Compared to water, the higher viscosity of jet fuel will also restrict NAPL movement through small
40 pore spaces, especially small water-filled cracks in massive basalt layers. In summary, updating the
41 geologic CSM would help develop a rational basis for estimating the volume of NAPL that could be
42 retained in the vadose zone (e.g., by residual saturation) and movement direction and extent of
43 NAPL releases.

3.1.2 Hydraulic Properties of Hydrogeologic Units

Although the recent USGS report by Izuka et al. 2016 provides an updated and detailed summary of the available hydrogeology information for the island of O'ahu, there does not appear to be any additional hydraulic property data available for the groundwater flow modeling area other than those available for the 2007 model report. Another groundwater modeling study by the USGS (Rotzoll 2012) used parameter values based on previous regional studies (Oki 2005). Hydraulic conductivity values specified in that model ranged from 0.2 ft/d for the caprock to 1,350 ft/d for the volcanic-rock aquifers (Rotzoll 2012). Horizontal hydraulic conductivity values for the volcanic rock aquifer in the 2012 model were 1,350 ft/d in the longitudinal direction of the surficial lava flows (approximately perpendicular to the coastline) and 675 ft/d in the transverse direction. Vertical hydraulic conductivity of the volcanic rock aquifer in the 2012 model was 6.8 ft/d. These values differ from those used by Rotzoll and El Kadi for the 2007 Red Hill model (DON 2007b); however, no actual data for these parameters are available for the modeling area since 2007. Thus, the more recent values from Rotzoll (2012) are relevant and potentially applicable so they will be considered for inclusion in the model, but may be of limited usefulness for refining the model. The only information for hydraulic properties in the model area collected since 2007 are the USGS pumping test data collected in May 2015 from the BWS Hālawā Shaft. These data appear to be useful and applicable for refining aquifer hydraulic properties in the model, including:

- Transmissivity
- Hydraulic conductivity
- Heterogeneity and anisotropy
- Storativity
- Specific yield
- Effective porosity

However, difficulties have been encountered in accessing the May 2015 data from the USGS website, resulting in the compilation of an incomplete data set; additional cooperation with the USGS will be required to obtain all relevant data. For the information that has already been compiled, variable pumping rates create uncertainties in evaluating the data. For instance, flow rate data for Red Hill Shaft do not include the entire pumping test period. Pumping rates are not shown in the records for Red Hill Shaft prior to May 22. On that day, the available data show that the pumping at Red Hill Shaft was stopped and re-started on a daily basis and that pumping rates varied substantially during that period through the end of May. Also, the very small water level changes in wells monitored in the primary area of interest (e.g., RHMW07) may not allow definitive evaluation because other factors, such as barometric effects and other wells pumping in the region, may have contributed to or obscured the effects of pumping at Hālawā Shaft. Unless additional information or data are provided by the USGS or the BWS, the May 2015 pumping test data may be of limited usefulness and applicability for refining the model.

3.1.3 Hydrologic Features in the Groundwater Flow Modeling Area

For the groundwater flow model, it is also important to account for interactions between groundwater and surface water. The principal surface water features in the primary area of interest include North Hālawā Stream, South Hālawā Stream, and Moanalua Stream. The USGS recently published a report presenting the results of a detailed hydrologic budget analysis that provides spatially distributed groundwater recharge rates for the modeling area (Engott et al. 2015). The analysis in that report

1 includes the effects of streambed seepage in the recharge rates. Thus, it appears that the recharge
2 rates from this USGS analysis can be used as direct input to the updated groundwater flow model for
3 most, if not all, of the modeling area. However, those recharge rates may need to be further evaluated
4 and modified in some areas to account for anthropogenic effects possibly not considered by the
5 USGS: for instance, in the area between the Facility and Hālawā Shaft, and north of South Hālawā
6 Stream, the natural watershed topography has been substantially modified by the Hālawā Quarry,
7 cement plant operations, and other industrial facilities.

8 Accumulation of stormwater runoff in the open pits of the Hālawā Quarry may increase the
9 groundwater recharge rate in those areas. Aerial photographs (GoogleEarth) of the cement plant
10 operations just east of the quarry show substantial areas of rock crushing and washing near the
11 cement plant, which appear to impound process water discharged during operations. Seepage from
12 those areas would substantially increase groundwater recharge rates. Extensive pavement areas in the
13 Hālawā Industrial Park and Hālawā Correctional Facility increase runoff from those areas and
14 concentrate the runoff flow to other areas. In combination, these surface features may change local
15 groundwater recharge rates and groundwater flow directions. At this time, however, the available
16 data for the quarry are limited to visual observations of aerial photographs.

17 **3.1.4 Spatial Distribution of Groundwater Levels, Hydraulic Heads, and Hydraulic** 18 **Gradients**

19 Overall, synoptic groundwater level data for the groundwater flow modeling area are sparse, and
20 there is substantial uncertainty in the spatial distribution of groundwater elevations, hydraulic heads,
21 and gradients. Away from the Facility, available water level measurements were taken at different
22 times with varying or uncertain pumping conditions. At present, only one set of synoptic
23 groundwater level measurements is available, which was collected on November 18, 2016 from the
24 Facility wells. Those measurements are from a period in which Red Hill Shaft was not pumping and
25 thus will be useful for developing the CSM. However, even these synoptic data are of limited
26 usefulness for calibrating the numerical flow model because water levels and pumping rates in other
27 nearby wells, including Hālawā Shaft, are not known during that period.

28 Another important limitation of the available groundwater level data for defining the distribution of
29 hydraulic heads and gradients appears to be potential inconsistency in using the exact same
30 measuring points over time and inaccuracy of the measurement point elevations at some or all of the
31 well heads. Unless data can be confirmed to have been collected using the exact same measuring
32 point in each well, the data collected may reflect inconsistencies and result in potential error in
33 determining the precise historical water level elevations. In addition, different survey benchmarks
34 and inconsistent datum elevations may have been used for different groups of wells, but this is
35 uncertain. Even though a previous effort to resurvey the wellhead elevations was conducted after
36 2007 (DON 2010a) to resolve this issue, questions remain about apparent inconsistencies in the
37 survey data and benchmarks. Unusually high degrees of accuracy and precision are needed for
38 defining the hydraulic gradients at this area because the high aquifer permeability causes relatively
39 flat gradients. This uncertainty has prompted the planned resurveying of the surface elevations at all
40 of the monitoring wells at the Facility to the highest standard, which is a Second-Order, Class I
41 geodetic level survey.

42 **3.1.5 Groundwater Sources and Sinks**

43 Recent USGS reports provide maps of estimated mean annual recharge rates for the model area. One
44 report (Izuka et al. 2016) presents a map of recharge rates for recent conditions (2010 land cover,
45 1978–2007 rainfall). Another USGS report (Engott et al. 2015) provides a comprehensive water

1 budget analysis and estimates of the spatial distribution of groundwater recharge rate. Results of the
2 USGS analyses include maps covering the entire modeling area that show recharge rates estimate for
3 average climate and drought conditions. Information on these maps will be useful and applicable for
4 refining the groundwater flow model. Assuming the maps are available as geographic information
5 system (GIS) shapefiles, it will be possible to directly import the recharge rates into the model to
6 define the areal distribution of groundwater recharge rates.

7 Groundwater discharge from the modeling area occurs by pumping water supply wells, from springs
8 and seeps along the shoreline, and outflow from the seafloor. According to the USGS (Izuka et al.
9 2016), the CWRM database of user-reported water withdrawals was used to compile groundwater
10 pumping information that is applicable and useful for refining the model. For the period after 2000,
11 the USGS worked closely with CWRM to ensure that the most current data were analyzed for the
12 2016 USGS study (Izuka et al. 2016). Withdrawal values for wells with data, along with well-
13 construction information, were compiled from CWRM's database. Even though the report by Izuka
14 and others does not contain the pumping information for individual wells, that information should be
15 available by request from the USGS and/or the CWRM and is essential for refining the groundwater
16 flow model.

17 Natural groundwater discharge also occurs as diffuse seepage near the coast, but the estimated rates
18 of discharge from seeps and springs is not provided in the recent USGS reports (Engott et al. 2015;
19 Izuka et al. 2016). A previous report by the USGS, however, does provide some information on
20 natural rates of groundwater discharge (Oki 2005). According to that report, discharge from the Pearl
21 Harbor springs is directly dependent on the head in the aquifer: Discharge is high when head in the
22 aquifer is high, and discharge is low when head in the aquifer is low. Using linear-regression
23 equations developed by Oki (1998), groundwater discharge rates from the major springs were
24 simulated in the regional groundwater flow model (Oki 2005). Model-simulated discharge from the
25 Pearl Harbor springs was approximately 137 mgd prior to historical development and declined
26 thereafter. From 1970 to early 1980, simulated discharge from the Pearl Harbor springs was in
27 general agreement with measured discharges. After the early 1980s, however, simulated spring
28 discharge generally was higher than measured spring discharge. These model-simulated values
29 appear to be applicable and useful for refining the Red Hill model. However, the USGS report
30 identified groundwater discharge rates as uncertainties in the model (Oki 2005). Better estimates of
31 groundwater discharge from seeps and springs along the shoreline and along the seafloor may be
32 available from the USGS modeling studies that are currently underway.

33 **3.1.6 Groundwater Contaminant Fate and Transport Parameters**

34 As is true for the aquifer hydraulic properties, little additional information has been obtained since
35 2007 for the CF&T modeling parameters. Information used for the existing 2007 CF&T model is
36 applicable and useful for the CF&T model refinement but uncertainties remain for some solute
37 transport parameters, and the extent of NAPL contributing to COPCs in the groundwater table. Site-
38 specific values for effective porosity and dispersivity of the aquifer are still uncertain and estimated
39 based on regional studies. Site-specific values for COPC sorption and degradation rates have not
40 become available since the 2007 model.

41 A more recent groundwater modeling study by the USGS (Rotzoll 2012) assigned solute transport
42 parameter values based on previous regional studies (Oki 2005). For the volcanic rock and caprock
43 aquifers, effective porosity values used in the newer model were 0.04 and 0.1, respectively (Rotzoll
44 2012). For the volcanic rock aquifer (Basalt HGU), Rotzoll (2012) assigned dispersivity of 164 ft in
45 the longitudinal horizontal direction, 8.2 ft in the transverse horizontal direction, and 0.8 ft in the

1 vertical direction. For the Caprock HGU, Rotzoll (2012) assigned dispersivity values of 33 ft in the
2 longitudinal direction, 1.6 ft in the transverse direction, and 0.2 ft in the vertical direction. These
3 values differ from those used by Rotzoll and El Kadi for the 2007 Red Hill model (DON 2007b);
4 however, no new data are available for these parameters.

5 Since 2007, additional information for fuel releases from the Facility has become available that are
6 applicable and potentially useful for refining the CF&T model, including estimates of the volume,
7 the type of fuel released, and tank leak location reported in January 2014. Groundwater monitoring
8 data from the Red Hill monitoring network show historical fuel leaks released petroleum-related
9 constituents to the groundwater, and indicate that TPH-d and naphthalene are the COPCs of primary
10 interest for CF&T modeling. Time series plots of the concentrations of COPCs and NAPs in the Red
11 Hill monitoring wells reflect mass loading, groundwater transport, and natural attenuation processes.

12 The available groundwater monitoring data are useful for establishing reasonable maximum COPC
13 concentrations in the source area and estimating other parameters for the CF&T modeling. For
14 instance, the spatial distribution of NAP concentrations will help characterize the nature and extent
15 of biological degradation and refine the CSM. The time series COPC data may also be useful in
16 estimating decay rates for these constituents if they are detected in a well directly downgradient of
17 the source area. For example, after calibration of the MODFLOW model, the decay rate caused by
18 biodegradation may be estimated by initially running the MODFLOW/MT3DMS model with the
19 advection and dispersion parameters held constant as the degradation rate parameter is adjusted to
20 obtain agreement with the observed COPC concentrations through time at a well near the
21 contaminant source and those at a well located directly downgradient from the source.

22 Available data for COPC concentrations include laboratory analyses of specific compounds likely to be
23 the major components of TPH, which include BTEX and PAHs such as naphthalene. These data are
24 applicable and useful for the CF&T model refinement. However, the elevated TPH concentrations in
25 the source area greatly exceed the sum of the individual compounds analyzed to date.

26 **3.2 CHEMICAL DATA**

27 Chemical data considered for use in the CF&T model will focus primarily on the following
28 constituents, spanning from 2005 to present: TPH-g, TPH-d, TPH-o, 1-methylnaphthalene,
29 2-methylnaphthalene, and naphthalene. Groundwater samples are presumed to have been collected in
30 accordance with protocols that align with proper groundwater sampling practices, and therefore
31 analytical results should be representative groundwater samples. To support the validity of the output
32 of the model within the confines of use for input into the groundwater flow model, data quality
33 assessments (i.e., evaluation of PARCC parameters [precision, accuracy, representativeness,
34 completeness, and comparability]) of previous groundwater monitoring reports were reviewed, if
35 available. In addition, analytical laboratory reports were reviewed to determine what laboratory
36 accreditation programs the analytical laboratory participated in, such as the National Environmental
37 Laboratory Accreditation Program (NELAP) and the Department of Defense Environmental
38 Laboratory Accreditation Program (DoD-ELAP).

39 NELAP relies on consensus standards (TNI 2016) that incorporate International Organization for
40 Standards [ISO] / International Electrotechnical Commission [IEC] 17025:2005[E], *General*
41 *requirements for the competence of testing and calibration laboratories*), representing the best
42 professional practices in the environmental laboratory industry to establish the requirements for this
43 program. Participation in NELAP by analytical laboratories ensures that data generated will be of a
44 known and documented quality.

1 DoD-ELAP accreditation further extends compliance beyond the standards in Volume 1 of TNI
2 Standards to include requirements specified in the DoD *Quality Systems Manual (QSM) for*
3 *Environmental Laboratories* (DoD QSM) (DoD 2013). Analytical laboratories participating in
4 DoD-ELAP means that the laboratory is capable of meeting the requirements specified in the DoD
5 QSM.

6 Prior to January 2008, the analytical laboratory analyzing groundwater samples for the Red Hill
7 project is unknown, and groundwater reports were not available for review.

8 *February 2005 – September 2005:* Groundwater samples were collected during four quarterly
9 monitoring events following sampling procedures in the contemporary *Project Procedures Manual,*
10 *US Navy PACDIV Installation Restoration Program* (DON 1998). The samples were submitted to
11 and analyzed by Columbia Analytical Services (CAS). CAS maintains a formal Quality
12 Assurance/Quality Control (QA/QC) program outlined in the laboratory's Quality Assurance Plan
13 (QAP), and analyzed the samples following the requirements of the National Environmental
14 Laboratory Accreditation Conference (NELAC) standards for all analytical methods used. Samples
15 were analyzed using EPA SW-846 methods 8270C SIM for PAHs, 8015B for TPH-g, TPH-d, and
16 TPH-o, 8260B for VOCs (BTEX, MtBE, and 1,2-dichloroethane only), and 6020 for total and
17 dissolved metals, and EPA method 504.1 for EDB. EPA Level II data packages were provided; thus,
18 limited data reviews are possible, and data quality assessments were not conducted as part of the
19 monitoring reports prepared by Dawson.

20 *September 2005 and July 2006:* Groundwater samples were collected by TEC as part of site
21 investigation activities during a Phase I (September 2005) and Phase II (July 2006) groundwater
22 sampling and natural attenuation parameter study. The samples were analyzed by Accutest
23 Laboratories Southeast (ALSE) and TestAmerica Laboratories, Inc. (TestAmerica) (also previously
24 known as Oceanic Laboratories) following NELAC standards and using EPA SW-846 methods, EPA
25 method RSK 175, and EPA Methods for the Chemical Analysis of Water and Wastes (MCAWW) as
26 applicable. Analytical data for both Phase I and Phase II events were validated by a third-party
27 validator (Laboratory Data Consultants, Inc. [LDC]). LDC conducted EPA Level III and Level IV
28 review and flagged data in accordance with the contemporary EPA Contract Laboratory Program
29 (CLP) National Functional Guidelines (NFG) for Organic Data Review (EPA 1999) and EPA CLP
30 NFG for Inorganic Data Review (EPA 2004). Data were considered usable, and therefore are
31 considered suitable for consideration for inclusion in the groundwater flow and CF&T modeling
32 effort.

33 *July 2006 – September 2007:* Groundwater samples were collected by TEC during two semiannual
34 groundwater sampling events in 2006 and three events in 2007. All samples were submitted to ALSE
35 for analysis following NELAC standards and using EPA SW-846 methods. EPA Level III data
36 packages were provided by ALSE, though data quality assessments were not conducted as part of the
37 monitoring reports. Based on review of the laboratory data, the data are considered suitable for
38 consideration for inclusion in the groundwater flow and CF&T modeling effort.

39 *January 2008 – July 2010:* Groundwater samples were analyzed by SGS Environmental Services
40 Inc., Alaska Division in Anchorage, Alaska. SGS maintains a formal QA/QC program outlined in the
41 laboratory's QAP. SGS has NELAP certifications for analytical methods 8270D-SIM for PAHs and
42 AK102/103 (the Alaska method version of 8015) for TPH-d. Data quality assessments were not
43 conducted as part of the TEC monitoring reports (DON [RH GM reports]). However, EPA Level II
44 data packages were provided, and limited data reviews are possible.

1 *October 2010 – July 2012:* Groundwater samples were analyzed by Agriculture and Priority
2 Pollutants Laboratories Inc. (APPL). APPL is DoD-ELAP- and NELAP-approved to conduct
3 analysis of PAHs and TPH-d by methods 8270D-SIM and 8015B, respectively. Environet, Inc.
4 (Environet) performed limited data review, which consisted of an evaluation of compliance with
5 laboratory control limits and adherence to a field QC program as specified in the associated WP/SAP
6 (DON 2010b). APPL laboratory reports are inconsistent on whether the laboratory employed DoD
7 QSM requirements or NELAP requirements only. The Environet data assessments concluded that all
8 data generated for each event were suitable for intended use based on the limitations called out in
9 each report. Therefore, the data generated by APPL are considered suitable for consideration for
10 inclusion in the groundwater flow and CF&T modeling effort.

11 *October 2012 – January 2015:* Groundwater samples were analyzed by Eurofins|Calscience formally
12 known as Calscience Environmental Laboratories, Inc. (CEL). CEL is DoD-ELAP- and NELAP-
13 approved to conduct analysis of PAHs and TPH-d by methods 8270C-SIM and 8015B (M),
14 respectively. Analytical laboratory reports indicate that work was performed in accordance with the
15 NELAP specifications unless otherwise noted, and control limits specified in the analytical
16 laboratory reports suggest that DoD QSM requirements were not followed. Environmental Science
17 International, Inc. (ESI) performed limited data reviews in accordance with their WP/SAP (DON
18 2012), which concluded that all data generated for each event were suitable for intended use based
19 on the limitations called out in each report. Therefore, the data generated by Eurofins|Calscience are
20 considered suitable for consideration for inclusion in the groundwater flow and CF&T modeling
21 effort.

22 *April 2015 – July 2016:* Groundwater samples were analyzed by Analytical Laboratory Services
23 (ALS) Environmental. ALS is DoD-ELAP- and NELAP-approved to conduct analysis of PAHs and
24 TPH-d by methods 8270C-SIM and 8015C, respectively. Analytical laboratory reports indicate that
25 work was performed in accordance with NELAP specifications unless otherwise noted, and control
26 limits specified in the analytical laboratory reports suggest that DoD QSM requirements were not
27 followed. Data reviews were performed by three reviewers over this period:

- 28 • ESI performed limited data reviews in accordance with their WP/SAP (DON 2012) for
29 samples collected in April and July 2015, which concluded that all data generated for
30 each event were suitable for intended use based on the limitations called out in each
31 report. Therefore, the data generated by ESI are considered suitable for consideration for
32 inclusion in the groundwater flow and CF&T modeling effort.
- 33 • Element Environmental, LLC performed limited data reviews in accordance with the
34 ESI 2012 WP/SAP (DON 2012) for samples collected in October 2015 through January
35 2016, which concluded that all data generated for each event were suitable for intended
36 use based on the limitations called out in each report. Therefore, the data generated by
37 Element Environmental, LLC are considered suitable for consideration for inclusion in
38 the groundwater flow and CF&T modeling effort.
- 39 • LDC performed a third-party review on the data generated from groundwater samples
40 collected in April and December 2016. LDC conducted a Level D review and flagged
41 data in accordance with the Navy *Project Procedures Manual* (DON 2015b) and as
42 specified in the DoD QSM (DoD 2013). Data were considered usable, and therefore are
43 considered suitable for consideration for inclusion in the groundwater flow and CF&T
44 modeling effort.

1 The output of the groundwater model is impacted not only by overall data quality but specifically
2 data comparability over the period in which data were generated. Data comparability for the
3 constituents to be used in the groundwater and CF&T model was not impacted by improved
4 sensitivities for their respective analytical methods. However, due to the inherent uncertainty
5 associated with EPA Method 8015, TPH results may be impacted by data comparability. Reported
6 results are impacted by several factors, which include laboratory-specific protocols for defining the
7 carbon range for TPH, an analyst's interpretation of TPH pattern, and how a TPH result is reported.
8 While TPH data have been considered usable based on data reviews performed, if anomalies are
9 identified upon modeling groundwater flow or CF&T, TPH data should undergo further review.

10 All laboratory data that were identified as not having undergone validation following the Navy
11 *Project Procedures Manual* (DON 2015b) or the DoD QSM (DoD 2013) used data qualifiers
12 specific to the WP or SAP used during that sampling event. As such, over time, there is an
13 inconsistent use of qualifiers. Data collected after July 2010 have undergone varied levels of review
14 in accordance with the referenced WP/SAPs, resulting in inconsistent use of flagging conventions
15 (i.e., application of data qualifiers). Data collected prior to 2010 had not undergone validation and
16 usability assessment similar to efforts done on data collected after 2010; thus, there are
17 inconsistencies between the data quality of the pre- and post-2010 data. Irrespective of the
18 inconsistencies, data reviewers found the data usable and applicable for their intended purpose.

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**Appendix A:
Data Tables
(Excel files on provided on CD-ROM or as PDF file attachments)**

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1 **APPENDIX A: DATA TABLES – CONTENTS AND REFERENCES**

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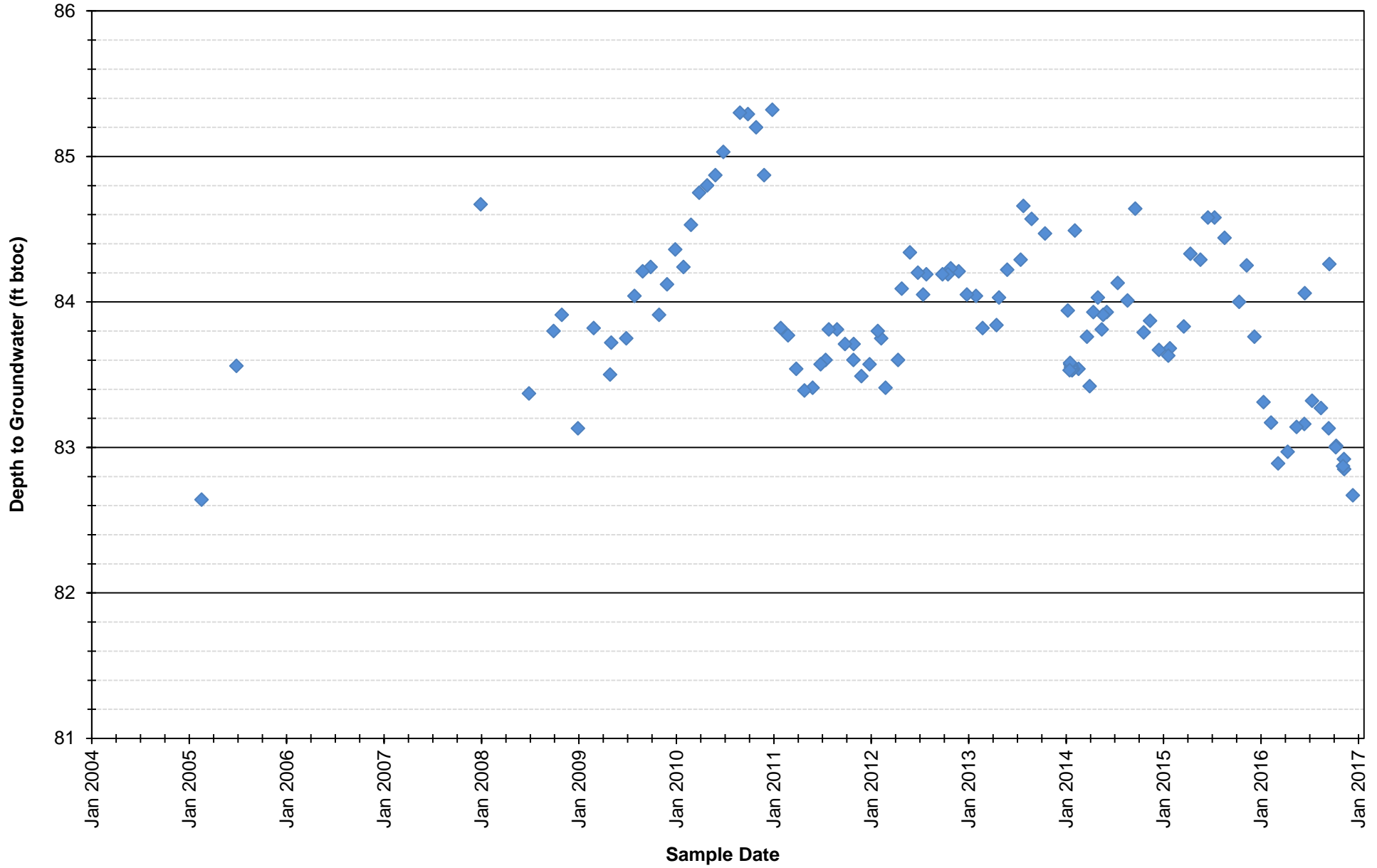
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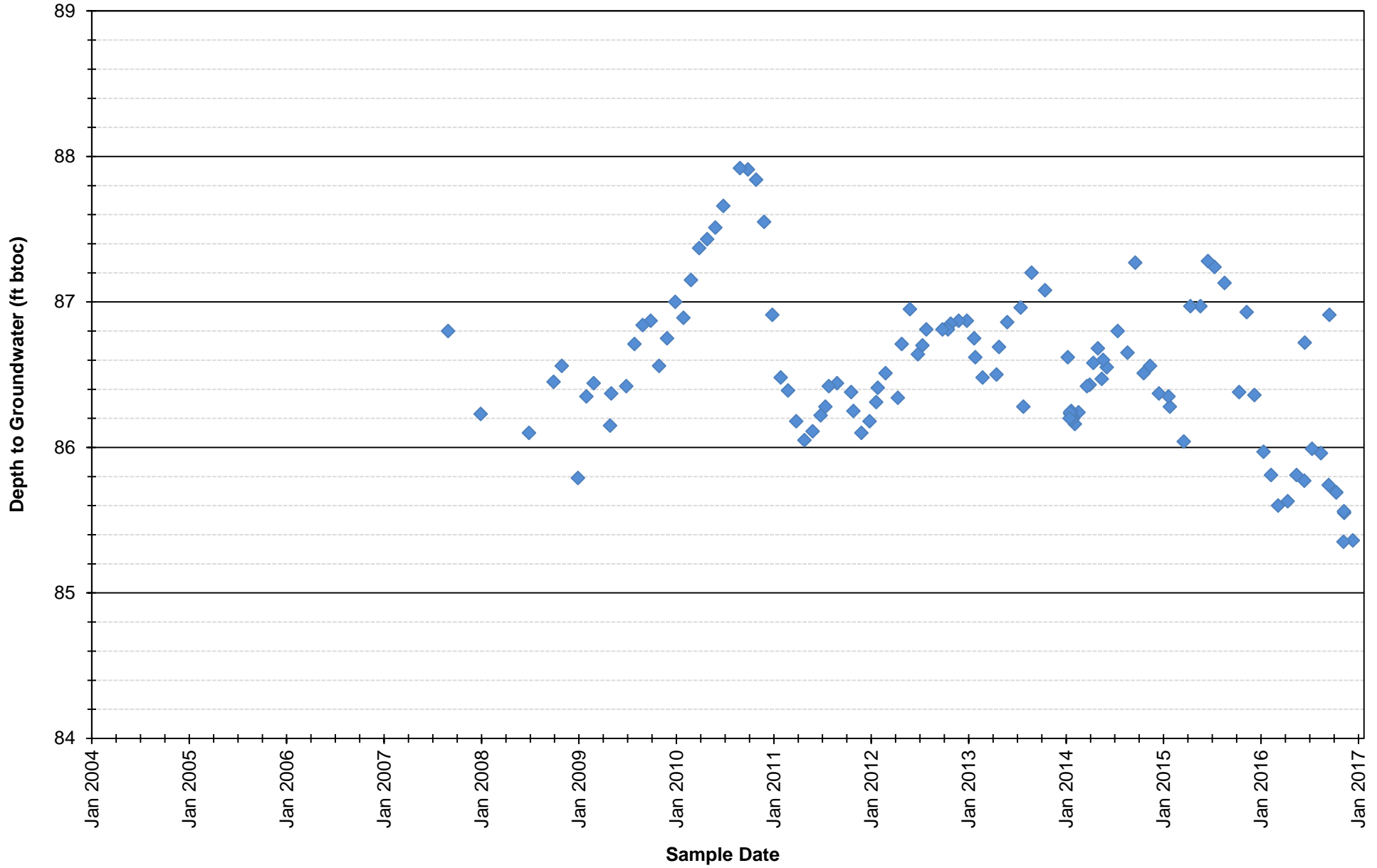
**Appendix B:
Depth to Groundwater Time-Series Charts
for Red Hill Groundwater Monitoring Wells
(data provided in Excel file on CD-ROM or as PDF file attachment)**

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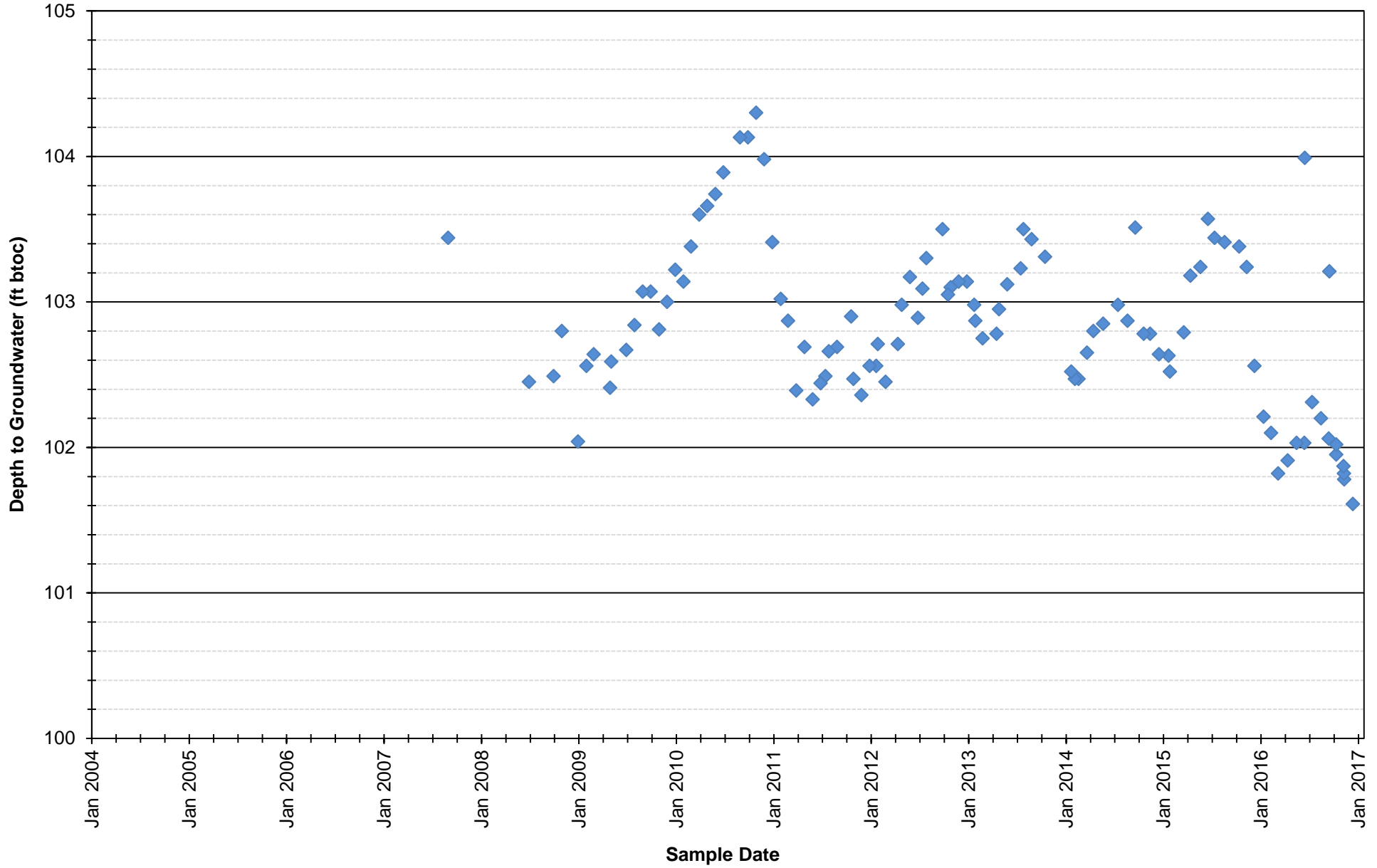
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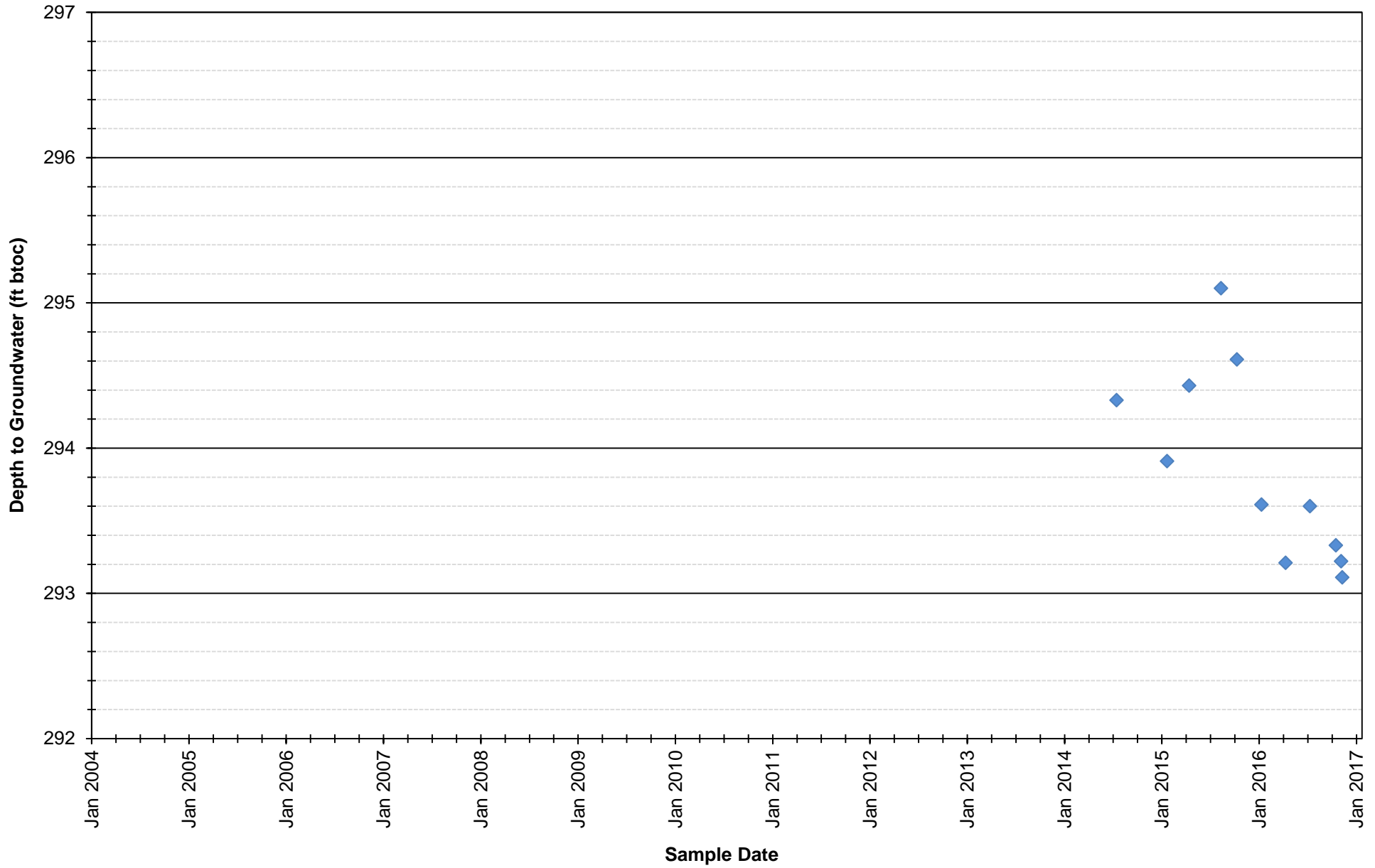
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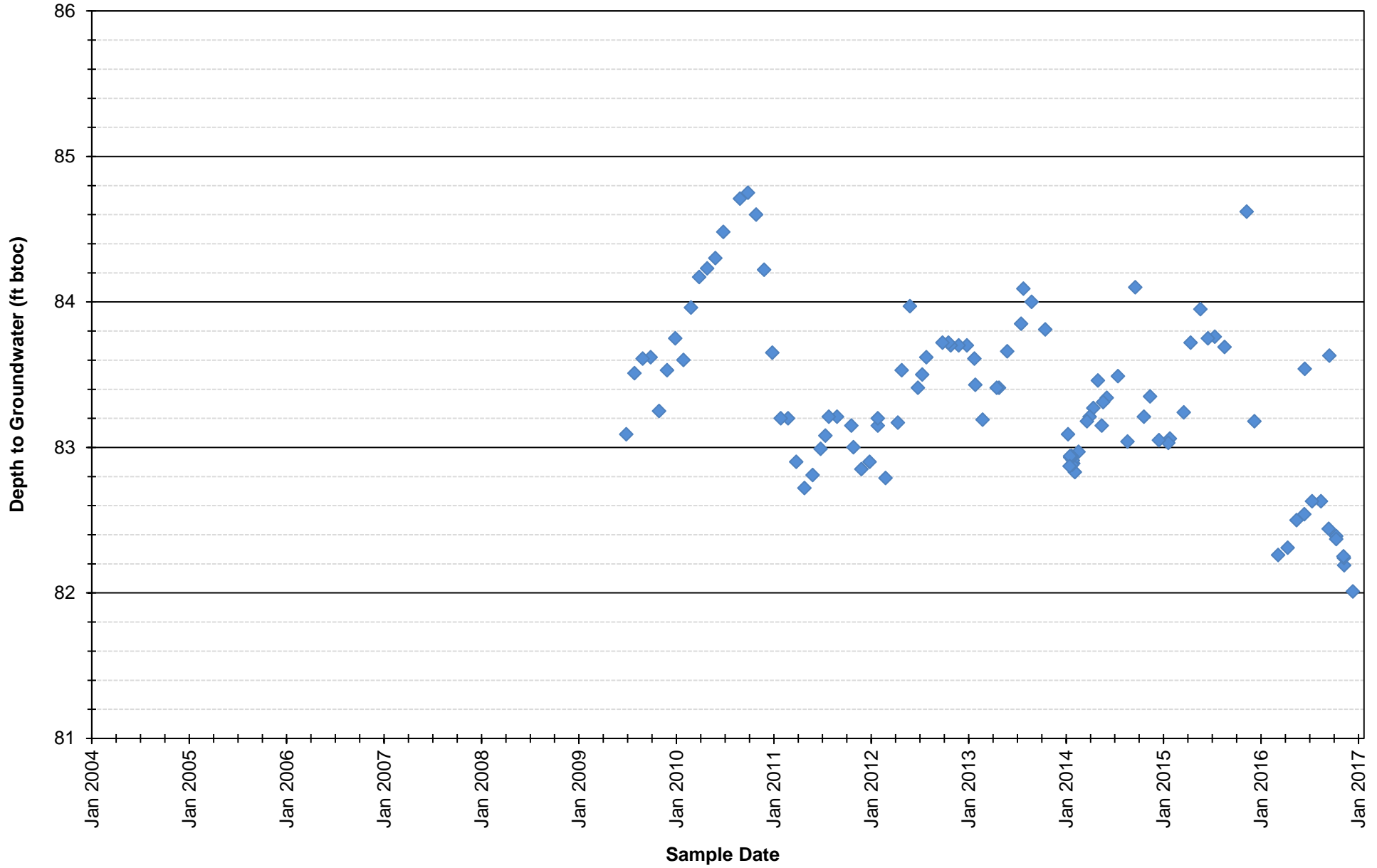
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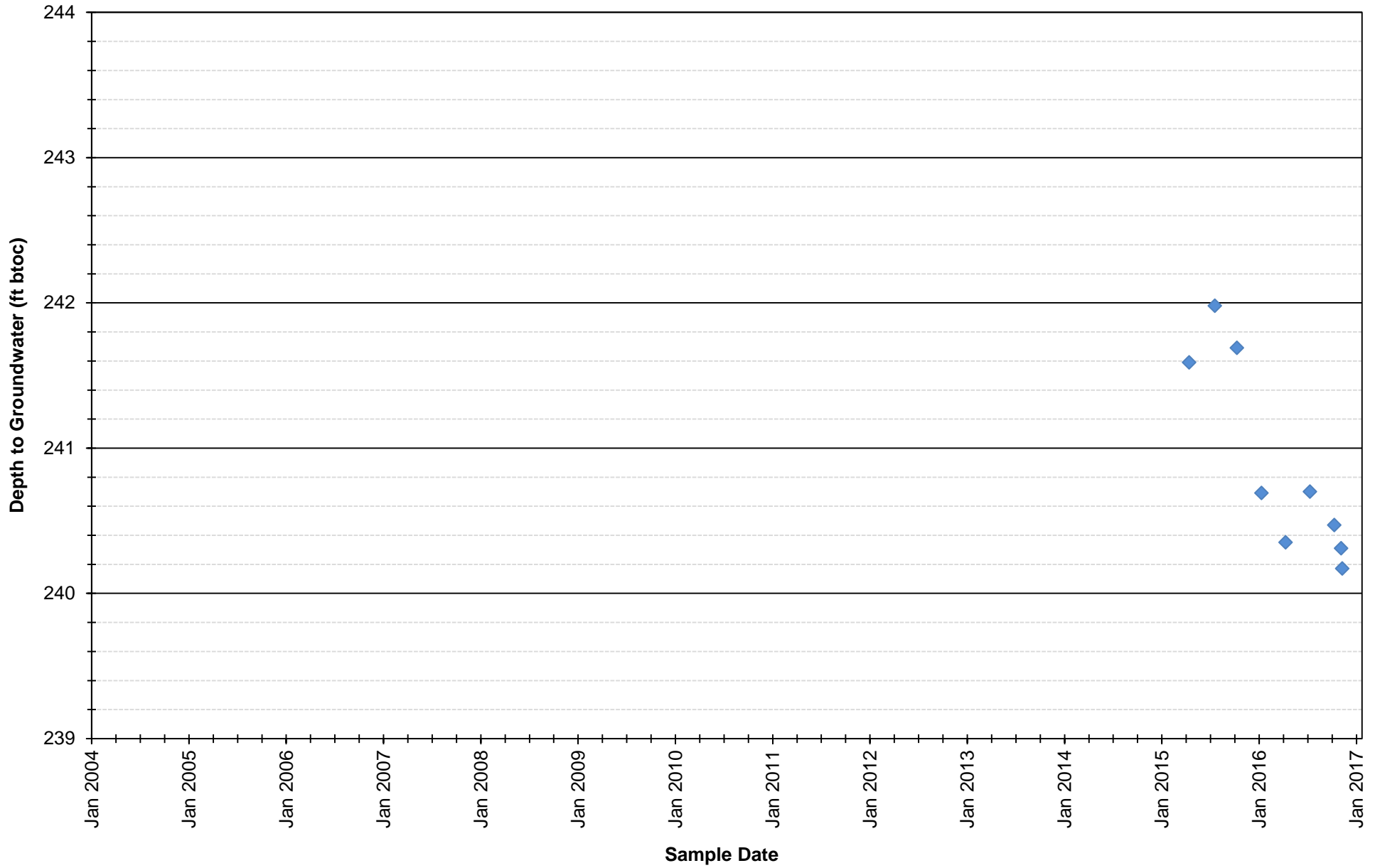
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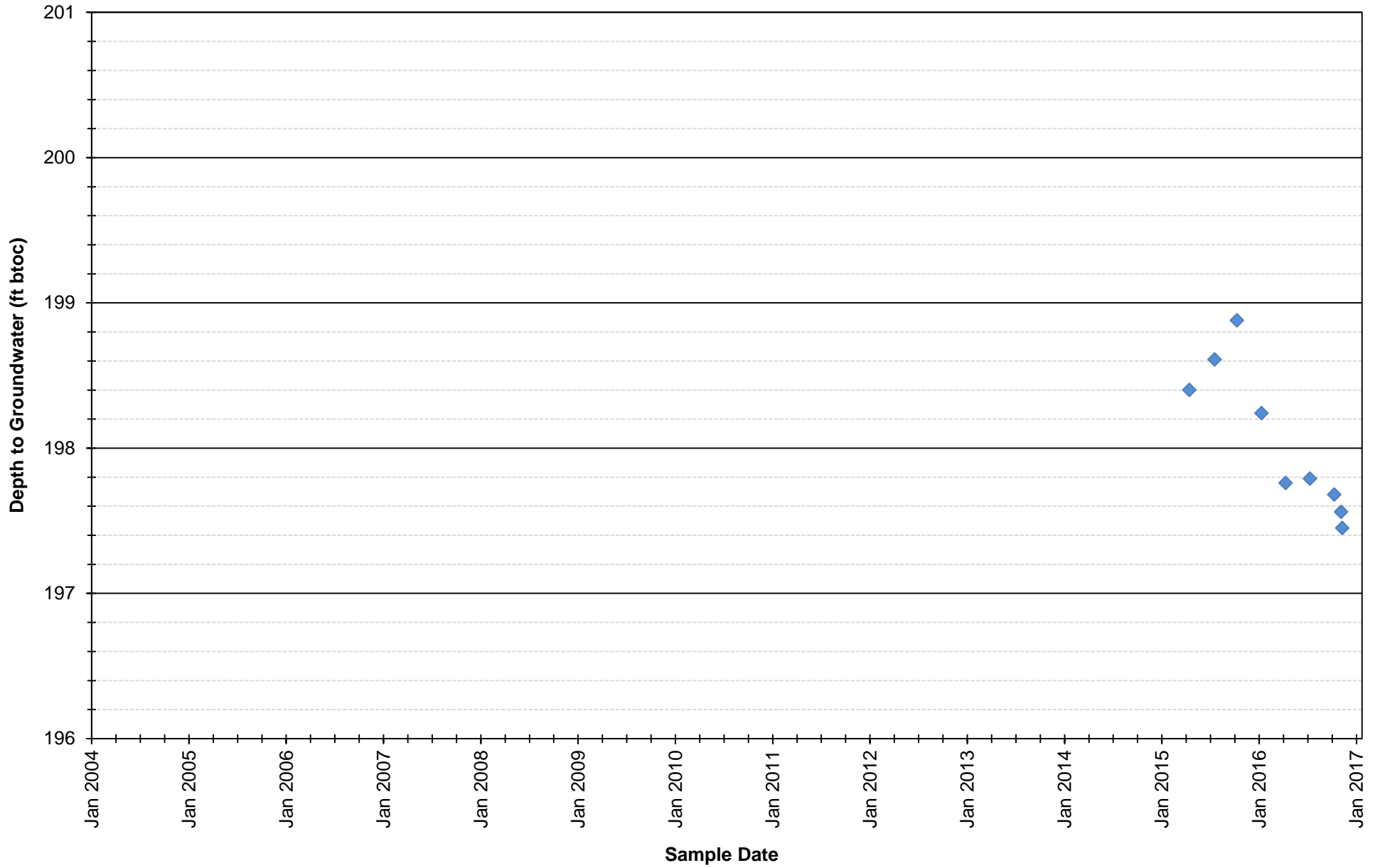
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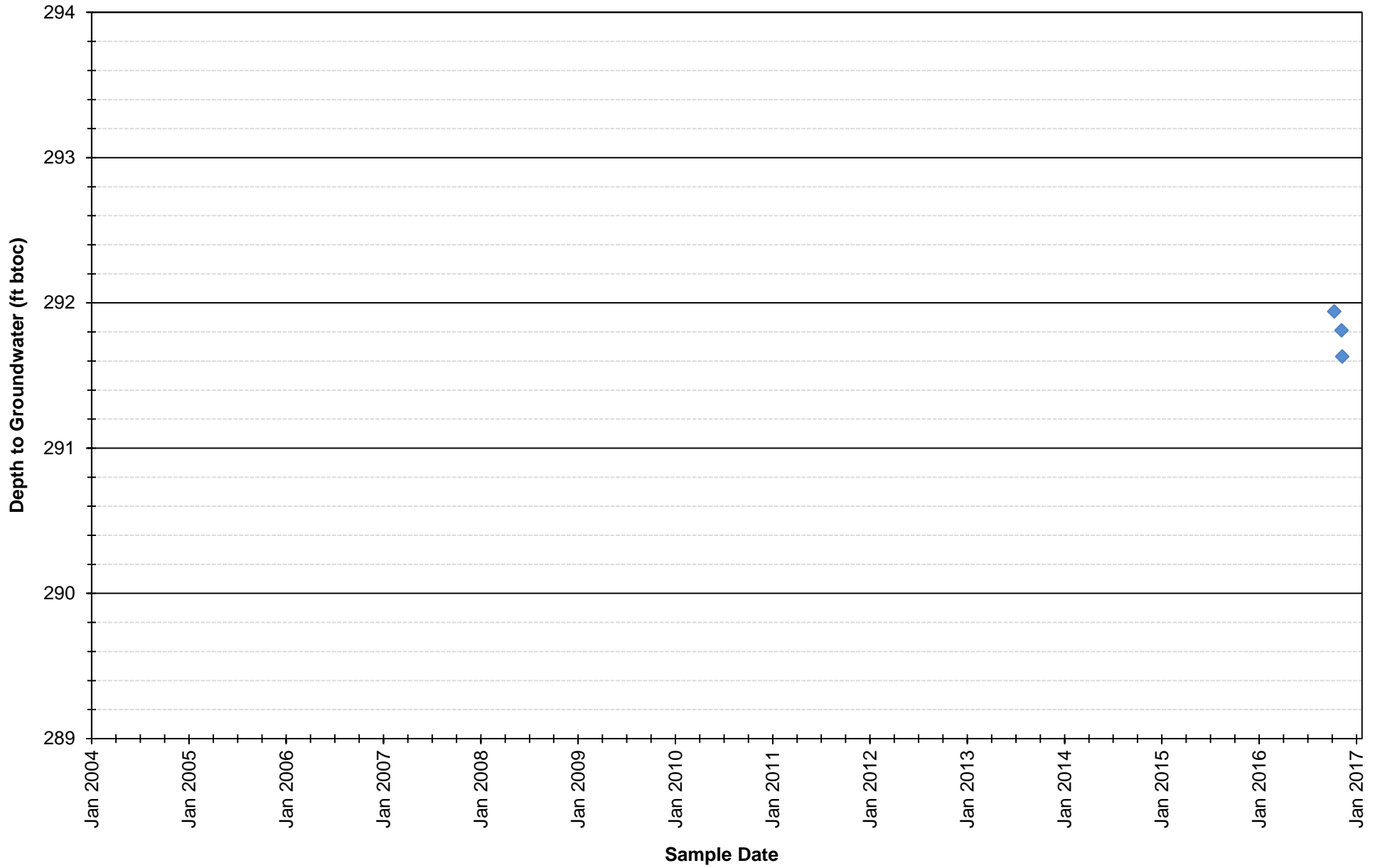
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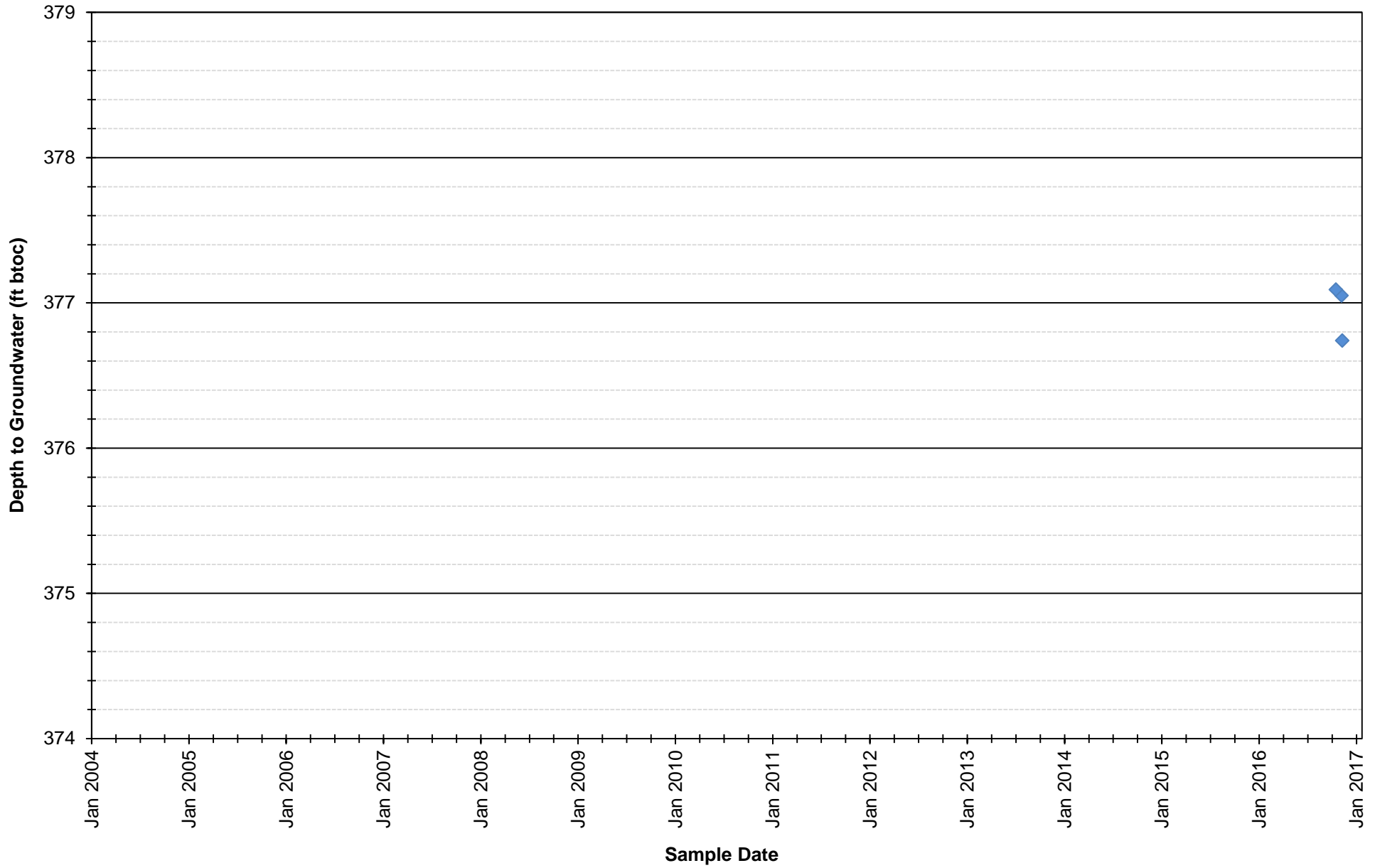
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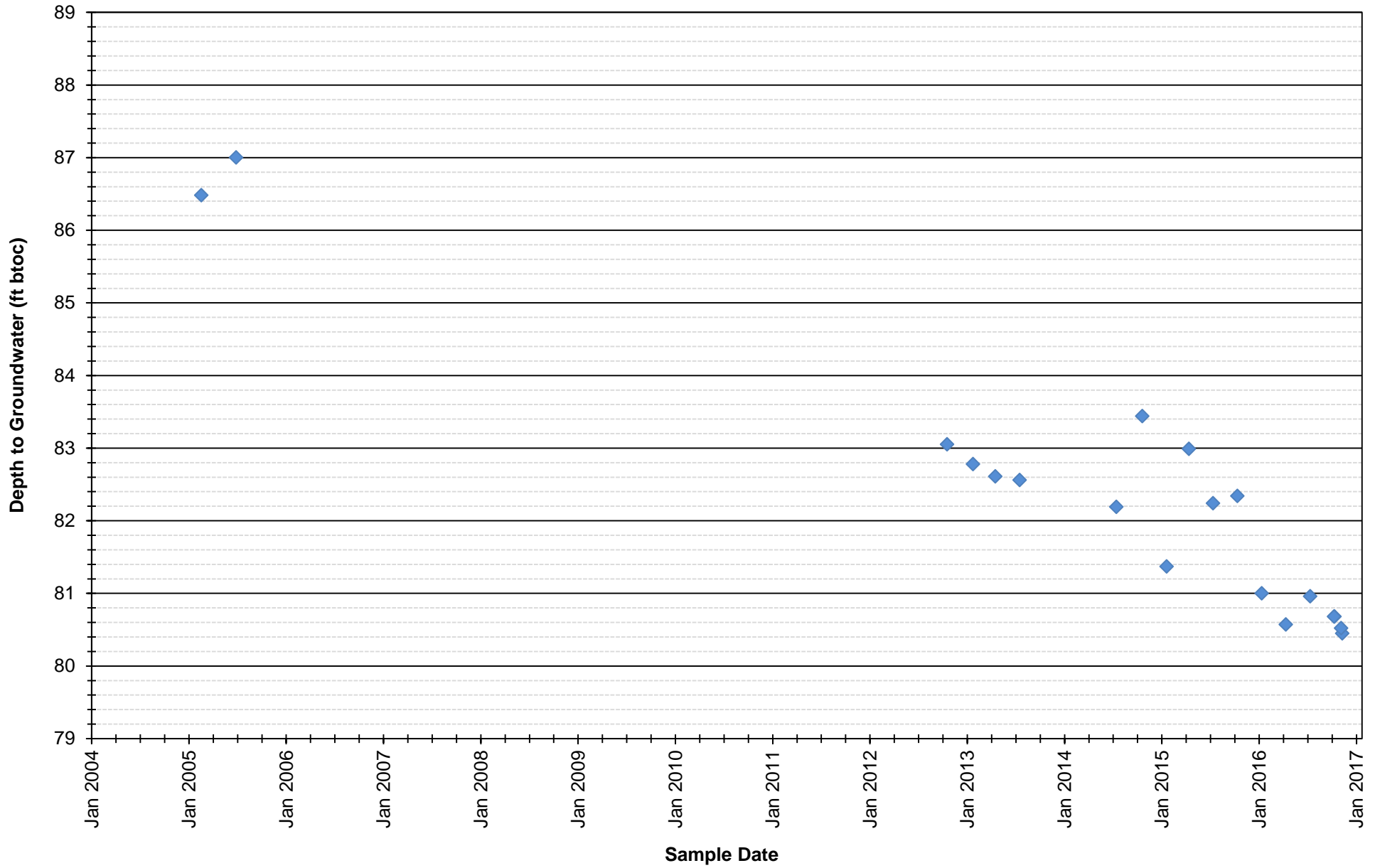
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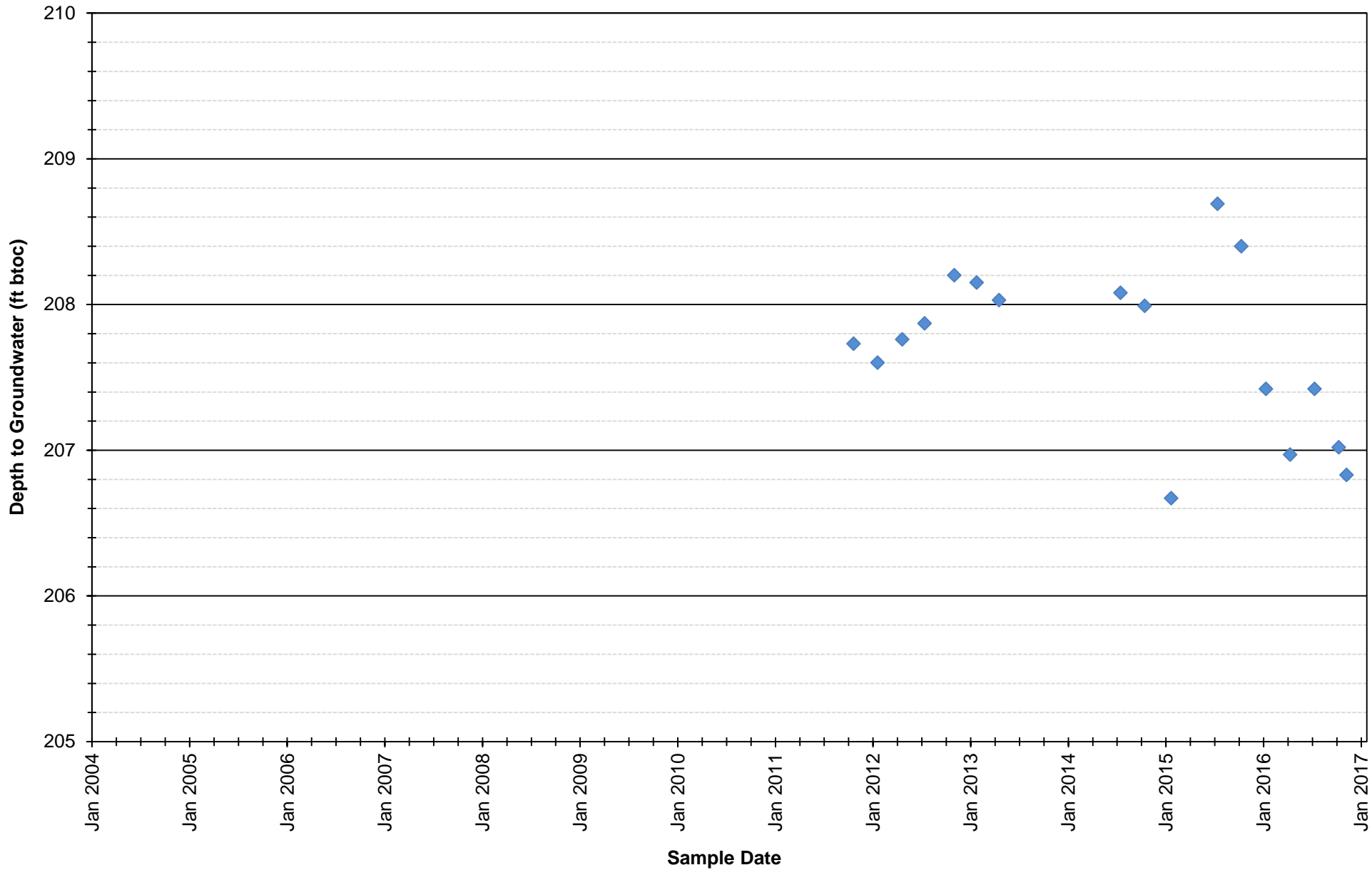
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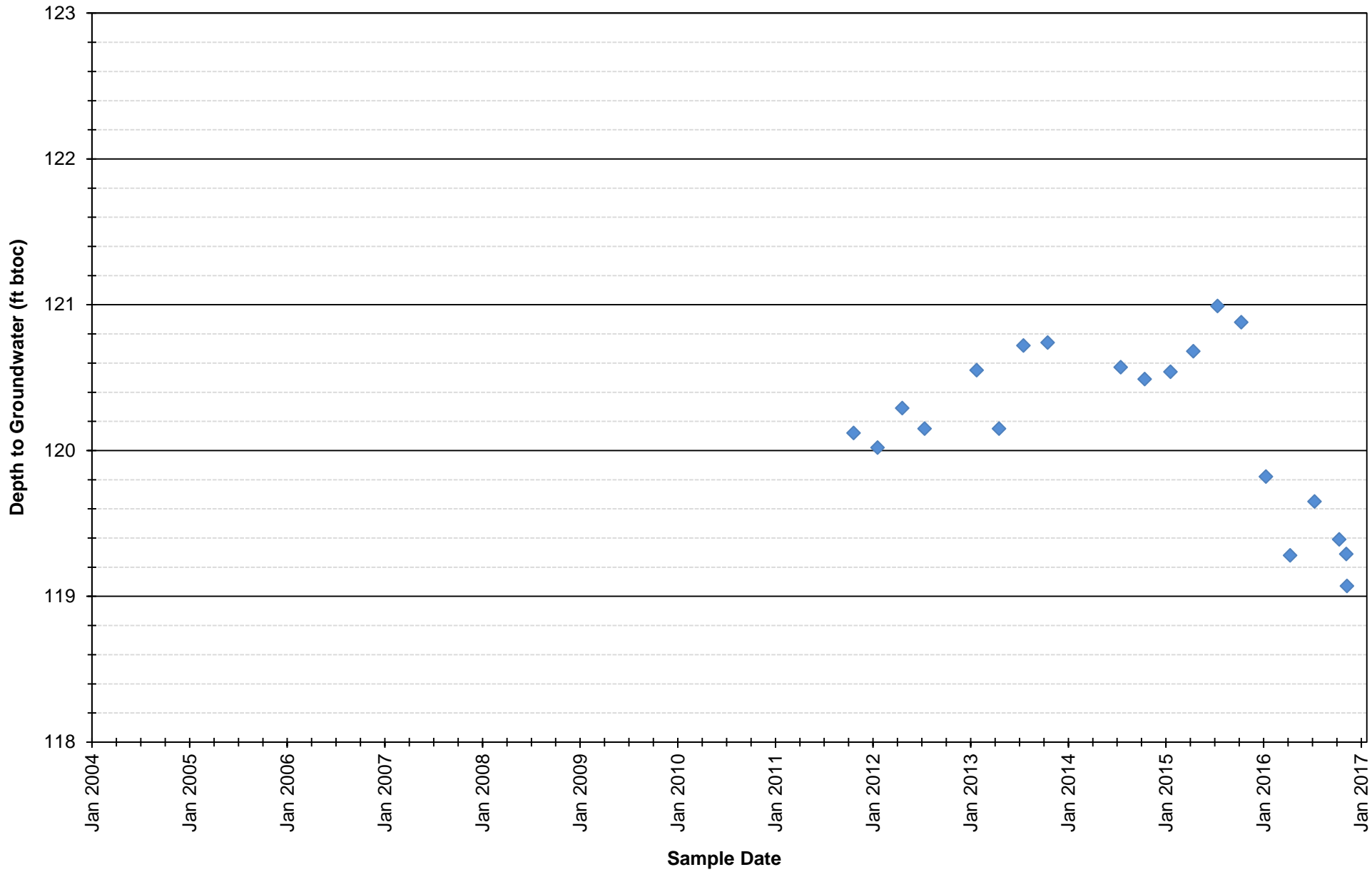
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Depth to Groundwater Time Series - HDMW2253-03



Depth to Groundwater Time Series - OWDFMW01

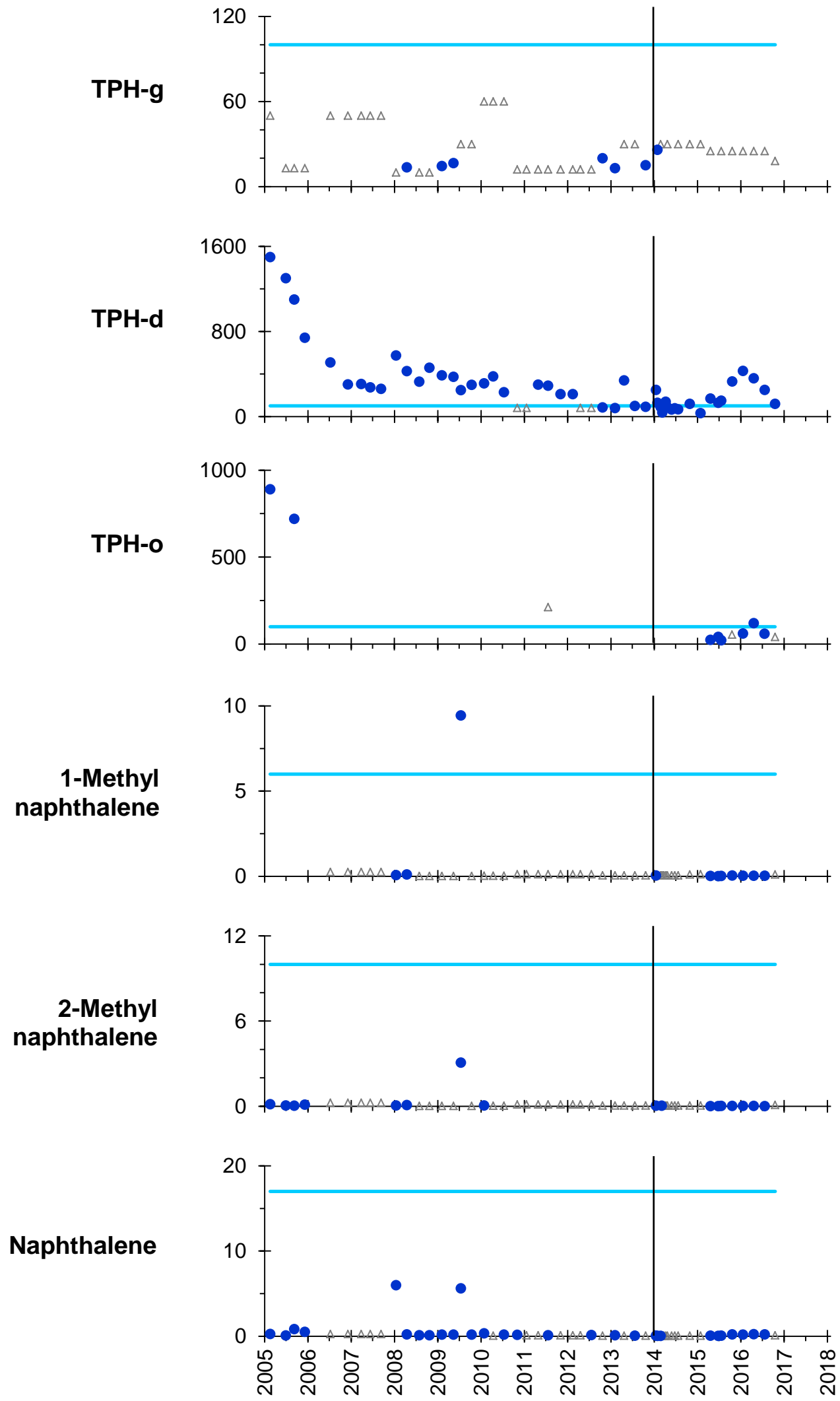


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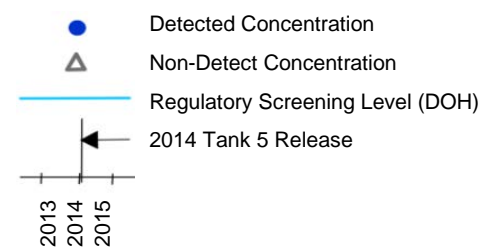
**Appendix C:
Historical Groundwater Concentration Trends
for Red Hill Groundwater Monitoring Wells
(data provided in Excel file on CD-ROM or as PDF file attachment)**

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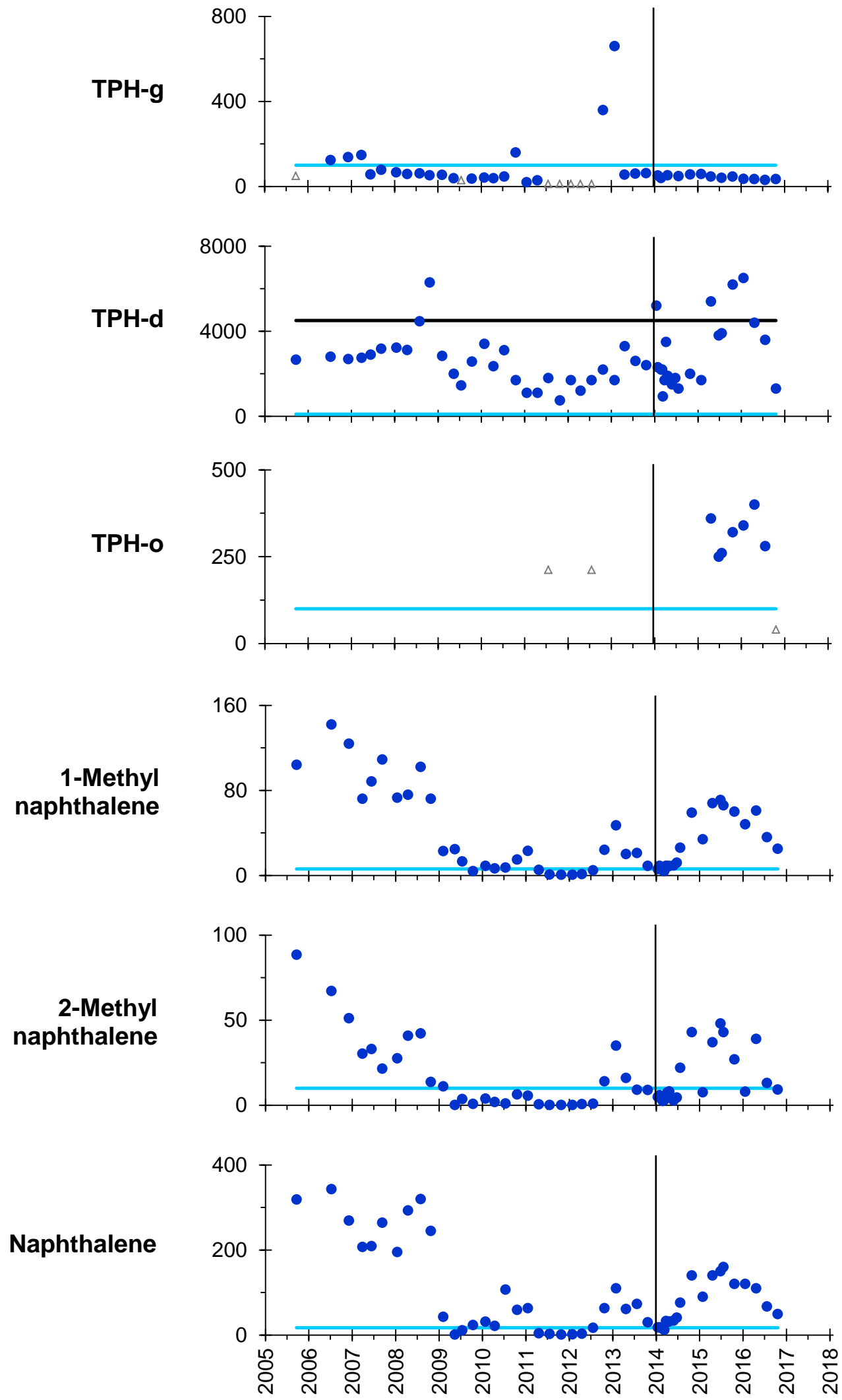
RHMW01



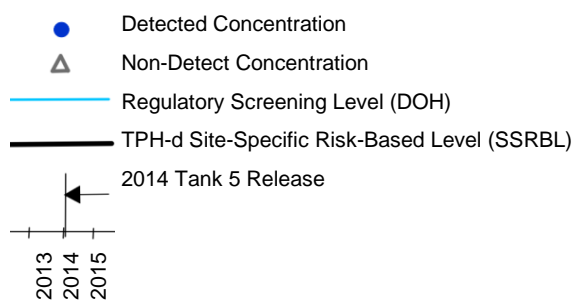
All results in micrograms per liter (µg/L or parts per billion [ppb]).



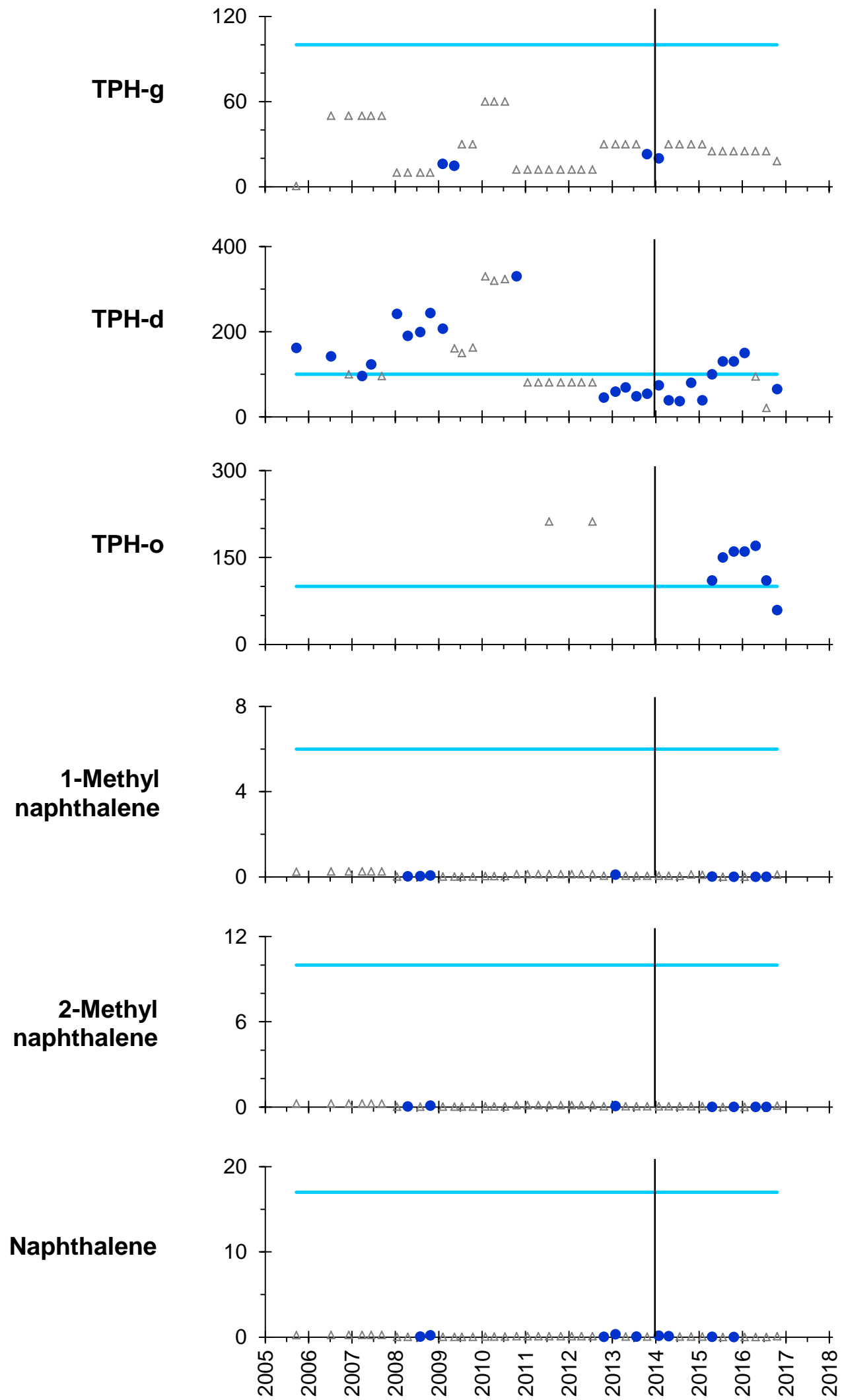
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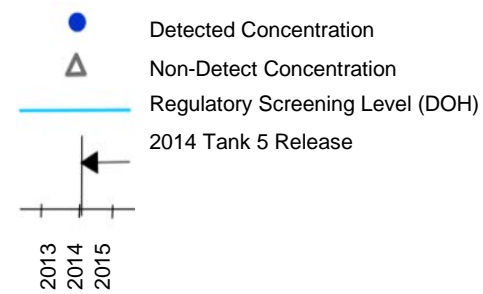
All results in micrograms per liter (µg/L or parts per billion [ppb]).



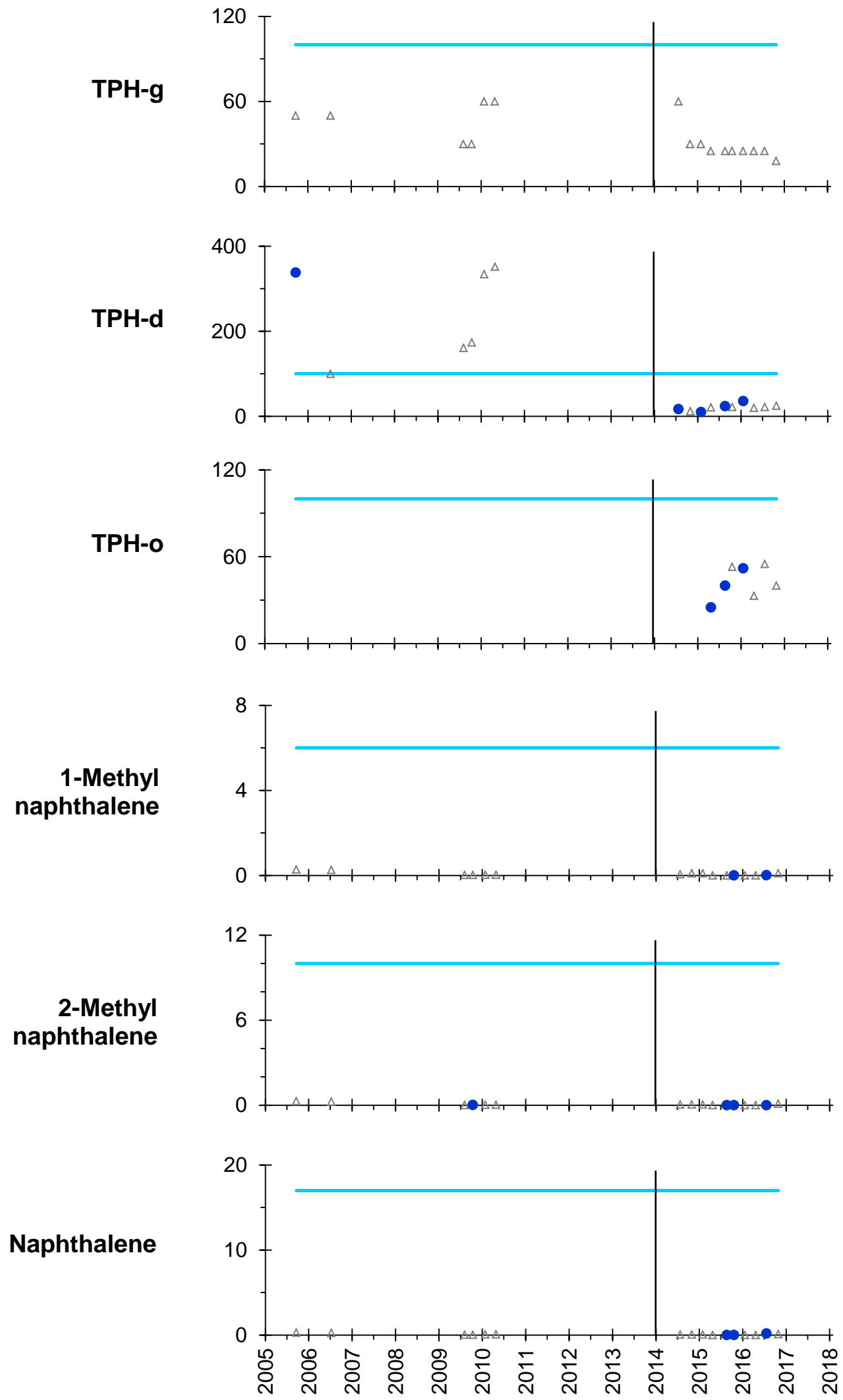
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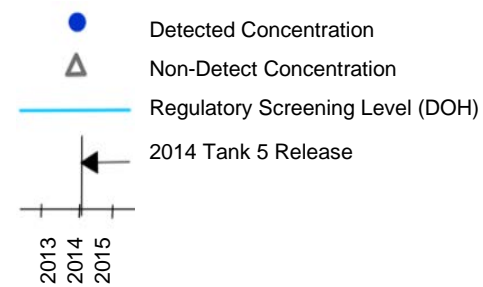
All results in micrograms per liter (µg/L or parts per billion [ppb]).



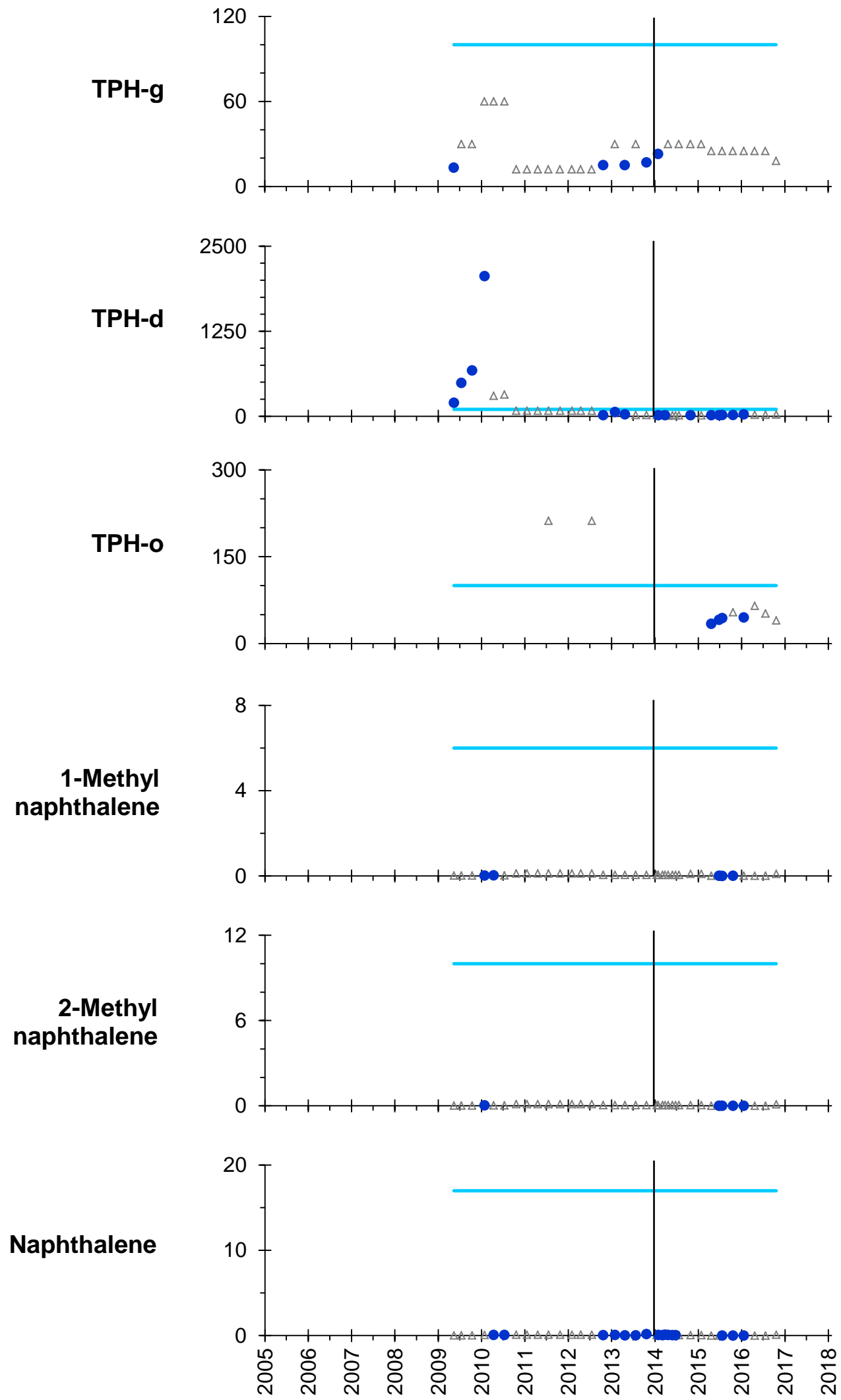
RHMW04



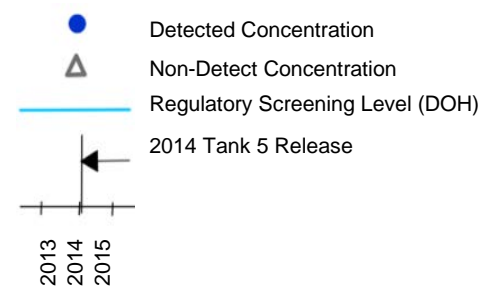
All results in micrograms per liter (µg/L or parts per billion [ppb]).



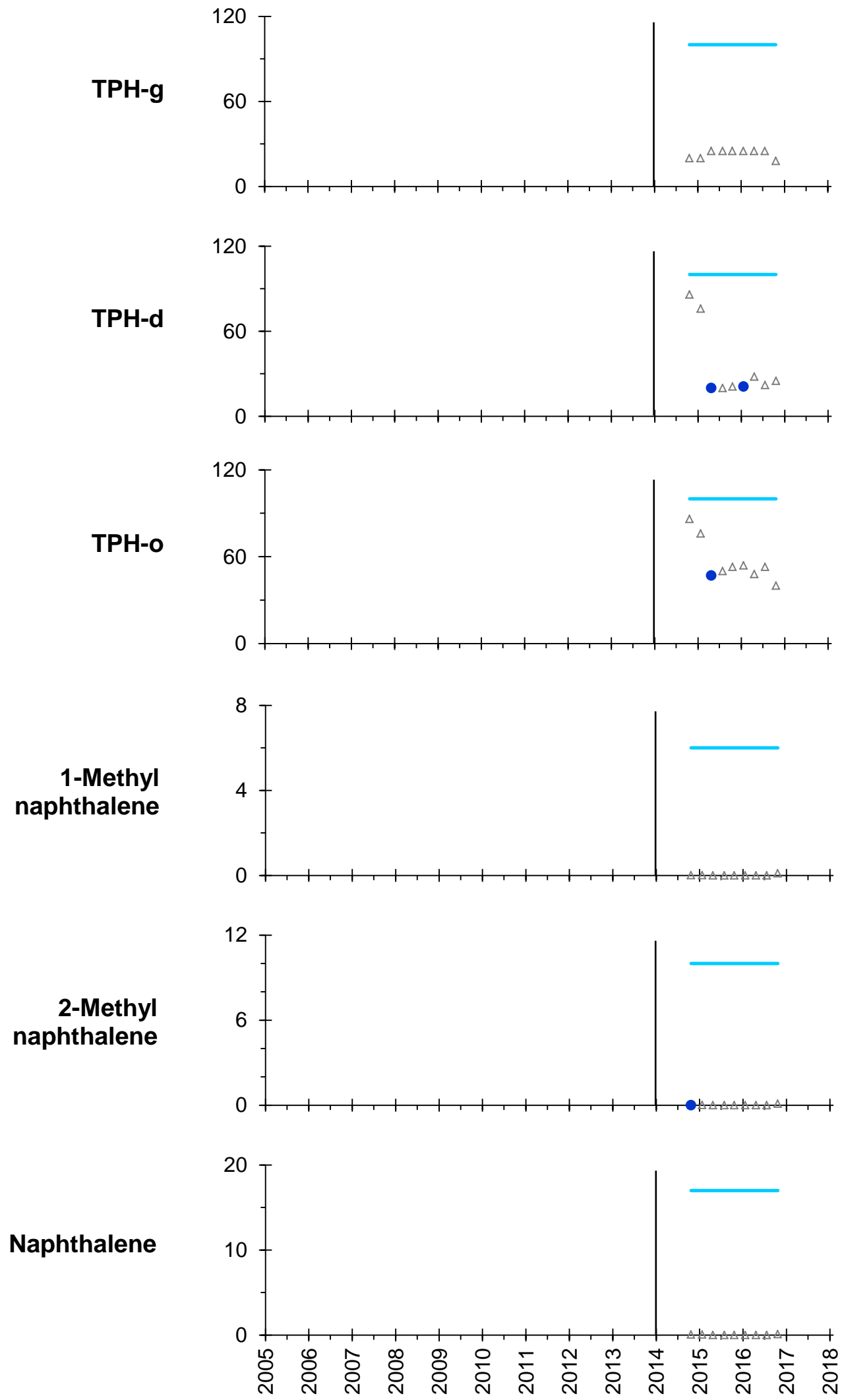
RHMW05



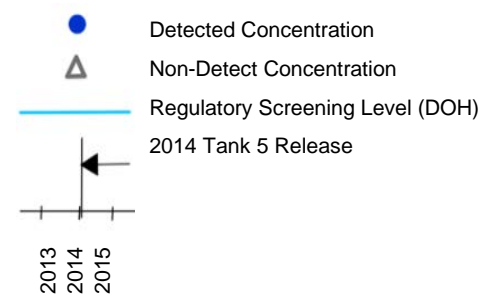
All results in micrograms per liter (µg/L or parts per billion [ppb]).



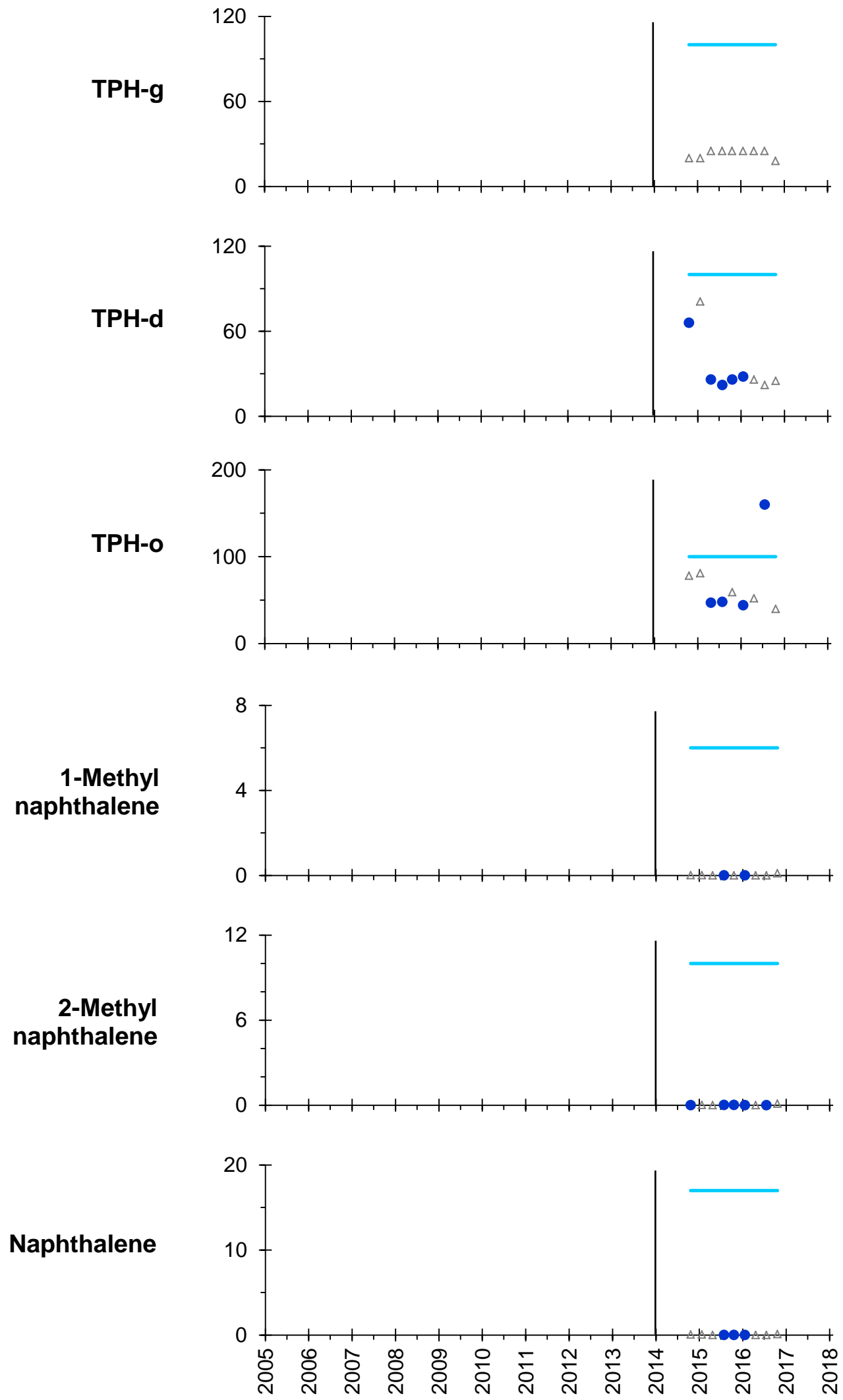
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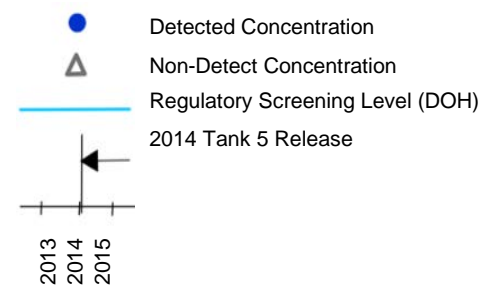
All results in micrograms per liter (µg/L or parts per billion [ppb]).



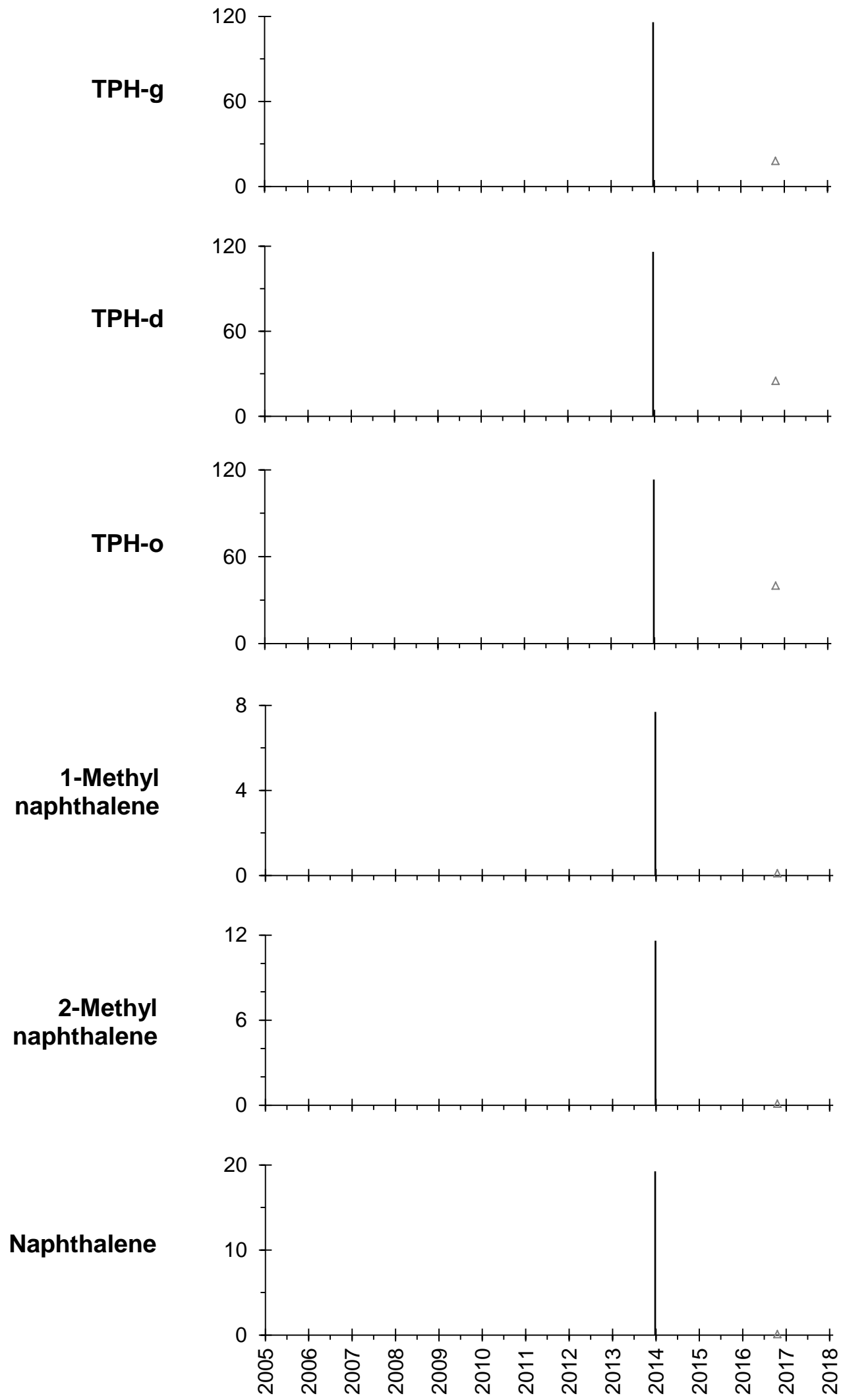
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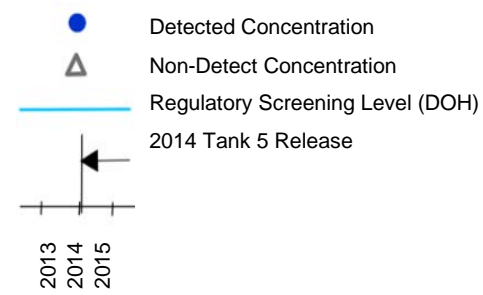
All results in micrograms per liter (µg/L or parts per billion [ppb]).



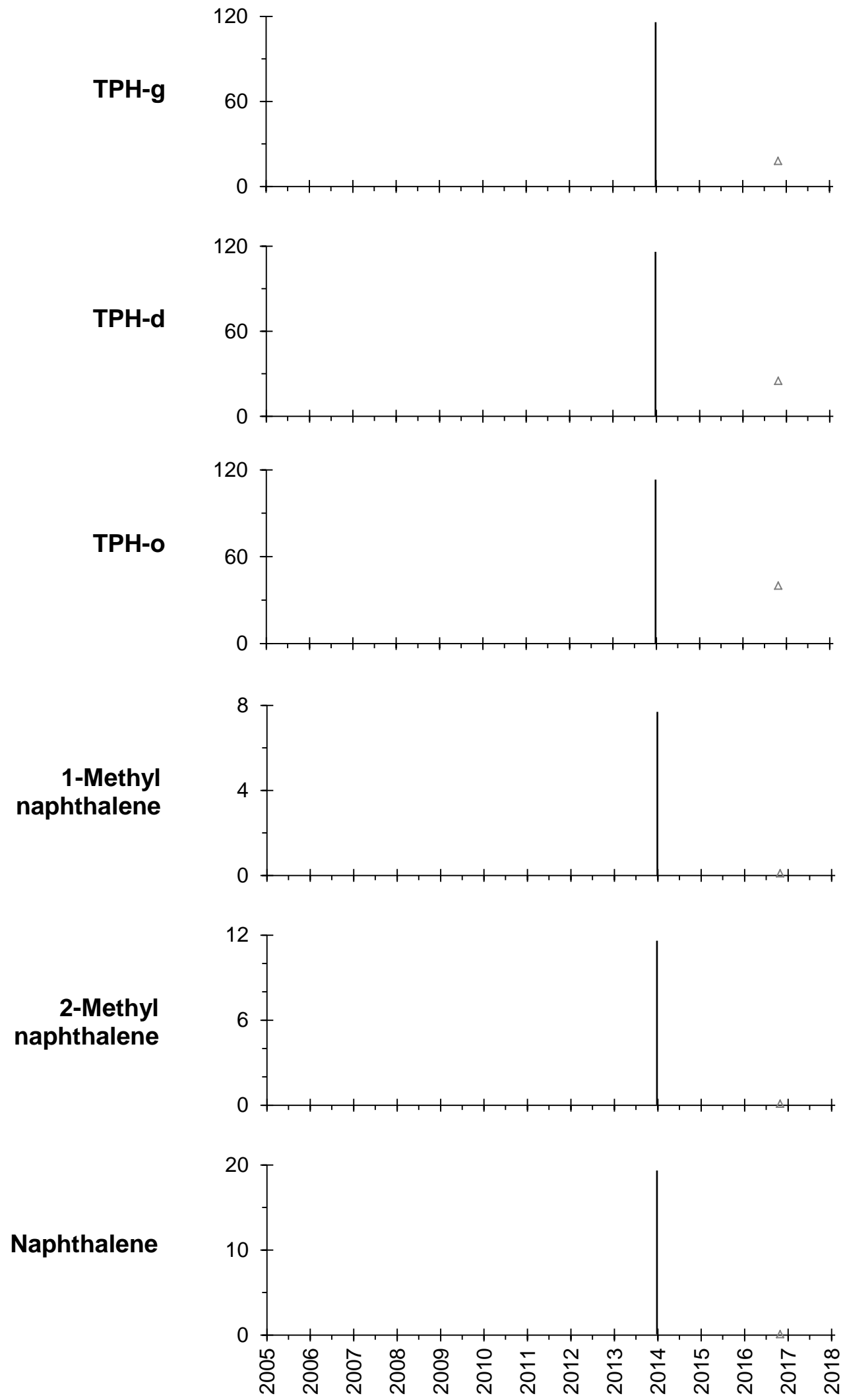
RHMW08



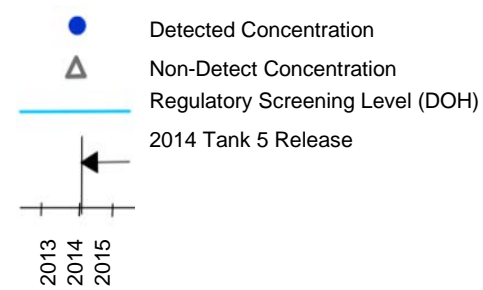
All results in micrograms per liter ($\mu\text{g/L}$ or parts per billion [ppb]).



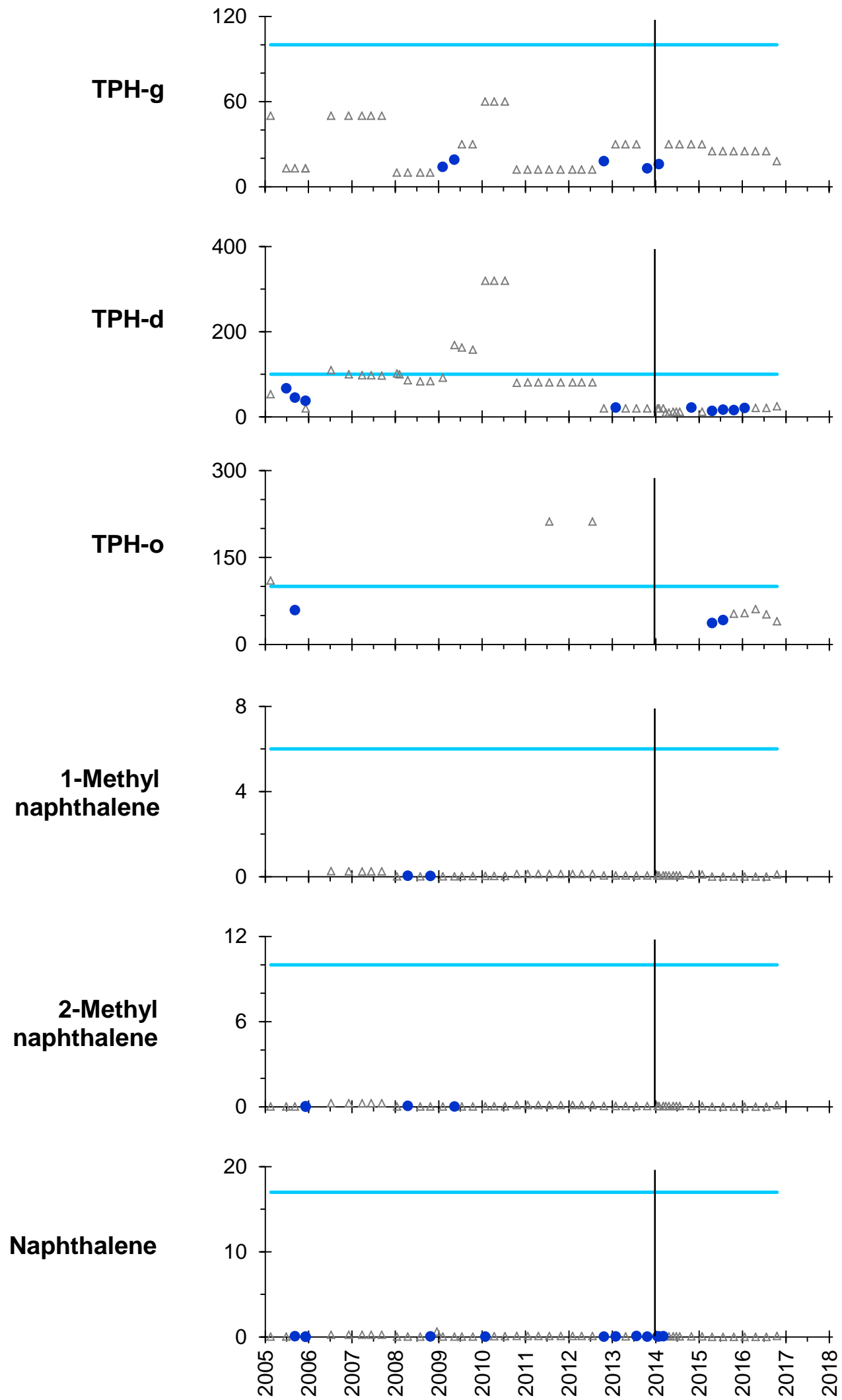
RHMW09



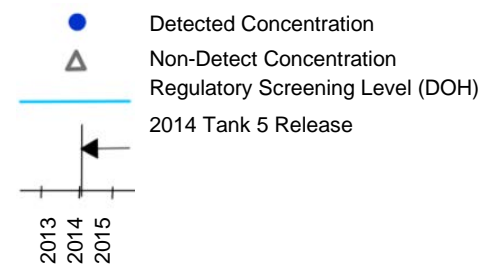
All results in micrograms per liter (µg/L or parts per billion [ppb]).



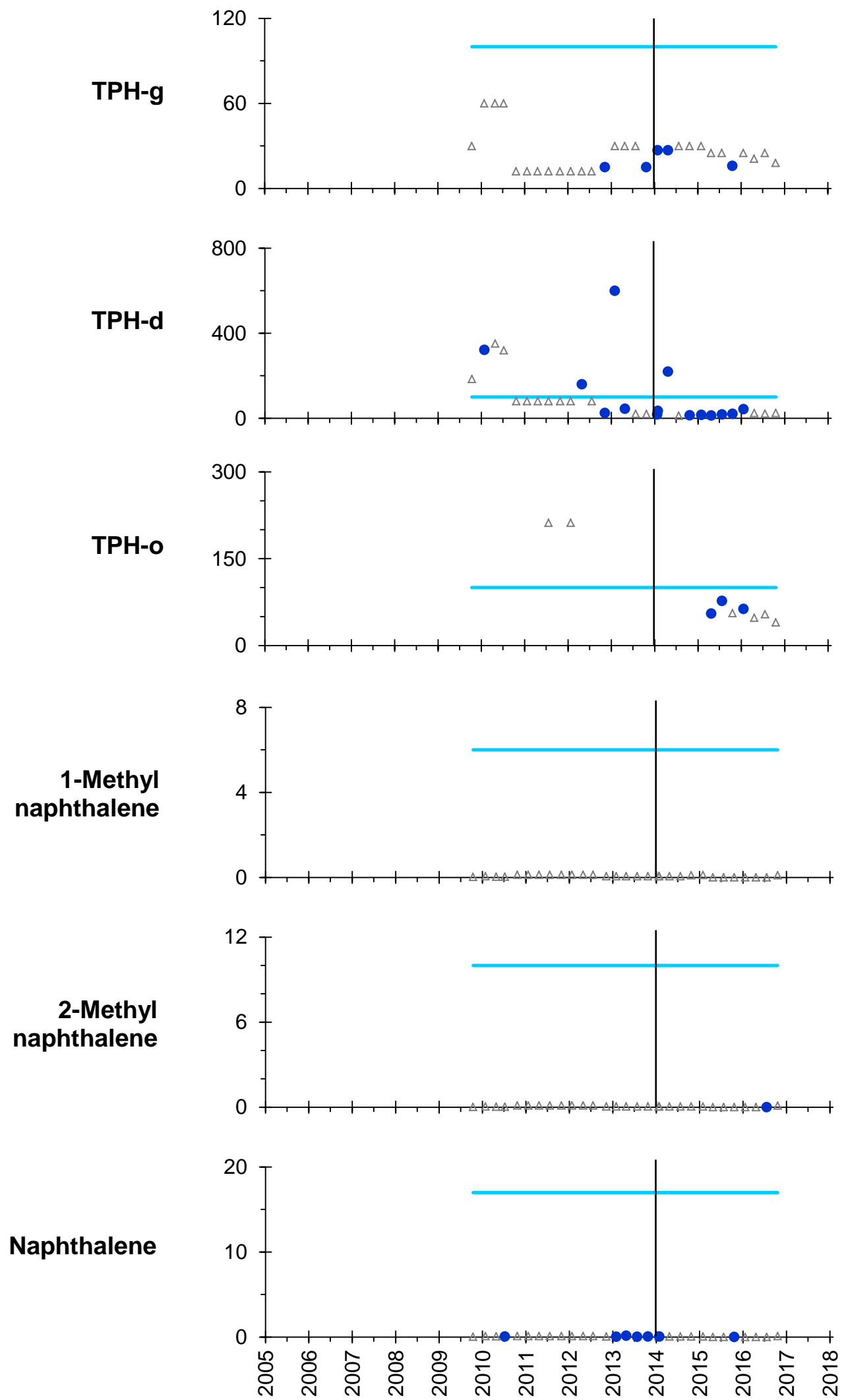
RHMW2254-01



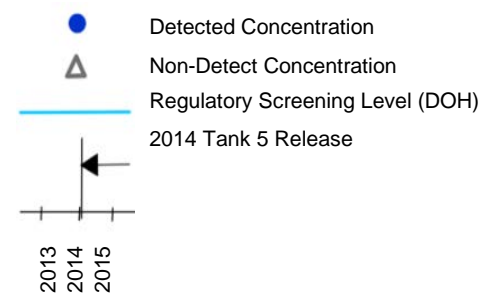
All results in micrograms per liter (µg/L or parts per billion [ppb]).



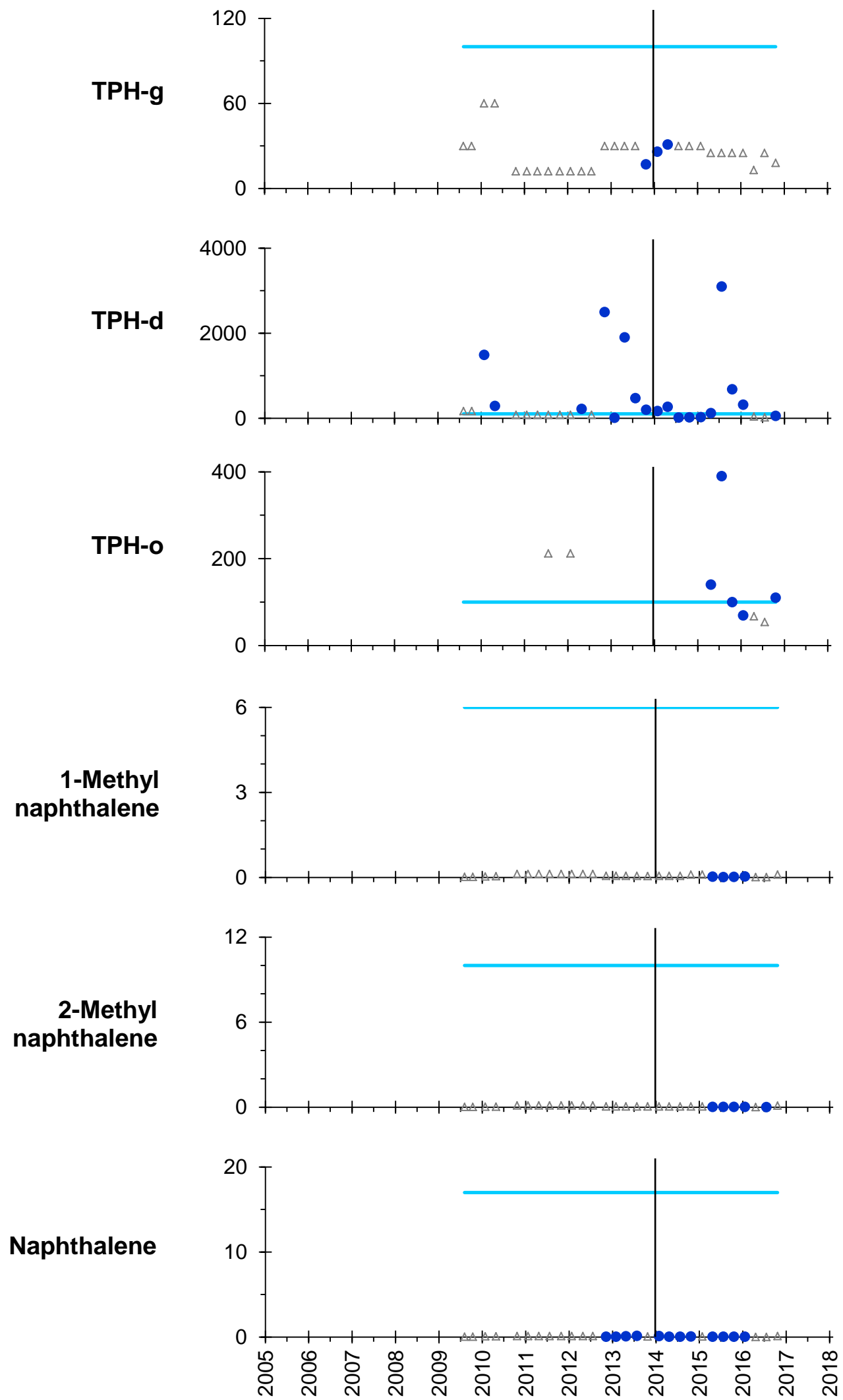
HDMW2253-03



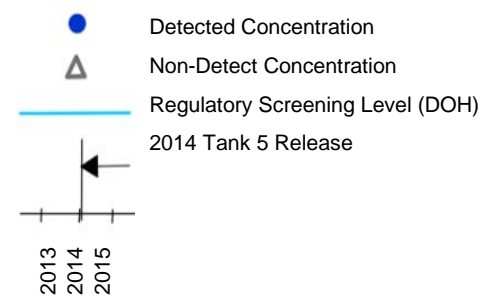
All results in micrograms per liter (µg/L or parts per billion [ppb]).



OWDFMW01



All results in micrograms per liter (µg/L or parts per billion [ppb]).



1
2

Appendix D: Boring Logs

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1 **APPENDIX D BORING LOGS – CONTENTS AND REFERENCES**

2 In the PDF program, display the Bookmarks pane (View menu) to facilitate navigation. Boring logs
3 are grouped as follows:

4 **OILY WASTE DISPOSAL FACILITY BORINGS:**

5 • **Phase I RI (DON 1996)**

6 – Department of the Navy (DON). 1996. Phase I Remedial Investigation Report, Red Hill
7 Oily Waste Disposal Facility, Fleet and Industrial Supply Center, Pearl Harbor, Oahu,
8 Hawaii. Prepared by Ogden Environmental and Energy Services Co., Inc., Honolulu, HI.
9 Pearl Harbor, HI: Pacific Division, Naval Facilities Engineering Command. January.

10 • **Phase II RI (DON 2000)**

11 – Department of the Navy (DON). 2000. *Phase II Remedial Investigation, Red Hill Oily*
12 *Waste Disposal Facility, Halawa, Oahu, Hawaii*. Prepared by Earth Tech, Inc.,
13 Honolulu, HI. Pearl Harbor, HI: Pacific Division, Naval Facilities Engineering
14 Command. September.

15 • **AST Characterization (DON 2003)**

16 – Department of the Navy (DON). 2003. 8,000-Gallon AST Area Total Petroleum
17 Hydrocarbon-Diesel Characterization Report, Red Hill Oily Waste Disposal Facility,
18 Hawaii. Prepared by Earth Tech, Inc., Honolulu, HI. Pearl Harbor, HI: Pacific Division,
19 Naval Facilities Engineering Command. December.

20 **HALAWA, WAIMALU DEEP MONITOR WELL BORINGS:**

21 • **Halawa Deep Monitor Well 3-2253-003 (CWRM 2001)**

22 – Commission on Water Resource Management. 2001. *Well Completion Report, Oahu*
23 *(Halawa) Deep Monitor Well 2253-03*. State of Hawaii Department of Land and Natural
24 Resources. October 11.

25 • **Waimalu Deep Monitor Well 2456-05 (URS 2006)**

26 – URS Corporation. 2006. *Final Summary of Drilling and Hydrogeologic Conditions for*
27 *Waimalu Deep Monitor Well No. 2456-05*. January 4. Prepared for: The Commission on
28 Water Resource Management, Department of Land and Natural Resources, State of
29 Hawaii.

30 **HALAWA CORRECTIONAL FACILITY, BUS FACILITY BORINGS:**

31 • **Halawa MS Correctional Facility Borings (Fewell 1982)**

32 – Fewell Geotechnical Engineering, Ltd. (Fewell). 1982. Preliminary Subsurface
33 Investigation Report, Halawa Medium Security Facility, South Halawa Valley, Oahu,
34 Hawaii. Prepared for Architects Hawaii Ltd. December 20.

35 • **Halawa MS Correctional Facility Borings (Dames & Moore 1991)**
















36 – Dames & Moore. 1991. Site Characterization, Halawa Medium Security Facility,
37 Halawa Valley, Oahu, Hawaii. D&M Job Number 0314-147-037. October 25.

- 1 • **Halawa HS Correctional Facility Borings** (MFA 1994)
- 2 – Masa Fujioka & Associates (MFA). 1994. *Boring Logs and Well Schematics for W-1 to*
- 3 *W-6 (December 1994); Halawa High Security Correctional Facility*. Hawai'i
- 4 Department of Health, Hazard Evaluation & Emergency Response Office records
- 5 request by AECOM Technical Services, Inc., February 3, 2016.
- 6 • **Halawa Correctional Facility Borings** (Unitek 1988)
- 7 – Unitek. 1988. *Halawa Medium Security Facility Borings by P.R. Drilling/Kenton Beal*
- 8 *for Wells 8067-001 to -005*. Reproduced in App. G of Dames & Moore 1991: Site
- 9 Characterization, Halawa Medium Security Facility, Halawa Valley, Oahu, Hawaii
- 10 (D&M Job Number 0314-147-037).
- 11 • **Halawa Bus Facility Boring F-4** (MFA 2005)
- 12 – Masa Fujioka & Associates (MFA). 2005. *Site Plan and Boring/Well Log F-4 (April 11,*
- 13 *2005): Former Halawa Bus Facility, 99-999 Iwaena Street, Aiea, HI*. Project 05096-064.
- 14 Hawai'i Department of Health, Hazard Evaluation & Emergency Response Office
- 15 Records Request by AECOM Technical Services, Inc., February 3, 2016.
- 16 **HALAWA VALLEY INTERSTATE H-3 BORINGS:**
- 17 • **H-3 Borings Halawa Quarry Viaduct Makai Section** (HDOT 1988)
- 18 – Hawaii Department of Transportation. 1988. *Plans for Construction of a Portion of*
- 19 *Interstate Route H-3, Halawa Quarry Viaduct Makai Section*. Boring Logs for IA8-01A
- 20 to IA8-09. F.A.I. Project No. 1-H3-1(54). Highways Division.
- 21 • **H-3 Borings N Halawa Valley Unit I Phase IB** (HDOT 1994)
- 22 – Hawaii Department of Transportation. 1994. As Built Plans for Construction of a Portion
- 23 of Interstate Route H-3, North Halawa Valley Highway, Unit I, Phase IB, STA. 415+00
- 24 TO STA. 477+57.77. F.A.I. Project No. I-H3-1(68). Highways Division.
- 25 • **H-3 Borings N Halawa Valley Unit II** (HDOT 1992)
- 26 – Hawaii Department of Transportation. 1992. As Built Plans for Construction of a Portion
- 27 of Interstate Route H-3, North Halawa Valley Highway, Unit II. F.A.I. Project No. I-H3-
- 28 1(69) & (70). Highways Division.
- 29 **PEARL HARBOR AREA BORINGS:**
- 30 • **Aiea Laundry 2002 RI/FS** (DON 2002a)
- 31 – Department of the Navy (DON). 2002a. Remedial Investigation/Feasibility Study
- 32 (RI/FS) Draft Final for Aiea Laundry Facility Naval Station (NAVSTA), Pearl Harbor,
- 33 Hawaii. Prepared by AMEC Earth and Environmental. Pearl Harbor, HI: Naval Facilities
- 34 Engineering Command, Pacific. May.
- 35 • **Aiea Laundry 2015 RI/FS** (DON 2015c)
- 36 – Department of the Navy (DON). 2015c. *Draft Final Remedial Investigation and*
- 37 *Feasibility Study, Former Aiea Laundry Facility*. Prepared by AECOM Technical
- 38 Services, Inc. JBPHH HI: Naval Facilities Engineering Command, Hawaii. June.

- 1 • **Upper Pearl Harbor Foundation Investigations** (DON 1967) (DON 1971a) (DON
2 1971b)
- 3 – Department of the Navy (DON). 1967. Site and Foundation Investigation, Proposed
4 Sanitary Sewerage Improvement, Upper Pearl Harbor and Pearl City, Oahu, Hawaii
5 (OICC MIDPAC P-112). Prepared by Dames & Moore, Honolulu, HI; Job No.
6 270202911 (17627). October 2.
- 7 – Department of the Navy (DON). 1971b. Foundation Investigation, Proposed Bachelor
8 Officers Quarters and Mess, Makalapa Crater, Pearl Harbor Naval Station, Oahu,
9 Hawaii. Prepared by Dames & Moore, Honolulu, HI; Job No. 2702-056-11. October 22.
- 10 – Department of the Navy (DON). 1971a. *Final Report, Foundation Investigation,*
11 *Proposed Handball and Squash Courts, Makalapa, Oahu, Hawaii.* Prepared by Dames
12 & Moore, Honolulu, HI; No. 2702-055-11. August 6.
- 13 • **Halawa Main Gate (RAA12 RI)** (DON 2015d)
- 14 – Department of the Navy (DON). 2015d. Final Remedial Investigation/Feasibility Study,
15 Remedial Action Area 12, Joint Base Pearl Harbor-Hickam, Halawa-Main Gate, Oahu,
16 Hawaii. Prepared by AECOM Technical Services, Inc. JBPHH HI: Naval Facilities
17 Engineering Command, Pacific. October.
- 18 • **Makalapa Crater RI** (DON 2016b)
- 19 – Department of the Navy (DON). 2016b. *Final Remedial Investigation, Makalapa Crater*
20 *Geographic Study Area, Joint Base Pearl Harbor-Hickam, Makalapa, Oahu, Hawaii.*
21 Prepared by AECOM Technical Services, Inc. JBPHH HI: Naval Facilities Engineering
22 Command, Hawaii. November.

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DEFINITION OF TERMS

PRIMARY DIVISIONS		SYMBOLS	SECONDARY DIVISIONS	
COARSE GRAINED SOILS More Than Half of Material is Larger Than No. 200 Sieve Size	GRAVELS More Than Half of Coarse Fraction is Larger Than No. 4 Sieve	CLEAN GRAVELS (Less Than 6% Fines)	 GW	Well graded gravels, gravel-sand mixtures, little or no fines.
		GRAVEL With Fines	 GP	Poorly graded gravels, gravel-sand mixtures, little or no fines.
		 GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines.	
		 GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.	
	SANDS More Than Half of Coarse Fraction is Smaller Than No. 4 Sieve	CLEAN SANDS (Less Than 6% Fines)	 SW	Well graded sands, gravelly sands, little or no fines.
		SANDS With Fines	 SP	Poorly graded sands, gravelly sands, little or no fines.
		 SM	Silty sands, sand-silt mixtures, non-plastic fines.	
		 SC	Clayey sands, sand-clay mixtures, plastic fines.	
FINE GRAINED SOILS More Than Half of Material is Smaller Than No. 200 Sieve Size	SILTS AND CLAYS Liquid Limit is Less Than 50%	 ML	Inorganic silts, rock flour, fine sandy silts or clays, and clayey silts with non- or slightly-plastic fines.	
		 CL	Inorganic clays of low to medium plasticity, gravelly clays, silty clays, sandy clays, lean clays.	
		 OL	Organic silts and organic silty clays of low plasticity.	
	SILTS AND CLAYS Liquid Limit is Greater Than 50%	 MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts, clayey silt.	
		 CH	Inorganic clays of high plasticity, fat clays.	
		 OH	Organic clays of medium to high plasticity, organic silts.	
HIGHLY ORGANIC SOILS		 Pt	Peat and other highly organic soils.	


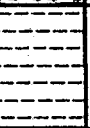
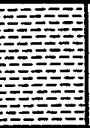

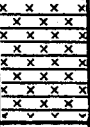




GRAIN SIZES								
SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS	
	FINE	MEDIUM	COARSE	FINE	COARSE			
	200	40	10	4	3/4"	3"	12"	
	U.S. STANDARD SERIES SIEVE				CLEAR SQUARE SIEVE OPENINGS			

RELATIVE DENSITY		CONSISTENCY		*NUMBER OF BLOWS OF 140 POUND HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1 3/8 INCH I.D.) SPLIT SPOON (ASTM D-1586).
SANDS, GRAVELS AND NON-PLASTIC SILTS	BLOWS/FOOT*	CLAYS AND PLASTIC SILTS	BLOWS/FOOT*	
VERY LOOSE	0 - 4	VERY SOFT	0 - 2	
LOOSE	4 - 10	SOFT	2 - 4	
MEDIUM DENSE	10 - 30	FIRM	4 - 8	
DENSE	30 - 60	STIFF	8 - 16	
VERY DENSE	OVER 50	VERY STIFF	16 - 32	
		HARD	OVER 32	
SPLIT-BARREL SAMPLER DRIVING RECORD				
Blows Per Foot	Description			
25.....	25 blows drove sampler 12 inches, after initial 6 inches of seating.			
50/7.....	50 blows drove sampler 7 inches, after initial 6 inches of seating.			
Ref/3".....	50 blows drove sampler 3 inches during initial 6-inch seating interval.			

FIGURE



DEFINITION OF TERMS

PRIMARY DIVISIONS		SYMBOLS	SECONDARY DIVISIONS		
SEDIMENTARY ROCKS	Clastic Sediments	CONGLOMERATE		CG	Coarse-grained Clastic Sedimentary Rock types including: Conglomerates and Breccias
		SANDSTONE		SS	Clastic Sedimentary Rock types including: Sandstone, Arkose and Greywacke
		SHALE		SH	Fine-grained Clastic Sedimentary Rock types including: Shale, Siltstone, Mudstone and Claystone
	Chemical Precipitates	CARBONATES		LS	Chemical Precipitates including: Limestone, Crystalline Limestone, Fossiliferous Limestone Micrite and Dolomite
		EVAPORITES		EV	Evaporites including: Anhydrite, Gypsum, Halite, Travertine and Caliche
IGNEOUS ROCKS	EXTRUSIVE (Volcanic)		IE	Volcanic Rock types including: Basalt, Andesite, Rhyolite, Volcanic Tuff, and Volcanic Breccia	
	INTRUSIVE (Plutonic)		II	Plutonic Rock types including: Granite, Diorite and Gabbro	
METAMORPHIC ROCKS	FOLIATED		MF	Foliated Rock types including: Slate, Phyllite, Schist and Gneiss	
	NON-FOLIATED		MN	Non-foliated Rock types including: Metaconglomerate, Quartzite and Marble	



OGDEN EXPLORATORY BORINGS LOGS

CLIENT U.S. Navy PACDIV
 PROJECT NAME/NUMBER Red Hill RI/FS, NO. 9-1053-1200
 DATE/TIME STARTED 10/29/91 / 1112
 DATE/TIME FINISHED 11/10/91 / 1230
 COORDINATES 2° 22' 24.8" N, 157° 54' 36.9" W
 ELEVATION AND DATUM 144.35 ft. MSL
 TOP OF CASING ELEVATION 146.55

BORING NUMBER RH-B01 (MW-01)
 COMPLETION DEPTH 83 ft.
 BOREHOLE DIAMETER 9"
 DRILLER/COMPANY Soil Sampling Services Inc.
 DRILLING METHOD/FLUID HSA/none; air rotary/none
 DRILLING EQUIPMENT Mobile B-61 (HSA)/Mobile B-80 (air rotary)
 GEOLOGIST John Fern/Bruce Tsutsui CHECKED BY Dave Martin

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
0-5	80	S01-D1'	10 27 30			GC	CLAYEY GRAVEL reddish brown, slightly moist, dense, very poorly sorted with subangular to angular basalt fragments to 1 1/2"	<p>SCH40 PVC</p> <p>grout</p>	0-5
5-10	80	S02-D4.5'	28 50/5"			GC CLAYEY GRAVEL as above auger flights bringing up angular basalt fragments to 1-2"	5-10		
10-15	60	S03-D9'	11 50/5"			GC SANDY GRAVEL gray to reddish brown, slightly moist, very dense, very poorly sorted auger flights bringing up reddish brown to gray clay	10-15		
15-20	100	S04-D14'	9 21 28			CL CLAY gray to green gray, slightly moist, very stiff, well sorted, with minor amounts of sand CLAY as above	15-20		
20-25	30	S05-D18'	12 25 31			CL CLAY as above, with dark brown to black mottling	20-25		
25-26	0	S06-D22'	50			rk refusal of HSA at about 22', switched to air rotary coring @ 08:50 on 11/7/91, using Mobile B-80 BASALT blue gray, massive, extensive fracturing exhibiting gray metallic sheen, black Mn staining (possibly a boulder)	25-26		
26-27		S07-D24-25'	core			CL SANDY CLAY reddish brown, slightly moist, stiff, with minor amounts of angular, gravel-sized basalt fragments	26-27		
		S08-D25-26'	core			CL			
		S09-D26-27'	core			CL SILTY CLAY reddish brown, slightly moist, very stiff to hard, minor amounts of subrounded, vesicular basalt to 1/16"			

CLIENT U.S. Navy PACDIV

BORING NUMBER RH-B01 (MW-01)

PROJECT NAME/NUMBER Red Hill RI/FS, NO. 9-1053-1200

COMPLETION DEPTH 83 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
33	✕	S10-D31-32'	core		CL	CL	<u>SILTY CLAY</u> as above, with subangular, vesicular basalt fragments	<p>SCH40 PVC</p> <p>gravel</p> <p>bentonite seal</p> <p>10/20 Colorado Sand</p>	33
					rk	rk	<u>BASALT</u> blue gray, lightly weathered, highly vesicular		
					rk CL	CL	<u>BASALT</u> blue gray, highly weathered, visible flow structure, elongate horizontal vesicles, large and extensive fractures in all directions infilled with light gray silty clay.		
38	✕	S11-D39.5'	core		CL	CL	<u>SILTY CLAY</u> dark reddish brown, slightly moist, with minor amounts of angular, pebble-sized basalt fragments		
43					rk	rk	<u>BASALT</u> blue gray, moderately weathered, lightly vesicular, moderate vertical fracturing, fractures infilled with gray, silty clay		
							no core recovery, 43'to 53', basalt inferred from drilling returns and field observations		
53	✕	S13-D53-54'	core		rk CL	rk CL	<u>BASALT</u> reddish brown, extremely weathered; interconnected large and elongate vesicles; extensive fracturing infilled with <u>SILTY CLAY</u> orange brown and yellow, slightly moist		53
					rk	rk	<u>BASALT</u> reddish brown, extremely weathered, fractured, large vesicles		
58					rk	rk	<u>BASALT</u> gray, moderately weathered; large, interconnected a'a-type voids; highly fractured and fragmented		

CLIENT U.S. Navy PACDIV

BORING NUMBER RH-B01 (MW-01)

PROJECT NAME/NUMBER Red Hill RI/FS, NO. 9-1053-1200

COMPLETION DEPTH 83 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
65		S14-D61'	core		rk	rk	<p>TUFF dark gray and reddish brown, highly weathered, partially welded, composed mainly of poorly sorted, silt- to pebble-sized fragments of scoria and ash</p> <p>BASALT gray, moderately weathered, elongate vesicles</p> <p>no core recovery, 62'to 66', basalt inferred by drilling returns and field observations</p>		65
70				GC rk	GC rk	<p>CLAYEY GRAVEL reddish brown, slightly moist, loose, very poorly sorted, rounded basalt fragments</p> <p>BASALT reddish brown, extremely weathered, massive, extremely fractured, grading into clayey gravel above</p> <p>CLAYEY GRAVEL reddish brown, slightly moist, loose, very poorly sorted, with subangular to rounded pebbles, possible Mn staining</p>	70		
75						<p>BASALT gray, moderately weathered, vesicular with a'a type voids, large fractures, mostly horizontal; some infilling along major fractures</p>	75		
80						<p>no core recovery (73' to 78'), basalt inferred based upon field observations</p>	80		
85		S15-D82-82.5'	core				<p>BASALT gray, moderately weathered; large, isolated, a'a type vesicles, extensive fracturing in horizontal and vertical directions, fracturing perpendicular, creating blocks; minor amounts of clay along major fracture surfaces</p>		85
90							BOTTOM OF BORING AT 83'		90

CLIENT U.S. Navy PACDIV
 PROJECT NAME/NUMBER Red Hill RI/FS, NO. 9-1053-1200
 DATE/TIME STARTED 11/05/91 / 0925 HST
 DATE/TIME FINISHED 11/13/91 / 1410 HST
 COORDINATES 21° 22' 26.1 N, 157° 54' 37.8 W
 ELEVATION AND DATUM 124.03 ft. MSL
 TOP OF CASING ELEVATION 126.03

BORING NUMBER RH-B02 (MW-02)
 COMPLETION DEPTH 41 ft.
 BOREHOLE DIAMETER 9"
 DRILLER/COMPANY Soil Sampling Service (SSS), Inc.
 DRILLING METHOD/FLUID HSA/none; Air Rotary/none
 DRILLING EQUIPMENT Mobile B-61 (HSA), Mobile B-80 (air rotary)
 GEOLOGIST John Fern/Bruce Tsutsui CHECKED BY Dave Martin

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
50	50	S01-D0.75'	7 15 15	N/A	AC C.F.		<u>SILTY CLAY</u> reddish brown, moist, stiff, non-plastic, very poorly sorted, with minor amounts of subangular particles to 3/4" (probably fill)	<p>SCH40 PVC</p> <p>grout</p> <p>bentonite seal</p> <p>encountered rock, HSA refusal at 23', begin air rotary 11/13/91 @ 1045</p>	50
66	66	S02-D4'	12 30 35	N/A		<u>SILTY CLAY</u> reddish brown, moist, very stiff, non-plastic, very poorly sorted, with minor amounts of sand, dark gray mottling (probably fill)	5		
66	66	S03-D8'	7 10 30	38		<u>SILTY CLAY</u> as above, with some HC staining	10		
33	33	S04-D10.5'	14 11 14	N/A		<u>SILTY CLAY</u> dark gray to greenish gray, moist, stiff to firm, with minor amounts of sand and gravel to 3/4", some HC staining (probably fill)	15		
50	50	S05-D14'	6 15 18	N/A		<u>SILTY CLAY</u> reddish brown, moist, firm to stiff, with minor amounts of sand and gravel to 3/4", some HC staining (probably fill)	20		
33	33	S06-D17.5'	9 18 28	430		<u>CLAY</u> reddish brown to dark brown, moist, stiff, high plasticity, with minor amounts of silt	25		
33	33	S07-D20.5'	6 12 17	N/A		<u>CLAY</u> dark brown to black, moist, stiff to hard, with minor amounts of coarse sand, basalt fragments, some HC staining	30		
					rk	encountered rock, HSA refusal at 23', begin air rotary 11/13/91 @ 1045			
						<u>BASALT</u> moderately weathered, highly vesicular, with pahoehoe type circular vesicles to 1/16", highly fractured, fractures primarily longitudinal and partially infilled with HC-stained clay			
						no recovery: basalt inferred, based upon drilling conditions			

CLIENT U.S. Navy PACDIV
 PROJECT NAME/NUMBER Red Hill RI/FS, NO. 9-1053-1200
 DATE/TIME STARTED 11/05/91 / 1245
 DATE/TIME FINISHED 11/25/91 / 1600
 COORDINATES 21° 22' 25.8" N, 157° 54' 37.9" W
 ELEVATION AND DATUM 124.05 ft. MSL
 TOP OF CASING ELEVATION 127.01

BORING NUMBER RH-B03 (MW-04)
 COMPLETION DEPTH 44 ft.
 BOREHOLE DIAMETER 10"
 DRILLER/COMPANY Mel Pederson/Soil Sampling Service (SSS), Inc.
 DRILLING METHOD/FLUID HSA/none; Air Rotary/none
 DRILLING EQUIPMENT Mobile B-61 (HSA), Mobile B-80 (air rotary)
 GEOLOGIST John Fern/Bruce Tsutsui CHECKED BY Dave Martin

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
5	33	S01-D0.5'	10 16 20	180		CL	<u>SILTY CLAY</u> dark brown, dry to slightly moist, stiff, non-plastic, with angular to subangular coral limestone fragments to 3/4" (probably fill)	<p>SCH40 PVC</p> <p>.02 Slot SS Screen</p> <p>grout</p> <p>bentonite seal</p> <p>sand</p>	5
5	66	S02-D4'	12 38 27	28			<u>SANDY CLAY</u> light brown, dry to slightly moist, stiff, poorly sorted, non-plastic, with subangular coral fragments to 3/4" (probably fill)		5
10	66	S03-D8'	6 17 17	650			<u>SILTY CLAY</u> dark brown to black, slightly moist, stiff, with minor amounts of coarse sand (probably fill)		10
10	66	S04-D11'	4 30 50/4'	200			<u>SILTY CLAY</u> dark brown to black, moist, dense to very dense, with 15% basalt fragments to 1/2" and copper wire; strong HC odor (product on outside of sampler)		10
15	66	S05-D14' S05-D14"-Dup	8 14 20	200			<u>SILTY CLAY</u> dark reddish brown, slightly moist, very stiff, well sorted, with ABOUT 5% coarse sand fragments		15
20	33	S06-D18.5'	18 19 26	N/A			<u>SILTY CLAY</u> dark reddish brown to dark gray, slightly moist, very stiff to hard, with minor amounts of angular basalt fragments to 3"		20
25	100	S07-D23'	7 19 26	N/A		GC	<u>CLAYEY GRAVEL</u> reddish brown to dark greenish gray, slightly moist, dense, with subrounded vesicular basalt fragments to 2"		25
25	17	S08-D25.25'	50/5'	N/A			refusal of HSA at about 25', switched to air rotary coring @ 1145 on 11/25/91		25
	100	S09-D28'	core	N/A		rk	<u>BASALT</u> blue gray, moderately weathered, extensive horizontal fracturing, vesicles elongate and interconnected		

CLIENT U.S. Navy PACDIV

BORING NUMBER RH-B03 (MW-04)

PROJECT NAME/NUMBER Red Hill RI/FS, NO. 9-1053-1200

COMPLETION DEPTH 44 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
33	60	S10-D33'	core	N/A	rk CL rk rk	rk CL rk rk	<p>CLAYEY SILTY SAND dark gray, slightly moist, loose, very poorly sorted, with angular basalt fragments to 2", probably weathering along contact, slight HC odor</p> <p>BASALT blue gray, moderately weathered, mostly massive, with rare rounded vesicles no core recovery 29.75' - 32.5', tuff inferred from field observations and drilling returns</p> <p>TUFF yellowish brown to gray, highly weathered, primarily silt-sized particles of ash and palagonite with traces of plagioclase and olivine, extensive fractures infilled with dark gray, slightly moist, soft clay; slight HC odor no core recovery, 34.5 - 41'</p>		33
43	100	S11-D42.5' S11D-D42.5'	SPT	N/A	CL	<p>CLAY dark brown to dark gray, wet, stiff to very stiff, slight HC odor</p>	43		
43	100	S12-D44'	SPT	N/A	CL	<p>CLAY as above</p>	43		
44						<p>BOTTOM OF BORING AT 44'</p>	44		

CLIENT U.S. Navy PACDIV
 PROJECT NAME/NUMBER Red Hill RI/FS, NO. 9-1053-1200
 DATE/TIME STARTED 11/18/91 / 1145
 DATE/TIME FINISHED 11/18/91 / 1625
 COORDINATES 21° 22' 25.6" N, 157° 54' 37.6" W
 ELEVATION AND DATUM 124.7 ft. MSL
 TOP OF CASING ELEVATION N/A

BORING NUMBER RH-B05
 COMPLETION DEPTH 29.5 ft.
 BOREHOLE DIAMETER 10"
 DRILLER/COMPANY Mel Pederson/Soil Sampling Service (SSS) Inc.
 DRILLING METHOD/FLUID HSA/none
 DRILLING EQUIPMENT Mobile B-80
 GEOLOGIST John Fern/Bruce Tsutsui CHECKED BY Dave Martin

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	REMARKS	DEPTH feet
7.5	75	S01-D0.5'				CL	<u>SILTY CLAY</u> reddish brown, slightly moist, very stiff, with angular to subangular basalt and limestone fragments to 2"	RH-B5 was drilled as an <i>angle</i> boring. Reported depths are converted downhole lengths which were calculated based upon a drilling angle of 30° from vertical.	7.5
15	75	S02-D3.5'				<u>SANDY CLAY</u> reddish brown, slightly moist, very stiff, with angular subrounded limestone and basalt fragments to 1/2"	15		
22.5	75	S03-D7.5'				CL <u>GRAVELLY CLAY</u> reddish brown, slightly moist, hard, poorly sorted, with subangular to subrounded basalt and limestone fragments to 2"; clumps of slightly moist, stiff, light gray clay with distinct HC odor	22.5		
30	100	S04-D11.5'				<u>GRAVELLY CLAY</u> reddish brown, slightly moist, hard, poorly sorted with subrounded to rounded fragments of vesicular basalt to 1"; common clumps of slightly moist, stiff, light gray clay with distinct HC odor	30		
37.5	50	S05-D15'				<u>GRAVELLY CLAY</u> yellowish brown, moist, hard, very poorly sorted, with subangular fragments of massive basalt to 1"; slight HC odor and staining	37.5		
45	75	S06-D18'					45		
52.5	50	S07-D21'				rk <u>TUFF</u> highly weathered, reddish brown, angular fragments in matrix of slightly moist, stiff clay with distinct HC odor	52.5		
60	100	S08-D24'				CL <u>TUFF</u> highly weathered, gray brown, angular to subangular rock and scoria fragments to 1"; common clumps of moist, soft, light gray clay with distinct HC odor	60		
67.5	75	S09-D28'					67.5		

CLIENT U.S. Navy PACDIV
 PROJECT NAME/NUMBER Red Hill RI/FS, NO. 9-1053-1200
 DATE/TIME STARTED 11/19/91 / 1255
 DATE/TIME FINISHED 11/21/91 / 1600
 COORDINATES 21° 22' 25.6" N, 157° 54' 37.2" W
 ELEVATION AND DATUM 125.14 ft. MSL
 TOP OF CASING ELEVATION N/A

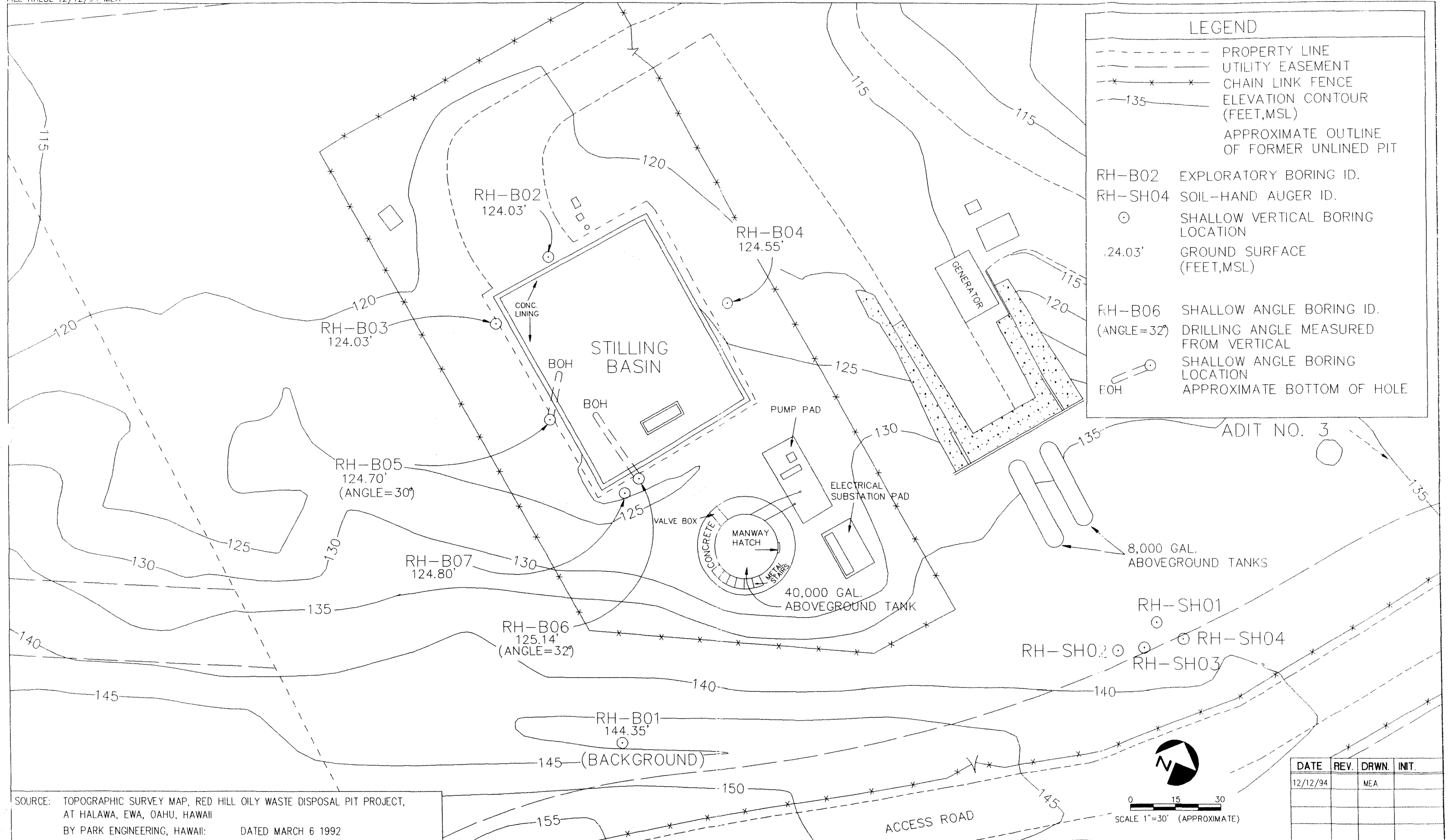
BORING NUMBER RH-B06
 COMPLETION DEPTH 41.5 ft.
 BOREHOLE DIAMETER 10"
 DRILLER/COMPANY Mel Pederson/Soil Sampling Service (SSS) Inc.
 DRILLING METHOD/FLUID HSA/none; air rotary/none
 DRILLING EQUIPMENT Mobile B-80
 GEOLOGIST John Fern/Bruce Tsutsui CHECKED BY Dave Martin

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	REMARKS	DEPTH feet
7.5	75	S01-D0.5'				GC	<u>GRAVELLY CLAY</u> reddish brown, slightly moist, soft, non-plastic, very poorly sorted, with angular to subangular massive basalt and limestone fragments to 1" (probably fill material)	RH-B06 was drilled as an <i>angle</i> boring. Reported depths are converted downhole lengths which were calculated based upon a drilling angle of 32° from vertical.	7.5
15	75	S02-D4'				<u>GRAVELLY CLAY</u> as above	15		
22.5	75	S03-D8'				<u>GRAVELLY CLAY</u> dark brown to black, moist, stiff, poorly sorted, with rounded fragments of massive basalt to 3/4"; common clumps of black mottling with strong HC odor	22.5		
27.5	100	S04-D11.5' S04D-D11.5'				CL <u>SILTY CLAY</u> dark reddish brown to black, moist, clumps of variable consistency, soft to stiff, minor amounts of gravel-sized vesicular basalt fragments, common mottling and clumps of moist, stiff dark black clay with very strong HC odor	27.5		
32.5	75	S05-D14.5' S05D-D14.5'				SW <u>GRAVELLY SAND</u> gray brown to black, moist, loose, poorly sorted, mostly angular fragments of highly weathered, vesicular basalt with round vesicles uniformly 1/16"	32.5		
37.5						GC rk	<u>GRAVELLY CLAY</u> gray brown, slightly moist, very stiff, very poorly sorted, with subangular basalt fragments to 1/2", yellow oxide staining on fragments <u>BASALT</u> gray, slightly weathered, a'a type vesicles, flow structure visible	HSA refusal at about 15', began coring @ 0830, 11/21/91 using Mobile B-80 no core recovery 15'-17'	37.5
42.5						rk	<u>TUFF</u> dark brown, mildly weathered, minor hairline fracturing; composed of well sorted, silt-sized particles of ash, palagonite, plagioclase; mild HC odor and staining	no core recovery 19.5'-22.5'	42.5
47.5						rk	<u>TUFF</u> dark grayish green, highly weathered, extensive fracturing; composed of sand- to silt-sized particles of palagonite, weathered ash, scoria and feldspar, laminations visible	no core recovery, 23'-26.5', tuff inferred from field observations and drilling returns	47.5

CLIENT U.S. Navy PACDIV
 PROJECT NAME/NUMBER Red Hill RI/FS, NO. 9-1053-1200
 DATE/TIME STARTED 11/22/91 / 1100
 DATE/TIME FINISHED 11/22/91 / 1630
 COORDINATES 21° 22' 25.5" N, 157° 54' 37.2" W
 ELEVATION AND DATUM 124.80 ft. MSL
 TOP OF CASING ELEVATION 126.9

BORING NUMBER RH-B07 (RH-MW-05)
 COMPLETION DEPTH 44 ft.
 BOREHOLE DIAMETER 10"
 DRILLER/COMPANY Mel Pederson/Soil Sampling Service (SSS) Inc.
 DRILLING METHOD/FLUID HSA/none
 DRILLING EQUIPMENT Mobile B-80
 GEOLOGIST John Fern/Bruce Tsutsui CHECKED BY Dave Martin

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
0-5	50	S01-D0.75'	36 28 18		[Hatched pattern]	CL	SANDY CLAY reddish brown, slightly moist to dry, stiff, poorly sorted, with limestone fragments to 1/4" (fill material)	<p>SCH40 PVC</p> <p>grout</p> <p>bentonite seal</p> <p>10/20 Colorado Sand</p> <p>.02 silt SS Screen</p>	0-5
5-10	50	S02-D3.75'	6 18 16		[Hatched pattern]	CL	SANDY CLAY as above		5-10
10-15	50	S03-D8'	6 50/5'		[Dotted pattern]	rk CL	Basalt rock/boulder CLAYEY SAND reddish brown, slightly moist, dense, poorly sorted, (probably fill material)		10-15
15-20	66	S04-D11'	16 26 50/4'		[Dotted pattern]	GW rk CL	GRAVEL gray, medium dense, poorly sorted, with angular, vesicular basalt fragments to 2", basalt section in end of sample shoe BASALT gray, lightly weathered, vesicular		20-25
20-25	66	S05-D14'	27 34 42		[Hatched pattern]	CL	SANDY CLAY brown, slightly moist, very stiff to hard, well sorted, no basalt fragments		25-30
25-30	100	S06-D19'	11 15 35		[Hatched pattern]	CL	CLAY light gray to greenish gray, moist, stiff to very stiff, with greenish gray staining, minor amounts of fine sand sized particles; strong HC odor		30-35
30-35	100	S07-D22.5'	7 23 41		[Dotted pattern]	SC	CLAYEY SAND dark brown, slightly moist, hard, moderately sorted, with some weathered tuff fragments, distinct HC odor and staining		35-40
35-44	50	S08-D26'	34 50/4'		[Dotted pattern]	CL rk	SANDY CLAY brown, moist, hard, with some angular to subangular basalt fragments and section of vesicular basalt in shoe TUFE extremely weathered, extensively fractured water on sides of sampler		40-44



**EXPLORATORY BORING SAMPLING LOCATIONS
 ALL AREAS
 RED HILL RI - PHASE 1**

**FIGURE
 2-4**

ATT EXPLORATORY BORING LOGS

LOG OF TEST BORING 1

ATT

EQUIPMENT 8" Hollow Auger
 DATE DRILLED 11/7/86
 ELEVATION 161.0 feet*

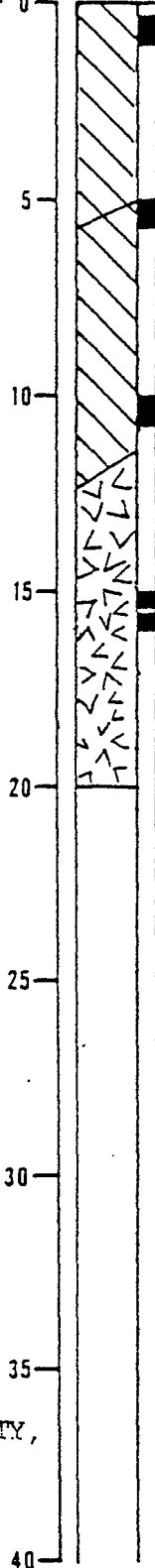
LABORATORY TESTS

MOISTURE CONTENT %
 DRY DENSITY (PCF)

DEPTH (FT)

SAMPLE

BLOWS PER FOOT



42 REDDISH BROWN SANDY CLAY (CL)
 stiff, dry, occasional basalt and coralline limestone fragments, abundant roots in upper 2 feet (fill)

40 DARK BROWN SILTY CLAY (CL)
 stiff, dry, occasional volcanic rock fragments (fill)
 becomes moist at 8.0 feet
 large boulder between 8.0 and 10.0 feet
 large boulder at 11.0 feet
 hollow auger refusal at 12.0 feet
 switch to 6" flight auger

87/9" large boulder at 11.0 feet
 hollow auger refusal at 12.0 feet
 switch to 6" flight auger

90/10" color change to reddish brown
 becomes very stiff to hard, contains abundant basalt fragments
 odor detected at 15.0 feet

50/0" DARK GRAY BASALT
 hard, strong, moderately weathered, vesicular

DRILLING REFUSAL AT 20.0 FEET

SAMPLER REFUSAL AT 20.0 FEET

NO GROUNDWATER ENCOUNTERED DURING DRILLING

BORING BACKFILLED WITH CEMENT/BENTONITE GROUT

SAMPLER TYPE:
 CALIFORNIA DRIVE:
 O.D. = 2.5 inches
 I.D. = 2.0 inches

HAMMER WEIGHT: 140 pounds
 HAMMER DROP: 30 inches

*ELEVATIONS ARE REFERENCED FROM FRESH WATER SYSTEM WATER TANK SITE PLAN, RED HILL FUEL STORAGE FACILITY, NAVFAC DRAWING NO. 1311790, DATED JANUARY 16, 1970

Subsurface Consultants

RED HILL OILY WASTE DISPOSAL SITE,
 PEARL HARBOR NAVAL BASE

PLATE

JOB NUMBER
 157.009

DATE
 12/5/86

APPROVED

2

LOG OF TEST BORING 2

ATT

LABORATORY TESTS

MOISTURE
CONTENT
%

DRY
DENSITY
(PCF)

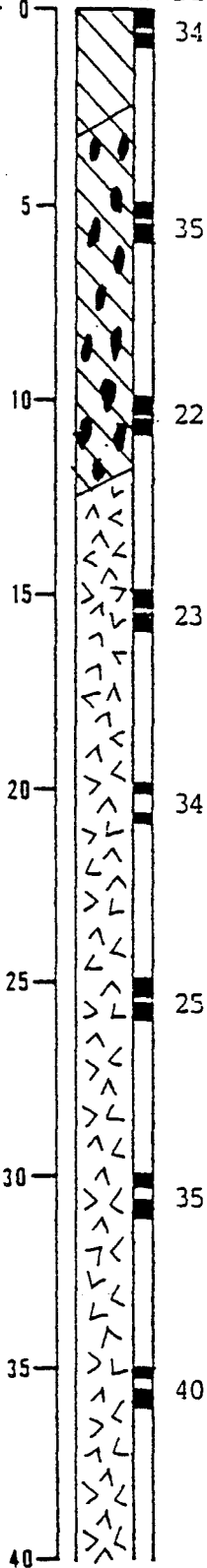
DEPTH
(FT)

SAMPLE

BLOWS
PER
FOOT

EQUIPMENT
DATE DRILLED
ELEVATION

8" Hollow Auger
11/5/86
161.0 feet*



3.4 REDDISH BROWN SANDY CLAY (CL)
dense, dry, occasional basalt,
tuff and coralline limestone frag-
ments (fill)
large boulder at 3.0 feet
hollow stem auger refusal at
3.0 feet
switch to 6" flight auger

35 REDDISH BROWN CLAYEY GRAVEL (GC)
dense, moist, abundant vesicular
basalt fragments (fill)

22

23 DARK ORANGE-BROWN BASALT
low hardness, friable, deeply
weathered, vesicular
becomes wet, black oil residue
and odor detected at 15.0 feet

34 odor detected between 20 and 21
feet

25

35 becomes deeply weathered to silty
clay, exhibits pervasive bedrock
fabric
odor detected at 31.0 feet

40 oil residue and odor detected at
35.0 feet

becomes intensely fractured, mod-
erately hard, and moderately
strong

Subsurface Consultants

RED HILL OILY WASTE DISPOSAL SITE,
PEARL HARBOR NAVAL BASE

PLATE

JOB NUMBER
157.009

DATE
12/12/86

APPROVED

3

LOG OF TEST BORING 2

(Continued)

ATT

LABORATORY TESTS

MOISTURE
CONTENT
%

DRY
DENSITY
(PCF)

DEPTH
(FT)

SAMPLE

BLOWS
PER
FOOT

EQUIPMENT

8" Hollow Auger

DATE DRILLED

11/5/86

ELEVATION

161.0 feet*

40

LV
TK

82

oily residue and odor detected
at 40.0 feet

45

NO GROUNDWATER ENCOUNTERED DURING
DRILLING

50

BORING BACKFILLED WITH CEMENT/
BENTONITE GROUT

55

60

65

70

75

80

Subsurface Consultants

RED HILL OILY WASTE DISPOSAL SITE,
PEARL HARBOR NAVAL BASE

PLATE

JOB NUMBER

157.009

DATE

12/5/86

APPROVED

[Signature]

4

LOG OF TEST BORING 3

ATT

EQUIPMENT 8" Hollow Auger
 DATE DRILLED 11/6/86
 ELEVATION 160.0 feet*

LABORATORY TESTS

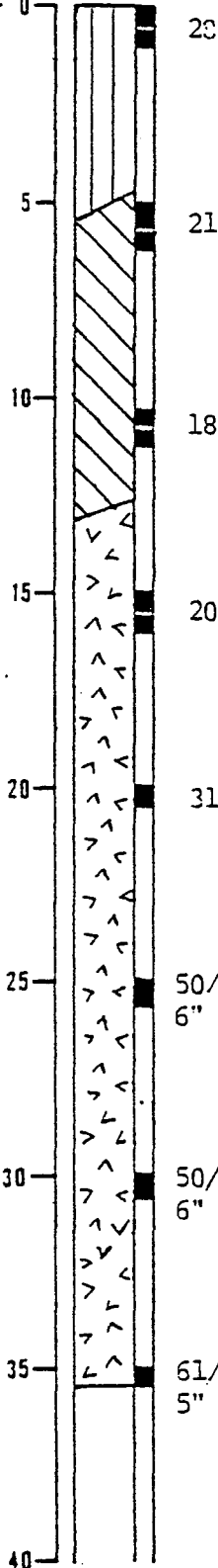
MOISTURE
CONTENT
%

DRY
DENSITY
(PCF)

DEPTH
(FT)

SAMPLE

BLOWS
PER
FOOT



20 BROWN SANDY SILT (ML)
 stiff, dry, occasional tuff,
 coralline limestone and basalt
 fragments (fill)
 coralline limestone boulder at
 2.0 feet

21 large boulder between 4.0 and
 5.0 feet

DARK REDDISH BROWN SILTY CLAY (CL)
 stiff, moist, occasional basalt
 fragments, oil residue, odor
 detected (fill)

18 oil residue, odor detected
 between 10.0 and 11.5 feet

DARK BROWN BASALT
 low hardness, friable to weak,
 deeply weathered, iron stained
 vesicles
 orange brown to light gray
 mottling at 15.0 feet
 odor detected at 15.0 feet

31

50/6" color change to dark brown-black
 becomes intensely fractured,
 moderately hard, weak, with
 deeply weathered clay-filled
 fractures, vesicular

50/6" switched to 6" solid flight auger
 GROUNDWATER LEVEL 11-7-86

61/5" BORING BACKFILLED WITH CEMENT/
 BENTONITE GROUT

DRILLING REFUSAL @ 35 FEET

Subsurface Consultants

RED HILL OILY WASTE DISPOSAL SITE,
 PEARL HARBOR NAVAL BASE

PLATE

JOB NUMBER
157.009

DATE
12/8/86

APPROVED

5

LOG OF TEST BORING 4

ATT

LABORATORY TESTS

MOISTURE
CONTENT
%

DRY
DENSITY
(PCF)

DEPTH
(FT)

SAMPLE

BLOWS
PER
FOOT

EQUIPMENT

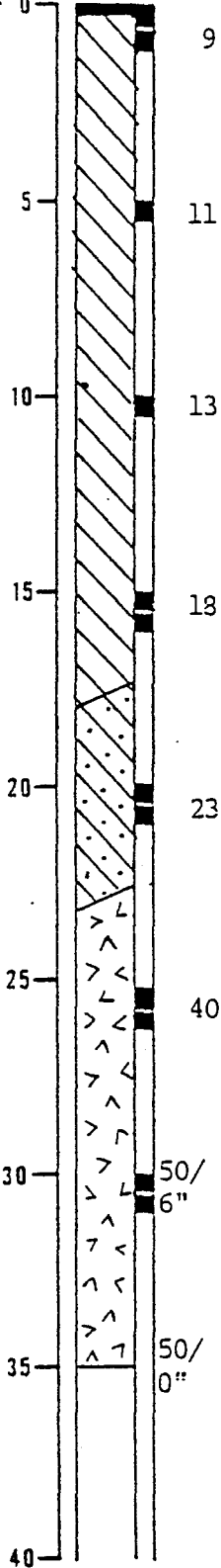
8" Hollow Auger

DATE DRILLED

11/7/86

ELEVATION

160.0 feet*



9 3" BLACK ASPHALT (fill)
DARK REDDISH BROWN SILTY CLAY (CL)
medium stiff, moist, abundant
basalt fragments (fill)

11 black oily residue, odor detected
at 5.0 feet

13 saturated with black oily residue
odor detected at 10.0 feet
abundant basalt boulders between
13.0 and 14.0 feet

18 odor detected at 15.0 feet

23 DARK GRAY BROWN CLAYEY SAND (SC)
medium dense, moist, medium to
coarse grained, abundant well
rounded vesicular basalt frag-
ments (alluvium)
oily residue and odor detected
between 25.0 and 26.0 feet

40 DARK BROWN BASALT
intensely fractured, low to mod-
erately hard, weak to moderately
strong, deeply weathered, vesicu-
lar, oil residue along fractures
hollow stem auger refusal
switched to 6" solid light auger
oily residue and odor detected
at 30.0 feet

50/0" drilling refusal at 35.0 feet
sampler refusal at 35.0 feet

NO GROUNDWATER ENCOUNTERED DURING
DRILLING

BORING BACKFILLED WITH CEMENT/
BENTONITE GROUT

Subsurface Consultants

RED HILL OILY WASTE DISPOSAL SITE,
PEARL HARBOR NAVAL BASE

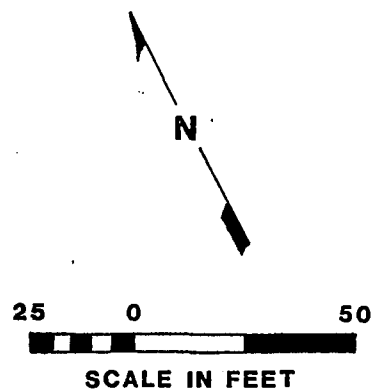
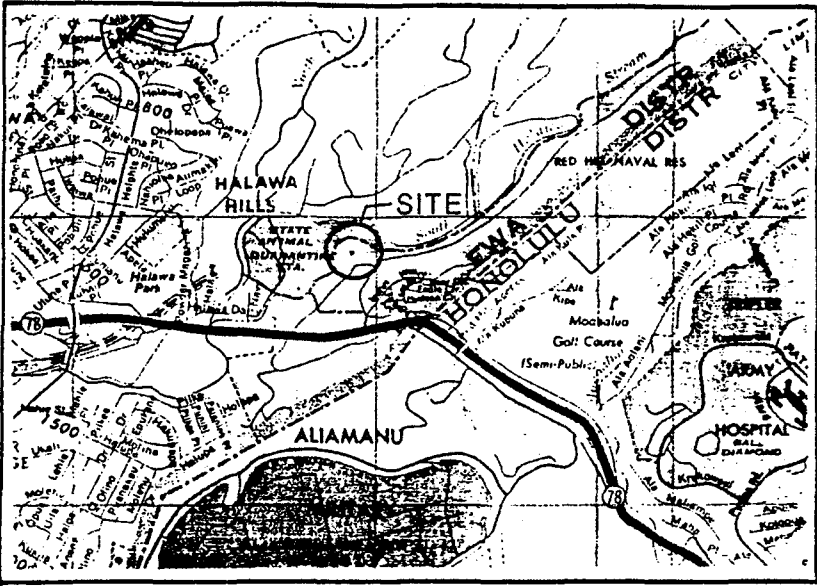
PLATE

JOB NUMBER
157.009

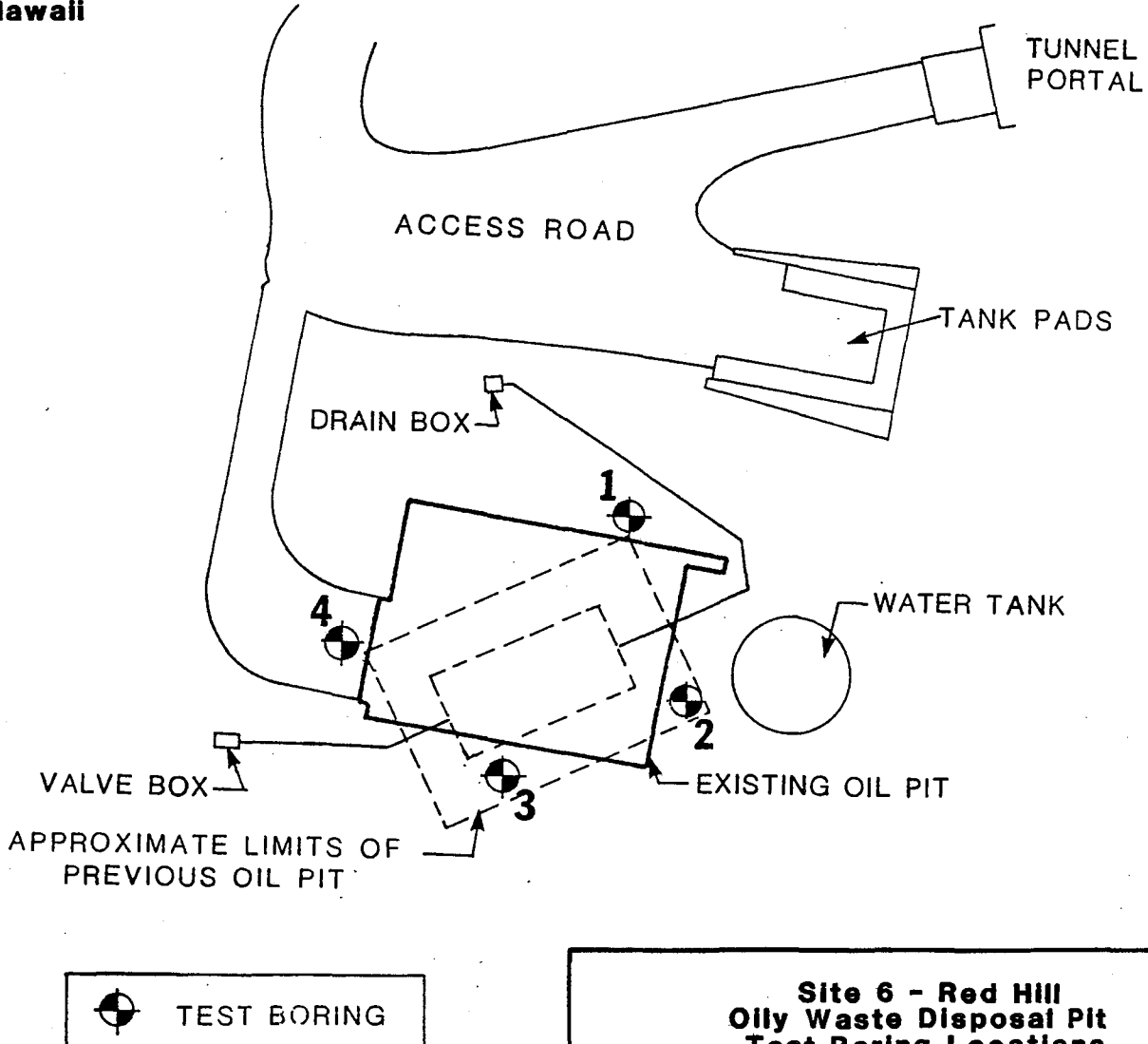
DATE
12/8/86

APPROVED
[Signature]

6



**LOCATION MAP
Oahu, Hawaii**

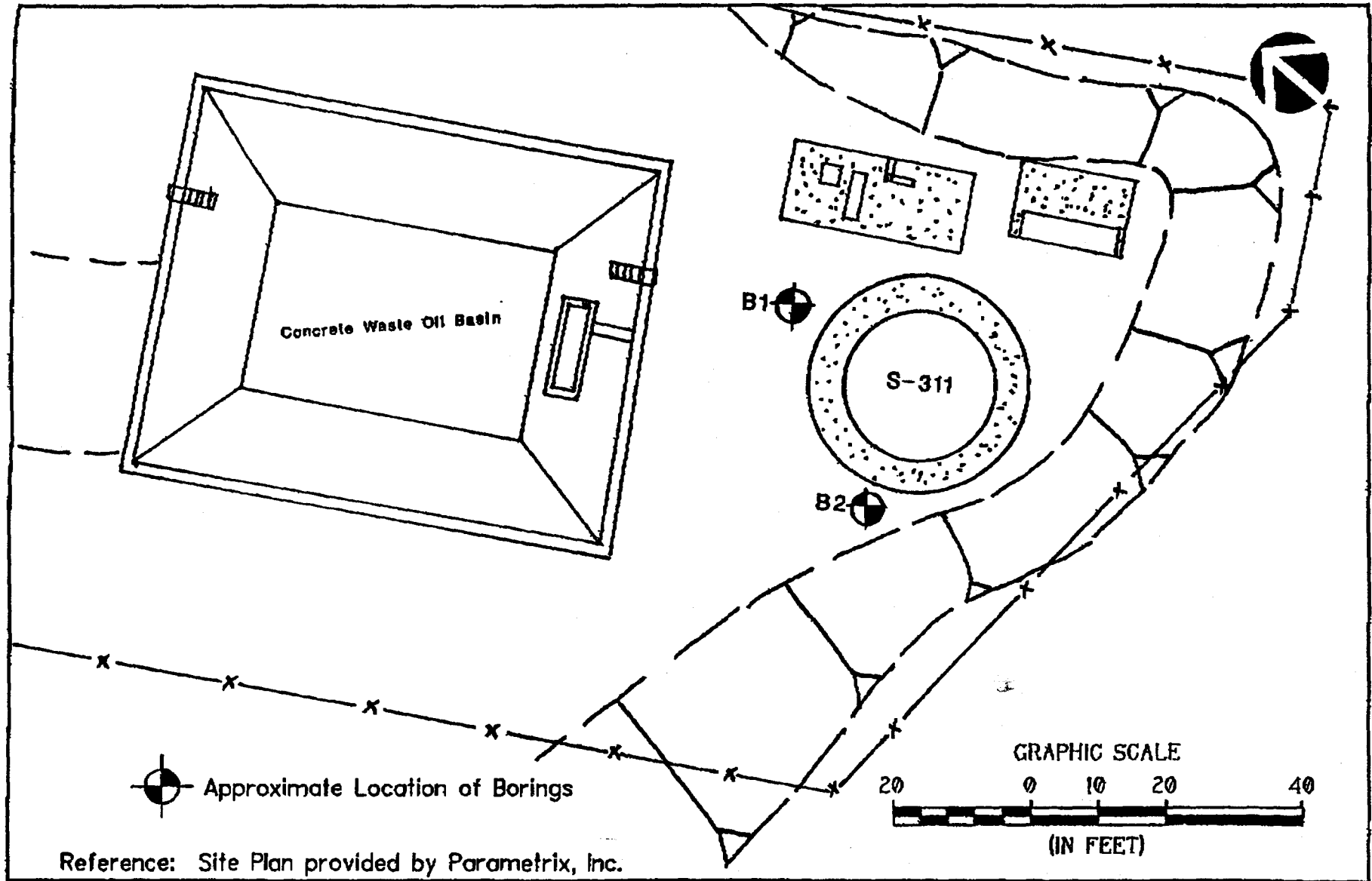


**Site 6 - Red Hill
Oily Waste Disposal Pit
Test Boring Locations**

Pearl Harbor Naval Base		PLATE 1
JOB NUMBER 503	DATE 5/20/87	

ATT Aqua Terra Technologies
Consulting Engineers
& Scientists

ERNEST K. HIRATA EXPLORATORY BORINGS LOGS



W.O. 92-2253	Oil Spill Prevention Facility - Red Hill Tank S-311
Ernest K. Hirata & Associates, Inc.	BORING LOCATION PLAN Plate 4

ERNEST K. HIRATA & ASSOCIATES, INC.

Soils and Foundation Engineering

BORING LOG

W.O. 92-2253

BORING NO. B1 DRIVING WT. 140 lb. DATE OF DRILLING 8-24-92
 SURFACE ELEV. 126.5 ± = DROP 30 in. WATER LEVEL None

DEPTH FOOT	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0	[Hatched pattern]		23/6" 50/5"	74	26	Silty CLAY (CL-ML) - Reddish brown, moist, stiff, with weathered rock fragments. Mottled brown with orange color at 3 feet. Grayish brown color at 6 feet.
5			40/6" 50/5"	83	25	
			78	85	29	
10						
	[Horizontal line pattern]		16/6" 50/5"	102	20	HIGHLY WEATHERED ROCK (WH) - Mottled gray, dense to medium hard, fractured.
15						End boring at 13 feet.
20						* Elevations based on Topographic Map provided by Parametrix, Inc.
25						
30						

ERNEST K. HIRATA & ASSOCIATES, INC.

Soils and Foundation Engineering

BORING LOG

W.O. 92-2253

BORING NO. B2 DRIVING WT. 140 lb. DATE OF DRILLING 8-24-92
 SURFACE ELEV. 127± DROP 30 in. WATER LEVEL None

DEPTH FOOT	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0	[Diagonal hatching]		50/6" 50/5"	96	23	Silty CLAY (CL-ML) - Mottled reddish brown, moist, stiff, with highly weathered rock fragments.
5	[Horizontal hatching]		24/6" 50/5"	78	37	HIGHLY WEATHERED ROCK (WH) - Mottled orange and gray, moist, dense to medium hard
			55/6" 50/4"	96	20	
			50/5"	84	24	
			29/6" 50/5"	88	26	
10						End boring at 10 feet.
15						
20						
25						
30						

Borehole/Well Construction Log

Project Name: Red Hill Phase II RI/FS		Project Number: CTO-0034		Borehole Number: MW06	
Borehole Location: Near UDA		Northing: 75249.52 Easting: 530353.87			Sheet 1 of 8
Drilling Agency: Valley Well Drilling			Driller: Dean Mclure, David Brown		
Drilling Equipment: B59, Jaswell 3000			Date & Time Started: 4/6/98	Total Depth (feet): 122.3	
Drilling Method: Air Rotary, Hollow Stem Auger		Top of Casing Elevation (feet msl): 121.27	Date & Time Finished: 4/20/98	Depth to Water (feet): See remarks	
Size and Type of Bit: -		Borehole Diameter (in): 10	Sample Bulk: NA Drive: x Type: SS: 35 Grab: NA	Sample Length (ft): 1.5' and 5' Driving Weight: NA Drop Length: NA	
Drilling Fluid: Air		Drilling Angle (degrees): 90	Number of Samples: 35		
Completion Information: See remarks			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			
1			12	50	1100	10	90	TR		SW	Top Soil	Ground surface elevation: 118.67 feet msl
			18								SAND WITH GRAVEL ; dark brown, 10YR 3/3; dry; very dense; SW; 90% fine, medium, coarse, and subangular and subrounded sand; 10% fine, subangular gravel; trace fines and roots.	
2			42									Steel casing (12 inch diameter) PVC Casing Grout
3												
4												
5			28	60	1110	10	80	10		SW	GRADING ; dark yellowish brown, 10YR 4/6; grading to 80% sand; grading with 10% low plastic inorganic clay.	
6			50									
7												
8												
9												
10			5	60	1150	-	5	95		CL	MEDIUM PLASTIC INORGANIC CLAY ; black, 5YR 2.5/1; dry; stiff; CL; 95% medium, inorganic plastic clay; 5% subrounded, coarse sand.	
11			13									
12			11									
13												
14												
15												

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS Project Number: CTO-0034 Borehole Number: MW06

Borehole Location: Near UDA Sheet 2 of 8


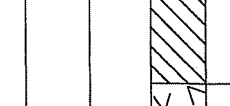








Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			
16			NA	0	1218							No Recovery
17												
18												
19												
20			NA	0	1334							No Recovery
21			NA	0	1340							No Recovery
22			NA	20	1348							
23												
24			32		1353							
25			50/4'									
26			NA	20	1400							
27			30	40	1412	-	-	100		CH		HIGH PLASTIC INORGANIC CLAY: very dark gray, 10YR 3/1; dry; hard; CH; 100% high plastic, inorganic clay; stained clay; smell odor.
28			28									
29			50/5'									
30			8	80	1440	5	80	15		SC		CLAYEY SAND: yellowish brown, 10YR 5/4; dry; very dense; SC; 80% fine, subrounded sand; 15% low plastic clay; 5% fine, angular gravel.
31			32									
32			40									
33			NA	10	1455					SC		Same as above
34												
35			11	50	1500	-	-	TR		IE		EXTRUSIVE: tuff; olive brown, 2.5Y 4/3; 100% ash; moderately weathered; hard; moist; smell odor; trace amount stained clay; IE.
36			50/3'									

Red Hill Phase II RI/FS/CTO-0034

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW06
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Borehole Location: Near UDA	Sheet 3 of 8
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks		
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic				USCS or Rock Type	
33			50	40	1503					IE	EXTRUSIVE ; tuff; olive brown, 2.5Y 4/3; 100% ash; faintly weathered; medium; dry; IE.			
34			38	50	1521	25	60	15		SC	CLAYEY SAND ; grayish brown, 2.5Y 5/2; moist; very dense; SC; 60% fine, subrounded sand; 25% medium plastic clay; 15% subangular gravel; smell diesel odor; stained clay.			
35			5	60	1530					IE	EXTRUSIVE ; tuff; olive brown, 2.5Y 4/3; 100% ash; faintly weathered; medium; dry; IE.			
36			40	50	1537					IE	Same as above			
37			8	100	1543	-	-	100		CH	HIGH PLASTIC INORGANIC CLAY ; dark yellowish brown, 10YR 3/6; dry; hard; CH; 100% high plastic, inorganic clay.			
38			11											
39			21											
40			NA	NA	1408	-	-	100		CL	LOW PLASTIC INORGANIC CLAY ; black, 5YR 2.5/1; moist; firm; CL; 100% low plastic, inorganic clay; trace amount of silt.			
41						40	-	60		CL	Grading to wet; grading to 60% clay; grading with 40% gravel.			
42			NA	40		40	TR	60		CL	Grading to dark brown (10YR 3/3); grading to moist; grading to 60% clay; grading with 40% gravel.			
43			NA	20						IE	EXTRUSIVE ; basalt; olive, 5YR 5/3; moderate weathering; fractured; hard; dry; IE.			
44											No Recovery			
45														
46														
47														
48														
49														
50														

Red Hill Phase II RI/FS/CTO-0034

Bottom of steel casing

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS Project Number: CTO-0034 Borehole Number: MW06

Borehole Location: Near UDA Sheet 4 of 8

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			
51									IE	EXTRUSIVE ; basalt; light olive gray, 5YR 6/2; moderately weathered; hard; moist; IE.		
52		NA		40		40	10	50	CL	GRAVELLY CLAY ; dark brown, 7.5YR 3/3; moist; soft; CL; 50% medium plastic clay; 40% coarse to medium, rounded to subrounded gravel; 10% medium, rounded sand.		
53												
54										No Recovery		
55						70	10	20	GC	CLAYEY GRAVEL ; reddish gray, 5YR 5/2; moist; GC; 70% coarse to fine, rounded to subrounded gravel; 20% medium plastic clay; 10% coarse to medium, subrounded sand.		
56									IE	EXTRUSIVE ; volcanic breccia; 10YR 3/3; 70% clast; 30% matrix; moderately weathered; hard; moist; IE.		
57		NA		40						No Recovery		
58												
59												
60												
61									IE	EXTRUSIVE ; basalt; brown, 7.5YR 4/4; 100% massive basalt; highly weathered; moderately hard; wet; IE.		
62		NA		60		80	-	20	GC	CLAYEY GRAVEL ; brown, 7.5YR 4/4; GC; 80% coarse to medium, subangular gravel; 20% high plastic, inorganic clay.		
63										No Recovery		
64						100	TR	TR	GW	WELL GRADED GRAVEL ; yellowish brown, 10YR 2.5/6; wet; very loose; GW; 100% fine to medium, rounded to subrounded, subangular gravel; trace sand and clay.		
65								100	CH	HIGH PLASTIC INORGANIC CLAY ; very dark brown, 7.5YR 2.5/3; dry; very dense; CH; 100% high plastic, inorganic clay.		
66												
67		NA		30	1210				CH	Same as above		

Red Hill Phase II RI/FS/CTO-0034

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW06
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Borehole Location: Near UDA	Sheet 5 of 8
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			
68												
69												
70												
71												
72		NA		100	1614	-	-	100	CH	Same as above		
73												
74												
75												
76												
77		NA		55					IE	EXTRUSIVE ; basalt; gray, 10YR 5/1; 100% massive basalt; faintly weathered; hard; dry; IE. No Recovery		
78												
79												
80												
81												
82												
83												
84												
85												

Red Hill Phase II RI/FS/CTO-0034

Top of Bentonite seal

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS Project Number: CTO-0034 Borehole Number: MW06

Borehole Location: Near UDA Sheet 6 of 8

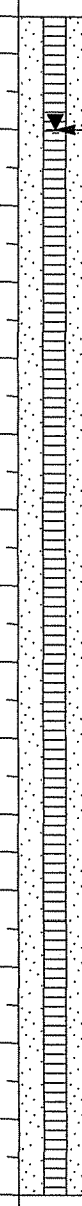
Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			
86												
87		NA		98						IE	EXTRUSIVE ; basalt; gray, 7.5YR 5/1; 100% massive basalt; fresh; very hard; wet; IE.	
88												
89												
90												
91												
92		NA		98								
93										IE	EXTRUSIVE ; volcanic breccia; reddish brown, 5YR 4/4; 80% clast; 20% matrix; moderately weathered; medium; wet; IE.	
94												
95										IE	EXTRUSIVE ; basalt; dark gray, 7.5YR 4/1; 100% massive basalt; highly weathered; moderately hard; wet; IE.	
96												
97		NA		95						IE	EXTRUSIVE ; volcanic breccia; dark gray, 7.5YR 4/1; 80% clast (basalt); 20% matrix; moderately weathered; hard; wet; IE.	Top of filter pack
98										IE	Grading to 60 matrix; grading to 40%.	
99												
100												Top of screen
101												0.02 inch stainless steel screen
102		NA		100	1414					IE	EXTRUSIVE ; basalt; dark gray, 7.5YR 4/1;	

Red Hill Phase II RI/FS/CTO-0034

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW06
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Borehole Location: Near UDA	Sheet 7 of 8
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks	
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic				USCS or Rock Type
103										IE	100% massive basalt with well developed vertical fractures; faintly weathered; hard; moist; IE.	 <p style="font-size: small;">Approximate static basal groundwater level (104 feet bgs)</p>	
104										IE	Grading to gray (10YR 5/1); grading to fresh; grading to very hard; grading to dry.		
105													
106													
107										IE	Grading to gray (10YR 5/1); grading to fresh; grading to very hard.		
108													
109													
110													
111													
112										IE	Same as above		
113													
114										IE	EXTRUSIVE ; volcanic breccia; dark gray, 10YR 4/1; 50% basalt clast; 50% matrix; slightly weathered; hard; wet; IE.		
115													
116										IE	Grading to reddish brown (2.5YR 4/4); grading to moist.		
117													
118												Bottom of well	
119													
120													

Red Hill Phase II RI/FS/CTO-0034

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW06
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Borehole Location: Near UDA	Sheet 8 of 8
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			
121 122									IE	Same as above		First encountered depth of basal groundwater (120 feet bgs)
										Boring finished @ 122 feet on 4/29/98.		Total depth of borehole

Borehole/Well Abandonment Log












Project Name: Red Hill Phase II RI/FS		Project Number: CTO-0034		Borehole Number: MW07	
Borehole Location: Near Former Stilling Basing Gate			Northing: 75374.68 Easting: 530450.7		Sheet 1 of 7
Drilling Agency: Valley Well Drilling			Driller: Dean Mclure, David Brown		
Drilling Equipment: Jaswell 3000, Mobile B-59			Date Installed: 4/27/98	Total Depth (feet): 118.0	
Drilling Method: Air Rotary, Hollow Stem Auger		Ground Surface Elevation (feet msl): 116.07	Date Abandoned: 5/15/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 10	Sample Type: Bulk: NA Drive: x SS: 46 Grab: NA	Sample Length (ft): 1.5' Driving Weight: NA Drop Length: NA	
Drilling Fluid: Air		Drilling Angle (degrees): 90	Number of Samples: 46		
Completion Information: Brass marker			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Abandonment Diagram	Remarks	
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic				USCS or Rock Type
1			20	80		65	10	25		GC	Topsoil	<div style="text-align: center;"> </div>	Former PVC casing reamed and removed by air rotary drilling; reamed borehole grouted to surface.
2			22								<p>CLAYEY GRAVEL; dark brown, 7.5YR 3/4; dry; very dense; GC; 65% fine, subrounded gravel; 25% medium plastic, inorganic clay; 10% fine, medium subrounded sand; trace amount of silt and roots.</p>		
3			28										
4											<p>Grading to black (5YR 2.5/1); grading to 80% gravel; grading to 20% clay; grading to trace amount of sand.</p>		
5			24	60	0838	80	TR	20		GC			
6			20								<p>LOW TO MEDIUM PLASTIC INORGANIC CLAY; black, 5YR 2.5/1; dry; hard; CL; 100% low to medium inorganic clay; trace amount of fine, subangular sand.</p>		
7			17										
8											<p>Grout</p>		
9													
10			23	5	0848	-	TR	100		CL			
11			36								<p>Grout</p>		
12			15										
13											<p>Grout</p>		
14													
15											<p>Grout</p>		

Borehole/Well Abandonment Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW07
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Borehole Location: Near Former Stilling Basing Gate	Sheet 2 of 7
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Abandonment Diagram	Remarks	
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic				USCS or Rock Type
16	17 20 30			100	0859	-	-	-		IE	EXTRUSIVE ; tuff; black, 5YR 2.5/1; 100% ash; soft; moderately weathered; dry; IE.		
17													
18													
19													
20	6 6 16			100	0904	-	-	-		IE	Grading to moist.		
21													
22	18 22 35			100	0912	-	20	80		CH	SANDY CLAY ; black, 5YR 2.5/1; moist; hard; CH; 80% high plastic, inorganic clay; 20% fine, subangular sand; stained clay.		
23	9 14 12			90	0920	-	-	100		CH	Grading to yellow (10YR 8/6); grading to dry; grading without sand; grading to 100% clay.		
24													
25	30 50/4'			100	0923	-	-	-		IE	EXTRUSIVE ; tuff; black, 5YR 2.5/1; 100% ash; highly weathered; very soft; dry; IE.		
26	18 38 38			100	0935	-	-	-		IE	Same as above		
27													
28	28 32 50/5'			80	0941	-	-	-		IE	Same as above; smell odor; stained highly weathered tuff.		
29	18 32 50/4'			100	0952	-	-	-		IE	Grading to moist.		
30													
31	38 50/4'			60	0955	-	-	-		IE	Same as above		
32	50/5'			70	1004	-	-	-		IE	Same as above		

Red Hill Phase II RI/FS/CTO-0034

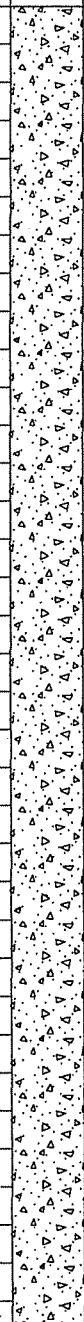
Borehole/Well Abandonment Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS Project Number: CTO-0034 Borehole Number: MW07

Borehole Location: Near Former Stilling Basing Gate Sheet 3 of 7

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Abandonment Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			
33												
34	40	50/3'	80	1012	-	-	-			Grading to moist.		
35		50/4'	80	1018	-	-	-			Same as above		
36												
37	30 30 15		60	1026	-	-	-			Grading to dark yellow brown (10YR 4/6).		
38	38 38		80	1031	-	-	-			Same as above		
39		50/6'										
40			0	1038	-	-	-			No Recovery		
41												
42	39	50/6'	60	1053	60	10	30		GC	CLAYEY GRAVEL ; black, 5YR 2.5/1; wet; hard; GC; 60% fine, subangular and subrounded gravel; 30% high plastic, inorganic clay; 10% fine to medium, subangular sand.		Bottom of steel casing; former PVC casing reamed and removed by air rotary drilling; reamed borehole grouted to surface.
43		100/6'	5	1105	55	10	35		GC	GRADING ; grading to 30% clay; grading to 55% gravel.		
44												
45	35	50/2'	15	1125	55	10	35		GC	Same as above		
46			0	1138						No Recovery		
47												
48			0	1143						No Recovery		
49			5	1145	40	TR	60		CL	GRAVELLY CLAY ; brownish yellow, 10YR 6/8; wet; very stiff; CL; 60% low plastic inorganic clay;		
50												


Borehole/Well Abandonment Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS				Project Number: CTO-0034				Borehole Number: MW07					
Borehole Location: Near Former Stilling Basing Gate								Sheet 4 of 7					
Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Abandonment Diagram	Remarks	
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic				USCS or Rock Type
51	32		50/4"	50						CL	40% fine, subrounded gravel; trace amount of silt and sand.		
52	20		65/6"	100	0919	80	TR	20		GC	GRAVELLY CLAY ; dark gray, 7.5YR 4/1; wet; CL; 70% high plastic, inorganic clay; 30% medium to coarse, subangular gravel.		
53	30		50/6"	100	0930	80	TR	20		GC	CLAYEY GRAVEL ; dark gray, 7.5YR 4/1; wet; GC; 80% fine to medium, subangular gravel; 20% low plastic inorganic clay; trace amount of sand.		
54	20		50/4"	60	0935						HIGH PLASTIC INORGANIC CLAY ; dark brown, 7.5YR 3/4; dry; CH; 100% high plastic, inorganic clay.		
55						60		40		GC	CLAYEY GRAVEL ; dark gray, 7.5YR 4/1; wet; GC; 80% fine to medium, subangular gravel; 20% low plastic inorganic clay; trace amount of sand.		
56	15		50/5"	100	0949	30		70		CL	No Recovery		
57	25		50/5"							CL	CLAYEY GRAVEL ; brown, 7.5YR 5/4; wet; GC; 60% medium to coarse subangular gravel; 40% high plastic, inorganic clay.		
58	14		20/25	100	0956			100		CL	GRAVELLY CLAY ; dark grayish brown, 10YR 4/2; wet; CL; 70% medium plastic, inorganic clay; 30% subangular and subrounded gravel.		
59	20		20/40	100	1002	70		30		GC	Grading to 100% low plastic, inorganic clay.		
60	20		20/40							GC	CLAYEY GRAVEL ; dark yellowish brown, 10YR 4/4; wet; firm; GC; 70% fine to coarse, subangular and subrounded gravel; 30% low plastic, inorganic clay.		
61	15		30/50/5"	100	1012	40	TR	60		CL	GRAVELLY CLAY ; brown, 10YR 4/3; dry; CL; 60% low to medium, low plastic.		
62	30		50/6"	60							No Recovery		
64	20		30/50/3"	100	1025	35		65		CL	Color changes to dark yellowish brown (10YR 3/4); grading to moist; grading to 35% gravel; grading to 65% clay; grading without trace amount of sand.		
65	15		15/25	100	1031	20	TR	80		CL	CLAYEY GRAVEL ; dark brown, 10YR 3/3; wet; GC; 70% fine to coarse, subangular and		
66													
67	20		50/5"	90	1039	70	TR	30		GC			

Borehole/Well Abandonment Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW07
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Borehole Location: Near Former Stilling Basing Gate	Sheet 5 of 7
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Abandonment Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			
68			25	90			100		CL	subrounded gravel; 30% medium plastic, inorganic clay; trace amount of sand.		
69			50/6"							<u>LOW PLASTIC INORGANIC CLAY</u> ; dark brown, 7.5YR 3/3; dry; CL; 100% low plastic, inorganic clay.		
70			15	100								
71			20									
72			50/6"									
73			20	60	1102					No Recovery		
74			50/4"			10		90	CL	<u>LOW PLASTIC INORGANIC CLAY</u> ; dark brown, 7.5YR 3/3; dry; CL; 90% low plastic, inorganic clay; 10% fine to medium, subangular gravel. Color changes to brown (7.5YR 4/4); grading to 80% clay; grading to 20% gravel.		
75			30	90	1117	20		80				
76			50/4"			60		40	GC	<u>CLAYEY GRAVEL</u> ; brown, 10YR 4/3; dry; GC; 60% fine to coarse, subangular and subrounded gravel; 40% medium plastic, inorganic clay.		
77			35	60	1125			70	CL	<u>GRAVELLY CLAY</u> ; brown, 10YR 4/3; dry; CL; 70% medium plastic, inorganic clay; 30% medium to coarse, subrounded gravel.		
78			27	100					IE	<u>EXTRUSIVE</u> ; basalt; black, 7.5YR 2.5/1; 100% massive basalt; faintly weathered; hard; wet; IE.		
79			50/4"	80	1139					No Recovery		
80			100/5'	5	1150							
81			NA	100	1310				IE	<u>EXTRUSIVE</u> ; basalt; black, 7.5YR 2.5/1; 100% massive basalt; faintly weathered; hard; wet; IE.		
82												
83												
84												
85												

Red Hill Phase II RI/FS/CTO-0034

Borehole/Well Abandonment Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW07
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Borehole Location: Near Former Stilling Basing Gate Sheet 6 of 7

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Abandonment Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			
86									IE	<p>EXTRUSIVE: basalt; black, 7.5YR 2.5/1; 100% massive basalt; faintly weathered; hard; wet; IE.</p>		<p>Top of screen</p> <p>Perforated stainless steel screen</p> <p>Stainless steel screen perforated with cutting tool. Former sand filter pack airlifted out. Entire Bentonite seal and perforated screen interval sealed by pressure grouting.</p>
87												
88												
89												
90												
91												
92												
93												
94												
95												
96												
97												
98												
99												
100												
101												
102												

Red Hill Phase II RI/FS/CTO-0034

Borehole/Well Abandonment Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS Project Number: CTO-0034 Borehole Number: MW07

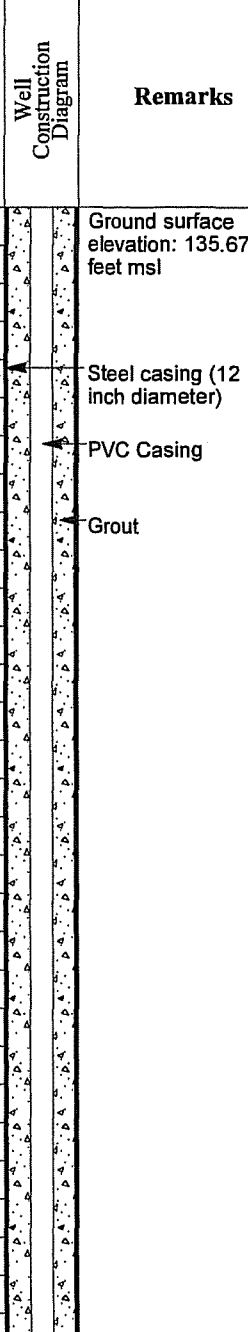
Borehole Location: Near Former Stilling Basing Gate Sheet 7 of 7

Depth (feet)	Samples					Estimated %			Log		Lithologic Description	Well Abandonment Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic	USCS or Rock Type			
103									↘	IE	EXTRUSIVE ; basalt; black, 7.5YR 2.5/1; 100% massive basalt; faintly weathered; hard; wet; IE.		
104									↘				
105									↘				
106									↘				
107									↘				
108									↘				
109									↘				
110									↘				
111									↘				
112									↘				
113									↘				
114									↘				
115									↘				
116									↘				
117									↘				
118									↘	Boring finished @ 118 feet on 4/27/98		Total depth of borehole	

Red Hill Phase II RI/FS/CTO-0034

Borehole/Well Construction Log

Project Name: Red Hill Phase II RI/FS		Project Number: CTO-0034		Borehole Number: MW08	
Borehole Location: Near AST		Northing: 75254.41 Easting: 530845.19		Sheet 1 of 9	
Drilling Agency: Valley Well Drilling			Driller: Dean Mclure, David Brown		
Drilling Equipment: B59, Jaswell 3000			Date & Time Started: 4/7/98	Total Depth (feet): 142.8	
Drilling Method: Air Rotary, Hollow Stem Auger		Top of Casing Elevation (feet msl): 138.06	Date & Time Finished: 4/24/98	Depth to Water (feet): See remarks	
Size and Type of Bit: -		Borehole Diameter (in): 10	Sample Bulk: NA Drive: x	Sample Length (ft): 1.5' or 5'	
Drilling Fluid: Air		Drilling Angle (degrees): 90	Sample Type: SS: 16 Grab: NA	Driving Weight: NA Drop Length: NA	
Completion Information: See remarks			Logged By: W. Wen		Checked By: B. Tsutsui

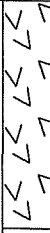



Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks		
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic				USCS or Rock Type	
1		50/5'	40	1352	5	TR	95		CL	Topsoil LOW PLASTIC INORGANIC CLAY ; black, 5YR 2.5/1; dry; hard; CL; 95% low plastic inorganic clay; 5% fine, subangular gravel; trace amount of sand and roots.		Ground surface elevation: 135.67 feet msl		
2														
3														
4														
5		50/5'	35	1359	TR	80	20		SC	CLAYEY SAND ; dark yellowish brown, 10YR 4/6; dry; dense; SC; 80% fine, medium, coarse, subrounded sand; 20% low plastic inorganic clay; trace amount of fine, subangular gravel.				
6														
7														
8														
9														
10		50/6'	15	1410	-	-	-		IE	EXTRUSIVE ; basalt; gray, 10YR 6/1; vesicular basalt; fresh; hard; dry; IE.				
11														
12														
13														
14														
15														

Red Hill Phase II RI/FS/CTO-0034

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW08
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Borehole Location: Near AST	Sheet 2 of 9
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













Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks	
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic				USCS or Rock Type
16			NA	5	1420	-	-	-		IE	Same as above		
17													
18			50/3"	0		-	-	-			No Recovery		
19											Called off at 1435, 4/7/98		
20			NA	70	1300	-	-	-			No recovery		
21													
22						-	-	-			No Recovery		
23													
24													
25			NA	0	1442	40	-	60		CL	GRAVELLY CLAY ; strong brown and dark gray, 7.5YR 5/6, 4/1; dry; soft; CL; 60% high plastic inorganic clay; 40% fine, subrounded basalt gravel.		
26											No Recovery		
27											Called off at 1442, 4/13/98		
28													
29													
30													
31													
32			NA	80	1430	-	TR	100		CH	HIGH PLASTIC INORGANIC CLAY ; dark	Bottom of steel casing	

Red Hill Phase II RI/FS/CTO-0034

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW08
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Borehole Location: Near AST	Sheet 3 of 9
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Gravel	Sand	Fines	Graphic	USCS or Rock Type			
33										brown, 7.5YR 3/3; moist; soft; CH; 100% high plastic inorganic clay; trace amount of sand. Logged at 1439, 4/14/98.		
34												
35												
36					30	TR	70		CL	GRAVELLY CLAY ; very dark gray and brown, 10YR 3/2; moist; stiff; CL; 30% subrounded gravel; 70% low plastic inorganic clay; trace amount of sand; extensive mottling.		
37		NA	60		-	-	-		IE	EXTRUSIVE ; basalt; light gray, 5YR 7/2; vesicular basalt; highly weathered; friable; dry; IE.		
38					-	-	-		IE	Same as above		
39					100	TR	-		GP	POORLY GRADED GRAVEL ; pale olive gray, 5YR 6/2; dry; GP; 100% coarse, subrounded gravel; trace amount of coarse sand.		
40					-	-	-		IE	EXTRUSIVE ; basalt; pale olive, 5YR 7/2; lightly weathered; massive; friable; dry; IE.		
41												
42		NA	70		80	10	10		GC	CLAYEY GRAVEL ; strong brown, 7.5YR 4/6; moist; GC; 80% fine, medium and coarse subrounded gravel; 10% coarse subrounded sand; 10% high plastic inorganic clay.		
43									GW	WELL GRADED GRAVEL ; brown, 7.5YR 4/3; moist; GW; 100% medium coarse subrounded gravel.		
44					100	-	-		IE	EXTRUSIVE ; basalt; brown, 7.5YR 4/3; highly weathered; vesicular basalt; fractured; moist; IE.		
45					90	5	5		GP	POORLY GRADED GRAVEL ; strong brown, 7.5YR 4/6; moist; GP; 90% fine, medium, coarse subrounded gravel; 5% coarse, subrounded sand; 5% high plastic inorganic clay.		
46									IE	EXTRUSIVE ; basalt; brown, 7.5YR 4/3; highly weathered; vesicular basalt; fractured; moist; IE.		
47		NA	80		-	-	-					
48					-	-	100		CH	HIGH PLASTIC INORGANIC CLAY ; brown, 7.5YR 4/2; moist; firm; CH; 100% medium plasticity inorganic clay.		
49					-	-	-		IE	EXTRUSIVE ; basalt; olive gray, 5YR 5/2; fresh; vesicular; moist; IE.		
50												

Red Hill Phase II RI/FS/CTO-0034

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS Project Number: CTO-0034 Borehole Number: MW08



















Borehole Location: Near AST Sheet 4 of 9

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			
51												
52			NA	100	1700	-	-	-		IE		Same as above
53												
54										IE		EXTRUSIVE ; basalt; gray, 10YR 5/1; most massive basalt with some vesicular fabric; fresh; hard; moist; IE.
55												
56										IE		EXTRUSIVE ; basalt; olive gray, 5YR 5/2; fresh; vesicular; moist; IE.
57			NA	80	0917	-	-	-		IE		No Recovery
58										IE		Grading to faintly weathered; well developed fracture in basalt.
59												
60												
61						70	10	20		GC		Color changes to brown (7.5YR 4/4); grading to highly weathered and soft. CLAYEY GRAVEL ; dark gray, 5YR 4/1; dry; dense; GC; 70% fine, subangular and subrounded gravel; 20% low plastic, inorganic clay; 10% fine, subangular sand.
62			NA	85	0947	-	-	-		IE		EXTRUSIVE ; basalt; brown, 7.5YR 4/4; massive basalt; highly weathered; medium hard; moist; IE.
63										IE		EXTRUSIVE ; volcanic breccia; gray, 5YR 5/1; 60% basalt clast; 20% matrix; 20% porosity; faintly weathered; hard; dry; IE.
64												
65												
66												
67			NA	80	1040	-	-	-				No recovery

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW08
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Borehole Location: Near AST	Sheet 5 of 9
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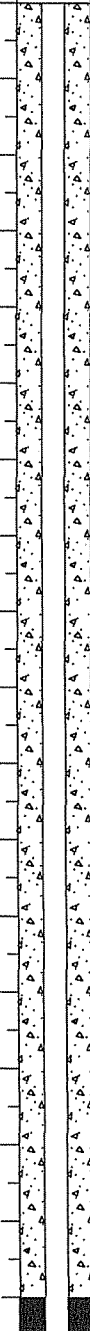
Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks	
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic				USCS or Rock Type
68						-	-	-		IE	EXTRUSIVE ; volcanic breccia; gray, 7.5YR 5/1; 40% basalt clast; 40% matrix; 20% porosity; faintly weathered; hard; wet; IE.		
69						-	-	-		IE	EXTRUSIVE ; basalt; dark gray, 7.5YR 4/1; massive basalt; fresh; hard; wet; IE.		
70													
71													
72		NA	90	1130		-	-	-		IE	Same as above		
73													
74													
75													
76													
77						-	-	-		IE	Same as above		
78													
79													
80													
81													
82													
83													
84													
85													

Red Hill Phase II RI/FS/CTO-0034

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW08
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Borehole Location: Near AST	Sheet 6 of 9
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks	
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic				USCS or Rock Type
86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102						·	·	·		IE	Same as above (Basalt)		
											Top of Bentonite seal		

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW08
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Borehole Location: Near AST	Sheet 7 of 9
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Depth (feet)	Samples					Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic	USCS or Rock Type			
103						-	-	-	\ /	IE	Same as above (basalt)		
104									\ /				
105									\ /				
106									\ /				
107									\ /				
108									\ /				
109									\ /				
110									\ /				
111									\ /				
112									\ /				
113									\ /				
114									\ /				
115									\ /				
116									\ /				
117									\ /				
118									\ /				
119									\ /				
120									\ /				

Red Hill Phase II RI/FS/CTO-0034

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS Project Number: CTO-0034 Borehole Number: MW08

Borehole Location: Near AST Sheet 8 of 9

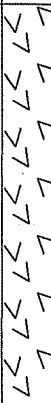
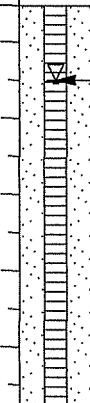




Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks	
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic				USCS or Rock Type
121						-	-	-	↖ ↗ ↘ ↙ ↚ ↛ ↜ ↝ ↞ ↠ ↡ ↢ ↣ ↤ ↥ ↦ ↧ ↨ ↩ ↪ ↫ ↬ ↭ ↮ ↯ ↰ ↱ ↲ ↳ ↴ ↵ ↶ ↷ ↸ ↹ ↺ ↻ ↼ ↽ ↾ ↿ ↻ ↽ ↿ ↻ ↽ ↿ ↻ ↽ ↿	IE	Same as above (basalt)		
122													
123													
124													
125													
126													
127													
128													
129													
130													
131													
132													
133													
134													
135													
136													
137													

Approximate static basal groundwater level (122.2 feet bgs); top of filter pack

Top of screen

0.02 inch stainless steel screen

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS					Project Number: CTO-0034					Borehole Number: MW08		
Borehole Location: Near AST										Sheet 9 of 9		
Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			
138									IE	Same as above (basalt)		First encountered depth of basal groundwater (138.5 feet bgs)
139												
140												
141												
142												Bottom of well
										Boring finished at 143 feet on 4/24/98.		Total depth of borehole

Borehole/Well Construction Log

Project Name: Red Hill Phase II RI/FS		Project Number: CTO-0034		Borehole Number: MW09 (B)	
Borehole Location: Near MW02		Northing: 75343.88 Easting: 530405.3		Sheet 1 of 9	
Drilling Agency: Valley Well Drilling			Driller: Dean Mclure, Charles Kaopua		
Drilling Equipment: B59, Jaswell 3000			Date & Time Started: 6/18/98	Total Depth (feet): 147.0	
Drilling Method: Air Rotary, Hollow Stem Auger		Top of Casing Elevation (feet msl): 118.38	Date & Time Finished: 7/13/98	Depth to Water (feet): See remarks	
Size and Type of Bit: -		Borehole Diameter (in): 10	Sample Type: Bulk: NA Drive: NA SS: NA Grab: NA	Sample Length (ft): NA Drilling Weight: NA Drop Length: NA	
Drilling Fluid: Air		Drilling Angle: (degrees) 90	Number of Samples: 0		
Completion Information: See remarks			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			
1										Topsoil		Ground surface elevation: 115.74 feet msl
2									CL	GRAVELLY CLAY		
3												
4												
5									GC	CLAYEY GRAVEL		
6												
7												
8												
9												
10												
11									IE	TUFF		
12												
13												
14												
15												

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW09 (B)
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Borehole Location: Near MW02	Sheet 2 of 9
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			
16								CL	<u>CLAY WITH TUFF</u>			
17												
18												
19												
20								IE	<u>TUFF</u>			
21												
22												
23												
24												
25								IE	<u>BASALT</u>			
26												
27												
28												
29												
30								IE	<u>TUFF WITH CLAY</u>			
31												
32												

Red Hill Phase II RI/FS/CTO-0034

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS Project Number: CTO-0034 Borehole Number: MW09 (B)

Borehole Location: Near MW02 Sheet 3 of 9

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			
33												
34												
35									CL	<u>CLAY</u>		
36												
37												
38												
39												
40												
41									GC-CL	<u>INTERBED GRAVELY CLAY AND CLAYEY GRAVEL</u>		
42												
43												
44												
45									CL	<u>CLAY</u>		
46												
47												
48												
49												
50												

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW09 (B)
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Borehole Location: Near MW02	Sheet 4 of 9
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			
51									CH	<u>HIGH PLASTIC INORGANIC CLAY</u>		
52												
53												
54												
55									GC-CL	<u>INTERBED GRAVELY CLAY AND CLAYEY GRAVEL</u>		
56												
57												
58												
59												
60									GC-CL	<u>INTERBED GRAVELY CLAY AND CLAYEY GRAVEL</u>		
61												
62												
63												
64												
65									GC-CL	<u>LOW PLASTIC CLAY WITH GRAVEL</u>		
66												
67												

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS Project Number: CTO-0034 Borehole Number: MW09 (B)


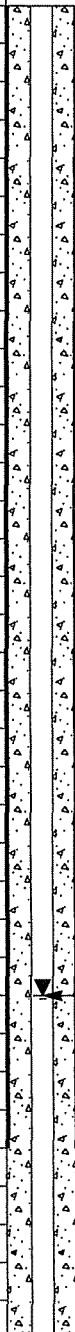



Borehole Location: Near MW02 Sheet 5 of 9

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			
68												
69												
70									GC-CL	<u>INTERBED GRAVELY CLAY AND CLAYEY GRAVEL</u>		
71												
72												
73												
74												
75									CL	<u>CLAY</u>		
76												
77												
78												
79												
80									GC-CL	<u>INTERBED GRAVELY CLAY AND CLAYEY GRAVEL</u>		
81												
82												
83												
84												
85												

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS Project Number: CTO-0034 Borehole Number: MW09 (B)

Borehole Location: Near MW02 Sheet 6 of 9


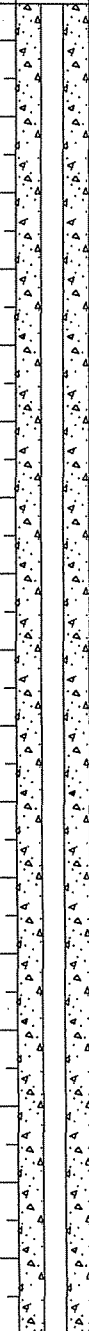


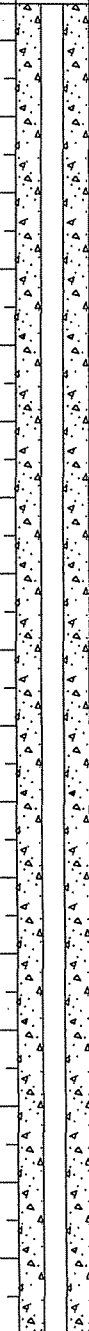





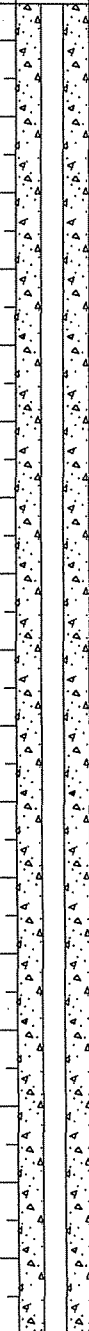





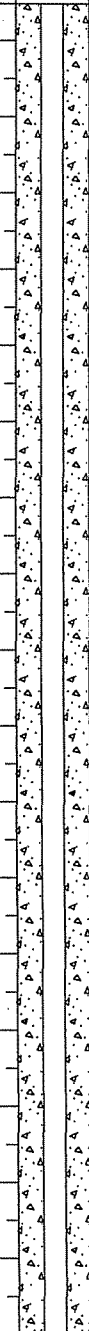





Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			
86									GC-CL	<u>INTERBED GRAVELY CLAY AND CLAYEY GRAVEL</u>		
87									IE	<u>BASALT</u> ; highly weathered basalt.		
88												
89									GC-CL	<u>INTERBED GRAVELY CLAY AND CLAYEY GRAVEL</u>	Approximate static basal groundwater level (98 feet bgs)	
90												
91												
92									GC-CL	<u>INTERBED GRAVELY CLAY AND CLAYEY GRAVEL</u>	Bottom of steel casing	
93												
94												
95												
96												
97												
98												
99												
100												
101												
102												

Red Hill Phase II RI/FS/CTO-0034

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW09 (B)
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Borehole Location: Near MW02	Sheet 7 of 9
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Depth (feet)	Samples					Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic	USCS or Rock Type			
103										GC-CL	<u>INTERBED GRAVELY CLAY AND CLAYEY GRAVEL</u>		
104													
105										GC-CL	<u>INTERBED GRAVELY CLAY AND CLAYEY GRAVEL</u>		
106													
107													
108													
109													
110										GC-CL	<u>INTERBED GRAVELY CLAY AND CLAYEY GRAVEL</u>		
111													
112													
113													
114													
115										GC-CL	<u>INTERBED GRAVELY CLAY AND CLAYEY GRAVEL</u>		
116													
117													
118													
119													
120													

Red Hill Phase II RI/FS CTO-0034

Borehole/Well Construction Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW09 (B)
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Borehole Location: Near MW02	Sheet 8 of 9
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			
121									GC-CL	<u>INTERBED GRAVELY CLAY AND CLAYEY GRAVEL</u>		
122												
123												
124												
125									IE	<u>BASALT</u> ; highly weathered basalt		
126												
127												
128												
129												
130												
131												
132												
133												
134												
135									GC-CL	<u>INTERBED GRAVELY CLAY AND CLAYEY GRAVEL</u>		
136												
137												

Red Hill Phase II RI/FS/CTO-0034

Top of Bentonite seal



Top of filter pack

First encountered depth of basal groundwater (136 feet bgs)

Borehole/Well Construction Log (Continuation Sheet)






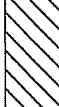
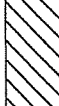
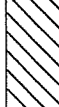
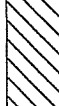
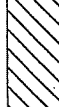
Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW09 (B)
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Borehole Location: Near MW02	Sheet 9 of 9
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Depth (feet)	Samples					Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks	
	Number	Type	Blow Count	Percent Recovery	Time	Gravel	Sand	Fines	Graphic	USCS or Rock Type				
138										GC-CL	<u>INTERBED GRAVELY CLAY AND CLAYEY GRAVEL</u>		Top of screen	
139														
140														
141														
142														
143														
144														
145														
146													0.02 inch stainless steel screen	
147													Total depth of well	
											Boring finished at 147 feet on 7/13/98		Total depth of borehole	

Borehole Log

Project Name: Red Hill Phase II RI/FS		Project Number: CTO-0034	Borehole Number: MW09 (T)
Borehole Location: Near MW02		Northing: 75329.27 Easting: 530393.62	Sheet 1 of 13
Drilling Agency: Valley Well Drilling		Driller: Dean Mclure, Charles Kaopua	
Drilling Equipment: B59, Jaswell 3000		Date & Time Started: 6/15/98,	Total Depth (feet): 142.0
Drilling Method: Air Rotary, Hollow Stem Auger		Elevation (feet MSL): 115.45	Date & Time Finished: 6/23/98,
Size and Type of Bit: -		Borehole Diameter (in): 10	Depth to Water (feet): NA
Drilling Fluid: Air		Drilling Angle (degrees): 90	Number of Samples: 11
Completion Information: Grouted to surface		Logged By: W. Wen	Checked By: B. Tsutsui








Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	Number	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
0											Topsoil	
1				100	1050					GC	CLAYEY GRAVEL ; dark brown, 10YR 3/3; dry; loose; GC; 80% fine to coarse, subangular and subrounded gravel; 20% clay; trace amount of sand and roots.	
2												
3												
4												
5				95	1058					CL	MEDIUM PLASTIC CLAY ; very dark grayish brown, 10YR 3/2; dry; medium dense; CL; 100% medium plastic inorganic clay; smell odor.	
6												
7												
8												
9												
10												

Red Hill Phase II RI/FS/CTO-0034

Borehole Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW09 (T)
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
Borehole Location: Near MW02	Sheet 2 of 13
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Depth (feet)	Samples					Estimated %			Log		Lithologic Description	Remarks
	Number	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic	USCS or Rock Type		
				0	1108						No Recovery	
11												
12												
13												
14												
15				100	1122					IE	EXTRUSIVE ; tuff; very dark gray, 10YR 3/1; highly weathered; hard; dry; IE.	
16												
17				50	1127					IE	Grading to moist.	
18				95	1133					IE	Grading to moist; see stained tuff; smell odor.	
19												
20				95	1139					IE	Color changes to black (2.5YR 2.5/1).	
21				90	1146					IE	Color changes to black (2.5YR 2.5/1).	

Borehole Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW09 (T)
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Borehole Location: Near MW02	Sheet 3 of 13
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	Number	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
22				85	1152					IE	Same as above	
23										IE		
24				60	1156					IE	Same as above	
25												
26				80	1200					IE	Same as above	
27				40	1203					IE	Same as above	
28												
29				50	1252					CH	HIGH PLASTIC CLAY ; black, 7.5YR 2.5/1; dry; very dense; CH; 100% high plastic inorganic clay; smell diesel odor.	
30				30	1255					IE	EXTRUSIVE ; tuff; very dark gray, 7.5YR 3/1; moderately weathered; stiff; dry; IE.	
31												
32				40	1302					IE	Color changes to very dark grayish brown (10YR 3/2); grading to slightly weathered; grading to hard.	
33				80	1308					CL	GRAVELLY CLAY ; brown, 10YR 4/3; dry; loose;	

Red Hill Phase II RI/FS/CTO-0034

Borehole Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW09 (T)
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Borehole Location: Near MW02	Sheet 4 of 13
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	Number	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
34										CL; 60% low plastic clay; 40% fine to medium, angular and subangular gravel.		
35				50	1313					IE	EXTRUSIVE ; tuff; dark olive brown, 2.5Y 3/3; slightly weathered; hard; dry; IE.	
36				100	1316					CH	GRAVELLY CLAY ; dark yellowish brown, 10YR 3/4; moist; soft; CH; 85% high plastic clay; 15% fine, subrounded gravel.	
37												
38				90	1323					IE	EXTRUSIVE ; basalt; olive gray, 5Y 4/2; fresh; 100% massive basalt; hard; wet; IE.	
39				20	1326					CL	CLAYEY GRAVEL ; dark yellow brown, 10YR 3/4; wet; dense; CL; 65% fine to coarse, subangular and angular gravel; 45% low plastic clay.	
40												
41				0	1342						No Recovery	
42											The lithology below is observation only, not logged.	
43												
44												
45												

Red Hill Phase II RI/FS/CTO-0034

Borehole Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW09 (T)
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Borehole Location: Near MW02	Sheet 5 of 13
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks
	Number	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic		
46								\ / \ / \ /	IE	<u>BASALT</u>	
47								\ / \ / \ /			
48								\ / \ / \ /	GC-CL	<u>INTERBED GRAVELY CLAY AND CLAYEY GRAVEL</u>	
49								\ / \ / \ /			
50								\ / \ / \ /			
51								\ / \ / \ /			
52								\ / \ / \ /			
53								\ / \ / \ /			
54								\ / \ / \ /	GC-CL	<u>INTERBED GRAVELY CLAY AND CLAYEY GRAVEL</u>	
55								\ / \ / \ /			
56								\ / \ / \ /			

Borehole Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS Project Number: CTO-0034 Borehole Number: MW09 (T)

Borehole Location: Near MW02 Sheet 6 of 13

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	Number	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
57										GC-CL	<u>INTERBED GRAVELY CLAY AND CLAYEY GRAVEL</u>	
58												
59												
60												
61												
62												
63												
64												
65												
66												
67												
68												

Borehole Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW09 (T)
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Borehole Location: Near MW02	Sheet 7 of 13
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks
	Number	Type	Headspace (ppm)	Percent Recovery	Gravel	Sand	Fines	Graphic	USCS or Rock Type		
69								GC-CL	<u>INTERBED GRAVELY CLAY AND CLAYEY GRAVEL</u>		
70											
71											
72											
73											
74											
75											
76											
77											
78											
79											
80											

Borehole Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW09 (T)
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Borehole Location: Near MW02	Sheet 8 of 13
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks
	Number	Type	Headspace (ppm)	Percent Recovery	Gravel	Sand	Fines	Graphic	USCS or Rock Type		
81									GC-CL	<u>INTERBED GRAVELY CLAY AND CLAYEY GRAVEL</u>	
82											
83											
84											
85											
86									IE	<u>BASALT</u>	
87											
88											
89									CL	<u>LOW PLASTIC CLAY</u>	
90											
91											

Borehole Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS					Project Number: CTO-0034			Borehole Number: MW09 (T)			
Borehole Location: Near MW02								Sheet 9 of 13			
Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks
	Number	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic		
92									CL	<u>LOW PLASTIC CLAY</u>	
93											
94											
95											
96											
97											
98											
99											
100											
101											
102											
103											

Borehole Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW09 (T)
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Borehole Location: Near MW02	Sheet 10 of 13
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks
	Number	Type	Headspace (ppm)	Percent Recovery	Gravel	Sand	Fines	Graphic	USCS or Rock Type		
104 105 106 107 108 109 110 111 112 113 114 115								CL	<u>LOW PLASTIC CLAY</u>		

Borehole Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW09 (T)
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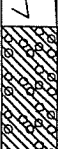
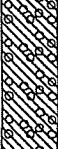
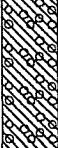

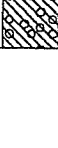

Borehole Location: Near MW02	Sheet 11 of 13
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks
	Number	Type	Headspace (ppm)	Percent Recovery	Gravel	Sand	Fines	Graphic	USCS or Rock Type		
16								\	IE	<u>BASALT</u>	
17								\	GC	<u>CLAYEY GRAVEL</u>	
18								\			
19								\			
20								\			
21								\	GC	<u>CLAYEY GRAVEL</u>	
22								\			
23								\			
24								\			
25								\			
26								\			

Borehole Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW09 (T)
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Borehole Location: Near MW02	Sheet 12 of 13
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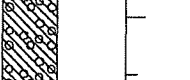
Depth (feet)	Samples					Estimated %			Log		Lithologic Description	Remarks
	Number	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic	USCS or Rock Type		
27											<u>CLAYEY GRAVEL</u>	
28										IE	<u>BASALT</u>	
29												
30												
31												
32												
33										GC	<u>CLAYEY GRAVEL</u>	
34												
35												
36												
37												
38												

Red Hill Phase II RI/FS, CTO-0034

Borehole Log (Continuation Sheet)

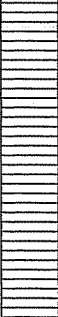

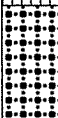

Project Name: Red Hill Phase II RI/FS	Project Number: CTO-0034	Borehole Number: MW09 (T)	
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Borehole Location: Near MW02	Sheet 13 of 13
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks
	Number	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic		
139 140 141 142									GC	<u>CLAYEY GRAVEL</u>	
										Boring finished @ 142 feet on 6/23/98.	Total depth of borehole

Borehole Log

Project Name: Red Hill Phase II, Pearl Harbor		Project Number: CTO-0034		Borehole Number: AST-B-001	
Borehole Location: AST, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/31/98	Total Depth (feet): 10.0	
Drilling Method: Direct Push			Number of Samples: 4	Date & Time Finished: 3/31/98	Depth to Water (feet): NA
Size and Type of Bit: -			Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 1	Sample Length (ft): 2'
Drilling Fluid: NA			Drilling Angle (degrees): 90	Elevation (feet MSL): 135.18	Northing: 75253.78 Easting: 530607.05
Completion Information: Grouted to surface on 3/31/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB208	X		100	1039	20	TR	80		ML	LOW PLASTIC SILT WITH GRAVEL; black, 5YR 2.5/1; dry; loose; ML; 80% low plastic inorganic silt; 15-20% fine, subangular gravel; trace amount of clay, sand, and roots.	Hand trowel AST-S001-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B, 8270B)
5	AB209	◇		90	1047	70	TR	25		GM	SILTY GRAVEL; brown, 7.5YR 4/4; dry; loose; GM; 70% fine, angular and subangular (basaltic) gravel; 25% low plastic silt; trace amount of sand and clay; smell diesel odor.	AST-B001-A02-D5.0 TEG (8015B)
7	AB210	◇		75	1105	15	85	TR		SW	SAND WITH GRAVEL; dark brown, 10YR 3/3; dry; loose; SW; 85% fine, medium, coarse, and angular and subangular sand; 15% fine, angular gravel; trace amount of fines.	AST-B001-A03-D7.0 TEG (8015B, 8100)
8	AB211	◇		90	1119	60	TR	40		GC	CLAYEY GRAVEL; dark gray, 7.5YR 4/1; dry; dense; GC; 60% fine, subrounded and rounded gravel; 40% medium plastic inorganic clay; trace amount of silt and sand; smell diesel odor.	AST-B001-A04-D10.0 TEG (8015B, 8100) MultiChem (8015B, 8270B)
10												Refusal at 10 feet, sample recovery at 10 feet. Vesicular basalt observed at this depth Boring terminated @10 feet at 1119, 3/31/98

Red Hill Phase II, Pearl Harbor/CTO-0034

Borehole Log

Project Name: Red Hill Phase II RI/FS, Pearl Harbor		Project Number: CTO-0034		Borehole Number: AST-B-002	
Borehole Location: AST, Red Hill OWDF				Sheet 1 of 2	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/31/98	Total Depth (feet): 16.0	
Drilling Method: Direct Push		Number of Samples: 4	Date & Time Finished: 3/31/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 1	Sample Length (ft): 2'	
		Drilling Angle (degrees): 90	Type: SS: 3 Grab: 3	Driving Weight: Drop Length:	
Drilling Fluid: NA			Elevation (feet MSL): 134.97	Northing: 75271.16 Easting: 530615.13	
Completion Information: Grouted to surface on 3/31/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB213	X		100	1230	5	95	TR	[Dotted Pattern]	SW	WELL GRADED SAND: dark brown, 10YR 3/3; dry; loose; SW; 95% fine, medium, coarse, and subangular and subrounded sand; 5% fine, angular gravel; trace amount of silt, clay and roots.	Hand trowel AST-S002-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B, 8270B)
2									[Dotted Pattern]			
3									[Dotted Pattern]			
4	AB214	◇		100	1250	15	85	TR	[Dotted Pattern]	SW	SAND WITH GRAVEL: dark grayish brown, 10YR 4/2; dry; loose; SW; 85% fine, medium, coarse, and subangular and subrounded sand; 15% fine, rounded gravel; trace amount of clay and silt.	AST-B002-A02-D5.0 TEG (8015B)
5									[Dotted Pattern]			
6									[Dotted Pattern]			
7									[Dotted Pattern]			
8									[Dotted Pattern]			
9	AB215	◇		100	1304	5	-	95	[Diagonal Pattern]	CL	LOW PLASTIC INORGANIC CLAY: black, 5YR 2.5/1; dry; very dense; CL; 95% low plastic, inorganic clay; 5% angular, fine gravel; stained clay, smell odor.	Smell strong odor (diesel) AST-B002-A03-D9.5 TEG (8015B, 8100)
10									[Diagonal Pattern]			
11									[Diagonal Pattern]			
12									[Diagonal Pattern]			
13									[Diagonal Pattern]			
14	AB216	◇		100	1344	20	60	20	[Dotted Pattern]	SW	CLAYEY-GRAVELLY SAND: black, 7.5YR 2.5/1; moist; dense; SW; 60% fine to medium, coarse subrounded sand; 20% fine, subangular gravel; 10-15% high plastic inorganic clay; 5% silt;	Smell strong odor (diesel) AST-B002-A04-D15.0 TEG (8015B, 8100) MultiChem (8015B,
15									[Dotted Pattern]			

Borehole Log (Continuation Sheet)

Project Name: Red Hill Phase II RI/FS, Pearl Harbor	Project Number: CTO-0034	Borehole Number: AST-B-002
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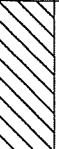
Borehole Location: AST, Red Hill OWDF	Sheet 2 of 2
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Depth (feet)	Samples					Estimated %			Log		Lithologic Description	Remarks
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic	USCS or Rock Type		
16		◇						●●●●● ●●●●● ●●●●● ●●●●● ●●●●●		stained sand, smell odor.	8270B)	
17											Refusal at 16 feet, no sample recovery, possible bedrock basalt. Boring terminated @ 16 feet, at 1456, 3/31/98	
18												
19												
20												
21												
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Red Hill Phase II RI/FS, Pearl Harbor CTO-0034


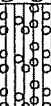
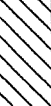
Borehole Log

Project Name: Red Hill Phase II, Pearl Harbor		Project Number: CTO-0034		Borehole Number: AST-B0-30	
Borehole Location: AST, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/30/98	Total Depth (feet): 6.0	
Drilling Method: Direct Push		Number of Samples: 2	Date & Time Finished: 3/30/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: None Drive: Type: SS: 2 Grab:	Sample Length (l): 2' Driving Weight: Drop Length:	
Drilling Fluid: NA		Drilling Angle (degrees): 90	Elevation (feet MSL): 135.20 Northing: 75266.1 Easting: 530615.01		
Completion Information: Grouted to surface on 3/30/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB188			100	1520	20	70	10		SW	GRAVELLY SAND ; dark reddish brown, 5YR 3/4; dry; very loose; SW; 70% fine, medium and coarse, angular and subangular sand; 20% fine, subangular gravel; 10% fines.	AST-S0-30-A01-D1.0 TEG (8015B, 8100) MultiChem (8015B, 8270B)
2												
3												
4	AB189			100	1545	40	TR	60		CL	GRAVELLY CLAY ; dark yellowish brown, 10YR 4/4; dry; loose; CL; 60% low plastic inorganic clay; 40% fine, rounded, and subrounded gravel; trace amount of basalt; smell odor.	AST-B0-30-A02-D5.0 TEG (8015B, 8100) MultiChem (8015B)
5												
6												Smell diesel, Refusal at 6 feet. Boring terminated @ 6 feet at 1545, 3/30/98
7												
8												
9												
10												
11												
12												
13												
14												
15												

Borehole Log

Project Name: Red Hill Phase II, Pearl Harbor		Project Number: CTO-0034		Borehole Number: AST-B0-40	
Borehole Location: AST, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/30/98	Total Depth (feet): 9.5	
Drilling Method: Direct Push		Number of Samples: 3	Date & Time Finished: 3/30/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 2	Sample Length (ft): 2'	
Drilling Fluid: NA		Drilling Angle: (degrees) 90	Elevation (feet MSL): 135.00 Northing: Easting:		
Completion Information: Grouted to surface on 3/30/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB183	X		100		15	80	5		SP	SAND WITH GRAVEL ; dark brown, 7.5YR 3/4; dry; loose; SP; 80% fine to medium subrounded sand; 15% fine subangular gravel; 5-10% clay and silt.	Hand trowel AST-S0-40-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B, 8270B)
5	AB184	◇		100		80	TR	20		GM	SILTY GRAVEL ; gray, 5YR 5/1; dry; loose; GM; 80% fine, subangular and subrounded gravel; 20% fines; trace amount of sand.	AST-B0-40-A02-D6.0 TEG (8015B)
8	AB185	◇		100		-	-	100		CL	LOW PLASTIC INORGANIC CLAY ; dark brown, 7.5YR 3/2; dry; soft; CL; 90% low plastic inorganic clay; 10% silt; smell odor; stained clay.	AST-B0-40-A03-D8.5 TEG (8015B, 8100) MultiChem (8015B)
10												Refusal at 10 feet. Boring terminated @ 9.5 feet at 1449, 3/30/98

Red Hill Phase II, Pearl Harbor, CTO-0034


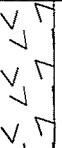
Borehole Log

Project Name: Red Hill Phase II, Pearl Harbor		Project Number: CTO-0034		Borehole Number: AST-B10-10	
Borehole Location: AST, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/19/98	Total Depth (feet): 10.0	
Drilling Method: Direct Push		Number of Samples: 3	Date & Time Finished: 3/19/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 1 Type: SS: 2 Grab: 1	Sample Length (ft): 2' Drop Length:	
Drilling Fluid: NA		Drilling Angle (degrees): 90	Elevation (feet MSL): 135.25 Northing: 75260.89 Easting: 530644.92		
Completion Information: Grouted to surface on 3/19/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB151	X		100	1430	15	85	TR	[Dotted Pattern]	SW	SAND WITH GRAVEL; dark brown, 10YR 3/3; dry; loose; SW; 85% fine, medium to coarse, angular and subangular sand; 15% fine, subangular and subrounded gravel; trace amount of silt and roots.	Hand trowel AST-S10-10-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B)
4	AB152	◇		100	1509	-	-	-	[Chevron Pattern]	IE	EXTRUSIVE; basalt; gray, 10YR 5/1; massive basalt; faintly weathered; hard; dry; IE.	AST-B10-10-A02-D5.0 TEG (8015B)
9	AB153	◇		75	1515	15	60	25	[Diagonal Line Pattern]	SC	CLAYEY SAND WITH GRAVEL; dark gray, 10YR 4/1; dry; loose; SC; 60% fine to medium, subangular and subrounded sand; 25% low plastic clay; 15% fine, subangular gravel.	AST-B10-10-A03-D9.0 TEG (8015B, 8100) MultiChem (8015B)
11												Refusal at 8.5 feet, move over for second attempt. Refusal at 10 feet. Boring terminated @ 10 feet at 1515, 3/19/98

Borehole Log


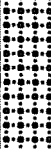
Project Name: Red Hill Phase II, Pearl Harbor		Project Number: CTO-0034		Borehole Number: AST-B10-20	
Borehole Location: AST, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/30/98	Total Depth (feet): 6.5	
Drilling Method: Direct Push			Number of Samples: 2	Date & Time Finished: 3/30/98	Depth to Water (feet): NA
Size and Type of Bit: -			Borehole Diameter (in): 2"	Sample Bulk: None Drive: SS: 2 Grab:	Sample Length (ft): 2' Drilling Weight: Drop Length:
Drilling Fluid: NA			Drilling Angle (degrees): 90	Elevation (feet MSL): 134.66 Northing: 75267.66 Easting: 530635.86	
Completion Information: Grouted to surface on 3/30/98				Logged By: W. Wen	
				Checked By: B. Tsutsui	

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB157			100		30	70	TR		SW	GRAVELLY SAND ; dark grayish brown, 10YR 4/2; dry; loose; SW; 70% fine, medium to coarse, and subangular and subrounded sand; 30% fine, angular and subangular gravel; trace amount of silt.	AST-S10-20-A01-D1.0 TEG (8015B, 8100) MultiChem (8270E)
5	AB158			75		-	-	-		IE	EXTRUSIVE ; basalt; gray, 5YR 6/1; massive basalt with vesicular fabric; faintly weathered; hard; dry; IE.	AST-B10-20-A02-D5.0 TEG (8015B, 8100) MultiChem (8015B)
6												
7												Refusal at 6 feet, move over, refusal at 6.5 on second attempt. Boring terminated @ 6.5 feet at 0846, 3/30/98
8												
9												
10												
11												
12												
13												
14												
15												

Red Hill Phase II, Pearl Harbor/CTO-0034




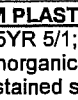


Borehole Log

Project Name: Red Hill Phase II, Pearl Harbor		Project Number: CTO-0034		Borehole Number: AST-B10-30	
Borehole Location: AST, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/30/98	Total Depth (feet): 6.0	
Drilling Method: Direct Push		Number of Samples: 2	Date & Time Finished: 3/30/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: None Drive: SS: 2 Grab:	Sample Length (ft): 2' Drop Length:	
Drilling Fluid: NA		Drilling Angle (degrees): 90	Elevation (feet MSL): 134.93 Northing: 75273.72 Easting: 530628.69		
Completion Information: Grouted to surface on 3/30/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB162			100	0905	10	90	TR		SW	SAND WITH GRAVEL: dark brown, 10YR 3/3; dry; very loose; SW; 90% fine, medium to coarse, subangular and subrounded sand; 10% fine, subrounded gravel; trace amount of silt and roots.	AST-S10-30-A01-D1.0 TEG (8015B, 8100) MultiChem (8015B)
4	AB163			90	0916	20	70	10		SW	Grading to gray (10YR, 6/1); grading to 70% sand; grading to 20% gravel; grading with 10% fines.	AST-B10-20-A02-D5.0 TEG (8015B, 8100) MultiChem (8015B)
7												Refusal at 7 feet, move over refusal at 7 feet on second attempt. Boring terminated @ 6 feet at 0930, 3/30/98

Borehole Log

Project Name: Red Hill Phase II, Pearl harbor		Project Number: CTO-0034		Borehole Number: AST-B10-40	
Borehole Location: AST, Red Hill OWDF				Sheet 1 of 2	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/30/98	Total Depth (feet): 17.5	
Drilling Method: Direct Push		Number of Samples: 5	Date & Time Finished: 3/30/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: None Drive: 5	Sample Length (ft): 2'	
Drilling Fluid: NA		Drilling Angle (degrees): 90	Elevation (feet MSL): 134.66	Northing: 75279.21 Easting: 530620.51	
Completion Information: Grouted to surface on 3/30/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB168			100	0938	-	95	TR		SP	POORLY GRADED SAND ; dark brown, 10YR 3/3; dry; loose; SP; 95% fine, subangular and subrounded sand; trace amount of silt and roots.	Bottom high plastic inorganic clay, stained clay, smell odor. AST-S10-40-A01-D1.0 TEG (8015B, 8100) MultiChem (8015B)
2									SW	WELL GRADED SAND WITH GRAVEL ; SW.		
3									CH	HIGH PLASTIC INORGANIC CLAY ; CH.		
4	AB169			90	0957	10	-	90		CL	MEDIUM PLASTIC INORGANIC CLAY ; dark gray, 7.5YR 5/1; dry; soft; CL; 90% medium plastic inorganic clay; 10% fine, subangular gravel; stained soil, smell odor.	Refusal at 6 feet, move over. AST-B10-40-A02-D5.0 TEG (8015B)
5												
6												
7												
8	AB170			100	1033	10	TR	85		CL	Grading to very dark gray (5YR 3/1); grading to 85% low plastic inorganic clay. Grading with trace amount of sand.	AST-B10-40-A03-D8.5 TEG (8015B) MultiChem (8270B)
9												
10												
11												
12												
13												
14	AB171			100	1055	5	-	95		CL	Grading to dark brown (7.5YR 3/4); grading to 95% clay; grading to 5% gravel; grading without sand.	Refusal at 16.5 feet, move over. AST-B10-40-A04-D14.5 TEG (8015B) MultiChem
15												

Borehole Log (Continuation Sheet)




Project Name: Red Hill Phase II, Pearl harbor	Project Number: CTO-0034	Borehole Number: AST-B10-40
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Borehole Location: AST, Red Hill OWDF	Sheet 2 of 2
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic		
16		◇							▨		(8015B, 8270B)
17	AB172	◇		50	1130	10	-	90	▨	CL	Grading to dark brown (7.5YR 3/4). AST-B10-40-A05-D17.0 TEG (8015B, 8100) MultiChem (8015B, 8270B)
18											Refusal at 17.5 feet. Boring terminated @ 17.5 feet at 1130, 3/30/98
19											
20											
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32											



Borehole Log

Project Name: Red Hill Phase II, Pearl Harbor	Project Number: CTO-0034	Borehole Number: AST-B0-50
Borehole Location: AST, Red Hill OWDF		Sheet 1 of 1
Drilling Agency: TEG	Driller: Dave Davis	
Drilling Equipment: Strataprobe	Date & Time Started: 3/30/98	Total Depth (feet): 9.5
Drilling Method: Direct Push	Number of Samples: 3	Date & Time Finished: 3/30/98
Size and Type of Bit: -	Borehole Diameter (in): 2"	Depth to Water (feet): NA
Drilling Fluid: NA	Drilling Angle (degrees): 90	Elevation (feet MSL): 134.79
Completion Information: Grouted to surface on 3/30/98		Logged By: W. Wen
		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB178			90	1325	TR	85	15		SC	CLAYEY SAND ; dark brown, 10YR 3/3; dry; loose; SC; 85% fine to medium, subangular and subrounded sand; 15% low plastic inorganic clay; trace amount of silt and roots.	AST-S0-50-A01-D1.0 TEG (8015B, 8100) MultiChem (8015B)
5	AB179			45	1333	5	-	95		CL	LOW PLASTIC CLAY WITH GRAVEL ; black, 5YR 2.5/1; dry; stiff; CL; 90-95% low plastic inorganic clay; 5% fine, subrounded gravel; smell odor.	AST-B0-50-A02-D5.0 TEG (8015B)
8	AB180			50	1347	70	TR	30		GC	CLAYEY GRAVEL ; dark brown, 7.5YR 3/2; dry; dense; GC; 70% fine, subrounded and rounded gravel; 20% black, low plastic clay; 10% silt; trace amount of sand; smell odor.	AST-B0-50-A03-D8.5 TEG (8015B, 8100) MultiChem (8015B, 8270B)
6												Refusal at 6 feet; move over, refusal at 9.5 feet on third attempt. Boring terminated @ 9.5 feet at 1347, 3/30/98

Borehole Log

Project Name: Red Hill Phase II, Pearl Harbor		Project Number: CTO-0034		Borehole Number: AST-B10-50	
Borehole Location: AST, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe		Date & Time Started: 3/20/98		Total Depth (feet): 7.0	
Drilling Method: Direct Push		Number of Samples: 2		Date & Time Finished: 3/20/98	
Size and Type of Bit: -		Borehole Diameter (in): 2"		Sample Bulk: None Drive: SS: 2 Grab: Sample Length (ft): 2' Driving Weight: Drop Length:	
Drilling Fluid: NA		Drilling Angle (degrees): 90		Elevation (feet MSL): 134.55 Northing: 75283.48 Easting: 530616.05	
Completion Information: Grouted to surface on 3/20/98				Logged By: W. Wen	
				Checked By: B. Tsutsui	

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB173			60	1250	TR	85	15		SC	CLAYEY SAND ; dark brown, 10YR 3/3; dry; loose; SC; 85% fine, medium, and coarse, subrounded sand; 15% medium plastic clay; trace fine, subangular gravel; trace amount of roots.	AST-S10-50-A01-D1.0 TEG (8015B, 8100) MultiChem (8015B)
4	AB174			80	1302	-	TR	95		CL	LOW PLASTIC CLAY ; black, 7.5YR 2.5/1; dry; stiff; CL; 95% low plastic inorganic clay; trace amount of sand and silt.	AST-B10-50-A02-D5.0 TEG (8015B, 8100) MultiChem (8015B)
6.5												Refusal at 6.5 feet on second attempt. Boring terminated @ 7 feet at 1307, 3/20/98

Borehole Log

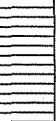

Project Name: Red Hill Phase II, Pearl Harbor		Project Number: CTO-0034		Borehole Number: AST-B20-10	
Borehole Location: AST, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/19/98	Total Depth (feet): 5.5	
Drilling Method: Direct Push			Number of Samples: 2	Date & Time Finished: 3/19/98	Depth to Water (feet): NA
Size and Type of Bit: -			Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 1 Type: SS: 1 Grab:	Sample Length (ft): 2' Driving Weight: Drop Length:
Drilling Fluid: NA			Drilling Angle (degrees): 90	Elevation (feet MSL): 135.52 Northing: 75269.65 Easting: 530650.08	
Completion Information: Grouted to surface on 3/19/98				Logged By: W. Wen	
				Checked By: B. Tsutsui	

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB146	X		100	1403	20	80	TR	(Graphic: Sand with gravel)	SP	GRAVELLY SAND ; dark brown, 10YR 3/3; dry; very loose; SP; 80% fine, medium, and coarse, angular and subangular sand; 20% fine, subangular and subrounded gravel; trace amount of silt.	Hand trowel AST-S20-10-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B)
4	AB147	X		80	1415	30	70	TR	(Graphic: Sand with gravel)	SP	Grading to gray (10YR, 6/1); grading to 70% fine, medium, and coarse, subangular and subrounded sand; grading to 30% subangular gravel.	AST-B20-10-A02-D5.0 TEG (8015B, 8100) MultiChem (8015B)
6												Refusal at 5.8 feet, refusal at 5.5 feet on second attempt. Boring terminated @ 5.5 feet at 1315, 319/98
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Red Hill Phase II, Pearl Harbor/CTO-0034

Borehole Log

Project Name: Red Hill Phase II, Pearl Harbor		Project Number: CTO-0034		Borehole Number: AST-B20-20	
Borehole Location: AST, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/31/98	Total Depth (feet): 5.5	
Drilling Method: Direct Push			Number of Samples: 2	Date & Time Finished: 3/31/98	Depth to Water (feet): NA
Size and Type of Bit: -			Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 1	Sample Length (ft): 2'
Drilling Fluid: NA			Drilling Angle (degrees): 90	Elevation (feet MSL): 135.24	Northing: 75273.42 Easting: 530646.68
Completion Information: Grouted to surface on 3/31/98				Logged By: W. Wen	
				Checked By: B. Tsutsui	

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB203	X		100	1008	TR	10	90		ML	LOW PLASTIC SILT ; dark brown, 10YR 3/3; dry; loose; ML; 80% low plastic inorganic silt; 10-15% fine to medium, subrounded sand; 5-10% clay; trace amount of subangular gravel and roots.	Hand trowel AST-S20-20-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B, 8270B)
4	AB204	◇		75	1020	80	TR	20		GM	SILTY GRAVEL ; brown, 7.5YR 4/4; dry; dense; GM; 80% rounded and subrounded, fine gravel; 15-20% silt; trace amount of sand and basalt.	AST-B20-20-A02-D4.5 TEG (8015B, 8100) MultiChem (8015B, 8270B)
6												Refusal at 5.5 feet. Vesicular basalt observed at this depth, boring terminated @ 5.5 feet at 1020, 3/31/98
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Borehole Log

Project Name: Red Hill Phase II, Pearl Harbor		Project Number: CTO-0034		Borehole Number: AST-B20-30	
Borehole Location: AST, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/31/98	Total Depth (feet): 4.5	
Drilling Method: Direct Push		Number of Samples: 2	Date & Time Finished: 3/31/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 1	Sample Length (ft): 2'	
Drilling Fluid: NA		Drilling Angle: (degrees) 90	Type: SS: 1 Grab:	Driving Weight: Drop Length:	
Completion Information: Grouted to surface on 3/31/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB198	X		100	0932	10	TR	90		CL	LOW PLASTIC INORGANIC CLAY ; black, 7.5YR 2.5/1; dry; loose; CL; 90% low plastic inorganic clay; 10% fine, subrounded gravel; trace amount of silt and roots.	Hand trowel AST-S20-30-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B)
4	AB199	◇		25	0945	-	-	-		IE	EXTRUSIVE ; basalt; gray, 5YR 5/1; massive basalt; faintly weathered; hard; dry; IE.	AST-B20-30-A02-4.5 TEG (8015B, 8100) MultiChem (8015B)
5												Refusal at 4.5 feet. Boring terminated @ 4.5 feet, at 0945, 3/31/98
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Borehole Log

Project Name: Red Hill Phase II, Pearl Harbor		Project Number: CTO-0034		Borehole Number: AST-B20-50	
Borehole Location: AST, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/31/98	Total Depth (feet): 5.2	
Drilling Method: Direct Push		Number of Samples: 2	Date & Time Finished: 3/31/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 1	Sample Length (l): 2'	
Drilling Fluid: NA		Drilling Angle (degrees): 90	Type: SS: 1 Grab: 1	Driving Weight: Drop Length:	
Completion Information: Grouted to surface on 3/31/98			Elevation (feet MSL): 134.37		Northing: 75291.4 Easting: 530622.08
Logged By: W. Wen			Checked By: B. Tsutsui		

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB193	X		100	0842	-	TR	95		ML	INORGANIC SILT ; dark brown, 10YR 3/3; ML; 90% inorganic with slightly plastic silt; trace amount of clay and fine sand (5% each).	Hand trowel AST-S20-50-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B, 8270B)
4	AB194	X		40	0920	-	-	-	\ / \ /	IE	EXTRUSIVE ; basalt; strong brown, 7.5 YR 4/6; massive basalt; highly weathered; soft; dry; IE.	AST-B20-50-A02-D4.5 TEG (8015B, 8100) MultiChem (8015B, 8270B)
5.2												Refusal at 5.2 feet. Boring terminated @ 5.2 feet at 0930, 3/31/98

Borehole Log

Project Name: Red Hill Phase II, Pearl Harbor	Project Number: CTO-0034	Borehole Number: AST-B30-10
Borehole Location: AST, Red Hill OWDF		Sheet 1 of 1
Drilling Agency: TEG	Driller: Dave Davis	
Drilling Equipment: Strataprobe	Date & Time Started: 3/19/98	Total Depth (feet): 6.0
Drilling Method: Direct Push	Number of Samples: 2	Date & Time Finished: 3/19/98
Size and Type of Bit: -	Borehole Diameter (in): 2"	Depth to Water (feet): NA
Drilling Fluid: NA	Drilling Angle (degrees): 90	Elevation (feet MSL): 135.30 Northing: 75278.09 Easting: 530657.48
Completion Information: Grouted to surface on 3/19/98		Logged By: W. Wen
		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspaces (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB129	X		100	1139	-	100	TR		SP	POORLY GRADED SAND ; dark brown, 10YR 3/3; dry; loose; SP; 100% fine and medium, subrounded and subangular sand; trace amount of silt and roots.	Hand trowel AST-S30-10-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B, 8270B)
4	AB130			100	1155	40	60	TR		SP	GRAVELLY SAND ; dark brown, 10YR 3/3; dry; very loose; SP; 60% fine to medium, subangular and subrounded sand; 40% fine, angular gravel; trace amount of silt.	AST-B30-10-A02-D5.0 TEG (815B, 8100) MultiChem (8015B, 8270B)
6												Refusal at 6 feet, move over, refusal at 7 feet on second attempt. Boring terminated @ 6 feet at 1155, 3/19/98
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Red Hill Phase II, Pearl Harbor CTO-0034



Borehole Log

Project Name: Red Hill Phase II, Pearl Harbor		Project Number: CTO-0034		Borehole Number: AST-B30-20	
Borehole Location: AST, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/19/98	Total Depth (feet): 4.8	
Drilling Method: Direct Push		Number of Samples: 2	Date & Time Finished: 3/19/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 1	Sample Length (ft): 2'	
Drilling Fluid: NA		Drilling Angle (degrees): 90	Type: SS: 1 Grab: 1	Driving Weight: Drop Length:	
Completion Information: Grouted to surface on 3/19/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB124	X		100	1110	15	85	TR		SP	POORLY GRADED SAND: dark yellowish brown, 10YR 3/6; dry; very loose; SP; 85% fine and medium, subangular and subrounded sand; 15% fine, subrounded gravel; trace amount of silt.	Hand trowel AST-S30-20-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B, 8270B)
3	AB125	◇		80	1122	-	-	-		IE	EXTRUSIVE: basalt; gray, 7.5YR 6/1; vesicular and massive basalt; slightly weathered; hard; dry; IE.	AST-B30-20-A02-D5.0 TEG (8015B, 8100) MultiChem (8015B, 8270B)
5												Refusal at 3 feet. Boring terminated @ 4.8 feet at 1122, 3/19/98
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Borehole Log

Project Name: Red Hill Phase II, Pearl Harbor		Project Number: CTO-0034		Borehole Number: AST-B30-30	
Borehole Location: AST, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/19/98	Total Depth (feet): 5.9	
Drilling Method: Direct Push			Number of Samples: 2	Date & Time Finished: 3/19/98	Depth to Water (feet): NA
Size and Type of Bit: -			Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 1 Type: SS: 1 Grab:	Sample Length (ft): 2' Driving Weight: Drop Length:
Drilling Fluid: NA			Drilling Angle: (degrees) 90	Elevation (feet MSL): 134.96 Northing: 75291.82 Easting: 530643.86	
Completion Information: Grouted to surface on 3/19/98				Logged By: W. Wen	
				Checked By: B. Tsutsui	

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB118	X		100	1020	TR	90	10		*SP	POORLY GRADED SAND; dark yellowish brown, 10YR 3/4; dry; very loose; SP; 90% fine and medium, subangular and subrounded sand; 10% silt; trace amount of fine, subrounded gravel.	Hand trowel AST-S30-30-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B, 8270B)
4	AB119	◇		90	1030	-	80	20		SP	Grading to 80% sand; grading to 20% low plastic clay.	AST-B30-30-A02-D5.0 TEG (815B, 8100) MultiChem (8015B, 8270B)
6												Refusal at 5.9 feet. Boring terminated @ 5.9 feet at 1030, 3/19/98
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Red Hill Phase II, Pearl Harbor/CTO-0034



Borehole Log

Project Name: Red Hill Phase II RI/FS, Pearl Harbor		Project Number: CTO-0034		Borehole Number: AST-B30-50	
Borehole Location: AST, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/19/98	Total Depth (feet): 7.0	
Drilling Method: Direct Push		Number of Samples: 2	Date & Time Finished: 3/19/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 1	Sample Length (l): 2'	
Drilling Fluid: NA		Drilling Angle (degrees): 90	Type: SS: 1 Grab: 1	Driving Weight: Drop Length:	
Completion Information: Grouted to surface on 3/19/98			Elevation (feet MSL): 134.34		Northing: 75301.7 Easting: 530629.66
Logged By: W. Wen			Checked By: B. Tsutsui		

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB113	X		100	1000					SM	SILTY SAND ; dark brown, 10YR 3/3; dry; SM; 85% fine to medium, subangular and subrounded sand; 15% silt; trace amount of subrounded gravel and roots.	Hand trowel, AST-S30,50-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B, 8270B)
2												
3												
4	AB114	X								ML	SANDY SILT ; dark brown, 10YR 3/3; dry; very loose; ML; 70% low plastic silt; 30% subangular and subrounded, fine to medium sand; trace subrounded and subangular, fine gravel; smell odor.	AST-B30,50-A02-D5.0 TEG (8015B, 8100) MultiChem (8015B, 8270B)
5			30	1006	TR	30	70					
6												
7												Refusal at 7 feet, no sample recovery, possible basalt or rock fragment; finished at 1016, 3/19/98
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10												
11												
12												
13												
14												
15												

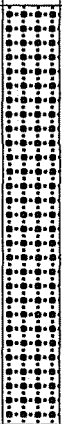
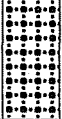
Borehole Log

Project Name: Red Hill Phase II, Pearl Harbor		Project Number: CTO-0034		Borehole Number: AST-B40-30	
Borehole Location: AST, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe		Date & Time Started: 3/19/98		Total Depth (feet): 7.0	
Drilling Method: Direct Push		Number of Samples: 2		Date & Time Finished: 3/19/98	
Size and Type of Bit: -		Borehole Diameter (in): 2"		Sample Bulk: 1 Drive: 1 Type: SS: 1 Grab: 1 Sample Length (ft): 2' Driving Weight: Drop Length:	
Drilling Fluid: NA		Drilling Angle (degrees): 90		Elevation (feet MSL): 136.20 Northing: 75298.95 Easting: 530649.83	
Completion Information: Grouted to surface on 3/19/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB140	X		100	1333	TR	85	15		SW	SAND WITH GRAVEL ; dark brown, 10YR 3/3; dry; loose; SW; 85% fine, medium to coarse, and subangular and subrounded sand; 15% fine, subrounded gravel; trace amount of silt and roots.	Hand trowel AST-S40-30-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B)
4	AB141	X		85	1341	TR	60	40		SC	CLAYEY SAND ; dark gray, 10YR 4/1; dry; firm; SC; 60% fine to medium, subrounded sand; 40% low plastic inorganic clay; trace amount of fine, subangular gravel.	AST-B40-30-A02-D5.0 TEG (8015B, 8100) MultiChem (8015B)
5.8												Refusal at 5.8 feet; move over, refusal at 7 feet. Boring terminated @ 7 feet at 1350, 3/19/98


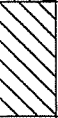
Borehole Log

Project Name: Red Hill Phase II, Pearl Harbor		Project Number: CTO-0034		Borehole Number: AST-B40-40	
Borehole Location: AST, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/19/98	Total Depth (feet): 5.5	
Drilling Method: Direct Push		Number of Samples: 2	Date & Time Finished: 3/19/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 1	Sample Length (ft): 2'	
Drilling Fluid: NA		Drilling Angle (degrees): 90	Type: SS: 1 Grab: 1	Driving Weight: Drop Length:	
Completion Information: Grouted to surface on 3/19/98			Elevation (feet MSL): 136.26		Northing: 75305.44 Easting: 530642.54
			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB135	X		100	1310	25	75	TR		SW	SAND WITH GRAVEL ; dark brown, 10YR 3/3; dry; loose; SW; 75% fine, medium to coarse, subangular and subrounded sand; 25% fine, subrounded and subangular gravel; trace amount of silt.	Hand trowel AST-S40-40-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B)
4	AB136	◇		75	1319	25	75	TR		SW	Same as above.	AST-B40-40-A02-D5.0 TEG (8015B, 8100) MultiChem (8015B)
6												Refusal at 5.5 feet. Boring terminated @ 5.5 feet at 1319, 3/19/98
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8												
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10												
11												
12												
13												
14												
15												

Borehole Log

Project Name: Red Hill Phase II, Pearl Harbor		Project Number: CTO-0034		Borehole Number: AST-B40-50	
Borehole Location: AST, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/19/98	Total Depth (feet): 5.5	
Drilling Method: Direct Push		Number of Samples: 2	Date & Time Finished: 3/19/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 1 Type: SS: 1 Grab:	Sample Length (ft): 2' Driving Weight: Drop Length:	
Drilling Fluid: NA		Drilling Angle (degrees): 90	Elevation (feet MSL): 134.87 Northing: 75305.95 Easting: 530633.15		
Completion Information: Grouted to surface on 3/19/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB107	X		100	0945	TR	90	TR		SP	POORLY GRADED SAND; dark brown, 10YR 3/3; dry; very loose; SP; 90% fine and medium, angular and subangular sand; trace amount of fine, subrounded gravel; trace amounts of fines and roots.	Hand trowel AST-S40-50-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B)
4	AB108	◇		75	0930	-	-	100		CL	LOW PLASTIC CLAY; dark reddish brown, 5YR 3/4; dry; firm; CL; 80-90% low plastic inorganic clay; 10-20% low plastic silt.	AST-B40-50-A02-D5.0 TEG (815B, 8100) MultiChem (8015B)
6												Refusal at 5.5 feet on second attempt. Boring terminated @ 5.5 feet at 0945, 3/19/98
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8												
9												
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Borehole Log

Project Name: Red Hill Phase II, RI/FS		Project Number: CTO-0034		Borehole Number: UDA-B001	
Borehole Location: UDA, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Slide hammer			Date & Time Started: 3/19/98	Total Depth (feet): 7.5	
Drilling Method: Direct Push		Number of Samples: 2	Date & Time Finished: 3/19/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 1	Sample Length (ft): 2	
			Type: SS: 1 Grab: 1	Driving Weight: Drop Length:	
Drilling Fluid: NA		Drilling Angle (degrees): 90	Elevation (feet MSL): 119.98 Northing: 75165.58 Easting: 530368.16		
Completion Information: Grouted to surface on 3/19/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB102	X		100	0812	-	-	100		ML	INORGANIC CLAYEY SILT ; dark, 5YR 2.5/1; dry; loose; ML; 85% low plastic inorganic silt; 15% clay; trace amount of roots.	Hand trowel UDA-S001-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B, 8270B)
2												
3	AB103	X		100	0900	-	TR	100		CL	LOW PLASTIC INORGANIC CLAY ; dark, 5YR 2.5/1; dry; soft; CL; 85% low plastic inorganic clay; 15% silt; trace amount of fine, subangular sand.	UDA-B001-A02-D5.0 TEG (8015B, 8100) MultiChem (8015B, 8270B)
4												
5												
6												
7												
8												Refusal at 7.5 feet on second attempt. Boring terminated @ 6 feet at 0900, 3/19/98
9												
10												
11												
12												
13												
14												
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
Borehole Log

Project Name: Red Hill Phase II, RI/FS		Project Number: CTO-0034		Borehole Number: UDA-B100-100	
Borehole Location: UDA, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe		Date & Time Started: 3/17/98	Total Depth (feet): 7.0		
Drilling Method: Direct Push		Number of Samples: 2	Date & Time Finished: 3/17/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 1	Sample Length (ft): 2'	
			Type: SS: 1 Grab:	Driving Weight: Drop Length:	
Drilling Fluid: NA		Drilling Angle: (degrees) 90	Elevation (feet MSL): 119.80 Northing: 75236.93 Easting: 530379.72		
Completion Information: Grouted to surface on 3/17/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB050	X		100	1025	10	90	TR		SW	WELL GRADED SAND ; dark brown, 10YR 3/3; dry; very loose; SW; 90% fine, medium to coarse, subangular and subrounded sand; 10% fine, subrounded gravel; trace amount of silt and roots.	Hand trowel UDA-S100-100-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B, 8270B)
2												
3												
4	AB051	◇		90	1040	10	85	5		SP	POORLY GRADED SAND ; dark brown, 10YR 3/3; dry; very loose; SP; 85% fine, angular and subangular sand; 10% fine, subangular gravel; 5% silt.	UDA-100-100-A01-D0.5 TEG (8015B) MultiChem (8015B)
5												
6												
7												Refusal at 7 feet on third attempt. Boring terminated @ at 1040, 3/17/98
8												
9												
10												
11												
12												
13												
14												
15												

Borehole Log

Project Name: Red Hill Phase II, RI/FS	Project Number: CTO-0034	Borehole Number: UDA-B100-125
Borehole Location: UDA, Red Hill OWDF		Sheet 1 of 2
Drilling Agency: TEG	Driller: Dave Davis	
Drilling Equipment: Strataprobe	Date & Time Started: 3/17/98	Total Depth (feet): 16.0
Drilling Method: Direct Push	Number of Samples: 4	Date & Time Finished: 3/17/98
Size and Type of Bit: -	Borehole Diameter (in): 2"	Depth to Water (feet): NA
Drilling Fluid: NA	Drilling Angle (degrees): 90	Elevation (feet MSL): 117.84 Northing: 75255.52 Easting: 530348.45
Completion Information: Grouted to surface on 3/17/98	Logged By: W. Wen	Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB060	X		100	1347	15	85	TR		SW	SAND WITH GRAVEL ; dark brown, 10YR 3/3; dry; very loose; SW; 85% fine, medium, and coarse, angular and subangular sand; 15% fine, subrounded gravel; trace amount of silt and roots.	Hand trowel UDA-S100-125-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B)
4	AB061	◇		60	1405	5	95	TR		SP	POORLY GRADED SAND ; yellowish brown, 10YR 5/6; dry; very loose; SP; 95% fine, angular and subangular sand; 5% fine, subangular gravel.	UDA-B100-125-A02-D5.0 TEG (8015B)
9	AB062	◇		100	1412	-	TR	95		CH	HIGH PLASTIC INORGANIC CLAY ; black, 7.5YR 2.5/1; dry; soft; CH; 95% high plastic inorganic clay; trace amount of subrounded coarse sand.	UDA-B100-125-A03-D10.0 TEG (8015B)
14	AB063	◇		100	1427	TR	-	95		CL	MEDIUM PLASTIC CLAY ; black 7.5YR 2.5/1; dry; hard; CL; 95% medium plastic inorganic clay;	UDA-B100-125-A04-D15.0 TEG (8015B, 8100) MultiChem (8015B)

Borehole Log (Continuation Sheet)

Project Name: Red Hill Phase II, RI/FS	Project Number: CTO-0034	Borehole Number: UDA-B100-125
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Borehole Location: UDA, Red Hill OWDF	Sheet 2 of 2
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic		
16		◇						▨		trace amount of coarse and subrounded gravel.	
17											Refusal at 16 feet. Boring terminated @ 16 feet at 1427, 3/17/98
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											

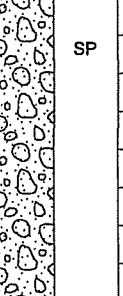
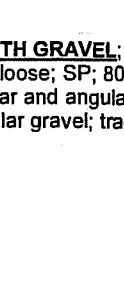
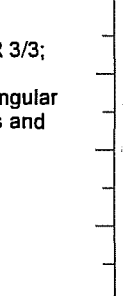
Borehole Log

Project Name: Red Hill Phase II, RI/FS		Project Number: CTO-0034		Borehole Number: UDA-B100-25	
Borehole Location: UDA, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe		Date & Time Started: 3/17/98		Total Depth (feet): 8.5	
Drilling Method: Direct Push		Number of Samples: 2		Date & Time Finished: 3/17/98	
Size and Type of Bit: -		Borehole Diameter (in): 2"		Sample Bulk: 1 Drive: 1 Type: SS: 1 Grab: 1 <small>Sample Length (ft): 2'</small> <small>Driving Weight: Drop Length:</small>	
Drilling Fluid: NA		Drilling Angle (degrees): 90		Elevation (feet MSL): 123.85 Northing: 75200.91 Easting: 530434.83	
Completion Information: Grouted to surface on 3/17/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB011	X		100	1045	25	75	TR		SP	SAND WITH GRAVEL; dark brown, 10YR 3/3; dry; very loose; SP; 75% fine to medium, angular and subangular sand; 25% rounded and subrounded gravel; trace amount of silt and roots.	Hand trowel UDA-S100-25-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B, 8270B)
2												
3	AB012	X		100	1055	TR	90	TR		SP	Grading to yellowish red (5YR 4/6); grading to 90% sand; grading to trace amount of silt and gravel.	UDA-B100-25-A02-D5.0 TEG (8015B) MultiChem (8015B, 8270B)
4												
5												
6												
7												
8												
9												Refusal at 8.5 feet. Move over, refusal at 5.5 feet on second attempt. Boring terminated @ 8.5 feet at 1120, 3/18/98
10												
11												
12												
13												
14												
15												

Borehole Log

Project Name: Red Hill Phase II, RI/FS		Project Number: CTO-0034		Borehole Number: UDA-B100-50	
Borehole Location: UDA, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/16/98	Total Depth (feet): 11.0	
Drilling Method: Direct Push		Number of Samples: 3	Date & Time Finished: 3/16/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 1 Type: SS: 2 Grab: 2	Sample Length (ft): 2' Drilling Weight: Drop Length:	
Drilling Fluid: NA		Drilling Angle (degrees): 90	Elevation (feet MSL): 122.52 Northing: 75212.28 Easting: 530414.99		
Completion Information: Grouted to surface on 3/18/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples			Estimated %			Log		Lithologic Description	Remarks		
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines			Graphic	USCS or Rock Type
1	AB022	X		100	1315	20	80	TR		SP	SAND WITH GRAVEL ; dark brown, 10YR 3/3; dry; very loose; SP; 80% fine, medium, subangular and angular sand; 20% subangular and angular gravel; trace amount of fines and roots.	Hand trowel UDA-S100-50-A01-D0.5 TEG (8015B) MultiChem (8015B)
4	AB023	◇		100	1321	15	70	15		SC	CLAYEY SAND WITH GRAVEL ; dark brown, 10YR 3/3; dry; loose; SC; 70% fine, angular and subangular sand; 15% low plastic silt and clay, 10-15% fine, subangular and angular gravel.	UDA-B100-50-A02-D5.0 TEG (8015B)
9	AB024	◇		100	1332	-	-	-		IE	EXTRUSIVE ; basalt; reddish yellow, 7.5YR 6/6; vesicular and massive basalt; highly weathered; moderately hard; dry; IE.	UDA-B100-50-A03-D10.0 TEG (8015B) MultiChem (8015B)
11												Refusal at 11 feet. Boring terminated @ 11 feet at 1332, 3/16/98

Borehole Log

Project Name: Red Hill Phase II, RI/FS		Project Number: CTO-0034		Borehole Number: UDA-B100-75	
Borehole Location: UDA, Red Hill OWDF				Sheet 1 of 2	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe		Date & Time Started: 3/16/98	Total Depth (feet): 16.2		
Drilling Method: Direct Push		Number of Samples: 4	Date & Time Finished: 3/16/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 1	Sample Length (ft): 2'	
			Type: SS: 3 Grab: 3	Driving Weight: Drop Length:	
Drilling Fluid: NA		Drilling Angle: (degrees) 90	Elevation (feet MSL): 120.62 Northing: 75225.86 Easting: 530396.42		
Completion Information: Grouted to surface on 3/16/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB027	X		100	1350	20	80	TR	[Pattern]	SW	SAND WITH GRAVEL ; dark brown, 10YR 3/3; dry; very loose; SW; 80% fine, medium and coarse, angular and subangular sand; 20% fine subangular gravel; trace amount of fines and roots.	Hand trowel UDA-S100-75-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B)
5	AB029	◇		80	1400	10	90	TR	[Pattern]	SW	Grading to dark brown, 10YR 3/3; grading to 90% sand; grading to 10% gravel.	UDA-B100-75-A02-D5.0 TEG (8015B)
9	AB030	◇		100	1409	5	TR	95	[Pattern]	CL	MEDIUM PLASTIC INORGANIC CLAY ; black, 7.5YR 2.5/1; dry; firm; CL; 95% medium plastic inorganic clay; trace amount of gravel.	UDA-B100-75-A03-D10.0 TEG (8015B)
15	AB031	◇		80	1420				[Pattern]	CL	Same as above.	UDA-B100-75-A04-D15.0 TEG (8015B) MultiChem (8015B, 8270B)

Red Hill Phase II, RI/FS/CTO-0034

Borehole Log (Continuation Sheet)

Project Name: Red Hill Phase II, RI/FS	Project Number: CTO-0034	Borehole Number: UDA-B100-75
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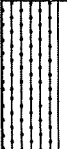
Borehole Location: UDA, Red Hill OWDF	Sheet 2 of 2
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic		
16		◇						▨		Same as above.	
17											Refusal at 16.2 feet, but get 16 inches of sample. Boring terminated @ 16.2 feet at 1420, 3/16/98
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											

Red Hill Phase II, RI/FS/CTO-0034





Borehole Log

Project Name: Red Hill Phase II, RI/FS	Project Number: CTO-0034	Borehole Number: UDA-B125-0
Borehole Location: UDA, Red Hill OWDF		Sheet 1 of 1
Drilling Agency: TEG	Driller: Dave Davis	
Drilling Equipment: Strataprobe	Date & Time Started: 3/16/98	Total Depth (feet): 6.0
Drilling Method: Direct Push	Number of Samples: 2	Date & Time Finished: 3/16/98
Size and Type of Bit: -	Borehole Diameter (in): 2"	Depth to Water (feet): NA
Drilling Fluid: NA	Drilling Angle (degrees): 90	Elevation (feet MSL): 124.20
Completion Information: Grouted to surface on 3/16/98		Logged By: W. Wen
		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB001	X		100	0845	20	80	TR		SP	SAND WITH GRAVEL: dark brown, 10YR 3/3; dry; very loose; SP; 80% medium, angular and subangular sand; 20% fine gravel; trace amount of clay and roots.	Hand trowel UDA-S125-0-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B)
4	AB002	◇		100	0915	TR	80	20		SM	SILTY SAND: yellowish brown, 10YR 5/4; very loose; SM; 80% fine to medium, angular and subangular sand; 20% silt; trace amount of gravel.	UDA-B125-0-A02-D5.0 TEG (8015B) MultiChem (8015B, 8270B)
6												Refusal at 6 feet. Move over, refusal at 3 feet. Boring terminated @ 6 feet at 0930, 3/16/98
7												
8												
9												
10												
11												
12												
13												
14												
15												

Borehole Log

Project Name: Red Hill Phase II, RI/FS		Project Number: CTO-0034		Borehole Number: UDA-B125-100	
Borehole Location: UDA, Red Hill OWDF				Sheet 1 of 2	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe		Date & Time Started: 3/17/98	Total Depth (feet): 20.0		
Drilling Method: Direct Push		Number of Samples: 5	Date & Time Finished: 3/17/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 1	Sample Length (ft): 2'	
Drilling Fluid: NA		Drilling Angle (degrees): 90	Type: SS: 4 Grab: 1	Elevation (feet MSL): 119.07 Northing: 75260.73 Easting: 530390.32	
Completion Information: Grouted to surface on 3/17/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB055	X		100	1222	10	90	TR		SP	POORLY GRADED SAND ; dark brown, 10YR 3/3; dry; very loose; SP; 90% fine to medium, angular and subangular sand; 10% fine, subangular gravel; trace amount of silt.	Hand trowel UDA-S125-100-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B, 8270B)
4	AB056	◇		100	1230	60	20	20		GM	SILTY GRAVEL WITH SAND ; gray, 10YR 5/1; dry; very loose; GM; 60% fine, angular gravel; 20% fine to medium, angular and subangular sand; 20% silt.	UDA-B125-100-A02-D5.0 TEG (8015B, 8100)
9	AB057	◇		100	1240	TR	-	95		CH	HIGH PLASTIC CLAY ; black, 7.5YR 2.5/1; dry; very soft; CH; 95% high plastic fat clay; trace amount of fine, angular gravel.	UDA-B125-100-A03-D10.0 TEG (8015B) MultiChem (8015B, 8270B) Smell odor.
14	AB058	◇		80	1258	TR	-	100		CH	Grading to 100% high plastic fat clay; grading without fine, angular gravel.	UDA-B125-100-A04-D15.0 TEG (8015B, 8100) Smell odor

Red Hill Phase II, RI/FS/CTO-0034

Borehole Log (Continuation Sheet)

Project Name: Red Hill Phase II, RI/FS Project Number: CTO-0034 Borehole Number: UDA-B125-100

Borehole Location: UDA, Red Hill OWDF Sheet 2 of 2

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
16		◇							▨			
17												
18												
19	AB059	◇		70	1317	-	-	-	▽	IE	EXTRUSIVE ; basalt; gray, 7.5YR 5/1; vesicular and massive basalt; fresh; very hard; dry; IE.	UDA-B125-100-A05-D20.0 TEG (8015B) MultiChem (8015B, 8270B)
20		◇										Boring terminated @ 20 feet at 1317, 3/17/98
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
32												


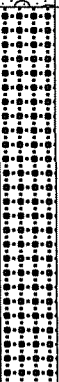

Borehole Log

Project Name: Red Hill Phase II, RI/FS		Project Number: CTO-0034		Borehole Number: UDA-B125-125	
Borehole Location: UDA, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/17/98	Total Depth (feet): 6.0	
Drilling Method: Direct Push		Number of Samples: 2	Date & Time Finished: 3/17/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 1	Sample Length (ft): 2'	
			Type: SS: 1 Grab:	Driving Weight: Drop Length:	
Drilling Fluid: NA		Drilling Angle (degrees): 90	Elevation (feet MSL): 117.94 Northing: 75272.77 Easting: 530373.75		
Completion Information: Grouted to surface on 3/17/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB065	X		100	1444	20	80	TR		SP	SAND WITH GRAVEL: dark brown, 10YR 3/3; dry; very loose; SP; 80% fine to medium, angular and subangular sand; 20% fine, subrounded gravel; trace amount of silt and roots.	Hand trowel UDA-S125-125-A01-D0.5 TEG (8015B) MultiChem (8015B, 8270B)
2												
3												
4	AB066	X		100	1452	40	60	TR		SP	Grading to 40% gravel; grading to 60% sand.	UDA-B125-125-A02-D5.0 TEG (8015B) MultiChem (8015B)
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												Refusal at 6 feet. Boring terminated @ 6 feet at 1452, 3/17/98

Borehole Log

Project Name: Red Hill Phase II, RI/FS		Project Number: CTO-0034		Borehole Number: UDA-B125-25	
Borehole Location: UDA, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/16/98	Total Depth (feet): 11.0	
Drilling Method: Direct Push		Number of Samples: 3	Date & Time Finished: 3/16/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: 1 Type: SS: 2	Drive: Grab:	Sample Length (ft): 2' Drop Length:
Drilling Fluid: NA		Drilling Angle (degrees): 90	Elevation (feet MSL): 122.48 Northing: 75216.83 Easting: 530451.5		
Completion Information: Grouted to surface on 3/16/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB006	X		100	0945	25	70	TR		SP	SAND WITH GRAVEL ; dark brown, 10YR 3/3; dry; very loose; SP; 70% fine to medium, angular and subangular sand; 25% angular gravel; trace amount of silt and roots.	Hand trowel UDA-S125-25-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B)
4	AB007			100	0955	60	35	TR		SW	GRAVELLY SAND ; dark yellowish brown, 10YR 4/4; very loose; SW; 60% fine, medium, coarse sand; 35% subangular and subrounded gravel; trace amount of silt and basaltic fragments.	UDA-B125-25-A02-D5.0 TEG (8015B)
9	AB008			100	1030	-	-	-		IE	EXTRUSIVE ; basalt; gray, 5YR 6/1; glassy, vesicular basalt; highly weathered; hard; dry; IE.	UDA-B125-25-A03-D10.0 TEG (8015B), MultiChem (8015B, 8270B)
11												Refusal at 8 feet, move over. Refusal at 11 feet on second attempt. Boring terminated @ 11 feet at 1030, 3/16/98

Red Hill Phase II, RI/FS/CTO-0034

Borehole Log

Project Name: Red Hill Phase II, RI/FS		Project Number: CTO-0034		Borehole Number: UDA-B125-50	
Borehole Location: UDA, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/16/98	Total Depth (feet): 11.0	
Drilling Method: Direct Push		Number of Samples: 4	Date & Time Finished: 3/16/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 1 Type: SS: 3 Grab: 3	Sample Length (ft): 2' Driving Weight: Drop Length:	
Drilling Fluid: NA		Drilling Angle (degrees): 90	Elevation (feet MSL): 121.43 Northing: 75225.91 Easting: 530429.56		
Completion Information: Grouted to surface on 3/18/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples			Estimated %			Log		Lithologic Description	Remarks		
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines			Graphic	USCS or Rock Type
1	AB016	X		100	1120	15	85	TR		SP	POORLY GRADED SAND ; dark brown, 10YR 3/3; loose; dry; SP; 85% fine to medium, subangular and subrounded sand; 15% fine, subrounded gravel; trace amount of silt and roots.	Hand trowel UDA-S125-50-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B, 8270B)
2												
3												
4	AB017	◇		85	1127	10	90	TR		SP	Grading to very loose; grading to 90% sand; grading to 10% rounded and subrounded gravel.	UDA-B125-50-A02-D5.0 TEG (8015B)
5												
6												
7												
8												
9	AB018	◇		30	1137	-	-	-		IE	EXTRUSIVE ; pale brown, 10YR 6/3; dry; soft; highly weathered basalt; trace amount of clay and gravel; IE.	UDA-B125-50-A03-D10.0 TEG (8015B) MultiChem (8015B, 8270B)
10	AB019	◇		45	1217	15	85	TR		SP	SAND WITH GRAVEL ; yellowish brown, 10YR 6/6; dry; loose; SP; 85% fine, angular and subangular sand; 15% angular and subangular gravel; trace amount of silt and clay.	UDA-B125-50-A04-D15
11												
12												
13												
14												
15												

Red Hill Phase II, RI/FS/CTO-0034

Borehole Log

Project Name: Red Hill Phase II, RI/FS		Project Number: CTO-0034		Borehole Number: UDA-B50-100	
Borehole Location: UDA, Red Hill OWDF				Sheet 1 of 2	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/18/98	Total Depth (feet): 17.0	
Drilling Method: Direct Push		Number of Samples: 4	Date & Time Finished: 3/18/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: None Drive: Type: SS: 4 Grab:	Sample Length (l): 2' Driving Weight: Drop Length:	
Drilling Fluid: NA		Drilling Angle: (degrees) 90	Elevation (feet MSL): 120.37 Northing: 75202.2 Easting: 530343.12		
Completion Information: Grouted to surface on 3/18/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB095			100	1413	20	80	TR	[Dotted Pattern]	SW	SAND WITH GRAVEL; dark yellowish brown, 10YR 3/6; dry; loose; SW; 80% fine, medium, and coarse, angular and subangular sand; 20% fine, subangular gravel; trace amount of fines and roots.	UDA-S50-100-A01-D1.0 TEG (8015B, 8100) MultiChem (8015B, 8270B)
4	AB096			85	1418	10	90	TR	[Dotted Pattern]	SW	Grading to dark brown, 10YR 3/3; grading to 90% sand; grading to 10% gravel.	UDA-B50-100-A02-D5.0 TEG (8015B)
9	AB097			100	1426	15	TR	85	[Diagonal Pattern]	CL	MEDIUM PLASTIC CLAY WITH GRAVEL; black, 10YR 2/1; dry; firm; CL; 85% medium plastic inorganic clay; 10-15% subrounded gravel; trace amount of sand.	UDA-B50-100-A03-D10.0 TEG (8015B)
14	AB098			100	1440	5	TR	95	[Diagonal Pattern]	CL	Grading to 95% clay; grading to 5% gravel; grading without sand.	UDA-B50-100-A04-D15.0 TEG (8015B, 8100) MultiChem (8015B)

Red Hill Phase II, RI/FS/CTO-0034

Borehole Log (Continuation Sheet)

Project Name: Red Hill Phase II, RI/FS	Project Number: CTO-0034	Borehole Number: UDA-B50-100
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Borehole Location: UDA, Red Hill OWDF	Sheet 2 of 2
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic		
16		◇						▨		Same as above.	
17											
18											Over pack to 18 feet, refusal at 17 feet. Move over, refusal twice at both 6 and 7 feet. Boring terminated @ 17 feet at 1440, 3/18/98
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											

Red Hill Phase II, RI/FS/CTO-0034

Borehole Log



Project Name: Red Hill Phase II, RI/FS		Project Number: CTO-0034		Borehole Number: UDA-B50-75	
Borehole Location: UDA, Red Hill OWDF				Sheet 1 of 2	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/18/98	Total Depth (feet): 20.0	
Drilling Method: Direct Push			Number of Samples: 5	Date & Time Finished: 3/18/98	Depth to Water (feet): NA
Size and Type of Bit: -			Borehole Diameter (in): 2"	Sample Bulk: None Drive: 5 Grab: 5	Sample Length (ft): 2' Driving Weight: Drop Length:
Drilling Fluid: NA			Drilling Angle (degrees): 90	Elevation (feet MSL): 122.81 Northing: 75187.01 Easting: 530365.3	
Completion Information: Grouted to surface on 3/18/98				Logged By: W. Wen	
				Checked By: B. Tsutsui	

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB089			90	1316	70	5	25		GM	SILTY GRAVEL ; brown, 7.5YR 4/3; dry; very loose; GM; 70% fine, subangular and subrounded gravel; 25% silt; 5% fine to medium, angular and subangular sand.	UDA-S50-75-A01-D1.0 TEG (8015B, 8100) MultiChem (8015B, 8270B)
2												
3												
4												
5	AB090			70	1320					SW	SAND WITH GRAVEL ; dark brown, 7.5YR 3/3; dry; very loose; SW; 85% fine, medium to coarse, subangular and subrounded sand; 15% fine, angular gravel; trace amount of fines.	UDA-B50-75-A02-D5.0 TEG (8015B)
6												
7												
8												
9	AB091			70	1326	65	15	20		GM	SILTY GRAVEL ; dark gray, 7.5YR 4/1; dry; very loose; GM; 65% angular and subangular, fine gravel; 20% silt; 15% fine, medium, and coarse sand.	UDA-B50-75-A03-D10.0 TEG (8015B, 8100)
10												
11												
12												
13												
14	AB092			100	1342	20	80	TR		SP	SAND WITH GRAVEL ; dark grayish brown, 10YR 4/2; dry; very loose; SP; 80% fine to	UDA-B50-75-A04-D15.0 TEG (8015B)
15												

Borehole Log (Continuation Sheet)

Project Name: Red Hill Phase II, RI/FS	Project Number: CTO-0034	Borehole Number: UDA-B50-75
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Borehole Location: UDA, Red Hill OWDF	Sheet 2 of 2
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic		
16										medium, angular and subangular sand; 20% angular sand; 20% angular, fine gravel; trace amount of silt; smell odor.	
18	AB093										
19			90	1356	40	TR	60		ML	SILT WITH GRAVEL ; dark gray, 10YR 4/1; dry; loose; ML; 60% low plastic silt; 40% angular, fine gravel; trace amount of fine and medium sand; smell diesel odor.	UDA-B50-75-A05-D20.0 TEG (8015B, 8100) MultiChem (8015B), Highly weathered tuffs.
20											Boring finished @20 feet at 1356, 3/18/98
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											

Borehole Log

Project Name: Red Hill Phase II, RI/FS	Project Number: CTO-0034	Borehole Number: UDA-B75-100
Borehole Location: UDA, Red Hill OWDF		Sheet 1 of 2
Drilling Agency: TEG	Driller: Dave Davis	
Drilling Equipment: Strataprobe	Date & Time Started: 3/17/98	Total Depth (feet): 16.0
Drilling Method: Direct Push	Number of Samples: 4	Date & Time Finished: 3/17/98
Size and Type of Bit: -	Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 1 Type: SS: 3 Grab: 1
Drilling Fluid: NA	Drilling Angle (degrees): 90	Elevation (feet MSL): 119.79 Northing: 75219.37 Easting: 530358.26
Completion Information: Grouted to surface on 3/17/98		Checked By: B. Tsutsui
		Logged By: W. Wen

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB044	X		100	0920	TR	95	-	[Dotted Pattern]	SW	WELL GRADED SAND; dark brown, 10YR 3/3; dry; very loose; SW; 95% fine, medium, and coarse, and subangular and subrounded sand; trace amount of gravel and roots.	Hand trowel UDA-S75-100-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B)
2									[Dotted Pattern]			
3									[Dotted Pattern]			
4	AB045	◇		80	0935	10	90	-	[Dotted Pattern]	SW	Grading to pale brown (10YR 6/3); grading to 90% sand; grading to 10% gravel.	UDA-B75-100-A02-D5.0 TEG (8015B)
5									[Dotted Pattern]			
6									[Dotted Pattern]			
7									[Dotted Pattern]			
8									[Dotted Pattern]			
9	AB046	◇		100	0943	5	TR	90	[Diagonal Pattern]	CL	MEDIUM PLASTIC INORGANIC CLAY; dark brown, 10YR 3/3; dry; soft; CL; 90% medium plastic inorganic clay; 5% fine, angular gravel; trace amount of medium, subrounded sand.	UDA-B75-100-A03-D10.0 TEG (8015B)
10									[Diagonal Pattern]			
11									[Diagonal Pattern]			
12									[Diagonal Pattern]			
13									[Diagonal Pattern]			
14	AB047	◇		90	0950	-	TR	95	[Diagonal Pattern]	CH	HIGH PLASTIC INORGANIC CLAY; dark brown, 10YR 3/3; dry; very soft; CH; 95% high	UDA-B75-100-A04-D15.0 TEG (8015B, 8100) MultiChem (8015B)
15									[Diagonal Pattern]			

Red Hill Phase II, RI/FS/CTO-0034

Borehole Log (Continuation Sheet)




Project Name: Red Hill Phase II, RI/FS	Project Number: CTO-0034	Borehole Number: UDA-B75-100
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Borehole Location: UDA, Red Hill OWDF	Sheet 2 of 2
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Gravel	Sand	Fines	Graphic	USCS or Rock Type		
16		◇						▨		plastic inorganic clay; trace amount of fine, subangular sand.	
17											Refusal at 16 feet. Boring terminated @ 16 feet at 0950, 3/17/98
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											





Borehole Log

Project Name: Red Hill Phase II, RI/FS		Project Number: CTO-0034		Borehole Number: UDA-B75-50	
Borehole Location: UDA, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/16/98	Total Depth (feet): 10.0	
Drilling Method: Direct Push		Number of Samples: 3	Date & Time Finished: 3/16/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 2	Sample Length (ft): 2'	
Drilling Fluid: NA		Drilling Angle (degrees): 90	Elevation (feet MSL): 123.68	Northing: 75190.79 Easting: 530399.82	
Completion Information: Grouted to surface on 3/16/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples					Estimated %			Log		Lithologic Description	Remarks
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic	USCS or Rock Type		
1	AB033	X		100	1440	20	80	TR		SW	SAND WITH GRAVEL ; dark brown, 10YR 3/3; dry; very loose; SW; 80% fine, medium, and coarse, angular and subangular sand; 20% fine, angular gravel; trace amount of clay and roots.	Hand trowel UDA-S75-50-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B)
4	AB034	◇		85	1450	10	90	TR		SP	POORLY GRADED SAND ; reddish yellow, 7.5YR 6/8; dry; very loose; SP; 90% fine, angular and subangular sand; 10% subangular gravel; trace amount of fines.	UDA-B75-50-A02-D5.0 TEG (8015B) MultiChem (8015B)
9	AB035	◇		30	1500	15	85	-		ML	LOW PLASTIC INORGANIC CLAY ; red, 2.5YR 4/6; dry; ML; 85% low plastic inorganic silt; 15% angular, fine gravel.	UDA-B50-100-A03-D10.0 TEG (8015B, 8100)
10												Saprolite observed in low plastic silt; refusal at 10 feet. Boring terminated @ 10 feet at 1500, 3/16/98

Borehole Log

Project Name: Red Hill Phase II, RI/FS		Project Number: CTO-0034		Borehole Number: UDA-B75-75	
Borehole Location: UDA, Red Hill OWDF				Sheet 1 of 2	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/17/98	Total Depth (feet): 15.8	
Drilling Method: Direct Push		Number of Samples: 4	Date & Time Finished: 3/17/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: 1 Drive: 1 Type: SS: 3 Grab: 1	Sample Length (ft): 2' Driving Weight: Drop Length:	
Drilling Fluid: NA		Drilling Angle (degrees): 90	Elevation (feet MSL): 121.57 Northing: 75206.05 Easting: 530380.18		
Completion Information: Grouted to surface on 3/17/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB040	X		100	0830	20	80	TR		SP	SAND WITH GRAVEL ; dark brown, 10YR 3/3; dry; loose; SP; 80% fine and medium, angular and subangular sand; 20% fine, angular and subangular gravel; trace amount of silt.	Hand trowel UDA-S75-75-A01-D0.5 TEG (8015B, 8100) MultiChem (8015B)
2												
3												
4	AB041	X		100	0839	30	70	TR		SP	Grading to 70% sand; grading to 30% gravel.	UDA-B75-75-A02-D5.0 TEG (8015B)
5												
6												
7												
8												
9	AB042	X		100	0848	TR	20	80		CL	MEDIUM PLASTIC CLAY WITH SAND ; dark yellowish brown, 10YR 4/4; dry; soft; CL; 80% medium plastic inorganic clay; 20% medium rounded and subrounded sand; trace amount of gravel.	UDA-B75-75-A03-D10.0 TEG (8015B)
10												
11												
12												
13												
14	AB043	X		80	0900	TR	TR	90		CH	HIGH PLASTIC INORGANIC CLAY ; dark yellowish brown, 10YR 3/4; dry; very soft; CH;	UDA-B75-75-A04-D14.5 TEG (8015B, 8100) MultiChem (8015B)
15												

Red Hill Phase II, RI/FS/CTO-0034

Borehole Log (Continuation Sheet)

Project Name: Red Hill Phase II, RI/FS	Project Number: CTO-0034	Borehole Number: UDA-B75-75
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Borehole Location: UDA, Red Hill OWDF	Sheet 2 of 2
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic		
16		◇							▨	90% high plastic inorganic clay; trace amounts of medium sand and fine gravel.	
17											Refusal at 15.8 feet. Boring terminated @ 15.8 feet at 0900, 3/17/98
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											

Borehole Log





Project Name: Red Hill Phase II, RI/FS	Project Number: CTO-0034	Borehole Number: UPD001
Borehole Location: UPD, Red Hill OWDF		Sheet 1 of 1
Drilling Agency: TEG	Driller: Dave Davis	
Drilling Equipment: Strataprobe	Date & Time Started: 3/18/98	Total Depth (feet): 11.0
Drilling Method: Direct Push	Number of Samples: 3	Date & Time Finished: 3/18/98
Size and Type of Bit: -	Borehole Diameter (in): 2"	Depth to Water (feet): NA
Drilling Fluid: NA	Drilling Angle (degrees): 90	Elevation (feet MSL): 116.24 Northing: 75347.43 Easting: 530528.47
Completion Information: Grouted to surface on 3/18/98		Logged By: W. Wen Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB073			55	0836	-	-	-		IE	EXTRUSIVE ; basalt; gray, 5YR 5/1; vesicular and massive basalt; fresh to moderately weathered; dry; IE.	UPD-S001-A01-D1.0 TEG (8015B, 8100) MultiChem (8015B, 8270B)
4	AB074			10	0845	60	TR	40		GC	CLAYEY GRAVEL ; yellowish red, 5YR 5/6; dry; loose; GC; 60% fine, subangular and subrounded gravel; 40% high plastic clay; trace amount of angular sand.	UPD-B001-A02-D5.0 TEG (8015B)
9	AB075			75	0900	50	-	50		GC	Grading to 50% gravel; grading to 50% clay.	UPD-B001-A03-D10.0 TEG (8015B, 8100) MultiChem (8015B)
11												Refusal at 11 feet. Boring terminated @ 11 feet at 0900, 3/19/98

Red Hill Phase II, RI/FS/CTO-0034

Borehole Log

Project Name: Red Hill Phase II, RI/FS		Project Number: CTO-0034		Borehole Number: UPD002	
Borehole Location: UPD, Red Hill OWDF				Sheet 1 of 2	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/18/98	Total Depth (feet): 15.5	
Drilling Method: Direct Push		Number of Samples: 4	Date & Time Finished: 3/18/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: None Drive: SS: 4 Grab:	Sample Length (ft): 2' Driving Weight: Drop Length:	
Drilling Fluid: NA		Drilling Angle (degrees): 90	Elevation (feet MSL): 116.32 Northing: 75354.19 Easting: 530514.33		
Completion Information: Grouted to surface on 3/18/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB078			100	0935	60	TR	40		GM	SILTY GRAVEL ; very dark gray, 5YR 3/1; dry; very loose; GM; 60% fine, subangular gravel; 40% non-plastic silt; trace amount of sand.	UPD-S002-A01-D1.0 TEG (8015B, 8100) MultiChem (8015B)
4	AB079			40	0948	75	TR	25		GM	Grading to dark reddish brown, 5YR 3/2; grading to 75% gravel; grading to 25% silt.	UPD-B002-A02-D5.0 TEG (8015B, 8100)
9	AB080			100	1002	20	-	80		CH	HIGH PLASTIC INORGANIC CLAY WITH GRAVEL ; black, 7.5YR 2.5/1; dry; soft; CH; 80% high plastic inorganic clay; 20% fine, subangular and subrounded gravel; smell odor, possible stained clay.	UPD-B002-A03-D10.0 TEG (8015B, 8100)
14	AB081			75	1033	-	-	-		IE	EXTRUSIVE ; basalt; gray, 5YR 5/1; massive basalt; faintly weathered; hard; dry; IE.	UPD-B002-A04-D15.0 TEG (8015B, 8100) MultiChem (8015B, 8270B)

Borehole Log (Continuation Sheet)




Project Name: Red Hill Phase II, RI/FS	Project Number: CTO-0034	Borehole Number: UPD002
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Borehole Location: UPD, Red Hill OWDF	Sheet 2 of 2
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic		
16		◇						V	^		Refusal at 15.5 feet. Boring terminated @ 16 feet at 1033, 3/18/98
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											

Borehole Log

Project Name: Red Hill Phase II, RI/FS		Project Number: CTO-0034		Borehole Number: UPD003	
Borehole Location: UPD, Red Hill OWDF				Sheet 1 of 1	
Drilling Agency: TEG			Driller: Dave Davis		
Drilling Equipment: Strataprobe			Date & Time Started: 3/18/98	Total Depth (feet): 12.0	
Drilling Method: Direct Push		Number of Samples: 3	Date & Time Finished: 3/18/98	Depth to Water (feet): NA	
Size and Type of Bit: -		Borehole Diameter (in): 2"	Sample Bulk: None Drive: Type: SS: 3 Grab:	Sample Length (ft): 2' Driving Weight: Drop Length:	
Drilling Fluid: NA		Drilling Angle: (degrees) 90	Elevation (feet MSL): 116.16 Northing: 75351.41 Easting: 530503.45		
Completion Information: Grouted to surface on 3/18/98			Logged By: W. Wen		Checked By: B. Tsutsui

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	EPA ID	Type	Headspace (ppm)	Percent Recovery	Time	Gravel	Sand	Fines	Graphic			USCS or Rock Type
1	AB084			100	1050	60	TR	40		GC	CLAYEY GRAVEL ; dark gray, 5YR 4/1; dry; very loose; GC; 60% fine to coarse, subangular and subrounded gravel; 40% high plastic inorganic clay; trace amount of sand.	UPD-S003-A01-D1.0 TEG (8015B, 8100) MultiChem (8015B)
4	AB085			70	1053	60	10	30		GM	SILTY GRAVEL ; dark gray, 5YR 4/1; dry; very loose; GM; 60% fine, angular and subangular gravel; 30% silt; 10% fine to medium, coarse sand.	UPD-B003-A02-D5.0 TEG (8015B, 8100)
9	AB086			100	1104	5	TR	95		CH	HIGH PLASTIC INORGANIC CLAY ; black, 5YR 2.5/1; dry; soft; CH; 95% high plastic inorganic clay; 5% fine, subrounded gravel; trace amount of sand.	UPD-B003-A03-D10.0 TEG (8015B, 8100) MultiChem (8015B, 8270B)
12												Refusal at 12 feet. Boring terminated @ 12 feet at 1104, 3/18/98

Borehole Log

Project Name: Red Hill Oily Waste Disposal Facility	Project Number: CTO-0034	Borehole Number: SB001
Borehole Location: Midway between guy pole and SB004.	Northing: 75260.4654 Easting: 530603.0513	Sheet 1 of 2
Drilling Agency: Valley Well Drilling	Driller: Tim Robertson	
Drilling Equipment: Mobile Drill B-59	Depth to Water (feet):	Total Depth (feet): 35.0
Drilling Method: Hollow Stem Auger	Elevation (feet MSL): 135.56	Date & Time Started: 8/28/2002, 9:50:00 AM Date & Time Finished: 8/28/2002, 12:30:00 PM
Size and Type of Bit: 6"	Borehole Diameter (in): 6"	Number of Samples: 13 Sample Type: Drive
Completion Information: Grouted to surface	Logged By: E. Lampitoc	Checked By: B. Tsutsui

Depth (feet)	Samples					Estimated %					Log	Lithologic Description	Remarks
	Number	Type	Blow Count	Percent Recovery	Analytical Samples & ID	Gravel	Sand	Fines	Graphic	USCS or Rock Type			
1						70	-	30		GM	SILTY GRAVEL ; brown, 7.5 YR 4/4; dry, non-plastic; subrounded to subangular; 70% gravel; 30% fines; GM.		
4	S1		50/4'	20	AB326							PID=5.7 ppm. No odor. AB326: TPH-D=64mg/kg. TPH-L=88mg/kg.	
5	S2		50/6'	33		-	-	100		ML	CLAYEY SILT ; olive brown, 2.5 Y 4/3; dry; stiff; very low plasticity; 100% fines; ML.	PID=15.5 ppm. No odor.	
7						-	-			IE	EXTRUSIVE ; volcanic basalt; weathered; fine grained; IE.		
9	S3		10	70	AB327/AB336	10	-	90		ML	CLAYEY SILT with GRAVEL ; greenish black, 1 Gley 2.5/1 mottled with dark yellowish brown, 10 YR 4/6; very slightly moist; stiff; 90% fines, 10% gravel; ML.	PID=131.5 ppm. Strong odor. AB327: TPH-D=5400mg/kg. AB336: TPH-D=3700mg/kg. PID=110.5 ppm. Strong odor.	
10	S4		21	100									
11			10										
12			28										
13			50										
14	S5		50/2'	20	AB328	-	-			IE	EXTRUSIVE ; volcanic basalt; weathered; fine grained; IE.	PID=15.3 ppm. Slight odor. AB328: TPH-D=740mg/kg. TPH-L=ND. PID=90.1 ppm. Very slight odor.	
15	S6		50/6'	33									
16			50/4'										
17													
18													
19	S7		26	66	AB329/AB335					GM	SILTY GRAVEL ; gravel is extrusive basalt; 90% gravel, 10% fines; IE.	PID=116.1 ppm. Strong odor. AB329: TPH-D=1100mg/kg.	
20			50/6'										

FS H.S.A. BORELOG NO WELL34 AST.GPJFORD.GDT11/1/02

Borehole Log

Project Name: Red Hill Oily Waste Disposal Facility	Project Number: CTO-0034	Borehole Number: SB002
Borehole Location: Midway between SB005 and SB003.	Northing: 75261.8035 Easting: 530614.8411	Sheet 1 of 2
Drilling Agency: Valley Well Drilling	Driller: Tim Robertson	
Drilling Equipment: Mobile Drill B-59	Depth to Water (feet):	Total Depth (feet): 35.0
Drilling Method: Hollow Stem Auger	Elevation (feet MSL): 136.26	Date & Time Started: 8/27/2002, 8:45:00 AM
Size and Type of Bit: 6"	Borehole Diameter (in): 6"	Number of Samples: 12
Completion Information: Grouted to surface	Logged By: E. Lampitoc	Checked By: B. Tsutsui

Depth (feet)	Samples					Estimated %					Log	Lithologic Description	Remarks
	Number	Type	Blow Count	Percent Recovery	Analytical Samples & ID	Gravel	Sand	Fines	Graphic	USCS or Rock Type			
1						80	-	20		GP	GRAVEL with SILT ; weak red, 10 R 4/3; dry; poorly graded; angular to subangular; 80% gravel, 20% fines; GP.		
4	S1		27	38									
5	S2		14		AB312	20	-	80		ML	GRAVELLY SILT ; dark brown, 7.5 YR 3/2; dry; stiff; 80% fines, 20% gravel; ML. Graded from gravel to silt.	PID=6.7 ppm. AB312: TPH-D=9.1mg/kg. TPH-L=11mg/kg.	
6			10	83									
7			38										
8			20										
9	S3		50/6"	0		-	-	-		IE	EXTRUSIVE ; volcanic basalt rock; dark greenish gray, 1 Gley 3/1; IE.	PID=11.4 ppm. No odor.	
10	S4		10	59		40	-	60		ML	GRAVELLY CLAYEY SILT ; dark brown, 7.5 YR 3/2; dry; very stiff; very hard; subrounded to angular gravel; 60% fines, 40% gravel; ML.	PID=28.0 ppm. Odor present. AB313: TPH-D=1100mg/kg. TPH-L=ND.	
11			15		AB313								
12			50										
13													
14	S5		50/6"	0		-	-	-		IE	EXTRUSIVE ; volcanic basalt rock; dark greenish gray, 1 Gley 3/1; aphanitic; unweathered; IE.		
15	S6		20	50									
16			50/6"		AB314								
17													
18													
19	S7		20	50		40	-	60		ML	CLAYEY SILT with GRAVEL ; very dark grayish brown, 10 YR 3/2; dry to very slightly moist; very stiff to stiff; 60% fines, 40% gravel; ML. Gravel is	PID=39.2 ppm. Odor present. AB314: TPH-D=980mg/kg. TPH-L=ND.	
20			50/6"		AB315								

FS H.S.A BORELOG NO WELL34 AST.GPI.FORD.GBT10/31/02

Borehole Log (Continuation Sheet)

Project Name: Red Hill Oily Waste Disposal Facility	Project Number: CTO-0034	Borehole Number: SB002	
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Borehole Location: Midway between SB005 and SB003.	Sheet 2 of 2
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	Number	Type	Blow Count	Percent Recovery	Analytical Samples & ID	Gravel	Sand	Fines	Graphic			USCS or Rock Type
21	S8		10	100							subangular. CLAYEY SILT ; same as above; grading from dark greenish gray, 1 Gley 4/1 to dark yellowish brown, 10 YR 4/4.	TPH-L=ND. PID=47.4 ppm. Strong odor.
22			18									
23			25									
24	S9		10	100							CLAYEY SILT ; same as above; color grading to dark gray, 5 Y 4/1.	PID=18.2 ppm. Very slight odor. AB316: TPH-D=ND.
25	S10		25	100	AB316/Geotech							
26			18									
27												
28												
29	S11		12	100							CLAYEY SILT ; same as above; color grading to mottled reddish brown, 5 R 4/3 and dark gray, 5 Y 4/1. CLAY ; pink, 5 YR 7/3; soft; 100% fines; CL.	PID=11.6 ppm. AB317: TPH-D=ND. PID=12.9 ppm.
30	S12		15	100	AB317	-	-	100		CL		
31			28									
32												
33												
34	S13		20	100		50	20	30		GC	GRAVEL ; dark reddish gray, 5 YR 3/2; moist; highly weathered basalt; 50% angular, vesicular gravel (<.5"), 20% basalt sand; 30% plastic fines; GC. Boring terminated at 35' bgs.	PID=12.3 ppm. AB318: TPH-D=4.9mg/kg. TPH-L=ND.
35			50		AB318							

Borehole Log

Project Name: Red Hill Oily Waste Disposal Facility	Project Number: CTO-0034	Borehole Number: SB003
Borehole Location: ~5' from concrete pad and 5,000 gal. AST.	Northing: 75258.8083 Easting: 530619.0089	Sheet 1 of 1
Drilling Agency: Valley Well Drilling	Driller: Tim Robertson	
Drilling Equipment: Mobile Drill B-59	Depth to Water (feet):	Total Depth (feet): 15.0
Drilling Method: Hollow Stem Auger	Elevation (feet MSL): 136.39	Date & Time Started: 8/27/2002, 1:45:00 PM Date & Time Finished: 8/27/2002, 4:15:00 PM
Size and Type of Bit: 6"	Borehole Diameter (in): 6"	Number of Samples: 3 Sample Type: Drive
Completion Information: Grouted to surface	Logged By: R. de la Sierra	Checked By: B. Tsutsui





Depth (feet)	Samples				Estimated %				Log	Lithologic Description	Remarks
	Number	Type	Blow Count	Percent Recovery	Gravel	Sand	Fines	Graphic			
1					80	-	20		GM	GRAVEL ; black, 5 YR 2.5/1; dry; firm; 80% gravel, basalt, angular; 20% non-plastic fines; GM.	
2											
3											
4	S1		8	0						GRAVEL ; same as above; gravel grading to diam. >2".	
5	S2		12	83	60	-	40		GM	SILTY GRAVEL ; reddish brown, 5 YR 5/3; dry; loose; 60% basalt gravel, diam. >2", 40% loose, non-plastic fines; GM.	PID=4.0 ppm.
6			25								
7			18								
8			25								Hard drilling.
9									IE	EXTRUSIVE ; volcanic basalt rock; IE.	
10	S3			66	40	-	60		ML	CLAYEY SILT with GRAVEL ; very dark grayish brown, 2.5 YR 3/2; dry; stiff; loose; 60% fines, 40% gravel; ML.	PID=12.0 ppm. Odor present. AB319: TPH-D=360mg/kg.
11											
12									IE	EXTRUSIVE ; volcanic basalt rock; IE.	
13											
14											
15										Boring terminated at 15' bgs due to refusal.	
16											
17											
18											
19											
20											

FS H.S.A BORELOG NO WELL34 AST.GPJFORD.GDT10/31/02

AB319

Borehole Log

Project Name: Red Hill Oily Waste Disposal Facility		Project Number: CTO-0034		Borehole Number: SB004	
Borehole Location: Midway between SB001 and concrete pad.		Northing: 75267.79 Easting: 530604.8		Sheet 1 of 2	
Drilling Agency: Valley Well Drilling			Driller: Tim Robertson		
Drilling Equipment: Mobile Drill B-59			Depth to Water (feet):		Total Depth (feet): 30.0
Drilling Method: Hollow Stem Auger		Elevation (feet MSL): 136.05		Date & Time Started: 8/26/2002, 9:30:00 AM	
Date & Time Finished: 8/26/2002, 12:35:00 PM		Size and Type of Bit: 6"		Borehole Diameter (in): 6"	
Number of Samples: 16		Sample Type: Drive		Completion Information: Grouted to surface	
Logged By: E. Lampitoc		Checked By: B. Tsutsui			

Depth (feet)	Samples				Estimated %					Log	Lithologic Description	Remarks
	Number	Type	Blow Count	Percent Recovery	Analytical Samples & ID	Gravel	Sand	Fines	Graphic			
1						30	-	70		CL	GRAVELLY CLAY ; dark reddish gray, 5 YR 4/2; hard; very stiff; 70% fines, 30% gravel, basalt, fresh to slightly weathered, vesicular; CL.	
2												
3												
4	S1		39	33								PID=6.6 ppm. AB300: TPH-D=91mg/kg. TPH-L=140mg/kg.
5	S2		50/12'	33	AB300							PID=9.9 ppm.
6			30									
7	S3		50/6'	0								
8												
9	S4		60/6'	33	AB301	70	-	30		GC	CLAYEY GRAVEL ; gray, 5 YR 5/1; dry; hard; weathered basalt; 70% gravel, 30% fines; GC.	PID=2.7 ppm. Odor present. AB301: TPH-D=180mg/kg. TPH-L=ND. PID=46.1 ppm.
10	S5		50/3'	100		20	-	80		CL-ML	GRAVELLY CLAY ; reddish gray, 10 R 6/1; medium plasticity; medium stiff; 80% fines, 20% weathered basalt gravel; CL.	
11			30									
12	S6		42	100		10		90		CL-ML	GRAVELLY CLAY ; dark greenish gray, 1 Gley 4/1 grading to greenish gray, 1 Gley 5/1; moist; medium plasticity; medium stiff; 90% fines, 10% weathered basalt gravel; CL.	PID=16.1 ppm. Strong odor.
13			50									
14	S7		20	100	AB302/Geotech							PID=64.0 ppm. Strong odor. AB302: TPH-D=ND.
15	S8		22	100								PID=92.0 ppm. Strong odor.
16			22									
17	S9		23	66								PID=12.0 ppm. Strong odor.
18			50									
19	S10		28	100	AB303							PID=61.0 ppm. Slight odor. AB303: TPH-D=1500mg/kg.
20			32									

FS H.S.A. BORELOG NO WELL34 AST.GFJFORD.GDT10/31/02

Borehole Log (Continuation Sheet)

Project Name: Red Hill Oily Waste Disposal Facility	Project Number: CTO-0034	Borehole Number: SB004	
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Borehole Location: Midway between SB001 and concrete pad. Sheet 2 of 2

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks
	Number	Type	Blow Count	Percent Recovery	Analytical Samples & ID	Gravel	Sand	Fines	Graphic		
21	S11	X	27 15	100					[Symbol]		PID=33.0 ppm. Slight odor.
22	S12	X	32 22	100					[Symbol]		PID=84.0 ppm. Strong odor.
24	S13	X	7	100					[Symbol]		PID=148.0 ppm. Strong odor. AB304: TPH-D=550mg/kg.
25	S14	X	9 5	100	[Symbol]				[Symbol]	AB304	PID=115.0 ppm. Strong odor.
27	S15	X	10 5 7	100					[Symbol]		PID=9.3 ppm.
29	S16	X	5 4	100					[Symbol]		PID=0.0 ppm. AB305: TPH-D=ND<500.
30			8		[Symbol]				[Symbol]		Boring terminated at 30' bgs.

Borehole Log

Project Name: Red Hill Oily Waste Disposal Facility		Project Number: CTO-0034		Borehole Number: SB005	
Borehole Location: Midway between SB004 and SB002.		Northing: 75265.5 Easting: 530607.8		Sheet 1 of 2	
Drilling Agency: Valley Well Drilling			Driller: Tim Robertson		
Drilling Equipment: Mobile Drill B-59			Depth to Water (feet):	Total Depth (feet): 30.0	
Drilling Method: Hollow Stem Auger		Elevation (feet MSL): 136.08	Date & Time Started: 8/26/2002, 2:30:00 PM	Date & Time Finished: 8/26/2002, 5:15:00 PM	
Size and Type of Bit: 6"		Borehole Diameter (in): 6"	Number of Samples: 14	Sample Type: Drive	
Completion Information: Grouted to surface			Logged By: E. Lampitoc	Checked By: B. Tsutsui	

Depth (feet)	Samples				Estimated %				Log	Lithologic Description	Remarks
	Number	Type	Blow Count	Percent Recovery	Gravel	Sand	Fines	Graphic			
1					-	-	-		IE	EXTRUSIVE ; weathered basalt; bluish gray, 2 Gley 5/1; dry; hard; gravelly; IE.	
2											
3											
4	S1	50/6"	33								PID=0.0 ppm. AB306: TPH-D=20mg/kg. TPH-L=28mg/kg.
5	S2	50/6"	27	66	30	-	70		CL	GRAVELLY CLAY ; bluish gray, 2 Gley 5/1; dry; very hard; low plasticity; 70% fines, 30% gravel, weathered basalt; CL.	
6											
7	S3	50/6"	0								
8											
9	S4	50/6"	30	66	20	-	80		CL	GRAVELLY CLAY ; dark grayish brown, 10 YR 4/2 to bluish gray, 2 Gley 6/1; dry; hard; very low plasticity; 80% fines, 20% gravel; CL.	PID=52.0 ppm. AB307: TPH-D=2400mg/kg.
10	S5	50/6"	39	66						GRAVELLY CLAY ; same as above; grading to dark gray, 1 Gley 4; grading from subrounded to subangular.	PID=59.5 ppm. Strong odor.
11	S6	50/6"	15	100						GRAVELLY CLAY ; dark grayish brown, 10 YR 4/2 to bluish gray, 2 Gley 6/1; dry to slightly moist; stiff; medium plasticity; 80% fines, 20% gravel; CL.	PID=104.0 ppm. Strong odor.
12											
13											
14	S7	50/6"	27	66						GRAVELLY CLAY ; same as above; grading to more moist.	PID=116.0 ppm. Strong odor. AB308: TPH-D=1300mg/kg.
15	S8	50/6"	28	100						GRAVELLY CLAY ; same as above; grading to really stiff.	PID=138.0 ppm. Strong odor.
16											
17	S9	50/6"	26	66						GRAVELLY CLAY ; same as above; grading to dark gray, 1 Gley 4; medium stiff to medium soft; low plasticity; grading from subrounded to subangular.	Strong odor.
18											
19	S10	50/6"	26	66							PID=63.1 ppm. Strong odor.
20											

PS H.S.A. BORELOG NO WELL 34 AST.GP.FORD.GDTI/031/02

Borehole Log (Continuation Sheet)

Project Name: Red Hill Oily Waste Disposal Facility	Project Number: CTO-0034	Borehole Number: SB005	
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Borehole Location: Midway between SB004 and SB002.	Sheet 2 of 2
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	Number	Type	Blow Count	Percent Recovery	Analytical Samples & ID	Gravel	Sand	Fines	Graphic			USCS or Rock Type
21	S11		10	100		-	-	100		CL	SILTY CLAY ; grading from strong brown, 7.5 YR 5/8 to dark greenish gray, 2 Gley 4/1; medium soft; slightly moist; very lean; 100% fines; CL.	PID=158.0 ppm. Strong odor.
22			19									
23			25									
24	S12		8	100							SILTY CLAY ; same as above; medium soft.	PID=21.9 ppm. Strong odor. AB310: TPH-D=2700mg/kg.
25			16		AB310							
26	S13		7	100								PID=114.0 ppm. Strong odor.
27			8									
28			12									
29	S14		5	100		-	-	100		CL	SILTY CLAY ; dark brown, 7.5 YR 3/3; very moist; medium soft; very lean; 100% fines; CL.	PID=0.8 ppm. Slight odor. AB311: TPH-D=ND.
30			8		AB311							
30			19								Boring terminated at 30' bgs.	

Borehole Log

Project Name: Red Hill Oily Waste Disposal Facility	Project Number: CTO-0034	Borehole Number: SB006
Borehole Location: ~5-6' from SB003.	Northing: 75254.1 Easting: 530613.5	Sheet 1 of 2
Drilling Agency: Valley Well Drilling	Driller: Tim Robertson	
Drilling Equipment: Mobile Drill B-59	Depth to Water (feet):	Total Depth (feet): 30.0
Drilling Method: Hollow Stem Auger	Elevation (feet MSL): 135.52	Date & Time Started: 8/27/2002, 3:35:00 PM Date & Time Finished: 8/27/2002, 6:10:00 PM
Size and Type of Bit: 6"	Borehole Diameter (in): 6"	Number of Samples: 11 Sample Type: Drive
Completion Information: Grouted to surface	Logged By: E. Lampitoc	Checked By: B. Tsutsui



Depth (feet)	Samples				Estimated %		Log		Lithologic Description	Remarks		
	Number	Type	Blow Count	Percent Recovery	Analytical Samples & ID	Gravel	Sand	Fines			Graphic	USCS or Rock Type
1						60	-	40		GM	SILTY GRAVEL ; dark olive brown, 2.5 Y 3/3; dry; subrounded to subangular; 60% gravel basalt, 40% fines; GM.	
2												
3												
4	S1		8	58								
5	S2		12	33	AB320					IE	EXTRUSIVE ; volcanic basalt; gray, 1 Gley 5; vesicular; highly weathered; IE.	PID=18.6 ppm. No odor. AB320: TPH-D=75mg/kg. TPH-L=140mg/kg.
6			18									
7			50									
8												
9	S3		10	66		30	-	70		ML	GRAVELLY SILT ; grading from dark brown, 10 YR 3/3 to greenish gray, 1 Gley 6/1; dry; stiff; 70% fines, 30% gravel, gravel is subrounded to subangular; ML.	PID=14.2 ppm. No odor.
10	S4		27	100	AB321							
11			15									
12			18							IE	EXTRUSIVE ; volcanic basalt; greenish gray, 1 Gley 5/1; fine grained; vesicular; weathered; IE.	PID=15.8 ppm. No odor. AB321: TPH-D=26mg/kg. TPH-L=57mg/kg.
13			50									
14	S5			53		60	-	40		GM	SILTY GRAVEL ; greenish gray, 1 Gley 6/1; stiff; 60% gravel, gravel is subrounded to subangular, 40% fines; GM.	PID=15.8 ppm. No odor.
15	S6			66	AB322	30	-	70		ML	GRAVELLY SILT ; grading from dark brown, 10 YR 3/3 to greenish gray, 1 Gley 6/1; dry; stiff; 70% fines, 30% gravel, gravel is subrounded to subangular; ML.	PID=10.3 ppm. No odor. AB322: TPH-D=5.3mg/kg. TPH-L=ND.
16												
17												
18												
19	S7		28	50		60	-	40		GM	SILTY GRAVEL ; greenish gray, 1 Gley 6/1; stiff; 60% gravel, gravel is subrounded to subangular, 40% fines; GM.	PID=19.0 ppm. No odor.
20			50/6"		AB323							

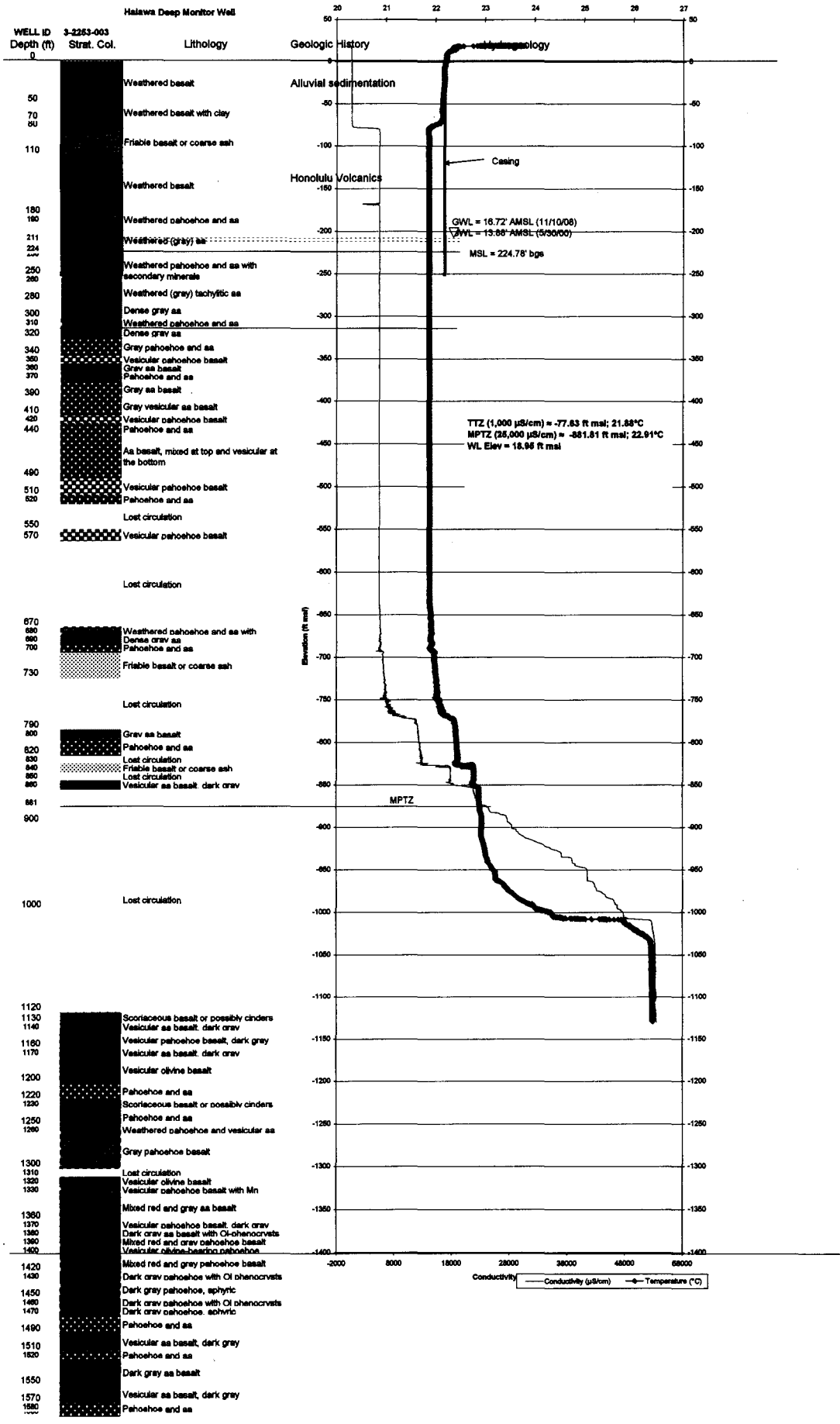
PS H.S.A BORELOG NO WELL34_AST.GPJ\FORD.GDT\1031\02

Borehole Log (Continuation Sheet)

Project Name: Red Hill Oily Waste Disposal Facility	Project Number: CTO-0034	Borehole Number: SB006	
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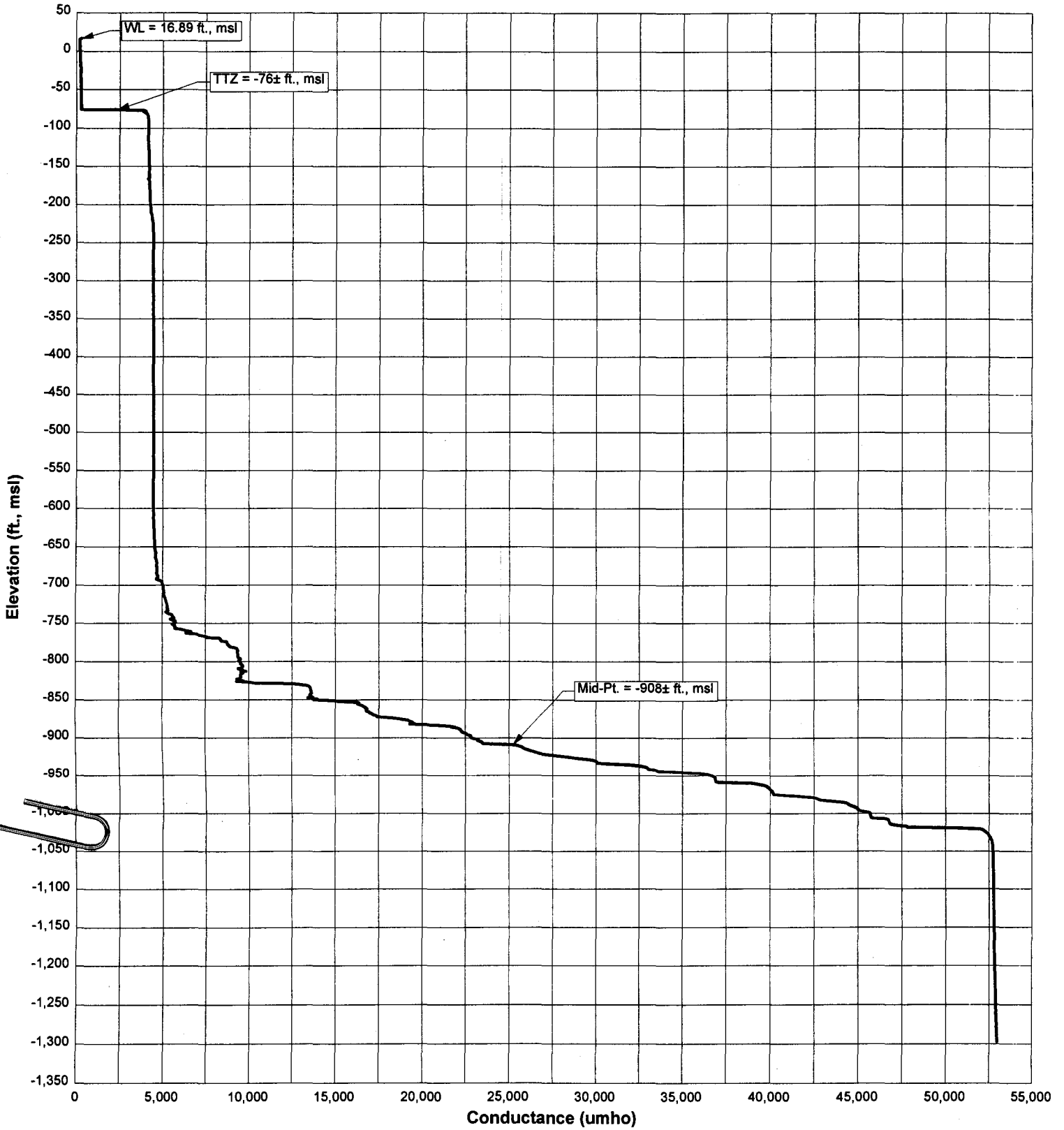
Borehole Location: ~5-6' from SB003.	Sheet 2 of 2
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Remarks	
	Number	Type	Blow Count	Percent Recovery	Analytical Samples & ID	Gravel	Sand	Fines	Graphic			USCS or Rock Type
21	S8		50/6"	66		-	-	-		IE	EXTRUSIVE ; volcanic basalt; greenish gray, 1 Gley 5/1; fine grained; vesicular; weathered; IE. SILTY GRAVEL ; greenish gray, 1 Gley 6/1; stiff; 60% gravel, gravel is subrounded to subangular, 40% fines; GM.	PID=18.5 ppm. No odor.
22						60	-	40		GM		
23												
24	S9		12	83								PID=16.2 ppm. No odor. AB324: TPH-D=ND.
25			27		AB324/Geotech							
25	S10		30	100		-	-	-		IE	EXTRUSIVE ; volcanic basalt; dark greenish gray, 1 Gley 4/1; vesicular; weathered; iron crystals; IE. CLAYEY SILT ; greenish gray, 1 Gley 6/1 mottled with strong brown, 7.5 YR 5/8; a little soft; very stiff; 90% fines, 10% gravel; ML.	PID=12.1 ppm. No odor.
26			16			10	-	90		ML		
27			18									
27			26									
28												
29	S11		10	83								PID=14.0 ppm. No odor. AB325: TPH-D=ND.
30			18		AB325							
30			26									Boring terminated at 30' bgs.



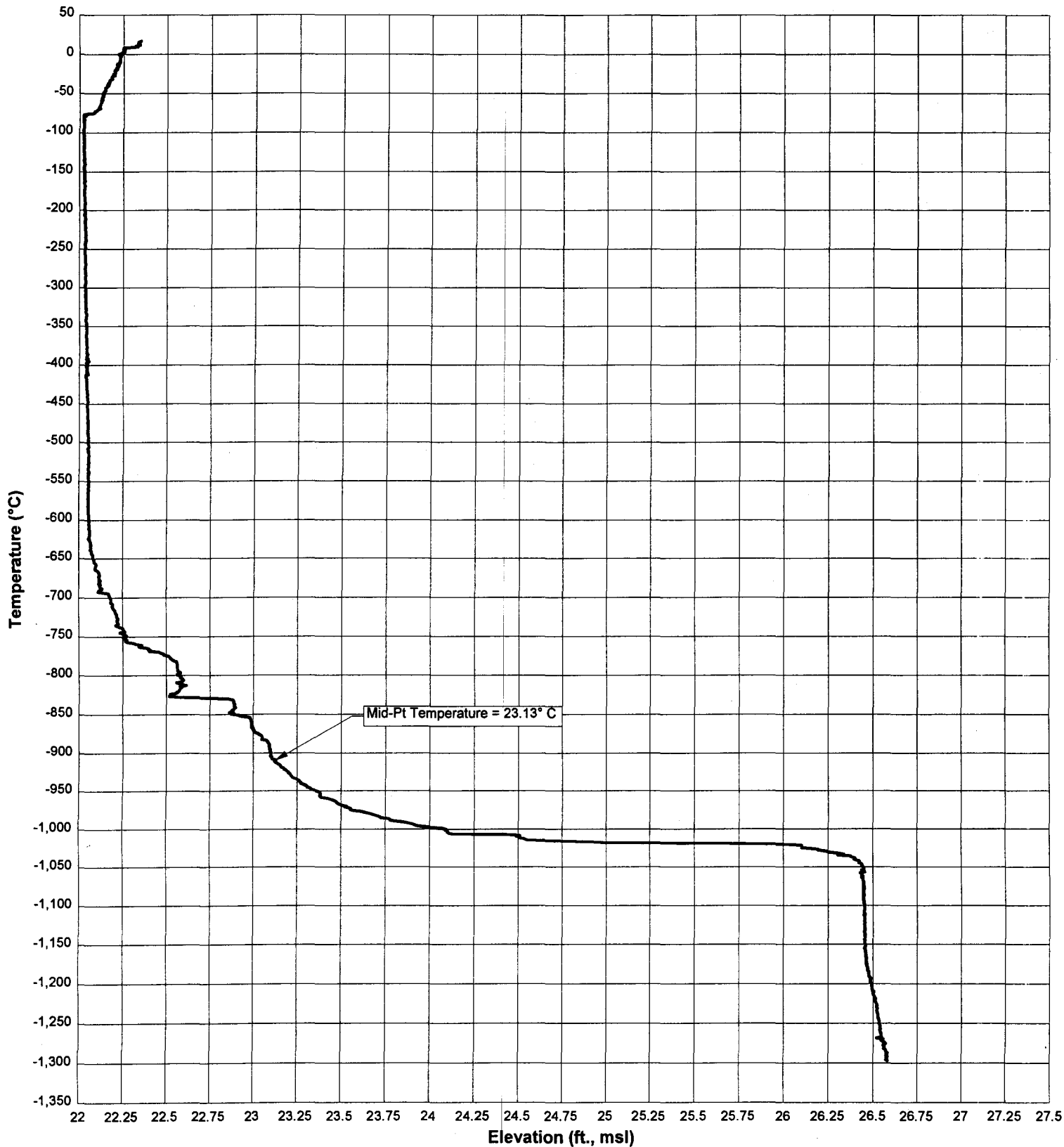
Halawa Deep Monitor Well No. 2253-03

CTD Logged June 4, 2002
Serial No. 425



Halawa Deep Monitor Well No. 2253-03

CTD Logged June 4, 2002
Serial No. 425



BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII



GILBERT S. COLOMA-AGARAN
CHAIRPERSON

BRUCE S. ANDERSON
ROBERT G. GIRALD
BRIAN C. NISHIDA
DAVID A. NOBRIGA
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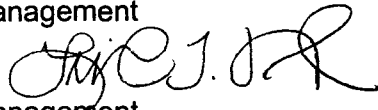
LINNEL T. NISHIOKA
DEPUTY DIRECTOR

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

OCT 17 2001

2253-03.wcr

TO: Dean Nakano, Planning Branch Chief
Commission on Water Resource Management

FROM: Linnel T. Nishioka, Deputy Director 
Commission on Water Resource Management

SUBJECT: Well Completion Report for Well No. 2253-03

We received your Well Completion Report Part I for the Halawa Deep Monitor (Well No. 2253-03) on **October 11, 2001** and acknowledge that it is complete. All regulatory requirements of the Well Construction Permit have been met.

If you have any questions, please contact Lenore Nakama of the Commission staff at 587-0218.

LN:ky



State of Hawaii
COMMISSION ON WATER RESOURCE MANAGEMENT
Department of Land and Natural Resources

WELL COMPLETION REPORT

3/20/96 WCR Form

(Check Appropriate Box) Well Construction (Permanent) Pump Installation

Instructions: Please print or type and submit completed report within 30 days after well completion to the Commission on Water Resource Management, P.O. Box 621, Honolulu, Hawaii 96809. An as-built drawing of the well and chemical analysis should also be submitted. For assistance call the Commission Regulation Branch at 587-0225, or 1-800-468-4644 Extension 70225.

1. State Well No.: 2253-03 Well Name: Oahu (Halawa) Deep Monitor Well Island: Oahu
2. Location/Address: Honolulu, Hawaii Tax Map Key: 9-9-10:28

PART I. WELL CONSTRUCTION REPORT

3. Drilling Company: Water Resources International, Inc.

4. Name of driller who performed work: Kihei Ahuna

5. Type of rig/construction: Spencer Harris 3500 Rotary Rig

6. Date(s) Well Construction and pump tests (if any) completed: 5-30-00

7. GROUND ELEVATION (referenced to mean sea level, msl): 224.78 ft.
Well Bench Mark (description/location): concrete base Elevation(msl): 224.98 ft.

8. DRILLER'S LOG: Please attach geologic log (if available or if required by permit)

Depths (ft.)	Rock Description, Water Level, Dates, etc.	Depths (ft.)	Rock Description, Water Level, Dates, etc.
to <u>See attached</u>		to _____	
to _____		to _____	

(If more space is needed, continue on back.)

9. Total depth of well below ground: 1575 ft.

10. Hole size: 15 inch dia. from -0- ft. to 250.00 ft. below ground
7 7/8 inch dia. from 250 ft. to 1325 ft. below ground
_____ inch dia. from _____ ft. to _____ ft. below ground

11. Casing Installed: 8 in. I.D. x 5/16 in. wall solid section to 250 ft. below ground
NA in. I.D. x _____ in. wall perforated section to _____ ft. below ground
Casing Material/Slot Size: NA

12. Annulus: Grouted from -0- ft. below ground to 210 ft. below ground
Gravel packed from 210 ft. below ground to 250 ft. below ground

13. Initial water level: 210.90 ft. below ground. Date and time of measurement: 2-14-00

14. Initial chloride: NA ppm Date and time of sampling: NA

15. Initial temperature: NA °F Date and time of measurement: NA

16. PUMPING TESTS: Reference Point (R.P.) used: NA which elevation is _____ ft.
(1) Step-Drawdown Test Date _____ (2) Long-term Aquifer Test Date _____
Start water level _____ ft. below R.P. Start water level _____ ft. below R.P.
End water level _____ ft. below R.P. End water level _____ ft. below R.P.

17. Aquifer Pump Test Procedures data & graphs (1/9/96 LTAT Form) attached? Yes No

18. As-built drawings attached? Yes No

19. Other remarks/comments: (On back of this form)

Well Drilling Contractor (print) Water Resources Int'l Inc C-57 Lic. No. AC 05058

Signature Blaise Clay Date June 2, 2000

Blaise Clay

Surveyor (print) R.W. Towill Corporation Lic. No. HI 4729

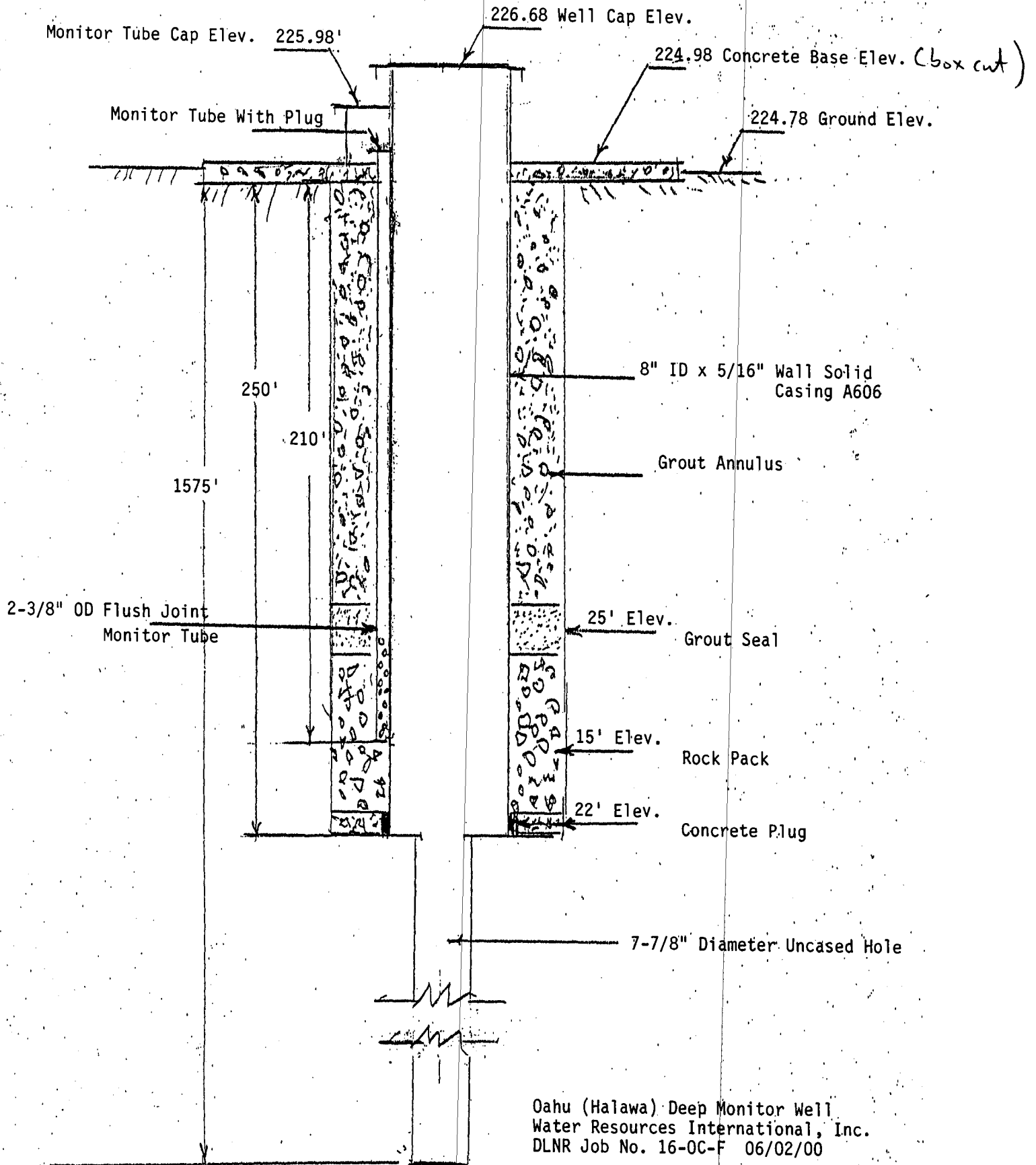
Signature Russell Figueiroa, Sr. Vice Pres. Date June 26, 2000

Applicant (print) _____ Date 10/11/01

Signature _____

RECEIVED
OCT 11 10 19
AID: 19

HALAWA DEEP MONITOR 2293-03, OAHU



Oahu (Halawa) Deep Monitor Well
Water Resources International, Inc.
DLNR Job No. 16-OC-F 06/02/00


NTS

WELL CONSTRUCTION PERMIT
Halawa Deep Monitor Well, Well No. 2253-02/3


In accordance with Department of Land and Natural Resources, Commission on Water Resource Management's Administrative Rules, Section 13-168, entitled "Water Use, Wells, and Stream Diversion Works", this document permits the construction and testing of Halawa Deep Monitor Well (Well No. 2253-02) at Halawa Correctional Facility, Oahu, TMK 9-9-10:28, subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97) which include but are not limited to the following conditions:

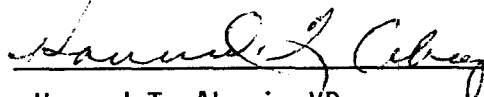
1. The Chairperson of the Commission on Water Resource Management (Commission), P.O. Box 621, Honolulu, HI 96809, shall be notified, in writing, at least two (2) weeks before any work authorized by this permit commences and staff shall be allowed to inspect installation activities in accordance with §13-168-15, Hawaii Administrative Rules.
2. The well construction permit shall be for construction and testing of the well only. A minimum one-inch diameter monitor tube shall be permanently installed, in a manner acceptable to the Chairperson, to accurately record water levels. The permittee shall coordinate with the Chairperson and conduct a pumping test in accordance with the Standards (a pump testing worksheet is attached). The permittee shall submit to the Chairperson the test results as a basis for supporting an application to install a permanent pump and withdraw water for use. No permanent pump may be installed until a pump installation permit is approved and issued by the Chairperson.
3. In basal ground water, the depth of the well may not exceed one-fourth (1/4) of the theoretical thickness (41 times initial head) of the basal ground water unless otherwise authorized by the Chairperson.
4. The permittee shall incorporate mitigation measures to prevent construction debris from entering the aquatic environment, to schedule work to avoid periods of high rainfall, and to revegetate any cleared areas as soon as possible.
5. In the event that subsurface cultural remains such as artifacts, burials or concentrations of shells or charcoal are encountered during construction, the permittee shall stop work and contact the Department's Historic Preservation Division (692-8015) immediately.
6. The proposed well construction shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. This permit or the authorization to construct the well shall not constitute a determination of correlative water rights.
7. The following shall be submitted to the Chairperson within sixty (60) days after completion of work:
 - a. Well completion report, (attached - Part I, Well Construction Report).
 - b. Elevation (referenced to mean sea level, msl) survey by a Hawaii-licensed surveyor.
 - c. As-built sectional drawing of the well.
 - d. Plot plan and map showing the exact location of the well.
 - e. Complete pumping test records, including time, pumping rate, drawdown, chloride content, and other data.
8. The permittee shall comply with all applicable laws, rules, and ordinances; non-compliance may be grounds for revocation of this permit.
9. The well construction permit application is incorporated into this permit by reference and is subject to the Hawaii Well Construction & Pump Installation Standards (January 23, 1997; HWCPLS). If the HWCPLS are not followed and as a consequence water is wasted or contaminated, a lien on the property may result.
10. The permit may be revoked by the Commission if work is not started within six (6) months after the date of approval or if work is suspended or abandoned for six (6) months, unless otherwise specified. The work proposed in the well construction permit application shall be completed within two (2) years from the date of permit approval, unless otherwise specified. The permit may be extended by the Chairperson upon a showing of good cause and good-faith performance. A request to extend the permit shall be submitted to the Chairperson no later than three (3) months prior to the date the permit expires. If the commencement date is not met, the Commission may revoke the permit after giving the permittee notice of the proposed action and an opportunity to be heard.
11. If the well is not to be used it must be properly capped. If the well is to be abandoned then the permittee must apply for a well abandonment permit in accordance with §13-168-12(f) prior to any well sealing or plugging work.
12. The permittee, its successors, and assigns shall indemnify, defend, and hold the State of Hawaii harmless from and against any loss, liability, claim, or demand for property damage, personal injury, or death arising out of any act or omission of the applicant, assigns, officers, employees, contractors, and agents under this permit or relating to or connected with the granting of this permit.
13. Special conditions in the attached cover transmittal letter are incorporated herein by reference.

Date of Approval: **August 19, 1999**
 Expiration Date: **August 19, 2001**


 TIMOTHY E. JOHNS, Chairperson
 Commission on Water Resource Management

I have read the conditions and terms of this permit and understand them. I accept and agree to meet these conditions as a prerequisite and underlying condition of my ability to proceed and understand that I do not hold a valid permit until I and the driller have signed, dated, and returned the permit to the Commission. I also understand that non-compliance with any permit condition may be grounds for revocation and fines of up to \$1000 per day starting from the permit date of approval.

Permittee's Signature:  Date: SEP - 3 1999
 Printed Name: Linnel T. Nishioka Firm or Title: Deputy Director

Driller's Signature:  C-57 License #: AC 5058 Date: Nov. 29, 1999
 Printed Name: Howard T. Akagi, VP Firm or Title: Water Resources International, Inc.

Please sign both copies of this permit, return one to the Chairperson, and retain the other for your records.

Attachment
 c: USGS
 Department of Health/ Safe Drinking Water, Wastewater, and Clean Water Branches
 Honolulu Board of Water Supply
 Ms. Mary Ann Teshima, Department of Public Safety

MEMO and ROUTE SLIP

10/27/00

3

WCR 1 Check for Well No. 2253-02 (survey to regulation memo)

1. **Pump Tests Check** Glenn Bauer _____ (initial)

Yes **No**

If no, describe deficiency

Step-Drawdown Test:

followed WCPI Stds	<input type="checkbox"/>	<input type="checkbox"/>
analysis attached	<input type="checkbox"/>	<input type="checkbox"/>
proposed pump cap o.k.	<input type="checkbox"/>	<input type="checkbox"/>

Aquifer Pump Test:

followed WCPI Stds	<input type="checkbox"/>	<input type="checkbox"/>
T & S analysis attached	<input type="checkbox"/>	<input type="checkbox"/>

Well Interference:

estimated Steady-State
drawdown at 1-mile radius is _____ ft.

analysis attached	<input type="checkbox"/>	<input type="checkbox"/>
-------------------	--------------------------	--------------------------

Stream Surface Water Impacted: ← If yes, identify most probable stream

2. **Construction Check** Mitch Ohye MO (initial) 10/30/00

Yes **No**

If no, describe deficiency

data complete	<input checked="" type="checkbox"/>	<input type="checkbox"/>
followed WCPI Stds	<input checked="" type="checkbox"/>	<input type="checkbox"/>
well database updated	<input checked="" type="checkbox"/>	<input type="checkbox"/>

OK

3. Charley/Lenore/Ryan _____ (initial) **take action based on above analysis**

4. Roy _____ (initial) **check**

5. Susan Subia _____ (initial) **finalize**

6. Linnel _____ (initial) **signature**

7. Charley/Lenore/Ryan **File**

Did they sign-off on permit?
10/30/00 gave copy to Andy M.
He will validate & get
driller to sign

State of Hawaii
Department of Land and Natural Resources
LAND DIVISION
Engineering Branch

OCT 24 2000

RECEIVED

00 OCT 24 P 3: 33

COMMISSION ON WATER
RESOURCE MANAGEMENT

TO: Linnel Nishioka, Deputy Director
Commission on Water Resources Management

FROM: Andrew Monden, Chief Engineer *Andrew Monden*

SUBJECT: **Job No. 16-OC-F, Oahu (Halawa) Deep Monitor Well, Well No. 2253-02⁰³**
Honolulu, Hawaii

Transmitted for your files is the Well Completion Report for the subject well.

Should you have any questions, please call Mr. Dickey Lee of the Inspection Section at
Ext. 7-0280.

CK:ka
Attach.

420 Waiakamilo Road
Suite 411
Honolulu Hawaii 96817-4941
Telephone 808 842 1133
Fax 808 842 1937
eMail rmtowill@i-one.com



R. M. TOWILL CORPORATION
SINCE 1930

Planning
Engineering
Environmental Services
Photogrammetry
Surveying
Construction Management

Memorandum

Project Halawa Deep Monitor Well (2293-03)

Telephone Conversation

Conference Report

Subject Elevation

Other

Date September 19, 2000 RMTC Project Number 1-18691-0-S

Fax No. 531-7181

To Howard
Water Resources International

Note: We assume that the mentioned items are stated correctly and that any future work or development will be based on these statements unless notified to the contrary within 7 days of the date shown on this document, in writing.

From Ryan Suzuki

Notes

The elevation of the top of well (higher) is 226.65 feet and the top of well (lower) is 225.98 feet. A box cut was set on the concrete pad next to the well, the elevation being 224.98 feet. All elevations being referred to Mean Sea Level.



State of Hawaii
COMMISSION ON WATER RESOURCE MANAGEMENT
Department of Land and Natural Resources

WELL COMPLETION REPORT

3/20/96 WCR Form

(Check Appropriate Box) Well Construction (Permanent) Pump Installation

Instructions: Please print or type and submit completed report within 30 days after well completion to the Commission on Water Resource Management, P.O. Box 621, Honolulu, Hawaii 96809. An as-built drawing of the well and chemical analysis should also be submitted. For assistance call the Commission Regulation Branch at 587-0225, or 1-800-468-4644 Extension 70225.

1. State Well No.: 2253-03 Well Name: Oahu (Halawa) Deep Monitor Well Island: Oahu
2. Location/Address: Honolulu, Hawaii Tax Map Key: 9-9-10:28

PART I. WELL CONSTRUCTION REPORT

3. Drilling Company: Water Resources International, Inc.

4. Name of driller who performed work: Kihei Ahuna

5. Type of rig/construction: Spencer Harris 3500 Rotary Rig

6. Date(s) Well Construction and pump tests (if any) completed: 5-30-00

7. GROUND ELEVATION (referenced to mean sea level, msl): 224.78 ft.
Well Bench Mark (description/location): concrete base Elevation (msl): 224.98 ft.

8. DRILLER'S LOG: Please attach geologic log (if available or if required by permit)
Depths (ft.) Rock Description, Water Level, Dates, etc. _____
_____ to See attached _____ to _____
_____ to _____
(If more space is needed, continue on back.)

9. Total depth of well below ground: 1575 ft.

10. Hole size: 15 inch dia. from -0- ft. to 250.00 ft. below ground
7 7/8 inch dia. from 250 ft. to 1325 ft. below ground
_____ inch dia. from _____ ft. to _____ ft. below ground

11. Casing Installed: 8 in. I.D. x 5/16 in. wall solid section to 250 ft. below ground
NA in. I.D. x _____ in. wall perforated section to _____ ft. below ground
Casing Material/Slot Size: NA

12. Annulus: Grouted from -0- ft. below ground to 210 ft. below ground
Gravel packed from 210 ft. below ground to 250 ft. below ground

13. Initial water level: 210.90 ft. below ground. Date and time of measurement: 2-14-00

14. Initial chloride: NA ppm Date and time of sampling: NA

15. Initial temperature: NA °F Date and time of measurement: NA

16. PUMPING TESTS: Reference Point (R.P.) used: NA, which elevation is _____ ft.
(1) Step-Drawdown Test Date _____ (2) Long-term Aquifer Test Date _____
Start water level _____ ft. below R.P. Start water level _____ ft. below R.P.
End water level _____ ft. below R.P. End water level _____ ft. below R.P.

17. Aquifer Pump Test Procedures data & graphs (1/9/96 LTAT Form) attached? Yes No

18. As-built drawings attached? Yes No

19. Other remarks/comments: (On back of this form)

Well Drilling Contractor (print) Water Resources Int'l Inc C-57 Lic. No. AC 05058

Signature Blaise Clay Date June 2, 2000
Blaise Clay

Surveyor (print) R.H. Swill Corporation Lic. No. HI 4729

Signature Russell Figueiroa, Sr. Vice Pres. Date June 26, 2000

Applicant (print) _____

Signature _____ Date _____

420 Waiakamilo Road
Suite 411
Honolulu Hawaii 96817-4941
Telephone 808 842 1133
Fax 808 842 1937
eMail rmtowill@i-one.com



R. M. TOWILL CORPORATION
SINCE 1930

Planning
Engineering
Environmental Services
Photogrammetry
Surveying
Construction Management

July 19, 2000

Mr. Blaise Clay
Water Resources International, Inc.
1100 Alakea Street, Suite 2900
Honolulu, Hawaii 96813

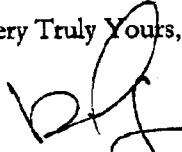
Dear Mr. Clay:

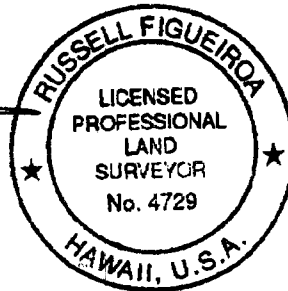
Elevation Data
Halawa Deep Monitoring Well (2293-03)
at Halawa, Ewa, Oahu, Hawaii

The undersigned hereby certifies that the elevations for the subject project was derived by running differential levels from benchmark "W-3" having an elevation of 6.089 feet Mean Sea Level which was established by the National Geodetic Survey. (See Attachments)

Should you have any questions, please feel free to call Ryan Suzuki or the undersigned at (808) 842-1133.

Very Truly Yours,


Russell Figueiroa
Licensed Professional Surveyor
Certificate Number 4729



AUGUST 1973

2293-03
VERTICAL CONTROL DATA
 by the
NATIONAL GEODETIC SURVEY
 SEA LEVEL DATUM OF 1929

QUAD 211573 FAC 1
 HAWAII
 LATITUDE 21°00' TO 21°30'
 LONGITUDE 157°30' TO 158°00'

U.S. DEPARTMENT OF COMMERCE
 NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
 NATIONAL OCEAN SURVEY

For tidal bench marks included in this list, elevations with respect to local tidal datum planes are available and may be obtained by writing to: NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, WASHINGTON SCIENCE CENTER, ROCKVILLE, MARYLAND 20852.

<u>LINE 101</u>			
ADJUSTMENT OF 4-7-70		HGZ L-21923	
C. Symms, Jr. 5-6-69 8-21-69 FIRST-ORDER			
BENCH MARK	ADJUSTED (Meters)	ELEVATION (Feet)	
Q-19 (SS)	35.138	115.282	
Q 13	30.484	100.013	
P 13	8.237	27.024	
V 3	NOT RECOVERED		
H 13	12.723	41.742	
M 13	8.081	26.512	
9-26 (SS)	4.481	14.701	
9-26 (HGS)			
RESET 1972		12.121	
L 13	4.035	13.238	
K 13	3.264	10.709	
*W 3	1.856	6.089	
H 10	3.771	12.372	
ADJUSTMENT OF 4-7-70		HGZ L-20925	
R.H. Allbritten 11-7-66 11-14-66 SECOND-ORDER			
EFS 1	2.243	7.359	
ADJUSTMENT OF 4-7-70		HGZ L-21923	
C. Symms, Jr. 5-6-69 8-21-69 FIRST-ORDER			
J 13	14.899	48.881	
H 13	9.599	31.493	
9-25 (SS)	7.539	24.734	
G 13	7.974	26.161	
F 13	6.907	22.661	
1-8 (SS)	2.630	8.629	
D 10	1.587	5.207	
C 10	20.851	68.409	
B 10	30.549	100.226	
	(DESTROYED)		
BM 90.15	27.462	90.098	
A 10	14.000	45.932	
ADJUSTMENT OF 1930		HGZ L-15	
Lansing G. Simmons 3-2-28 3-23-28 FIRST-ORDER			
N (CoFH)	12.108	39.724	
P (CoFH)	14.642	48.038	
V 4	60.920	199.868	

* Changed elevation.

<u>LINE 101</u> (Continued)			
ADJUSTMENT OF 4-7-70		HGZ L-21923	
C. Symms, Jr. 5-6-69 8-21-69 FIRST-ORDER			
BENCH MARK	ADJUSTED (Meters)	ELEVATION (Feet)	
A 13	15.206	49.888	
Q 12	15.120	49.616	
200 (C OF H)	INACCESSIBLE		
B 11	8.718	28.602	
TIDAL 15	5.644	18.517	
BM 34 (CoFH)	3.067	10.062	(DESTROYED)
*TIDAL 17	2.055	6.742	(DESTROYED)
TIDAL 2	NOT RECOVERED		
*TIDAL 11	1.686	5.531	
TIDAL 10	2.441	8.009	
BM 8 (USGS)	2.426	7.959	
BM 19 (CoFH)	1.955	6.414	(DESTROYED)
*TIDAL 12	3.845	12.615	
TIDAL 14	5.346	17.539	
TIDAL 13	5.917	19.413	
TIDAL 21	2.162	7.093	
TIDAL 20	1.737	5.699	
2-1 (SS)	1.145	3.757	
M RESET (CoFH)	1.268	4.160	
*B 5	1.839	6.033	
C 5			
RESET 1963	1.195	3.921	
ADJUSTMENT OF 4-7-70		HGZ L-21203	
David M. Whipp 8-14-67 10-9-67 SECOND-ORDER			
*C 5	1.786	5.860	
C 5 RESET 1971		4.167	
ADJUSTMENT OF 4-7-70		HGZ L-21923	
C. Symms, Jr. 5-6-69 8-21-69 FIRST-ORDER			
C 11	1.692	5.551	
2-9 (SS)	1.457	4.780	
N 5	.745	2.444	
J 5			
RESET 1959	1.826	5.991	

F13 1975 re-set: 24.645 (state)

JUL-24-00 MON 16:39
 BARNWELL INDUSTRIES, INC
 FAX NO. 8085317181
 P. 02/03

AUG 1973

2293-03

VERTICAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
SEA-LEVEL DATUM OF 1929

QUAD 211573 PAGE NO. 2
HAWAII
LATITUDE 21°00' TO 21°30'
LONGITUDE 157°30' TO 158°00'

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

DESCRIPTION OF BENCH MARK

Designation 9-26 (SS) State Hawaii County Honolulu
Nearest town Pearl City Chief of party C. Symms
Distance and direction from nearest town 1.15 miles southeast Leveling date July 1969
Character of mark SS disk Stamp No. 9-26 1969
Established by State of Hawaii
Detailed description

1.15 miles southeast along State Highway 90 from the intersection of Waimano Home Road at Pearl City, 1.4 feet north of the north curb of the west bound lanes of the highway, 47.5 feet west of power pole 126 bearing a street light, 69.0 feet east of power pole 127 bearing a street light, 115.0 feet east of the extended center line of a paved road to Pearl Harbor Beach Park, 0.05 mile east of the junction of Hila Place, and set in the top of a concrete post flush with the ground.

DESCRIPTION OF BENCH MARK

Designation K 13 State Hawaii County Honolulu
Nearest town Pearl City Chief of party C. Symms
Distance and direction from nearest town 2.1 miles southeast Leveling date July 1969
Character of mark C&GS bench mark disk Stamp No. K 13 1969
Established by C&GS
Detailed description

2.1 miles southeast along State Highway 90 from the intersection of Waimano Home Road at Pearl City, at the east end of the Kalauao Springs Bridge over the west lanes of the highway, in the top of the north end of the east concrete abutment, 5.6 feet north of the north curb of the west bound lanes of the highway, 0.8 foot north of a concrete and metal railing, 6.0 feet west of the east end of the bridge, 1.4 feet east of the west side of the abutment, and about 1/2 foot higher than the highway.

DESCRIPTION OF BENCH MARK

Designation 9226(HGS) RESET 1972 State Hawaii County Honolulu
Nearest town Pearl City Chief of party P.T. Ruby
Distance and direction from nearest town 1.16 southeast Leveling date June 1972
Character of mark A State Survey disk Stamp No. 9-26 1969 RESET
Established by Mr. Paul T. Ruby, Land Surveyor 1972
Detailed description

1.16 miles southeast from the intersection of Waimano Home Road at Pearl City, on the north side of State Highway 90, 187.5 feet northwest of the northwest corner of Waimalu Stream concrete bridge, 1.4 feet north of the curb of the west bound lanes of the highway, 69 feet northwest of the extended line of northwest side of Pump Station building at the northeast corner of Pearl Harbor Beach Park, 10 feet southeast of the center of manhole cover and about 1/2 foot above the highway and set in the top of the manhole cover.

DESCRIPTION OF BENCH MARK

Designation L 13 State Hawaii County Honolulu
Nearest town Pearl City Chief of party C. Symms
Distance and direction from nearest town 1.4 miles southeast Leveling date July 1969
Character of mark C&GS bench mark disk Stamp No. L 13 1969
Established by C&GS
Detailed description

1.4 miles southeast along State Highway 90 from the intersection of Waimano Home Road at Pearl City, in the top of the northeast end of the southeast concrete abutment of a bridge over Waimalu Stream, 6.0 feet northeast of the northeast curb of the northwest bound lanes of the highway, 22.2 feet northwest of telephone pole M 250, 9.7 feet northwest of the southeast corner of an "L" shaped retaining wall, 4.6 feet northwest of the southeast end of the bridge, 1.0 foot southeast of a concrete and metal handrail of the bridge, 0.5 foot southeast of the northwest edge of the wall, and about level with the highway.

* RECOVERY NOTE, BENCH MARK *

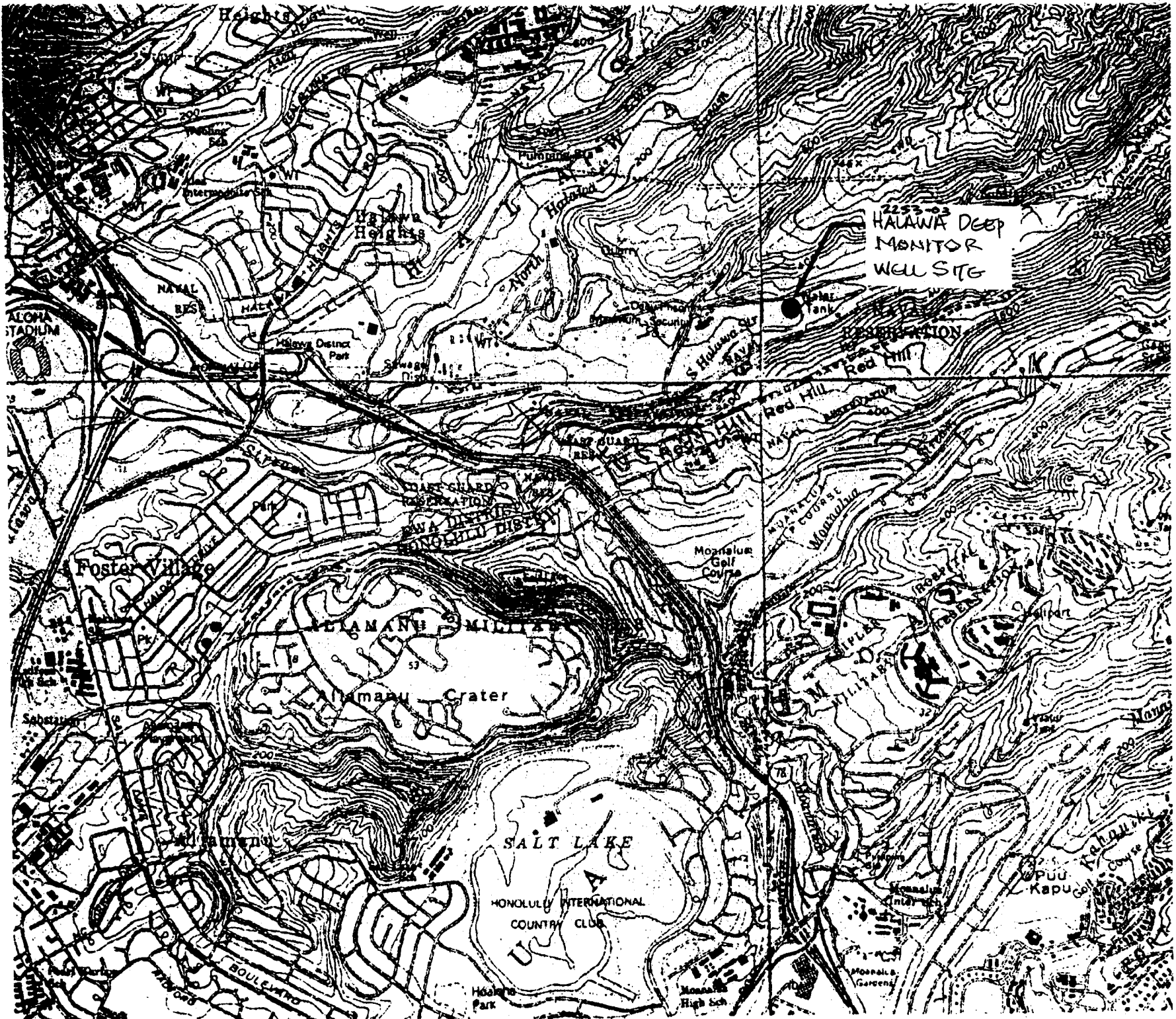
Designation W 3 State Hawaii County Honolulu
Nearest town Pearl City Described in HGZ 20925 Chief of party C. Symms
Distance and direction from nearest town 3.0 miles southeast Recovery date June 1969
Character of mark C&GS tidal mark disk Established by C&GS
Stamping W 3 1927
Also horizontal control point Present condition Good

3.0 miles southeast along State Highway 90 from the intersection of Waimano Home Road at Pearl City, 0.1 mile northeast of Cincpacflt Boat Pool Building No. 23, 71.5 feet southeast of the center door of the building, 42 feet northeast of power pole 41, 59.5 feet southwest of a mesh-wire fence corner, 29.2 feet northwest of the 5th fence post southwest of the fence corner, 37.4 feet southeast of a concrete curb, in the center of a lawn and set in the top of a 12-inch-square concrete monument projecting 0.7 foot above the ground.
NOTE: The corners of the monument are chipped but the mark is solid.

RECOVERY NOTE, BENCH MARK

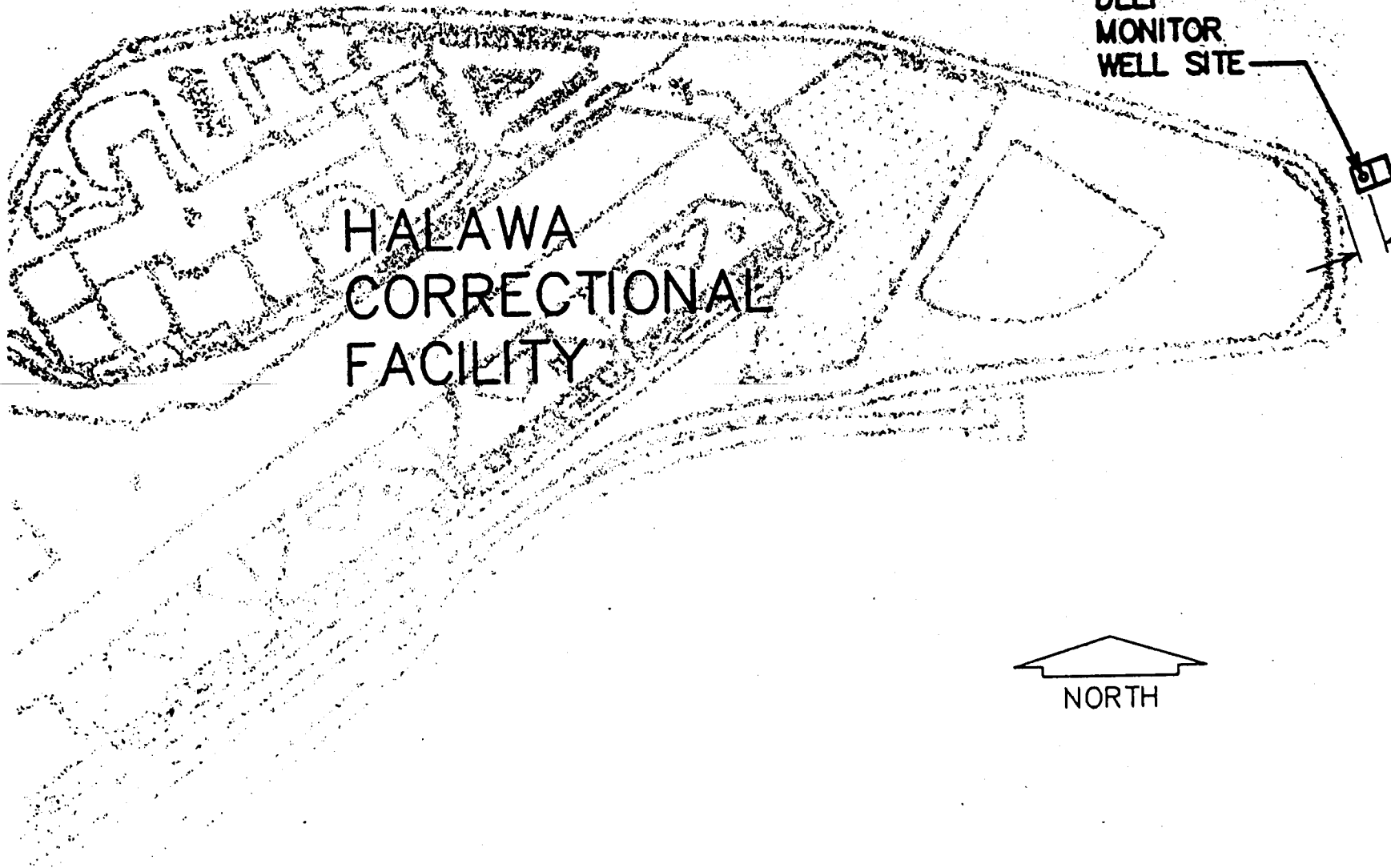
Designation N 10 State Hawaii County Honolulu
Nearest town Pearl City Described in HGZ 20925 Chief of party C. Symms
Distance and direction from nearest town 3.8 miles southeast Recovery date June 1969
Character of mark C&GS bench mark disk Established by C&GS
Stamping N 10 1966
Also horizontal control point Present condition Good

3.8 miles southeast along State Highway 90 from the intersection of Waimano Home Road at Pearl City, in the top of the northeast concrete foundation of the northeast steel post that supports "HALAWA GATE" sign for the Pearl Harbor Naval Supply Center, 43.0 feet northwest of the northwest curb of the entrance and exit roads to the supply center, 68.6 feet south of the southeast gate post to a pumpout pumphouse building No. S 386, 44.0 feet southwest of a traffic control box, about two feet lower than the highway and level with the roads.



2293-03

HALAWA
DEEP
MONITOR
WELL SITE



HALAWA
CORRECTIONAL
FACILITY



LOCATION PLAN

DRILLERS REPORT 2293-03

WELL NAME: HAWAII DEEP MOUNTAIN PAL #16-01 JOB NO. 454

DRILLER: K. ANTON

SUBSURFACE FORMATION

DRILLERS LOG:

Depth, ft.	Rock description & Remarks	Water level ft.
0 to 10'	DIRT SOFT MUD BUT COND. PIPE DEPTH	
10' to 56'	6 K HARD TO MED SOFT DIRT & ROCK	
56' to 60'	2-6 K HARD SECTIONS MIXED DIRT & ROCK	
60' to 122'	2-4 K SOFT DIRT	
122' to 150'	2-4 K SOFT TO MED SOFT MIXED DIRT	
150' to 169'	2-4 K SOFT DIRT AGAIN	
169' to 203'	2-6 K MED TO MED HARD MIXED DIRT & ROCK	
203' to 226'	6 K MED HARD	
226' to 260'	4-6 K MED SOFT LOSS BOTTOM	
260' to 271'	6-8 K MED HARD TO HARD	
271' to 280'	4-8 K HARD TO MED ROCK & SAND	
280' to 285'	4-6 K MED SOFT " "	
285' to 289'	6-8 K " HARD LOST CIRC @ 285'	
289' to 297'	4-6 K SOFT ALL ROCK REMAIN CIRC. PARTIAL @ 289'	
297' to 320'	6-8 K MED TO MED HARD ALL ROCK LOST CIRC @ 320'	
320' to 325'	2-4 K SOFT 325 BEGIN CIRC. 50%	
325' to 330'	4 K MED SOFT LOSS SAND	
330' to 342'	4 K SOFT " "	
342' to 365'	2-4 MED SOFT LOST CIRC @ 351 9000 UP PIPE 200 PSI COVER PLATE	
365' to 378'	2 K SOFT	
378' to 378'	2-4 K	

DRILLERS REPORT

2293-03

WELL NAME: Alana Deep Monitor Well #16-06-00 JOB NO. 454

DRILLER: K. Aruna

SUBSURFACE FORMATION

DRILLERS LOG:

Depth, ft.	Rock description & Remarks	Water level ft.
<u>403' to 417'</u>	<u>HARD</u>	
<u>417' to 428'</u>	<u>8 K MED HARD BLK Rock Some Rod Run</u>	
<u>428' to 436'</u>	<u>8 K MED - BLK " "</u>	
<u>436' to 442'</u>	<u>8-10 K BLK ROCK HARD</u>	
<u>442' to 449'</u>	<u>4 K SOFT BLK ROCK</u>	
<u>449' to 464'</u>	<u>10 K HARD BLK ROCK</u>	
<u>464' to 468'</u>	<u>2 K BRN " "</u>	
<u>468' to 478'</u>	<u>8 K BLK ROCK HARD</u>	
<u>478' to 496'</u>	<u>4 K MED SOFT BLK ROCK</u>	
<u>496' to 501'</u>	<u>8-10 K HARD</u>	
<u>501' to 508'</u>	<u>6-8 K MED</u>	
<u>508' to 521'</u>	<u>6-10 K HARD BLK ROCK</u>	
<u>521' to 550'</u>	<u>6-8 K MED SOFT (NO GR.)</u>	
<u>550' to 557'</u>	<u>10 K HARD</u>	
<u>557' to 572'</u>	<u>6-8 K MED TO MED HARD</u>	
<u>572' to 583'</u>	<u>10 K HARD</u>	
<u>583' to 591'</u>	<u>4-8 K SOFT</u>	
<u>591' to 602'</u>	<u>6-10 K HARD</u>	
<u>602' to 609'</u>	<u>6-10 K MED HARD</u>	
<u>609' to 642'</u>	<u>10 K HARD</u>	
<u>642' to 646'</u>	<u>6-8 SOFT</u>	
<u>646' to 650'</u>	<u>10 K HARD</u>	

DRILLERS REPORT

(2293-03)

WELL NAME: Mauna Kea North Hill #1000 JOB NO. 454

DRILLER: K. ADUNA

SUBSURFACE FORMATION

DRILLERS LOG:

Depth, ft.	Rock description & Remarks	Water level ft.
<u>650' to 657'</u>	<u>10 K. MED HARD</u>	<u>REVERSE AIR @ 657'</u>
<u>657' to 664'</u>	<u>10 K " " BULKY ROCK</u>	
<u>664' to 690'</u>	<u>10-12 K HARD - BULKY</u>	
<u>690' to 700'</u>	<u>8-10 K MED HARD FINE CUTTINGS BULKY</u>	
<u>700' to 706'</u>	<u>10 K HARD AGAIN BULKY</u>	
<u>706' to 722'</u>	<u>8-10 K MED HARD</u>	
<u>722' to 752'</u>	<u>8-10 K MED BULKY</u>	
<u>752' to 760'</u>	<u>10 K " HARD BULKY</u>	
<u>760' to 766'</u>	<u>12 K HARD RED BULKY</u>	
<u>766' to 792'</u>	<u>8-10 K MED HARD BULKY CUTTINGS BULKY FEE</u>	
<u>792' to 799'</u>	<u>10 K HARD</u>	
<u>799' to 801'</u>	<u>12 K SUPER HARD</u>	
<u>801' to 815'</u>	<u>10-12 K HARD BULKY CUTTINGS OBSERVE 1/2 OF PIPE PROGRESS</u>	
<u>815' to 825'</u>	<u>10 K HARD (NO CORE) (SQUIRREL DRUG @ 815')</u>	
<u>825' to 827'</u>	<u>8-10 K MED</u>	
<u>827' to 834'</u>	<u>8-10 K MED HARD</u>	
<u>834' to 852'</u>	<u>6-10 K MED SOFT TO MED</u>	
<u>852' to 867'</u>	<u>10 K HARD</u>	
<u>867' to 882'</u>	<u>6 K SOFT</u>	
<u>882' to 887'</u>	<u>10 K HARD</u>	
<u>887' to 896'</u>	<u>10 K " STILL SQUIRREL DRUG</u>	
<u>896' to 934'</u>	<u>4-8 K SOFT TO MED</u>	

DRILLERS REPORT 2293-03

WELL NAME: Holomua Deep Monitor Well #16-06-F JOB NO. 454

DRILLER: K. ANUNA

SUBSURFACE FORMATION

DRILLERS LOG:

Depth, ft.		Rock description & Remarks	Water level ft.
<u>924' to 935'</u>	8 K	MED HARD (No Conc) (Square Drill)	
<u>935' to 952'</u>	6 K	SOFT	
<u>952' to 956'</u>	10 K	MED HARD	
<u>956' to 975'</u>	6 K	SOFT	
<u>975' to 983'</u>	10 K	MED HARD	
<u>983' to 1000'</u>	4-6	SOFT	
<u>1010' to 1022'</u>	8-10-12	HARD	
<u>1022' to 1028'</u>	10 K	HARD	
<u>1028' to 1069'</u>	6-8 K	SOFT	
<u>1069' to 1080'</u>	10-12 K	HARD	
<u>1080' to 1090'</u>	5-10 K	MED - HARD	
<u>1090' to 1132'</u>	4-10 K	MED - SOFT SWF BACK TO REMOVED PILE @ 1120'	
<u>1132' to 1145'</u>	10 K	BLK CUTTINGS	
<u>1145' to 1165'</u>	8-10 K	MED - HARD BLK	
<u>1165' to 1175'</u>	8-10 K	MED - SOFT BLK AT SOME PLS	
<u>1175' to 1179'</u>	10 K	MED - SOFT " "	
<u>1179' to 1182'</u>	10 K	HARD RED ROCK	
<u>1182' to 1186'</u>	10 K	MED BLK	
<u>1186' to 1216'</u>	15-18 K	SUPER HARD BLK & RED ROCK	
<u>1216' to 1225'</u>	8-10 K	MED SOFT BLK & GRAY	
<u>1225' to 1237'</u>	8-10 K	SOFT SOME RED & BRN	
<u>1237' to 1255'</u>	10-18 K	HARD ABOVE (BLK CUTTINGS 1/4-3/4" RED - BLK)	
	8-10 K	MED TO SOFT BLK & SOME RED	

DRILLERS REPORT

2293-03

WELL NAME: Amawa Deep Marine Well # 10001 JOB NO. 454

DRILLER: K. Akiwa

SUBSURFACE FORMATION

DRILLERS LOG:

Depth, ft.	Rock description & Remarks	Water level ft.
1255' to 1258'	20K SUPER HARD BLK & GRAY ROCK	
1258' to 1314'	6-12K STEADY MED TO MED SOFT BLK & SOME RED	
1314' to 1340'	8-10K MED BLK - RED ROCK	
1340' to 1356'	15-20K HARD BLK & RED ROCK	
1356' to 1368'	6-8K MED SOFT BLK	
1368' to 1378'	15-20 HARD RED & BLK ROCK	
1378' to 1382'	10K MED	
1382' to 1390'	10-20K MED HARD RED & BLK	
1390' to 1398'	15K MED SOFT BLK	
1398' to 1402'	15K HARD	
1402' to 1421'	10-12K MED SOFT BLK	
1421' to 1426'	10-20K MED	
1426' to 1429'	10K SOFT STILL BLK	
1429' to 1435'	20-10K MED HARD BLK & RED	
1435' to 1465'	8-10K SOFT STILL BLK	
1465' to 1468'	10-15K HARD	
1468' to 1488'	4K SOFT	
1488' to 1501'	8-10K MED BLK & RED ROCK	
1501' to 1518'	8-10K SOFT SOME RED CINDER	
1518' to 1530'	8-12K MED HARD BLK	
1530' to 1538'	10-15K SOFT BLK & RED	
1538' to 1546'	10-15K HARD " "	

Halawa Deep Monitor Well No. 2253-~~02~~ 03
Geologic Log by Glenn Bauer

<u>Depth (ft.)</u>	<u>Description</u>
0-50	Very weathered gray, tan, and red rock; cuttings are rounded and angular
50-70	Same as above, however cuttings are redder and clay present
70-80	Weathered tan cuttings, some of the vesicles lined with Mn
80-100	Weathered reddish-brown friable cuttings
100-110	Same as above, though cuttings are redder
110-130	Weathered tan cuttings
130-140	Weathered red cuttings with clay
140-150	Weathered light brown cuttings
150-170	Weathered brown aa basalt with angular vesicles some coated with Mn
170-180	Weathered dense brown, tan, and gray cuttings
180-190	Mixture of weathered brown pahoehoe and aa basalt
190-210	Weathered gray aa basalt
210-230	Friable brown-gray aa basalt
230-250	Mixture of weathered aa and pahoehoe basalt; some of the pahoehoe has secondary minerals in the vesicles.
250-260	Weathered pahoehoe basalt with secondary minerals in the vesicles
260-270	Mixture of light gray and dark gray aa basalt with a few tachylitic cuttings present
270-280	Weathered gray aa basalt with tachylite
280-290	Dense light gray aa basalt
290-300	Mixture of dense non-vesicular light gray and dark gray aa basalt
300-310	Mixture of weathered gray pahoehoe and non-vesicular aa basalt
310-320	Dense dark gray non-vesicular aa basalt
320-340	Mixture of light and dark gray pahoehoe and aa basalt
340-350	Slightly weathered reddish brown pahoehoe basalt with many small round vesicles

350-360	Slightly weathered gray aa basalt
360-370	Mixture of dark gray and gray-brown pahoehoe and aa basalt
370-380	Dark gray aa basalt with angular vesicles
380-390	Same as above, except some light gray and red cuttings mixed in
390-400	Dark gray vesicular aa basalt
400-410	Mixture of dark gray vesicular aa dense light gray non-vesicular aa basalt
410-420	Gray pahoehoe basalt with small round vesicles < 1.0 mm in diameter
420-440	Mixture of vesicular gray pahoehoe and aa basalt with vesicles < 1.0 mm in diameter; minor amount of dense light gray aa basalt
440-450	Mixture of dark gray and tan aa basalt; secondary minerals filling the vesicles
450-460	Reddish dark gray vesicular aa basalt
460-480	Dense gray aa basalt
480-490	Slightly vesicular gray aa basalt
490-510	Vesicular dark gray pahoehoe basalt; vesicles are round and large > 2mm in diameter
510-520	Mixture of glassy dark gray aa and pahoehoe basalt
520-550	NO SAMPLE COLLECTED (LOST CIRCULATION)
550-570	Brown-gray pahoehoe basalt with small round vesicles <1.0 mm in diameter
570-670	NO SAMPLE COLLECTED (LOST CIRCULATION)
670-680	Mixture of gray aa and weathered brown aa and pahoehoe basalt; some vesicles filled with secondary minerals
680-690	Dense non-vesicular dark gray aa basalt
690-700	Mixture of vesicular dark gray aa and pahoehoe basalt; vesicles < 1.0 mm diameter
700-730	Dark gray sand-size cuttings
730-790	NO SAMPLE COLLECTED (LOST CIRCULATION)
790-800	Fresh dark gray aa basalt
800-810	Mixture of dark gray aa and pahoehoe basalt
810-820	Fresh dark gray pahoehoe basalt
820-830	NO SAMPLE COLLECTED (LOST CIRCULATION)

830-840	Dark gray sand-size cuttings
840-850	NO SAMPLE COLLECTED (LOST CIRCULATION)
850-860	Dark gray vesicular aa basalt
860-1120	NO SAMPLE COLLECTED (LOST CIRCULATION)
1120-1130	Glassy black scoriaceous pahoehoe basalt (cinder?)
1130-1140	Dark gray/black vesicular aa basalt
1140-1160	Dark gray/black vesicular pahoehoe basalt
1160-1170	Fresh dark gray vesicular aa basalt
1170-1200	Fresh dark gray vesicular aa basalt with minor phenocrysts and microphenocrysts of olivine
1200-1220	Mixture of dense dark gray aa basalt and vesicular dark gray pahoehoe basalt
1220-1230	Dark gray brown scoriaceous pahoehoe basalt
1230-1250	Mixture of dense dark gray/black aa and vesicular pahoehoe basalt
1250-1260	Mixture of weathered reddish-black scoriaceous pahoehoe and dark gray vesicular aa basalt
1260-1270	Dark gray pahoehoe basalt
1270-1300	Reddish dark gray pahoehoe basalt
1300-1310	NO SAMPLE COLLECTED (LOST CIRCULATION)
1310-1320	Fresh dark gray aa basalt with microphenocrysts of olivine
1320-1330	Weathered vesicular pahoehoe basalt with Mn lining vesicles
1330-1360	Mixture of red-brown and dark gray aa basalt
1360-1370	Dark gray pahoehoe basalt with small round vesicles
1370-1380	Dark gray aa basalt with minor phenocrysts of olivine < 1.0mm across
1380-1390	Mixture of red and gray pahoehoe basalt
1390-1400	Dark gray highly vesicular pahoehoe basalt with phenocrysts of olivine about 5% volume of the rock
1400-1410	Same as above, but less vesicular and fewer olivine phenocrysts
1410-1420	Mixture reddish brown and dark gray pahoehoe basalt
1420-1430	Dark gray pahoehoe basalt with phenocrysts of olivine
1430-1450	Same as above except rock is aphyric

- 1450-1460 Dark gray pahoehoe basalt with red glass lining vesicles and minor phenocrysts of olivine
- 1460-1470 Same as above except rock is aphyric
- 1470-1490 Mixture of dense gray aa and pahoehoe basalt
- 1490-1510 Dark gray vesicular aa basalt
- 1510-1520 Mixture of dark gray aa and pahoehoe basalt
- 1520-1550 Dark gray aa basalt
- 1550-1570 Dense slightly vesicular dark gray aa basalt
- 1570-1580 Mixture of vesicular gray aa and pahoehoe basalt
- 1580-1585 Same as above, except some glassy pahoehoe and dense aa basalt present

State of Hawaii
Department of Land and Natural Resources
LAND DIVISION
Engineering Branch

OCT - 9 2000

RECEIVED
00 OCT 9 AM 11:39

COMMISSION ON WATER
RESOURCE MANAGEMENT

TO: Dean Nakano
Commission on Water Resources Management

FROM: Andrew Monden, Chief Engineer *Andrew Monden*

SUBJECT: Job No. 16-0C-F, Well No. 2253-⁰³02, Halawa Deep Monitor Well
Honolulu, Hawaii

A final inspection was held on September 29, 2000. Present at the inspection were as follows:

Dickey Lee, Clarence Kubo, Mitch Ohye – DLNR
Dan Lum – Water Resources Assoc.
Howard Arakagi – Water Resources International
Tamateru Kodama – Ralph Inouye Co.

The project was constructed in accordance with the project plans and specifications, and it was accepted on September 29, 2000.

The surveyor's certified benchmarks are as follows:

Top of concrete slab (adjacent to well head) = 224.980 feet
Top of monitor tube cap = 225.985 feet
Top of well head cap = 226.655 feet

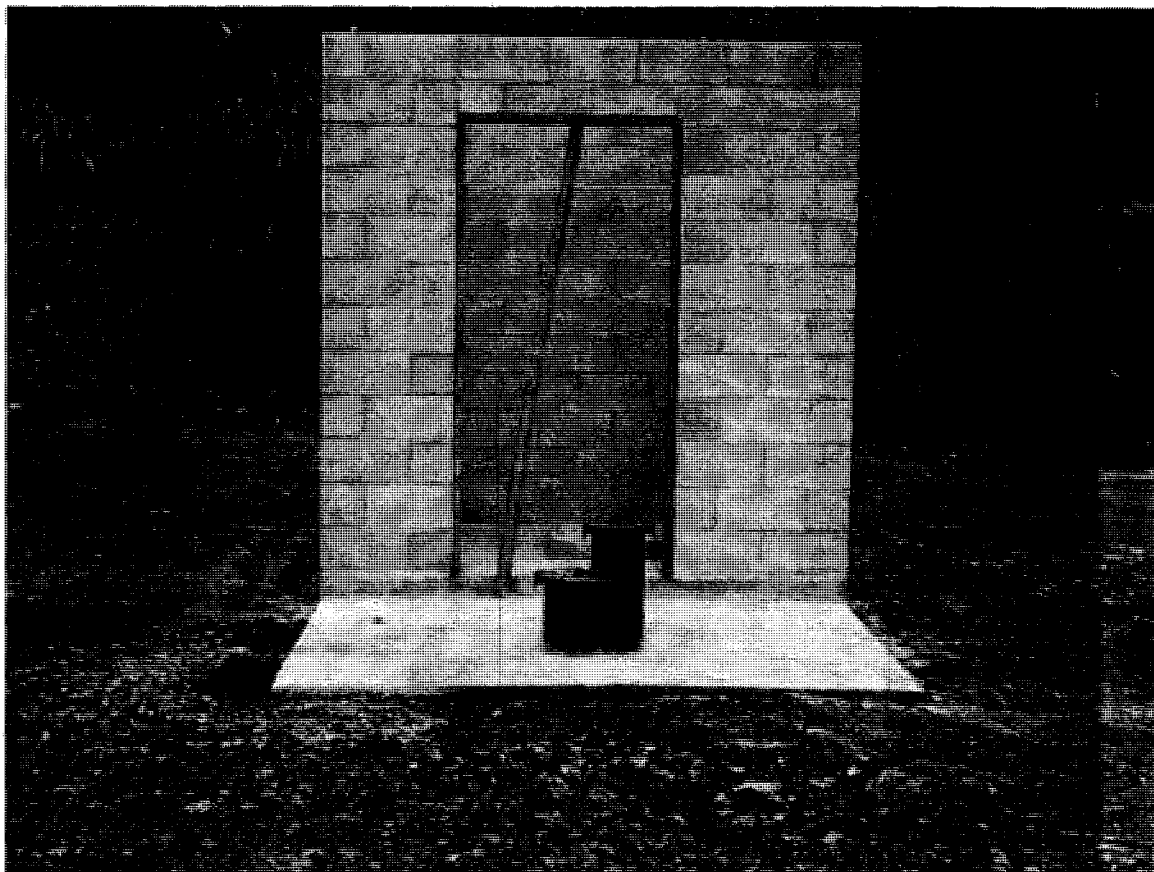
Water levels were taken inside the well and monitor tube. The water level readings were as follows:

	Cap Head Elev. (MSL)	Water Level Depth (Below Top of Head Cap)	Water Level Elev. (MSL)
Monitor Tube	225.985'	209.39'	16.595'
Well	226.655'	210.23'	16.423'

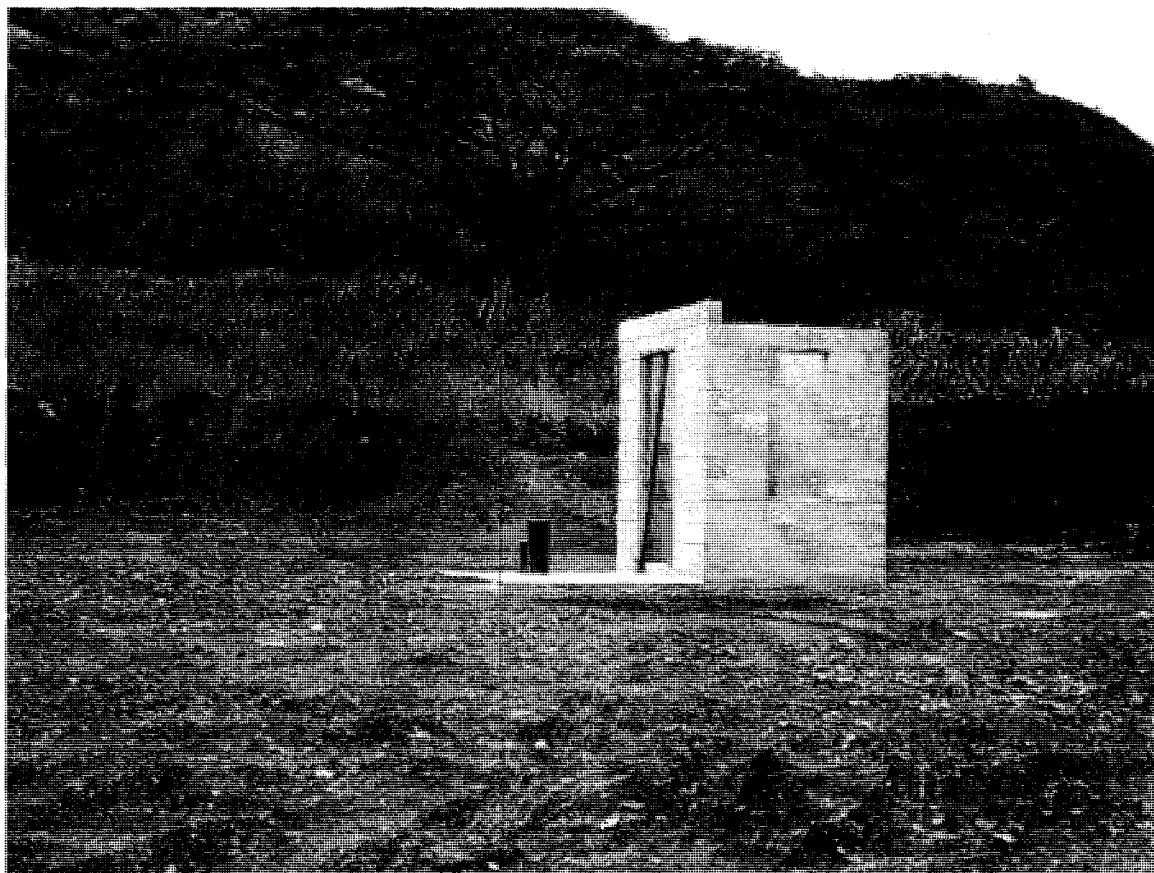
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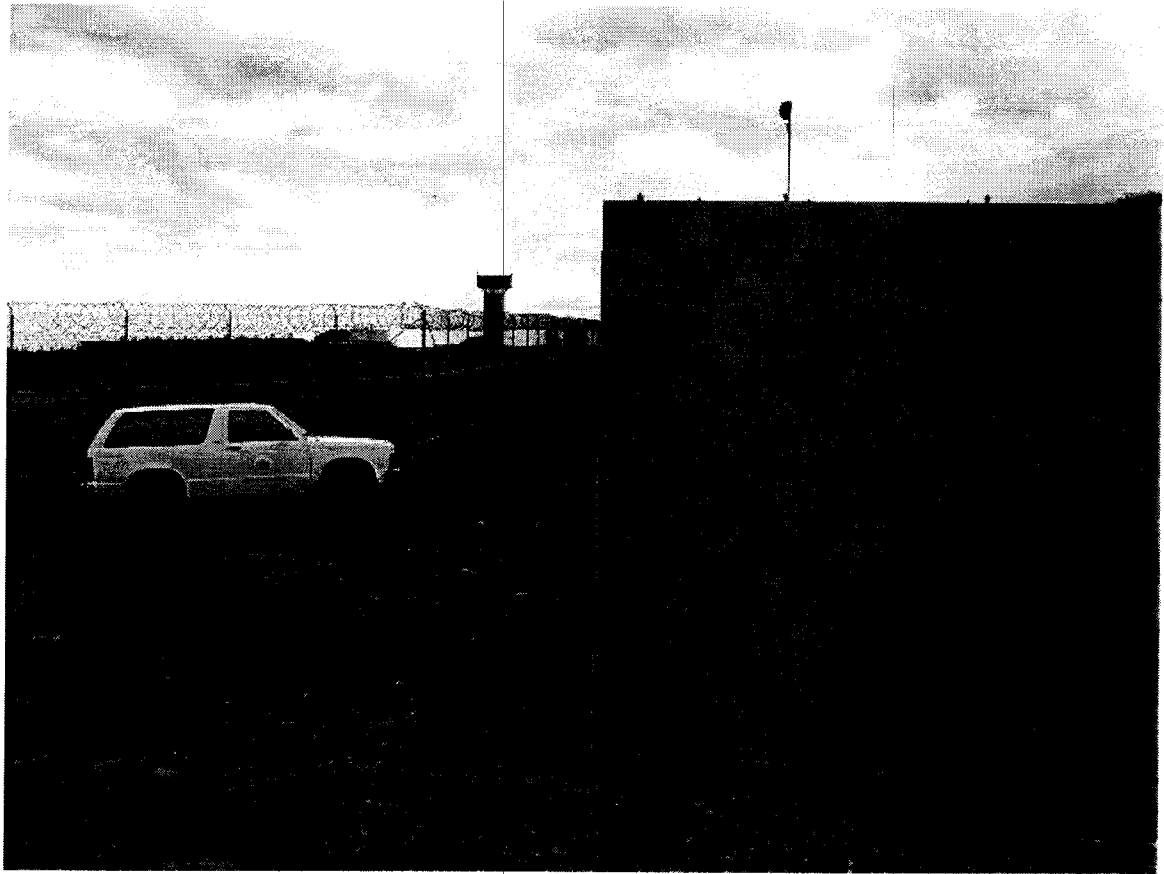
Close-up of the Halawa Deep Monitor Well (2295-03)
Picture Shows Well Casing and Housing
For Handar Instrumentation



View of Halawa Deep Monitor Well and
Instrument House



Side View of Halawa Deep Monitor Well and Instrument House



View of Instrument House and Prison Beyond

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII



TIMOTHY E. JOHNS
CHAIRPERSON

BRUCE S. ANDERSON
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LINNEL T. NISHIOKA
DEPUTY DIRECTOR

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

SEP - 2 1999

TO: Dean Nakano
Commission on Water Resource Management

FROM: Timothy E. Johns, Chairperson *Timothy E. Johns*
Commission on Water Resource Management

SUBJECT: Well Construction Permit
Halawa Deep Monitor Well (Well No. 2253-02)⁰³

Enclosed are two (2) copies of your approved Well Construction Permit for the captioned well(s) that authorize well construction activities but excludes installation work for your permanent pump. As part of the Chairperson's approval, the following special conditions were added and are part of your permit under Permit Condition 13:

Special Conditions

1. Attached for your information is a copy of the Department of Health's (DOH) review comments. Please note DOH's requirements related to discharge of effluent from well drilling and testing activities.
2. Standard Conditions 2 and 7.e. are waived.

To validate your permit, please sign and have the contractor sign both permit originals and return one for our files. Also, copies of the aquifer pump test worksheet and the well completion report form are enclosed for your use.

IMPORTANT - Drilling work may not proceed without a validated permit returned to the Commission. Please provide all the information in this packet to your well drilling contractor. The permittee is responsible for all conditions of the permit. This includes ensuring that the well construction contractor, or other party who constructs the well(s), submits a completed Part I of the Well Completion Report form (enclosed) within sixty (60) days after the well construction work is completed. Be advised that you may be subject to fines of up to \$1000 per day for any violations of your permit conditions starting from the permit approval date.

If you have any questions, please contact Lenore Nakama.

LN:ss
Enclosures

WELL CONSTRUCTION PERMIT
Halawa Deep Monitor Well, Well No. 2253-02⁰³

In accordance with Department of Land and Natural Resources, Commission on Water Resource Management's Administrative Rules, Section 13-168, entitled "Water Use, Wells, and Stream Diversion Works", this document permits the construction and testing of Halawa Deep Monitor Well (Well No. 2253-02) at Halawa Correctional Facility, Oahu, TMK 9-9-10:28, subject to the Hawaii Well Construction & Pump Installation Standards (1/23/97) which include but are not limited to the following conditions:

1. The Chairperson of the Commission on Water Resource Management (Commission), P.O. Box 621, Honolulu, HI 96809, shall be notified, in writing, at least two (2) weeks before any work authorized by this permit commences and staff shall be allowed to inspect installation activities in accordance with §13-168-15, Hawaii Administrative Rules.
2. The well construction permit shall be for construction and testing of the well only. A minimum one-inch diameter monitor tube shall be permanently installed, in a manner acceptable to the Chairperson, to accurately record water levels. The permittee shall coordinate with the Chairperson and conduct a pumping test in accordance with the Standards (a pump testing worksheet is attached). The permittee shall submit to the Chairperson the test results as a basis for supporting an application to install a permanent pump and withdraw water for use. No permanent pump may be installed until a pump installation permit is approved and issued by the Chairperson.
3. In basal ground water, the depth of the well may not exceed one-fourth (1/4) of the theoretical thickness (41 times initial head) of the basal ground water unless otherwise authorized by the Chairperson.
4. The permittee shall incorporate mitigation measures to prevent construction debris from entering the aquatic environment, to schedule work to avoid periods of high rainfall, and to revegetate any cleared areas as soon as possible.
5. In the event that subsurface cultural remains such as artifacts, burials or concentrations of shells or charcoal are encountered during construction, the permittee shall stop work and contact the Department's Historic Preservation Division (692-8015) immediately.
6. The proposed well construction shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. This permit or the authorization to construct the well shall not constitute a determination of correlative water rights.
7. The following shall be submitted to the Chairperson within sixty (60) days after completion of work:
 - a. Well completion report, (attached - Part I, Well Construction Report).
 - b. Elevation (referenced to mean sea level, msl) survey by a Hawaii-licensed surveyor.
 - c. As-built sectional drawing of the well.
 - d. Plot plan and map showing the exact location of the well.
 - e. Complete pumping test records, including time, pumping rate, drawdown, chloride content, and other data.
8. The permittee shall comply with all applicable laws, rules, and ordinances; non-compliance may be grounds for revocation of this permit.
9. The well construction permit application is incorporated into this permit by reference and is subject to the Hawaii Well Construction & Pump Installation Standards (January 23, 1997; HWCPIIS). If the HWCPIIS are not followed and as a consequence water is wasted or contaminated, a lien on the property may result.
10. The permit may be revoked by the Commission if work is not started within six (6) months after the date of approval or if work is suspended or abandoned for six (6) months, unless otherwise specified. The work proposed in the well construction permit application shall be completed within two (2) years from the date of permit approval, unless otherwise specified. The permit may be extended by the Chairperson upon a showing of good cause and good-faith performance. A request to extend the permit shall be submitted to the Chairperson no later than three (3) months prior to the date the permit expires. If the commencement date is not met, the Commission may revoke the permit after giving the permittee notice of the proposed action and an opportunity to be heard.
11. If the well is not to be used it must be properly capped. If the well is to be abandoned then the permittee must apply for a well abandonment permit in accordance with §13-168-12(f) prior to any well sealing or plugging work.
12. The permittee, its successors, and assigns shall indemnify, defend, and hold the State of Hawaii harmless from and against any loss, liability, claim, or demand for property damage, personal injury, or death arising out of any act or omission of the applicant, assigns, officers, employees, contractors, and agents under this permit or relating to or connected with the granting of this permit.
13. Special conditions in the attached cover transmittal letter are incorporated herein by reference.

Date of Approval: **August 19, 1999**
Expiration Date: **August 19, 2001**


TIMOTHY E. JOHNS, Chairperson
Commission on Water Resource Management

I have read the conditions and terms of this permit and understand them. I accept and agree to meet these conditions as a prerequisite and underlying condition of my ability to proceed and understand that I do not hold a valid permit until I and the driller have signed, dated, and returned the permit to the Commission. I also understand that non-compliance with any permit condition may be grounds for revocation and fines of up to \$1000 per day starting from the permit date of approval.

Permittee's Signature: _____ Date: _____

Printed Name: _____ Firm or Title: _____

Driller's Signature: _____ C-57 License #: _____ Date: _____

Printed Name: _____ Firm or Title: _____

Please sign both copies of this permit, return one to the Chairperson, and retain the other for your records.

Attachment
c: USGS
Department of Health/ Safe Drinking Water, Wastewater, and Clean Water Branches
Honolulu Board of Water Supply
Ms. Mary Ann Teshima, Department of Public Safety

Well No. 2253-02 03
 Well Name halawa deep monitor
 Applicant cwm

Date of Review 8/19/99
 Reviewer RRI

SECTION 1: WELL LOCATION INFORMATION

Island	<u>OAHU</u>	Proposed Use	<u>Other</u>
Aquifer System	<u>PEARL HARBOR</u>	Proposed Withdrawal	<u>0</u>
Aquifer Sector	<u>WAIMALU</u>	System Sustainable Yield	<u>45</u>

SECTION 2: WELL SECTION DATA (enter data in grey cells only)

Elevation at top of casing	<u> </u> ft., m.s.l.	Solid Casing	
Ground Elevation	<u> </u> ft., m.s.l.	Material	<u> </u>
Cement Grout	<u> </u> ft.	Designation	<u> </u>
Rock Packing	<u> </u> ft.	Length	<u> </u> ft.
Hole Diameter	<u> </u> in.	Diameter	<u> </u> in.
Total Depth	<u> </u> ft.	Wall Thickness	<u> </u> in.
Estimated Head	<u> </u> ft., m.s.l.	Casing	
Calculated Aquifer Thickness	<u>574</u> ft.	Material	<u> </u>
County Water Supply (Y/N ?)	<u> </u>	Designation	<u> </u>
		Length	<u> </u> ft.
		Diameter	<u> </u> in.
		Wall Thickness	<u> </u> in.
		Openings	<u> </u> sq.in./l.f.
		Open Hole	
		Length	<u> </u> ft.
		Diameter	<u> </u> in.

SECTION 3: CHECKLIST (values to check are shaded)

Well Depth

Theoretical Thickness of Aquifer	<u>574 ft.</u>	
1/4 Aquifer Thickness	<u>143.5 ft.</u>	
Depth of Well below Sea Level	<u>185 ft.</u>	too deep (refer to HWCPIS Section 2.2) Monitor well => OK

Well Casing

Minimum Wall Thickness		
Material	<u>Steel</u>	
County or Non-County	<u>non-county</u>	
Minimum Thickness per standards	<u>0.250 in.</u>	
Wall Thickness Provided	<u>0.313 in.</u>	okay (refer to HWCPIS Section 2.4 c)
Minimum Length of Solid Casing		
90% of ground to top of aquifer	<u>189.9 ft.</u>	
Length of solid casing Provided	<u>225 ft.</u>	okay (refer to HWCPIS Section 2.4 d)
Casing Material	<u>#####</u>	##### (refer to HWCPIS Section 2.4 e)

Annular Space

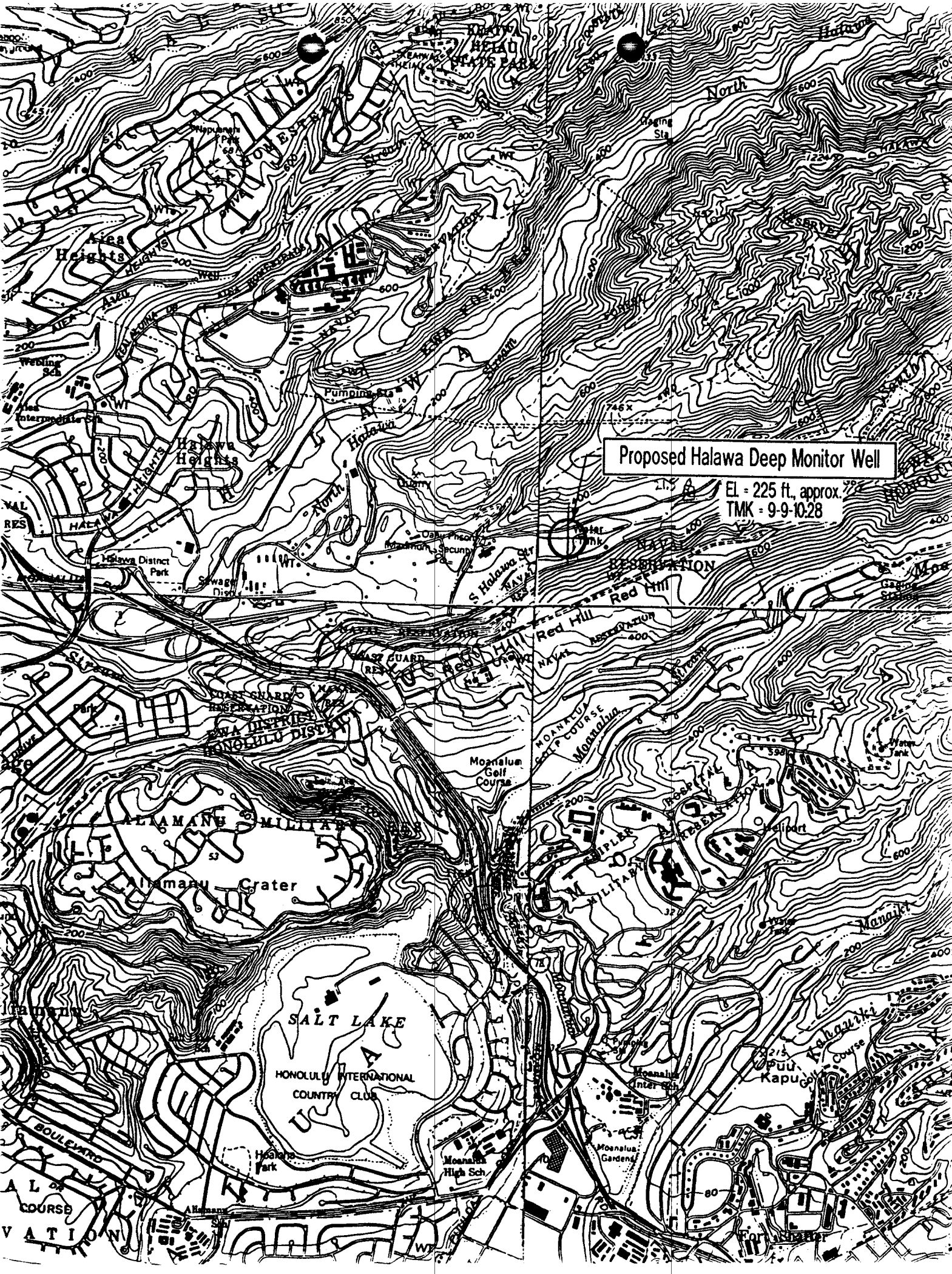
Depth of Grouting		
Calculated Depth of Grouting	<u>147.7 ft.</u>	
Depth of Grouting provided	<u>185 ft.</u>	okay (refer to HWCPIS Section 2.6 c)
Thickness of Annular Space	<u>3 in.</u>	okay (refer to HWCPIS Section 2.6 d)

EXCEEDS ASTM Standard (geothermal?)



Proposed Halawa Deep Monitor Well

EL - 225 ft. approx.
TMK - 9-9-10-28



Proposed Halawa Deep Monitor Well

EL - 225 ft. approx.
TMK - 9-9-10-28

BENJAMIN J. GAYETANO
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LINNEL T. NISHIOKA
DEPUTY DIRECTOR

F 507-0219
8-11-99

1 pg.

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 827
HONOLULU, HAWAII 96809

JUL 15 1999

FROM
TO:

Honorable Bruce S. Anderson, Director
Department of Health
Attention: Dennis Tulang, Wastewater Branch
William Wong, Safe Drinking Water Branch

TO
FROM:

Timothy E. Johns, Chairperson
Commission on Water Resource Management

[Handwritten signature]

SUBJECT:

Well Construction Permit Application
Halawa Deep Monitor Well (Well No. 2253-02)⁰³

Transmitted for your review and comment is a copy of the captioned well application.

We would appreciate your comments on the captioned application for any conflicts or inconsistencies with the programs, plans, and objectives specific to your department. Please respond by returning this cover memo form by August 4, 1999.

Please find the attached maps to locate the proposed well. If you have any questions about this permit application, request additional information, or request additional review time, please contact Lenore Nakama of the Commission staff at 587-0218.

LN:ss
Attachment(s)

RESPONSE:

- This well qualifies as a source which will serve as a source of potable water to a public water system (serving 25 or more people at least 60 days per year or has 15 or more service connections) and must receive Director of Health approval prior to its use to comply with Hawaii Administrative Rules (HAR), Title 11, Chapter 20, Rules Relating to Potable Water Systems, §11-20-29.
- This well does not qualify as a source serving a public water system (serves less than 25 people or more people at least 60 days per year or 15 service connections) and if the well water is used for drinking, the private owner should test for bacteriological and chemical presence before initiating such use and routinely monitor the water quality thereafter. However, if future planned use from this source increases to meet the public water system definition then Director of Health approval is required prior to implementation.
- If the well is used to supply both potable and non-potable purposes in a single system, the user shall eliminate cross-connections and backflow connections by physically separating potable and non-potable systems by an air gap or an approved backflow preventer, and by clearly labeling all non-potable spigots with warning signs to prevent inadvertent consumption of non-potable water. Backflow prevention devices should be routinely inspected and tested.
- It does not appear that this well will be used for consumptive purposes and is not subject to Safe Drinking Water Regulations.
- For the applicant's information, a source of possible wastewater contamination [] is not located near the proposed well site (information attached).
- Other relevant DOH rules/regulations, information, or recommendations are attached.
No comments/objections

Contact Person:

Lori N. Kajiwara

Phone:

506-4594

Signed:

Lori N. Kajiwara

Date:

8-11-99

COMMISSION ON WATER
RESOURCE MANAGEMENT

99 AUG 18 2:35

RECEIVED

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII



TIMOTHY E. JOHNS
CHAIRPERSON

BRUCE S. ANDERSON
ROBERT G. GIRALD
BRIAN C. NISHIDA
DAVID A. NOBRIGA
HERBERT M. RICHARDS, JR.

LINNEL T. NISHIOKA
DEPUTY DIRECTOR

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

FACSIMILE TRANSMITTAL

To: **Lori Kajiwara**

From: **Lenore Nakama**

Company: **Dept. of Health, Wastewater Branch**

Date: **August 11, 1999**

Fax Number: **586-4300**

Pages Including Header: **7**

Phone Number: **586-4294**

Subject: **Request for Review Comments**

Notes/Comments:

I guess this one got lost enroute somewhere. Could you take a look at it and fax back comments. This one's for us (CWRM); we're proposing to drill a deep monitor well for water level & chloride information. No pump will be installed. Thanks, Lenore

WPK

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII



TIMOTHY E. JOHNS
CHAIRPERSON

BRUCE S. ANDERSON
ROBERT G. GIRALD
BRIAN C. NISHIDA
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LINNEL T. NISHIOKA
DEPUTY DIRECTOR

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

RECEIVED
SAFE DRINKING WATER BRANCH

JUL 15 1999

JUL 19 1999

TO: Honorable Bruce S. Anderson, Director
Department of Health
Attention: Dennis Tulang, Wastewater Branch
William Wong, Safe Drinking Water Branch

FROM: Timothy E. Johns, Chairperson
Commission on Water Resource Management *[Signature]*

SUBJECT: Well Construction Permit Application ⁰³
Halawa Deep Monitor Well (Well No. 2253-02)

Transmitted for your review and comment is a copy of the captioned well application.

We would appreciate your comments on the captioned application for any conflicts or inconsistencies with the programs, plans, and objectives specific to your department. **Please respond by returning this cover memo form by August 4, 1999.**

Please find the attached maps to locate the proposed well. If you have any questions about this permit application, request additional information, or request additional review time, please contact Lenore Nakama of the Commission staff at 587-0218.

LN:ss
Attachment(s)

RESPONSE:

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- For the applicant's information, a source of possible wastewater contamination [] is [] is not located near the proposed well site (information attached).
- Other relevant DOH rules/regulations, information, or recommendations are attached.
- No comments/objections

Contact Person: William Wong

Phone: 586-4

Signed: *[Signature]*

Date: 07/20/99

RECEIVED
99 JUL 23 P 2: 00
COMMISSION ON WATER
RESOURCE MANAGEMENT

The Department of Health, Clean Water Branch has the following comments:

1. For Well-Drilling Activities

Any discharge to State waters of treated process wastewater effluent associated with well drilling activities is regulated by Hawaii Administrative Rules, Chapter 11-55, Appendix I, effective September 22, 1997. Treated process wastewater effluent covered by this general permit includes well drilling slurries, lubricating fluids wastewaters, and well purge wastewaters. This general permit does not cover well pump testing. The applicable Notice of Intent Forms and filing fee shall be submitted at least thirty (30) days before the start of discharge to the Department of Health, Clean Water Branch at 919 Ala Moana Boulevard, Room 301, Honolulu, Hawaii 96814-4920 or P.O. Box 3378, Honolulu, Hawaii 96801-3378. Inquiries may be directed to the Clean Water Branch at (808) 586-4309 or by fax at (808) 586-4352.

2. For Well Pump Testing

The discharger shall take all measures necessary to prevent the discharge of pollutants from entering state waters. Such measures shall include, if necessary, containment of the initial discharge until the discharge is essentially free of pollutants. If the discharge is entering a stream or river bed, best management practices shall be implemented to prevent the discharge from disturbing the clarity of the receiving water. If the discharge is entering a storm drain, the discharger must obtain written permission from the owner of that storm drain prior to discharge. Furthermore, best management practices shall be implemented to prevent the discharge from collecting sediments and other pollutants prior to entering the storm drain.

JS/cr

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII



TIMOTHY E. JOHNS
CHAIRPERSON

BRUCE S. ANDERSON
ROBERT G. GIRALD
BRIAN C. NISHIDA
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LINNEL T. NISHIOKA
DEPUTY DIRECTOR

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

JUL 15 1999

TO : Mr. Dean Nakano
Commission on Water Resource Management

FROM: Linnel T. Nishioka, Deputy Director
Commission on Water Resource Management

A handwritten signature in black ink, appearing to read "L. Nishioka".

SUBJECT: Well Construction Permit Application for Well No. 2253-⁰³02

We acknowledge receipt, on **July 8, 1999**, of your completed well construction permit application for the **Halawa Deep Monitor Well (Well No. 2253-⁰³02)**. You can expect your application to be processed within ninety (90) days from this date.

If you have any questions about your permit application, please contact Lenore Nakama.



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

JUL 15 1999

TO: Honorable Bruce S. Anderson, Director
Department of Health
Attention: Dennis Tulang, Wastewater Branch
William Wong, Safe Drinking Water Branch

FROM: Timothy E. Johns, Chairperson
Commission on Water Resource Management *[Signature]*

SUBJECT: Well Construction Permit Application ⁰³
Halawa Deep Monitor Well (Well No. 2253-02)

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Please find the attached maps to locate the proposed well. If you have any questions about this permit application, request additional information, or request additional review time, please contact Lenore Nakama of the Commission staff at 587-0218.

LN:ss
Attachment(s)

RESPONSE:

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- For the applicant's information, a source of possible wastewater contamination is is not located near the proposed well site (information attached).
- Other relevant DOH rules/regulations, information, or recommendations are attached.
- No comments/objections

Contact Person: _____ Phone: _____

Signed: _____ Date: _____



State of Hawaii
COMMISSION ON WATER RESOURCE MANAGEMENT
Department of Land and Natural Resources
APPLICATION FOR PERMIT

For Official Use Only:

Well Construction or Pump Installation

Instructions: Please print in ink or type and send completed application with attachments to the Commission on Water Resource Management, P.O. Box 621, Honolulu, Hawaii 96809. Application must be accompanied by a non-refundable filing fee of \$25.00 payable to the Dept. of Land and Natural Resources. The Commission may not accept incomplete applications. For assistance, call the Regulation Branch at 587-0225. (Also, please check our website at - <http://www.hawaii.gov/dlnr/dwrm/dwrm.html>)

~~CONFIDENTIAL~~

APPLICANT INFORMATION: (Fill out all three, if applicable, and place a check next to the primary contact)

1. (a) **WELL OWNER:** Comm. on Water Res. Management Contact Person: Dean Nakano Phone: 587-0240
 Mailing Address: 1151 Punchbowl street, #227, Honolulu, HI 96813
 Fax: 587-0219 E-mail: _____
- (b) **LAND OWNER:** Dept of Public Safety Contact Person: Mary Ann Teshima Phone: 587-1235
 Mailing Address: 919 Ala Moana Blvd., 4th floor, Honolulu, HI 96814
 Fax: _____ E-mail: _____
- (c) **CONTRACTOR:** N/A Contact Person: _____ Phone: _____
 Mailing Address: _____
 Fax: _____ E-mail: _____ Lic #: _____

(circle one: C-57, C-57a, or A)

WELL & PUMP INFORMATION: (Please fill in the diagram on the back of this form.)

2. **WELL LOCATION/NAME:** Halawa Deep Monitor Well Island: Oahu
 Address Halawa Correctional Facility Tax Map Key: 9-9-10:28

Attach the relevant portion of (a) a 7.5-Minute Series USGS topographic map (scale 1"=24,000'), and (b) a property tax map, showing well location referenced to established property boundaries.

3. **PROPOSED WORK:** (Check all that apply)
- | | | |
|--|----------------------------------|---|
| <input checked="" type="checkbox"/> Drill New Well | <input type="checkbox"/> Deepen | <input type="checkbox"/> Install New Pump |
| <input type="checkbox"/> Modify Existing Well | <input type="checkbox"/> Redrill | <input type="checkbox"/> Modify Pump |
| <input type="checkbox"/> Abandon/Seal * | | <input type="checkbox"/> Replace Pump |
- * Well No.: _____ Be sure to complete and submit well abandonment report upon completion of work.

4. **CONSTRUCTION:**
- | | | | | |
|------------------------------|--------------------------------|---------------------------------|---|---------------------------------|
| <input type="checkbox"/> Dug | <input type="checkbox"/> Bored | <input type="checkbox"/> Driven | <input checked="" type="checkbox"/> Drilled | <input type="checkbox"/> Radial |
|------------------------------|--------------------------------|---------------------------------|---|---------------------------------|
- Is this well a part of a battery of wells? Yes No (Please describe.)

5. **PROPOSED PUMP INFORMATION:** Rated Pump Capacity: None gallons per minute
- Pump Type (Check one):
- | | | | |
|--|--|--|--|
| <input type="checkbox"/> Deep Well Turbine | <input type="checkbox"/> Rotary | <input type="checkbox"/> Propeller | Powered by: |
| <input type="checkbox"/> Submersible | <input type="checkbox"/> Rotary-Displacement | <input type="checkbox"/> Reciprocating | <input type="checkbox"/> Diesel |
| <input type="checkbox"/> Centrifugal | <input type="checkbox"/> Rotary-Gear | <input type="checkbox"/> Impulse | <input type="checkbox"/> Gas |
| | | | <input type="checkbox"/> Electric, rated horsepower: _____ |

6. **PROPOSED USE:** (Check all that apply)
- | | |
|--|--|
| <input type="checkbox"/> Municipal (including hotels, stores, etc.) | <input type="checkbox"/> Industrial |
| <input type="checkbox"/> Domestic (individual, noncommercial water system) | No. of Dwelling Units: _____ |
| <input type="checkbox"/> Irrigation (crop) _____ | No. of Acres: _____ |
| <input type="checkbox"/> Military | <input checked="" type="checkbox"/> Other (explain): <u>monitoring</u> |

7. (a) **PROPOSED AMOUNT OF WITHDRAWAL:** None gallons per day
 (b) **METHOD OF FLOW MEASUREMENT:** Flowmeter Open-pipe Weir Orifice Other(explain)

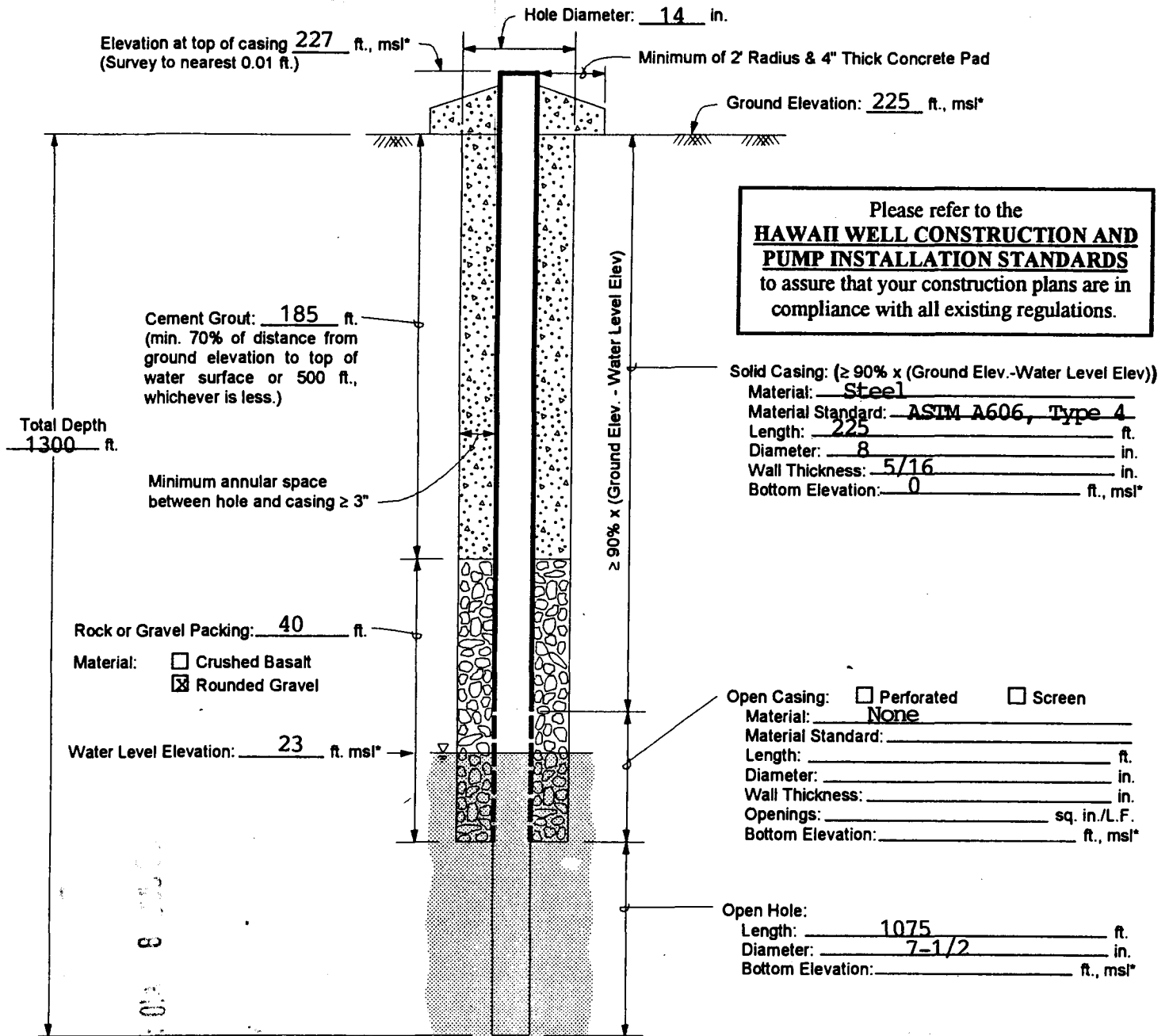
OTHER IMPORTANT INFORMATION:

8. **PENDING ACTIONS:** Cдуа SMA EIS EA NONE Other (explain)
9. If a pump installation permit request is part of this application, please answer the following: THE LANDOWNER CERTIFIES THAT THE SUBJECT PROPERTY, OR A PORTION THEREOF, WAS OR WAS NOT A STATE OF HAWAII LAND PATENT GRANT ISSUED AFTER 1960. (Please check with your title search company or the Land Division, Department of Land and Natural Resources at 587-0414 for help.)

10. **REMARKS, EXPLANATIONS:** _____

RECEIVED
 09 JUL 8 AIO: 18
 COMMISSION ON WATER RESOURCE MANAGEMENT

9. PROPOSED WELL SECTION



For non-salt water Basal Wells - bottom elevation of well should not be deeper than 1/4 of aquifer thickness or,

$$\text{Bottom Elevation of Well Limit} = \left(\text{Water Elevation} - \frac{41 \times \text{Water Level Elevation}}{4} \right)$$

Example: Estimated + 2 ft. Water Level Elev. \rightarrow Bottom Elevation of Well Limit = $\left(2 - \frac{41 \times (2)}{4} \right) = -18.5$ ft.

* The approximate elevation must be referenced to mean sea level (msl) at the time of application filing. Final elevations of well components shall be submitted in the Well Completion/Well Abandonment reports and referenced to a benchmark which has been established by a surveyor licensed by the State.

Solid Casing Material:

- Steel: compliant with (check one or more): ANSI/AWWA C200 API Spec. 5L ASTM A53 ASTM A139
 And compliant with (check one or more): ASTM A242 Type E Type S Grade B Other ASTM A606
- Stainless Steel: (check one): ASTM A409 ASTM A312
- ABS Plastic conforming to ASTM F480 and ASTM D1527: (check one) Schedule 40 Schedule 80
- PVC Plastic conforming to ASTM F480 and (ASTM D1785 or ASTM D2241): (check one): Schedule 40 Schedule 80
- Thermoset Plastic: (check one) Filament Wound Resin Pipe conforming to ASTM D2996
 Centrifugally Cast Resin Pipe conforming to ASTM D2997
 Reinforced Plastic Mortar Pressure Pipe conforming to ASTM D3517
 Glass Fiber Reinforced Resin Pressure Pipe conforming to AWWA C950
 PTFE Fluorocarbon Tubing conforming to ASTM D3296



State of Hawaii
COMMISSION ON WATER RESOURCE MANAGEMENT
Department of Land and Natural Resources
APPLICATION FOR PERMIT

Well Construction or Pump Installation

For Official Use Only:

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~~10 PI: 18~~

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 Fax: _____ E-mail: _____
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 Mailing Address: _____
 Fax: _____ E-mail: _____ Lic #: _____

(circle one: C-57, C-57a, or A)

WELL & PUMP INFORMATION: (Please fill in the diagram on the back of this form.)

2. **WELL LOCATION/NAME:** Halawa Deep Monitor Well Island: Oahu
 Address Halawa Correctional Facility Tax Map Key: 9-9-10:28

Attach the relevant portion of (a) a 7.5-Minute Series USGS topographic map (scale 1"=24,000'), and (b) a property tax map, showing well location referenced to established property boundaries.

3. **PROPOSED WORK:** (Check all that apply)
 Drill New Well Deepen Install New Pump
 Modify Existing Well Redrill Modify Pump
 Abandon/Seal * Replace Pump
 * Well No.: _____ Be sure to complete and submit well abandonment report upon completion of work.

4. **CONSTRUCTION:** Dug Bored Driven Drilled Radial
 Is this well a part of a battery of wells? Yes No (Please describe.)

5. **PROPOSED PUMP INFORMATION:** Rated Pump Capacity: None gallons per minute
 Pump Type (Check one): Deep Well Turbine Rotary Propeller Diesel
 Submersible Rotary-Displacement Reciprocating Gas
 Centrifugal Rotary-Gear Impulse Electric, rated horsepower: _____

6. **PROPOSED USE:** (Check all that apply)
 Municipal (including hotels, stores, etc.) Industrial
 Domestic (individual, noncommercial water system) No. of Dwelling Units: _____
 Irrigation (crop) _____ No. of Acres: _____
 Military Other (explain): monitoring

7. (a) **PROPOSED AMOUNT OF WITHDRAWAL:** None gallons per day
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OTHER IMPORTANT INFORMATION:

8. **PENDING ACTIONS:** Cдуа SMA EIS EA NONE Other (explain)

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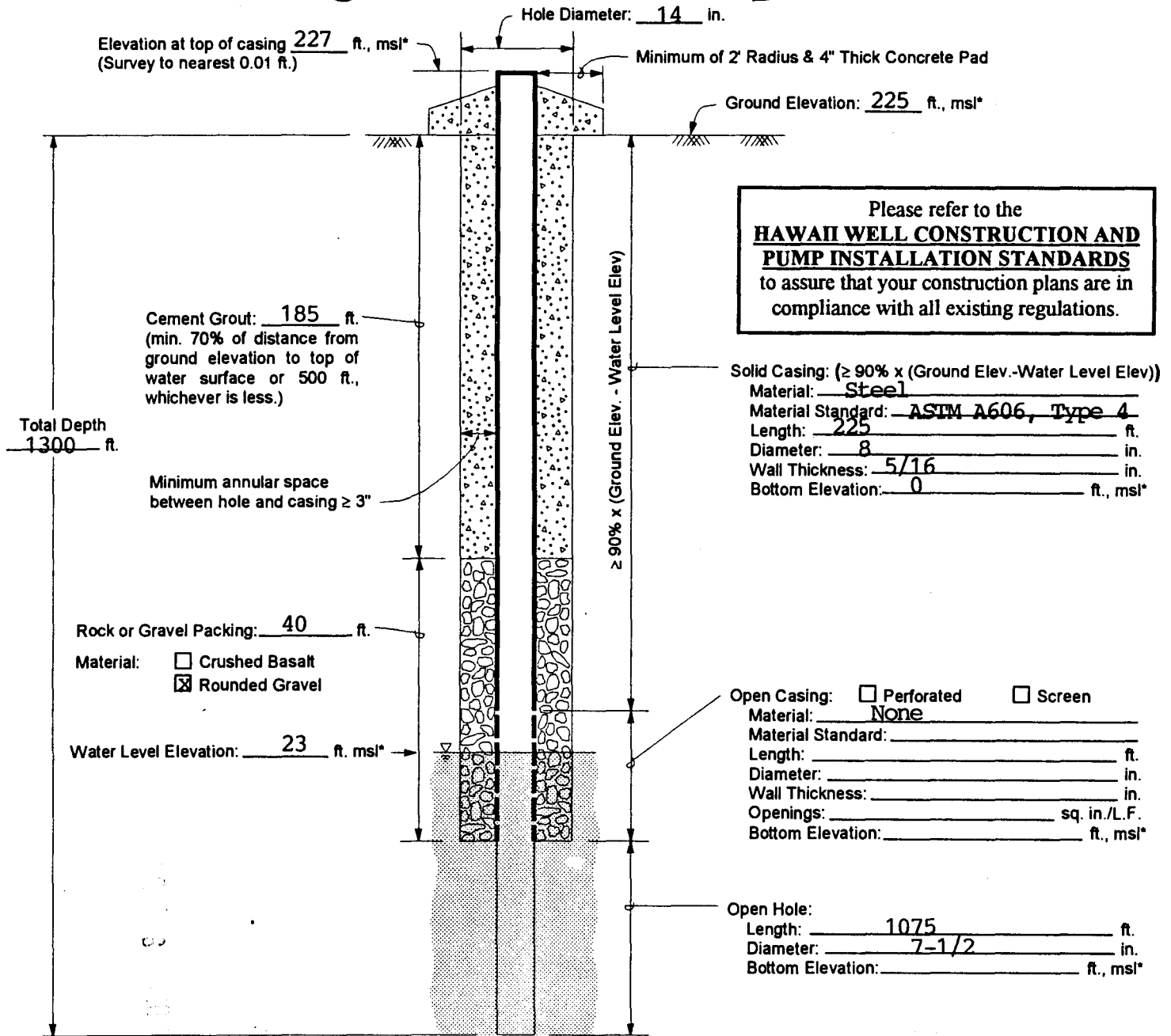
10. **REMARKS, EXPLANATIONS:** _____
 (If more space is needed, please attach additional sheet)

I understand that approval of this application attaches the following standard conditions: 1) the proposed work is to be completed within two (2) years of the approval date; 2) the contractor shall submit to the Commission a well completion/abandonment report within 30 days after the completion date of the permitted work; 3) monthly water use data shall be submitted to the Commission; 4) such approval shall not constitute a determination of correlative water rights and shall not guarantee the pump capacity or future use up to the permitted pump capacity.

Well Owner CWRM Landowner Dept of Public Safety Contractor _____
 Signature Edwin T. Jaksila Signature Red Seal Signature _____
 Date 5/11/99 Date 6/23/99 Date _____

Field Checked By _____ Longitude _____ Aquifer System Name WAIMANA 30201
 Date _____ Latitude _____ State Well No. 2253-03

9. PROPOSED WELL SECTION



For non-salt water Basal Wells - bottom elevation of well should not be deeper than 1/4 of aquifer thickness or,
 Bottom Elevation of Well Limit = $(\text{Water Elevation} - \frac{41 \times \text{Water Level Elevation}}{4})$
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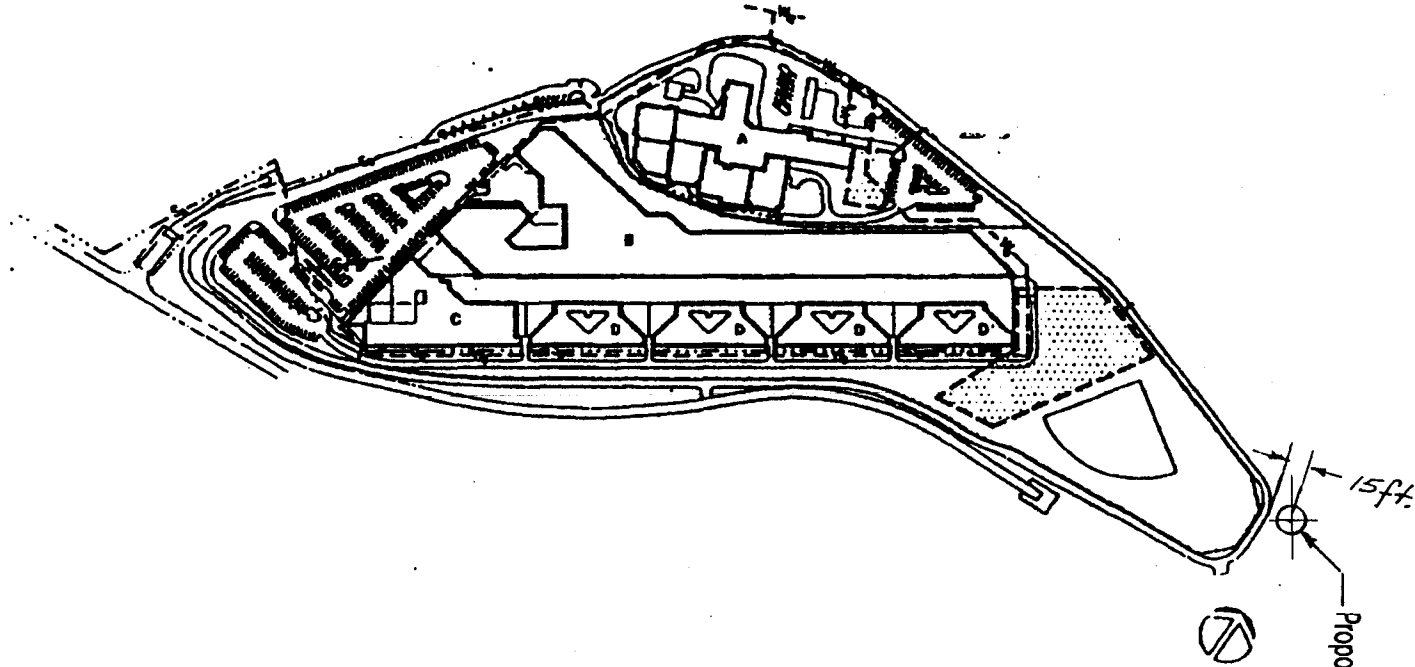
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 And compliant with (check one or more): ASTM A242 Type E Type S Grade B Other ASTM A606
- Stainless Steel: (check one): ASTM A409 ASTM A312
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 Centrifugally Cast Resin Pipe conforming to ASTM D2997
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 Glass Fiber Reinforced Resin Pressure Pipe conforming to AWWA C950
 PTFE Fluorocarbon Tubing conforming to ASTM D3296
 FEP Fluorocarbon Tubing conforming to ASTM D3296

Open Casing Material:

- Steel: compliant with (check one or more): ANSI/AWWA C200 API Spec. 5L ASTM A53 ASTM A139
 And compliant with (check one or more): ASTM A242 Type E Type S Grade B Other _____
- Stainless Steel: (check one): ASTM A409 ASTM A312
- ABS Plastic conforming to ASTM F480 and ASTM D1527: (check one) Schedule 40 Schedule 80
- PVC Plastic conforming to ASTM F480 and (ASTM D1785 or ASTM D2241): (check one): Schedule 40 Schedule 80
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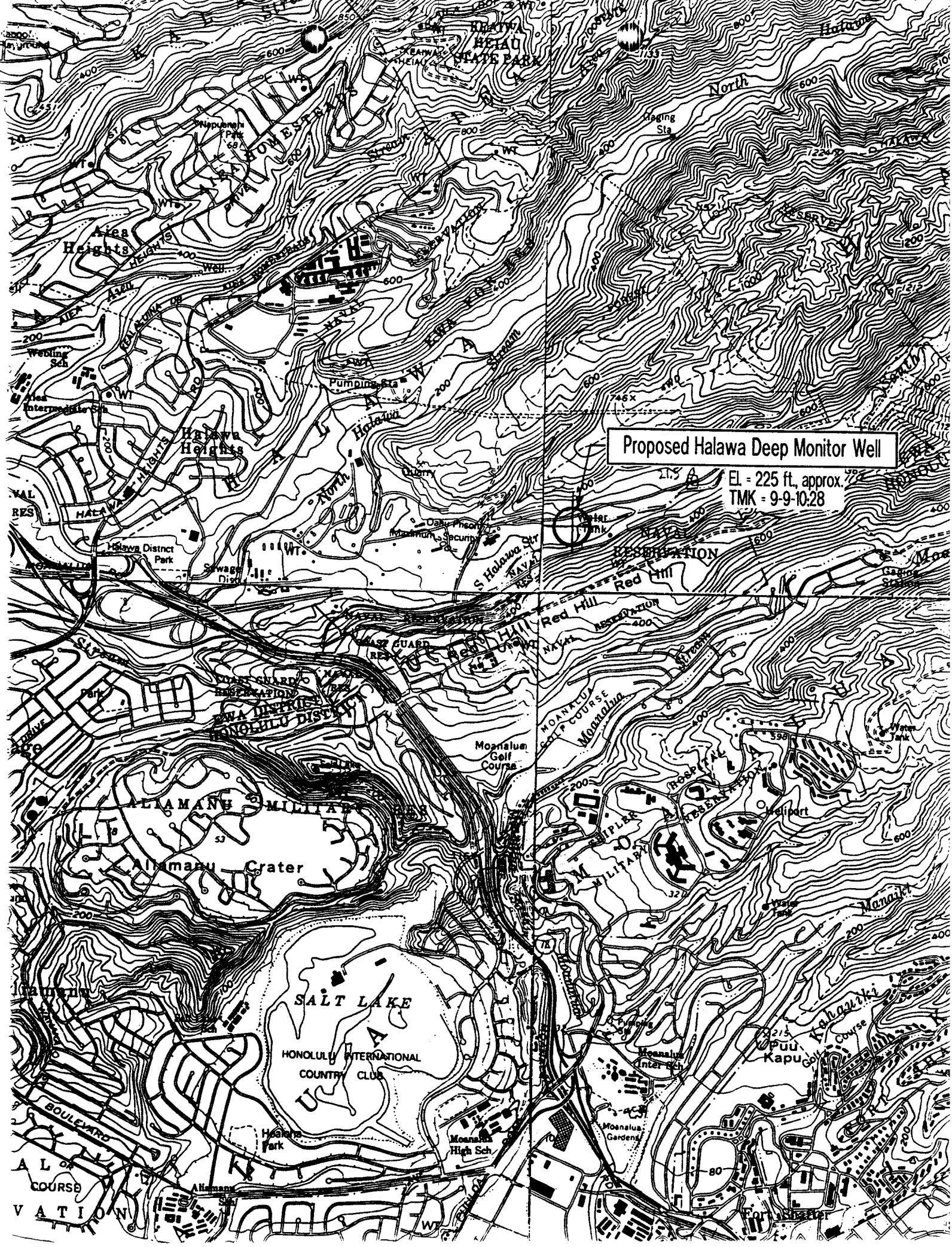
- LEGEND**
- | BLDG | USE |
|------|---|
| A | HIGH SECURITY FACILITY |
| B | MEDIUM SECURITY FACILITY |
| C | FACILITY ADMINISTRATION & SPECIAL HOUSING |
| D | HSP HOUSING |



Proposed Halawa Deep Monitor Well

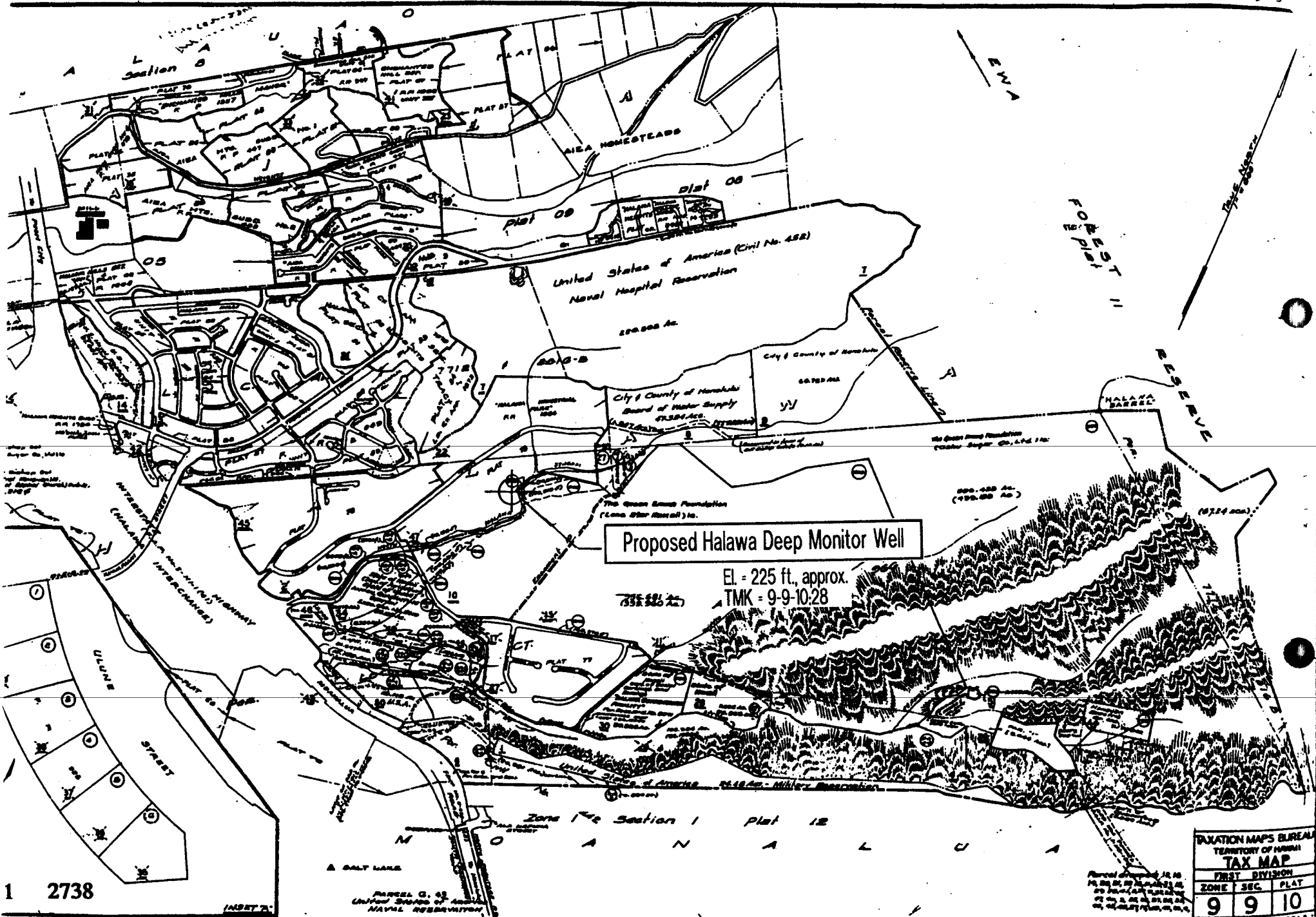
To: DEAN NAUANO	From: MARY ANN
Co./Dept: DAUJL	Co: PSD
Phone #: 587-0240	Phone #: 587-1235
Fax #: 587-0214	Fax #: 587-1244
1st Fax Note 7671	Date 7/9
	# of pages 1

HALAWA MEDIUM AND HIGH SECURITY FACILITY



Proposed Halawa Deep Monitor Well

El. - 225 ft., approx.
TMK - 9-9-10-28



Proposed Halawa Deep Monitor Well

El. - 225 ft., approx.
 TMK - 9-9-10-28

1 2738

P. AIEA & HALAWA, EWA, OAHU.

TAXATION MAPS BUREAU		
Territory of Hawaii		
TAX MAP		
FIRST DIVISION		
ZONE	SEC.	PLAT
9	9	10
CONTAINING PARCELS:		
SCALE: 1/4" = 40' APPROX.		

SUBJECT TO CHANGE

APPENDIX A

**VALLEY WELL DRILLING, INC.
WAIMALU DEEP MONITOR WELL DRILLING LOG
AND WELL COMPLETION REPORT**



State of Hawaii
 COMMISSION ON WATER RESOURCE MANAGEMENT
 Department of Land and Natural Resources
 DRILLER'S LOG

For Official Use Only:

Well Number: 2456-05

Depths (ft.)		Rock description, Water level, etc.	Dates
0	to 8	large basalt boulders w/dark brown silty sand	2/24/05
8	to 40	large basalt boulders w/dark brown silty sand	2/25/05
40	to 50	blue gray basalt mixed w/clay	2/28/05
50	to 75	soft brown clay mixed w/weathered basalt	2/28/05
75	to 95	saphrolite reddish brown	2/28/05
95	to 100	blue gray basalt, med hard	2/28/05
95	to 105	blue gray basalt med hard	3/1/05
105	to 125	weathered basalt med	3/1/05
120	to 130	light brown weathered rock	3/14/05
130	to 140	dark brown vesicular basalt	3/14/05
140	to 150	greenish gray basalt, very hard	3/15/05
150	to 170	light brown, vesicular, med hard	3/15/05
170	to 180	light gray, weathered soft	3/15/05
180	to 240	dark gray basalt, very hard	3/15/05
240	to 250	basalt olive gray, very hard	3/16/05
250	to 260	weathered, light brown, med hard	3/16/05
260	to 280	greenish gray, dense, very hard	3/16/05
280	to 295	light gray basalt, very hard	3/17/05

Depths (ft.)		Rock description, Water level, etc.	Dates
295	to 305	light brown, vesicular, medium	3/17/05
305	to 310	dark brown, vesicular, med	3/17/05
310	to 315	dark gray basalt very hard	3/17/05
315	to 320	greenish gray, med hard	3/17/05
320	to 330	light brown, vesicular med	3/18/05
330	to 340	light brown, vesicular med	3/18/05
340	to 360	dark brown vesicular med	3/18/05
360	to 390	dark brown vesicular med	3/18/05
390	to 395	dark gray, weathered, mix w/dark gray clay, soft	3/18/05
395	to 400	olive gray, vesicular, med	3/18/05
400	to 410	olive gray, vesicular, med	3/18/05
410	to 420	olive gray w/olivine, hard	3/18/05
420	to 430	olive gray basalt, hard	3/21/05
430	to 438	cinders, varying colors	3/21/05
438	to 450	light brown vesicular basalt, med hard	3/21/05
450	to 455	light reddish brown, weathered	3/21/05
455	to 460	olive gray vesicular, med hard	3/21/05
460	to 470	dark gray, dense, very hard	3/21/05

Remarks:
 page 1 of 3



State of Hawaii
 COMMISSION ON WATER RESOURCE MANAGEMENT
 Department of Land and Natural Resources
 DRILLER'S LOG

For Official Use Only:

Well Number: 2456-05

Depths (ft.)		Rock description, Water level, etc.	Dates
470	to 480	light brown, weathered, med	3/21/05
480	to 490	olive gray basalt, weathered, med hard	3/21/05
490	to 510	olive gray basalt, weathered med hard	3/21/05
510	to 520	olive gray, dense, very hard	3/21/05
520	to 530	dark gray basalt, hard	3/22/05
530	to 540	dark gray, weathered, med	3/22/05
540	to 557	dark brown vesicular	3/22/05
557	to 560	dark gray, dense, hard	3/22/05
560	to 580	dark gray, med hard	3/22/05
580	to 590	light brown, weathered	3/22/05
590	to 600	olive gray, very hard	3/22/05
610	to 615	dark gray hard, basalt	3/23/05
615	to 630	dark gray, weathered, med hard	3/23/05
630	to 640	dark gray, very hard	3/23/05
640	to 650	dark brown vesicular, med	3/23/05
650	to 660	olive gray vesicular, med hard	3/23/05
660	to 670	dark brown vesicular	3/23/05
670	to 680	dark gray, very hard	3/23/05

Depths (ft.)		Rock description, Water level, etc.	Dates
680	to 700	basalt, dark gray, dense, very hard	3/24/05
700	to 710	basalt, dark gray weathered, med hard	3/25/05
710	to 720	dark gray, vesicular, med hard	3/25/05
720	to 730	light brown, weathered, med	3/25/05
730	to 740	dark gray, hard	3/25/05
740	to 750	dark brown, weathered	3/25/05
750	to 760	dark gray, hard	3/25/05
760	to 780	cinders, light & dark brown	3/25/05
780	to 800	dark gray, vesicular, weathered	3/25/05
800	to 810	basalt, dark gray vesicular	3/28/05
810	to 820	cinders, dark gray, light brown	3/28/05
820	to 830	light brown, weathered	3/28/05
830	to 850	dark gray, med hard	3/28/05
850	to 860	dark brown vesicular	3/28/05
860	to 870	olive gray weathered	3/28/05
870	to 880	light brown, weathered	3/28/05
880	to 890	dark gray, med hard	3/28/05
890	to 895	dark gray, weathered	3/28/05

Remarks:
 page 2 of 3



State of Hawaii
COMMISSION ON WATER RESOURCE MANAGEMENT
 Department of Land and Natural Resources
DRILLER'S LOG

For Official Use Only:

Well Number: 2456.05

Depths (ft.)		Rock description, Water level, etc.	Dates
895	to 900	light brown clay med	3/29/05
900	to 910	dark gray weathered basalt	3/29/05
910	to 920	dark gray, hard	3/29/05
920	to 930	dark brown mix w/dark gray, hard	3/29/05
930	to 940	olive gray med hard	3/29/05
940	to 957	cinders dark brown, med	3/29/05
957	to 970	dark gray vesicular	3/29/05
970	to 990	olive gray, dense, hard	3/29/05
990	to 1000	dark gray, hard	3/29/05
1000	to 1010	dark gray mix w/dark brown	3/29/05
1010	to 1020	dark brown vesicular	3/30/05
1020	to 1030	dark gray vesicular	3/30/05
1030	to 1040	dark brown weathered	3/30/05
1040	to 1050	dark gray basalt mix w/light brown clay	3/30/05
1050	to 1060	dark gray, very hard	3/30/05
	to		
	to		
	to		

Depths (ft.)		Rock description, Water level, etc.	Dates
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Remarks:
 page 3 of 3



State of Hawaii
COMMISSION ON WATER RESOURCE MANAGEMENT
Department of Land and Natural Resources
WELL COMPLETION REPORT - PART I
Well Construction

For Official Use Only:

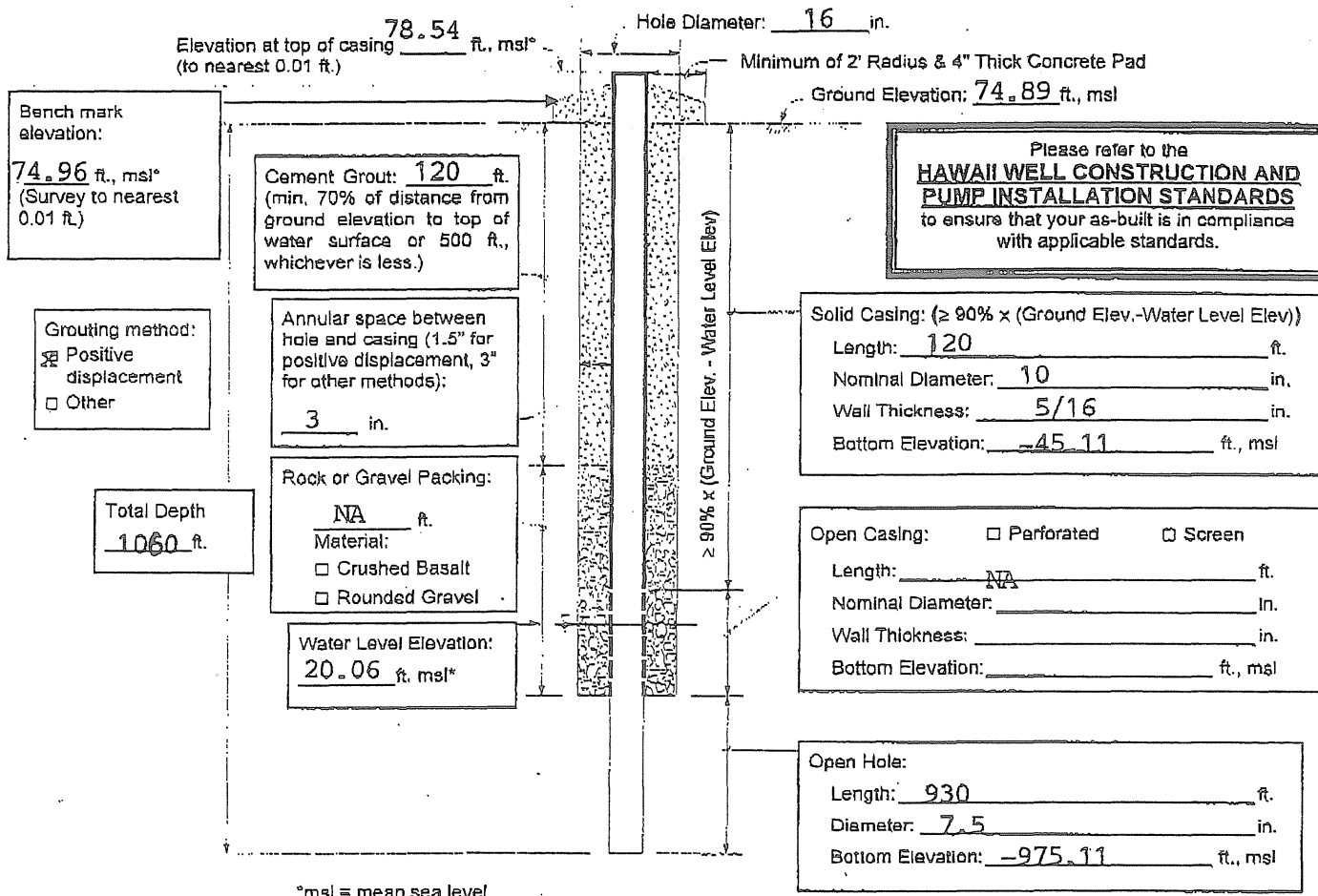
Instructions: Please print in ink or type and send completed report (with attachments, if applicable) to the Commission on Water Resource Management, P.O. Box 821, Honolulu, Hawaii 96809. The Commission may not accept incomplete reports. This form shall be submitted within 60 days of the completion of work. For assistance, please consult the Hawaii Well Construction and Pump Installation Standards or call the Regulation Branch at 587-0225. For updates to this form or additional information, please visit our website at <http://www.state.hi.us/dlnr/cwrm/>

1. State Well No.: 2456-05 Well Name: Waimalu Deep Monitor Island: Oahu
 2. Address: Kilinoe Street Tax Map Key: 9-8-11:006
 3. Drilling Company: Valley Well Drilling
 4. Drilling method used during construction: Rotary Percussion Other (describe) Reverse Circ.
 5. Date Well Construction (drilled, cased, grouted) completed: 4/29/05 Fill out attached Driller's Log
month/day/year
In addition to the driller's log, if a geologic log was prepared, please submit with this form.
 6. Was the subject well cored? Yes No
 7. Initial water-level encountered 54.8 ft. below ground Date and time of measurement: 3/15/05 0700
month/day/year time
 8. Step-Drawdown Test completed? No Yes Attach Step-Drawdown Test form (12/17/97 SDPTD Form)
 9. Constant Rate Aquifer Test completed? No Yes Attach Constant Rate Aquifer Test form (12/17/97 CRPTD Form)
- Parameters prior to pump test:
10. Water-level: _____ ft. above msl Date and time of measurement: _____
month/day/year time
 11. Chloride: _____ ppm Date and time of sampling: _____
month/day/year time
 12. Temperature: _____ °F Date and time of measurement: _____
month/day/year time
13. Fill in the as-built section on the other side of this sheet.
 14. Attach photograph of well and concrete pad showing benchmark on concrete pad.
 15. Fill in attached surveyor's report.
 16. If a pump is not planned to be installed, please describe (below in the remarks section) how well is secured to prevent unauthorized access (example: lockable cover, threaded coupling, etc.)
 17. Remarks: Lockable cover

Licensed Driller (print) Valley Well Drilling C-57 Lic. No. 21358

Signature _____ Date _____

13. AS-BUILT WELL SECTION (Please attach as-built if different from diagram provided below)



Solid Casing Material:

- Carbon Steel: compliant with (check one or more): ANSI/AWWA C200 API Spec. 5L ASTM A53 ASTM A139
 And compliant with (check one or more): ASTM A242 or A606 Type E Type S Grade B Other
- Stainless Steel: (check one): ASTM A409 (production wells) ASTM A312 (monitor wells)
- ABS Plastic conforming to ASTM F480 and ASTM D1527: (check one) Schedule 40 Schedule 80
- PVC Plastic conforming to ASTM F480 and (ASTM D1785 or ASTM D2241): (check one): Schedule 40 Schedule 80 Schedule 120
- Thermoset Plastic: (check one) Filament Wound Resin Pipe conforming to ASTM D2996
 Centrifugally Cast Resin Pipe conforming to ASTM D2997
 Reinforced Plastic Mortar Pressure Pipe conforming to ASTM D3517
 Glass Fiber Reinforced Resin Pressure Pipe conforming to AWWA C950
 PTFE Fluorocarbon Tubing conforming to ASTM D3296
 FEP Fluorocarbon Tubing conforming to ASTM D3296

Open Casing Material:

- Carbon Steel: compliant with (check one or more): ANSI/AWWA C200 API Spec. 5L ASTM A53 ASTM A139
 And compliant with (check one or more): ASTM A242 or A606 Type E Type S Grade B Other
- Stainless Steel: (check one): ASTM A409 (production wells) ASTM A312 (monitor wells)
- ABS Plastic conforming to ASTM F480 and ASTM D1527: (check one) Schedule 40 Schedule 80
- PVC Plastic conforming to ASTM F480 and (ASTM D1785 or ASTM D2241): (check one): Schedule 40 Schedule 80 Schedule 120
- Thermoset Plastic: (check one) Filament Wound Resin Pipe conforming to ASTM D2996
 Centrifugally Cast Resin Pipe conforming to ASTM D2997
 Reinforced Plastic Mortar Pressure Pipe conforming to ASTM D3517
 Glass Fiber Reinforced Resin Pressure Pipe conforming to AWWA C950
 PTFE Fluorocarbon Tubing conforming to ASTM D3296
 FEP Fluorocarbon Tubing conforming to ASTM D3296

APPENDIX B

URS WAIMALU DEEP MONITOR WELL GEOLOGICAL LOG

Project: DLNR Deep Monitor Well		Well ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
10	40% slightly vesicular basalt, 5Y 5/1 gray (dry), 5Y 3/1 very dark gray (wet), slightly weathered vesicles, hard; 40% slightly vesicular basalt, 5Y 6/1 gray (dry and wet) weathered with secondary staining, hard; 20% fine grained soil 10YR 5/3 brown; organics present		Cuttings: 0.2 - 1.2 cm, subangular - angular		
20	As above		As above		
30	Weathered basalt/saprolite, 50% 10YR 6/3 pale brown (dry), 10YR 5/4 yellowish brown (wet), 50% 5Y 5/1 gray (dry), 5Y 3/1 very dark gray (wet), extremely weathered, staining from alteration on surfaces and in vesicles, soft		As above		
40	As above		As above		
50	As above		As above		
REMARKS:		Legend:			
				Vesicular basalt	
				Basalt with phenocrysts	
				Cement	

Project: DLNR Deep Monitor Well		Site ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
60	Weathered basalt/saprolite, 50% 10YR 6/3 pale brown (dry), 10YR 5/4 yellowish brown (wet), 50% 5Y 5/1 gray (dry), 5Y 3/1 very dark gray (wet), extremely weathered, staining from alteration on surfaces and in vesicles, soft		Cuttings: 0.2 - 1.2 cm, subangular - angular GW at 54.8' bgs on 3/15/05 (VWD) and 54.78' bgs on 4/11/05 (DLNR)		
70	50% slightly vesicular basalt, 5Y 5/1 gray (dry) 5Y 3/1 very dark gray (wet), slightly weathered with staining on surfaces and vesicles hard; 50% weathered basalt/saprolite, 10YR 6/3 pale brown (dry), 10YR 5/4 yellowish brown (wet), extremely weathered, staining on surfaces and vesicles, soft		Cuttings: 0.2 - 1.3 cm, subangular - subrounded		
80	As above with 60% slightly vesicular basalt, 40% weathered basalt/saprolite		As above		
90	As above		Cuttings: 0.2 - 1.3 cm, angular - subrounded		
100	Weathered highly vesicular basalt/saprolite, 10YR 6/4 light yellowish brown (dry), 10YR 3/4 dark yellowish brown (wet), extremely weathered, staining on surfaces and vesicles, 2% slightly vesicular basalt, 5Y 5/1 gray (dry), 5Y 3/1 very dark gray (wet), slightly weathered with staining present		Cuttings: 0.2 - 2.5 cm, subangular - subrounded		
REMARKS:		Legend:			
		Clay Saprolite Massive basalt		Vesicular basalt Basalt with phenocrysts Cement	

Project: DLNR Deep Monitor Well		Site ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
110	Weathered highly vesicular basalt/saprolite, 10YR 6/4 light yellowish brown (dry), 10YR 3/4 dark yellowish brown (wet), extremely weathered, staining on surfaces and vesicles, 2% slightly vesicular basalt, 5Y 5/1 gray (dry), 5Y 3/1 very dark gray (wet), slightly weathered with staining present, organics present		Cuttings: 0.5 - 4.0 cm, subrounded - subangular		
120	50% slightly vesicular basalt, 5Y 5/1 gray (dry) 5Y 3/1 very dark gray (wet), slightly weathered with staining on surfaces and vesicles hard; 50% weathered basalt/saprolite, 10YR 6/3 pale brown (dry), 10YR 5/4 yellowish brown (wet), extremely weathered, staining on surfaces and vesicles, soft, organics present		Cuttings: 0.2 - 1.5 cm, subangular - angular		
130	As above with 95% weathered vesicular basalt/saprolite and 5% slightly vesicular basalt		Cuttings: 0.2 - 1.0 cm, subangular		
140	Slightly vesicular weathered basalt/saprolite, 5Y 5/1 gray (dry), 5Y 3/1 very dark gray (wet), soft, vesicles ≤ 1 mm, weathered, reddish brown and white staining in vesicles		Cuttings: 0.2 - 0.8 cm, subangular - subrounded		
150	70% as above; 30% saprolite, 5YR 5/4 reddish brown (dry), 5YR 3/4 dark reddish brown (wet), soft, vesicles < 1 mm		Cuttings: 0.2 - 0.6 cm, subangular - subrounded		
REMARKS:		Legend:			
		Clay Saprolite Massive basalt		Vesicular basalt Basalt with phenocrysts Cement	

Project: DLNR Deep Monitor Well		Site ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
160	Slightly vesicular weathered basalt/saprolite, 5Y 5/1 gray (dry), 5Y 3/1 very dark gray (wet), soft, vesicles ≤ 1 mm, weathered, reddish brown and white staining in vesicles with 2% saprolite, 5YR 5/4 reddish brown (dry), 5YR 3/4 dark reddish brown (wet), soft, vesicles < 1 mm		Cuttings: 0.2 - 0.6 cm, subangular - subrounded		
170	Saprolite, 5YR 4/2 dark reddish gray (dry), 5YR 3/2 dark reddish brown (wet), weathered, some vesicles < 1 mm visible, soft		Cuttings: < 0.1 - 0.6 cm, subrounded - rounded		
180	As above with white secondary minerals infilling the vesicles		As above		
190	Saprolite, 50% 5Y 6/1 gray (dry), 5Y 3/1 very dark gray (wet), reddish-brown staining in vesicles, soft; 50% 5YR 5/2 reddish gray (dry), 5YR 3/2 dark reddish brown (wet), soft		Cuttings: 0.2 - 0.6 cm, subangular - subrounded		
200	As above		As above		
REMARKS:		Legend:			

Project: DLNR Deep Monitor Well		Site ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
210	Weathered vesicular basalt/saprolite, 70% 5Y 6/1 gray (dry), 5Y 3/1 very dark gray (wet), reddish-brown staining in vesicles, soft; 30% 5YR 5/2 reddish gray (dry), 5YR 3/2 dark reddish brown (wet), soft		Cuttings: 0.2 - 0.6 cm, subangular - subrounded		
220	As above with 80% gray, 15% reddish gray, 5% vesicular basalt, 5Y 2.5/1 black (wet), hard, vesicles < 1 mm - 2 mm, vesicles slightly weathered		Cuttings: 0.2 - 3 cm, subangular - angular		
230	As above		As above		
240	As above		As above		
250	As above		As above		
REMARKS:		Legend:			
		Clay Saprolite Massive basalt		Vesicular basalt Basalt with phenocrysts Cement	

Project: DLNR Deep Monitor Well		Site ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
260	Massive basalt, 5Y 4/1 dark gray (dry), 5Y 2.5/1 black (wet) hard, slightly weathered with some brown staining		Cuttings: 0.2 - 1 cm, subangular to angular cuttings all fairly flat in shape (flake-like)		
270	50% slightly vesicular weathered basalt/saprolite, 5Y 5/1 gray (dry), 5Y 3/1 very dark gray (wet), slightly weathered with staining on surfaces and vesicles, breakable; 50% weathered vesicular basalt/saprolite, 5YR 4/4 reddish brown (dry), 5YR 3/4 dark reddish brown (wet), weathered with staining in vesicles, soft		Cuttings: 0.2 - 0.8 cm, subangular - subrounded		
280	As above with 70% reddish brown and 30% gray		As above		
290	Massive basalt, 5Y 4/1 dark gray (dry), 5Y 2.5/1 black (wet) hard, slightly weathered with some brown staining, trace olivine crystals and phenocrysts		Cuttings: 0.2 - 1 cm, subangular to angular cuttings all fairly flat in shape (flake-like)		
300	As above		As above		
REMARKS:		Legend: Clay Saprolite Massive basalt Vesicular basalt Basalt with phenocrysts Cement			

Project: DLNR Deep Monitor Well		Site ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
310	Weathered vesicular basalt/saprolite, 5YR 4/3 reddish brown (dry), 5YR 3/4 dark reddish brown (wet), weathered, some pieces breakable, white secondary minerals infilling vesicles		Cuttings: 0.2 - 1.0 cm, subangular - angular		
320	Vesicular basalt, 5Y 5/1 gray (dry), 5Y 2.5/1 black (wet), hard, slightly weathered		As above		
330	50% weathered vesicular basalt/saprolite, 5Y 4/1 dark gray (dry), 5Y 2.5/1 black (wet), soft and breakable, weathered with brown staining in vesicles; 50% ash, 5Y 8/1 white (dry), 5Y 6/1 gray (wet), brittle and breakable		As above		
340	As above with 50% dark gray weathered vesicular basalt/saprolite, 25% white ash, 25% weathered vesicular basalt/saprolite, 5YR 4/3 reddish brown (dry), 5YR 3/4 dark reddish brown (wet), weathered, soft and breakable		As above		
350	As above with 50% reddish brown weathered vesicular basalt/saprolite, 25% dark gray weathered vesicular basalt/saprolite, and 25% white ash. Some infilling of vesicles with white secondary mineral.		As above		
REMARKS:		Legend:			
		Clay Saprolite Massive basalt		Vesicular basalt Basalt with phenocrysts Cement	

Project: DLNR Deep Monitor Well		Site ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
360	As above with 15% white ash, 5% reddish brown weathered vesicular basalt/saprolite, 80% vesicular basalt, 5Y 4/1 dark gray (dry), 5Y 2.5/1 black (wet), hard, vesicles slightly staining brown, slightly weathered		Cuttings: 0.1 - 0.7 cm, subangular - angular		
370	As above with trace olivine crystals and phenocrysts		As above		
380	As above with 90% dark gray vesicular basalt, 5% reddish brown weathered vesicular basalt/saprolite, 5% white ash, and no olivine		As above		
390	As above with 95% dark gray vesicular basalt, 5% white ash, trace reddish brown weathered vesicular basalt/saprolite		As above		
400	Saprolite, 5YR 3/1 very dark gray (dry), 5YR 2.5/1 black (wet), soft and breakable; 5% white ash as above		Cuttings: 0.1 - 1.2 cm, subangular - subrounded		
REMARKS:			Legend: <ul style="list-style-type: none"> Clay Saprolite Massive basalt Vesicular basalt Basalt with phenocrysts Cement 		

Project: DLNR Deep Monitor Well		Site ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
410	Olivine vesicular basalt, 5Y 4/1 dark gray (dry), 5Y 2.5/1 black (wet), hard, weathered, vesicles up to 5 mm, 15% olivine crystals up to 3 mm, olivine phenocrysts		Cuttings: 0.1 - 1.8 cm, subangular - angular		
420	As above		As above		
430	As above with 5% olivine crystals, 5% ash, 5Y 8/1 white (dry), 5Y 6/1 gray (wet), brittle and breakable		Cuttings 0.1 - 1.4 cm, subangular - angular		
440	Vesicular basalt, GLEY 1 4/N dark gray (dry), GLEY 1 2.5/10 Y greenish black (wet), unweathered, hard, no staining		As above		
450	Weathered vesicular basalt/saprolite, 5YR 3/2 dark reddish brown (dry), 5YR 2.5/2 dark reddish brown (wet), some pieces breakable, white secondary minerals, trace pieces of dark gray vesicular basalt from 430'		As above		
REMARKS:		Legend:			
		Clay Saprolite Massive basalt		Vesicular basalt Basalt with phenocrysts Cement	

Project: DLNR Deep Monitor Well		Site ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
460	Vesicular basalt, GLEY 1 4/N dark gray (dry), GLEY 1 2.5/10 Y greenish black (wet), feldspar phenocrysts, unweathered, hard, no staining		Cuttings 0.1 - 1.4 cm, subangular - angular		
470	As above with some weathering and brown staining in vesicles		Cuttings: 0.1 - 0.6 cm, subangular - angular		
480	As above at 450', some vesicles bluish/black		As above		
490	As above		As above		
500	As above		As above		
REMARKS:		Legend:			
		Clay Saprolite Massive basalt		Vesicular basalt Basalt with phenocrysts Cement	

Project: DLNR Deep Monitor Well		Site ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
510	Vesicular basalt, 80% 5YR 4/3 reddish brown (dry), 5YR 3/4 dark reddish brown (wet), 20% GLEY 1 4/N dark gray (dry), GLEY 1 2.5/10 Y greenish black (wet), hard, feldspar phenocrysts, unweathered		Cuttings: 0.1 - 0.6 cm, subangular - angular		
520	As above with 45% reddish brown vesicular basalt, 45% dark gray vesicular basalt, 10% saprolite, 10YR 7/6 yellow (dry), 10YR 6/6 brownish yellow (wet), soft		Cuttings: 0.1 - 1.2 cm, subangular - angular		
530	Vesicular basalt, GLEY 1 4/N dark gray (dry), GLEY 1 2.5/10 Y greenish black (wet), feldspar phenocrysts, unweathered, hard, no staining		As above		
540	As above		As above		
550	Highly vesicular basalt 5Y 4/1 dark gray (dry), 5Y 2.5/1 black (wet), vesicles ≤ 2 mm, weathered, some breakable pieces		Cuttings: 0.1 - 0.8 cm, subangular - angular		
REMARKS:		Legend:			
		Clay Saprolite Massive basalt		Vesicular basalt Basalt with phenocrysts Cement	

Project: DLNR Deep Monitor Well		Site ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
560	Highly vesicular basalt 5Y 4/1 dark gray (dry), 5Y 2.5/1 black (wet), vesicles ≤ 2 mm, weathered, some breakable pieces		Cuttings: 0.1 - 0.8 cm, subangular - angular		
570	Vesicular basalt, GLEY 1 4/N dark gray (dry), GLEY 1 2.5/10 Y greenish black (wet), feldspar phenocrysts, unweathered, hard, no staining		Cuttings: 0.1 - 1.2 cm, subangular - angular		
580	As above		As above		
590	Slightly vesicular basalt, GLEY 1 4/N dark gray (dry), GLEY 1 2.5/N black (wet), hard, unweathered, 5% saprolite, 2.5YR 3/6 dark red (dry), 2.5YR 3/6 dark red (wet), soft and breakable		Cuttings: 0.1 - 0.5 cm, subangular - subrounded		
600	Vesicular basalt, 5YR 4/3 reddish brown (dry), 5YR 3/4 dark reddish brown (wet), hard, unweathered, no staining		Cuttings: 0.1 - 0.8 cm, subangular - angular		
REMARKS:		Legend:			
		Clay Saprolite Massive basalt		Vesicular basalt Basalt with phenocrysts Cement	

Project: DLNR Deep Monitor Well		Site ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
610	Slightly vesicular - massive basalt, GLEY 1 4/N dark gray (dry), GLEY 1 2.5/N black (wet), hard, slightly weathered, some white and brown staining, cuttings flat and flake-like		Cuttings: 0.2 - 1.5 cm, subangular - subrounded		
620	75% massive basalt, GLEY 1 4/N dark gray (dry), GLEY 1 2.5/N black (wet), hard, slightly weathered, some white and brown staining; 15% vesicular basalt, 5R 4/1 dark reddish gray (dry), 2.5YR 2.5/2 very dusky red (wet), hard, reddish and bluish staining on surface of vesicles, vesicles < 1 mm		Cuttings: 0.5 - 2.0 cm, subangular - subrounded		
630	As above		Cuttings: 0.1 cm - 1.0 cm, subangular - subrounded		
640	As above		As above		
650	Slightly vesicular - massive basalt, GLEY 1 4/N dark gray (dry), GLEY 1 2.5/N black (wet), hard, slightly weathered, some white and brown staining, cuttings flat and flake-like		Cuttings: 0.2 - 1.5 cm, subangular - subrounded		
REMARKS:		Legend:			
		Clay Saprolite Massive basalt		Vesicular basalt Basalt with phenocrysts Cement	

Project: DLNR Deep Monitor Well		Site ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
660	Weathered vesicular basalt/saprolite, 5Y 4/1 dark gray (dry), 5Y 2.5/1 black (wet), some pieces breakable, reddish brown and yellow staining, vesicles up to 3 mm		Cuttings: 0.1 - 1.0 cm, subangular - subrounded		
670	Highly vesicular basalt, 5Y 4/1 dark gray (dry), 5Y 2.5/1 black (wet), hard, vesicles < 2 mm, bluish staining on some vesicle walls		Cuttings: 0.1 - 0.6 cm, subrounded		
680	Slightly vesicular basalt, pieces are both red and gray, GLEY 1 4/N dark gray and 10R 5/1 reddish gray (dry), 5R 2.5/1 reddish black and 5YR 3/3 dark reddish brown (wet), hard, unweathered		Cuttings: 0.1 - 1.0 cm, subangular - subrounded		
690	Slightly vesicular - massive basalt, GLEY 1 4/N dark gray (dry), GLEY 1 2.5/N black (wet), hard, slightly weathered, some white and brown staining, cuttings flat and flake-like		Cuttings: 0.2 - 1.5 cm, subangular - subrounded		
700	As above		As above		
REMARKS:		Legend:			
		Clay Saprolite Massive basalt		Vesicular basalt Basalt with phenocrysts Cement	

Project: DLNR Deep Monitor Well		Site ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
710	Highly vesicular basalt, 50% 5YR 4/2 dark reddish gray (dry), 5YR 2.5/2 dark reddish brown (wet), 50% GLEY 1 4/N dark gray (dry), GLEY 1 2.5/N black (wet), hard, unweathered, vesicles < 2 mm		Cuttings: 0.1 - 0.6 cm, subangular - subrounded		
720	Highly vesicular basalt, 5Y 4/1 dark gray (dry), 5Y 2.5/1 black (wet), hard, vesicles < 2 mm, white secondary mineral on vesicle walls		Cuttings: 0.1 - 1.2 cm, subangular - subrounded		
730	Slightly vesicular basalt, 5Y 4/1 dark gray (dry), 5Y 2.5/1 black (wet), hard, vesicles < 2 mm, bluish staining on some vesicle walls		Cuttings: 0.2 - 1.8 cm, subangular - subrounded		
740	Highly vesicular basalt, GLEY 1 4/N dark gray (dry), 5YR 2.5/2 dark reddish brown (wet), weathered and altered, orangish-brown and deep yellow staining, reddish-blue staining in vesicles, vesicles < 1 mm		Cuttings: 0.1 - 1.4 cm, subangular - subrounded		
750	Slightly vesicular basalt, 90% GLEY 1 4/N dark gray (dry), GLEY 1 2.5/N black (wet), 10% 2.5YR 3/2 dusky red (dry and wet), hard, slightly weathered, some white and brown staining, cuttings flat and flake-like		Cuttings 0.2 - 1.2 cm, subangular - subrounded		
REMARKS:		Legend:			
		Clay Saprolite Massive basalt		Vesicular basalt Basalt with phenocrysts Cement	

Project: DLNR Deep Monitor Well		Site ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
760	Highly vesicular basalt, 10R 3/4 dusky red (wet), orangish-brown and deep yellow staining, vesicles < 1 mm, some pieces have glassy texture, hard		Cuttings: 0.1 - 1.2 cm, subangular - subrounded		
770	As above except no glassy texture		As above		
780	Vesicular basalt, pieces are both red and gray, GLEY 1 4/N dark gray and 10R 5/1 reddish gray (dry), 5R 2.5/1 reddish black and 5YR 3/3 dark reddish brown (wet), hard, unweathered		Cuttings: 0.1 - 1.4 cm, subangular - subrounded		
790	Highly vesicular basalt, 10R 3/4 dusky red (wet), orangish-brown and deep yellow staining, vesicles < 1 mm, some pieces have glassy texture, hard		Cuttings: 0.1 - 1.2 cm, subangular - subrounded		
800	Vesicular basalt, GLEY 1 2.5/N black (wet), hard, unweathered, vesicles < 3 mm, no staining		Cuttings: 0.2 - 1.2 cm, subangular - subrounded		
REMARKS: Samples are wet		Legend: Clay Saprolite Massive basalt Vesicular basalt Basalt with phenocrysts Cement			

Project: DLNR Deep Monitor Well		Site ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
810	Highly vesicular basalt, 50% 5YR 4/2 dark reddish gray (dry), 5YR 2.5/2 dark reddish brown (wet), 50% GLEY 1 4/N dark gray (dry), GLEY 1 2.5/N black (wet), hard, unweathered, vesicles < 2 mm		Cuttings: 0.2 - 1.2 cm, subangular - subrounded		
820	Highly vesicular basalt, GLEY 1 2.5/N black (wet), hard, unweathered, vesicles < 1 mm		Cuttings: 0.3 - 0.8 cm, subangular - subrounded		
830	Highly vesicular basalt, 50% 5YR 4/2 dark reddish gray (dry), 5YR 2.5/2 dark reddish brown (wet), 50% GLEY 1 4/N dark gray (dry), GLEY 1 2.5/N black (wet), hard, unweathered, vesicles < 2 mm		Cuttings: 0.1 - 0.5 cm, subangular - subrounded		
840	As above		Cuttings: 0.2 - 1.0 cm, subangular - subrounded		
850	As above except slightly vesicular basalt, 90% dark gray and 10% dark reddish gray		As above		
REMARKS: Samples are wet		Legend: Clay Saprolite Massive basalt Vesicular basalt Basalt with phenocrysts Cement			

Project: DLNR Deep Monitor Well		Site ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
860	Slightly vesicular basalt, GLEY 1 4/N dark gray (dry), GLEY 1 2.5/N black (wet), hard, slightly weathered, some white and brown staining, cuttings flat and flake-like		Cuttings: 0.1 - 1.2 cm, subangular		
870	Highly vesicular basalt, 50% 5YR 4/2 dark reddish gray (dry), 5YR 2.5/2 dark reddish brown (wet), 50% GLEY 1 4/N dark gray (dry), GLEY 1 2.5/N black (wet), hard, unweathered, vesicles < 2 mm		Cuttings: 0.1 - 0.8 cm, subangular - subrounded		
880	Vesicular basalt, GLEY 1 2.5/N black (wet), unweathered, hard, vesicles up to 6 mm		As above		
890	Highly vesicular basalt, 50% 5YR 4/2 dark reddish gray (dry), 5YR 2.5/2 dark reddish brown (wet), 50% GLEY 1 4/N dark gray (dry), GLEY 1 2.5/N black (wet), hard, unweathered, vesicles < 2 mm		As above		
900	Vesicular basalt, 5Y 2.5/1 black (wet), unweathered, hard, vesicles < 2 mm, 5% saprolite, 2.5YR 4/8 dark red (wet), weathered, soft, breakable		As above		
REMARKS: Samples are wet		Legend: Clay Saprolite Massive basalt Vesicular basalt Basalt with phenocrysts Cement			

Project: DLNR Deep Monitor Well		Site ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
910	Saprolite, 5YR 3/4 dark reddish brown (wet), soft, 15% vesicular basalt, GLEY 1 2.5/N black (wet), hard, unweathered, vesicles < 1 mm		Cuttings: 0.2 - 1.4 cm, subrounded		
920	Vesicular basalt, 5Y 2.5/1 black (wet), unweathered, hard, vesicles < 2 mm, 5% saprolite, 2.5YR 4/8 dark red (wet), weathered, soft, breakable		Cuttings: 0.1 - 1.4 cm, subangular - subrounded		
930	As above except basalt pieces flake-like		As above		
940	Vesicular basalt, pieces are both red and gray, GLEY 1 2.5/N black and 10R 4/3 weak red (wet), vesicles up to 1 cm, hard; 5% saprolite, 2.5YR 4/8 dark red (wet), weathered, soft, breakable		Cuttings: 0.1 - 1.2 cm, subangular - angular		
950	As above		As above		
REMARKS: Samples are wet		Legend: Clay Saprolite Massive basalt Vesicular basalt Basalt with phenocrysts Cement			

Project: DLNR Deep Monitor Well		Site ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
960	Vesicular basalt, pieces are both red and gray, GLEY 1 2.5/N black and 10R 4/3 weak red (wet), vesicles up to 1 cm, hard		Cuttings: 0.1 - 1.8 cm, subangular - subrounded		
970	Highly vesicular basalt, 50% 5YR 4/2 dark reddish gray (dry), 5YR 2.5/2 dark reddish brown (wet), 50% GLEY 1 4/N dark gray (dry), GLEY 1 2.5/N black (wet), hard, unweathered, vesicles < 2 mm, some pieces look like pumice		Cuttings: 0.1 - 1.4 cm, subrounded		
980	Vesicular basalt, GLEY 1 2.5/N black (wet), vesicles < 1 mm, hard, unweathered		Cuttings: 0.1 - 1.4 cm, subangular - subrounded		
990	Slightly vesicular basalt, 5Y 2.5/1 black (wet), vesicles < 1 mm, hard, unweathered		As above		
1000	Vesicular basalt, 10R 3/2 dusky red (wet), vesicles < 1 mm, hard, unweathered		Cuttings: 0.1 - 0.8 cm, subangular - subrounded		
REMARKS: Samples are wet		Legend: Clay Saprolite Massive basalt Vesicular basalt Basalt with phenocrysts Cement			

Project: DLNR Deep Monitor Well		Site ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
1010	Vesicular basalt, GLEY 2.5/N black (wet), vesicles < 2 mm, hard, unweathered, 5% saprolite, 2.5YR 4/8 dark red (wet), weathered, soft, breakable		Cuttings: 0.1 - 0.8 cm, subangular - subrounded		
1020	Vesicular basalt, 10R 3/2 dusky red (wet), vesicles < 1 mm, hard, unweathered, trace olivine		As above		
1030	Vesicular basalt, 2.5YR 2.5/1 reddish black (wet), vesicles < 1 mm, hard, unweathered		Cuttings: 0.3 - 1.2 cm, subangular - subrounded		
1040	Vesicular basalt, GLEY 1 4/N dark gray (dry), GLEY 1 2.5/N black (wet), vesicles < 2 mm, hard, slightly weathered with white staining		As above		
1050	As above with 15% massive basalt, 2.5YR 4/6 dark red (dry), 2.5YR 2.5/4 very dusky red (wet), hard, no weathering		As above		
REMARKS:		Legend:			
		Clay Saprolite Massive basalt		Vesicular basalt Basalt with phenocrysts Cement	

Project: DLNR Deep Monitor Well		Site ID: Waimalu		Location Type: Monitoring Well (MW)	
Location Description: Dirt road end of Kilinoe Street, TMK (1) 9-8-11:006				Coordinates: 21°23'50.6", 157°56'5.4" (NAD 83)	
Consultant: URS Corporation		Geologist: D. Stiffel		Drilling Company: Valley Well Drilling	
Drilling Foreman: Dean McClure		Ground Surface Elevation: 74.89 ft msl		Datum: MSL	
Sampling Device: logging f/cuttings		Borehole Diameter (inches): 16 (0-120'), 7.5 (120-1,060')		Total Depth (Feet): 1,060	
Date Drilling Started: 2/24/2005			Date Total Depth Reached: 3/30/2005		
Depth (feet)	LITHOLOGIC DESCRIPTION (interval in ft) ROCK TYPE: dry Munsell color, wet Munsell color, USCS grain size, mineralogy; texture; foliation or bedding; weathering; odor and staining	Graphic	STRUCTURE/DRILLING Date, time, structures, fractures, drilling problems, general information	Well Construction Detail	
1060	50% vesicular basalt, 5Y 3/1 very dark gray (dry), 5Y 2.5/1 black (wet), vesicles < 1 mm, unweathered, hard, 50% saprolite, 5YR 4/4 reddish brown (dry), 5YR 3/4 dark reddish brown (wet), soft, weathered		Cuttings: 0.2 - 1.4 cm, subrounded		
1070	Slightly vesicular basalt, GLEY 1 3/N very dark gray (dry), GLEY 1 2.5/N black (wet), vesicles < 1 mm, slightly weathered with white staining, 2% saprolite, 5YR 4/4 reddish brown (dry), 5YR 3/4 dark reddish brown (wet), soft, weathered		Cuttings: 0.1 - 1.0 cm, subangular - subrounded		
1080					
1090					
1100					
REMARKS:		Legend:			
		Clay Saprolite Massive basalt		Vesicular basalt Basalt with phenocrysts Cement	







Boring 1		File 407-1		U.S.C.S. Symbol	Dry Density	Moisture Content	Remarks
Depth	Sample Number	Penetration Resistance	Date 10-18-82				
ft.	bl. /ft.	Soil Symbol	Description	pcf	%		
			Boring 1 Elevation 164± Water Level 10.8' (10-18-82) Water Elevation 153±				
5	1-1	78	 Brown Sandy SILT with cobbles and debris  BOULDERS  Brown Silty CLAY with Gravel, <u>very hard, dry</u>  BOULDERS	MH	84	29	Expansive Clay
10	1-2	19/0.5 90/0.5	 Brown GRAVEL and Silty SAND, <u>medium dense to dense, moist</u>				Decomposed Sand and Gravel
15	1-3	53	 Interbedded layers of gray and brown Silty CLAY with Gravel, Gravelly CLAY, and Clayey GRAVEL, <u>stiff to dense, saturated</u>	GC			Decomposed Conglomerate
20	1-4	124 0.7					
25	1-5	57			80	43	C=725 psf φ=43°
30	1-6	110					
Boring terminated at 31.5'							

Figure 4

Depth	Sample Number	Location	Penetration Resistance	Soil Symbol	Boring 2 Elevation 192± Water Level None Encountered Water Elevation	File 407-1 Date 10-18-82	U.S.C.S. Symbol	Dry Density	Molsture Content	Remarks
ft.			bl./ft.		Description			pcf	%	
2-1			139		Brown Silty CLAY with Gravel and Cobbles, <u>hard</u> , dry to damp		MH	84	27	Expansive Clay
2-2			178 0.8		Reddish brown Clayey SILT, <u>very hard</u> , dry to damp, blocky		MH	88	29	Expansive Clay LL=70, PI=34
2-3			126 0.6		Orange and gray Clayey SILT with decomposed Gravel and boulders, <u>very hard</u> , dry to damp		MH	95	24	Decomposed Conglomerate
2-4			141 0.8							
2-5			163 0.8		(At 15.0' grading to weathered GRAVEL with Clay seams, <u>very hard</u> , dry)					
2-6			83 0.4		Boring terminated at 20.4'					

Figure 5

Depth	Sample Number	Location	Penetration Resistance	Soil Symbol	Boring 3 Elevation 210± Water Level 13.6' (10-27-82) Water Elevation 196±	File 407-1 Date 10-12-82	U.S.C.S. Symbol	Dry Density	Moisture Content	Remarks
ft.			bl./ft.		Description			pcf	%	
3-1			61		Reddish brown Clayey SILT with Gravel, Cobbles and debris, <u>hard</u> , dry to damp		ML MH	84	36	Uncompacted Fill
3-2			8/0.5 36/0.5		Brown Silty CLAY with Gravel, Cobbles and decayed organics, loose, damp				30	Uncompacted Fill
5					Decayed organics					Uncompacted Fill
3-3			67		Dark Brown Silty CLAY with weathered Gravel, <u>very hard</u> , dry		MH	102	24	Expansive Clay LL=57, PI=26
10	3-4		10/0		Gray GRAVEL, COBBLES, and BOULDERS with brown and gray clay, moist					Decomposed Conglomerate
15			100% Rec.							
3-5			99		Gray CLAY with seams of brown Silt, <u>hard</u> , moist		CH	81	38	Decomposed Conglomerate C=1150 psf $\phi=16\frac{1}{2}^\circ$
20					(At 21.0', grading with Boulders)					
3-6			101 0.3		(At 24.0', grading with Gravel)		MH			LL=74, PI=34
25					(At 29.0', grading to Gravelly CLAY, stiff to hard, moist)					
30	3-7		132 0.9		Boring terminated at 29.9'			81	39	

Figure 6

Depth	Sample Number	Location	Penetration Resistance	Soil Symbol	Boring 4 Elevation 182± Water Level 21.0' (10-27-82) Water Elevation 161±	File 407-1 Date 10-27-82	U.S.C.S. Symbol	Dry Density	Moisture Content	Remarks
ft.			bl./ft.		Description			pcf	%	
4-1			127 0.8		Brown Sandy SILT, <u>hard</u> , dry Gray and brown Gravelly CLAY, <u>hard</u> , dry		MH			
4-2			145 0.8		BOULDERS and brown Silty SAND /Sandy SILT with Gravel, <u>very dense</u> , dry		SM ML		17	
4-3			136		Brown Clayey SILT with Boulders and weathered Sand and Gravel, <u>very hard</u> , dry to damp		ML MH			Decomposed Conglomerate
10					BOULDERS					
4-4			119		Brown Clayey SILT with Boulders, weathered Sand and Gravel and seams of stiff gray Clay, <u>hard</u> , damp			81	41	Decomposed Conglomerate
4-5			118 0.8		(At 16.0', grading to moist)					
4-6			47		Brown and gray Silty CLAY with Sand and weathered Gravel, <u>stiff to very stiff</u> , saturated		MH CH	70	49	C=625 psf φ=30°
4-7			114		(At 24.0', grading to Clayey SAND and GRAVEL, <u>dense</u> , saturated)					
					Boring terminated at 26.5'					
30										

Figure 7

Depth	Sample Number	Location	Penetration Resistance	Soil Symbol	Boring 5 Elevation 174± Water Level 3.7' (10-27-82) Water Elevation 170±	File 407-1 Date 10-22-82	U.S.C.S. Symbol	Dry Density	Molsture Content	Remarks
ft.			bl./ft.		Description			pcf	%	
5-1			73/0.7		Brown Clayey SILT with seams of gray Sandy CLAY and weathered Gravel, <u>very hard</u> , dry to damp		MH			LL=59, PI=24
5-2			55/0.5		▼ Brown and gray Clayey SAND and GRAVEL with Cobbles, <u>very dense</u> , dry to damp		GP			
5-3			61							
5-4			101		BOULDERS		GP- GC			
5-5			14		Orange and brown Clayey SILT with gray Clay, <u>medium stiff</u> , saturated					Decomposed Sand and Gravel
5-6			101		Orange and brown weathered SAND and GRAVEL with gray Sandy Clay, <u>very dense</u> , saturated		GP			Decomposed Sand and Gravel
5-7			80/0.8		Brown and gray Clayey GRAVEL, with seams of stiff Gravelly Clay, <u>very dense</u> , saturated					
5-8			70		Dark gray CLAY, <u>very stiff</u> , saturated		CH			
					Boring terminated at 26.5'					

Figure 8

Depth	Sample Number	Location	Penetration Resistance	Soil Symbol	Boring 6 Elevation 193 \pm Water Level 22.0' (10-25-82) Water Elevation 171 \pm	File 407-1 Date 10-14-82	U.S.C.S. Symbol	Dry Density	Moisture Content	Remarks
ft.			bl./ft.		Description			pcf	%	
6-1			97		Dark brown Silty CLAY with decomposed Gravel, <u>hard</u> , damp		MH			Expansive Clay LL=66, PI=30
6-2			47					84	34	C=1150 psf $\phi=26^\circ$
6-3			74/0.4'		BOULDERS with dark brown Clay					
6-4			80/0.3'							
			83% Rec.							
6-5			58		Reddish brown Silty SAND with seams of gray Clay, <u>dense</u> , wet		SM	65	54	River Sand
6-6			87		Reddish brown Silty SAND and GRAVEL, with interbedded layers of stiff sandy Clay, <u>dense</u> , saturated					Decomposed Conglomerate
6-7			108					70	53	

Figure 9


Depth	Sample Number	Location	Penetration Resistance	Soil Symbol	Boring 6 (cont'd) File 407-1 Elevation 193'± Date 10-14-82 Water Level 14.0' Water Elevation 178.9'±	U.S.C.S. Symbol	Dry Density	Moisture Content	Remarks
ft.			bl./ft.		Description		pcf	%	
35	6-8		103		Reddish brown Clayey SAND and GRAVEL with seams of gray Clay, <u>dense</u> , saturated				Decomposed Conglomerate
					Boring terminated at 36.0'				

Figure 9a

Depth ft.	Sample Number	Location	Penetration Resistance bl./ft.	Soil Symbol	Boring 7 File 407-1		U.S.C.S. Symbol	Dry Density pcf	Moisture Content %	Remarks	
					Elevation 198 $\frac{1}{2}$	Date 11-10-82					
					Water Level 11.2' (11-22-82)						
					Water Elevation 187 $\frac{1}{2}$						
					Description						
7-1			51/0.2		Brown Sandy CLAY, <u>medium stiff to stiff, moist to wet</u>		MH	79	36		
7-2			40		Brown Clayey GRAVEL, <u>medium dense, damp</u>		GC	76	39		
5					BOULDERS with brown Silty CLAY						
7-3			64/0.5		Brown mottled Clayey GRAVEL, <u>medium dense to dense, saturated</u>		GC			Decomposed Sand and Gravel	
7-4			57		Brown mottled Clayey GRAVEL, <u>dense to very dense, saturated</u>		GC			Decomposed Sand and Gravel	
7-5			112		Orange and brown Clayey GRAVEL with seams of gray Clay, <u>very dense, saturated</u>		GC			Decomposed Conglomerate	
7-6			53					74	47		
7-7			72								

Figure 10



Depth	Sample Number	Location	Penetration Resistance	Soil Symbol	Boring 7 (cont'd) File 407-1 Elevation 198± Date 11-10-82 Water Level 11.2' Water Elevation 187±	U.S.C.S. Symbol	Dry Density	Moisture Content	Remarks
ft.			bl./ft.		Description		pcf	%	
35	7-7		72		Orange and brown Clayey GRAVEL with seams of gray Clay, <u>very dense, saturated</u>	GH			Decomposed Conglomerate
	7-8		86		Gray CLAY, <u>very stiff, saturated</u>	CH			
40					Boring terminated at 36.5'				

Figure 10a

Depth	Sample Number	Location	Penetration Resistance	Soil Symbol	Boring 8 Elevation 213'± Water Level 0 (11-24-82) Water Elevation 213'±	File 407-1 Date 11-22-82	U.S.C.S. Symbol	Dry Density	Molsture Content	Remarks
ft.			bl./ft.		Description			pcf	%	
							GC			Base Course
	8-1		30/0.3				CH			Expansive Clay
	8-2		50/0.5				GC			
5										
	8-3		58				CH	66	65	Expansive Clay
10	8-4		R							
			92% Rec.							
15	8-5		80/0.3							
20	8-6		86/0.5							Expansive Clay LL=74, PI=29
	8-7		49							
25	8-8		70				MH			
30	8-9		92/0.8				ML	73	50	C=1000 psf φ=41°

Figure 11

Depth	Sample Number	Location	Penetration Resistance	Soil Symbol	Boring 8 (cont'd) Elevation 213± Water Level 0 Water Elevation 213±	File 407-1 Date 11-22-82	U.S.C.S. Symbol	Dry Density	Moisture Content	Remarks
ft.			bl./ft.		Description			pcf	%	
8-9			92/0.8		Brown mottled SILT with pockets of gray sandy Clay		ML	73	50	C=1000 psf φ=41°
35	8-10		50/0.1		BOULDERS and brown Silty CLAY					
40	8-11 8-12		61/0.1 84		Boring terminated at 41.3'					
45										

Figure 11a

Depth	Sample Number	Location	Penetration Resistance	Soil Symbol	Boring 9 Elevation 237'± Water Level 22.9' (12-14-82) Water Elevation 214'±	File 407-1 Date 11-30-82	U.S.C.S. Symbol	Dry Density	Moisture Content	Remarks
ft.			bl./ft.		Description			pcf	%	
0-5	9-1		30/0.2		Brown Silty GRAVEL with concrete debris					Uncompacted Fill
5-10					Concrete					Uncompacted Fill
10-15	9-2		52/0.5 26/0.5		Brown Clayey SILT, <u>hard</u> , damp	ML				Uncompacted Fill
10-15					BOULDERS with gray Clay and Organics, damp					Uncompacted Fill
15-20	9-3		27		Brown Sandy CLAY with concrete debris, <u>medium stiff to stiff</u> , moist to wet					Uncompacted Fill
15-20	9-4		59							
20-25	9-5		31							
20-25	9-6		23							
25-30	9-7		44/0.5 19/0.5		Brown Clayey GRAVEL with seams of soft to medium stiff Clay, <u>medium dense</u> , moist to wet	GC				Uncompacted Fill
30-35	9-8		32		Gray CLAY, <u>stiff to very stiff</u> , damp		77	43		Expansive Clay
30-35					BOULDERS and very stiff brown Silty CLAY, damp					

Figure 12





Depth	Sample Number	Location	Penetration Resistance	Soil Symbol	Boring 9 (cont'd) File 407-1 Elevation 237± Date 11-30-82 Water Level 22.9' (12-14-82) Water Elevation 214±	U.S.C.S. Symbol	Dry Density	Moisture Content	Remarks
ft.			bl./ft.		Description		pcf	%	
35	9-9		85/0.8		BOULDER and very stiff brown Silty CLAY, damp		87	33	
40	9-10		42/0.3		Brown SILT, <u>hard</u> , dry to damp	ML			
45	9-11		71		Gray CLAY with pockets of Silt, <u>very stiff</u> , damp	CH	79	41	Expansive Clay
50	9-12		108/0.8		Orange Clayey SILT with pockets of gray Clay, <u>very stiff to hard</u> , moist		71	45	Decomposed Conglomerate
					Boring terminated at 46.3'				

Figure 12a

Depth	Sample Number	Location	Penetration Resistance	Soil Symbol	Boring 10 Elevation 211± Water Level 23.0' (11-15-82) Water Elevation 188±	File 407-1 Date 11-15-82	U.S.C.S. Symbol	Dry Density	Moisture Content	Remarks
ft.			bl./ft.		Description			pcf	%	
10-1			67		Dark brown Silty CLAY with roots, <u>very stiff</u> , damp		MH	78	42	Expansive Clay LL=80, PI=38
5	10-2	X	73/0.7		BOULDER and COBBLES					
10-3			104/0.8		Gray Clayey GRAVEL with orange Silt, <u>very dense</u> , damp		GC	80	39	Decomposed Sand and Gravel
10-4			112		Orange Clayey GRAVEL with seams of gray Clay, <u>very dense</u> , damp		GC	80	41	Decomposed Conglomerate
10-5			84/0.7		(at 20.0' grading to wet)		GC			LL=74, PI=31
10-6			106							
10-7			99					71	51	

Figure 13


Depth	Sample Number	Location	Penetration Resistance	Soil Symbol	Boring 10 (cont'd) File 407-1 Elevation 211± Date 11-15-82 Water Level 23.0' (11-15-82) Water Elevation 188±	U.S.C.S. Symbol	Dry Density	Moisture Content	Remarks
ft.			bl./ft.		Description		pcf	%	
10-7			99		Orange Clayey GRAVEL with seams of gray Clay, <u>very dense</u> , saturated	GC	71	51	Decomposed Conglomerate
35									
10-8			118			GC			
40					Boring terminated at 36.5'				

Figure 13a

Depth	Sample Number	Location	Penetration Resistance	Soil Symbol	Boring 11 Elevation 242 $\frac{1}{2}$ Water Level 18.9' (11-29-82) Water Elevation 223 $\frac{1}{2}$	File 407-1 Date 11-18-82	U.S.C.S. Symbol	Dry Density	Moisture Content	Remarks
ft.			bl./ft.		Description			pcf	%	
11-1			49/0.8		Brown Sandy SILT with Cobbles and debris					Uncompacted Fill
11-2			20/R		BOULDERS					Uncompacted Fill
11-3			26		Black Silty CLAY with Boulders, medium stiff to stiff, damp					Uncompacted Fill
11-4			5/0.1		BOULDERS and dark brown CLAY, very stiff to hard, damp	CH				Expansive Clay
11-5			75/0.5		BOULDERS and dark brown CLAY, very stiff to hard, damp	CH				Expansive Clay
11-6			19/0.5		BOULDERS and dark brown CLAY, very stiff to hard, damp	CH	80	42		Expansive Clay
11-7			93		BOULDERS and dark brown CLAY, very stiff to hard, damp	CH	86	35		U.C.=10,661 psf
11-8			68/0.8		BOULDERS and dark brown CLAY, very stiff to hard, damp	CH				U.C.=10,661 psf
11-9			15/0.1		BOULDERS and dark brown CLAY, very stiff to hard, damp	CH				U.C.=10,661 psf

Figure 14


Depth	Sample Number	Location	Penetration Resistance	Soil Symbol	Boring 11 (cont'd) File 407-1 Elevation 242± Date 11-18-82 Water Level 18.9' (11-29-82) Water Elevation 223±	U.S.C.S. Symbol	Dry Density	Moisture Content	Remarks
ft.			bl./ft.		Description		pcf	%	
11-9			15/0.1		BOULDERS and dark brown CLAY, <u>very stiff to hard</u> , damp	CH	81	40	
35	11-10		68/0.8					82	
					Boring terminated at 37.5'				

Figure 14a

Depth	Sample Number	Location	Penetration Resistance	Soil Symbol	Boring 12 Elevation 212 $\frac{1}{2}$ Water Level 5.0' (11-15-82) Water Elevation 207 $\frac{1}{2}$	File 407-1 Date 11-15-82	U.S.C.S. Symbol	Dry Density	Moisture Content	Remarks
ft.			bl./ft.		Description			pcf	%	
12-1			70		Brown Silty CLAY with roots, <u>stiff</u> , damp to moist		MH	117	18	Expansive Clay
12-2			37		Brown and orange Clayey GRAVEL, <u>medium dense</u> , damp		GC			
12-3			44/0.8							
12-4			9/0.5 20/0.5		BOULDERS		MH	55	75	C=1100 psf $\phi=17^\circ$
12-5			75/0.8		Brown Clayey SILT, <u>hard</u> , saturated					
12-6			122/0.9		Gray and orange Clayey GRAVEL, <u>very dense</u> , saturated		GC			
12-7			96							
12-8			77							
12-9			15/0.2 R		Orange mottled Clayey GRAVEL with gray Clay, <u>very dense</u> , saturated		GC	78	41	Decomposed Conglomerate

Figure 15


Depth	Sample Number	Location	Penetration Resistance	Soil Symbol	Boring 12 (cont'd) File 407-1 Elevation 212± Date 11-15-82 Water Level 5.0' (11-15-82) Water Elevation 207±	U.S.C.S. Symbol	Dry Density	Moisture Content	Remarks
ft.			bl./ft.		Description		pcf	%	
	12-9		15/0.2 R			GC	78	41	Decomposed Conglomerate
35	12-10		133		Boring terminated at 36.0'				
40									

Figure 15a











Depth	Sample Number	Location	Penetration Resistance	Soil Symbol	Boring 13 Elevation 247'± Water Level 14.8' (11-29-82) Water Elevation 232'±	File 407-1 Date 11-5-82	U.S.C.S. Symbol	Dry Density	Moisture Content	Remarks
ft.			bl./ft.		Description			pcf	%	
					Brown Silty CLAY, Moist					Uncompacted Fill
					Gray Silty SAND and GRAVEL with concrete debris, <u>uncompacted</u> , moist					Uncompacted Fill
5										
10										
	13-1		46/0.3		Brown Gravelly CLAY, <u>hard</u> , moist					Fill
15										
	13-2		37		Brown CLAY, <u>stiff to very stiff</u> , damp to moist		CH	81	41	Expansive Clay
20					(At 20.0' grading to gray and brown CLAY)					
	13-3		64.0					82	40	
25					Gray Silty CLAY, <u>very stiff to hard</u> , damp		CH			Expansive Clay
	13-4		64/0.8							C=1000 psf φ = 20°
30					Gray and brown CLAY, <u>very stiff to hard</u> , damp					Expansive Clay
	13-5		99							

Figure 16






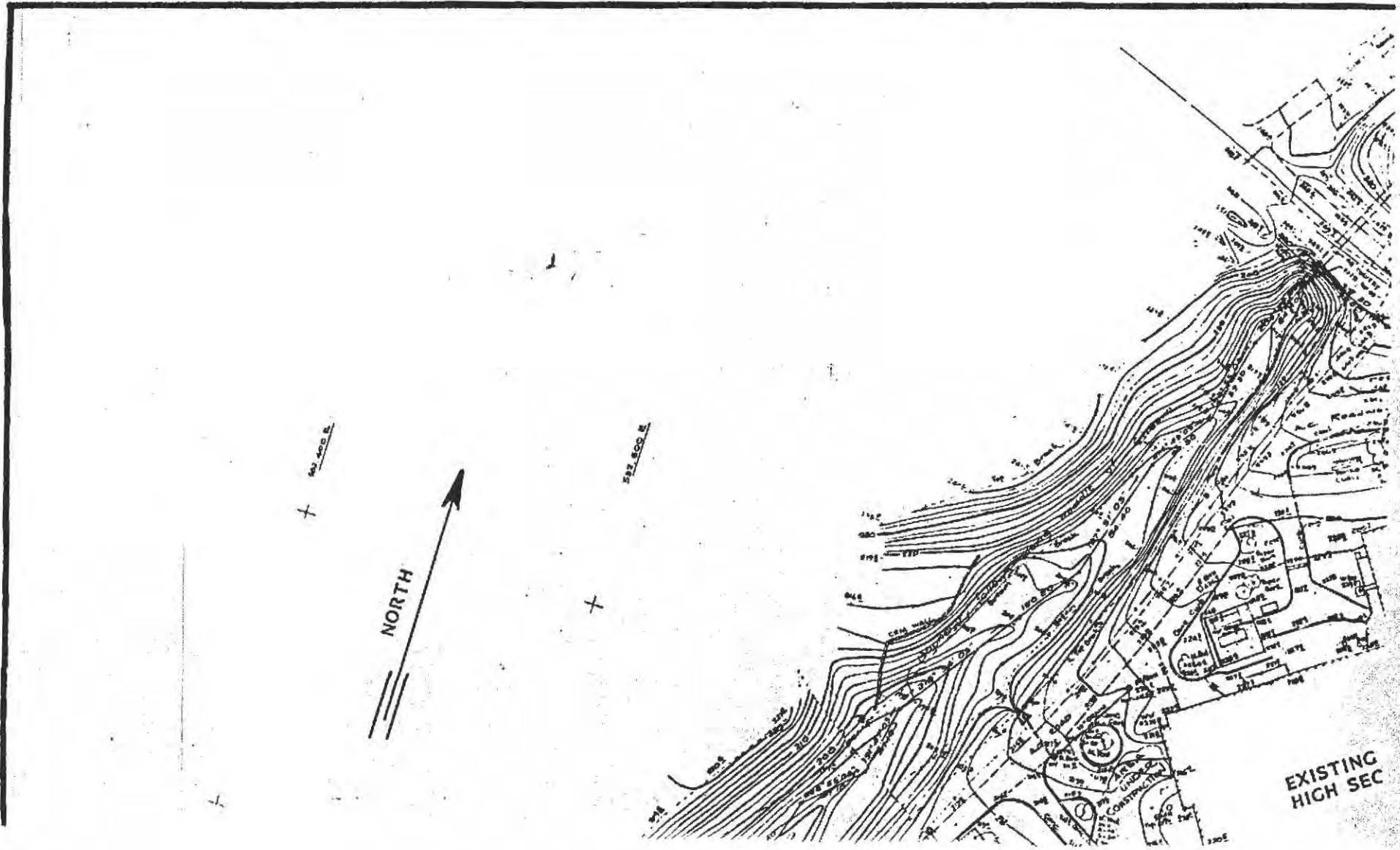
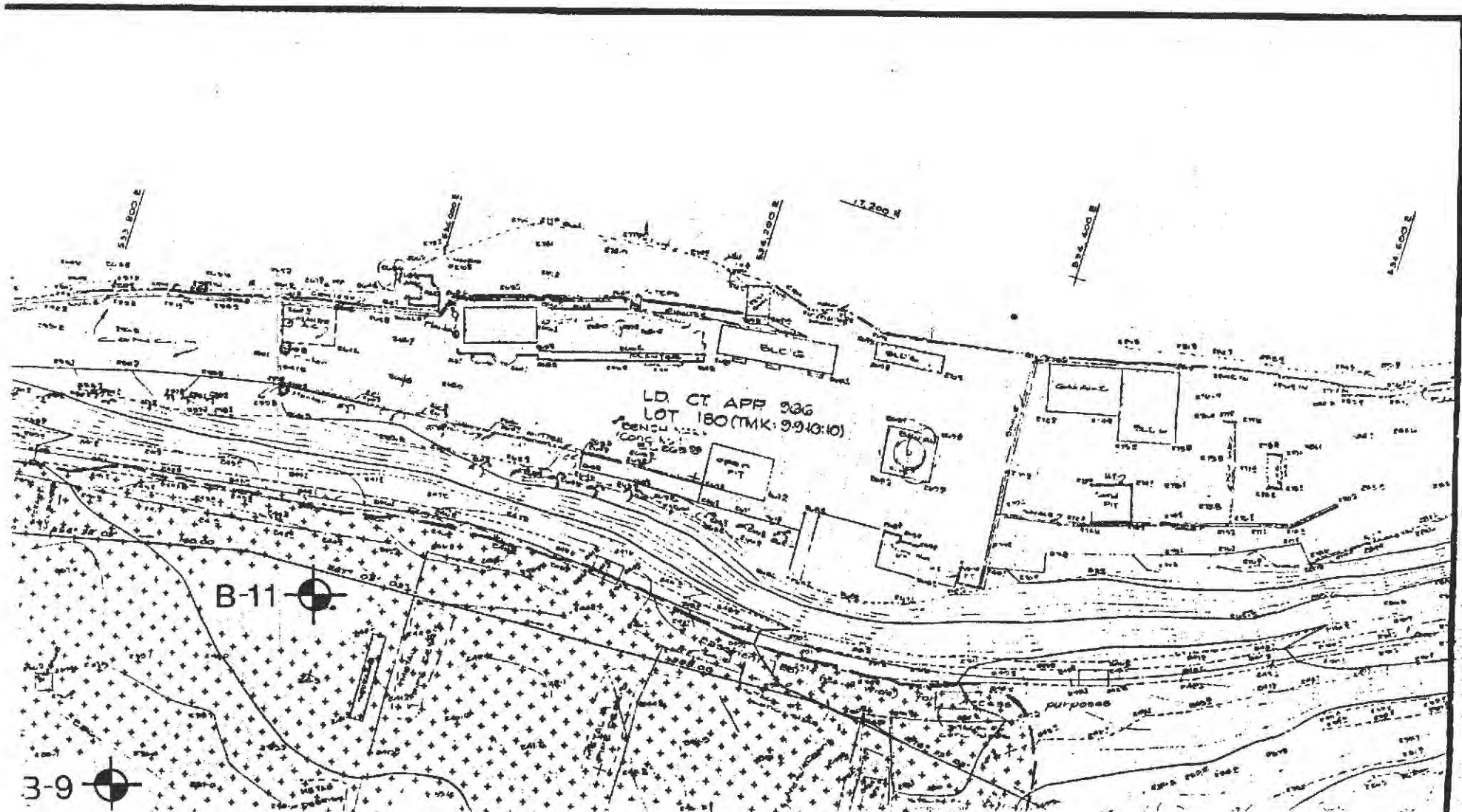
Depth	Sample Number	Location	Penetration Resistance	Soil Symbol	Boring 13 (cont'd) File 407-1 Elevation 247± Date 11-5-82 Water Level 14.8' (11-29-82) Water Elevation 232'±	U.S.C.S. Symbol	Dry Density	Moisture Content	Remarks
ft.			bl./ft.		Description		pcf	%	
13-5			99		Gray and brown CLAY, <u>very stiff to hard</u> , damp	CH			
35	13-6		30/R		Orange and brown SILT, <u>hard</u> , dry to humid				
40	13-7		107 0.8		Brown and orange Clayey GRAVEL, <u>very dense</u> , moist to wet	GC			Decomposed Conglomerate
45	13-8		111 0.8				76	42	
50	13-9		105 0.9						
					Boring terminated at 50.9'				

Figure 16a

Depth	Sample Number	Location	Penetration Resistance	Soil Symbol	Boring 14 Elevation 209 $\frac{1}{2}$ Water Level 7.6' (12-14-82) Water Elevation 202 $\frac{1}{2}$	File 407-1 Date 12-1-82	U.S.C.S. Symbol	Dry Density	Moisture Content	
ft.			bl./ft.		Description			pcf	%	
	14-1		36		Brown Silty SAND with concrete debris, <u>uncompacted</u> , damp		SP			Uncompacted Fill
5	14-2		39		Brown Sandy CLAY with gravel and wood debris, <u>very stiff</u> , damp		CH	74	42	Uncompacted Fill
	14-3		18/0.5 33/0.5		Gray and brown Clayey GRAVEL with roots, <u>dense</u> , moist to wet		GC	77	42	Decomposed Conglomerate
10	14-4	X	10/0.1 R		(at 10.0' grading to Gravelly Clay, <u>very stiff</u>)					
15					BOULDER, COBBLES and GRAVEL					
20	14-5		83/0.8		Gray and brown CLAY, <u>hard</u> , damp		CH	83	38	Expansive Clay
	14-6		112/0.8							
25	14-7		74/0.3		Gray Clayey GRAVEL with orange Silt, <u>very dense</u> , dry to damp		GC			Decomposed Conglomerate
30	14-8		60/0.3		Boring terminated at 30.3'					

Figure 17

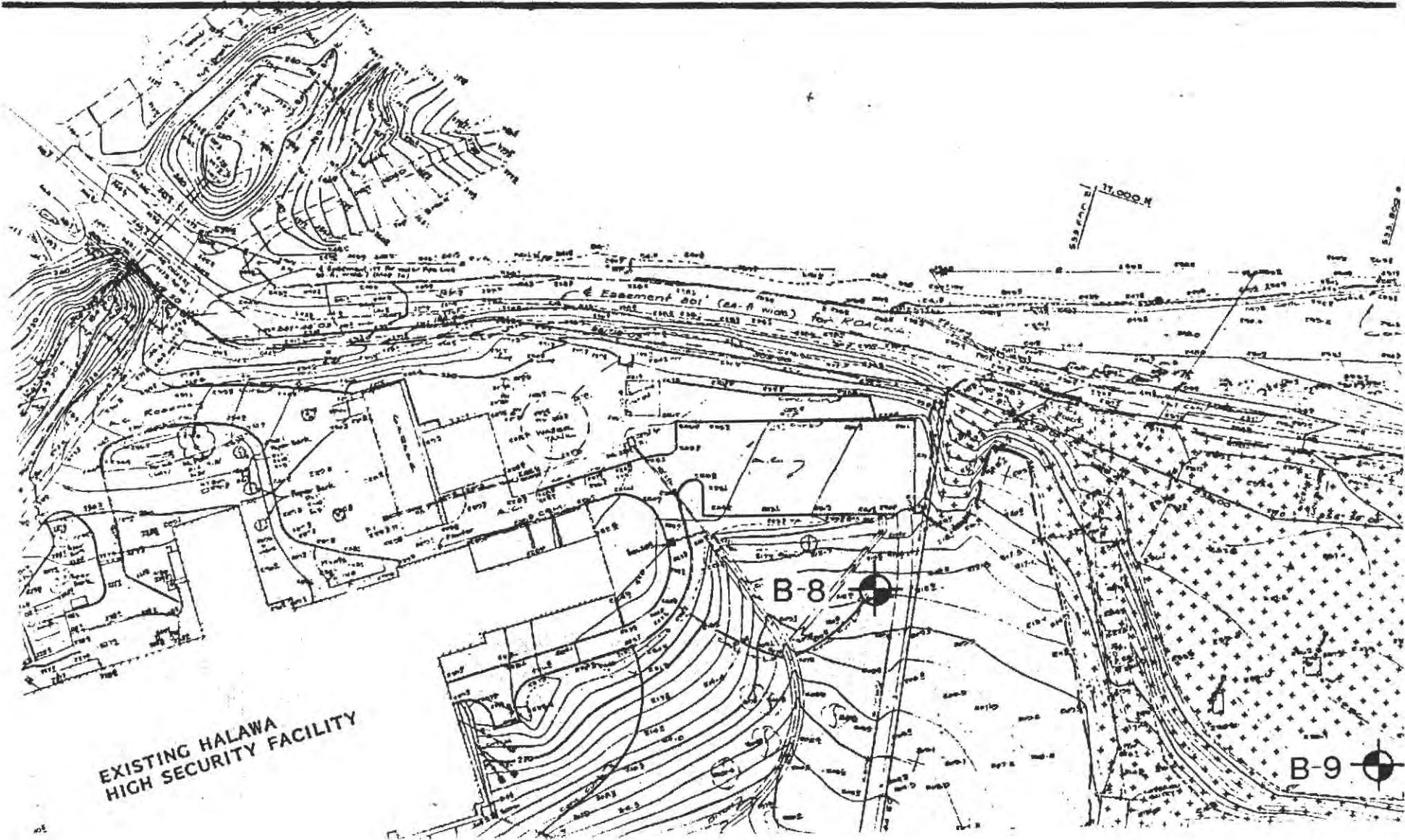




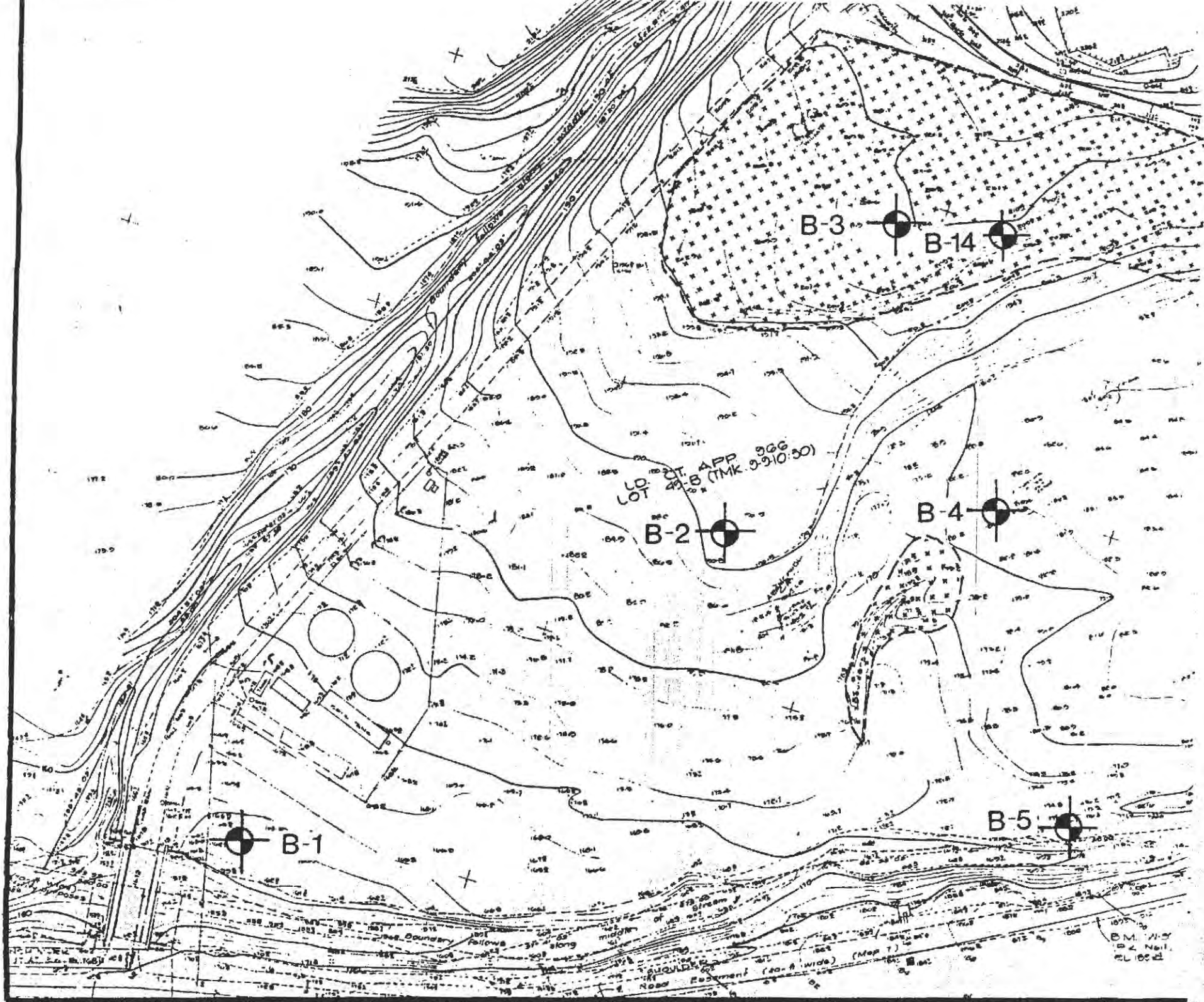
LD CT APP 936
LOT 180 (TMK: 991010)

B-11

3-9



EXISTING HALAWA
HIGH SECURITY FACILITY



B-3

B-14

B-2

B-4

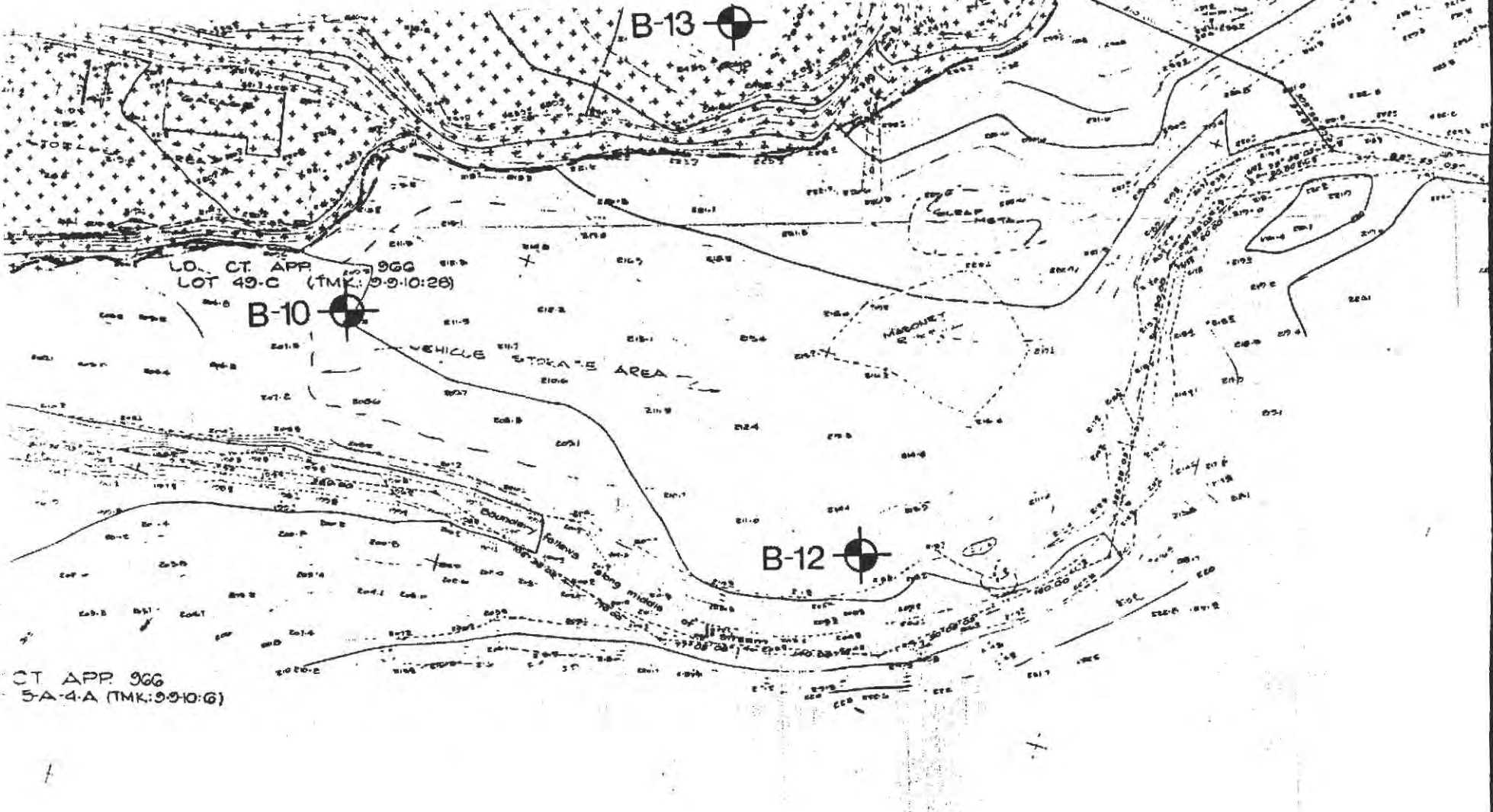
B-1

B-5

LOT APP 366
B (TMK 9-2-10-50)

B.M. 714
102.41
E.L. 100.0

Boundary follows stream
Road Resurfacing (20 ft wide) (Map 7)



LEGEND



F.G.E. Boring Location



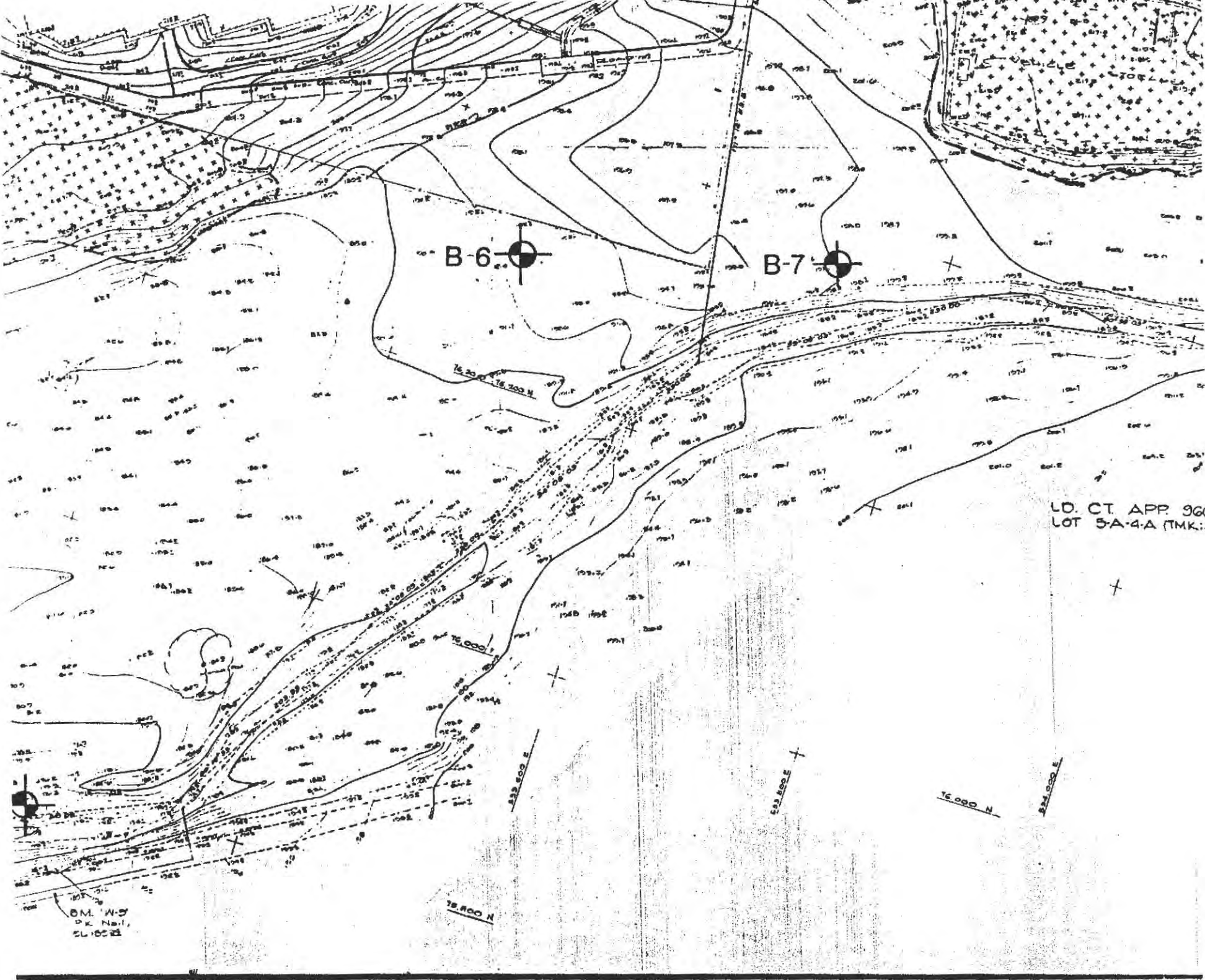
Approximate Area of Existing Fills

234.250'

Approximate Scale: 1" = 80'

Ref: Topographic Map by R. M. Towill Corporation

SITE AND BORING LOCATION PLAN
HALAWA MEDIUM SECURITY FACILITY
SOUTH HALAWA VALLEY, OAHU, HAWAII
 for
ARCHITECTS HAWAII LTD.
FEWELL GEOTECHNICAL ENGINEERING, LTD.
FILE 407-1 **DECEMBER 1982**
FIGURE 2



B-6

B-7

LD. CT. APP 30
LOT 3A-4A (TMK.)

BM. W-3
OK Nail,
51022

BORING 1

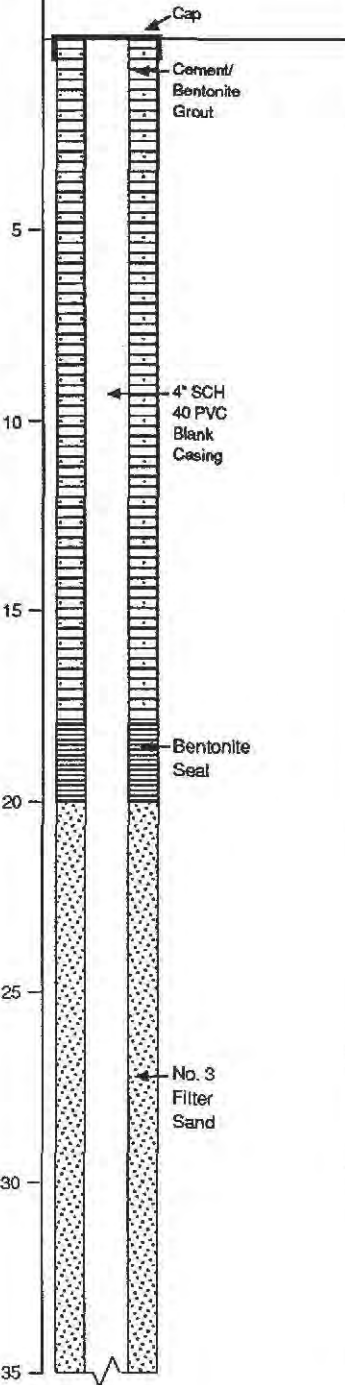
SAMPLING METHOD: Split Spoon Sampler

DRILLING METHOD: N.A.

SURFACE ELEVATION: 188.4 feet MSL

DEPTH (IN FEET)

WELL CONSTRUCTION



SAMPLE DATA

BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
14/6"	1'	1	☒	GM	[Pattern]
71/4"	3'	2	☒		
75/6"	7'	3	☒		
25/0"	10'	4	☒	MH	[Pattern]
111	16'	5	■		
127	21'	6	■		
126/10"	26'	7	■		[Pattern]
46	31'	8	■	SM	

SOIL TYPE

DESCRIPTION

2" asphaltic concrete
 Grey sand, some silt, little fine gravel

Fill

Mottled brown and grey clayey silt, trace rounded fine gravel, moist, very dense

Note: grades with less rounded basaltic gravel

Greyish-brown silty sand, with fine gravel, wet

LOG OF BORING

HALAWA MEDIUM SECURITY FACILITY
 Honolulu, Hawaii

DAMES & MOORE

DRAFT

BORING 1 CONT'D

SAMPLING METHOD: Split Spoon Sampler

DRILLING METHOD: N.A.

SURFACE ELEVATION: 188.4 feet MSL

DEPTH (IN FEET)	WELL CONSTRUCTION	SAMPLE DATA				SOIL TYPE			
		BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS		
30	4" Sch 40 PVC Screen (0.020" Slots)	30	36'	10	■	SM			
40									
41									
42									
45	No. 3 Filter Sand	29	41'	11	■	MH			
46									
47									
48									
50	End Cap	66	46'	12	■	MH			
51									
52									
53									
55	End Cap	99	51'	13	■	MH			
56									
57									
58									
60		113/10"	56'	14	■	MH			

DESCRIPTION

Greyish-brown clayey silt, with trace fine gravel, saturated
(Note: gravel well rounded)

▽ Note: grades grey and hard

Grey clayey basaltic gravel, very dense, saturated

▽ As above, with occasional weathered basaltic gravel

Boring B-1 completed at a depth of 55.8 feet bgs on February 7, 1989.
Ground water encountered at a depth of approximately 38 feet bgs.

LOG OF BORING HALAWA MEDIUM SECURITY FACILITY Honolulu, Hawaii

BORING 2

SAMPLING METHOD: Split Spoon Sampler

DRILLING METHOD: N.A.

SURFACE ELEVATION: 191.6 feet MSL

DESCRIPTION

DEPTH (IN FEET)	WELL CONSTRUCTION	SAMPLE DATA				SOIL TYPE	
		BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
0 - 5	Cap Cement/Bentonite Grout					GM/GC	Light brown and fine silty, sandy gravel, moist (Note: fill, with strong hydrocarbon odor and petroleum stains on surface)
5 - 7.5		58	3'	1	■		Brown clayey silt with medium to fine sand, little fine gravel, moist (fill)
7.5 - 10		42	7.5'	2	⊗		
10 - 15	4" SCH 40 PVC Blank Casing	82/6'	10'	3	■	MH	Mottled brown to grey to black clayey silt, with fine gravel (moist)
15 - 17.5							⚡ Boulder or coarse gravel encountered from 15.5- 17.0' bgs
17.5 - 20		82	18'	4	■		
20 - 25	Bentonite Seal No. 3 Filter Sand	79	21'	5	■		Light grey clayey silt with fine gravel, moist
25 - 30		20	26'	6	■		
30 - 35	4" Sch 40 PVC Screen (0.020" Slots)	15	31'	7	■	SM	Note: changed based on soil description and blowcount Dark brown clayey silt with some fine gravel, and trace coarse sand

LOG OF BORING

HALAWA MEDIUM
SECURITY FACILITY
Honolulu, Hawaii

DAMES & MOORE

BORING 2 CONT'D

SAMPLING METHOD: Split Spoon Sampler

DRILLING METHOD: N.A.

SURFACE ELEVATION: 191.6 feet MSL

DESCRIPTION

DEPTH (IN FEET)	WELL CONSTRUCTION	SAMPLE DATA				SOIL TYPE	
		BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
36	4" Sch 40 PVC Screen (0.020" Slots)	16	36'	8	□	SM	Brown fine sand with some clay and silt
41		50	41'	9	■	MH	
45	No. 3 Filter Sand						
	End Cap						
50							

⚠ Note: some resistant materials encountered when advancing borehole

Boring B-2 completed at a depth of 45.0 feet bgs on February 8, 1989.
Ground water encountered at a depth of approximately 33 feet bgs.

LOG OF BORING

HALAWA MEDIUM
SECURITY FACILITY
Honolulu, Hawaii

DRAFT

DAMES & MOORE

BORING 3

SAMPLING METHOD: Split Spoon Sampler

DRILLING METHOD: N.A.

SURFACE ELEVATION: 191.6 feet MSL

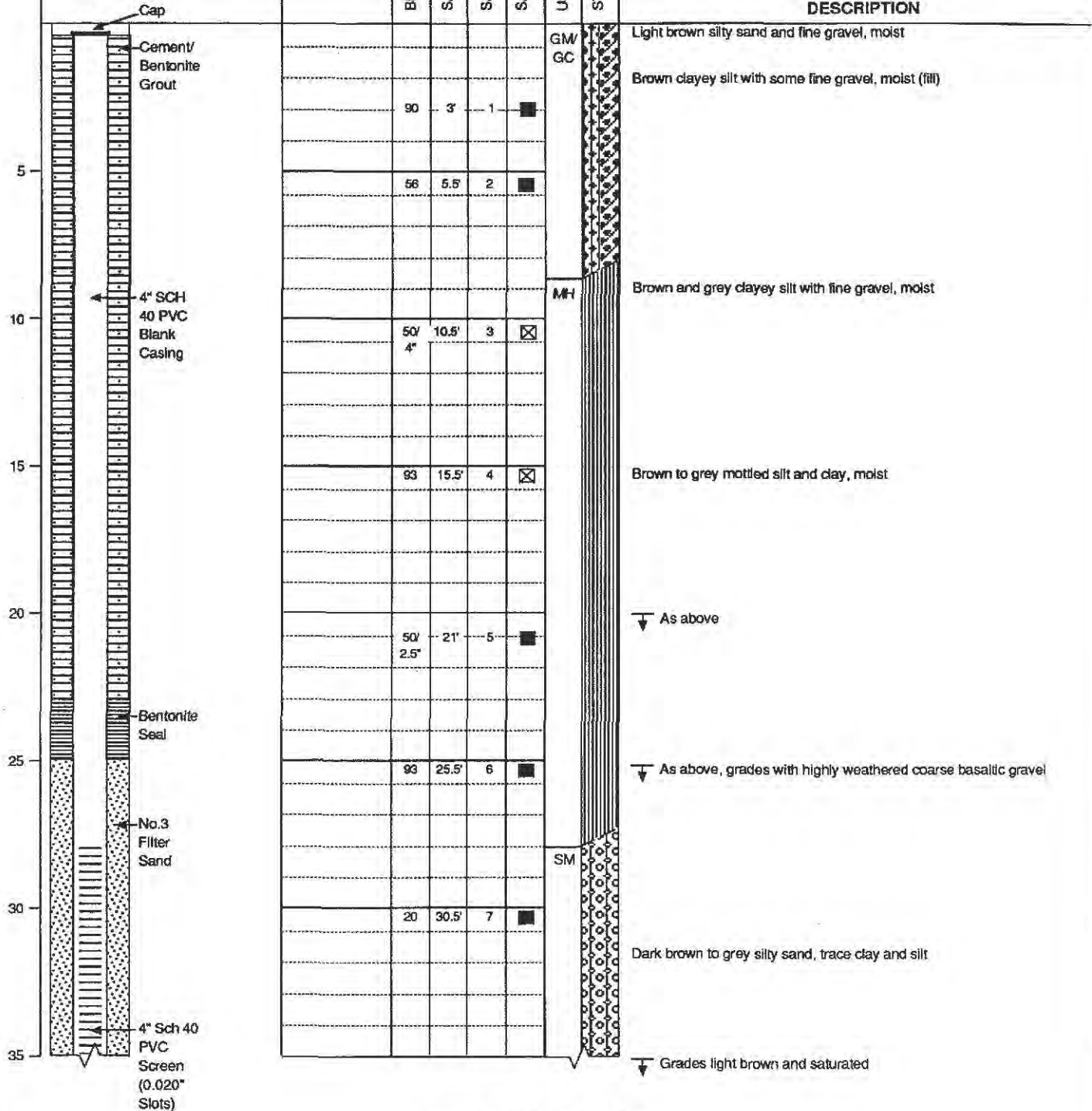
DEPTH (IN FEET)

WELL CONSTRUCTION

SAMPLE DATA

SOIL TYPE

DESCRIPTION



LOG OF BORING
 HALAWA MEDIUM
 SECURITY FACILITY
 Honolulu, Hawaii

BORING 3 CONT'D

SAMPLING METHOD: Split Spoon Sampler

DRILLING METHOD: N.A.

SURFACE ELEVATION: 191.6 feet MSL

DESCRIPTION

DEPTH (IN FEET)	WELL CONSTRUCTION	SAMPLE DATA				SOIL TYPE	
		BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
36	<p>4" Sch 40 PVC Screen (0.020" Slots)</p> <p>No. 3 Filter Sand</p> <p>End Cap</p>	29	36'	8	■	SM	
40		40/3'	41'	9	⊗	MH	
45		79	46'	10	■		
50		72	51'	11	■		
55							

Greyish-brown sand with clayey silt, saturated

Mottled brown and grey clayey silt with some fine sand, occasional subrounded fine to coarse gravel layer, moist

Brown to grey silty clay, trace coarse sand, wet

Boring B-3 completed at a depth of 51.5 feet bgs on February 10, 1989. Ground water encountered at a depth of approximately 34 feet bgs.

LOG OF BORING

HALAWA MEDIUM
SECURITY FACILITY
Honolulu, Hawaii

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DAMES & MOORE

BORING 4

SAMPLING METHOD: Split Spoon Sampler

DRILLING METHOD: N.A.

SURFACE ELEVATION: 191.9 feet MSL

DEPTH (IN FEET)	WELL CONSTRUCTION	SAMPLE DATA				SOIL TYPE		DESCRIPTION
		BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS	
0 - 6	Cap Cement/Bentonite Grout					GM GC	6" of concrete Brown clayey silt, very stiff, with coarse to fine gravel, moist (fill) (slight hydrocarbon odor)	
6 - 8		64	3'	1				
8 - 10		29	5.5'	2				
10 - 11	4" SCH 40 PVC Blank Casing						↓ Boulders	
11 - 12		50/ 3.5"	10'	3		MH	Greyish-brown clayey silt and grey silty fine gravel, dense, moist	
12 - 25							Grey clayey silt, trace to fine sand, moist	
25 - 26	Bentonite Seal							
26 - 29	No. 3 Filter Sand							
29 - 31		79	25'	4			Grey to brown clayey silt, trace coarse to fine gravel	
31 - 34		75	29.5'	5				
34 - 35	4" Sch 40 PVC Screen (0.020" Slots)					SM	Brown silty sand, loose, with fine gravel, wet	
35 - 36		23	34.5'	6				

LOG OF BORING
 HALAWA MEDIUM
 SECURITY FACILITY
 Honolulu, Hawaii

BORING 4 CONT'D

SAMPLING METHOD: Split Spoon Sampler

DRILLING METHOD: N.A.

SURFACE ELEVATION: 191.9 feet MSL

DEPTH (IN FEET)	WELL CONSTRUCTION	SAMPLE DATA				SOIL TYPE	
		BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
40	4" Sch 40 PVC Screen (0.020" Slots) No. 3 Filter Sand End Cap	15	39.5'	7	■	SM	
45		26	44.5'	8	■		
50		130/6"	49.5'	9	☒	MH	

DESCRIPTION

Brown silty sand with fine gravel, trace coarse gravel

Grades dark brown

Dark brown clayey silt, trace fine gravel, saturated

Boring B-4 completed at a depth of 49.5 feet bgs on February 14, 1989.
Ground water encountered at a depth of approximately 38 feet bgs.

LOG OF BORING

HALAWA MEDIUM
SECURITY FACILITY
Honolulu, Hawaii

DRAFT

DAMES & MOORE

BORING 5

SAMPLING METHOD: Dames & Moore U-Type Sampler

DRILLING METHOD: 4" O.D. Solid Stem Auger

SURFACE ELEVATION: 184.3 feet MSL

DESCRIPTION

DEPTH (IN FEET)	WELL CONSTRUCTION	SAMPLE DATA				SOIL TYPE	
		BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
0 - 1	Cap						
1 - 2	Cement/ Bentonite Grout					GM GC	2" asphaltic concrete Grey sandy gravel, dense, moist (base course)
2 - 3	Bentonite Seal	113	2.5'	1	☒		Grey clayey gravel, little medium to fine sand, trace coarse fine gravel, occasional cobbles, moist
3 - 8		114/5'	5'	2	☒	MH	Mottled brown and grey clayey silt to silty clay, trace coarse to fine sand, moist
8 - 10	2" SCH 40 PVC Blank Casing	110/6'	10'	3	☒		Occasional fine/ sandy silt with clay lenses
10 - 15	No. 3 Filter Sand						
15 - 20	2" Sch 40 PVC Screen (0.020" Slots)	125/2'	15'	4	☒		Boulder 15'- 15'
20 - 20.5	End Cap	150/6'	20'		☐		

Boring B-5 completed at a depth of 20.5 feet bgs on March 15, 1989.
No ground water encountered.

LOG OF BORING

HALAWA MEDIUM
SECURITY FACILITY
Honolulu, Hawaii

DAMES & MOORE

BORING 6

SAMPLING METHOD: Dames & Moore U-Type Sampler

DRILLING METHOD: 4" O.D. Solid Stem Auger

SURFACE ELEVATION: 191.9 feet MSL

DEPTH (IN FEET)	WELL CONSTRUCTION	SAMPLE DATA				SOIL TYPE	
		BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
0 - 5	Cap Cement/Bentonite Grout Bentonite Seal	60	2.5'	1	■	GM GC	5" of concrete Brown silty sand and fine gravel, moist
5 - 6							Grades to brown clayey silt, fine, with gravel, moist
6 - 10	2" SCH 40 PVC Blank Casing No. 3 Filter Sand	58	6'	2	⊗		
10 - 15						MH	Brown to grey clayey silt, trace to little fine gravel, moist
15 - 18	2" Sch 40 PVC Screen (0.020" Slots)	125/4"	15.5'	4	⊗		Grades with numerous cobbles and boulders from 15'-18'
18 - 20							
20 - 20.7	End Cap	25/2"	20'	5	⊗		
20.7 - 25							

DESCRIPTION

5" of concrete
Brown silty sand and fine gravel, moist

Grades to brown clayey silt, fine, with gravel, moist

Brown to grey clayey silt, trace to little fine gravel, moist

Grades with numerous cobbles and boulders from 15'-18'

Boring B-6 completed at a depth of 20.7 feet bgs on March 15, 1989.
No ground water encountered.

LOG OF BORING

HALAWA MEDIUM
SECURITY FACILITY
Honolulu, Hawaii

DAMES & MOORE

BORING 7

SAMPLING METHOD: Dames & Moore U-Type Sampler

DRILLING METHOD: 4" O.D. Solid Stem Auger

SURFACE ELEVATION: 191.9 feet MSL

DEPTH (IN FEET)	WELL CONSTRUCTION	SAMPLE DATA				SOIL TYPE	
		BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
0	Cap						
0-1	Cement/Bentonite Grout					GM/GC	
1-1.5	Bentonite Seal						
1.5-2.5		102	2.5'	1	☒		
2.5-5.5							
5.5-10.5		49	5.5'	2	■		
10.5-15.5							
15.5-20.5		70/2'	15.5'	4	☒		
20.5-20.8		100/3'	20.5'	5	☒		

DESCRIPTION

Light brown silty sand with gravel, moist

Brown and grey clayey silt with rounded gravel, coarse to fine sand, moist

Grades dense

Mottled brown and grey clayey silt, trace fine gravel, trace coarse to fine sand, moist

Boring B-7 completed at a depth of 20.8 feet bgs on March 15, 1989. No ground water encountered.

LOG OF BORING
 HALAWA MEDIUM
 SECURITY FACILITY
 Honolulu, Hawaii

DAMES & MOORE

BORING 8

SAMPLING METHOD: Dames & Moore U-Type Sampler

DRILLING METHOD: 4" O.D. Solid Stem Auger

SURFACE ELEVATION: 191.7 feet MSL

DEPTH (IN FEET)	WELL CONSTRUCTION	SAMPLE DATA				SOIL TYPE	
		BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
0	Cap						
0	Cement/ Bentonite Grout					GM/ GC	3" asphaltic concrete
0	Bentonite Seal						Grey sand with fine gravel, dense, moist
5		28/ 1"	3'	1	☒		Brown and grey clayey gravel, very dense, moist
5			5.5'		☐		Grades with boulders
10	2" SCH 40 PVC Blank Casing	44/ 1"	10'		☐		
15	No. 3 Filter Sand					MH	Mottled brown, grey, and black clayey silt, dense, with fine gravel, moist
15		69	15.5'	3	☒		
20	2" Sch 40 PVC Screen (0.020" Slots)						
20	End Cap	110/ 6"	20.5'	4	☒		
25							

DESCRIPTION

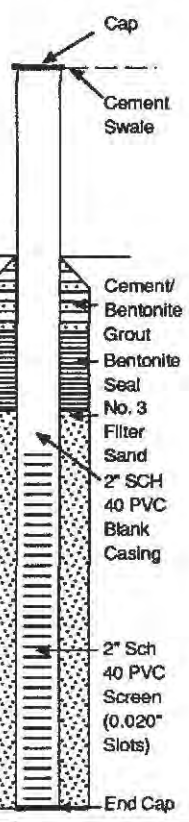
Boring B-8 completed at a depth of 20.5 feet bgs on March 16, 1989. No ground water encountered.

LOG OF BORING
 HALAWA MEDIUM
 SECURITY FACILITY
 Honolulu, Hawaii

DAMES & MOORE

DEPTH (IN FEET)

WELL CONSTRUCTION



SAMPLE DATA

SOIL TYPE

BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
				GM/GC	
6	7.5		<input type="checkbox"/>		
18	10.5	1	<input checked="" type="checkbox"/>		
91	14.5	3	<input checked="" type="checkbox"/>		
130	20	4	<input checked="" type="checkbox"/>	MH	

BORING 9

SAMPLING METHOD: Dames & Moore U-Type Sampler

DRILLING METHOD: 4" O.D. Solid Stem Auger

SURFACE ELEVATION: 202.5 feet MSL

DESCRIPTION

3" asphaltic concrete

Mottled brown and grey clay with some fine gravel, trace coarse to fine sand, loose, moist

Grades with boulders

Mottled brownish-black and grey clayey silt with trace rounded gravel, dense, moist

Boring B-9 completed at a depth of 19.5 feet bgs on March 20, 1991. No ground water encountered.

LOG OF BORING
 HALAWA MEDIUM
 SECURITY FACILITY
 Honolulu, Hawaii

BORING 10

SAMPLING METHOD: Dames & Moore U-Type Sampler

DRILLING METHOD: 4" O.D. Solid Stem Auger

SURFACE ELEVATION: 202.1 feet MSL

DESCRIPTION

Brown coarse to fine sand with fine gravel, frequent cobbles

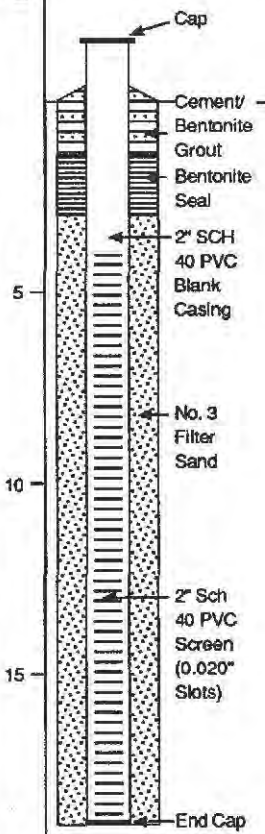
Grades medium dense

Boulder from 18'- 19'

Boring B-10 completed at a depth of 19 feet bgs on March 20, 1989.
No ground water encountered.

DEPTH (IN FEET)	SAMPLE DATA				SOIL TYPE	
	BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
0 - 5	7	5.5'	1	☒	GM/GC	
5 - 10	43	10.5'	2	☒		
10 - 15	62	15.5'	3	■	MH	
15 - 20						

WELL CONSTRUCTION



LOG OF BORING

HALAWA MEDIUM
SECURITY FACILITY
Honolulu, Hawaii

DAMES & MOORE

BORING 11

SAMPLING METHOD: Dames & Moore U-Type Sampler

DRILLING METHOD: 4" O.D. Solid Stem Auger

SURFACE ELEVATION: 202.4 feet MSL

DEPTH (IN FEET)	SAMPLE DATA				SOIL TYPE	
	BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
0 - 5					GM/GC	
5 - 6	8	6'	1	☒		
6 - 11	30	11'	2	☒		
11 - 16	210	16'	3	☒		
16 - 20	95	20'	4	☒		
20 - 25						

DESCRIPTION

Brown coarse to fine sand, with fine gravel, frequency cobbles and boulders

Grades medium dense (slight hydrocarbon odor)

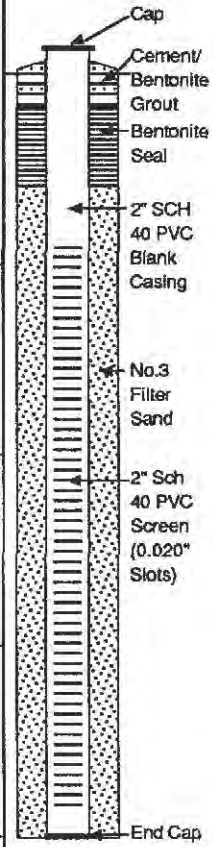
Boulders

Boulders at 16'

Grades very stiff

Boring B-11 completed at a depth of 20.0 feet bgs on March 21, 1989. No ground water encountered.

WELL CONSTRUCTION



LOG OF BORING

HALAWA MEDIUM
SECURITY FACILITY
Honolulu, Hawaii

DAMES & MOORE

BORING 12

SAMPLING METHOD: Split Spoon Sampler, Dames & Moore U-Type

DRILLING METHOD: 4" O.D. Solid Stem Auger

SURFACE ELEVATION: 180.0 feet MSL

DEPTH (IN FEET)	WELL CONSTRUCTION		SAMPLE DATA					SOIL TYPE			
			OVA (ppm)			BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
			AUGER	SAMPLE	CUTTINGS						
0 - 3	Cap	Cement/Bentonite Grout							GM	3" of concrete	
3 - 5	4" SCH 40 PVC Blank Casing	Bentonite Seal	8	38	4.5'	1	■			Grey and brown sand, silt and gravels mixture, medium dense, moist	
5 - 15			8	25	9.5'	2	■				
15 - 20			8	32	14.5'	3	■	SM		Brownish-yellow silty sand with weathered fine gravels	
20 - 25			8	37	19'	4	■			Hydrocarbon odor	
25 - 30			8	41	25.5'	5	■				
30 - 34	No.3 Filter Sand		8	43	29.5'	6	■	MH		Brownish-grey clayey silt with weathered fine gravels	
34 - 35	4" Sch 40 PVC Screen (0.020" Slots)		8	29	34.5'	7	■				

DESCRIPTION

3" of concrete

Grey and brown sand, silt and gravels mixture, medium dense, moist

Brownish-yellow silty sand with weathered fine gravels

Hydrocarbon odor

Brownish-grey clayey silt with weathered fine gravels

LOG OF BORING

HALAWA MEDIUM
SECURITY FACILITY
Honolulu, Hawaii

DRAFT

BORING 12 CONT'D

SAMPLING METHOD: Split Spoon Sampler,
Dames & Moore U-Type
DRILLING METHOD: 4" O.D. Solid Stem Auger
SURFACE ELEVATION: 180.0 feet MSL

DEPTH (IN FEET)	WELL CONSTRUCTION	SAMPLE DATA						SOIL TYPE		
		OVA (ppm)			BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
		AUGER	SAMPLE	CUTTINGS						
40	<p>No. 3 Filter Sand 4" Sch 30 PVC Screen (0.020" Slots) End Cap</p>								MH	
45										

DESCRIPTION

Boring B-12 completed at a depth of 40.2 feet bgs on January 1, 1991.
Ground water encountered at a depth of approximately 9.5 feet bgs.

LOG OF BORING

HALAWA MEDIUM
SECURITY FACILITY
Honolulu, Hawaii

DAMES & MOORE

ESTD 1910

BORING 13

SAMPLING METHOD: Split Spoon Sampler

DRILLING METHOD: 4" O.D. Solid Stem Auger and 4" I.D. Casing

SURFACE ELEVATION: 201.9 feet MSL

DEPTH (IN FEET)

WELL CONSTRUCTION



SAMPLE DATA

OVA (ppm)			BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	SOIL TYPE	
AUGER	SAMPLE	CUTTINGS					USCS	SYMBOLS
							GM/GC	
			12	5'	1	☒		
			16	10'	2	☒		
			41-10"	15.5'	3	☒		
			42	20.7'	4	☒	MH	
			41	25.6'	5	☒		
			22	31.7'	6	☒	SM	

DESCRIPTION

1.5" asphalt underlain by brown clayey silt with gravel

Grades to grey sandy gravel (fill), little to trace fine sand, (contains basalt fragments)

Brown silty clay with coarse to fine sand and gravel, saturated

Small cobbles to boulder at 13'- 14.5'

Grey clayey silt with fine gravel

Boulder at 19'- 20'

Boulders from 22'- 24'

Boulder at 24.3'- 25.5'

Greyish-brown, clayey silt with fine gravel

Grey boulder at 28'

Occasional clay seams at 29'

Mottled greyish-brown and yellow silty clay, trace coarse to fine gravel

Contains round to subrounded pebble clasts

Mottled greyish-brown yellow silty sandy, clayey gravel, saturated, loose

LOG OF BORING

HALAWA MEDIUM
SECURITY FACILITY
Honolulu, Hawaii

DAMES & MOORE

BORING 13 CONT'D

SAMPLING METHOD: Split Spoon Sampler

DRILLING METHOD: 4" O.D. Solid Stem Auger and 4" I.D. Casing

SURFACE ELEVATION: 201.9 feet MSL

DEPTH (IN FEET)	WELL CONSTRUCTION	SAMPLE DATA						SOIL TYPE		
		OVA (ppm)			BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
		AUGER	SAMPLE	CUTTINGS						
40	<p>No. 3 Filter Sand 4" Sch 30 PVC Screen (0.020" Slots) End Cap</p>				7	36.3	7	<input checked="" type="checkbox"/>	SM	
45					36	41.2	8	<input checked="" type="checkbox"/>		

DESCRIPTION

Brown silty clay with fine gravel, little medium to fine sand

Boring B-13 completed at a depth of 41.5 feet bgs on February 4, 1991.
Ground water encountered at a depth of approximately 11.8 feet bgs.

LOG OF BORING

HALAWA MEDIUM
SECURITY FACILITY
Honolulu, Hawaii

DAMES & MOORE

BORING 14

SAMPLING METHOD: Split Spoon Sampler, Dames & Moore U-Type

DRILLING METHOD: 4" O.D. Solid Stem Auger, 4" I.D. Casing

SURFACE ELEVATION: 213.4 feet MSL

DEPTH (IN FEET)	WELL CONSTRUCTION		SAMPLE DATA					SOIL TYPE			
			OVA (ppm)			BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
			AUGER	SAMPLE	CUTTINGS						
0	Cap										
0-5	Cement/Bentonite Grout										
0-5	4" SCH 30 PVC Blank Casing										
5				102	5.7	1		GM/GC			
5-10											
10				32	10.4	2					
10-15											
15				19	16.3	3					
15-20											
20				20	21.2	4					
20-25											
25	Bentonite Seal			28	25						
25-30	No. 3 Filter Sand										
30-35											
35	4" Sch 30 PVC Screen (0.020" Slots)			52	31.2	5					

DESCRIPTION

Fine gravel fill, loose, dry

Brown silty clay, trace fine gravel

▽ Grey basaltic boulder at 4'

Greyish-brown clayey sand, trace fine gravel, occasional cobbles (weathered basaltic)

Grey silty gravel, little coarse to fine sand, occasional cobbles (rust brown color)

▽ Basaltic boulder at 13'

Mottled grey and rust brown clayey silt with fine gravel

▽ Boulder at 18'- 19.5'

▽ Small cobble size basaltic rock fragments at 19.5'- 20'

Mottled grey-rust brown clayey silt with fine gravel, trace coarse to fine sand, occasional cobbles

▽ Basalt boulders from 31.5'

▽ Basaltic a'a boulders with grey clayey seams along fractures

LOG OF BORING

HALAWA MEDIUM
SECURITY FACILITY
Honolulu, Hawaii

DAMES & MOORE

BORING 14 CONT'D

SAMPLING METHOD: Split Spoon Sampler, Dames & Moore U-Type
 DRILLING METHOD: 4" O.D. Solid Stem Auger, 4" I.D. Casing
 SURFACE ELEVATION: 213.4 feet MSL

DEPTH (IN FEET)	WELL CONSTRUCTION	SAMPLE DATA						SOIL TYPE		DESCRIPTION	
		OVA (ppm)			BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS		SYMBOLS
		AUGER	SAMPLE	CUTTINGS							
40	No. 3 Filter Sand 4" Sch 30 PVC Screen (0.020" Slots) End Cap				100-6"	40.5'	7	☒	MH	Grey slightly weathered highly fractured basaltic boulders, minor amounts of grey silty clay, no hydrocarbon odor ↓ Grey clay with some gravel at 3.5"	
45					14	45.7'	8	☒	SM	↓ Brown volcanic tuff (7" thick) ↓ Brown volcanic tuff (3.5" thick) overlain by 0.5" of grey clay (tuff contains pebble-sized clasts) ↓ Grey clay (3" thick), sticky, moist, dense	
50					34	51.0'	9	☒		Grey to dark gray clayey, sandy silt with minor or no gravel, medium to low plasticity, moist, dense to very dense, no hydrocarbon odor	
55					19	56.4'	10	☒		Brown mottled grey and rust brown colored clayey silt to silty clay with minor gravel, medium plasticity, moist, dense, no hydrocarbon odor	
60					73-10"	61.5'	11	☒		↓ Cobble at 59.5' Mottled brownish-grey and rust colored sandy gravel, moist, very dense, contains rounded pebbles of basaltic rock, no hydrocarbon odor	
65										Boring B-14 completed at a depth of 61.7 feet bgs on January 24, 1991. No ground water encountered.	

LOG OF BORING HALAWA MEDIUM SECURITY FACILITY Honolulu, Hawaii

BORING 15

SAMPLING METHOD: Split Spoon Sampler

DRILLING METHOD: 4" O.D. Solid Stem Auger, 4" I.D. Casing

SURFACE ELEVATION: 191.9 feet MSL

DESCRIPTION

DEPTH (IN FEET)	WELL CONSTRUCTION	SAMPLE DATA						SOIL TYPE		
		OVA (ppm)			BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
		AUGER	SAMPLE	CUTTINGS						
0	Cap									
0-2	Cement/ Bentonite Grout Bentonite Seal							GM/ GC		
2-5	4" SCH 30 PVC Blank Casing									
5	4" Sch 30 PVC Screen (0.020" Slats)				3	6.3'	1			
5-10	No. 3 Filter Sand							MH		
10					24	11.2'	2			
15										
15					42	16.3'	3			
20	End Cap									
20					59	21.2'	4			
25										

Asphaltic concrete ~2" thick underlain by grey coarse gravel

Brownish-grey clayey silt, little coarse to fine sand, trace fine gravel

Brownish-grey
NOTE: Oily sheen observed

Mottled brown and grey clayey silt with fine gravel

Boring B-15 completed at a depth of 21.5 feet bgs on February 6, 1991.
Ground water encountered at a depth of approximately 7.3 feet bgs.

LOG OF BORING HALAWA MEDIUM SECURITY FACILITY Honolulu, Hawaii

BORING 16

SAMPLING METHOD: Split Spoon Sampler

DRILLING METHOD: 4" O.D. Solid Stem Auger

SURFACE ELEVATION: 192.2 feet MSL

DEPTH (IN FEET)	WELL CONSTRUCTION	SAMPLE DATA						SOIL TYPE		
		OVA (ppm)			BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
		AUGER	SAMPLE	CUTTINGS						
0	Cap									
0-2	Cement/Bentonite Grout							GM		
2-4	4" SCH 30 PVC Blank Casing							GC		
4-5	Bentonite Seal									
5-10	4" Sch 30 PVC Screen (0.020" Slots)				79-11"	6.3'	1			
10-13.5	No. 3 Filter Sand									
13.5-14										
14-15					108-10"	12.3'	2			
15-16										
16-17					38	16.2'	3			
17-20										
20-22.3	End Cap				100-4"	22'	4			

DESCRIPTION

Asphaltic concrete ~2" thick underlain by gravel fill
 Grey silty, clay with fine gravel

↓ Boulders from 4.5'- 5.5'

Grey silty to clay with fine gravel

↓ Basaltic boulders from 6.5'- 11'

Grey fine gravel with silty clay, occasional cobble

↓ Boulder from 14'- 15'

Mottled rust brown and grey clayey gravel, grades to a silty clay trace fine gravel, moist to saturated

↓ Boulder from 20'- 22'+

Boring B-16 completed at a depth of 22.3 feet bgs on February 6, 1991.
 Ground water encountered at a depth of approximately 13.5 feet bgs.

LOG OF BORING

HALAWA MEDIUM
 SECURITY FACILITY
 Honolulu, Hawaii

DAMES & MOORE

BORING B-20

SAMPLING METHOD: Standard Split Spoon Sampler

DRILLING METHOD: 4" O.D. Solid Stem Auger

SURFACE CONDITIONS: 191.6 feet MSL datum

DEPTH (IN FEET)	SAMPLE DATA							SOIL TYPE	
	OVA (ppm)		PID (ppm)	BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
	AUGER	SAMPLE							
			0	33	1'	1	■	GM	
								GM	
				23	4'	2	■		
5			0	24	5'	3	■		
			5	17	6'	4	■		
			107.5	11	8.5'	5	■		
10			65	48	9.5'	6	■	MH	
				33	63	11'	7	■	
				0	52	12.5'	8	■	
				0	30	14'	9	■	
15				0	40	15'	10	■	
20									

DESCRIPTION

Mixture of gravel and sand (fill)
 Grey medium to fine sandy gravel

▼ Diesel odor from 5'-9'

Reddish-brown silty clay, trace fine gravel, trace medium to fine sand
 ▼ Diesel odor from 9'-10'

▼ Boulder from 15.5'-16.5'

Boring B-20 completed at a depth of 16.5 feet bgs on April 1, 1991.
 No ground water encountered.

LOG OF BORING
 HALAWA MEDIUM
 SECURITY FACILITY
 Honolulu, Hawaii

DAMES & MOORE

BORING B-21

SAMPLING METHOD: Standard Split Spoon Sampler

DRILLING METHOD: 4" O.D. Solid Stem Auger

SURFACE CONDITIONS: 191.6 ± feet MSL datum

DEPTH (IN FEET)	SAMPLE DATA							SOIL TYPE	
	OVA (ppm)		PID (ppm)	BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
	AUGER	SAMPLE							
			0	41	1.5'	1	█	GM	
			0	25	3.5'	2	█	GM	
5			0	36	5'	3	█	GM	
			0	17	6'	4	█	GM	
			140	17	7.5'	5	█	GM	
10			59	16	9.5'	6	█	GM	
			32	50-4"	11'	7	█	MH	
			0	88	12.5'	8	█	MH	
15			0	93	14'	9	█	MH	
			0	58	15'	10	█	MH	
			0	65	16'	11	█	MH	
20									

DESCRIPTION

Mixture of gravel and sand (fill)

Grey to brownish-gray coarse to fine sandy gravel, (sand mixed with basaltic gravel, very moist)

▽ Diesel odor from 7'- 8'

Grey silty clay, little fine gravel, trace medium to fine sand

Boring B-21 completed at a depth of 18.0 feet bgs on April 1, 1991.
No ground water encountered.

LOG OF BORING

HALAWA MEDIUM
SECURITY FACILITY
Honolulu, Hawaii

DAMES & MOORE

BORING B-22

SAMPLING METHOD: Standard Split Spoon Sampler

DRILLING METHOD: 4" O.D. Solid Stem Auger

SURFACE CONDITIONS: 191.5 feet MSL datum

DEPTH (IN FEET)	SAMPLE DATA							SOIL TYPE	
	OVA (ppm)		PID (ppm)	BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
	AUGER	SAMPLE							
5			152	62	1'	1	■	GM	
			64	19	2.5'	2	■	GM	
			26	25	3.5'	3	■	GM	
			52	31	5'	4	■	GM	
			40	23	6.5'	5	■	GM	
			11	19	8'	6	■	GM	
10			28	50	9.5'	7	■	MH	
			12	50-4"	11'	8	■		
			12	29	12.5'	9	■		
15			40	50-3"	15'	10	■		
20									

DESCRIPTION

Reddish-brown sand and gravel, strong diesel odor (fill)
 Grey sandy gravel, sand mixed with basaltic gravel, diesel odor

Grey silty clay, with fine gravel (weathered basalt)

Boring B-22 completed at a depth of 15.3 feet bgs on April 1, 1991.
 No ground water encountered.

LOG OF BORING
 HALAWA MEDIUM
 SECURITY FACILITY
 Honolulu, Hawaii

DAMES & MOORE

BORING B-23

SAMPLING METHOD: 2' Standard Split Spoon Sampler

DRILLING METHOD: 4" Hollow Stem Auger

SURFACE ELEVATION: 187.0 feet MSL

DESCRIPTION

DEPTH (IN FEET)	SAMPLE DATA						SOIL TYPE		
	OVA (ppm)			BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
	AUGER	SAMPLE	CUTTINGS						
0	0			1'	1	☒	GM/GC		
0	X		28	3'	2	☒			
5	0		54	5'	3	☒			
0	0		60	6'	4	☒			
0	0		97-10"	9'	5	☒	MH		
0	X		89-11"	11'	6	☒			
0			50-0"			☐			
0				14'	7	☐			
0	0		110-10"	16'	8	☒			
0	0		100-5"	17'	9	☒			
0	X		26-9"	20'	10	☒			
0	0		61	23'	11	☒			
0	0		44	25'	12	☒			
0	0		52	26.5'	13	☒			
0	0		70-5"	27'	14	☒			
0							SM		
0	0		20	31'	15	☒			
0	X		14	33'	16	☒			

Asphalt
Brown silty sand and basaltic gravel with some clay, dense, moist

▽ With reddish-brown clay, no hydrocarbon odor

▽ Boulder at 5.5'

▽ Refusal at ~6', boulder
63" to 77" boulder

Mottled reddish-brown and grey silty clay/ clayey silt with some fine gravel, moist

▽ 11'- 13' very hard drilling, boulder

▽ Very hard drilling at 13', boulder

▽ Encountered basaltic boulder at 27'

Reddish-brown silty fine to medium sand with trace clay and trace gravel, moist to very moist, medium dense, no hydrocarbon odor

LOG OF BORING

HALAWA MEDIUM
SECURITY FACILITY
Honolulu, Hawaii

DAMES & MOORE


BORING B-23 CONT'D

SAMPLING METHOD: 2' Standard Split Spoon Sampler

DRILLING METHOD: 4" Hollow Stem Auger

SURFACE ELEVATION: 187.0 feet MSL

DESCRIPTION

DEPTH (IN FEET)	SAMPLE DATA							SOIL TYPE	
	AUGER	OVA (ppm)		BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
		SAMPLE	CUTTINGS						
40		0	X	19	36'	17	☒	SM	
		0		19	38'	18	☒		

Boring B-23 completed at a depth of 38 feet bgs on May 7, 1991.
Ground water encountered at a depth of approximately 33 feet bgs.

LOG OF BORING

HALAWA MEDIUM
SECURITY FACILITY
Honolulu, Hawaii

DAMES & MOORE

BORING 24

SAMPLING METHOD: 2' Standard Split Spoon Sampler

DRILLING METHOD: 4" Hollow Stem Auger

SURFACE ELEVATION: 189.7 feet MSL

DESCRIPTION

DEPTH (IN FEET)

WELL CONSTRUCTION

SAMPLE DATA

SOIL TYPE

DEPTH (IN FEET)	WELL CONSTRUCTION							SOIL TYPE		DESCRIPTION
	OVA (ppm)			BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS	
	AUGER	SAMPLE	CUTTINGS							
0		0		21	1'	1	☒	GM/GC	Asphalt	
0		0		79	3'	2	☒		Brown silty, clay with basaltic gravel, fine to medium grained (fill)	
5		0		102	5'	3	☒		▼ Boulder at 3.5' bgs, slow drilling from 3.5'-6'	
5		0		102	6.5'	4	☒			
10		0.5		67	9'	5	☒			
10		1.4			11'	6	☐		▼ Silty at 10', no hydrocarbon odor or visible staining	
10		0			12-14'	7	☐		9.5'-14' boulders, slow drilling	
15		0		81	14'	8	☒		▼ 14.5'-18' boulders, no hydrocarbon odor or staining in cuttings	
15		0								
20		0		105	18'	9	☒	MH		
20		0		72	20'	10	☒		Brownish-yellow (10 YR 6/8) to light grey (N7) clayey silt with grey medium to coarse rounded fine gravel and occasional basaltic cobbles	
20		0		77	22'	11	☒		▼ Brownish-grey weathered basalt	
25		0		72	25'	12	☒			
25		0		41	27'	13	☒			
30		0		120	29'	14	☒		▼ Boulders at 29' bgs	
30		0						SM		
30		0		31	32'	15	☒		Brownish-yellow (10 YR 6/8) to light gray (N7) mottled clayey silt with fine to coarse angular basaltic gravel, moist	
35		0	X	14	34'	16	☒			

LOG OF BORING

HALAWA MEDIUM
SECURITY FACILITY
Honolulu, Hawaii

DAMES & MOORE

BORING 24 CONT'D

SAMPLING METHOD: 2" Standard Split Spoon Sampler

DRILLING METHOD: 4" Hollow Stem Auger

SURFACE ELEVATION: 189.7 feet MSL

DEPTH (IN FEET)	WELL CONSTRUCTION	SAMPLE DATA						SOIL TYPE		
		OVA (ppm)			BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
		AUGER	SAMPLE	CUTTINGS						
	<p>2" Sch 30 PVC Screen (0.002" Slots)</p> <p>End Cap</p>	0			18	36'	17	☒	SM	
		0			18	38'	18	☒		
40		0			27	40'	19	☒		
		0			26	42'	20	☒		
		0	X		21	43'	21	☒		
45										
50										

DESCRIPTION

NOTE: Driller ran out of sample rod. Drilled down to 47.5' bgs and reamed hole.

Boring B-24 completed at a depth of 47.0 feet bgs on May 8, 1991. Ground water encountered at a depth of approximately 37 feet bgs.

LOG OF BORING

HALAWA MEDIUM
SECURITY FACILITY
Honolulu, Hawaii

DAMES & MOORE

BORING 25

SAMPLING METHOD: 2' Standard Split Spoon Sampler

DRILLING METHOD: 4" Hollow Stem Auger

SURFACE ELEVATION: 189.8 feet MSL

DEPTH (IN FEET)	WELL CONSTRUCTION	SAMPLE DATA						SOIL TYPE		
		OVA (ppm)			BLOWS/AFT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
		AUGER	SAMPLE	CUTTINGS						
0	Cap									
0	Cement/Bentonite Grout	0			36	1'	1	☒	AF	
0	2" SCH 30 PVC Blank Casing	0	X		84	2.5'	2	☒	GM GC	
5		0			88	5'	3	☒		
		0			94	7'	4	☒		
		0			100	8'	5	☒		
10		0	X		100	10'	6	☐		
		0			170	13.5'	7	☐		
15		7	X		15	17'	8	☒		
		0			100	17'	9	☒	MH	
20		0			100	20'	10	☒		
		0			106	24'	11	☒		
25	Bentonite Seal	0			55	26'	12	☒		
	No. 3 Filter Sand	0			96	29'	13	☒		
30		0	X		36	30'	14	☒	SM	
		0			16	33'	15	☒		
35	2" Sch 30 PVC Screen (0.002" Slots)	0			10	34'	16	☒		

DESCRIPTION

Asphalt
Brown (10 YR 3/3), grey, yellowish-red silt, sand, angular gravels and boulders, dense (fill)
Yellowish-red (5 YR 4/6) to brown (10 YR 3/3) clayey silty gravel with sand, dense to very dense, dry to moist

↓ Coarse basaltic gravel, light gray (N7) gravel

↓ Clayey reddish-brown (basaltic gravel) (10 YR 3/6) between 6'- 6.5' bgs

↓ Boulders between 9' - 12' bgs

↓ Boulders between 14' - 17' bgs

Yellowish-red (5 YR 4/6) and light grey (N7) clayey silt with some fine to medium angular gravel and sand, slightly moist, very dense,

↓ Weathered basaltic cobble at 28.5', dark gray coloration (N3)

Brownish-yellow (10 YR 6/8) to reddish-brown silty fine sand with some clay, slightly moist, dense, thin light gray (N7) silty clay layers

LOG OF BORING

HALAWA MEDIUM
SECURITY FACILITY
Honolulu, Hawaii

CRAFT

DAMES & MOORE

BORING 25 CONT'D

SAMPLING METHOD: 2' Standard Split Spoon Sampler

DRILLING METHOD: 4" Hollow Stem Auger

SURFACE ELEVATION: 189.0 feet MSL

DEPTH (IN FEET)	WELL CONSTRUCTION	SAMPLE DATA						SOIL TYPE		
		OVA (ppm)			BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
		AUGER	SAMPLE	CUTTINGS						
40	<p>2" Sch 30 PVC Screen (0.002" Slots)</p> <p>End Cap</p>	0	X		37	17	☒	SM		
		0			26	39	18			☒
		0			26	41	19			☒
		0			25	42	20			☒
45										
50										

DESCRIPTION

Boring B-25 completed at a depth of 46.0 feet bgs on May 9, 1991. Ground water encountered at a depth of approximately 34 feet bgs.

LOG OF BORING
 HALAWA MEDIUM
 SECURITY FACILITY
 Honolulu, Hawaii

DAMES & MOORE

BORING B-26

SAMPLING METHOD: 2" Standard Split Spoon Sampler

DRILLING METHOD: 4" Solid Stem Auger, Mobile B-33

SURFACE ELEVATION: 179.5 feet MSL

DEPTH (IN FEET)	SAMPLE DATA						SOIL TYPE		
	OVA (ppm)			BLOWS/FT.	SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE TYPE	USCS	SYMBOLS
	AUGER	SAMPLE	CUTTINGS						
	0			26	1'	1	☒	GM/GC	
	0			9	2'	2	☒		
						4	☐	MH	
5	0			6	6'	4	☒		
	0			24	9'	4	☒		
10	0			23	11'	5	☒		
15									

DESCRIPTION

Dark brown (10 YR 5/3) and light gray (N7) silty clayey fine to coarse angular basaltic gravel with little sand, slightly moist, medium dense

Dark brown (10 YR 7/7) to reddish-brown (10 R3/6), some sand and trace fine angular gravel, very moist, loose to medium dense, no hydrocarbon odor

Dark brown (10 YR 3/3) silty clay fine to coarse angular gravel, very moist

Dark brown (10 YR 3/3) clayey silt with little sand, slightly moist

Boring B-26 completed at a depth of 12 feet bgs on May 10, 1991.
No ground water encountered.

LOG OF BORING

HALAWA MEDIUM
SECURITY FACILITY
Honolulu, Hawaii

DAMES & MOORE

9-202399

BORING/WELL: W-1

DRILLING DATE: December 07, 1994
 SAMPLING METHOD: SPT/Split Spoon
 DRILLING METHOD: Solid Stem Auger
 HAMMER TYPE: 140 lb. slide
 STATIC WATER LEVEL: Initial >15' TOC (12/9/94 @ 1530)

WELL SCHEMATIC

DEPTH	SAMPLE DATA					SOIL TYPE		Description	WELL SCHEMATIC
	Blows / 6"	P/D/OVA (ppm)	Sample Depth (ft)	Sample Number	Sample Type	Symbols	USCS		
0								0' Grass.	
0-3'						GW	0-3' FILL: Silty/Sandy Gravel. 70% coarse gravel; 30% sandy silt. Moderately well-graded, subangular to angular loose, dry. No odor. Mixed basalt and coral material.		
4	26 46/3'	0		W-1-5.0'		GC	4-5' Gravel/silty clay. 60% coarse basalt gravel; 40% silty very stiff tan/yellow/red mottled clay. Poorly graded, subangular to angular, damp, no odor.		
						Rock	5-7.5' No samples possible due to hard basalt. Extremely hard drilling.		
8	20 26	0		W-1-8.5'		CL	7.5-8.5' Clay with sandy silt. 80% very stiff yellow/red/gray mottled saprolitic clay; 20% sandy silt. Poorly graded, damp, no odor.		
						Rock	10' Hard basalt.		
12	50/3'	0		W-1-12.5'		CL	12-12.5' Clay with silt. 90% stiff red/gray/light brown mottled saprolitic clay; 10% silt. Poorly graded, damp, no odor.		
						Rock	12.5' Hard basalt.		
16	28 56	0		W-1-16.0'		CL	15-16' Clay with gravel. 80% very stiff dark brown clay; 20% medium to coarse subangular basalt gravel. Moderately well-graded, damp, no odor.		
							Total Depth = 16 feet.		
20									
24									

LEGEND:

- Sample for Physical Description
- ▣ Sample for Laboratory Analysis
- Sample attempted, but no recovery

BORING LOG AND WELL SCHEMATIC

Halawa High Security Correctional Facility
 99-902 Moanalua Road
 Aiea, Oahu, Hawaii

M_FA MASA FUJIOKA & ASSOCIATES
 ENVIRONMENTAL - GEOTECHNICAL - HYDROGEOLOGICAL CONSULTANTS

9-202399

BORING/WELL: W-2

DRILLING DATE: December 08, 1994
 SAMPLING METHOD: SPT/Split Spoon
 DRILLING METHOD: Solid Stem Auger
 HAMMER TYPE: 140 lb. slide
 STATIC WATER LEVEL: Initial >15' TOC
 (12/9/94 @ 1530)

WELL SCHEMATIC

DEPTH	SAMPLE DATA					SOIL TYPE		Description	WELL SCHEMATIC
	Blows / 6"	PID/OVA (ppm)	Sample Depth (ft)	Sample Number	Sample Type	Symbols	USCS		
0							CL	0-0.25' Asphaltic concrete. 0.25-1.5' Silty Clay and Sand. 60% silty clay; 40% coralline sand. No odor. 1.5-2' Silty clay, dark brown. 2-8' Basalt. Gray, very dense, damp, no odor.	
4						Rock			
8	55	0		W-2-8.5'		CL	8-8.5' Clay with Gravel and trace Silt. 80% hard, damp, low to moderate plasticity, olive gray/yellowish orange clay; 15% basalt gravel; 5% silt. No odor.		
12	30	7		W-2-12.5'		CL	11' Silty Sand/Clay and Gravel. 80% silty sand and clay; 40% basalt gravel. 12-12.5' Clay. 95% hard, light gray/reddish brown mottled, low to moderately plastic saprolitic clay; 5% silt. Poorly graded, damp, no odor.		
16	20 33/3"	0		W-2-15.5'		CL	12.5-15' Clay with Gravel. 60% medium stiff light brown/dark brown/yellowish brown clay; 30% basalt gravel; 5% sand; 5% silt. Gravel and silt are subrounded to rounded. Damp, medium dense, no odor.		
15-15.5'							15-15.5' Clay with trace silt. 95% hard reddish brown/gray/yellowish brown mottled saprolitic clay; 5% silt. Poorly graded, damp, no odor.	Total Depth = 18 feet.	

LEGEND:

- Sample for Physical Description
- Sample for Laboratory Analysis
- Sample attempted, but no recovery

BORING LOG AND WELL SCHEMATIC

Halawa High Security Correctional Facility
 99-902 Moanalua Road
 Aiea, Oahu, Hawaii

M_FA MASA FUJIOKA & ASSOCIATES
 ENVIRONMENTAL • GEOTECHNICAL • HYDROGEOLOGICAL CONSULTANTS

9-202399

BORING/WELL: W-3

DRILLING DATE: December 08, 1994
 SAMPLING METHOD: SPT/Split Spoon
 DRILLING METHOD: Solid Stem Auger
 HAMMER TYPE: 140 lb. slide
 STATIC WATER LEVEL: 5.0' TOC (12/9/94 @ 1530)

DEPTH	SAMPLE DATA					SOIL TYPE	
	Blows / 6"	PID/OVA (ppm)	Sample Depth (ft)	Sample Number	Sample Type	Symbols	USCS
0							SP
4							CL/Rock
8	75	0	W-3-8.0'				CL/Rock
12							
16	41 50/3'	0	W-3-16.5'				
20							
24							

Description

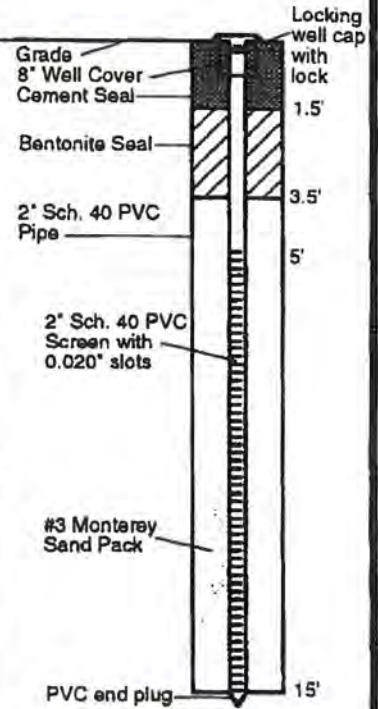
0-0.25' Asphaltic concrete.
 0.25-1' Fill. Coral sand and coral, saturated.
 1-7.5' Gravel and Clay. Mixed basalt gravel and Clay. No odor.

7.5-8' Clay with Gravel and Sand. 85% hard, brown/gray/red/yellow mottled clay; 15% basalt gravel and sand. Moderately well-graded, moist (saturated at 8'), no odor.

8-15' Clay and gravel. 80% dark brown clay with silty sand; 40% gray basalt gravel. Interlayered clay/gravel zones. Slightly to moderately moist, no odor.

16-16.5' Clay with Gravel. 80% very stiff gray/yellow/raddish brown saprolitic clay; 10% basalt gravel; 5% sand; 5% silt. Moderately well-graded, subangular to angular (gravel and sand), damp, no odor.

WELL SCHEMATIC



Total Depth = 16.5 feet

LEGEND:

- Sample for Physical Description
- Sample for Laboratory Analysis
- ▨ Sample attempted, but no recovery

BORING LOG AND WELL SCHEMATIC

Halawa High Security Correctional Facility
 99-902 Moanalua Road
 Aiea, Oahu, Hawaii

M_FA MASA FUJIOKA & ASSOCIATES
 ENVIRONMENTAL - GEOTECHNICAL - HYDROGEOLOGICAL CONSULTANTS

9-202399

BORING/WELL: W-4

DRILLING DATE: December 09, 1994
 SAMPLING METHOD: SPT/Split Spoon
 DRILLING METHOD: Solid Stem Auger
 HAMMER TYPE: 140 lb. slide
 STATIC WATER LEVEL: 2.8' TOC (12/9/94 @ 1530)

WELL SCHEMATIC

DEPTH	SAMPLE DATA					SOIL TYPE		Description	WELL SCHEMATIC
	Blows / 6"	PI/D/OVA (ppm)	Sample Depth (ft)	Sample Number	Sample Type	Symbols	USCS		
0								0-0.25' Asphaltic concrete. 0.25-1' FILL. Clay with silty sand. 90% reddish brown clay; 5% silt; 5% sand. Slightly moist, moderately plastic, no odor.	
4	4 15	0	W-4-6.0'			CL	5-6.0' Clay. 95% very stiff gray/brown mottled clay; 5% silt. Poorly graded, damp, no odor. 6.0-10' Clay, as above.		
8									
10						Rock	10-11.5' Basalt. Moderately difficult drilling. 11.5-12.5' Clay. 85% very stiff mottled saprolitic clay; 5% basalt gravel; 5% sand; 5% silt. Poorly to moderately well-graded, damp.		
12	14 15	0	W-4-12.5'			CL	12.5-15' Clay and Gravel. 80% medium to high plasticity saprolitic clay; 20% basalt well-rounded gravel to 2" length. Moist to wet, no odor.		
14						GC	15-16.5' Clay. 95% hard gray/yellow/brown mottled saprolitic clay. Poorly graded, wet to saturated, no odor.		
16	15 18	0	W-4-16'			CL			
20									
24									

LEGEND:

- Sample for Physical Description
- Sample for Laboratory Analysis
- Sample attempted, but no recovery

BORING LOG AND WELL SCHEMATIC
 Halawa High Security Correctional Facility
 99-902 Moanalua Road
 Aiea, Oahu, Hawaii

M_FA MASA FUJIOKA & ASSOCIATES
 ENVIRONMENTAL - GEOTECHNICAL - HYDROGEOLOGICAL CONSULTANTS

9-202399

BORING/WELL: W-5

DRILLING DATE: December 09, 1994
 SAMPLING METHOD: SPT/Split Spoon
 DRILLING METHOD: Solid Stem Auger
 HAMMER TYPE: 140 lb. slide
 STATIC WATER LEVEL: 6.6' TOC (12/9/94 @ 1530)

WELL SCHEMATIC

DEPTH	SAMPLE DATA					SOIL TYPE		Description	WELL SCHEMATIC
	Blows / 6"	PI/D/OVA (ppm)	Sample Depth (ft)	Sample Number	Sample Type	Symbols	USCS		
0								0'-0.4' Grass. Clay. Reddish brown silty sandy clay.	
4						Rock	4-5' Rock. Very hard drilling in basalt.		
16 24	0	6.0'	W-5-6.0'		Rock	GC	5-6' Gravel and Clay. 55% gray coarse subangular basalt gravel; 35% saprolitic clay; 5% sand; 5% silt. Moderately well-graded, dense, gray/tan mottled, damp, no odor. Rock, basalt.		
8						Rock	6-7' Rock, basalt.		
16 19	0	11.0'	W-5-11.0'			CL	10-11' Clay. 95% hard, light greenish-gray, low to medium plasticity clay; 5% silty sand. Poorly graded, moist to wet, no odor. Rock, basalt.		
12						Rock	11-12.5' Rock, basalt.		
12.5-15'						CL	12.5-15' Clay, same as 10-11' sample.		
16 17 26	0	16'	W-5-16'			CL	15-16.5' Clay, saturated (no recovery).		
16								Total Depth = 16 feet.	
20									
24									

LEGEND:

- Sample for Physical Description
- ▨ Sample for Laboratory Analysis
- Sample attempted, but no recovery

BORING LOG AND WELL SCHEMATIC
 Halawa High Security Correctional Facility
 99-902 Moanalua Road
 Aiea, Oahu, Hawaii

M_FA MASA FUJIOKA & ASSOCIATES
 ENVIRONMENTAL • GEOTECHNICAL • HYDROGEOLOGICAL CONSULTANTS

9-202399

BORING/WELL: W-6

DRILLING DATE: December 09, 1994
 SAMPLING METHOD: SPT/Split Spoon
 DRILLING METHOD: Solid Stem Auger
 HAMMER TYPE: 140 lb. slide
 STATIC WATER LEVEL: Initial >15' TOC
 (12/9/94 @ 1530)

WELL SCHEMATIC

DEPTH	SAMPLE DATA					SOIL TYPE		Description	WELL SCHEMATIC
	Blows / 6"	PID/OVA (ppm)	Sample Depth (ft)	Sample Number	Sample Type	Symbols	USCS		
0								0'-4' Grass. FILL. Clay and Gravel. 60% dark brown clay; 20% basalt gravel; 10% silt; 10% sand. Slightly moist, no odor.	
4	10 15	0	6.0'	W-6-6.0'		GC	5-6' Clay with Sandy Silt. 85% very stiff dark brown clay; 10% silt; 5% sand. Moderately well-graded, no odor. Wood debris fragments in sample.		
8	14 17	0	11.0'	W-6-11.0'		CL	10-11' Clay with Silt. Very stiff to hard, dark brown clay with silt. Moist. No return.		
12	9 17 25	0	16'	W-6-16'			15.5-16.5' Clay. 95% very stiff black and gray saprolitic clay; 5% silt. Poorly graded, moist, no odor.		
16								Total Depth = 16 feet.	
20									
24									

LEGEND:

- Sample for Physical Description
- ▤ Sample for Laboratory Analysis
- ▨ Sample attempted, but no recovery

BORING LOG AND WELL SCHEMATIC
 Halawa High Security Correctional Facility
 99-902 Moanalua Road
 Aiea, Oahu, Hawaii

M_FA MASA FUJIOKA & ASSOCIATES
 ENVIRONMENTAL • GEOTECHNICAL • HYDROGEOLOGICAL CONSULTANTS

LOG OF EXPLORATORY BORING

LOCATION: HALAWA CORRECTIONAL FACILITY

DIAMETER: 6 INCHES

DATE: SEPTEMBER 13, 1988

JOB #: 8067

WELL #: 8067-000

GEOLOGIST: Kenton Beal

DRILLER: P.R. Drilling

GROUNDWATER LEVEL: 6' 3.5"

Depth (ft)	Graphic Log	Organic Vapor Concentration	Sample	Soil Group Symbol	Blow Counts	Description and Comments
0 - 1.5				PT		Highly organic top soil.
1.5 - 5		0 PPM		CL	9-44-43	Dark brown to brown-orange gravelly clay with basalt cobbles.
5 - 10		0 PPM		CL	16-100	Dark brown to brown-orange gravelly clay with basalt cobbles. Also, a substantial percentage (~50%) of large (1-2 ft.) basalt boulders.
10 - 30		0 PPM		CL	2-2-2	Interbedded layers of clays and sandy gravels overlapping and grading into one another. Layers are 1/4" to 2 1/2" thick. Colors range from gray, gray-blue, brown, brown-orange, and tan.

LOG OF EXPLORATORY BORING

LOCATION: HALAWA CORRECTIONAL FACILITY

DIAMETER: 8 INCHES

DATE: September 19, 1988

JOB #: 8067

WELL #: 8067-001

GEOLOGIST: Kenton Beal

DRILLER: P.R. Drilling

GROUNDWATER LEVEL: 30' 4"

Depth (ft)	Graphic Log	Organic Vapor Concentration	Sample	Soil Group Symbol	Blow Counts	Description and Comments
		0.3 ppm		GW	26-34-12	Very coarse, well sorted, very poorly rounded, basalt gravel fill.
5		0.2 ppm		CH	11-50 (R)	Brown to red-brown very plastic clay with some (~5%) basalt fragments. (R) = rejection
10		0 ppm		CL/GC	CORE SAMPLE	Large (up to 2'), very dense basalt boulders suspended in a gravelly sand and sandy clay matrix
15		0 ppm		CL	CORE SAMPLE	Red-brown and blue-gray clay and mud, with some (<5%) basalt fragments.
20		0 ppm			6-10-13	
25		0 ppm			6-11-16	
30						

(Cont'd)

LOG OF EXPLORATORY BORING

LOCATION: Halawa Correctional Facility

DIAMETER: 8 inches

DATE: September 19, 1988

JOB #: 8067

WELL #: 8067-001 (cont'd)

GEOLOGIST: Kenton Beal

DRILLER: P.R. Drilling

GROUNDWATER LEVEL: 30'4"

Depth (ft)	Graphic Log	Organic Vapor Concentration	Sample	Soil Group Symbol	Blow Counts	Description and Comments
30				CL		
35						
40						
45						T.D. = 45 ft.
50						
55						

LOG OF EXPLORATORY BORING

LOCATION: HALAWA CORRECTIONAL FACILITY

DIAMETER: 8 INCHES

DATE: September 19, 1988

JOB #: 8067

WELL #: 8067-002

GEOLOGIST: Kenton Beal

DRILLER: P.R. Drilling

GROUNDWATER LEVEL: 30' 4"

Depth (ft)	Graphic Log	Organic Vapor Concentration	Sample	Soil Group Symbol	Blow Counts	Description and Comments
		0 ppm		GW	6-7-8	Coarse basalt gravel fill, little or no fines
5		0.5 ppm		CL	3-5-6	Brown sandy clay with some gravel pieces.
10		0 ppm		CL/GP	CORE SAMPLE	Red-brown clay with ~50% basalt boulders. Very little sand and mudstone cobbles.
15		0 ppm		GM	CORE SAMPLE	Poorly graded, well rounded fine sand to coarse gravel
20		0 ppm		CL	CORE SAMPLE	Brown gavelly clay with 50% basalt boulders.
25				CL		Brown to orange-brown clay and mud.
30	T. D. 30'					

LOG OF EXPLORATORY BORING

LOCATION: HALAWA CORRECTIONAL FACILITY

DIAMETER: 6 INCHES

DATE: September 24, 1988

JOB #: 8067

WELL #: 8067-005

GEOLOGIST: Kenton Beal

DRILLER: P.R. Drilling

GROUNDWATER LEVEL: 20' 1"

Depth (ft)	Graphic Log	Organic Vapor Concentration	Sample	Soil Group Symbol	Blow Counts	Description and Comments
				PT		Highly organic top soil and plant material
5				CL		Red-brown clay with a high percentage (~50%) of large (1-2 ft.) basalt boulders
10				CL		Red-brown clay with small amounts (~10%) of basalt fragments, cobbles, etc.
15						
20						
25						
30	T. D. at 30 ft.					



AS BUILT DRAWING OF

GROUNDWATER MONITORING/RECOVERY WELL

Well Number 8067-000

Elevation top of casing _____ ft.

Ground Elevation _____ ft.

CEMENT 1.5 ft.
BENTONITE 2.0 ft.
GRAVEL 3.5 ft.

SOLID CASING:
Material PVC
Length 10 ft.
Diameter 4 in.
Wall Thick. 0.237 in.

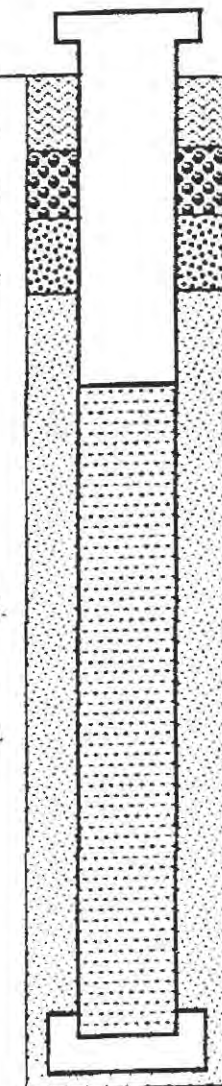
CASING: Perforated Screen
Material PVC
Length 15 ft.
Diameter 4 in.
Wall Thick. 0.237 in.
Openings 0.02 in.

Hole Diameter 8 in.

SAND 19.0 ft.

OPEN HOLE:
Length 1.0 ft.
Diameter 8.0 in.

END CAP:
Material PVC



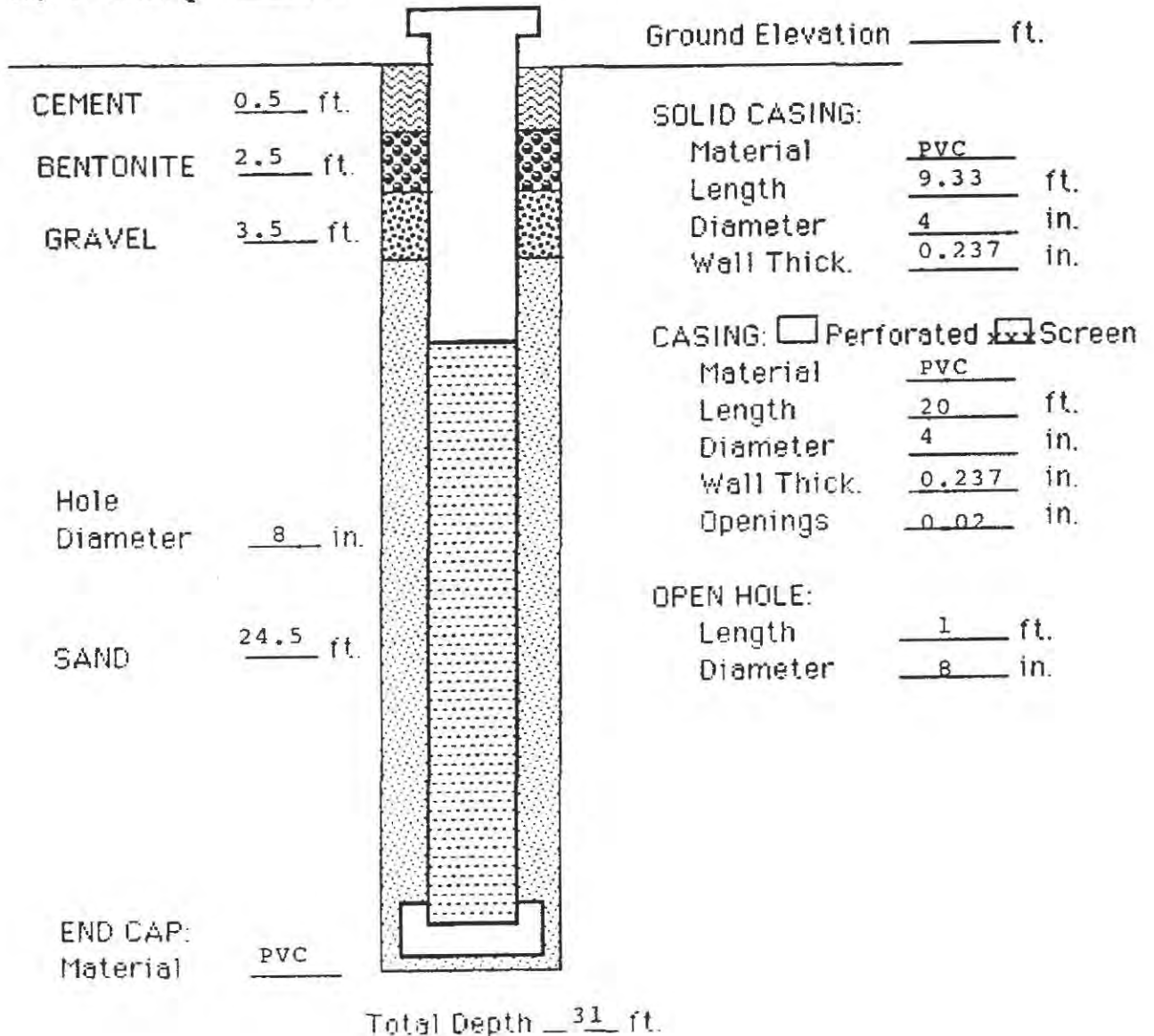
Total Depth 26 ft.

AS BUILT DRAWING OF
GROUNDWATER MONITORING/RECOVERY WELL

Well Number 8067-001

Elevation top of casing _____ ft.

Ground Elevation _____ ft.

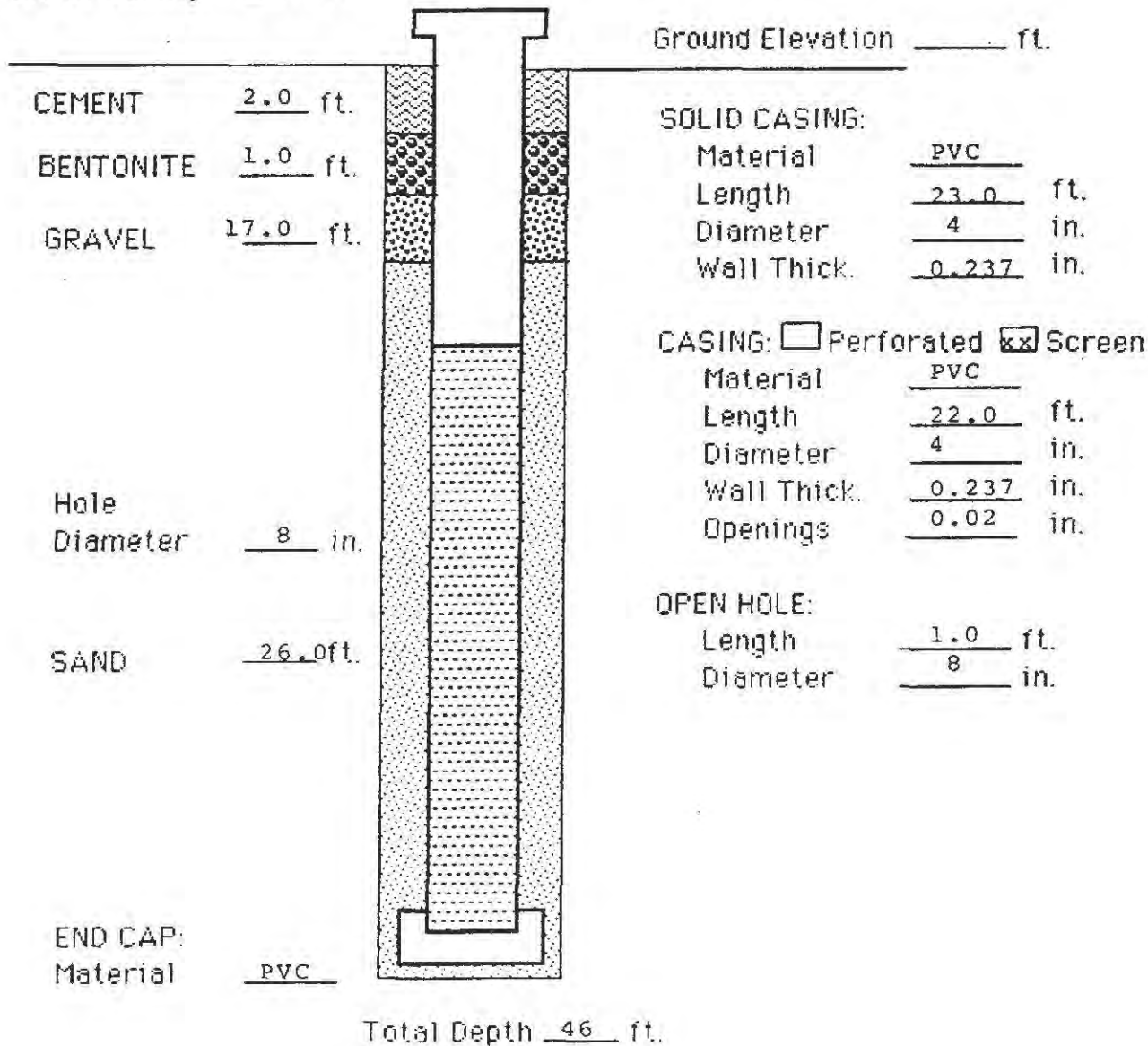


AS BUILT DRAWING OF
GROUNDWATER MONITORING/RECOVERY WELL

Well Number 8067-002

Elevation top of casing _____ ft.

Ground Elevation _____ ft.



AS BUILT DRAWING OF GROUNDWATER MONITORING/RECOVERY WELL

Well Number 8067-005

Elevation top of casing _____ ft.

Ground Elevation _____ ft.

CEMENT 1.0 ft.
 BENTONITE 1.0 ft.
 GRAVEL 6.0 ft.

SOLID CASING:
 Material PVC
 Length 10 ft.
 Diameter 4 in.
 Wall Thick. 0.237 in.

Hole Diameter 8 in.

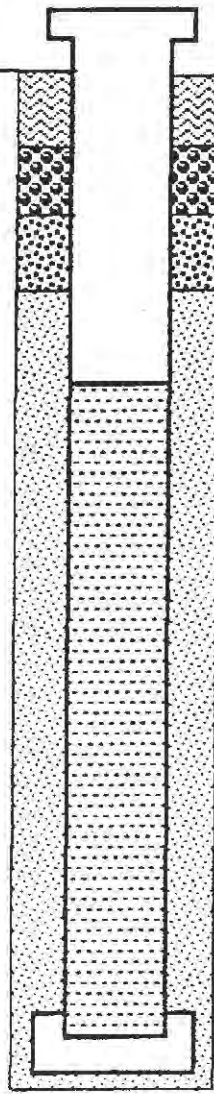
CASING: Perforated Screen
 Material PVC
 Length 20 ft.
 Diameter 4 in.
 Wall Thick. 0.237 in.
 Openings 0.02 in.

SAND 23 ft.

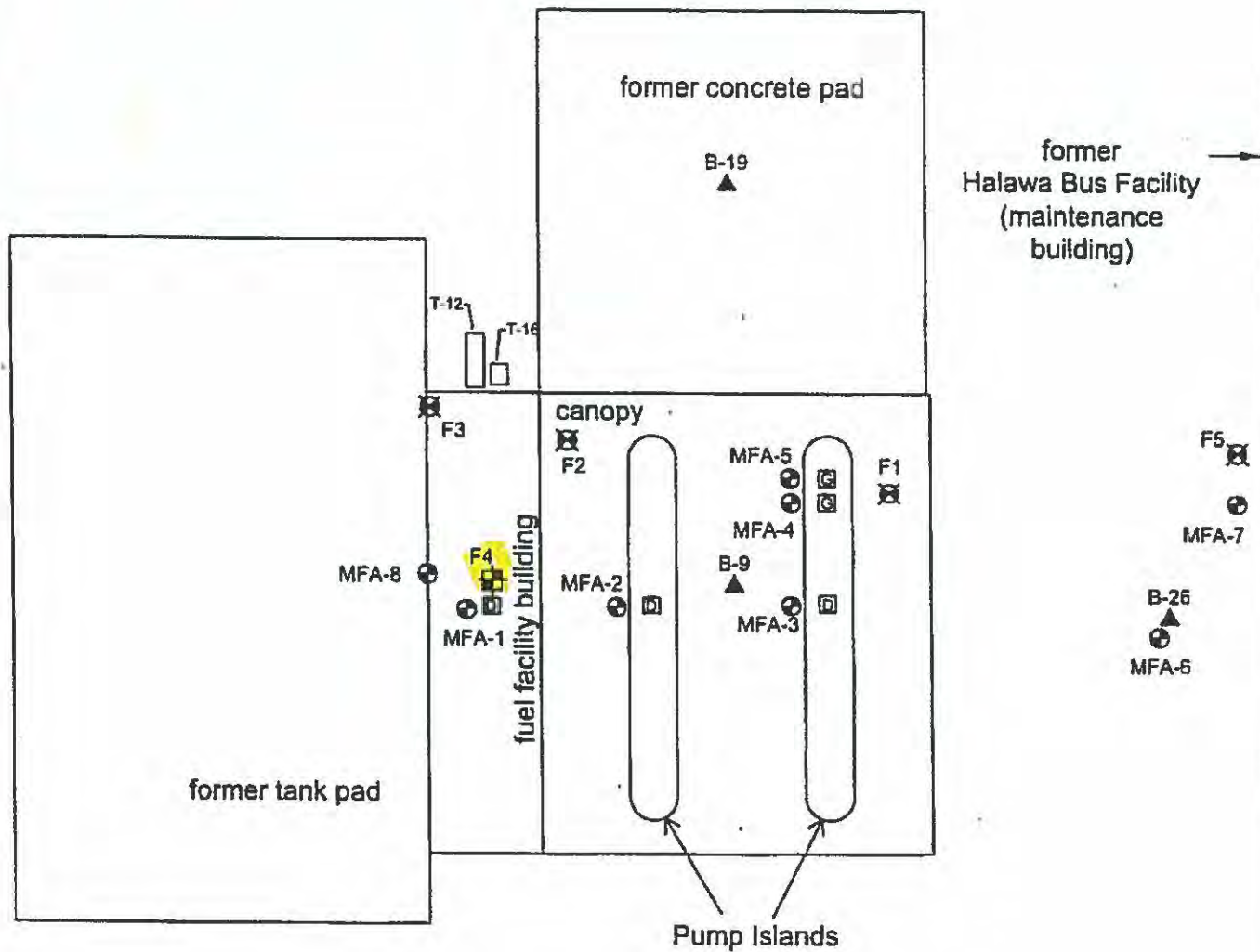
OPEN HOLE:
 Length 1.0 ft.
 Diameter 8 in.

END CAP:
 Material PVC

Total Depth 31 ft.




Iwaena Street (to the west)



Legend:

- ☒ Boring Location and ID, March 2005
- ⊕ Boring/Monitoring Well Location and ID, March 2005
- ⊙ Boring Location and ID, Jan/Feb. 2004
- ▲ Boring Location and ID, Kimura 1999.
- ⊠ Former Gasoline Fuel Dispenser
- ⊡ Former Diesel Fuel Dispenser

Source: Kimura Incrational, Inc., 1999



Project:	05096-064
Approved by:	DRD
Drawn by:	FC
Date:	NOV 2006
Scale:	schematic only

**Figure 2
Site Plan**

Former Halawa Bus Facility
99-999 Iwaena Street
Aiea, Oahu, Hawaii

M - F A MASA FUJIOKA & ASSOCIATES
ENVIRONMENTAL • GEOTECHNICAL • HYDROGEOLOGICAL CONSULTANTS

File: C:\Documents and Settings\p66h11\My Documents\active jobs\06-064 Former Halawa Bus Facility (Halawa Corp Yard), beginning March 2005\06-0
 SuperLog V2.0 CliffTech Software, USA www.clifftech.com


Masa Fujioka & Associates Aiea, Hawaii (808)484-5366 mfa@lava.net	BORING/WELL LOG: F-4 Former Halawa Bus Facility 99-999 Iwaena Street Aiea, Oahu, Hawaii		Page 1
			Job Number: 05096-064
			Elevation:
Driller: MFA	Drilling	Date:	Time:
Drill Method: 4" Solid Stem	Started:	March 10-14, 2005 (to 30.5')	
Sample Method: 2" Spltt w/ 7.5# hammer	Finished:	April 11, 2005	
Borehole Diameter: 4"	Water Level : 37.7'	Logged By: W. Lyon	Checked By: DRD

Sample No. and Depth (ft)	PID (ppm)	Sample Type	Blows / Foot	Depth (ft)	Materials Description	Well Construction
				0	CN FL Concrete walkway in building corridor Gravel fill	
				0-5	SM Tan silty sand w/ gravel	
F4-5	165	☑	NA	5	MH Dark grayish-brown clayey silt w/ sand, moist (strong petroleum odor, no stain)	
F4-10	182	☑	NA	10	(slight petroleum odor)	
				10-14	CB Boulders and cobbles to 14'	
F4-15	114	☑	NA	15	MH (slight petroleum odor)	
				15-18	BL Boulder at 16' to 18'	
F4-20	91	☑	NA	20	MH (slight petroleum odor)	
F4-25	87	☑	NA	25	Grades to dark gray clayey silt, moist (slight petroleum odor)	
F4-30	90	☑	NA	30	(slight petroleum odor)	
				30-35	CH Light brown saprolite, wet-moist (slight petroleum odor)	

Masa Fujioka & Associates
 Former Halawa Bus Facility (Halawa Corp. Year) beginning March 2003/09/04
 Job: 05098-064
 Documents and Settings\500mar11\My Documents\active jobs\05098-064
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 SuperLog V2L8 CivilTech Software, USA www.civilttech.com

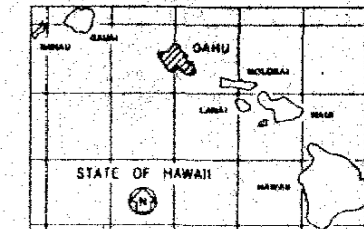
Masa Fujioka & Associates Aiea, Hawaii (808)484-5366 mfa@lava.net	BORING/WELL LOG: F-4 Former Halawa Bus Facility 99-999 Iwaena Street Aiea, Oahu, Hawaii	Page 2 Job Number: 05098-064 Elevation:
---	---	---

Driller: MFA	Drilling	Date:	Time:
Drill Method: 4" Solid Stem	Started:	March 10-14, 2005 (to 30.5')	
Sample Method: 2" Split w/ 7.5# hammer	Finished:	April 11, 2005	
Borehole Diameter: 4"	Water Level : 37.7'	Logged By: W. Lyon	Checked By: DRD

Sample No. and Depth (ft)	PID (ppm)	Sample Type	Blows / Foot	Depth (Ft)	Materials Description	Well Construction
F4-40	8	<input checked="" type="checkbox"/>	NA	35	CH (slight petroleum odor) END (no odor) Boring terminated 45.5' bgs.	 sand Well screen Well end cap
F4-45	0	<input checked="" type="checkbox"/>	NA	45		

INDEX TO DRAWINGS	
SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	STANDARD PLANS SUMMARY
3	GENERAL PLAN
4 & 5	TYPICAL ROADWAY SECTIONS
6 TO 8	DEMOLITION PLAN
9 TO 11	GEOMETRICS PLAN
12 TO 16	PROFILE AND SE DIAGRAM
17 TO 19	RAMP TERMINAL DETAILS
20 TO 27	GRADING AND DRAINAGE PLAN
23	RIGID BARRIER DETAILS
24	DRAINAGE ESTIMATED QUANTITIES
25 & 26	DRAINAGE DETAILS & LINE PROFILES
27 TO 32	BRIDGE DECK DRAIN LAYOUT PLAN & DETAILS
33 TO 37	UTILITY PLAN, PROFILE & DETAILS
38 TO 40	LOGS OF BORINGS
41 TO 44	SIGNING AND STRIPING PLAN & DETAILS
45 TO 55	CROSS SECTIONS
56 TO 62	ELECTRICAL PLANS & DETAILS
63 TO 74	LANDSCAPE PLANS & DETAILS
75 TO 114	STRUCTURAL DRAWINGS
115 TO 137	STRUCTURAL TYPICAL DRAWINGS
137 54	CONSTRUCTION SCHEDULE

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I- H3-1(54)	1989	1	137

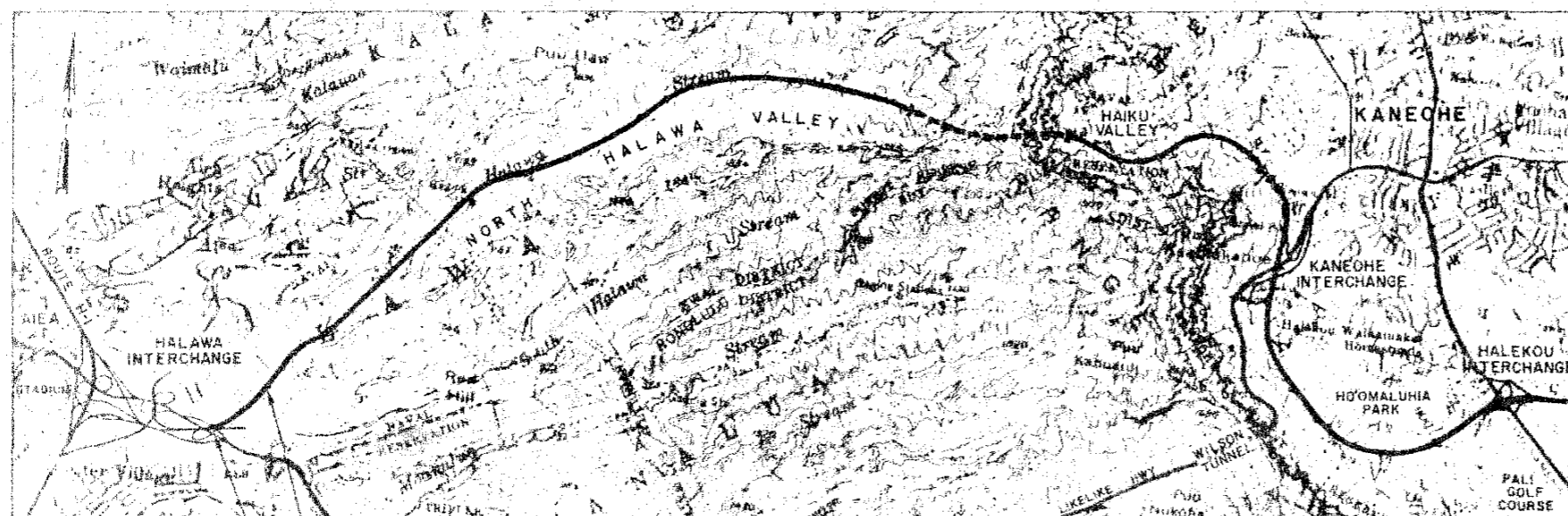
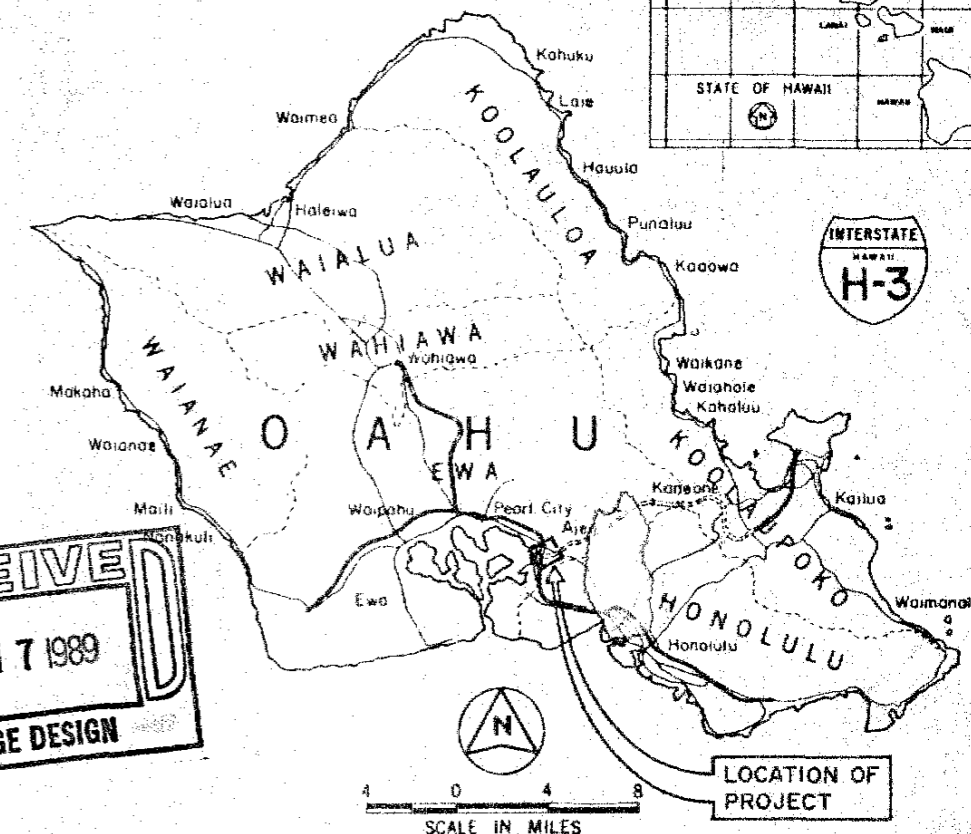
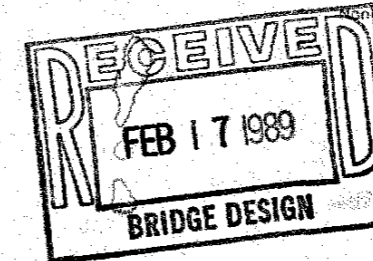


STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
HONOLULU, HAWAII

PLANS FOR
CONSTRUCTION OF A PORTION OF
INTERSTATE ROUTE H-3
HALAWA QUARRY VIADUCT
MAKAI SECTION

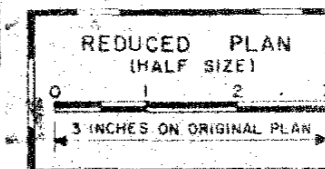
FEDERAL AID INTERSTATE PROJECT NO. I-H3-1(54)

DISTRICT OF EWA
ISLAND OF OAHU



LAYOUT PLAN

SCALE IN MILES
1/2 0 1/2 1



--- FEDERAL AID INTERSTATE PROJECTS PREVIOUSLY CONSTRUCTED OR UNDER CONSTRUCTION

DESIGN CLASSIFICATION

DESIGN ADT (2008)	45,220
DHV	4,282
D	76/24
T	2.1%
T24	4.1%
V	60 MPH

BEGIN PROJECT @ STA. 333+27.85 END PROJECT @ STA. 356+70

LENGTH OF PROJECT • 0.44 MILE

1-25-89	ADDED CONSTRUCTION SCHEDULE SHEET
DATE	REVISION

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
APPROVED: *[Signature]* 7/24/88
DIVISION ADMINISTRATOR DATE

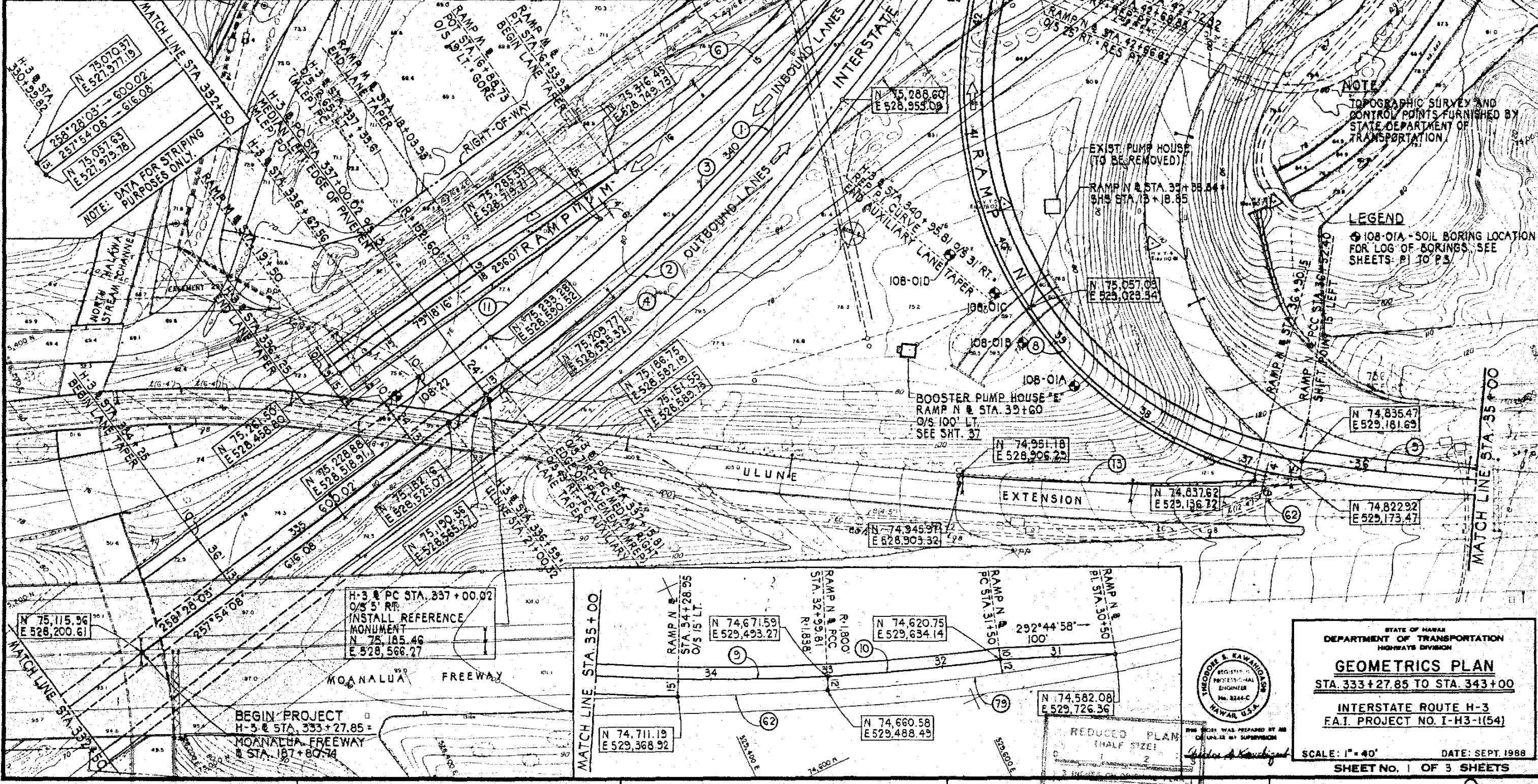
DEPARTMENT OF TRANSPORTATION
STATE OF HAWAII
APPROVED: *[Signature]* 8/21/88
DIR. OF TRANSPORTATION DATE

SSEM ENGRS. INC. DESIGNED BY P. MIKAMI P.E. & E. B. 549-7469 PHONE 549-7469 SEPT. 1988 DATE

CURVE DATA						CC COORDINATES		PI COORDINATES		
NO.	Δ	Δ/2	R	TAN Ch	Lc	NORTH	EAST	NORTH	EAST	
1	54°23'00"	27°11'30"	1,600.00'	821.99'	1,462.30'	1,518.67'	76,758.06	528,245.39	75,354.70	529,370.66
2	54°23'00"	27°11'30"	1,607.00'	825.59'	1,468.70'	1,525.31'	76,758.06	528,245.39	75,359.78	529,389.44
3	27°00'00"	13°30'00"	1,521.60'	365.30'	710.42'	717.04'	76,700.65	528,291.11	75,282.80	529,239.01
4	17°08'04"	8°34'02"	1,303.43'	196.13'	388.34'	389.79'	76,426.03	528,316.56	75,192.70	528,781.73
5	2°25'28"	1°12'44"	1,485.60'	31.44'	62.86'	62.86'	76,700.65	528,291.11	75,489.77	529,152.37
6	23°30'52"	11°45'26"	1,000.00'	208.13'	407.53'	410.40'	76,299.08	528,564.14	75,355.08	528,954.26
7	27°23'00"	13°41'30"	1,595.00'	388.57'	755.06'	762.30'	76,758.06	528,245.39	75,752.43	529,542.97
8	104°28'00"	52°14'00"	340.00'	438.85'	537.55'	619.92'	75,107.30	529,359.82	75,063.46	528,806.40
9	10°59'29"	5°29'44.5"	1,838.00'	176.84'	352.05'	352.59'	76,372.78	530,189.11	74,738.54	529,329.60

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(84)	1989	9	157

NOTE: FOR ADDITIONAL CURVE DATA, SEE SHT. 11



NOTE: TOPOGRAPHIC SURVEY AND CONTROL POINTS FURNISHED BY STATE DEPARTMENT OF TRANSPORTATION

LEGEND
 108-01A - SOIL BORING LOCATION FOR LOG OF BORINGS. SEE SHEETS P1 TO P3

REVISION	DATE	BY

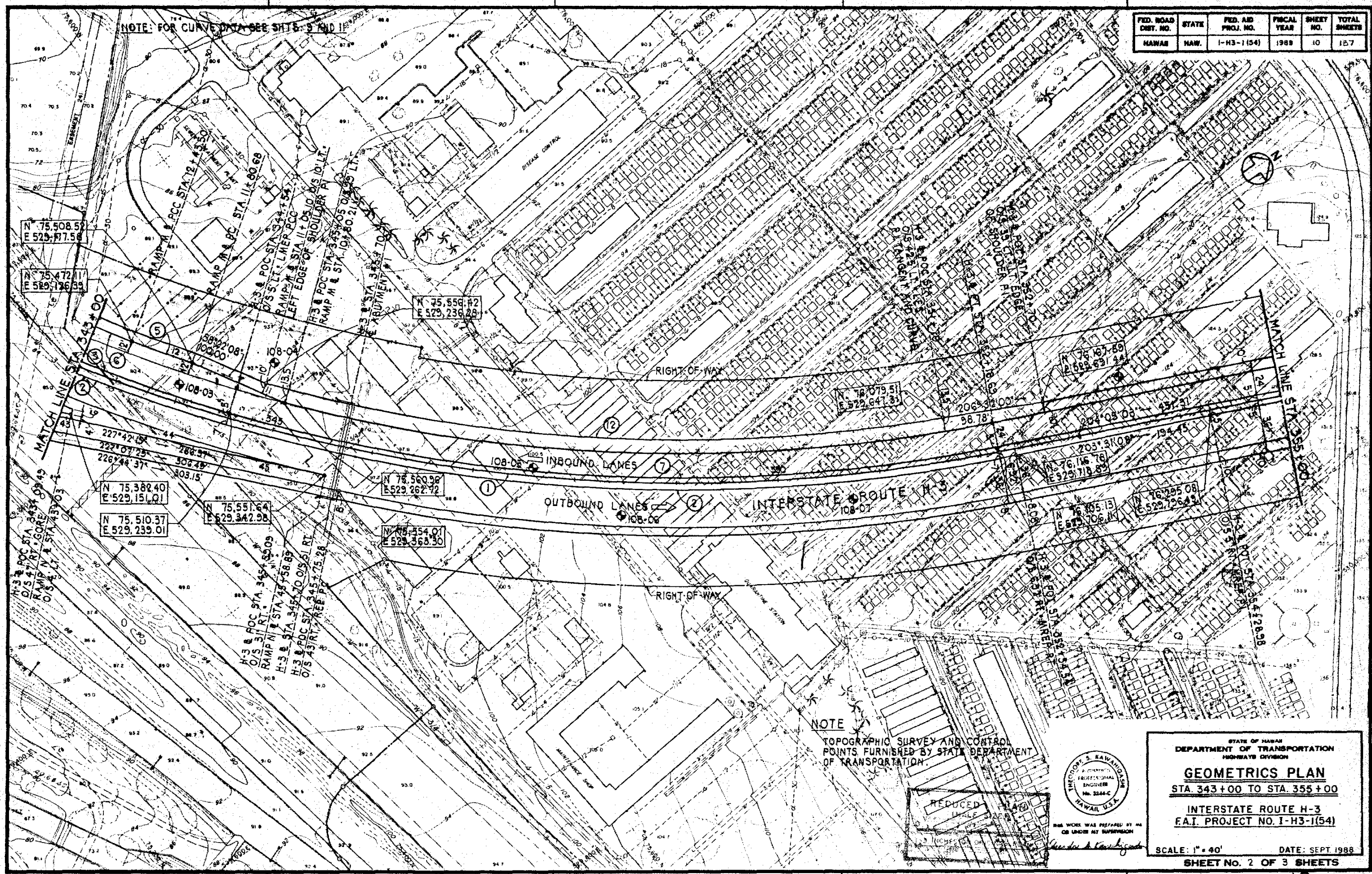


STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
GEOMETRICS PLAN
 STA. 333+27.85 TO STA. 343+00
 INTERSTATE ROUTE H-3
 F.A.I. PROJECT NO. I-H3-1(84)
 SCALE: 1" = 40'
 DATE: SEPT. 1988
 SHEET NO. 1 OF 3 SHEETS

REDUCED PLAN
 (HALF SIZE)

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(54)	1988	10	127

NOTE: FOR CURVE DATA SEE SHTS. 9 AND 10



CHECKED BY: _____ DATE: _____
 SURVEY PLAN: _____
 TRACKED BY: _____
 DESIGNED BY: _____
 QUANTIFIED BY: _____
 NOTED BY: _____
 CHECKED BY: _____

NOTE
 TOPOGRAPHIC SURVEY AND CONTROL
 POINTS FURNISHED BY STATE DEPARTMENT
 OF TRANSPORTATION.



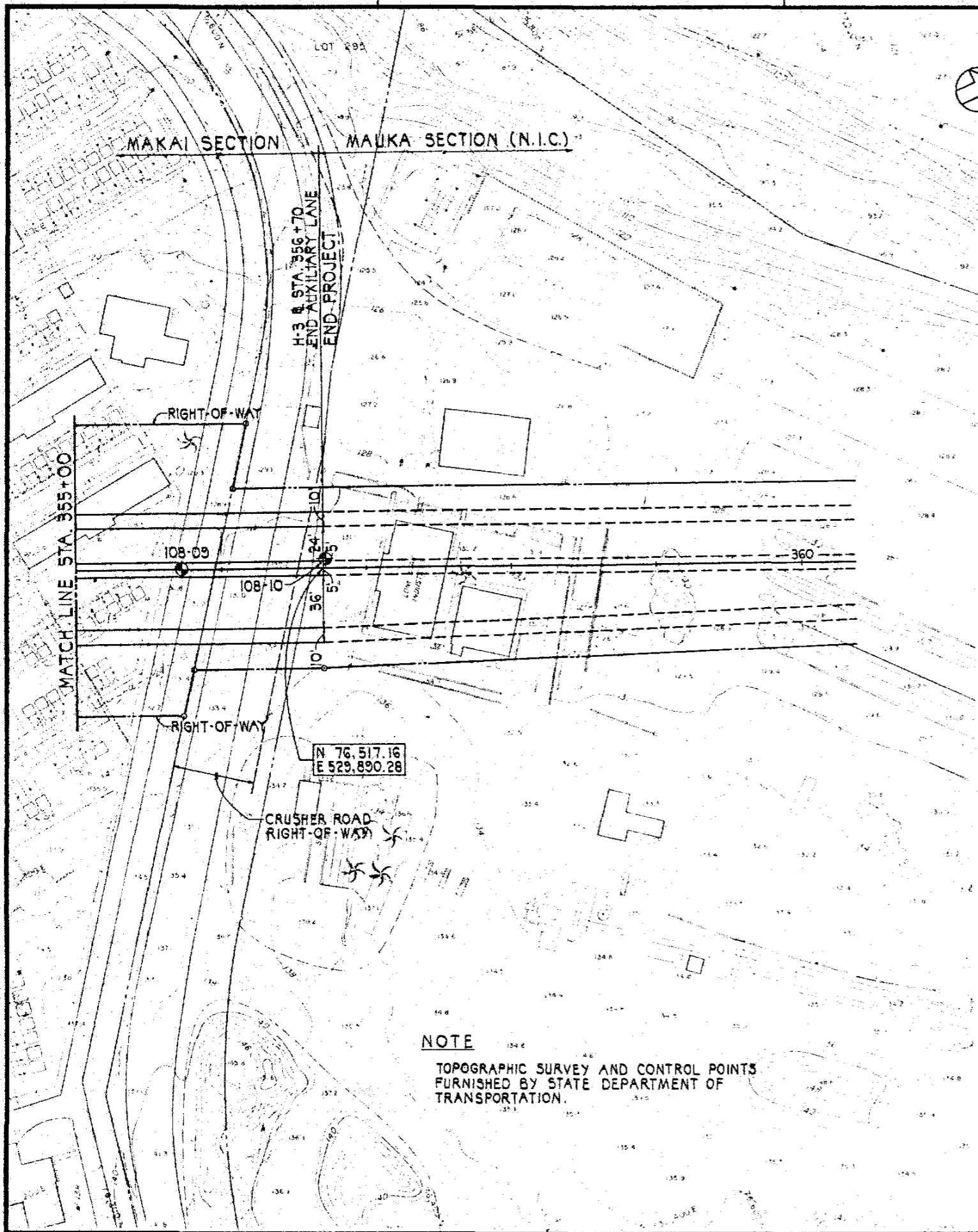
THIS WORK WAS PREPARED BY ME
 OR UNDER MY SUPERVISION

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
GEOMETRICS PLAN
 STA. 343+00 TO STA. 355+00
 INTERSTATE ROUTE H-3
 F.A.I. PROJECT NO. I-H3-1(54)

SCALE: 1" = 40'
 DATE: SEPT. 1988
 SHEET No. 2 OF 3 SHEETS

REDUCED
 SCALE
 1" = 40'

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(54)	1989	11	137



NO.	CURVE DATA						CC COORDINATES		PI COORDINATES	
	Δ	$A/2$	R	TAN	Ch	Lc				
10	4° 48' 02"	2° 24' 01"	1,788.00'	74.95'	149.76'	149.81'	76,326.50	530,170.19	74,643.21	529,562.64
11	8° 20' 22"	4° 10' 11"	1,434.34'	104.57'	208.59'	208.77'	76,634.26	528,292.15'	75,249.78	528,621.36
12	24° 39' 45"	12° 19' 55.5"	1,557.50'	340.48'	665.25'	670.41'	76,758.06	528,245.39	75,773.04	529,236.28
13	7° 00' 52"	3° 30' 26"	2,099.70'	128.69'	256.90'	257.06'	76,774.27	529,947.98	74,887.34	529,018.03
62	10° 47' 35.2"	5° 23' 47.6"	4,984.82'	470.90'	937.63'	939.02'	79,274.09	531,376.34	74,838.92	529,052.67
79	20° 03' 12.7"	10° 01' 36.4"	1,800.00'	318.26'	626.79'	630.00'	76,326.50	530,170.19	74,540.05	529,783.04

DESIGNED BY _____
 CHECKED BY _____
 TRACED BY _____
 QUANTITIES BY _____
 NOTE BOOK _____
 No. _____

NOTE
 TOPOGRAPHIC SURVEY AND CONTROL POINTS
 FURNISHED BY STATE DEPARTMENT OF
 TRANSPORTATION.

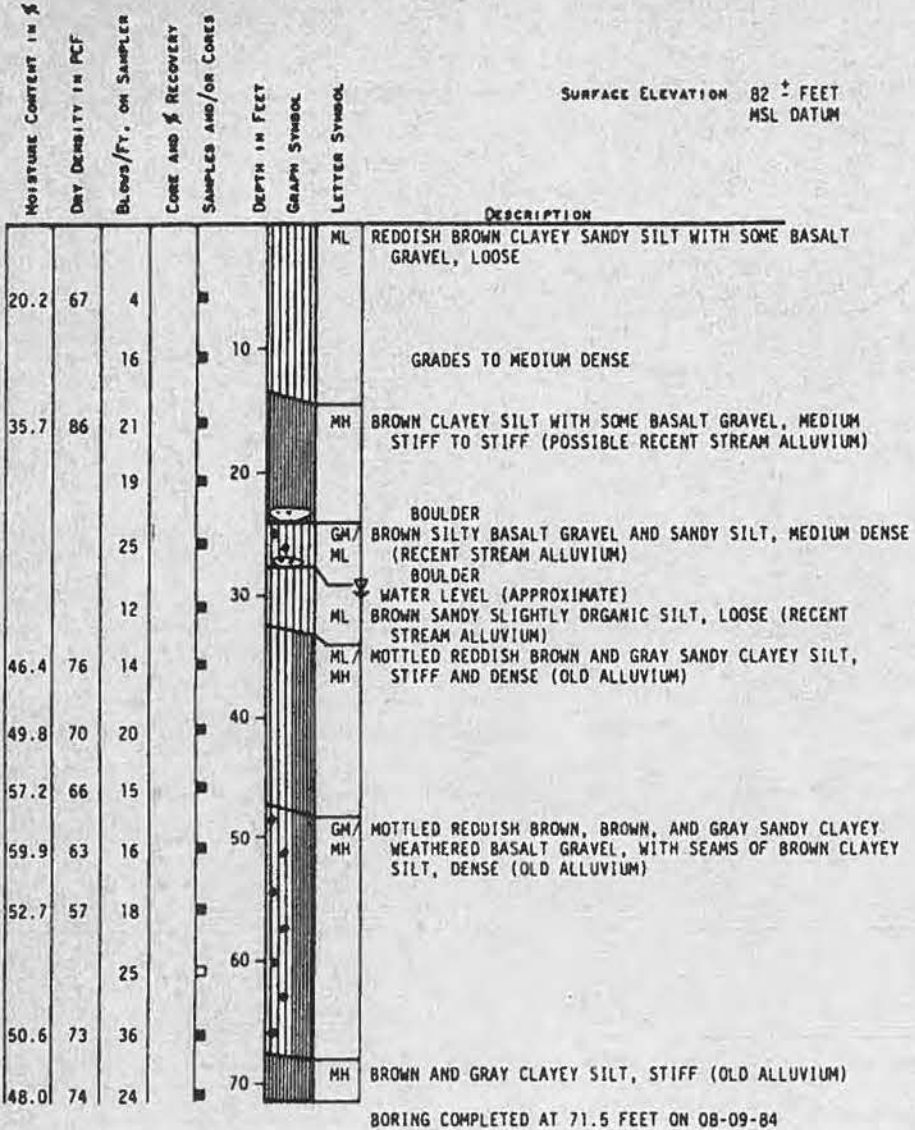
REDUCED PLAN
 (HALF SIZE)
 3 INCHES ON ORIGINAL PLAN



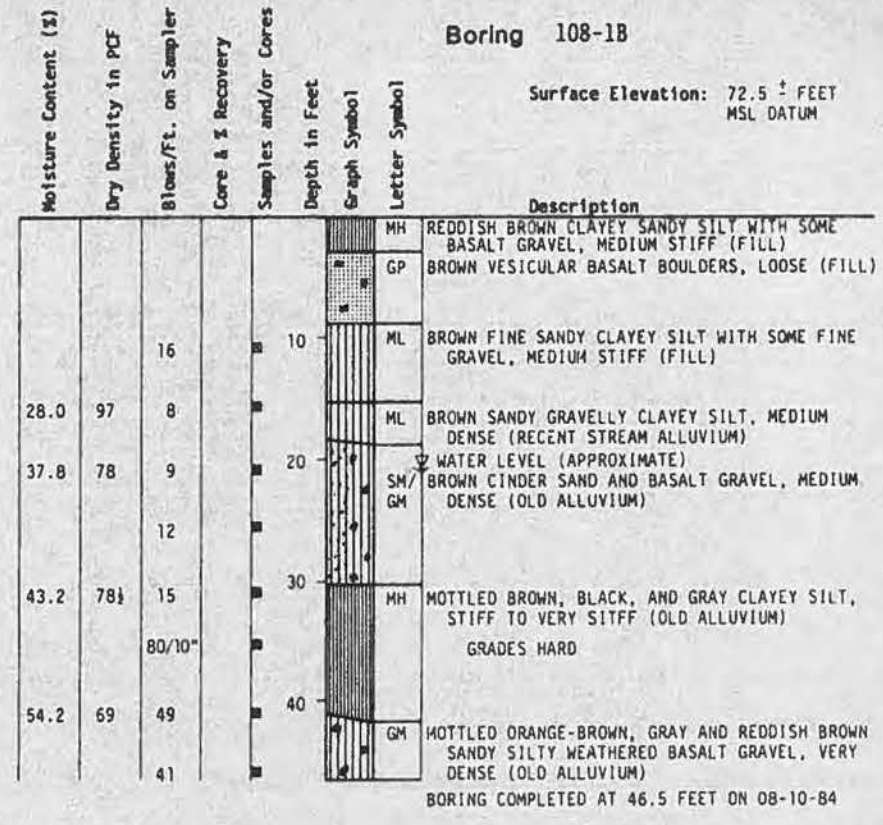
THIS WORK WAS PREPARED BY ME
 OR UNDER MY SUPERVISION
Theodore S. Kawahara

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
GEOMETRICS PLAN
 STA. 355 + 00 TO STA. 356 + 70
 INTERSTATE ROUTE H-3
 F.A.I. PROJECT NO. I-H3-1(54)
 SCALE: 1" = 40' DATE: SEPT. 1988
 SHEET NO. 3 OF 3 SHEETS

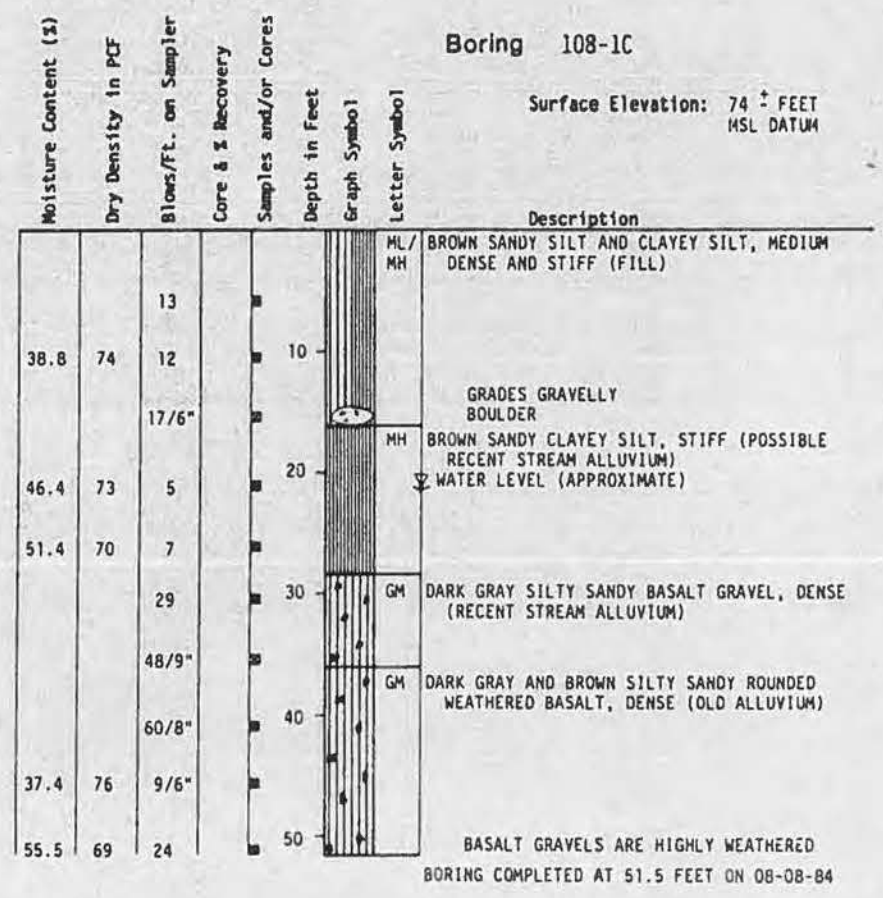
BORING 108-1A



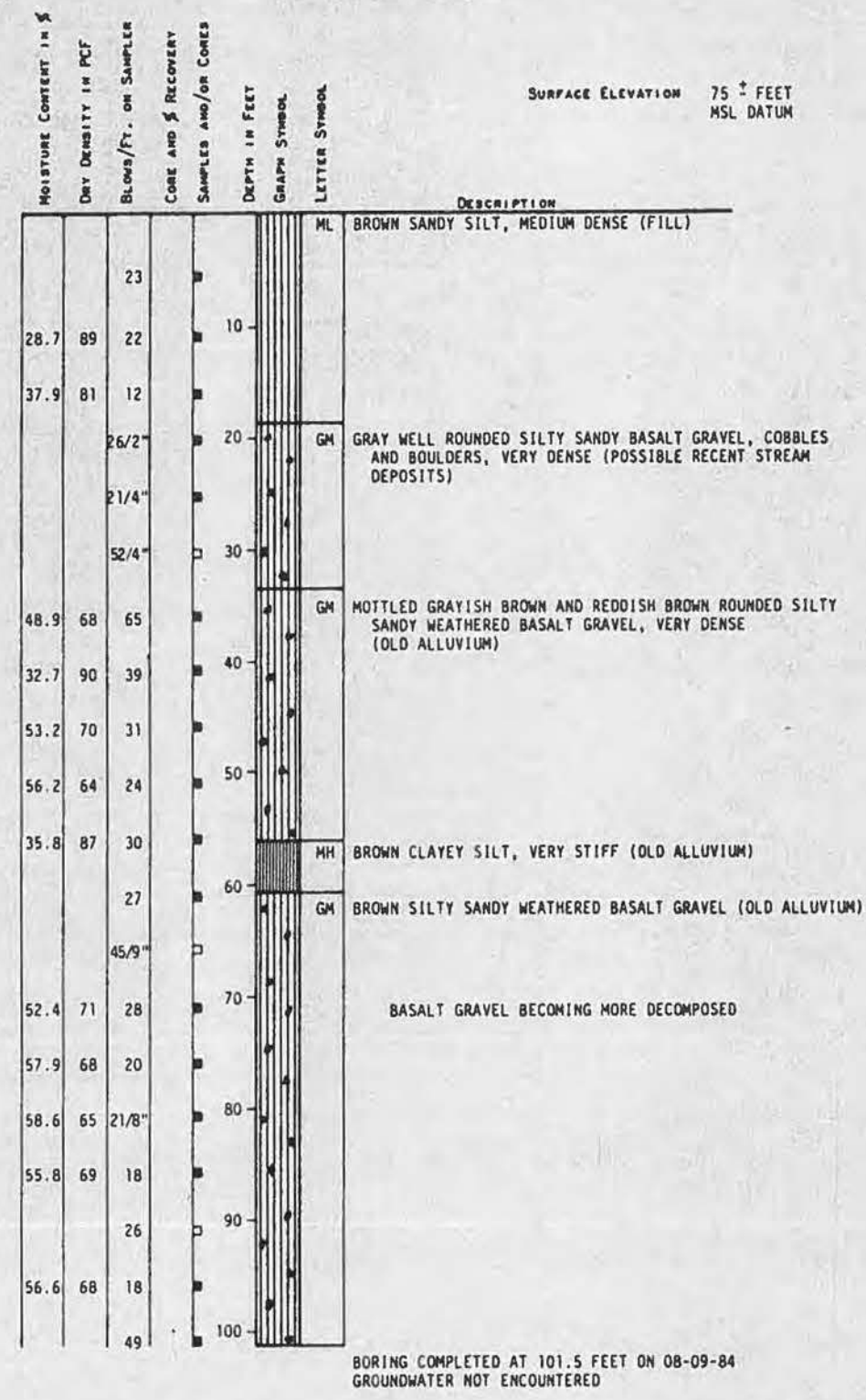
Boring 108-1B



Boring 108-1C



BORING 108-1D



NOTES:
 ■ -DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
 ⊠ -DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
 □ -DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
 I -DEPTH AND LENGTH OF CORE RUN
 DRIVING ENERGY- 300 -LB WEIGHT DROPPING 30 INCHES

LOG OF BORINGS



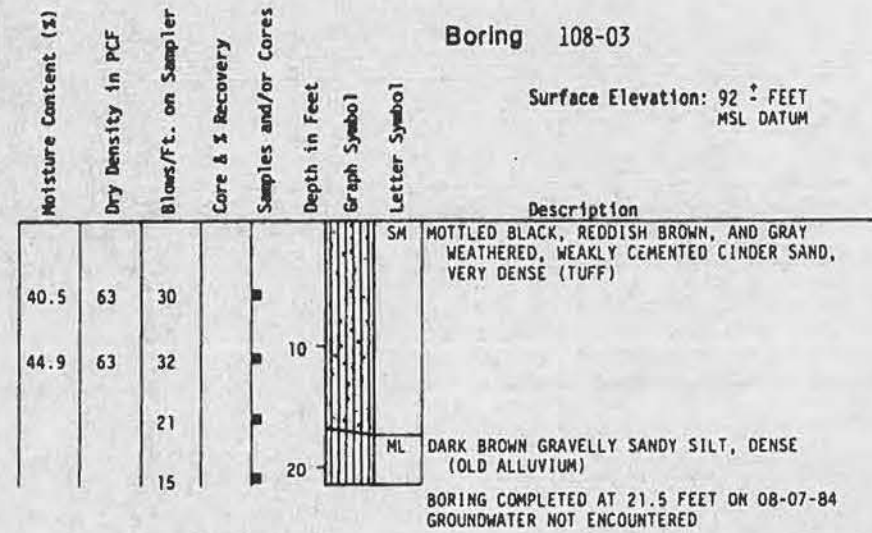
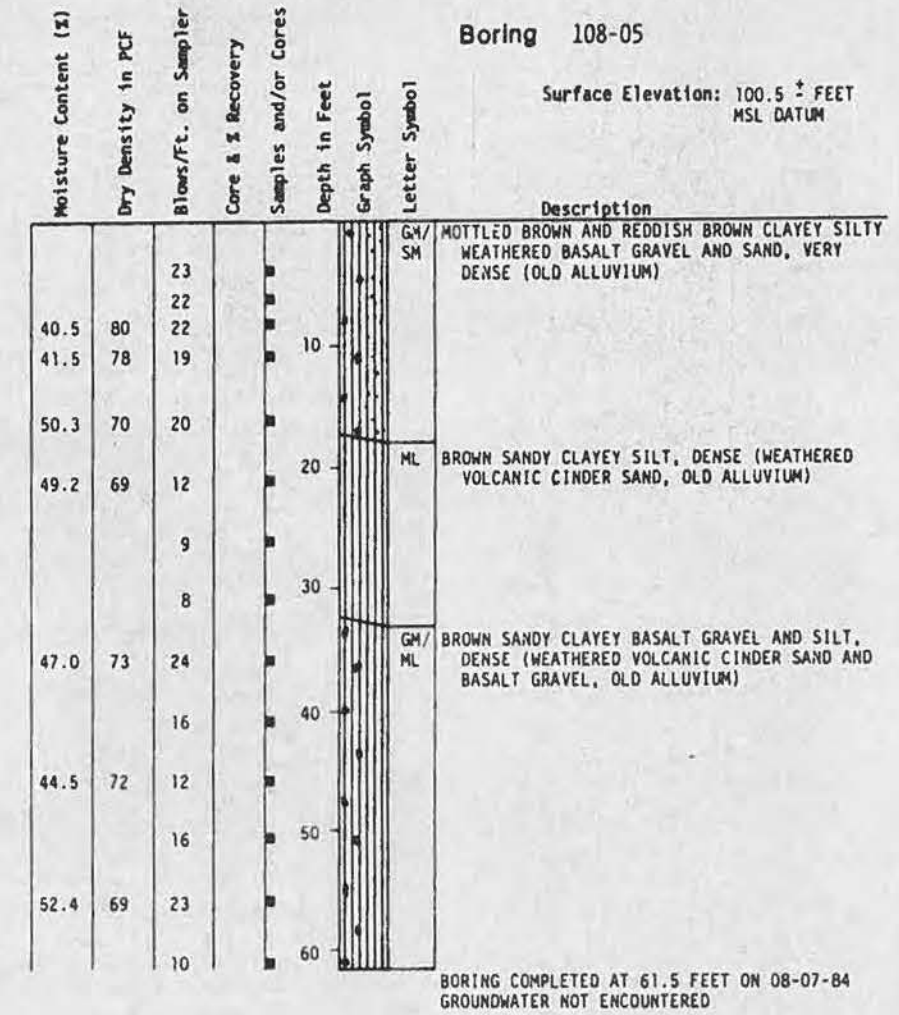
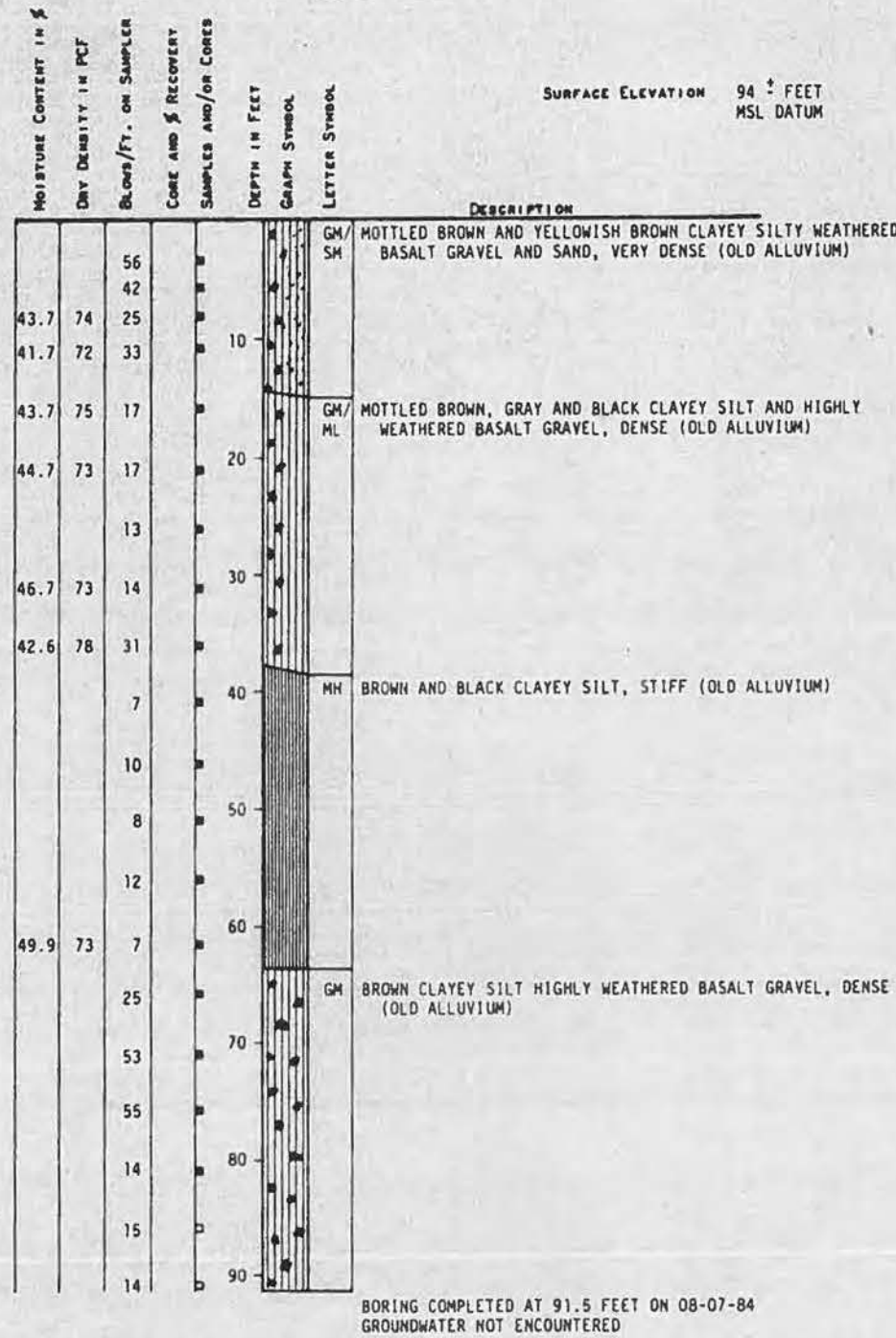
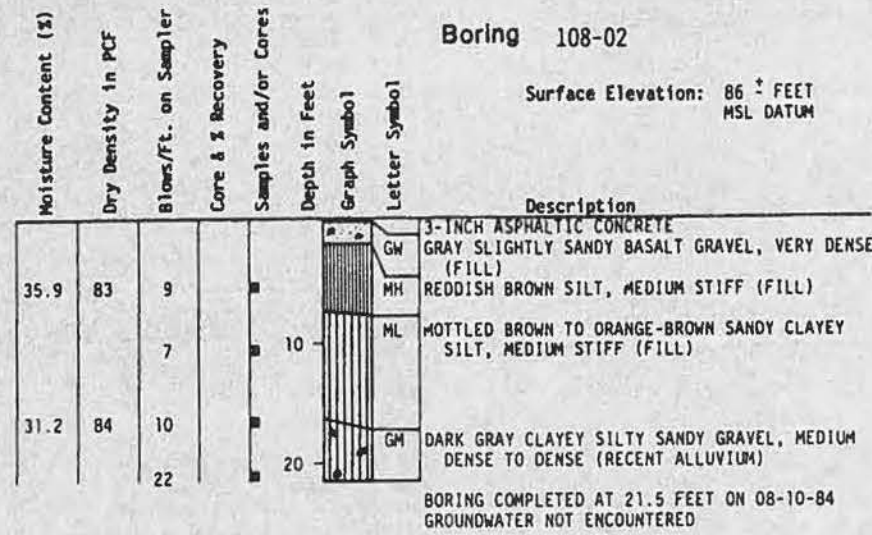
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

LOG OF BORINGS

INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. I-H3-1(54)

NOT TO SCALE DATE: SEPT 1988
SHEET No. 1 OF 3 SHEETS

BORING 108-04



NOTES:

- -DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
 - ⊗ -DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
 - -DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
 - I -DEPTH AND LENGTH OF CORE RUN
- DRIVING ENERGY- 300 -LB WEIGHT DROPPING 30 INCHES

LOG OF BORINGS



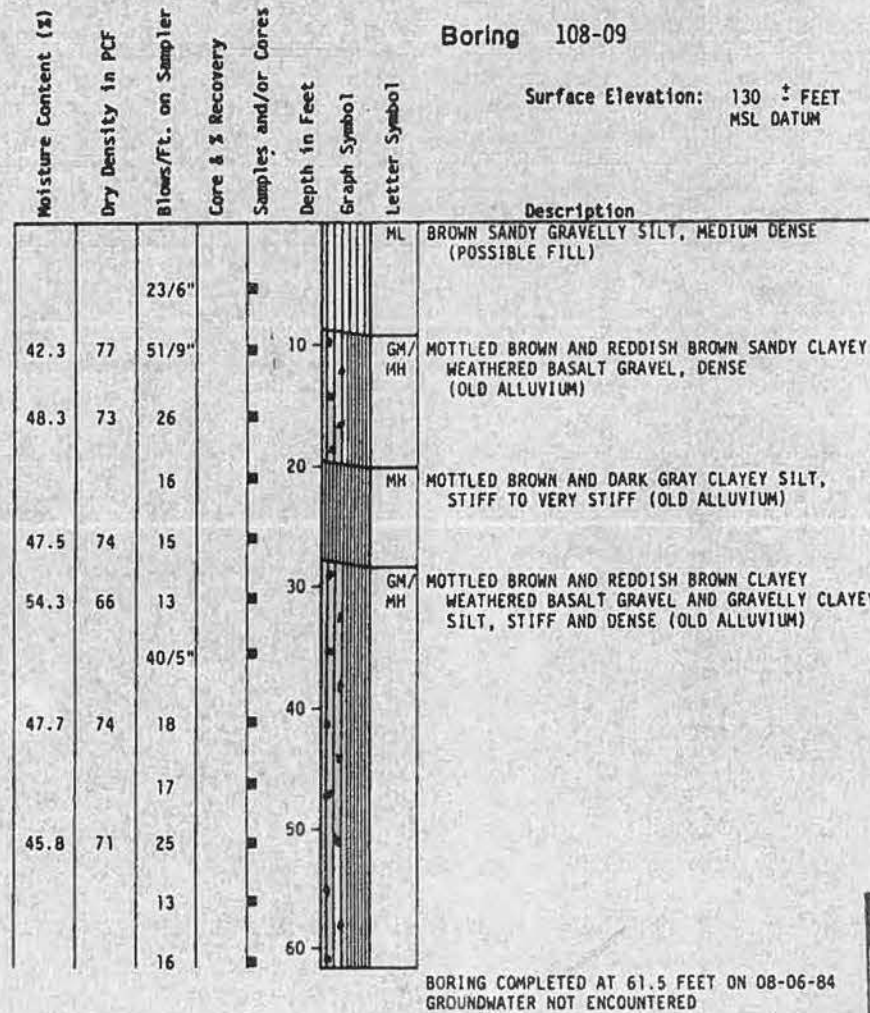
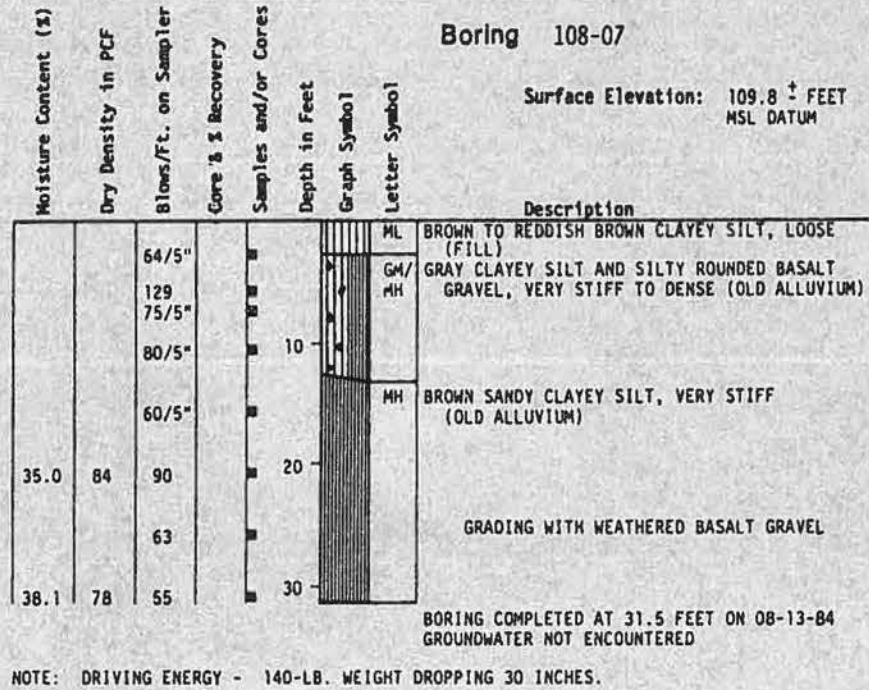
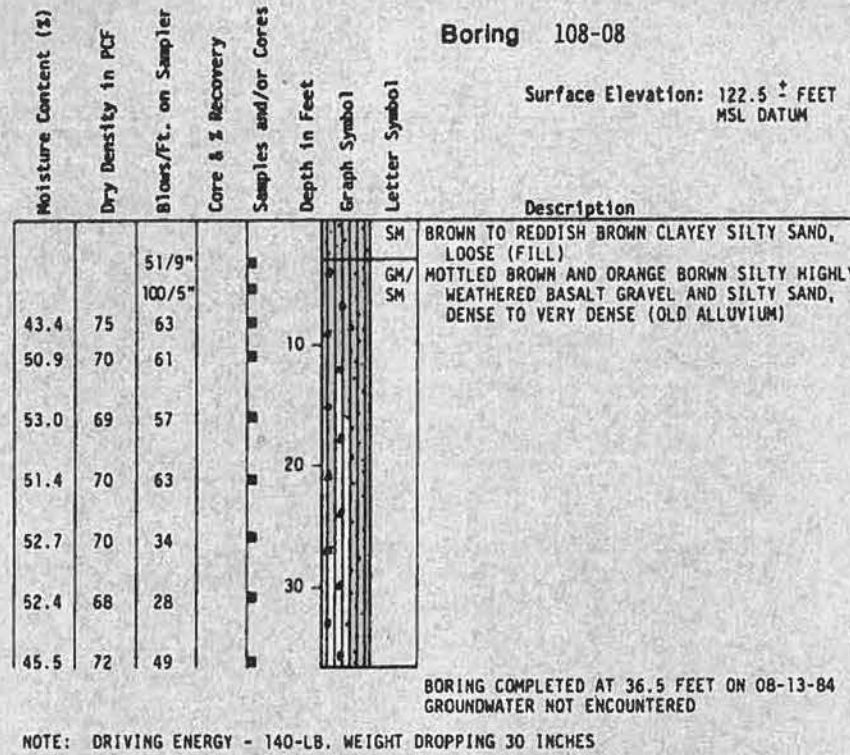
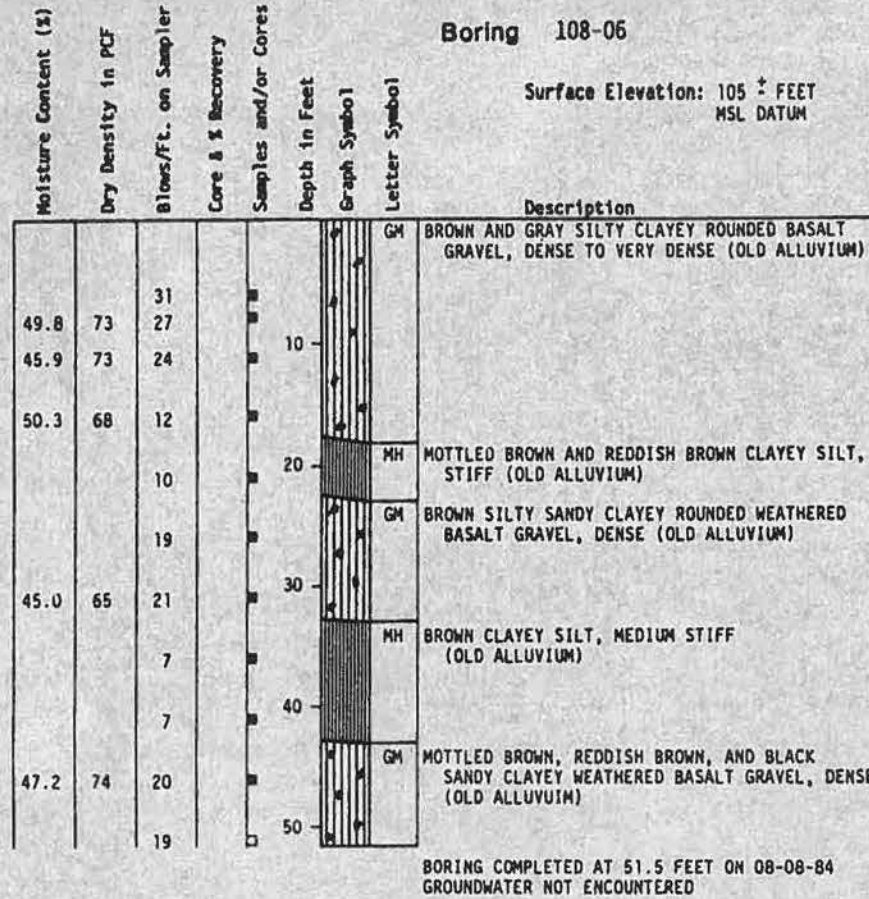
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
Sik-Kong Djou

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

LOG OF BORINGS

INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. I-H3-1(54)

NOT TO SCALE DATE: SEPT 1988
SHEET No. 2 OF 3 SHEETS



NOTES:
 ■ -DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
 ⊠ -DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
 □ -DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
 I -DEPTH AND LENGTH OF CORE RUN
 DRIVING ENERGY- 300 -LB WEIGHT DROPPING 30 INCHES

LOG OF BORINGS



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Shukong Djou

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

LOG OF BORINGS

INTERSTATE ROUTE H-3
 E.A.I. PROJECT NO. I-H3-1(54)

NOT TO SCALE DATE: SEPT. 1988
 SHEET No. 3 OF 3 SHEETS

INDEX TO DRAWINGS	
SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	STANDARD PLANS SUMMARY
3-10	TYPICAL SECTIONS & DETAILS
11	GENERAL LAYOUT PLAN
12-21	ROADWAY PLANS
22-29	PAYEMENT GRADE PLANS
30-38	GRADING PLANS
39-51	ROADWAY PROFILES, H-3, CAR & SRC
52-54	SE DIAGRAMS, H-3 & CAR
55-80	DRAINAGE PLANS & DETAILS
81-92	DRAINAGE SUMMARY
93-98	SIGNING & STRIPING PLANS H-3 & CAR
99-134	ELECTRICAL PLANS, 11.5KV & H-3
135-193	BORING LOCATION & LOGS
194-333	NHV BRIDGE NO. 3
334-393	NHV BRIDGE NO. 4
394-454	CROSS SECTIONS H-3
455-470	CROSS SECTIONS CAR & SRC

SEE SHEET 15-1 FOR SUPPLEMENTAL INDEX TO DRAWINGS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	1	470

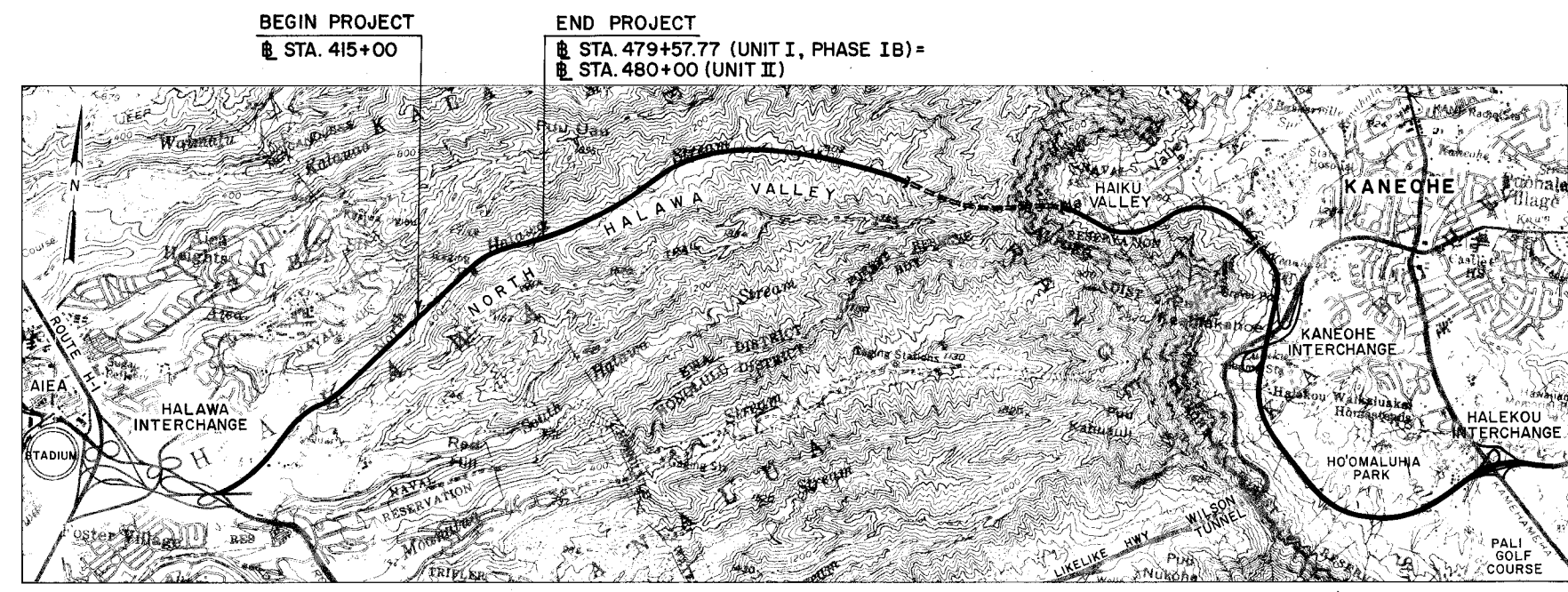
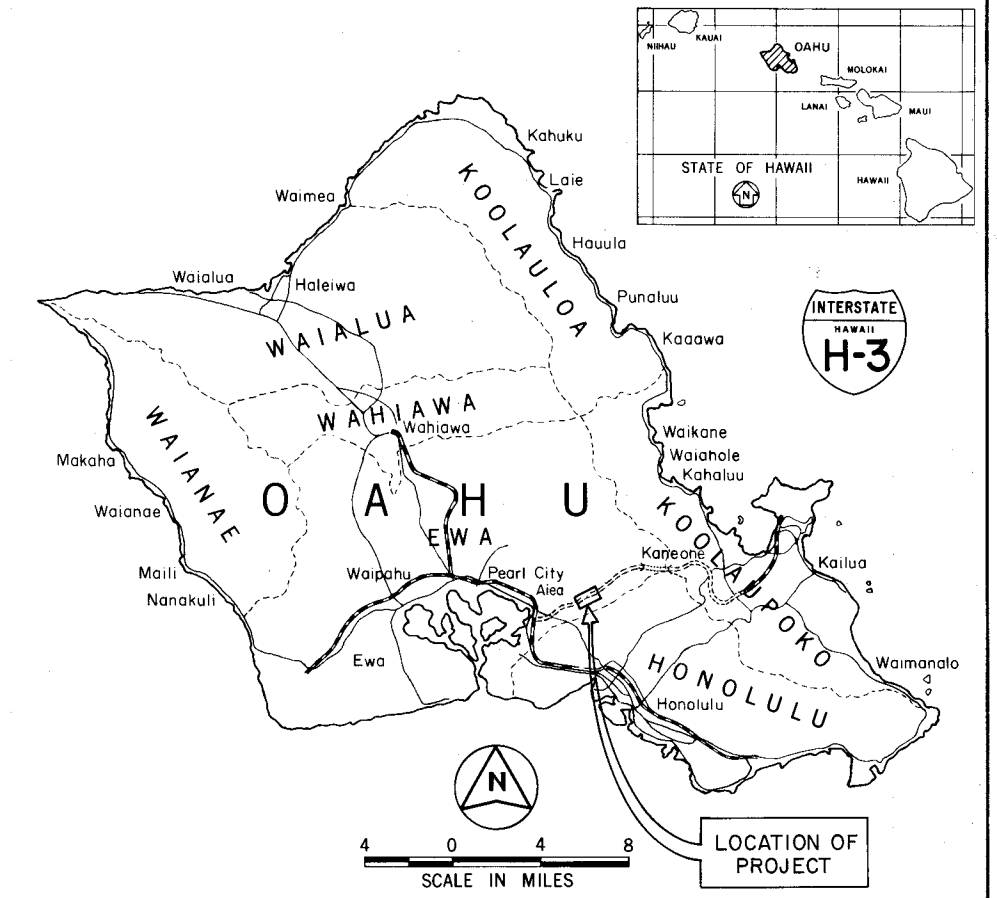
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

HONOLULU, HAWAII

AS BUILT

PLANS FOR
CONSTRUCTION OF A PORTION OF
INTERSTATE ROUTE H-3
NORTH HALAWA VALLEY HIGHWAY
UNIT I, PHASE IB
STA. 415+00 TO STA. 479+57.77

FEDERAL AID INTERSTATE PROJECT NO. I-H3-1(68)
DISTRICT OF EWA
ISLAND OF OAHU



LAYOUT PLAN

ROADWAY	= 0.139
NORTH HALAWA VALLEY BRIDGE NO. 2	= 0.967
NORTH HALAWA VALLEY BRIDGE NO. 4	= 0.117
TOTAL LENGTH OF PROJECT	= 1.223

--- FEDERAL AID INTERSTATE PROJECTS PREVIOUSLY CONSTRUCTED OR UNDER CONSTRUCTION

CHANGES MADE DURING CONSTRUCTION HAVE BEEN INCORPORATED ON THESE PLANS IN RED EXCEPT CHANGES IN THE ORIGINAL THEORETICAL QUANTITIES. FOR ACTUAL QUANTITIES, REFER TO PROJECT LEDGER AND/OR COMPUTATION BOOK.

RESIDENT ENGINEER *Wanda Lee* DATE 4/16/99

DESIGN CLASSIFICATION

DESIGN ADT (2008)	45,220
DHV	4,282
D	76/24
T	2.1%
T24	4.1%
V	60 MPH

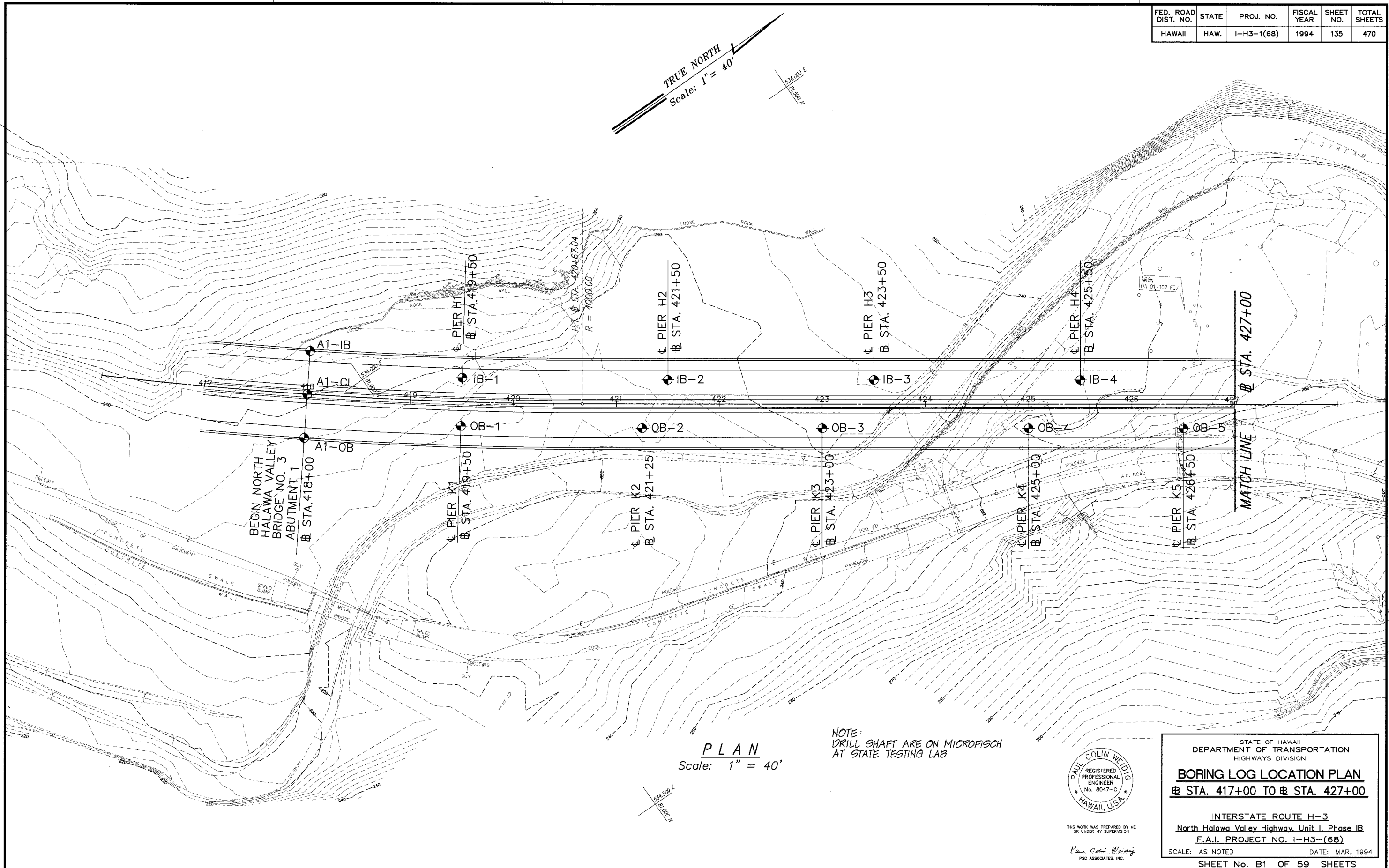
DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
APPROVED: *Michael A. Cook* 5-16-94
DIVISION ADMINISTRATOR DATE

DEPARTMENT OF TRANSPORTATION
STATE OF HAWAII
APPROVED: *T. Harano* 4/16/99
DIR. OF TRANSPORTATION DATE

Par En, Inc. dba Park Engineering DESIGNED BY
Kenneth W.G. Wong P. S. & E. BY
587-2241 PHONE
MAR 1994 DATE

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	135	470

TRUE NORTH
Scale: 1" = 40'



BEGIN NORTH HALAWA VALLEY BRIDGE NO. 3 ABUTMENT 1
STA. 418+00

MATCH LINE
STA. 427+00

PLAN
Scale: 1" = 40'

NOTE: DRILL SHAFT ARE ON MICROFISCH AT STATE TESTING LAB.



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
Paul Colin Weidig
PSC ASSOCIATES, INC.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOG LOCATION PLAN
STA. 417+00 TO STA. 427+00

INTERSTATE ROUTE H-3
North Halawa Valley Highway, Unit I, Phase IB
F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR, 1994
SHEET No. B1 OF 59 SHEETS

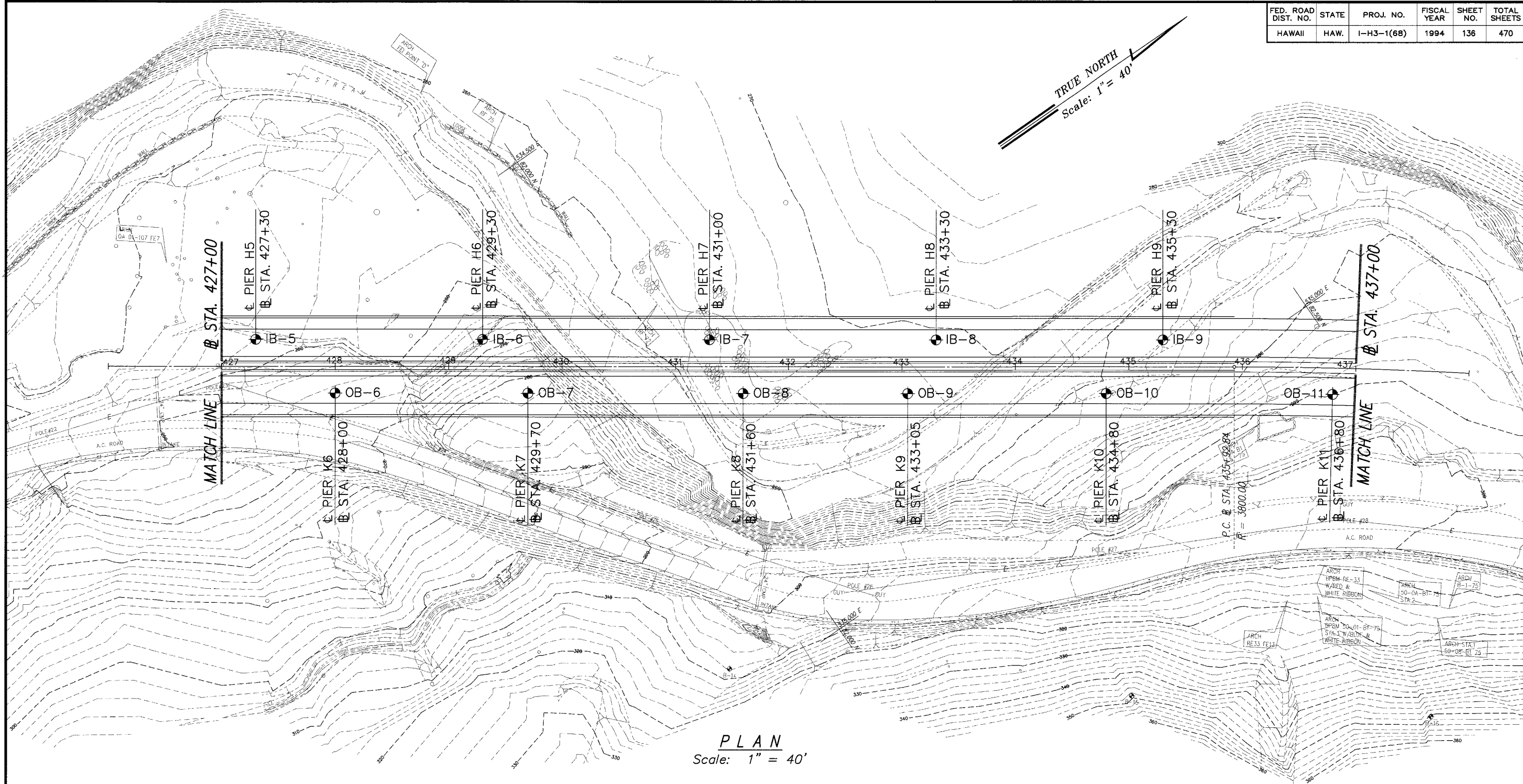
ORIGINAL PLAN	DATE
SURVEY PLOTTED BY	
TRACED BY	
DESIGNED BY	
QUANTITIES BY	
CHECKED BY	
No.	

ESTABLISHED 20' 50" BASE PT. 0.0

LIB: STATE DOT 3-V-3030 ECR0001 3/21/94 RES

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	136	470

TRUE NORTH
Scale: 1" = 40'



PLAN
Scale: 1" = 40'

DATE	_____
DESIGNED BY	_____
TRACED BY	_____
DESIGNED BY	_____
QUANTITIES BY	_____
CHECKED BY	_____

DATE: 05/26/94
SCALE: 1" = 40'



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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

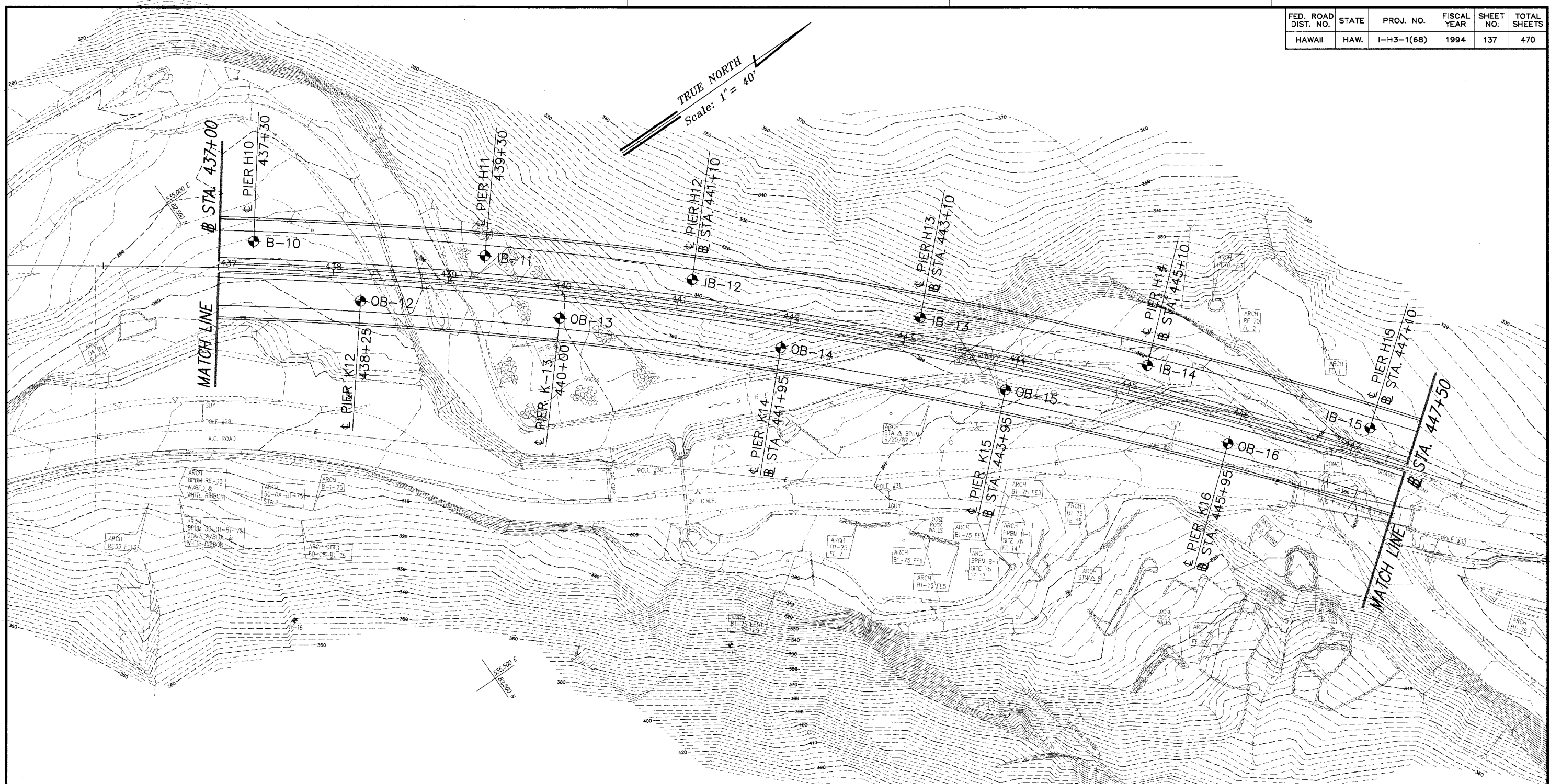
BORING LOG LOCATION PLAN
 STA. 427+00 TO STA. 437+00

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit I, Phase 1B
 F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B2 OF 59 SHEETS

U.S. STATE VDOT - 3-V-3030A
 BORING 3/21/94

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	137	470



PLAN
Scale: 1" = 40'

ORIGINAL PLAN	DATE
NOTED BY	
DESIGNED BY	
CHECKED BY	

REVISION: 55, 20, 57
PAGE 171 OF 510



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Paul Colin Weidig
PSC ASSOCIATES, INC.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOG LOCATION PLAN
B STA. 437+00 TO B STA. 447+50

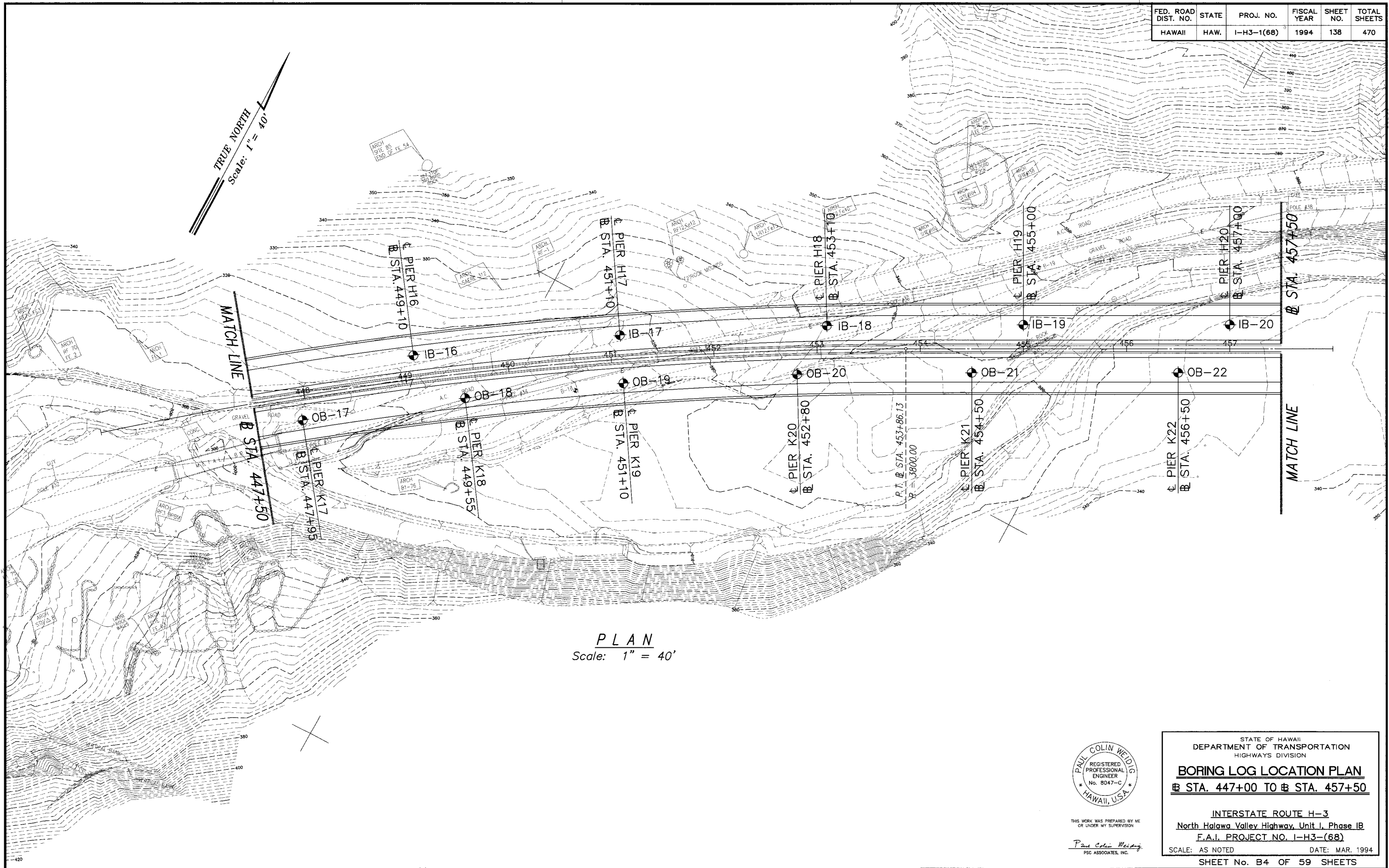
INTERSTATE ROUTE H-3
North Halawa Valley Highway, Unit I, Phase IB
F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994
SHEET No. B3 OF 59 SHEETS

LIB. STATE UDTA--JA-3030
BORING 3/21/94-REO

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	138	470

TRUE NORTH
Scale: 1" = 40'



PLAN
Scale: 1" = 40'

DATE	_____
DESIGNED BY	_____
TRACED BY	_____
QUANTITIES BY	_____
CHECKED BY	_____
NO.	_____



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Paul Colin Weidig
PSC ASSOCIATES, INC.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOG LOCATION PLAN
STA. 447+00 TO # STA. 457+50

INTERSTATE ROUTE H-3
North Halawa Valley Highway, Unit I, Phase IB
F.A.I. PROJECT NO. I-H3-(68)

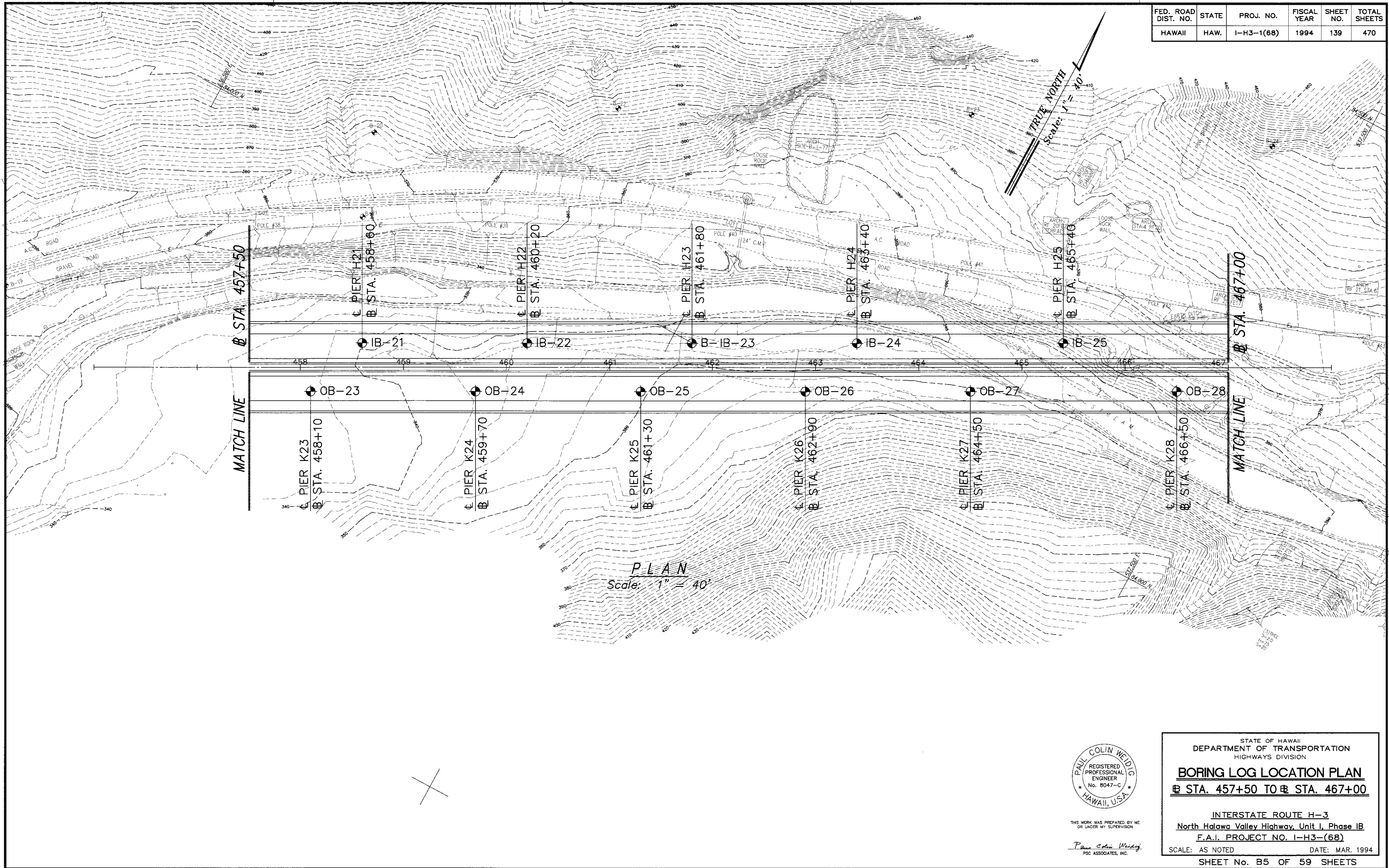
SCALE: AS NOTED DATE: MAR. 1994

SHEET No. B4 OF 59 SHEETS

VERTICAL: 20" = 3'
SCALE: 1" = 40'

LIB: STATE MOVTY-3A-3030
BORING- 3/21/94 RSD

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	139	470



PLAN
Scale: 1" = 40'

DATE	
SURVEY PLOTTED BY	
DESIGNED BY	
TRACED BY	
NOTE BOOK	
QUANTITIES BY	
CHECKED BY	
No.	



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Paul Colin Weidig
PSC ASSOCIATES, INC.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOG LOCATION PLAN
@ STA. 457+50 TO @ STA. 467+00

INTERSTATE ROUTE H-3
North Halawa Valley Highway, Unit I, Phase IB
F.A.I. PROJECT NO. I-H3-(68)

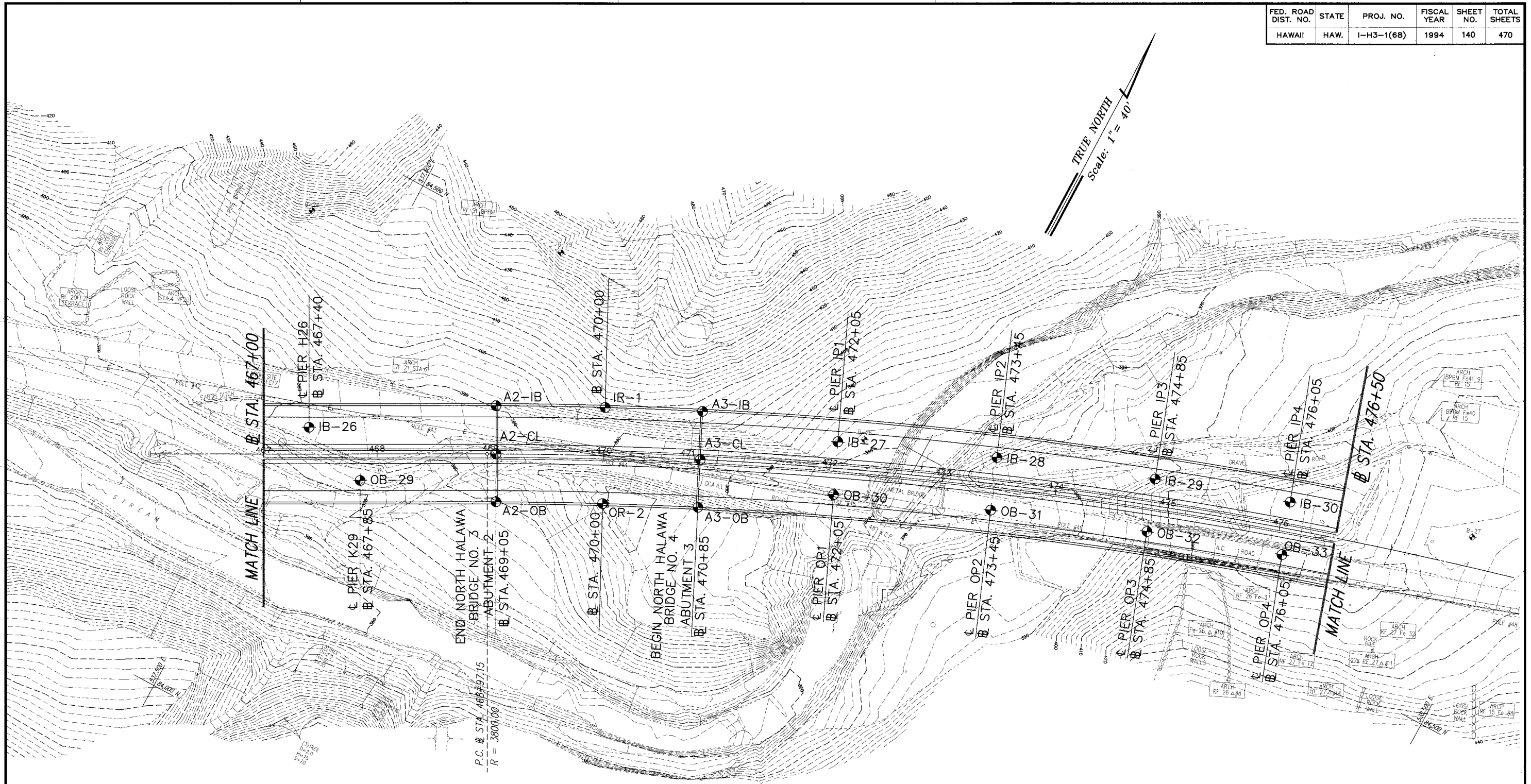
SCALE: AS NOTED DATE: MAR. 1994

SHEET No. B5 OF 59 SHEETS

DATE: 2/16/94
SCALE: 1" = 40'

LIB. STATE WOTV--3A-3037
BORINGS 3/21/94

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	140	470



TRUE NORTH
Scale: 1" = 40'

PLAN
Scale: 1" = 40'

ORIGINAL PLAN	DATE
DESIGNED BY	
QUANTITIES BY	
CHECKED BY	

FOOTED: 26' 18" 37"
SCALE: 1" = 50'



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PSC ASSOCIATES, INC.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

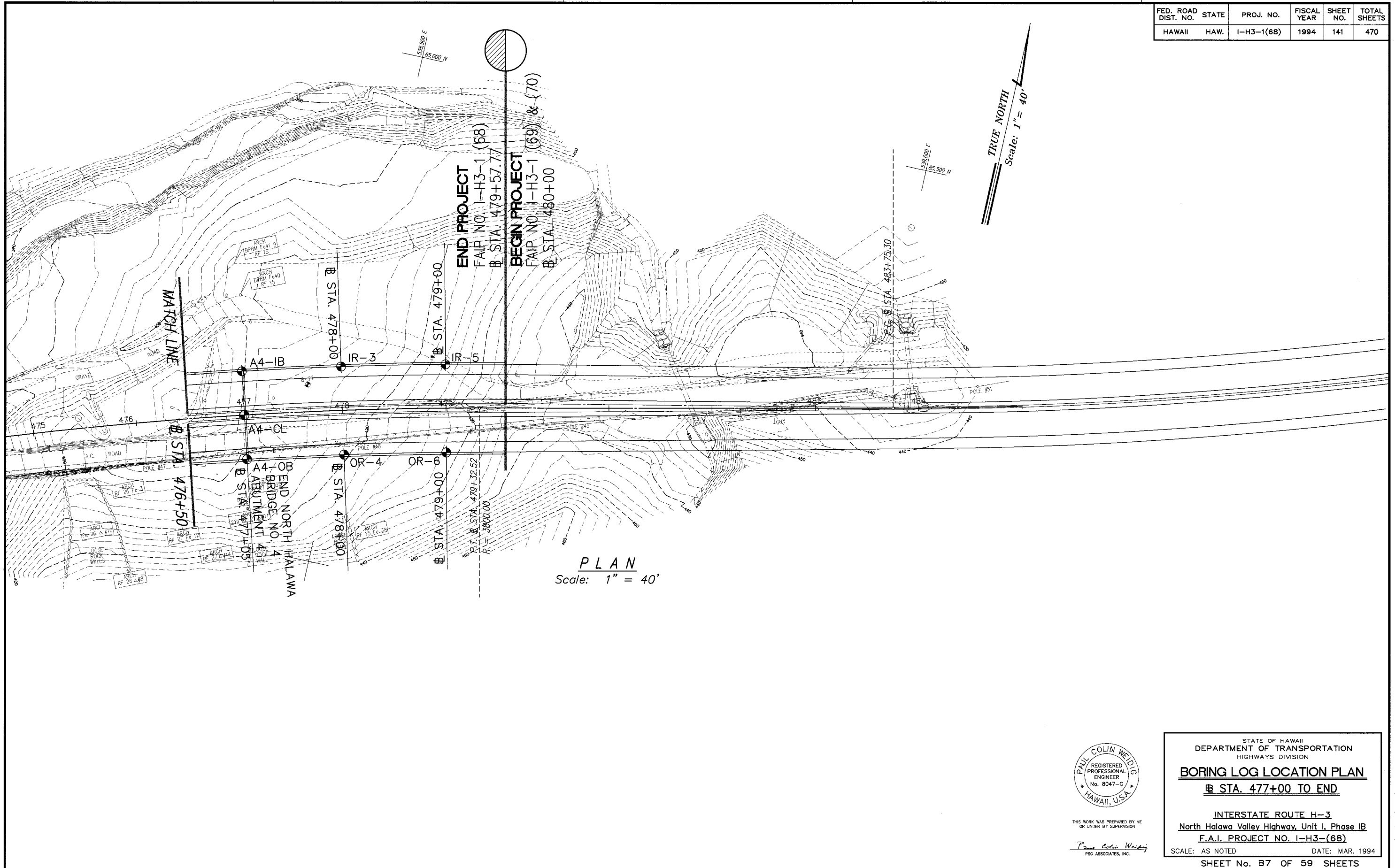
BORING LOG LOCATION PLAN
STA. 467+00 TO # STA. 477+00

INTERSTATE ROUTE H-3
North Halawa Valley Highway, Unit I, Phase IB
F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994
SHEET No. B6 OF 59 SHEETS

LB: STATE/DOIT--JAN3039
BORING LOG 5/21/94 REC

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	141	470



PLAN
Scale: 1" = 40'

TRUE NORTH
Scale: 1" = 40'

NO.	DATE	BY

ESTATED: 19' 44' 57"
BASE PT. 0.0



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Paul Colin Weidig
PSC ASSOCIATES, INC.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOG LOCATION PLAN
STATION 477+00 TO END

INTERSTATE ROUTE H-3
North Halawa Valley Highway, Unit 1, Phase 1B
F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994

SHEET No. B7 OF 59 SHEETS

LIB: STATE VDOT/JV-3032/REG
BORING 3/21/94

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	142	470

SAMPLE TYPE		OTHER LABORATORY TESTS			
BK - Bulk	DM - Dames & Moore	CN - Consolidation	PR - Proctor Compaction		
CB - Core Barrel	SP - Standard Penetration	DS - Direct Shear	SA - Sieve Analysis		
DN - Denison Barrel	ST - Shelby Tube	PI - Atterberg Limits	UC - Unconfined Compression		

BORING LOG LEGEND

MAJOR DIVISIONS		SYMBOLS		TYPICAL DESCRIPTIONS
		ICON	CODE	
COARSE-GRAINED SOILS More than 50% of material is larger than No. 200 Sieve size	GRAVEL AND GRAVELLY SOILS Less than 50% of coarse fraction passes the No. 4 Sieve	CLEAN GRAVELS	GW	Well-graded gravels, gravel - sand mixtures, little or no fines
		SILTY OR CLAYEY GRAVELS	GM	Silty gravels, gravel - sand - silt mixtures
		CLAYEY GRAVELS	GC	Clayey gravels, gravel - sand - clay mixtures
	SAND AND SANDY SOILS At least 50% of coarse fraction passes the No. 4 Sieve	CLEAN SANDS	SW	Well-graded sands, gravelly sands, little or no fines
		SILTY OR CLAYEY SANDS	SM	Silty sands, sand - silt mixtures
		CLAYEY SANDS	SC	Clayey sands, sand - clay mixtures
FINE GRAINED SOILS More than 50% of material is smaller than No. 200 Sieve size	SILTS AND CLAYS Liquid limit is less than 50	Plasticity index is above "A" Line	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		Plasticity index is below "A" Line	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		Plasticity index is above "A" Line	CH	Inorganic clays of high plasticity
	SILTS AND CLAYS Liquid limit is greater than 50	Plasticity index is below "A" Line	MH	Inorganic silts, micaceous or diatomaceous fine sand or silty soils
		Plasticity index is above "A" Line	OH	Organic clays of medium to high plasticity, organic silts
			Pt	Peat, humus, swamp soils with high organic contents

UNIFIED SOIL CLASSIFICATION SYSTEM

PSC ASSOCIATES, INC. SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS	INTERSTATE ROUTE H-3, NORTH HALAWA VALLEY HIGHWAY Unit I, Phase IB, North Halawa Valley, Oahu, Hawaii	
	DATE: January, 1994	PROJECT NO. 93110.10

BORING LOCATION: Center Sta. 418+00		DRILLER: GeoLabs-Hawaii		BORING A1-CL						
BORING ELEVATION: +240.5 ft		LOGGED BY: J. Brock/H. Clark								
DATE(S) DRILLED: 06/23/93 06/24/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
DS PI PR	80	47.7				BK-1			MH	CLAYEY, SANDY SILT, reddish-brown, stiff, dry to moist, fine to coarse sand - Alluvium
UC	77	38.5			32	DM-2	5		CH	SILTY CLAY, dark brown, hard, dry to moist - Alluvium
	100	28.2			42	DM-3	10		GM GC	SILTY, CLAYEY COBBLES AND BOULDERS, gray-brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
	76	43.8			90	DM-4	15		SC GC	CLAYEY COBBLES AND BOULDERS, gray-brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
UC	69	53.0	42			CB-5	20		GC	CLAYEY COBBLES AND BOULDERS, gray-brown, very dense, wet to saturated, fine to coarse sand, fine to coarse gravel - Alluvium
			73			CB-6	25			SAPROLITE, dark green, soft, weak, highly to extremely weathered
										greenish-brown to brown-gray
										greenish-brown to gray-green and orange-brown mottled

BORING LOCATION: Center Sta. 418+00		DRILLER: GeoLabs-Hawaii		BORING A1-CL						
BORING ELEVATION: +240.5 ft		LOGGED BY: J. Brock/H. Clark								
DATE(S) DRILLED: 06/23/93 06/24/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-7	30			greenish-brown to reddish-brown, soft, weak to moderately strong
			75			CB-8	35			greenish-brown to brown-gray, soft to moderately hard, highly weathered
			78			CB-9	40			light gray, highly weathered
			75			CB-10	45			gray to gray-brown, moderately hard
			82			CB-11	50			gray to dark brown, soft to moderately hard
UC	157	1.8	100			CB-11	50			gray to dark brown, soft to moderately hard

BORING LOCATION: Center Sta. 418+00		DRILLER: GeoLabs-Hawaii		BORING A1-CL						
BORING ELEVATION: +240.5 ft		LOGGED BY: J. Brock/H. Clark								
DATE(S) DRILLED: 06/23/93 06/24/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100			CB-12	55			gray to gray-brown, moderately hard
			99			CB-13	60			gray-green to gray-brown and reddish-brown to yellowish-brown, soft to moderately hard, highly to extremely weathered, dark green, highly weathered, vesicular
							65			Bottom of Boring No. A1-CL @ 63.0 ft.
							70			
							75			

ORIGINAL PLAN	DATE
SURVEY PLOTTED BY	
TRACED BY	
DESIGNED BY	
QUANTITIES BY	
CHECKED BY	
NO.	



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit I, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994

SHEET No. 88 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	143	470

BORING LOCATION: 23.5 ft. Lt. Sta. 418+00		DRILLER: GeoLabs-Hawaii		BORING A1-IB						
BORING ELEVATION: +243.4 ft		LOGGED BY: E. Menor								
DATE(S) DRILLED: 07/08/93 07/13/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
CN PI	72	42.4			27	DM-1	0		MH	CLAYEY SILT, dark reddish-brown, very stiff, dry, with finely disseminated organic matter - Alluvium
					87	DM-2	5		GM GC	CLAYEY, SILTY GRAVEL, dark reddish-brown, loose to medium dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
SG		8.6			30/4*	DM-3	10		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, dark gray-brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium brown to light brown
						CB-4	15			light brown to orange-brown, wet to saturated
						CB-5	20			mottled brown and light brown, saturated
							25			SAPROLITE, green-gray, soft, weak, highly to extremely weathered, very closely fractured

BORING LOCATION: 23.5 ft. Lt. Sta. 418+00		DRILLER: GeoLabs-Hawaii		BORING A1-IB						
BORING ELEVATION: +243.4 ft		LOGGED BY: E. Menor								
DATE(S) DRILLED: 07/08/93 07/13/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-11	40			dark brown to brownish-gray
UC	153	1.3	81			CB-12	55			dark brown to greenish-gray
						CB-13	80			greenish-gray, weak to moderately strong, highly weathered, vesicular, olivine crystals visible in vesicles
							85			Bottom of Boring No. A1-IB ? 85.0 ft.
							70			
							75			

BORING LOCATION: 23.5 ft. Rt. Sta. 418+00		DRILLER: GeoLabs-Hawaii		BORING A1-OB						
BORING ELEVATION: +237.9 ft		LOGGED BY: E. Menor								
DATE(S) DRILLED: 07/06/93 07/07/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-8	0			gray-brown
						CB-9	30			
						SP-10	35			gray, soft to moderately hard, weak to moderately strong
						CB-11	45			dark gray to greenish-gray, weak
						CB-12	40			
						CB-13	45			dark gray to gray-brown, soft
							60			

BORING LOCATION: Center Sta. 469+05		DRILLER: GeoLabs-Hawaii		BORING A2-CL						
BORING ELEVATION: +384.9 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 06/05/93 06/08/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						DM-1	5		GW	SANDY GRAVEL, gray-brown, dense, moist, fine to coarse sand, fine to coarse gravel - Road Bed Fill
UC	85	50.0				DM-1	31		CH	SILTY CLAY, medium brown to dark gray-brown, stiff, moist - Alluvium
						DM-2	10		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, dark gray-brown to gray, dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium gray-brown, dense to very dense, moist to wet
						DM-3	16			
UC	86	55.0				DM-4	18		CH	SILTY, SANDY, GRAVELLY CLAY, gray-brown, soft to stiff, wet to saturated, fine to coarse sand, fine to coarse gravel - Alluvium
						DM-5	25		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown,

BORING LOCATION: 23.5 ft. Lt. Sta. 418+00		DRILLER: GeoLabs-Hawaii		BORING A1-IB						
BORING ELEVATION: +243.4 ft		LOGGED BY: E. Menor								
DATE(S) DRILLED: 07/08/93 07/13/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-6	40			gray to light gray, highly weathered
UC	134	12	80			CB-7	30			green-gray to dark gray, highly to extremely weathered
						CB-8	35			dark greenish-gray
						CB-9	40			greenish-gray
						CB-10	45			
							50			

BORING LOCATION: 23.5 ft. Rt. Sta. 418+00		DRILLER: GeoLabs-Hawaii		BORING A1-OB						
BORING ELEVATION: +237.9 ft		LOGGED BY: E. Menor								
DATE(S) DRILLED: 07/06/93 07/07/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						DM-1	5		MH	CLAYEY SILT, reddish-brown, dry to moist, stiff - Alluvium
CN PI	80	38.5				DM-2	10		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, reddish-brown, dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
						SP-3	20/8* 23/8*		GM GC	SILTY, CLAYEY GRAVEL, gray-brown to light reddish-brown, moist, dense, fine to coarse sand, fine to coarse gravel - Alluvium
						DM-4	41			SAPROLITE, gray-brown, soft, weak, highly weathered, vesicular, very closely fractured
UC	53	43.6				DM-5	73			gray-brown
						DM-6	86			dark gray and brown mottled
						CB-7	25			

BORING LOCATION: 23.5 ft. Rt. Sta. 418+00		DRILLER: GeoLabs-Hawaii		BORING A1-OB						
BORING ELEVATION: +237.9 ft		LOGGED BY: E. Menor								
DATE(S) DRILLED: 07/06/93 07/07/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-14	80			gray, soft to moderately hard, weak to moderately strong
						CB-15	70			ASH AND CINDERS, greenish-gray, soft, weak, highly weathered
						CB-16	60			SAPROLITE, dark gray to greenish-gray, soft, weak, highly weathered, vesicular, very closely fractured
						CB-17	65			dark brown, soft to moderately hard, weak to moderately strong
							70			
							75			Bottom of Boring No. A1-OB ? 70.0 ft

DATE: _____
 SURVEY PLANNED BY: _____
 DESIGNED BY: _____
 CHECKED BY: _____
 ORIGINAL PLAN: _____
 NOTE BOOK: _____
 No. _____



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit I, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B9 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	144	470

BORING LOCATION: Center Sta. 489+05		DRILLER: GeoLabs-Hawaii		BORING A2-CL						
BORING ELEVATION: +384.9 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 06/05/93 06/08/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	91	18.9			72/6*	DM-6	30			dense to very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
					67	DM-7	35			SAPROLITE, gray-brown, soft, weak, highly weathered, very closely fractured dark gray-green
	84	36.4			107	DM-8	40			brown
	87	34.5			120/4*	DM-9	45			light gray
							50			

BORING LOCATION: Center Sta. 489+05		DRILLER: GeoLabs-Hawaii		BORING A2-CL						
BORING ELEVATION: +384.9 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 06/05/93 06/08/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
DS	76	46.6			100/2*	DM-15	80			gray-brown, highly weathered
					80	SP-16	80			gray-brown to dark brown and violet mottled
		38.9					85			gray-brown
		38.1			111/9*	SP-17	85			gray-brown
					70/3*	SP-18	90			BASALT, gray-brown, moderately hard, moderately strong, highly to moderately weathered, closely fractured, vesicular - 'A'
		40.2			98/6*	SP-19	95			soft to moderately hard, moderately weathered
							100			

BORING LOCATION: 23.5 ft. Lt. Sta. 489+05		DRILLER: GeoLabs-Hawaii		BORING A2-IB						
BORING ELEVATION: +389.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/17/93 08/19/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							5		GC	CLAYEY GRAVEL, gray-brown, dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
CN	70	52.0			26	DM-1	5		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, reddish-brown, dense to very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
UC	75	39.2			47	DM-2	10			wet to saturated
UC	64	59.2			29	DM-3	15			saturated
							20			
							25			

BORING LOCATION: 23.5 ft. Lt. Sta. 489+05		DRILLER: GeoLabs-Hawaii		BORING A2-IB						
BORING ELEVATION: +389.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/17/93 08/19/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100				55			light gray
UC	109	20.1	95				60			gray, weak to friable, extremely weathered, vesicular
			95				65			medium gray, weak, highly weathered, very closely fractured, olivine crystals visible in vesicles
			70				70			light gray, hard, moderately strong, moderately weathered, closely fractured
UC	155	2.5	80				75			light gray, soft, weak, moderately to highly weathered

BORING LOCATION: Center Sta. 489+05		DRILLER: GeoLabs-Hawaii		BORING A2-CL						
BORING ELEVATION: +384.9 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 06/05/93 06/08/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	80	41.1			138/8*	DM-10	55			brownish-gray to dark brown
UC	78	43.1			126	DM-11	60			gray-brown
DS	81	37.8			75/6*	DM-12	60			
		67.8			78/6*	DM-13	65			
DS	81	40.7			122/6*	DM-14	70			grayish-green, highly to extremely weathered
							75			

BORING LOCATION: Center Sta. 489+05		DRILLER: GeoLabs-Hawaii		BORING A2-CL						
BORING ELEVATION: +384.9 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 06/05/93 06/08/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
		37.2			74/8*	SP-20	105			Bottom of Boring No. A2-CL ? 101.0 ft.
							110			
							115			
							120			
							125			

BORING LOCATION: 23.5 ft. Lt. Sta. 489+05		DRILLER: GeoLabs-Hawaii		BORING A2-IB						
BORING ELEVATION: +389.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/17/93 08/19/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	66	52.1					30			
							35			SAPROLITE, gray to brown, soft, weak to friable, extremely weathered, very closely fractured
							40			brownish-gray, weak, highly weathered
							45			weak to friable, extremely weathered, vesicular
							50			medium to light gray, weak, highly weathered, closely fractured

SURVEY PLOTTED BY	DATE
DESIGNED BY	
TRACED BY	
NOTE BOOK	
QUANTITIES BY	
CHECKED BY	



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Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit I, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994

SHEET No. B10 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1-H3-1(68)	1994	145	470

BORING LOCATION: 23.5 ft. Lt. Sta. 489+05		DRILLER: GeoLabs-Hawaii		BORING A2-1B						
BORING ELEVATION: +389.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/17/93 08/19/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC 79	32.3	82				CB-16	80			CLINKER, tan, soft, weak, highly weathered
					100	CB-17	85			ASH AND CINDERS, tan to dark gray, soft, weak, highly weathered, welded texture
					100	CB-18	90			ASH, tan to dark gray, soft, weak, highly weathered, welded texture
UC 184	2.9	100	80			CB-19	95			BASALT, medium gray, hard, strong, slightly weathered, fractured, vesicular - 'A'a
					80	CB-20	100			brownish-gray to dark gray, soft, friable, highly weathered, very closely fractured - 'A'a

BORING LOCATION: 23.5 ft. Rt. Sta. 489+05		DRILLER: GeoLabs-Hawaii		BORING A2-0B						
BORING ELEVATION: +379.4 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/18/93 08/20/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	86	54.5			24	DM-1	5			SILTY, CLAYEY GRAVEL, reddish-brown and reddish-orange mottled, dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
										very dense
SA 66	57.9				32	DM-2	10			
			40			CB-3	15			yellowish-gray, wet to saturated
			84			CB-4	20			gray, dense, saturated
			57			CB-5	25			
			73			CB-6	25			SAPROLITE, gray, black and

BORING LOCATION: 23.5 ft. Rt. Sta. 489+05		DRILLER: GeoLabs-Hawaii		BORING A2-0B						
BORING ELEVATION: +379.4 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/18/93 08/20/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							80			green, gray, black, orange and yellow mottled
							100			red, brown, green and gray mottled
UC 83	58.0	87				CB-14	65			orange, gray and black mottled, with thin ash partings
UC 90	12.4	98				CB-15	70			gray, black and brown mottled
							76			purple, black and brown mottled, closely fractured

BORING LOCATION: 23.5 ft. Rt. Sta. 489+05		DRILLER: GeoLabs-Hawaii		BORING A2-0B						
BORING ELEVATION: +379.4 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/18/93 08/20/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										highly weathered, vesicular - 'A'a
UC 123	10.2	72	70			CB-22	105			gray to black, hard, moderately weathered
UC 79	28.5	82	80			CB-23	110			reddish-gray, black and brown mottled
							115			Bottom of Boring No. A2-0B ? 118.0 ft.
							120			
							125			

BORING LOCATION: 23.5 ft. Lt. Sta. 489+05		DRILLER: GeoLabs-Hawaii		BORING A2-1B						
BORING ELEVATION: +389.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/17/93 08/19/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							105			Bottom of Boring No. A2-1B ? 100.5 ft.
							110			
							115			
							120			
							125			

BORING LOCATION: 23.5 ft. Rt. Sta. 489+05		DRILLER: GeoLabs-Hawaii		BORING A2-0B						
BORING ELEVATION: +379.4 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/18/93 08/20/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										orange mottled, soft, weak, highly to extremely weathered, very closely fractured, vesicular
			40			CB-7	30			green, black and orange mottled
			20			CB-8	35			green, black, orange and brown mottled
			37			CB-9	40			red, black, brown and yellow mottled
			80			CB-10	46			red, black, brown and gray mottled
			73			CB-11	60			green, black, orange, yellow and brown mottled

BORING LOCATION: 23.5 ft. Rt. Sta. 489+05		DRILLER: GeoLabs-Hawaii		BORING A2-0B						
BORING ELEVATION: +379.4 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/18/93 08/20/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							75			gray, green and brown mottled
							50			gray, green, yellow, red and orange mottled
							90			gray, green, black and brown mottled
							100			gray, green, black and orange mottled, weak to moderately strong, highly to extremely weathered
UC 71	34.8	100	95			CB-21	100			gray, brown, red and orange mottled, weak, with thin ash partings BASALT, gray, green and black mottled, moderately hard to hard, strong, moderately to

ORIGINAL PLAN
DATE
SURVEY PLOTTED BY
CHECKED BY
DESIGNED BY
QUANTITIES BY
NOTED BY



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
Paul Colin Weidig
PSC ASSOCIATES, INC.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
North Halawa Valley Highway, Unit 1, Phase 1B
F.A.I. PROJECT NO. 1-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994
SHEET No. B11 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	146	470

BORING LOCATION: Center Sta. 470+85		DRILLER: GeoLabs-Hawaii		BORING A3-CL						
BORING ELEVATION: +385.1 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 07/18/93 07/21/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
SA 91	7.3				80/7"	DM-1	0		GW SM GM GC	ASPHALTIC CONCRETE SANDY GRAVEL, gray, dense, moist, fine to coarse sand, fine to medium gravel - Base Rock
	78	35.6			87	DM-2	5			SILTY, GRAVELLY SAND, gray-brown, moist, dense, fine to coarse sand, fine to coarse gravel - Alluvium SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium gray-brown, very dense
UC 69	55.7				49	DM-3	10		GC	CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
UC PI 78	42.3				108	DM-4	15		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, wet, fine to coarse sand, fine to coarse gravel - Alluvium
UC 64	55.3				38	DM-5	20			dense, saturated

BORING LOCATION: Center Sta. 470+85		DRILLER: GeoLabs-Hawaii		BORING A3-CL						
BORING ELEVATION: +385.1 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 07/18/93 07/21/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC 70	48.6				84/7"	DM-11	0			dark brown and tan mottled, vesicular
UC 70	51.0				28/9"	DM-12	55			dark brown, weak to moderately strong
UC 68	47.0				95/7"	DM-13	60			dark brown and tan mottled
	75	40.0			30/7"	DM-14	65			dark gray, moderately hard
			50			CB-15	70			gray, soft to moderately hard, highly to moderately weathered, very closely fractured
			0			CB-16	75			

BORING LOCATION: Center Sta. 470+85		DRILLER: GeoLabs-Hawaii		BORING A3-CL						
BORING ELEVATION: +385.1 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 07/18/93 07/21/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC 116	6.3		100	90		CB-23	105			gray to reddish-gray
							110			Bottom of Boring No. A3-CL ? 108.0 ft.
							115			
							120			
							125			

BORING LOCATION: 23.5 ft. Lt. Sta. 470+85		DRILLER: GeoLabs-Hawaii		BORING A3-IB						
BORING ELEVATION: +410.1 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 08/24/93 08/26/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			50			CB-6	30			wet to saturated
			80			CB-7	30			saturated
			67			CB-8	35			
			67			CB-9	40			CONGLOMERATE, SILTY CLAYEY GRAVEL, COBBLES AND BOULDERS, brown to gray, dense to very dense, saturated, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
			80			CB-10	46			brown, very dense

BORING LOCATION: Center Sta. 470+85		DRILLER: GeoLabs-Hawaii		BORING A3-CL						
BORING ELEVATION: +385.1 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 07/18/93 07/21/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC 70	47.8				71	DM-6	0			dark reddish-brown, dense
UC 60	52.5				38	DM-7	30			gray-brown
UC 69	46.9				80/7"	DM-8	35			SAPROLITE, dark gray-green, soft, weak to moderately strong, highly to extremely weathered
UC 73	47.1				93	DM-9	40			dark brown, soft to moderately hard, highly weathered
UC 74	47.1				93/9"	DM-10	45			dark gray, moderately strong

BORING LOCATION: Center Sta. 470+85		DRILLER: GeoLabs-Hawaii		BORING A3-CL						
BORING ELEVATION: +385.1 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 07/18/93 07/21/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100			CB-17	80			dark gray, moderately hard
			100			CB-18	80			gray, highly weathered
			100			CB-19	85			reddish-brown, soft, weak to moderately strong, moderately to highly weathered
UC 113	2.5		100	80		CB-20	90			BASALT, gray, moderately hard to hard, moderately strong, moderately weathered, vesicular - 'A'a
			100	30		CB-21	95			dark brown, moderately hard
UC 91	20.4		100	100		CB-22	100			

BORING LOCATION: 23.5 ft. Lt. Sta. 470+85		DRILLER: GeoLabs-Hawaii		BORING A3-IB						
BORING ELEVATION: +410.1 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 08/24/93 08/26/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
PI 71	49.7				71	DM-1	5		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
							10			dense to very dense
							25			
							104			brown to gray
			57			DM-3	15			
			60			CB-4	20			
						CB-5	25		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown to gray, dense to very dense, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium

SURVEY PLOTTED BY	DATE
DESIGNED BY	
NOTED BY	
CHECKED BY	



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
Paul Colin Weidig
PSC ASSOCIATES, INC.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
North Halawa Valley Highway, Unit 1, Phase IB
F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994

SHEET No. B12 OF 59 SHEETS

DATE: 03/21/94

L.B. STATE DOT--3V-303P LOG#0816 3/21/94 RSC

BORING LOCATION: 23.5 ft. Lt. Sta. 470+85		DRILLER: GeoLabs-Hawaii		BORING A3-IB						
BORING ELEVATION: +410.1 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 08/24/93 08/26/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	88	21.2	76			CB-11	55			SAPROLITE, reddish-brown, soft, weak, extremely weathered, very closely fractured
			30			CB-12	60			CLINKER, gray-brown, medium dense, highly weathered
			80			CB-13	65			SAPROLITE, dark gray to brown, soft, weak, highly weathered
						CB-14	70			greenish-gray, closely to very closely fractured
			80			CB-15	75			highly to extremely weathered
										brown, very closely fractured

BORING LOCATION: 23.5 ft. Lt. Sta. 470+85		DRILLER: GeoLabs-Hawaii		BORING A3-IB						
BORING ELEVATION: +410.1 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 08/24/93 08/26/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			86			CB-21	105			brown, soft, weak, highly weathered
			80			CB-22	110			gray, moderately hard, moderately strong, moderately weathered, closely to very closely fractured
UC	81	32.2	87			CB-23	115			CLINKER, gray to brown, soft, weak, highly weathered
			87			CB-24	120			BASALT, gray, moderately hard, strong, moderately to highly weathered, closely fractured, vesicular - 'A'a brown, soft, weak, highly weathered
							125			gray-brown, moderately hard, strong, moderately weathered
										Bottom of Boring No. A3-IB ? 120.0 ft.

BORING LOCATION: 23.5 ft. Rt. Sta. 470+85		DRILLER: GeoLabs-Hawaii		BORING A3-OB						
BORING ELEVATION: +398.3 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 08/27/93 08/31/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			83			CB-7	30			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, dark brown, medium dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
UC	83	12.6	90			CB-8	35			greenish-gray
			89			CB-9	40			CONGLOMERATE SANDY GRAVEL, dark brown, soft, weak, medium dense, highly weathered, weakly cemented matrix
			83			CB-10	45			SAPROLITE, gray, soft to moderately hard, weak to moderately strong, highly weathered, very closely fractured, vesicular
			90			CB-11	50			

BORING LOCATION: 23.5 ft. Rt. Sta. 470+85		DRILLER: GeoLabs-Hawaii		BORING A3-OB						
BORING ELEVATION: +398.3 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 08/27/93 08/31/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			85			CB-17	80			gray, soft to moderately hard, weak to moderately strong
			100			CB-18	85			gray, soft to hard, weak to strong, moderately to highly weathered
			90			CB-19	90			soft to moderately hard, weak to moderately strong, closely fractured
			40			CB-20	95			brown, soft, weak, highly to extremely weathered, very closely fractured
			90			CB-21	100			CLINKER, gray-brown, soft, weak, highly weathered

BORING LOCATION: 23.5 ft. Lt. Sta. 470+85		DRILLER: GeoLabs-Hawaii		BORING A3-IB						
BORING ELEVATION: +410.1 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 08/24/93 08/26/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			80			CB-16	80			CLINKER, gray, soft, weak, highly weathered
			80			CB-17	85			SAPROLITE, gray, soft, weak to moderately strong, moderately to highly weathered, closely fractured
UC	87	30.1	80			CB-18	90			brown, soft, weak, extremely weathered, very closely fractured
			100			CB-19	95			ASH AND SANDS, gray to tan, soft, weak, highly weathered
UC	166	3.2	90			CB-20	100			BASALT, gray, moderately hard, strong to very strong, moderately to slightly weathered, closely fractured, vesicular - 'A'a

BORING LOCATION: 23.5 ft. Rt. Sta. 470+85		DRILLER: GeoLabs-Hawaii		BORING A3-OB						
BORING ELEVATION: +398.3 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 08/27/93 08/31/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			87			DM-1	5			SILTY, CLAYEY GRAVEL, brown, dense to very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
UC	87	53.3	87			DM-2	10			mottled dark brown
			81			DM-3	15			mottled dark brown, dense to very dense
SG	74	47.8	83			CB-4	20			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, dark brown, very dense, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium
			80			CB-5	25			SILTY GRAVEL, COBBLES AND BOULDERS, gray to gray-brown, medium dense to dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
			83			CB-6	30			brown, dense

BORING LOCATION: 23.5 ft. Rt. Sta. 470+85		DRILLER: GeoLabs-Hawaii		BORING A3-OB						
BORING ELEVATION: +398.3 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 08/27/93 08/31/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			80			CB-12	55			dark gray to brown, soft, weak, highly weathered, very closely fractured
			86			CB-13	60			dark gray to brown, soft, weak, highly weathered, very closely fractured
			68			CB-14	65			
			80			CB-15	70			
			80			CB-16	75			dark gray to brown, soft, weak

SURVEY PLOTTED BY: _____ DATE: _____
 ORIGINAL PLAN: _____
 NOTE BOOK: _____
 QUANTITIES BY: _____
 CHECKED BY: _____



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
BORING LOGS
 INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)
 SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B13 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	148	470

BORING LOCATION: 23.5 ft. Rt. Sta. 470+86		DRILLER: GeoLabs-Hawaii		BORING A3-OB						
BORING ELEVATION: +398.3 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 08/27/93 08/31/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	97	8.9	100	30		CB-22	105			SAPROLITE, brown, soft, weak, extremely weathered, very closely fractured
UC						CB-23	110			BASALT, gray, moderately hard, strong, moderately weathered, very closely fractured, vesicular - 'A'a
UC	116	13.7	100	83		CB-24	115			
							120			Bottom of Boring No. A3-OB ? 117.5 ft.
							125			

BORING LOCATION: Center Sta. 477+05		DRILLER: GeoLabs-Hawaii		BORING A4-CL						
BORING ELEVATION: +407.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 08/28/93 08/29/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
DS SA	80	37.5			21	DM-8	30		GM	SILTY GRAVEL, dark gray and brown mottled, dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
DS SA	84	38.8			84	DM-7	35		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
					75	DM-8	35			brownish-gray
UC	69	23.9			67	DM-9	40			SAPROLITE, brown and orange-brown mottled, soft, weak, highly weathered, vesicular, gray-brown and orange-brown mottled, very closely fractured
UC	70	43.8			51	DM-10	45			dark gray, soft to moderately hard, weak to moderately strong
							50			

BORING LOCATION: Center Sta. 477+05		DRILLER: GeoLabs-Hawaii		BORING A4-CL						
BORING ELEVATION: +407.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 08/28/93 08/29/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
					80		80			gray-brown
					75	CB-18	85			BASALT, light gray, hard, strong to moderately strong, moderately to slightly weathered, vesicular - 'A'a
					60	CB-20	90			reddish-brown, soft to moderately hard, moderately strong, moderately weathered, very closely fractured
					80	CB-21	90			
							95			Bottom of Boring No. A4-CL ? 93.0 ft.
							100			

BORING LOCATION: 23.5 ft. Lt. Sta. 477+05		DRILLER: GeoLabs-Hawaii		BORING A4-IB						
BORING ELEVATION: +410.9 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 08/14/93 09/16/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
					48	DM-8 CB-7	30			reddish-brown
					68	CB-8	35			gray to reddish-brown
					70	CB-9	40			CLUNKER, gray, soft to moderately hard, weak, highly weathered
					68	CB-10	40			SAPROLITE, gray, soft, weak, highly weathered, very closely fractured
					77	CB-11	46			gray-brown to greenish gray, soft to moderately hard, weak to moderately strong, highly to extremely weathered
							50			

BORING LOCATION: Center Sta. 477+05		DRILLER: GeoLabs-Hawaii		BORING A4-CL						
BORING ELEVATION: +407.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 08/28/93 08/29/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
CN	73	46.8			18	DM-1	5		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, dense, dry, fine to coarse sand, fine to coarse gravel, disseminated organic matter - Alluvium
UC	69	49.8			33	DM-2	5		CH	SILTY, GRAVELLY CLAY, brown, very stiff, moist, fine to coarse gravel - Alluvium
UC	76	44.4			56	DM-3	10		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
UC PI	73	46.3			44	DM-4	15			wet to saturated
UC	77	44.0			94	DM-5	20			wet to saturated
							25			

BORING LOCATION: Center Sta. 477+05		DRILLER: GeoLabs-Hawaii		BORING A4-CL						
BORING ELEVATION: +407.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 08/28/93 08/29/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	75	40.2			86	DM-11	55			dark gray to brown
					45	CB-12	65			dark gray, soft, weak
					80	CB-13	65			dark gray, soft, weak
					100	CB-14	60			dark brown, soft to moderately hard, weak to moderately strong, very closely fractured
					80	CB-15	65			gray, moderately weathered
					80	CB-16	70			soft, weak to moderately strong, highly weathered
					83	CB-17	75			gray-green, soft to moderately hard
							75			

BORING LOCATION: 23.5 ft. Lt. Sta. 477+05		DRILLER: GeoLabs-Hawaii		BORING A4-IB						
BORING ELEVATION: +410.9 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/14/93 09/16/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
DS PI PR	73	55.1				BK-1	5		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
PI					53	DM-2	5			gray-brown
					38	DM-3	10			gray, wet to saturated
					55	DM-4	15			saturated
DS	65	55.7			56	DM-5	20			saturated
							25			

DATE: _____
 SURVEY PLANNED BY: _____
 DESIGNED BY: _____
 NOTE BOOK: _____
 QUANTITIES BY: _____
 CHECKED BY: _____



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994

SHEET No. B14 OF 59 SHEETS

LB: STATE 0071--JAN-2000
 LOGS007 3/21/94 R50

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	149	470

BORING LOCATION: 23.5 ft. Lt. Sta. 477+05		DRILLER: GeoLabs-Hawaii		BORING A4-IB						
BORING ELEVATION: +410.9 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/14/93 09/16/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			20			CB-12	55			gray-brown, soft, weak, extremely weathered
			87			CB-13	60			reddish-gray, weak to moderately strong, highly weathered
			80			CB-14	65			
			80			CB-15	70			
			90			CB-16	75			gray, soft to moderately hard

BORING LOCATION: 23.5 ft. Lt. Sta. 477+05		DRILLER: GeoLabs-Hawaii		BORING A4-IB						
BORING ELEVATION: +410.9 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/14/93 09/16/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100	0		CB-22	105			BASALT, gray, moderately hard, moderately weathered, very closely fractured - 'A'a
			65	0		CB-23	110			ASH AND CINDERS, brown to dark brown, moderately hard to hard, moderately strong, highly to moderately weathered
			100	80		CB-24	115			ASH, brown to dark brown, moderately hard to hard, weak to moderately strong, moderately weathered
			80	23		CB-25	120			CLINKER, gray-brown, hard, moderately strong, moderately weathered
UC	187	2.2	60	23		CB-26	125			BASALT, gray, hard, strong, slightly weathered, moderately fractured, vesicular - 'A'a
			90	80		CB-28				reddish-brown, soft, weak to moderately strong, highly weathered
										gray, hard, strong, slightly weathered, closely fractured

BORING LOCATION: 23.5 ft. Rt. Sta. 477+05		DRILLER: GeoLabs-Hawaii		BORING A4-OB						
BORING ELEVATION: +410.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 10/17/93 10/21/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			73	46.2		DM-1	5		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, mottled brown, medium-dense to dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
						DM-2	10			dense to very dense, wet to saturated
			67			CB-3	15			gray-brown, very dense, saturated
			30			CB-4	20			
							25			

BORING LOCATION: 23.5 ft. Rt. Sta. 477+05		DRILLER: GeoLabs-Hawaii		BORING A4-OB						
BORING ELEVATION: +410.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 10/17/93 10/21/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			60			CB-10	55			SAPROLITE, dark brown to brown, soft, weak, highly to extremely weathered, very closely fractured dark brown to brown
			40			CB-11	60			gray-brown, soft to moderately hard, weak to moderately strong, highly weathered
			100			CB-12	65			greenish-gray, vesicular
			85			CB-13	70			gray to dark gray-brown
			80			CB-14	75			

BORING LOCATION: 23.5 ft. Lt. Sta. 477+05		DRILLER: GeoLabs-Hawaii		BORING A4-IB						
BORING ELEVATION: +410.9 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/14/93 09/16/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100			CB-17	80			reddish-gray, soft
			100			CB-18	85			gray, soft to moderately hard
			50			CB-19	90			grayish-orange, soft, weak, highly to extremely weathered
			50			CB-20	95			CLINKER, gray, soft to moderately hard, weak, highly weathered
			40	0		CB-21	100			

BORING LOCATION: 23.5 ft. Lt. Sta. 477+05		DRILLER: GeoLabs-Hawaii		BORING A4-IB						
BORING ELEVATION: +410.9 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/14/93 09/16/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							130			Bottom of Boring No. A4-IB ? 125.5 ft.
							135			
							140			
							146			
							150			

BORING LOCATION: 23.5 ft. Rt. Sta. 477+05		DRILLER: GeoLabs-Hawaii		BORING A4-OB						
BORING ELEVATION: +410.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 10/17/93 10/21/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			30			CB-5	30			brownish-gray, dense to very dense
			65			CB-6	35			orange-brown
			60			CB-7	40			SAPROLITE, gray-brown, soft to moderately hard, weak to moderately strong, highly weathered, closely to very closely fractured
			60			CB-8	45			SAPROLITE, gray, soft, weak, highly weathered, very closely fractured
			60			CB-9	50			reddish-brown, extremely weathered
										greenish-gray to brown and dark brown mottled

ORIGINAL PLAN
NOTE BOOK
No.

SURVEY PLOTTED BY _____ DATE _____
TRACED BY _____
DESIGNED BY _____
QUANTITIES BY _____
CHECKED BY _____



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
Paul Colin Weidig
PSC ASSOCIATES, INC.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
North Halawa Valley Highway, Unit 1, Phase 1B
F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994

SHEET No. B15 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	150	470

BORING LOCATION: 23.5 ft. Rt. Sta. 477+05		DRILLER: GeoLabs-Hawaii		BORING A4-OB						
BORING ELEVATION: +410.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 10/17/93 10/21/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC 123	14.6		100	100		CB-15	80			BASALT, gray, soft to moderately hard, weak to moderately strong, moderately to highly weathered, closely fractured, vesicular - 'A'a
			80	40		CB-16	80			CLINKER, reddish-brown, soft, weak, highly to extremely weathered
			40	30		CB-17	85			BASALT, gray, soft to moderately hard, weak to moderately strong, moderately weathered, closely fractured, vesicular - 'A'a gray-brown, moderately strong, highly weathered
			20	17		CB-18	90			dark gray-brown, moderately strong to strong, moderately weathered
UC 84	27.1		20	13		CB-19	95			gray-brown, moderately hard, moderately strong

BORING LOCATION: 23.5 ft. Lt. Sta. 419+50		DRILLER: GeoLabs-Hawaii		BORING IB- 1						
BORING ELEVATION: +238.3 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/21/93 07/28/93		TYPE RIG: Rotary wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	88	25.0			100/6"	DM-1	5			light gray to gray, very dense
DS 87	26.4				100/6"	DM-2	10			brownish-gray, moist to wet
UC 70	38.0				70/6"	DM-3	15			orange-brown, wet to saturated
	43.0				100/6"	DM-4	20			CONGLOMERATE, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, dense, wet to saturated, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix

BORING LOCATION: 23.5 ft. Lt. Sta. 419+50		DRILLER: GeoLabs-Hawaii		BORING IB- 1						
BORING ELEVATION: +238.3 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/21/93 07/28/93		TYPE RIG: Rotary wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC 178	1.1		68			CB-10				gray-green
			93			CB-11	55			greenish-brown, gray and orange mottled
UC 134	4.9		72			CB-12	60			gray, green, orange and brown mottled
			77			CB-13	65			orange, brown and gray-green mottled
			78			CB-14	70			orange-brown

BORING LOCATION: 23.5 ft. Lt. Sta. 419+50		DRILLER: GeoLabs-Hawaii		BORING IB- 1						
BORING ELEVATION: +238.3 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/21/93 07/28/93		TYPE RIG: Rotary wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			83			CB-20				red, brown, orange and gray-green mottled, highly weathered
			85			CB-21	105			red, orange and brown mottled
			85			CB-22	110			reddish-brown and gray-green mottled, highly to extremely weathered
			73			CB-23	115			gray, green, orange and brown mottled
UC 61	65.8		75			CB-24	120			red, brown, gray, green and black mottled

BORING LOCATION: 23.5 ft. Rt. Sta. 477+05		DRILLER: GeoLabs-Hawaii		BORING A4-OB						
BORING ELEVATION: +410.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 10/17/93 10/21/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC 83	51.9		100	50		CB-20	105			gray, hard, strong, slightly weathered
			93	70		CB-21	110			CLINKER, reddish-brown, soft to moderately hard, weak to moderately strong, moderately weathered
										BASALT, brown, hard to moderately hard, strong, moderately weathered, closely to very closely fractured, vesicular - 'A'a
UC 154	4.6		100	85		CB-22	115			gray, hard, moderately to slightly weathered, closely to moderately fractured

BORING LOCATION: 23.5 ft. Lt. Sta. 419+50		DRILLER: GeoLabs-Hawaii		BORING IB- 1						
BORING ELEVATION: +238.3 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/21/93 07/28/93		TYPE RIG: Rotary wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
					100/6"	DM-5				dark brown to dark gray-brown, saturated
UC 88	33.0		33		100/6"	DM-6	30			reddish-brown, very dense
						CB-7	35			gray-brown, dense
			77			CB-8	40			SAPROLITE, reddish-brown and gray-green mottled, soft, weak, highly to extremely weathered, very closely fractured
			53			CB-9	45			gray, green and orange mottled

BORING LOCATION: 23.5 ft. Lt. Sta. 419+50		DRILLER: GeoLabs-Hawaii		BORING IB- 1						
BORING ELEVATION: +238.3 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/21/93 07/28/93		TYPE RIG: Rotary wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
DS 76	30.9		88			CB-16				highly weathered
			83			CB-16	80			reddish-brown and gray-green mottled
DS 65	57.5		77			CB-17	85			orange-brown and gray-green mottled, highly to extremely weathered
			88			CB-18	90			orange-brown
			88			CB-19	95			orange, brown, red and green mottled, vesicular

DATE: _____
 SURVEY PLOTTED BY: _____
 CHECKED BY: _____
 ORIGINAL PLAN: _____
 NOTE BOOK: _____
 QUANTITIES BY: _____
 CHECKED BY: _____



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit I, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B16 OF 59 SHEETS

LB: STATE DOT--3V-3200V
 LOGBORNG 3/21/94 R50

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	151	470

BORING LOCATION: 23.5 ft. Lt. Sta. 419+50		DRILLER: GeoLabs-Hawaii		BORING IB- 1						
BORING ELEVATION: +238.3 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/21/93 07/26/93		TYPE RIG: Rotary wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100			CB-25				red, orange and brown mottled
			73			CB-26	130			dark gray, black, red and orange mottled
			90			CB-27	135			red, white, orange, yellow, gray and green mottled
			100			CB-28	140			gray-green to greenish-brown
UC	84	28.7	98			CB-29	145			gray-green to greenish-brown
							150			

BORING LOCATION: 23.5 ft. Lt. Sta. 421+44		DRILLER: GeoLabs-Hawaii		BORING IB- 2						
BORING ELEVATION: +238.7 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/19/93 06/21/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										MH CLAYEY, GRAVELLY SILT, dark brown, stiff, dry to moist, with finely disseminated organic matter - Alluvium
										GM GC SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
DS	70	46.1			46	DM-1	5			SM GM SILTY, GRAVELLY SAND, light gray, loose, wet, fine to coarse gravel, fine to coarse sand - Alluvium
										GM GC SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
										GC CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
DS	74	43.7			26	DM-2	20			CONGLOMERATE, SILTY, CLAYEY, GRAVELLY SAND, yellow-brown, dense, saturated, fine to coarse sand, fine to coarse gravel, weakly cemented matrix
							25			

BORING LOCATION: 23.5 ft. Lt. Sta. 421+44		DRILLER: GeoLabs-Hawaii		BORING IB- 2						
BORING ELEVATION: +238.7 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/19/93 06/21/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										soft to moderately hard, highly weathered
										gray-brown
UC	59	57.4	93		10	CB-12	65			gray-green, weak to moderately strong, highly to extremely weathered
							70			Bottom of Boring No. IB-2 ? 68.0 ft.
							75			

BORING LOCATION: 23.5 ft. Lt. Sta. 423+50		DRILLER: GeoLabs-Hawaii		BORING IB- 3						
BORING ELEVATION: +242.2 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 06/19/93 06/22/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	93	30.3			121/8*	DM-3	30			brown, very dense, saturated, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
										SAPROLITE, orange-brown to reddish brown, soft, weak, highly to extremely weathered, vesicular reddish-gray
										gray-brown, soft to medium-hard, weak to moderately strong, highly weathered, olivine crystals visible in vesicles
										CLINKER, reddish-brown, soft, weak, highly to extremely weathered
										SAPROLITE, gray, soft, weak to moderately strong, highly weathered, closely fractured

BORING LOCATION: 23.5 ft. Lt. Sta. 419+50		DRILLER: GeoLabs-Hawaii		BORING IB- 1						
BORING ELEVATION: +238.3 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/21/93 07/26/93		TYPE RIG: Rotary wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			83			CB-30				gray-green and dark gray mottled, soft to moderately hard, weak to moderately strong, highly weathered
			72			CB-31	156			red, gray, green and brown mottled
			70			CB-32	160			reddish-brown
							165			Bottom of Boring No. IB-1 ? 165.0 ft.
							170			
							175			

BORING LOCATION: 23.5 ft. Lt. Sta. 421+44		DRILLER: GeoLabs-Hawaii		BORING IB- 2						
BORING ELEVATION: +238.7 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/19/93 06/21/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	56	52.7			96	DM-3				SAPROLITE, green, soft, weak, highly to extremely weathered
										orange-brown and gray-green mottled
										reddish-brown, soft to moderately hard, weak to moderately strong
										dark gray-green, highly weathered
UC	161	1.1	87		28	CB-8	45			gray-green, soft, highly to extremely weathered, vesicular
										moderately strong

BORING LOCATION: 23.5 ft. Lt. Sta. 423+50		DRILLER: GeoLabs-Hawaii		BORING IB- 3						
BORING ELEVATION: +242.2 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 06/19/93 06/22/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, dense to very dense, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium
										SILTY, CLAYEY COBBLES AND BOULDERS, reddish-brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
UC	86	35.2			35	DM-1	15			CONGLOMERATE, CLAYEY, GRAVELLY SAND, gray-brown, medium-dense to dense, saturated, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
										CONGLOMERATE, SILTY, GRAVELLY SAND, brown, medium-dense to dense, saturated, fine to coarse sand, fine to coarse gravel, trace of clay, highly weathered, weakly cemented matrix
SA	78	38.8			103/11*	DM-2	20			CONGLOMERATE, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, very dense, saturated, fine to coarse sand, fine to coarse gravel, trace of clay, highly weathered, weakly cemented matrix
										CONGLOMERATE, CLAYEY GRAVEL

ORIGINAL PLAN
 SURVEY PLOTTED BY
 DATE
 TRACKED BY
 DESIGNED BY
 QUANTITIES BY
 CHECKED BY
 No.



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994

SHEET No. B17 OF 59 SHEETS

BORING LOCATION: 23.5 ft. Lt. Sta. 423+50		DRILLER: GeoLabs-Hawaii		BORING IB- 3						
BORING ELEVATION: +242.2 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 06/19/93 06/22/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
		80.6	80			CB-11	55			weak
						CB-12	90			CLINKER, brown, hard, moderately strong, moderately to highly weathered
						CB-13	80			SAPROLITE, gray-green, soft to moderately hard, moderately strong, highly weathered, closely fractured, vesicular
						CB-14	98			gray-brown
						CB-15	70			reddish-brown to gray, soft, weak, highly to extremely weathered

BORING LOCATION: 23.5 ft. Lt. Sta. 425+50		DRILLER: GeoLabs-Hawaii		BORING IB- 4						
BORING ELEVATION: +248.0 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/30/93 08/02/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						DM-1	5			SILTY CLAY, orange-brown, soft, moist - Alluvium
						DM-2	10			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, gray and reddish-brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
						DM-3	20			gray-brown, dense to very dense, moist to wet
						DM-4	20			gray, saturated
						CB-5	25			gray-green, black, brown and orange, very dense, saturated

BORING LOCATION: 23.5 ft. Lt. Sta. 425+50		DRILLER: GeoLabs-Hawaii		BORING IB- 4						
BORING ELEVATION: +248.0 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/30/93 08/02/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-11	55			green-black, soft, weak, highly to extremely weathered, very closely fractured, vesicular
						CB-12	61			dark green, brown and reddish-brown, extremely weathered
						CB-13	80			dark green, reddish-brown, highly to extremely weathered, olivine and vesuvianite crystals visible in vesicles
						CB-14	72			dark green-black
						CB-15	70			red, brown, green and orange mottled

BORING LOCATION: 23.5 ft. Lt. Sta. 425+50		DRILLER: GeoLabs-Hawaii		BORING IB- 4						
BORING ELEVATION: +248.0 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/30/93 08/02/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-22	105			green, gray, red and brown mottled
						CB-23	110			BASALT, greenish-gray to brown, moderately hard, highly weathered, closely fractured, vesicular, olivine crystals visible in vesicles - 'A'
						CB-24	110			gray, brown and red mottled, medium-hard to hard, moderately strong to strong, moderately weathered
						CB-25	116			brown, red and gray mottled, soft to medium-hard, weak to moderately strong, highly weathered
						CB-25	125			brown, red and gray mottled, medium-hard to hard, moderately strong to strong

BORING LOCATION: 23.5 ft. Lt. Sta. 423+50		DRILLER: GeoLabs-Hawaii		BORING IB- 3						
BORING ELEVATION: +242.2 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 06/19/93 06/22/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							80			Bottom of Boring IB-3 ? 77.5 ft.
							85			
							90			
							95			
							100			

BORING LOCATION: 23.5 ft. Lt. Sta. 425+50		DRILLER: GeoLabs-Hawaii		BORING IB- 4						
BORING ELEVATION: +248.0 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/30/93 08/02/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-6	28			SILTY GRAVEL, COBBLES AND BOULDERS, gray-green, black and brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
						CB-7	30			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-green, gray and brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
						CB-8	35			CONGLOMERATE, SILTY GRAVEL, COBBLES AND BOULDERS, gray, brown and orange, dense, moist, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
						CB-9	40			reddish-brown to brown, very dense
						CB-10	45			orange-brown and red-brown
							60			SAPROLITE, very dark

BORING LOCATION: 23.5 ft. Lt. Sta. 425+50		DRILLER: GeoLabs-Hawaii		BORING IB- 4						
BORING ELEVATION: +248.0 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/30/93 08/02/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-16	88			very dark green-black and purple mottled
						CB-17	80			red-brown, gray to orange-brown mottled
						CB-18	77			orange, red-brown, and dark green to black mottled
						CB-19	90			greenish-gray
						CB-20	97			green, gray, red and brown mottled
						CB-21	0			green, gray, red and brown mottled

REVISIONS
 NO. DATE BY
 1 06/19/93 C. Isaacson
 2 06/22/93 C. Isaacson
 3 07/30/93 S. Hickman
 4 08/02/93 S. Hickman



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 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit I, Phase IB
 F.A.I. PROJECT NO. 1-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B18 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	153	470

BORING LOCATION: 19 ft. Lt. Sta. 427+30		DRILLER: GeoLabs-Hawaii		BORING IB- 5						
BORING ELEVATION: +257.9 ft		LOGGED BY: E. Menor								
DATE(S) DRILLED: 06/30/93 07/03/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
PI UC	78	28.8			54	DM-1			MH	CLAYEY SILT, dark brown, stiff, moist, with gravel and roots - Alluvium
UC	74	37.0			82	DM-2	5			mottled dark brown and light brown, dry, with weathered rock fragments
UC	89	38.5			33	DM-3	10		MH	CLAYEY SILT, mottled orange-brown, stiff, wet
							15		GM	SILTY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
							20		GM	SILTY GRAVEL, COBBLES AND BOULDERS, dark brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
							26		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, dark brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
			20							gray-brown

BORING LOCATION: 19 ft. Lt. Sta. 427+30		DRILLER: GeoLabs-Hawaii		BORING IB- 5						
BORING ELEVATION: +257.9 ft		LOGGED BY: E. Menor								
DATE(S) DRILLED: 06/30/93 07/03/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							50			gray, closely fractured
							100			gray, weak to moderately strong, olivine crystals visible in vesicles
	82	30.0					75		CB-11	
							75		CB-12	
							75		CB-13	
							75		CB-14	
							30		CB-15	
							50		CB-16	

BORING LOCATION: 28 ft. Lt. Sta. 429+30		DRILLER: Geolabs-Hawaii		BORING IB- 6						
BORING ELEVATION: +287.4 ft		LOGGED BY: E. Menor								
DATE(S) DRILLED: 06/28/93 06/29/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							57		MH	CLAYEY SILT, dark brown, dry, very stiff - Alluvium
							5		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, orange-brown, dense to very dense, dry, fine to coarse sand, fine to coarse gravel - Alluvium
							84/10"		DM-2	brown to reddish-brown
							10			light brown and gray mottled
							50/6"		DM-3	dark brown, saturated
							41		DM-4	orange-brown, saturated
							152/10"		DM-5	
							25			

BORING LOCATION: 28 ft. Lt. Sta. 429+30		DRILLER: Geolabs-Hawaii		BORING IB- 6						
BORING ELEVATION: +287.4 ft		LOGGED BY: E. Menor								
DATE(S) DRILLED: 06/28/93 06/29/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							79/8"		DM-11	highly weathered
							56		CB-12	green-gray, weak, with thin oolite partings
							75		CB-13	mottled brown and dark gray
							80		CB-14	dark gray, weak to moderately strong
							86		CB-15	mottled dark gray and gray-brown
							70		CB-16	mottled gray-green, soft, moderately strong, moderately weathered
							75			

BORING LOCATION: 19 ft. Lt. Sta. 427+30		DRILLER: GeoLabs-Hawaii		BORING IB- 5						
BORING ELEVATION: +257.9 ft		LOGGED BY: E. Menor								
DATE(S) DRILLED: 06/30/93 07/03/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							75		GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, reddish-brown to gray-brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
							80		CB-7	SAPROLITE, greenish-gray, soft, weak, highly to extremely weathered, very closely fractured gray, highly weathered
							35			light brown to greenish-gray, highly to extremely weathered gray, weak to moderately strong, moderately weathered
							50		CB-8	greenish gray to dark gray, weak, highly to extremely weathered
							50		CB-9	greenish gray to dark gray, highly weathered
							50		CB-10	greenish gray to dark gray, highly weathered

BORING LOCATION: 19 ft. Lt. Sta. 427+30		DRILLER: GeoLabs-Hawaii		BORING IB- 5						
BORING ELEVATION: +257.9 ft		LOGGED BY: E. Menor								
DATE(S) DRILLED: 06/30/93 07/03/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							85		CB-17	dark gray
							30		CB-18	gray-green
							59		CB-19	CLINKER, mottled dark gray and dark brown, very soft, extremely weathered, faint vesicles
							90			Bottom of Boring No. IB-5 ? 91.0 ft.
							95			
							100			

BORING LOCATION: 28 ft. Lt. Sta. 429+30		DRILLER: Geolabs-Hawaii		BORING IB- 6						
BORING ELEVATION: +287.4 ft		LOGGED BY: E. Menor								
DATE(S) DRILLED: 06/28/93 06/29/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							89/6"		DM-6	SAPROLITE, reddish brown, soft, weak, highly to extremely weathered
							35			gray-green
							178/9"		DM-7	gray-green
							40		DM-8	mottled orange and brown
							45		DM-9	mottled gray and light brown
							89/6"		DM-10	mottled gray and brown, soft, weak to moderately strong

SURVEY PLOTTED BY: _____ DATE: _____
 ORIGINAL PLAN: _____
 NOTE BOOK: _____
 DESIGNED BY: _____
 QUANTITIES BY: _____
 CHECKED BY: _____
 No. _____



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 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
BORING LOGS
 INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)
 SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B19 OF 59 SHEETS

BORING LOCATION: 28 ft. Lt. Sta. 429+30		DRILLER: Geolabs-Hawaii		BORING IB- 6						
BORING ELEVATION: +287.4 ft		LOGGED BY: E. Menor								
DATE(S) DRILLED: 06/28/93 06/29/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	88	18.3	100			CB-17	80			dark gray, weak, highly weathered
			0			CB-18	85			highly to moderately weathered, very closely fractured
			0			CB-19	90			gray-green, weak to moderately strong, highly weathered
Bottom of Boring No. IB-6 ? 89.5 ft.										

BORING LOCATION: 23.5 ft. Lt. Sta. 431+00		DRILLER: Geolabs-Hawaii		BORING IB- 7						
BORING ELEVATION: +284.3 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 07/26/93 07/28/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			90			CB-6	30			CONGLOMERATE SILTY, SANDY, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, very dense, moist, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
			97			CB-7	35			gray, saturated
			80			CB-8	40			gray-brown
			90			CB-9	45			brown
			95			CB-10	50			gray

BORING LOCATION: 23.5 ft. Lt. Sta. 431+00		DRILLER: Geolabs-Hawaii		BORING IB- 7						
BORING ELEVATION: +284.3 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 07/28/93 07/28/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			90			CB-16	80			medium brownish-gray, closely fractured
UC	88	20.7	100			CB-17	85			light brownish-gray
			100			CB-18	90			medium brownish-gray, weak to moderately strong
			100			CB-19	95			light brownish-gray
UC	72	51.0	98			CB-20	100			medium brownish-gray

BORING LOCATION: 23.5 ft. Lt. Sta. 433+00		DRILLER: GeoLabs-Hawaii		BORING IB- 8						
BORING ELEVATION: +288.8 ft		LOGGED BY: J. Brook								
DATE(S) DRILLED: 06/30/93 07/07/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							5			CLAYEY, GRAVELLY SILT, dark brown, stiff, moist, fine to coarse gravel, with finely disseminated organic matter - Alluvium
							10			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, dense to very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
DS	69	49.0			77	DM-1	15			CLAYEY, SILTY, GRAVELLY SAND, brown, loose, saturated, fine to coarse gravel, fine to coarse sand - Alluvium
SA	78	31.7			39	DM-2	20			orange-brown and red-brown mottled, dense, moist
							25			CONGLOMERATE SILTY, CLAYEY GRAVEL AND COBBLES, gray-green, dense to very dense, moist, highly weathered, weakly cemented matrix - Conglomerate
UC	88	34.5	47		91/8'	DM-3	20			
						CB-4	25			

BORING LOCATION: 23.5 ft. Lt. Sta. 431+00		DRILLER: Geolabs-Hawaii		BORING IB- 7						
BORING ELEVATION: +284.3 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 07/26/93 07/28/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			78			CB-1	5			SANDY SILT, dark gray to black, loose, moist, fine to medium sand, with finely disseminated organic matter
			87			CB-2	10			wet to saturated
			80			CB-3	15			brown, saturated
			20			CB-4	20			reddish-brown
			80			CB-5	25			orange-gray

BORING LOCATION: 23.5 ft. Lt. Sta. 431+00		DRILLER: Geolabs-Hawaii		BORING IB- 7						
BORING ELEVATION: +284.3 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 07/26/93 07/28/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	112	17.7	80			CB-11	55			dark gray, moist
			80			CB-12	60			light to medium gray
			100			CB-13	65			SAPROLITE, tan and gray to gray-brown mottled, soft, weak, highly weathered
							70			light to dark gray and brown mottled
UC	75	41.0	98			CB-14	75			
UC	88	7.1	97			CB-15	76			dark gray to gray brown

BORING LOCATION: 23.5 ft. Lt. Sta. 431+00		DRILLER: Geolabs-Hawaii		BORING IB- 7						
BORING ELEVATION: +284.3 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 07/28/93 07/28/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	118	4.7	88			CB-21	105			BASALT, dark gray, soft to moderately hard, weak to moderately strong, highly weathered, closely fractured - 'A'
UC	123	5.8	100			CB-22	110			
Bottom of Boring No. IB-7 ? 112.0 ft.										

SURVEY PLOTTED BY: _____ DATE: _____
 ORIGINAL PLAN: _____
 NOTE BOOK: _____
 QUANTITIES BY: _____
 CHECKED BY: _____
 No. _____



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 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
BORING LOGS
 INTERSTATE ROUTE H-3
 North Hala Valley Highway, Unit 1, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)
 SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B20 OF 59 SHEETS

BORING LOCATION: 23.5 ft. Lt. Sta. 433+00		DRILLER: GeoLabs-Hawaii		BORING IB- 8						
BORING ELEVATION: +268.8 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/30/93 07/07/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			47			CB-5	28			brown to gray-brown
			70			CB-6	30			gray to gray-brown
			78			CB-7	35			brown to gray-brown
			63			CB-8	40			gray to dark brown
			67			CB-9	45			red-brown to orange-brown and gray-brown mottled, moist to wet
							50			

BORING LOCATION: 23.5 ft. Lt. Sta. 435+30		DRILLER: GeoLabs-Hawaii		BORING IB- 9						
BORING ELEVATION: +271.8 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/03/93 08/04/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
					100	DM-1	5			SILTY CLAY, brown, soft, moist - Alluvium
										orange-brown, dense to very dense
		30.3			49	SP-2	10			brown, moist to wet
		34.1			100	SP-3	15			gray-green and brown mottled, very dense, wet to saturated
		42.9			58	SP-4	20			greenish-brown, saturated
			17			CB-5	25			

BORING LOCATION: 23.5 ft. Lt. Sta. 435+30		DRILLER: GeoLabs-Hawaii		BORING IB- 9						
BORING ELEVATION: +271.8 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/03/93 08/04/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100			CB-11	55			red, brown, black and gray mottled
			93			CB-12	60			red, brown and yellow-orange mottled
			96			CB-13	65			red, brown and black mottled
			97			CB-14	70			gray-green, black and orange mottled
UC	80	36.7	100			CB-15	75			gray-green and reddish-brown, vesicular

BORING LOCATION: 23.5 ft. Lt. Sta. 435+30		DRILLER: GeoLabs-Hawaii		BORING IB- 9						
BORING ELEVATION: +271.8 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/03/93 08/04/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100	67		CB-21	105			gray-green to brown, moderately weathered
							110			Bottom of Boring No. IB-9 ? 106.0 ft.
							115			
							120			
							125			

BORING LOCATION: 23.5 ft. Lt. Sta. 433+00		DRILLER: GeoLabs-Hawaii		BORING IB- 8						
BORING ELEVATION: +268.8 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/30/93 07/07/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
		59.6	73			CB-10	55			SAPROLITE, tan to orange-brown, soft, weak to moderately strong, highly to extremely weathered
			67			CB-11	60			light orange-brown to tan, soft to moderately hard, highly weathered
			63			CB-12	65			reddish-brown to dark brown, highly to extremely weathered, vesicular
							70			Bottom of Boring No. IB-8 ? 66.0 ft
							75			

BORING LOCATION: 23.5 ft. Lt. Sta. 435+30		DRILLER: GeoLabs-Hawaii		BORING IB- 9						
BORING ELEVATION: +271.8 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/03/93 08/04/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										gray to dark gray
			57			CB-6	30			orange-brown
			97			CB-7	35			reddish-brown to yellow-brown
			82			CB-8	40			
			87			CB-9	45			SAPROLITE, red, brown and gray mottled, soft, weak, very closely fractured, extremely weathered
			83			CB-10	60			red, brown and green mottled

BORING LOCATION: 23.5 ft. Lt. Sta. 435+30		DRILLER: GeoLabs-Hawaii		BORING IB- 9						
BORING ELEVATION: +271.8 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/03/93 08/04/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100			CB-16	80			red-brown and black mottled
			100			CB-17	85			reddish-brown to brown
			97			CB-18	90			gray, red and brown mottled
UC	116	7.7	80	27		CB-19	95			BASALT, gray-green, soft to medium hard, weak, closely fractured, highly weathered, vesicular - 'A'a
UC	129	7.6	97	27		CB-20	100			gray-brown, moderately strong

SURVEY PLOTTED BY: _____ DATE: _____
 ORIGINAL PLAN TRACKED BY: _____
 NOTE BOOK DESIGNED BY: _____
 QUANTITIES BY: _____
 CHECKED BY: _____
 No. _____



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 OR UNDER MY SUPERVISION
 Paul C. Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
BORING LOGS
 INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)
 SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B21 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	156	470

BORING LOCATION: 23.5 ft. Lt. Sta. 437+30		DRILLER: GeoLabs-Hawaii		BORING IB-10						
BORING ELEVATION: +286.4 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/03/93 08/04/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	85	23.7			24	DM-1	5		CH	SILTY, SANDY, GRAVELLY CLAY, brownish-gray, very stiff, moist, fine to coarse sand, fine to medium gravel - Alluvium
					70/3*	DM-2	10			coarse sand, fine to medium gravel - Alluvium
	84	32.3			28	DM-3	15		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
							20			
							25			

BORING LOCATION: 23.5 ft. Lt. Sta. 437+30		DRILLER: GeoLabs-Hawaii		BORING IB-10						
BORING ELEVATION: +286.4 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/03/93 08/04/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100			CB-10	55			SAPROLITE, dark gray, soft, weak, highly weathered, very closely fractured
		84.9	90			CB-11	60			weak to moderately strong
UC	80	81.2	90			CB-12	65			gray-black, soft to friable, weak, highly to extremely weathered
			98			CB-13	70			dark gray, weak to moderately strong, highly weathered, closely fractured
			80			CB-14	75			greenish-brown, highly to extremely weathered

BORING LOCATION: 23.5 ft. Lt. Sta. 437+30		DRILLER: GeoLabs-Hawaii		BORING IB-10						
BORING ELEVATION: +286.4 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/03/93 08/04/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	86	29.5	100			CB-20	105			dark gray and purple mottled, highly to extremely weathered
			100			CB-21	110			dark gray to medium light gray
							115			Bottom of Boring No. IB-10 ? 112.5 ft.
							120			
							125			

BORING LOCATION: 23.5 ft. Lt. Sta. 439+30		DRILLER: GeoLabs-Hawaii		BORING IB-11						
BORING ELEVATION: +287.3 ft		LOGGED BY: J. Brook								
DATE(S) DRILLED: 07/15/93 07/20/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
					100/8*	DM-5	30			orange-brown and reddish-brown mottled, very dense, wet, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
UC	150	19	53			CB-6	35			wet to saturated
			70			CB-6	40			
			57			CB-7	45			
UC	82	58.8	88			CB-8	50			saturated
						CB-9	55			

BORING LOCATION: 23.5 ft. Lt. Sta. 437+30		DRILLER: GeoLabs-Hawaii		BORING IB-10						
BORING ELEVATION: +286.4 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/03/93 08/04/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	86	30.7			70/4*	DM-4	30			gray
			80			CB-5	35			
			85			CB-6	40			CONGLOMERATE SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, orange-brown, very dense, moist, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
			80			CB-7	45			brown to orange-brown, moist to wet
			80			CB-8	50			brown to dark gray, moist
	59.7		98			CB-9	55			orange-brown

BORING LOCATION: 23.5 ft. Lt. Sta. 437+30		DRILLER: GeoLabs-Hawaii		BORING IB-10						
BORING ELEVATION: +286.4 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/03/93 08/04/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			75			CB-15	80			dark gray, highly weathered
			88			CB-16	85			orange to brown-gray, weak, highly to extremely weathered
UC	75	38.3	87			CB-17	90			brownish-gray, weak to moderately strong, highly weathered
UC	97	32.7	80			CB-18	95			weak
UC	68	48.8	100			CB-19	100			weak to moderately strong

BORING LOCATION: 23.5 ft. Lt. Sta. 439+30		DRILLER: GeoLabs-Hawaii		BORING IB-11						
BORING ELEVATION: +287.3 ft		LOGGED BY: J. Brook								
DATE(S) DRILLED: 07/15/93 07/20/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						MH	5			CLAYEY SILT, very dark brown, soft to medium-stiff, dry to moist - Alluvium
						GM GC	5			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, dense to very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
						GM GC	5			SILTY, CLAYEY GRAVEL, gray-brown, medium-dense, moist to saturated - Alluvium
	106	21.0			87/7*	DM-1	10			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, dense to very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
							15			CONGLOMERATE CLAYEY GRAVEL, COBBLES AND BOULDERS, orange-brown and reddish-brown mottled, dense, moist to wet, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
							20			CONGLOMERATE SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, orange-brown and reddish-brown mottled, dense, wet, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
	108	20.1			104/10*	DM-4	25			CONGLOMERATE CLAYEY GRAVEL, COBBLES AND BOULDERS,

DATE	
DESIGNED BY	
CHECKED BY	
QUANTITIES BY	
TRACED BY	
PLANNED BY	
ORIGINAL PLAN	
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 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B22 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	157	470

BORING LOCATION: 23.5 ft. Lt. Sta. 439+30		DRILLER: GeoLabs-Hawaii		BORING IB-11						
BORING ELEVATION: +287.3 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 07/15/93 07/20/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	98	28.2	83			CB-10	55			reddish-brown to brown
						CB-11	60			orange-brown and reddish-brown mottled
						CB-12	62			SAPROLITE, very dark gray to dark gray-green, soft, weak, highly to extremely weathered, vesicular
						CB-13	65			very dark gray to blue-gray and black mottled
UC	58	81.7	100			CB-14	70			dark brown to orange-brown and reddish-brown, olivine and vesuvianite crystals visible in vesicles
							75			

BORING LOCATION: 23.5 ft. Lt. Sta. 439+30		DRILLER: GeoLabs-Hawaii		BORING IB-11						
BORING ELEVATION: +287.3 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 07/15/93 07/20/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-20	106			very dark gray to gray-green, weak to moderately strong
						CB-21	110			very dark brown to very dark gray and violet mottled
							115			Bottom of Boring No. IB-11 ? 111.0 ft.
							120			
							125			

BORING LOCATION: 19 ft. Lt. Sta. 441+10		DRILLER: GeoLabs-Hawaii		BORING IB-12						
BORING ELEVATION: +311.1 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 07/21/93 07/24/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	79	41.5				DM-5	30			orange-brown to reddish-brown
							35			brownish-gray, moist to wet
							40			reddish-brown to brownish-gray, wet to saturated
						CB-6	45			orange-brown to reddish-brown
UC	183	1.9	87			CB-7	50			orange-brown, moist

BORING LOCATION: 19 ft. Lt. Sta. 441+10		DRILLER: GeoLabs-Hawaii		BORING IB-12						
BORING ELEVATION: +311.1 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 07/21/93 07/24/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	90	15.1	98			CB-13	80			red, brown, black and gray mottled
UC	70	48.2	98			CB-14	85			green, brown, orange and red mottled, extremely to completely weathered
UC	71	52.1	97			CB-15	90			dark brown, black and orange mottled, extremely weathered
						CB-16	95			brown, black and purple mottled, extremely to completely weathered
UC	81	32.4	100			CB-17	100			dark brown, orange, purple and gray mottled, highly to extremely weathered

BORING LOCATION: 23.5 ft. Lt. Sta. 439+30		DRILLER: GeoLabs-Hawaii		BORING IB-11						
BORING ELEVATION: +287.3 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 07/15/93 07/20/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-15	80			dark brown to orange-brown and dark gray
						CB-16	85			dark gray-green to reddish-brown and purple mottled
						CB-17	90			purple-brown and black mottled
						CB-18	95			violet, brown and dark gray mottled
UC	118	8.7	92			CB-19	100			dark gray-green to black

BORING LOCATION: 19 ft. Lt. Sta. 441+10		DRILLER: GeoLabs-Hawaii		BORING IB-12						
BORING ELEVATION: +311.1 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 07/21/93 07/24/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	78	35.3				DM-1	5			CLAYEY, SANDY, GRAVELLY SILT, very dark brown, stiff to very stiff, moist, fine to coarse sand, fine to coarse gravel - Colluvium
DS	75	39.1				DM-2	10			CLAYEY, SILTY GRAVEL, COBBLES AND BOULDERS, brownish-gray, very dense, moist, fine to coarse sand, fine to coarse gravel, incipiently cemented - Older Alluvium
						DM-3	15			
						DM-4	20			dark brownish-gray
							25			

BORING LOCATION: 19 ft. Lt. Sta. 441+10		DRILLER: GeoLabs-Hawaii		BORING IB-12						
BORING ELEVATION: +311.1 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 07/21/93 07/24/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-8	55			CONGLOMERATE, CLAYEY, SILTY GRAVEL, orange-brown to reddish-brown, very dense, wet, fine to coarse sand, fine to coarse gravel, highly weathered, weakly to well cemented matrix
UC	71	46.3	98			CB-9	60			reddish-brown
						CB-10	65			red, orange, purple and brown mottled, wet
						CB-11	70			reddish-orange and brown mottled
UC	57	55.3	98			CB-12	75			SAPROLITE, red, brown and black mottled, soft, weak, extremely weathered, closely fractured, vesicular

DATE	_____
BY	_____
CHECKED BY	_____
DESIGNED BY	_____
TRACED BY	_____
PLANNED BY	_____
NO.	_____



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Paul Colin Weidig
PSC ASSOCIATES, INC.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
North Halawa Valley Highway, Unit 1, Phase IB
F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994

SHEET No. B23 OF 59 SHEETS

SCALE: 1" = 10'
BASE: 1" = 10'

LIB: STATE DOT/1-3V-3000
LOGDATE: 3/21/94

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1-H3-1(68)	1994	158	470

BORING LOCATION: 19 ft. Lt. Sta. 441+10		DRILLER: GeoLabs-Hawaii		BORING IB-12						
BORING ELEVATION: +311.1 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 07/21/93 07/24/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	84	32.6	100			CB-18	105			black and violet mottled, weak to moderately strong, extremely weathered
UC	172	2.2	100	82		CB-19	110			BASALT, dark gray, very hard, very strong, moderately to slightly weathered, moderately fractured, vesicular - 'A'a
UC	146	6.1	87	42		CB-20	115			dark gray to green, hard to very hard, strong
Bottom of Boring No. IB-12 ? 116.0 ft.										

BORING LOCATION: 23.5 ft. Lt. Sta. 443+10		DRILLER: GeoLabs-Hawaii		BORING IB-13						
BORING ELEVATION: +308.9 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/05/93 08/10/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						SP-3	30			saturated
						DM-4	35			
						DM-5	40			
			0			CB-6	45			CONGLOMERATE- CLAYEY GRAVEL, COBBLES AND BOULDERS, orange-brown and reddish-brown, mottled, hard, moist, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
			0			CB-7	50			moist

BORING LOCATION: 23.5 ft. Lt. Sta. 443+10		DRILLER: GeoLabs-Hawaii		BORING IB-13						
BORING ELEVATION: +308.9 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/05/93 08/10/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	154	8.2	98			CB-13	80			dark green and red mottled
						CB-14	85			dark green and red mottled
						CB-15	90			purple, black and brown mottled, extremely to completely weathered
UC	98	23.3	80			CB-16	95			
						CB-17	100			

BORING LOCATION: 26.5 ft. Lt. Sta. 445+05		DRILLER: GeoLabs-Hawaii		BORING IB-14						
BORING ELEVATION: 299.6 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/02/93 08/04/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						DM-1	5		GM GC	CLAYEY, SILTY GRAVEL, COBBLES AND BOULDERS, dark brown-red brown, dense, wet to saturated, fine to coarse sand, fine to coarse gravel - Alluvium
100	22.2					DM-1	10			orange-brown, very dense, saturated
75	46.9				80/8'	DM-2	20			reddish-brown to dark gray-brown

BORING LOCATION: 23.5 ft. Lt. Sta. 443+10		DRILLER: GeoLabs-Hawaii		BORING IB-13						
BORING ELEVATION: +308.9 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/05/93 08/10/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						DM-1	5		GC	CLAYEY GRAVEL, orange-brown to reddish-brown, loose, moist, fine to coarse sand, fine to coarse gravel - Colluvium
						DM-1	10			CLAYEY GRAVEL, COBBLES AND BOULDERS, orange-brown and reddish-brown mottled, dense, moist to wet, fine to coarse sand, fine to coarse gravel, incipiently cemented - Older Alluvium
					50/2'	DM-1	15			satuated
					50/3'	DM-2	20			wet to saturated

BORING LOCATION: 23.5 ft. Lt. Sta. 443+10		DRILLER: GeoLabs-Hawaii		BORING IB-13						
BORING ELEVATION: +308.9 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/05/93 08/10/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	73	35.4	77			CB-8	55			SAPROLITE, green, soft, weak, highly to extremely weathered, closely fractured, vesicular
						CB-8	60			black, brown, orange and red mottled, extremely to completely weathered
						CB-8	65			red-brown to brownish-purple
UC	115	16.8	85			CB-10	70			dark gray, green and violet mottled
						CB-11	75			purple, black and brown mottled
UC	78	16.9	100			CB-12	80			purple and black mottled, highly weathered

BORING LOCATION: 23.5 ft. Lt. Sta. 443+10		DRILLER: GeoLabs-Hawaii		BORING IB-13						
BORING ELEVATION: +308.9 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/05/93 08/10/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	180	6.3	97	42		CB-18	105			BASALT, dark gray, soft to moderately hard, weak to moderately strong, moderately fractured, slightly weathered, vesicular - 'A'a
UC	81	16.2	100	90		CB-19	110			red, orange, yellow and purple mottled, soft, highly weathered
Bottom of Boring No. IB-13 ? 111.5 ft.										

ORIGINAL PLAN
NOTE BOOK
No.

DATE: 08/10/93
PAGE: 01



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Paul Colin Weidig
PSC ASSOCIATES, INC.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
North Halawa Valley Highway, Unit 1, Phase IB
F.A.I. PROJECT NO. 1-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994

SHEET No. B24 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	159	470

BORING LOCATION: 26.5 ft. Lt. Sta. 445+05		DRILLER: GeoLabs-Hawaii		BORING IB-14						
BORING ELEVATION: 299.8 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/02/93 08/04/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	76	45.8			80/8"	DM-3	30			orange-brown
	69	55.1			51	DM-4	35			SAPROLITE, purple, orange and brown mottled, soft, weak, highly to extremely weathered
UC	70	53.0			80/9"	DM-5	35			purple and black mottled
			98			CB-6	40			green to very dark gray, highly weathered, vesicular, olivine and vesuvianite crystals visible in vesicles
			95			CB-7	45			dark green, purple, brown and black mottled, highly to extremely weathered, very closely fractured
			83			CB-8	50			dark green, purple, brown and black mottled, highly to extremely weathered, very closely fractured

BORING LOCATION: 26.5 ft. Lt. Sta. 445+05		DRILLER: GeoLabs-Hawaii		BORING IB-14						
BORING ELEVATION: 299.8 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/02/93 08/04/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	78	34.4	75			CB-14	80			very dark gray to black, brown and purple mottled, highly to extremely weathered
			72			CB-15	85			purple to orange-brown, highly weathered
			87			CB-16	90			BASALT, very dark gray to gray-green, soft to medium hard, weak to moderately strong, highly weathered, vesicular - 'A'
			93	91		CB-17	95			Bottom of Boring No. IB-14 ? 96.0 ft.

BORING LOCATION: 23.5 ft. Lt. Sta. 447+05		DRILLER: GeoLabs-Hawaii		BORING IB-15						
BORING ELEVATION: +310.9 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/05/93 08/07/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	66	52.4			44	DM-5	30			reddish-brown to orange-brown
			80			CB-6	35			brown
			70			CB-7	40			SAPROLITE, gray and reddish-brown mottled, soft, weak, highly weathered, very closely fractured
UC	80	35.1	100			CB-8	45			brown, purple and gray mottled
			60			CB-9	50			gray
			80			CB-10	55			gray and reddish-brown mottled, weak to moderately strong

BORING LOCATION: 23.5 ft. Lt. Sta. 447+05		DRILLER: GeoLabs-Hawaii		BORING IB-15						
BORING ELEVATION: +310.9 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/05/93 08/07/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100			CB-16	80			dark reddish-brown
UC	112	14.3	80			CB-17	85			reddish-brown to gray
UC	132	2.4	90			CB-18	90			gray, weak to moderately strong, vesicular
			70			CB-19	95			brownish-gray, weak to friable
			80			CB-20	100			light gray, soft to moderately hard, moderately strong

BORING LOCATION: 26.5 ft. Lt. Sta. 445+05		DRILLER: GeoLabs-Hawaii		BORING IB-14						
BORING ELEVATION: 299.8 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/02/93 08/04/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			80			CB-9	55			brown, reddish-brown and very dark gray mottled, highly weathered
UC	92	16.4	98			CB-10	60			brown-gray to dark blue gray to green-gray
UC	58	60.2	95			CB-11	65			dark brown, orange-brown and violet mottled
	61	31.5	95			CB-12	70			greenish-gray to brownish-gray, highly to extremely weathered
UC	80	25.3	93			CB-13	75			reddish-brown, purple and gray-green mottled

BORING LOCATION: 23.5 ft. Lt. Sta. 447+05		DRILLER: GeoLabs-Hawaii		BORING IB-15						
BORING ELEVATION: +310.9 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/05/93 08/07/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						GM GC	5			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown-gray, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
	11.2				70/5'	DM-1	10			brown-gray
	8.4				138/10'	DM-2	15			moist to wet
	32.6				61	DM-3	20			orange-brown to gray-brown, saturated
DS	66	52.1			43	DM-4	25			brown-gray

BORING LOCATION: 23.5 ft. Lt. Sta. 447+05		DRILLER: GeoLabs-Hawaii		BORING IB-15						
BORING ELEVATION: +310.9 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/05/93 08/07/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			70			CB-11	55			brownish-gray
			0			CB-12	60			weak to friable, very closely fractured
UC	56	59.8	70			CB-13	65			closely fractured
			60			CB-14	70			gray
			95			CB-15	75			reddish-brown

DATE	_____
DESIGNED BY	_____
CHECKED BY	_____
DATE	_____
DESIGNED BY	_____
CHECKED BY	_____



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Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit I, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994

SHEET No. B25 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1-H3-1(68)	1994	160	470

BORING LOCATION: 23.5 ft. Lt. Sta. 447+05		DRILLER: GeoLabs-Hawaii		BORING IB-15						
BORING ELEVATION: +310.9 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/05/93 08/07/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	93	26.5	85			CB-21	105			reddish-brown to gray, weak to friable, very closely fractured
						CB-21	110			
UC	81	28.2	95			CB-22	115			brownish-gray
							120			Bottom of Boring No. IB-15 ? 117.0 ft.
							125			

BORING LOCATION: 23.5 ft. Lt. Sta. 449+10		DRILLER: GeoLabs-Hawaii		BORING IB-16						
BORING ELEVATION: +315.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/11/93 08/15/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-5	30			SAPROLITE, light gray, soft, weak, highly weathered, closely fractured
						CB-6	35			gray, very closely fractured
						CB-7	40			medium gray
						CB-8	45			brownish-gray, weak to moderately strong, vesicular
UC	74	38.0	90			CB-9	50			

BORING LOCATION: 23.5 ft. Lt. Sta. 449+10		DRILLER: GeoLabs-Hawaii		BORING IB-16						
BORING ELEVATION: +315.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/11/93 08/15/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-15	80			dark gray, weak to friable
						CB-16	85			dark gray
						CB-17	90			weak to moderately strong
						CB-18	95			medium gray
						CB-19	100			

BORING LOCATION: 23.5 ft. Lt. Sta. 449+10		DRILLER: GeoLabs-Hawaii		BORING IB-16						
BORING ELEVATION: +315.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/11/93 08/15/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							130			CLINKER, reddish-brown, soft to moderately hard, moderately strong, moderately to slightly weathered, very closely fractured Bottom of Boring No. IB-16 ? 125.5 ft.
							135			
							140			
							145			
							150			

BORING LOCATION: 23.5 ft. Lt. Sta. 449+10		DRILLER: GeoLabs-Hawaii		BORING IB-16						
BORING ELEVATION: +315.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/11/93 08/15/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						DM-1	5		CH	SILTY, SANDY CLAY, dark brown, stiff, moist - Alluvium
	83	30.4			52	DM-1	10		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium moist to wet, dense to very dense
						DM-2	15		GC	CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, saturated, very dense, fine to coarse sand, fine to coarse gravel - Alluvium
SA	87	34.0			61	DM-3	20			
						CB-4	25			

BORING LOCATION: 23.5 ft. Lt. Sta. 449+10		DRILLER: GeoLabs-Hawaii		BORING IB-16						
BORING ELEVATION: +315.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/11/93 08/15/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-10	55			dark gray, closely fractured
UC	100	11.8	95			CB-11	60			brownish-gray to medium gray
						CB-12	65			brownish-gray, weak to friable
						CB-13	70			medium gray, weak to moderately strong
						CB-14	75			medium gray, very closely fractured

BORING LOCATION: 23.5 ft. Lt. Sta. 449+10		DRILLER: GeoLabs-Hawaii		BORING IB-16						
BORING ELEVATION: +315.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/11/93 08/15/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-20	105			brownish-gray, weak to friable, extremely weathered
UC	129	6.0	100		30	CB-21	110			BASALT, medium gray, moderately hard, moderately to slightly weathered, moderately fractured, vesicular - 'A'a
						CB-22	115			ASH, dark gray, moderately hard, moderately strong, moderately weathered, very closely fractured, welded texture
UC	152	3.5	100		40	CB-23	120			BASALT, light gray, moderately hard, moderately strong, moderately to slightly weathered, vesicular - 'A'a
						CB-24	125			hard, strong, slightly weathered

SURVEY PLOTTED BY: _____ DATE: _____
 ORIGINAL PLAN REVISIONS: _____
 NOTE BOOK DESIGNED BY: _____
 QUANTITIES BY: _____
 CHECKED BY: _____
 No. _____



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 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
BORING LOGS
 INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit I, Phase IB
 F.A.I. PROJECT NO. 1-H3-(68)
 SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B26 OF 59 SHEETS

BORING LOCATION		DRILLER		BORING IB-17						
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
28 ft. Lt. Sta. 451+10		GeoLabs-Hawaii								
+318.8 ft		C. Isaacson								
08/07/93 08/11/93		Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
DS PI PR	80	47.5				BK-1	0		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, brownish-gray, loose, moist, fine to coarse sand, fine to coarse gravel - Alluvium
CN	88	39.7			47	DM-2	5			brown, dense
SA					125	DM-3	10			very dense, saturated
DS	72	48.2			82	DM-4	15			dense, moist
					50	DM-5	20			
							25			

BORING LOCATION		DRILLER		BORING IB-17						
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
28 ft. Lt. Sta. 451+10		GeoLabs-Hawaii								
+318.8 ft		C. Isaacson								
08/07/93 08/11/93		Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			80			CB-13	55			dark gray, weak to friable
			80			CB-14	60			medium gray, weak
UC	63	50.8	90			CB-15	65			gray-brown, weak to friable, weak, extremely weathered, very closely fractured
			90			CB-16	70			medium to dark gray
			100			CB-17	75			medium gray, weak to moderately strong, highly weathered, closely fractured

BORING LOCATION		DRILLER		BORING IB-17						
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
28 ft. Lt. Sta. 451+10		GeoLabs-Hawaii								
+318.8 ft		C. Isaacson								
08/07/93 08/11/93		Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100	20		CB-23	105			BASALT, dark gray, soft to moderately hard, moderately strong, moderately to highly weathered, moderately fractured, vesicular - 'A'a
UC	110	17.0	100	80		CB-24	110			moderately strong to strong
UC	85	23.3	98	90		CB-25	115			moderately strong
UC	107	10.9	100	37		CB-26	120			moderately strong
							125			Bottom of Boring No. IB-17 ? 122.0 ft.

BORING LOCATION		DRILLER		BORING IB-18						
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
23.5 ft. Lt. Sta. 453+10		GeoLabs-Hawaii								
331.08 ft		S. Hickman								
08/11/93 08/13/93		Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			83			CB-6	30			green-gray, highly to extremely weathered
			100			CB-7	35			gray, brown and yellow mottled
			92			CB-8	40			reddish-brown
60	74.5	78				CB-9	45			gray, green and black mottled
			100			CB-10	50			red, brown and yellow-orange mottled, closely fractured
			50			CB-11	55			gray, black and red mottled
			0			CB-12	60			black, yellow and orange mottled, extremely weathered

BORING LOCATION		DRILLER		BORING IB-17						
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
28 ft. Lt. Sta. 451+10		GeoLabs-Hawaii								
+318.8 ft		C. Isaacson								
08/07/93 08/11/93		Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	70	34.0	0		80	DM-6	30			CONGLOMERATE, SILTY, CLAYEY GRAVEL, brown, dense, moist, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
			80			CB-7	35			gray-brown, friable, poorly cemented matrix
			98			CB-9	40			SAPROLITE, dark gray to brown, soft, weak, highly to extremely weathered, very closely fractured, vesicular
			98			CB-10	45			dark gray, weak to friable, highly weathered, closely fractured
			97			CB-11	50			medium to dark gray, weak
			90			CB-12	55			

BORING LOCATION		DRILLER		BORING IB-17						
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
28 ft. Lt. Sta. 451+10		GeoLabs-Hawaii								
+318.8 ft		C. Isaacson								
08/07/93 08/11/93		Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	103	19.0	100			CB-18	80			dark to medium gray, weak to friable, highly to extremely weathered, very closely fractured
			78			CB-19	85			medium gray
			98			CB-20	90			brownish-gray
			100			CB-21	95			
UC	78	36.0	85			CB-22	100			

BORING LOCATION		DRILLER		BORING IB-18						
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
23.5 ft. Lt. Sta. 453+10		GeoLabs-Hawaii								
331.08 ft		S. Hickman								
08/11/93 08/13/93		Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			85			CB-1	5		CH	SILTY, SANDY, GRAVELLY CLAY, brown, soft, moist, fine to coarse sand, fine to coarse gravel - Alluvium.
			45			CB-2	10		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, moist, very dense, fine to coarse sand, fine to coarse gravel - Alluvium.
			80			CB-3	15			brownish-gray
			52			CB-4	20			SAPROLITE, gray, soft, weak, highly to extremely weathered, vesicular
57	53.4	55				CB-5	25			

DATE: _____
 SURVEY PLOTTED BY: _____
 DESIGNED BY: _____
 CHECKED BY: _____



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halaawa Valley Highway, Unit I, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994

SHEET No. B27 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	162	470

BORING LOCATION: 23.5 ft. Lt. Sta. 453+10		DRILLER: GeoLabs-Hawaii		BORING IB-18						
BORING ELEVATION: 331.08 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/11/93 08/13/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	61	50.6	92			CB-13				very closely fractured red, yellow and orange mottled
						CB-14	55			red, orange and brown mottled
	54	59.6	100			CB-15				gray, orange and black mottled, highly to extremely weathered, closely fractured
			88			CB-16	60			brown, yellow and orange mottled, very closely fractured
		55.2	100			CB-17	65			blue-gray
						CB-18	70			green, orange and brown mottled, extremely weathered
	60	55.0	93			CB-19	75			purple, yellow and orange mottled, highly to extremely weathered

BORING LOCATION: 23.5 ft. Lt. Sta. 453+10		DRILLER: GeoLabs-Hawaii		BORING IB-18						
BORING ELEVATION: 331.08 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/11/93 08/13/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	UC 101	8.2	100	63		CB-25	105			gray-green and brown mottled, moderately weathered
						CB-26	110			gray, green and yellow mottled, hard, strong
	UC 148	5.2	100	55		CB-27	115			green and black mottled, moderately hard to hard
							120			
							125			Bottom of Boring No. IB-18 ? 117.0 ft.

BORING LOCATION: 23.5 ft. Lt. Sta. 455+00		DRILLER: GeoLabs-Hawaii		BORING IB-19						
BORING ELEVATION: +330.3 ft		LOGGED BY: C. Issacson								
DATE(S) DRILLED: 06/23/93 06/25/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						DM-2	75			CLAYEY, SANDY, GRAVELLY SILT, reddish-brown, very stiff, wet to saturated, fine to coarse sand, fine to coarse gravel - Alluvium
						CB-3	30			SAPROLITE, gray, soft, weak, highly to extremely weathered, very closely fractured
						CB-4	35			highly weathered
						CB-5	40			dark gray to tan and orange-brown mottled, highly to extremely weathered
						CB-6	45			gray
						CB-7	50			CLINKER, dark gray-brown, soft to friable, weak, highly weathered

BORING LOCATION: 22 ft. Lt. Sta. 457+00		DRILLER: GeoLabs-Hawaii		BORING IB-20						
BORING ELEVATION: +335.4 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/11/93 08/16/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	89	24.7				DM-1	5			SILTY CLAY, very dark brown, soft, moist
							10			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, very dark brown, dense, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium
							15			brownish-gray to gray-orange, very dense, moist
	UC 85	34.6				DM-2	20			CLAYEY GRAVEL, COBBLES AND BOULDERS, brown to reddish-brown, very dense, wet, fine to coarse sand, fine to coarse gravel - Alluvium
						DM-3	25			SAPROLITE, green, orange and yellow-brown mottled, soft, weak, highly to extremely weathered, closely fractured, vesicular
			95			CB-4				

BORING LOCATION: 23.5 ft. Lt. Sta. 453+10		DRILLER: GeoLabs-Hawaii		BORING IB-18						
BORING ELEVATION: 331.08 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/11/93 08/13/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	63	45.8	70			CB-20	80			red, brown and gray mottled
						CB-21	85			red, brown and black mottled
			97			CB-22	90			gray, green and black mottled
	62	49.3	100	10		CB-23	95			gray, green, purple and black mottled
						CB-24	100			BASALT, gray-green, soft to moderately hard, moderately strong, moderately fractured, highly weathered, vesicular - 'A'a moderately strong to strong

BORING LOCATION: 23.5 ft. Lt. Sta. 455+00		DRILLER: GeoLabs-Hawaii		BORING IB-19						
BORING ELEVATION: +330.3 ft		LOGGED BY: C. Issacson								
DATE(S) DRILLED: 06/23/93 06/25/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	DS 69	48.0			90/9*	DM-1	5			CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
							10			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
							15			brown, wet to saturated
							20			gray-brown, saturated

BORING LOCATION: 23.5 ft. Lt. Sta. 455+00		DRILLER: GeoLabs-Hawaii		BORING IB-19						
BORING ELEVATION: +330.3 ft		LOGGED BY: C. Issacson								
DATE(S) DRILLED: 06/23/93 06/25/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-8	55			SAPROLITE, dark gray, soft, weak, highly weathered, vesicular
						CB-9	60			
						CB-10	65			ASH AND CINDERS, light brown, soft, weak, highly weathered
			90				70			
							75			Bottom of Boring No. IB-19 ? 68.0 feet.

ORIGINAL PLAN	DATE
REVISION	
NO.	



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Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit I, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994

SHEET No. B28 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1-H3-1(68)	1994	163	470

BORING LOCATION: 22 ft. Lt. Sta. 457+00		DRILLER: Geolabs-Hawaii		BORING IB-20						
BORING ELEVATION: +335.4 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/11/93 08/18/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	98	22.2	93			CB-5	30			dark gray, red, brown and black mottled, extremely weathered, very closely fractured
						CB-6	33			very dark gray, black, and violet mottled
						CB-7	35			violet and black mottled, extremely weathered
						CB-8	40			gray, green, purple and red mottled, highly to extremely weathered
						CB-9	45			purple, brown and black mottled, extremely to completely weathered
							50			

BORING LOCATION: 22 ft. Lt. Sta. 457+00		DRILLER: Geolabs-Hawaii		BORING IB-20						
BORING ELEVATION: +335.4 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/11/93 08/18/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-15	80			green, brown and black mottled, highly weathered
UC	119	14.5	90			CB-16	85			purple, green, brown and black mottled, soft, weak, extremely to completely weathered, very closely fractured, vesicular
						CB-17	90			gray, red, brown and black mottled, highly to extremely weathered
UC	128	7.7	100	87		CB-18	95			BASALT, brown to gray, hard, strong, moderately to slightly weathered, vesicular - A'a
UC	111	3.7	100	78		CB-19	100			very dark gray-brown, black and purple mottled, soft to moderately hard, moderately strong, moderately to highly weathered

BORING LOCATION: 25.5 ft. Lt. Sta. 458+80		DRILLER: Geolabs-Hawaii		BORING IB-21						
BORING ELEVATION: +339.5 ft		LOGGED BY: J. Brock/C. Isaacson								
DATE(S) DRILLED: 08/20/93 09/01/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										CLAYEY SILT, dark brown, stiff, moist, with scattered fine to coarse sand and gravel - Alluvium
	82	28.8			64	DM-1	5	GM GC		SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, dense, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium
					41	DM-2	10	GC		CLAYEY GRAVEL, COBBLES AND BOULDERS, orange-brown to red-brown, dense, wet, fine to coarse sand, fine to coarse gravel - Alluvium
		17.4			83	DM-3	15	GM GC		SILTY GRAVEL, COBBLES AND BOULDERS, gray, dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
						CB-4				
						CB-5				
						CB-6				
						CB-7				SILTY GRAVEL, COBBLES AND BOULDERS, brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
							25			SAPROLITE, gray to dark gray,

BORING LOCATION: 25.5 ft. Lt. Sta. 458+80		DRILLER: Geolabs-Hawaii		BORING IB-21						
BORING ELEVATION: +339.5 ft		LOGGED BY: J. Brock/C. Isaacson								
DATE(S) DRILLED: 08/20/93 09/01/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-13	55			medium to dark gray-brown
						CB-14	60			brownish-gray
						CB-15	65			medium to dark gray
						CB-16	70			brownish-gray, highly to extremely weathered
UC	68	47.2	90			CB-17	75			brownish-gray, highly weathered

BORING LOCATION: 22 ft. Lt. Sta. 457+00		DRILLER: Geolabs-Hawaii		BORING IB-20						
BORING ELEVATION: +335.4 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/11/93 08/18/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100			CB-10	55			purple, gray, red and brown mottled
						CB-11	60			green, red and purple mottled
						CB-12	65			black, purple, green and gray mottled, soft to moderately hard, moderately strong, highly to extremely weathered, closely fractured
						CB-13	70			gray, brown, orange and purple mottled, soft, weak, extremely to completely weathered, very closely fractured
						CB-14	75			brown to dark brown and orange mottled, highly to extremely weathered
							76			

BORING LOCATION: 22 ft. Lt. Sta. 457+00		DRILLER: Geolabs-Hawaii		BORING IB-20						
BORING ELEVATION: +335.4 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/11/93 08/18/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							105			Bottom of Boring No. IB-20 ? 101.5 ft.
							110			
							115			
							120			
							125			

BORING LOCATION: 25.5 ft. Lt. Sta. 458+80		DRILLER: Geolabs-Hawaii		BORING IB-21						
BORING ELEVATION: +339.5 ft		LOGGED BY: J. Brock/C. Isaacson								
DATE(S) DRILLED: 08/20/93 09/01/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			98			CB-8	30			soft, weak, highly to extremely weathered, very closely fractured, vesicular gray, highly weathered, closely fractured
						CB-9	35			weak to friable, highly to extremely weathered, very closely fractured
						CB-10	40			brownish-gray, soft, weak, highly weathered
UC	75	38.0	86			CB-11	45			medium gray
						CB-12	50			medium to dark gray, weak to friable, vesicular

ORIGINAL PLAN	DATE
TRACED BY	
DESIGNED BY	
QUANTITIES BY	
CHECKED BY	



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit I, Phase IB
 F.A.I. PROJECT NO. 1-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994

SHEET No. B29 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	164	470

BORING LOCATION: 25.5 ft. Lt. Sta. 458+80		DRILLER: Geolabs-Hawaii		BORING IB-21						
BORING ELEVATION: +339.5 ft		LOGGED BY: J. Brock/C. Isaacson								
DATE(S) DRILLED: 08/20/93 09/01/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	90	20.0	80			CB-18	80			weak to moderately strong, closely fractured
						CB-19	100			
						CB-20	90			
UC	76	7.6	80			CB-21	90			highly to extremely weathered
						CB-22	95			
UC	94	24.2	80	30			100			BASALT, brownish-gray to light gray, moderately hard, moderately strong, moderately weathered, moderately fractured, vesicular - 'A'a

BORING LOCATION: 20.5 ft. Lt. Sta. 460+22		DRILLER: Geolabs-Hawaii		BORING IB-22						
BORING ELEVATION: +344.3 ft		LOGGED BY: J. Brock/C. Isaacson								
DATE(S) DRILLED: 08/23/93 08/28/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						OL	5			ORGANIC SILT, loose, moist - Alluvium
						GM GC	5			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, moist, dense, fine to coarse sand, fine to coarse gravel - Alluvium
					82	DM-1	10			
			34			CB-2	10			
			0			CB-3	16			gray-brown, wet to saturated, very dense
			60			CB-4	20			
			60			CB-5	25			

BORING LOCATION: 20.5 ft. Lt. Sta. 460+22		DRILLER: Geolabs-Hawaii		BORING IB-22						
BORING ELEVATION: +344.3 ft		LOGGED BY: J. Brock/C. Isaacson								
DATE(S) DRILLED: 08/23/93 08/28/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-11	55			dark gray, olivine crystals visible in vesicles
						CB-12	58			dark gray to brown, weak, highly to extremely weathered
UC	80	30.6	100			CB-13	60			dark gray to brown
						CB-14	65			
UC	68	45.9	70			CB-15	70			weak to friable, olivine crystals visible in vesicles
							75			

BORING LOCATION: 20.5 ft. Lt. Sta. 460+22		DRILLER: Geolabs-Hawaii		BORING IB-22						
BORING ELEVATION: +344.3 ft		LOGGED BY: J. Brock/C. Isaacson								
DATE(S) DRILLED: 08/23/93 08/28/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	87	24.8	98			CB-21	105			
UC	70	37.2	100			CB-22	110			medium to dark brown
							115			
							120			
							125			Bottom of Boring No. IB-22 ? 112.0 ft.

BORING LOCATION: 25.5 ft. Lt. Sta. 458+80		DRILLER: Geolabs-Hawaii		BORING IB-21						
BORING ELEVATION: +339.5 ft		LOGGED BY: J. Brock/C. Isaacson								
DATE(S) DRILLED: 08/20/93 09/01/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100	30		CB-23	105			light gray to medium gray, soft to moderately hard, moderately strong to strong
							110			
							115			
							120			
							125			Bottom of Boring No. IB-21 ? 105.5 ft.

BORING LOCATION: 20.5 ft. Lt. Sta. 460+22		DRILLER: Geolabs-Hawaii		BORING IB-22						
BORING ELEVATION: +344.3 ft		LOGGED BY: J. Brock/C. Isaacson								
DATE(S) DRILLED: 08/23/93 08/28/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			60			CB-6	30			SAPROLITE, gray-brown, soft to friable, weak, extremely weathered, very closely fractured
						CB-7	35			vesicular
			30			CB-8	40			gray-brown to reddish-brown, weak to friable, extremely weathered
UC	64	41.5	78			CB-9	45			ASH AND SPATTER, light to dark brown, soft, weak, extremely weathered, welded texture
			70			CB-10	50			SAPROLITE, dark gray-brown, weak to friable, extremely weathered, very closely fractured, vesicular
							55			gray-brown, extremely weathered

BORING LOCATION: 20.5 ft. Lt. Sta. 460+22		DRILLER: Geolabs-Hawaii		BORING IB-22						
BORING ELEVATION: +344.3 ft		LOGGED BY: J. Brock/C. Isaacson								
DATE(S) DRILLED: 08/23/93 08/28/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	75	37.0	55			CB-16	80			dark gray, orange-brown and red mottled
UC	128	8.7	100			CB-17	85			dark gray to greenish-brown
			53.5	70		CB-18	90			dark gray to gray-brown and reddish-brown
			85			CB-19	95			ASH AND SANDERS, light brown, soft, weak, highly to extremely weathered, welded texture
			100			CB-20	100			SAPROLITE, light brown, weak to friable, highly to extremely weathered, very closely fractured

SURVEY PLANNED BY: _____ DATE: _____
 FIELD NOTES BY: _____
 DESIGNED BY: _____
 QUANTITIES BY: _____
 CHECKED BY: _____
 No. _____



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
BORING LOGS
 INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)
 SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B30 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	165	470

BORING LOCATION		DRILLER		BORING IB-23						
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
23.5 ft. Lt. Sta. 461+80		GeoLabs-Hawaii								
+343.5 ft		H. Clark								
07/07/93 07/09/93		Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	90	21.9			75/6"	DM-1	5	CH		SILTY CLAY, brown, very soft, moist, with roots - Alluvium
								MH		SANDY, GRAVELLY SILT, orange-brown, stiff, dry, fine to coarse sand, fine to coarse gravel - Alluvium
SA	89	36.3			24/6"	DM-2	10	GM		SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium reddish-brown
										wet to saturated
			63		38/6"	DM-3	15			orange-brown, moist
						CB-4	20			SAPROLITE, light gray to dark brown, soft, weak, highly weathered, vesicular, olivine crystals visible in vesicles
			80			CB-5	25			reddish-gray to brown, highly to extremely weathered, with ash partings

BORING LOCATION		DRILLER		BORING IB-23						
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
23.5 ft. Lt. Sta. 461+80		GeoLabs-Hawaii								
+343.5 ft		H. Clark								
07/07/93 07/09/93		Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										light gray to gray-brown, closely fractured
										orange-brown to gray, highly to extremely weathered, very closely fractured
UC	60	53.1	80			CB-14	60			reddish-brown, weak to moderately strong, olivine crystals visible in vesicles
										ASH AND CINDEERS, orange, soft, weak, extremely to completely weathered, welded texture Bottom of Boring No. IB-23 ? 86.0 ft.

BORING LOCATION		DRILLER		BORING IB-24						
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
23.5 ft. Lt. Sta. 463+41		GeoLabs-Hawaii								
+345.2 ft		C. Isaacson								
09/15/93 09/17/93		Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										SAPROLITE, gray, soft, weak, highly weathered, very closely fractured
										medium gray
										brownish-gray to dark gray, weak to friable, weak, extremely weathered, closely fractured, vesicular
UC	85	55.6	95			CB-10	50			ASH AND SPATTER, brown and black mottled, soft, weak, highly to extremely weathered, welded texture SAPROLITE, dark gray, soft, weak, highly weathered,

BORING LOCATION		DRILLER		BORING IB-24						
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
23.5 ft. Lt. Sta. 463+41		GeoLabs-Hawaii								
+346.2 ft		C. Isaacson								
09/15/93 09/17/93		Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	71	48.8	100			CB-16	80			tan
			80	25		CB-17	85			BASALT, dark gray, soft to moderately hard, strong, moderately to slightly weathered, moderately fractured, vesicular - 'A'a
			43	0		CB-18	90			dark gray, hard, strong, slightly weathered
			100	30		CB-19	95			
			78	0		CB-20	100			
Bottom of Boring No. IB-24 ? 96.0 ft.										

BORING LOCATION		DRILLER		BORING IB-23						
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
23.5 ft. Lt. Sta. 461+80		GeoLabs-Hawaii								
+343.5 ft		H. Clark								
07/07/93 07/09/93		Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			68			CB-6	30			ASH AND CINDEERS, gray-brown, soft, weak, highly weathered
										SAPROLITE, reddish-gray, soft, weak, highly to extremely weathered, very closely fractured
			50			CB-7	35			gray-green to reddish-gray, soft to moderately hard, highly to extremely weathered, closely fractured
			58			CB-8	40			gray-green to reddish-brown, vesicular
			66			CB-9	45			reddish-orange to reddish-gray, soft
			68			CB-10	50			brownish-gray, highly weathered, very closely fractured
			71			CB-11	55			

BORING LOCATION		DRILLER		BORING IB-24						
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
23.5 ft. Lt. Sta. 463+41		GeoLabs-Hawaii								
+345.2 ft		C. Isaacson								
09/15/93 09/17/93		Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										ORGANIC SILT, dark brown, loose, moist - Alluvium
										SILTY GRAVEL COBBLES AND BOULDERS, brown, very dense, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium
					101	DM-1	5			saturation
			50			CB-2	10			
			80			CB-3	15			
			60			CB-4	20			SAPROLITE, medium gray, soft, weak, highly weathered, very closely fractured
			70			CB-5	25			CLINKER, mottled brown and dark gray, soft, weak, highly to extremely weathered

BORING LOCATION		DRILLER		BORING IB-24						
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
23.5 ft. Lt. Sta. 463+41		GeoLabs-Hawaii								
+345.2 ft		C. Isaacson								
09/15/93 09/17/93		Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										close to fractured, vesicular
										ASH AND CINDEERS, tan, soft, weak, highly to extremely weathered, welded texture
UC	88	51.6	100			CB-12	60			ASH AND SPATTER, dark brown to reddish-brown, soft, weak, highly to extremely weathered, welded texture
			100			CB-13	65			ASH AND CINDEERS, dark brown, soft, weak, highly to extremely weathered, welded texture
			100			CB-14	70			orange-brown, red, yellow-brown and gray mottled
			100			CB-15	75			light yellow-brown and red-orange mottled

ORIGINAL PLAN
 SURVEY PLOTTED BY
 TRACED BY
 NOTE BOOK
 DESIGNED BY
 QUANTITIES BY
 CHECKED BY
 No.



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 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
BORING LOGS
 INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)
 SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B31 OF 59 SHEETS

LBL STATE WDTV-3V-3030V
 LOGBOR24 3/21/94 RSC

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	166	470

BORING LOCATION: 21 ft. Rt. Sta. 465+40		DRILLER: GeoLabs-Hawaii		BORING IB-25						
BORING ELEVATION: +383.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/15/93 08/17/93		TYPE RIG: Rotary wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	89	39.6			40	DM-1	5		GC	CLAYEY GRAVEL, brown, loose, moist, fine to coarse sand, fine to coarse gravel - Alluvium
CN	86	21.3			61	DM-2	10		GM	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
										wet to saturated
SG	101	20.6			140	DM-3	15		GM	gray-brown, very dense, saturated
DS	87	47.6			104	DM-4	20		GM	
							25			

BORING LOCATION: 21 ft. Rt. Sta. 465+40		DRILLER: GeoLabs-Hawaii		BORING IB-25						
BORING ELEVATION: +383.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/15/93 08/17/93		TYPE RIG: Rotary wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			70			CB-11	55			gray-brown, brecciated
			90			CB-12	55			light to medium gray, weak to moderately strong, highly weathered
UC	148	5.4	100			CB-13	60			soft to moderately hard, moderately strong
UC	78	34.4	100			CB-14	85			dark gray and brown mottled, weak
UC	140	2.3	85	13		CB-15	70			BASALT, light to medium gray, hard to moderately hard, strong, moderately weathered, vesicular - 'A'a
							75			

BORING LOCATION: 23.5 ft. Lt. Station 467+40		DRILLER: GeoLabs-Hawaii		BORING IB-26						
BORING ELEVATION: +382.0 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/12/93 08/15/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							5		GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, mottled brown and gray, dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
							5		GC	CLAYEY GRAVEL, COBBLES AND BOULDERS, mottled brown and gray, dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
DS	72	46.8			40	DM-1	10		GM	SILTY, CLAYEY GRAVEL, gray-brown, very dense, wet to saturated, fine to coarse sand, fine to coarse gravel - Alluvium saturated
							15		GM	SILTY GRAVEL, gray-brown, very dense, wet to saturated, fine to coarse sand, fine to coarse gravel - Alluvium
					30/6"	DM-2	15		GM	
							20		GM	SILTY, CLAYEY GRAVEL, gray-brown, very dense, wet to saturated, fine to coarse sand, fine to coarse gravel - Alluvium
					25/7"	DM-3	20			saturated
							25			

BORING LOCATION: 23.5 ft. Lt. Station 467+40		DRILLER: GeoLabs-Hawaii		BORING IB-26						
BORING ELEVATION: +382.0 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/12/93 08/15/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			50			CB-8	55			dark gray-brown, soft, weak, highly weathered, very closely fractured
			50			CB-9	55			dark gray to gray-green, soft to moderately hard, moderately strong
			95			CB-10	60			dark gray-brown
UC	82	20.1	75			CB-11	65			dark gray to gray-green and gray-brown mottled
							70			dark gray, moderately hard, moderately strong, highly weathered
			95			CB-12	70			
							75			

BORING LOCATION: 21 ft. Rt. Sta. 465+40		DRILLER: GeoLabs-Hawaii		BORING IB-25						
BORING ELEVATION: +383.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/15/93 08/17/93		TYPE RIG: Rotary wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	85	56.7			95	DM-5	30			SAPROLITE, gray, soft, weak, extremely weathered, very closely fractured, vesicular
			83			CB-6	30			
			70			CB-7	30			brownish-gray, weak to friable
			80			CB-8	35			
			80			CB-9	40			
			50			CB-10	45			
							50			

BORING LOCATION: 21 ft. Rt. Sta. 465+40		DRILLER: GeoLabs-Hawaii		BORING IB-25						
BORING ELEVATION: +383.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/15/93 08/17/93		TYPE RIG: Rotary wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			90		30	CB-16	80			ASH, reddish-brown, brown and tan mottled, moderately hard, strong, moderately to highly weathered
UC	130	7.7	100		48	CB-17	80			
UC	120	2.5	100		60	CB-18	85			BASALT, dark gray, hard to moderately hard, strong, slightly to moderately weathered, vesicular - 'A'a
UC	87	16.8	90		40	CB-19	90			
							95			Bottom of Boring No. IB-25 ? 95.0 ft.
							100			

BORING LOCATION: 23.5 ft. Lt. Station 467+40		DRILLER: GeoLabs-Hawaii		BORING IB-26						
BORING ELEVATION: +382.0 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/12/93 08/15/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							30			
							35			SAPROLITE, dark gray, soft, weak, highly weathered
							40			dark gray to gray-brown, soft, weak, highly weathered
							45			
							45			gray-brown to reddish-brown, soft to moderately hard, weak to friable, highly to extremely weathered
							50			

ORIGINAL PLAN TRACKED BY DATE
 NOTE BOOK DESIGNED BY
 QUANTITIES BY
 CHECKED BY



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B32 OF 59 SHEETS

LIB: STATE DOT/1-3V-3031
 LOG#0525-371/94 RSO

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	167	470

BORING LOCATION: 23.5 ft. Lt. Station 467+40		DRILLER: GeoLabs-Hawaii		BORING IB-26						
BORING ELEVATION: +382.0 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 06/12/93 06/16/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	144	0.9				CB-13	0			dark gray-green, soft to moderately hard
						CB-14	0			BASALT, brown, moderately hard, moderately strong to strong, moderately to slightly weathered, vesicular - 'A'a
						CB-15	80			gray-brown
						CB-16	85			
							90			Bottom of Boring No. IB-26 ? 88.0 ft.
							95			
							100			

BORING LOCATION: 23.5 ft. Lt. Sta. 472+05		DRILLER: GeoLabs-Hawaii		BORING IB-27						
BORING ELEVATION: +381.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/02/93 09/03/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-6	0			
						CB-7	30			gray, wet
						CB-8	35			dense to very dense
						CB-9	40			brown-gray
UC	157	3.3				CB-10	45			
							50			SAPROLITE, reddish-brown, soft, weak, extremely

BORING LOCATION: 23.5 ft. Lt. Sta. 472+05		DRILLER: GeoLabs-Hawaii		BORING IB-27						
BORING ELEVATION: +381.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/02/93 09/03/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-16	0			gray, closely fractured
						CB-17	80			gray to dark brown, highly to extremely weathered
UC	113	13.6				CB-18	85			BASALT, gray, moderately hard, strong, moderately weathered, closely fractured, vesicular - 'A'a
						CB-19	90			
						CB-20	95			hard, slightly to moderately weathered
							100			

BORING LOCATION: 23.5 ft. Lt. Baseline Sta. 473+46		DRILLER: GeoLabs-Hawaii		BORING IB-28						
BORING ELEVATION: +387.1 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 08/07/93 08/09/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						DM-1	5			SILTY GRAVEL, gray-brown, medium-dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium dense
SA						CB-2	5			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
						CB-3	10			moist to wet
						CB-4	15			wet
						CB-5	20			aturated
							25			

BORING LOCATION: 23.5 ft. Lt. Sta. 472+05		DRILLER: GeoLabs-Hawaii		BORING IB-27						
BORING ELEVATION: +381.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/02/93 09/03/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CH	0			SILTY CLAY, mottled brown, stiff, moist - Alluvium
						GM	6			SILTY GRAVEL, COBBLES AND BOULDERS, gray-brown, dense, wet, fine to coarse sand, fine to coarse gravel - Alluvium
						GM	6			SILTY, CLAYEY GRAVEL COBBLES AND BOULDERS, gray-dark brown, very dense, wet, fine to coarse sand, fine to coarse gravel - Alluvium
						GM	10			SILTY GRAVEL, COBBLES AND BOULDERS, gray-dark brown, dense, wet, fine to coarse sand, fine to coarse gravel - Alluvium
						GM	15			SILTY, CLAYEY GRAVEL COBBLES AND BOULDERS, grayish-brown, very dense, wet to saturated, fine to coarse sand, fine to coarse gravel - Alluvium
						GM	20			CONGLOMERATE SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, reddish-brown, very dense, moist, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
							25			

BORING LOCATION: 23.5 ft. Lt. Sta. 472+05		DRILLER: GeoLabs-Hawaii		BORING IB-27						
BORING ELEVATION: +381.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/02/93 09/03/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-11	0			weathered
						CB-12	55			gray, highly weathered
UC	167	1.9				CB-13	60			reddish-brown, extremely weathered
						CB-14	65			gray, highly to extremely weathered, closely fractured
						CB-15	70			very closely fractured, vesicular
							75			

BORING LOCATION: 23.5 ft. Lt. Sta. 472+05		DRILLER: GeoLabs-Hawaii		BORING IB-27						
BORING ELEVATION: +381.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/02/93 09/03/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	118	11.6				CB-21	30			reddish-brown, moderately hard, moderately strong, highly weathered, very closely fractured
UC	128	8.0				CB-22	30			gray, strong, moderately weathered, closely fractured CLINKER brown, moderately hard, weak, highly to moderately weathered BASALT, gray, moderately hard, strong, moderately weathered, moderately fractured, vesicular - 'A'a Bottom of Boring No. IB-27 ? 110 ft.
							105			
							110			
							115			
							120			
							125			

SURVEY PLOTTED BY: _____ DATE: _____
 DESIGNED BY: _____
 NOTE BOOK: _____
 QUANTITIES BY: _____
 CHECKED BY: _____



THIS WORK WAS PREPARED BY ME
 OR UNDER MY SUPERVISION
 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
BORING LOGS
 INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit I, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)
 SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B33 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1-H3-1(68)	1994	168	470

BORING LOCATION: 23.5 ft. Lt. Sta. 473+45		DRILLER: GeoLabs-Hawaii		BORING IB-28						
BORING ELEVATION: +387.1 ft		LOGGED BY: P.Padilla								
DATE(S) DRILLED: 09/07/93 09/09/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			40			CB-6	25			dark brown, very dense
						CB-7	30			SAPROLITE, dark brown, soft, weak, highly to extremely weathered, very closely fractured
			40			CB-8	35			gray, soft to moderately hard, highly weathered, closely fractured, vesicular
						CB-9	40			CLINKER, gray-brown, moderately hard, weak to moderately strong, highly weathered
						CB-10	45			SAPROLITE, gray, soft to moderately hard, weak to moderately strong, highly to moderately weathered, closely fractured
			65			CB-10	50			SAPROLITE, gray, soft to moderately hard, weak to moderately strong, highly to moderately weathered, closely fractured

BORING LOCATION: 23.5 ft. Lt. Sta. 473+45		DRILLER: GeoLabs-Hawaii		BORING IB-28						
BORING ELEVATION: +387.1 ft		LOGGED BY: P.Padilla								
DATE(S) DRILLED: 09/07/93 09/09/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100			CB-16	80			soft
			0			CB-17	85			gray, weak
			30			CB-18	90			CLINKER, gray-brown, moderately hard, weak to moderately strong, highly weathered
			18			CB-19	95			CLINKER, gray-brown, moderately hard, weak to moderately strong, highly weathered
			80			CB-20	100			SAPROLITE, gray, soft to moderately hard, weak to moderately strong, highly to moderately weathered, closely fractured

BORING LOCATION: 27 ft. Lt. Sta. 474+83		DRILLER: GeoLabs-Hawaii		BORING IB-29						
BORING ELEVATION: +390.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/15/93 08/18/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	83	34.4			9/3*	DM-1	5		GC	CLAYEY GRAVEL, COBBLES AND BOULDERS, medium dark gray-brown, dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
SA	78	46.0			57	DM-2	5		SC GC GM	CLAYEY, GRAVELLY SAND, gray-brown, medium-dense to dense, wet to saturated, fine to coarse sand, fine to coarse gravel
						DM-3	10			SILTY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
						SP-3	15		GC	CLAYEY GRAVEL, gray-brown, dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
						DM-4	20		CH	SILTY CLAY, reddish-brown, very stiff, moist to wet - Alluvium
DS	81	38.5			31	DM-5	20			SAPROLITE, gray, soft, weak to friable, highly weathered
										gray-brown, soft to very soft

BORING LOCATION: 27 ft. Lt. Sta. 474+83		DRILLER: GeoLabs-Hawaii		BORING IB-29						
BORING ELEVATION: +390.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/15/93 08/18/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			70			CB-12	55			reddish-brown, weak, highly to extremely weathered
			80	0		CB-13	60			brown to gray-brown, vesicular
			80	0		CB-14	65			brown to gray-brown, vesicular
			90	0		CB-15	70			brown to gray-brown, vesicular
							70			Bottom of Boring No. IB-29 ? 70.0 ft.
							75			

BORING LOCATION: 23.5 ft. Lt. Sta. 473+45		DRILLER: GeoLabs-Hawaii		BORING IB-28						
BORING ELEVATION: +387.1 ft		LOGGED BY: P.Padilla								
DATE(S) DRILLED: 09/07/93 09/09/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			20			CB-11	55			CLINKER, gray-brown, soft, weak, highly weathered
			60			CB-12	60			SAPROLITE, gray, soft to moderately hard, weak, highly weathered, closely fractured, vesicular
						CB-13	65			gray-brown, soft, highly to extremely weathered, very closely fractured
			70			CB-14	70			gray-brown, soft, highly to extremely weathered, very closely fractured
			40			CB-15	75			gray-brown, soft, highly to extremely weathered, very closely fractured

BORING LOCATION: 23.5 ft. Lt. Sta. 473+45		DRILLER: GeoLabs-Hawaii		BORING IB-28						
BORING ELEVATION: +387.1 ft		LOGGED BY: P.Padilla								
DATE(S) DRILLED: 09/07/93 09/09/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			73			CB-21	105			CLINKER, gray-brown, soft, weak to moderately strong, highly weathered
UC	162	2.8	100	83		CB-22	110			BASALT, gray, hard, strong, moderately to slightly weathered, vesicular - 'A'a
			85	30		CB-23	115			CLINKER, gray-brown, moderately hard, moderately strong, moderately to slightly weathered
			100	40		CB-24	120			CLINKER, gray-brown, moderately hard, moderately strong, moderately to slightly weathered
							126			Bottom of Boring No. IB-28 ? 121.0 ft.

BORING LOCATION: 27 ft. Lt. Sta. 474+83		DRILLER: GeoLabs-Hawaii		BORING IB-29						
BORING ELEVATION: +390.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/15/93 08/18/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	100	27.7			107/8*	DM-6	30			reddish-brown, weak, highly to extremely weathered
			50			CB-7	35			gray, weak to friable, highly weathered
			80			CB-8	40			gray to yellow-brown, highly to extremely weathered, faint joint development
			40			CB-9	45			gray, soft, highly weathered
			50			CB-10	50			gray, soft, highly weathered

SURVEY PLOTTED BY: _____ DATE: _____
 ORIGINAL PLAN TRACED BY: _____
 NOTE BOOK DESIGNED BY: _____
 QUANTITIES BY: _____
 CHECKED BY: _____
 No. _____



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 Paul Colin Weldig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
BORING LOGS
 INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase 1B
 F.A.I. PROJECT NO. 1-H3-(68)
 SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B34 OF 59 SHEETS

BORING LOCATION: 23.5 ft. Lt. Sta. 478+05		DRILLER: GeoLabs-Hawaii		BORING IB-30						
BORING ELEVATION: +408.1 ft		LOGGED BY: S. Wang								
DATE(S) DRILLED: 09/21/93 09/24/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
					13	DM-1	5		CH	SILTY CLAY, dark brown, stiff, moist to wet - Alluvium
					23	DM-2	10		GM	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, dark brown, dense, wet, fine to coarse sand, fine to coarse gravel - Alluvium
						CB-3	15			medium-dense
			71			CB-4	20			gray to brown, dense
			87			CB-5	25			brown
			80							reddish-brown

BORING LOCATION: 23.5 ft. Lt. Sta. 478+05		DRILLER: GeoLabs-Hawaii		BORING IB-30						
BORING ELEVATION: +408.1 ft		LOGGED BY: S. Wang								
DATE(S) DRILLED: 09/21/93 09/24/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
					77	CB-11	55			reddish-gray
					80	CB-12	60			
			47			CB-13	65			SAPROLITE, brownish-gray, soft, weak, moderately to highly weathered, very closely fractured, vesicular
			40			CB-14	70			reddish-gray, soft, weak, highly to extremely weathered
			100			CB-15	75			gray, moderately to highly weathered, closely fractured
										brownish-gray

BORING LOCATION: 23.5 ft. Lt. Sta. 478+05		DRILLER: GeoLabs-Hawaii		BORING IB-30						
BORING ELEVATION: +408.1 ft		LOGGED BY: S. Wang								
DATE(S) DRILLED: 09/21/93 09/24/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-21	105			closely fractured
UC	71	51.5	86	47		CB-22	110			CLINKER, reddish-gray, soft, weak, moderately weathered
						CB-23	115			BASALT, brownish-orange, soft, weak, highly weathered, closely fractured
UC	92	28.1	93	47			120			gray to brownish-gray, moderately hard, strong, moderately weathered
							125			Bottom of Boring No. IB-30 ? 116.5 ft.

BORING LOCATION: 23.5 ft. Lt. Sta. 470+00		DRILLER: GeoLabs-Hawaii		BORING IR-1						
BORING ELEVATION: +409.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/19/93 08/22/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-6	30			gray
						CB-7	35			
			85			CB-8	40			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, saturated, fine to coarse sand, coarse gravel - Alluvium
						CB-9	45			SAPROLITE, gray, soft, highly weathered, closely fractured
						CB-10	50			gray to brown-gray, highly to extremely weathered, very closely fractured

BORING LOCATION: 23.5 ft. Lt. Sta. 478+05		DRILLER: GeoLabs-Hawaii		BORING IB-30						
BORING ELEVATION: +408.1 ft		LOGGED BY: S. Wang								
DATE(S) DRILLED: 09/21/93 09/24/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-6	30			reddish-brown to gray, saturated
						CB-7	35		GC	CLAYEY GRAVEL, COBBLES AND BOULDERS, gray to reddish gray, dense, wet, fine to coarse sand, fine to coarse gravel - Alluvium
						CB-8	40		GW	SANDY GRAVEL, reddish-gray, dense, wet, fine to coarse sand, fine to coarse gravel - Alluvium
						CB-9	45			CONGLOMERATE, SILTY CLAYEY GRAVEL, COBBLES AND BOULDERS, gray to brownish-gray, dense, wet, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
						CB-10	50			CONGLOMERATE, SILTY GRAVEL, gray, dense, wet, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix

BORING LOCATION: 23.5 ft. Lt. Sta. 478+05		DRILLER: GeoLabs-Hawaii		BORING IB-30						
BORING ELEVATION: +408.1 ft		LOGGED BY: S. Wang								
DATE(S) DRILLED: 09/21/93 09/24/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-16	80			soft to moderately hard, weak to moderately strong
						CB-17	85			reddish-gray, soft, weak, highly to extremely weathered
			80			CB-18	90			SAPROLITE, reddish-gray, soft, weak, highly to extremely weathered, closely fractured, vesicular
			80			CB-19	95			CLINKER, gray, soft, weak, highly weathered
						CB-20	100			reddish-gray, highly to extremely weathered
										BASALT, brownish-gray, moderately hard, strong, moderately weathered, moderately fractured, vesicular - 'A'

BORING LOCATION: 23.5 ft. Lt. Sta. 470+00		DRILLER: GeoLabs-Hawaii		BORING IR-1						
BORING ELEVATION: +409.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/19/93 08/22/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							5		MH	CLAYEY SILT, reddish-brown, moist, soft - Alluvium
							10		GM	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, reddish-brown, moist, dense, fine to coarse sand, fine to coarse gravel - Alluvium
						DM-1	15			
						DM-2	20			brown, wet to saturated, very dense
DS	73	57.1	56			DM-3	25		GC	CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
						DM-4				
						CB-5				

SURVEY PLOTTED BY: _____ DATE: _____
 ORIGINAL PLAN TRACKED BY: _____
 NOTE BOOK DESIGNED BY: _____
 QUANTITIES BY: _____
 CHECKED BY: _____
 No. _____



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 Paul Colin Weldig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
BORING LOGS
 INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)
 SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B35 OF 59 SHEETS

L.B. STATE DOT--3/30/94
 LOG#B228 3/21/94

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	170	470

BORING LOCATION: 23.5 ft. Lt. Sta. 470+00		DRILLER: GeoLabs-Hawaii		BORING IR- 1						
BORING ELEVATION: +409.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/19/93 08/22/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	83	32.1	98			CB-11	55			brownish-gray, closely fractured, highly weathered
						CB-12	60			gray, highly weathered, very closely fractured
						CB-13	60			
						CB-14	65			
							70			Bottom of Boring No. IR-1 ? 70.0 ft.
							75			

BORING LOCATION: 45 ft. Lt. Sta. 478+00		DRILLER: GeoLabs-Hawaii		BORING IR- 3						
BORING ELEVATION: +415.0 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 09/15/93 09/17/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-6	53			highly to extremely weathered, vesicular
						CB-7	70			gray to gray-green, highly to extremely weathered
						CB-8	75			red, purple and brown mottled, extremely weathered
						CB-9	88			gray and red mottled
						CB-10	77			gray

BORING LOCATION: 44 ft. Lt. Sta. 479+00		DRILLER: Geolabs-Hawaii		BORING IR- 5						
BORING ELEVATION: +424.0 ft		LOGGED BY: J. Brock/C. Isaacson								
DATE(S) DRILLED: 09/17/93 09/21/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						DM-1	32			CLAYEY, SANDY, GRAVELLY SILT, dark brown, soft to medium-stiff, moist, fine to coarse sand, fine to coarse gravel - Alluvium
						DM-2	76			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, orange-brown mottled, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
						DM-3	49			wet to saturated
						DM-4	47			CLAYEY GRAVEL, COBBLES AND BOULDERS, orange-brown, very dense, wet to saturated, fine to coarse sand, fine to coarse gravel - Alluvium
UC	70	49.1				CB-5	70			

BORING LOCATION: 44 ft. Lt. Sta. 479+00		DRILLER: Geolabs-Hawaii		BORING IR- 5						
BORING ELEVATION: +424.0 ft		LOGGED BY: J. Brock/C. Isaacson								
DATE(S) DRILLED: 09/17/93 09/21/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-11	70			brownish-gray, highly weathered, vesicular
						CB-12	20			gray-brown
						CB-13	60			brownish-gray to dark gray, highly to extremely weathered
						CB-14	95			brownish to medium gray, highly weathered
						CB-15	20			medium-gray

BORING LOCATION: 45 ft. Lt. Sta. 478+00		DRILLER: GeoLabs-Hawaii		BORING IR- 3						
BORING ELEVATION: +415.0 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 09/15/93 09/17/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
CN	64	59.5			22	DM-1	5			SILTY, SANDY, GRAVELLY CLAY, dark brown, soft to stiff, moist, fine to coarse sand, fine to coarse gravel - Alluvium
UC	62	58.3			44	DM-2	10			SILTY CLAYEY GRAVEL, COBBLES AND BOULDERS, brown to orange-brown, dense, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium
						DM-3	15			brown to reddish-brown and orange-brown mottled, very dense, wet to saturated
						DM-4	54			orange-brown, very dense, saturated
UC	76	41.3			59	DM-5	25			SAPROLITE, gray, soft, weak, extremely weathered, very closely fractured

BORING LOCATION: 45 ft. Lt. Sta. 478+00		DRILLER: GeoLabs-Hawaii		BORING IR- 3						
BORING ELEVATION: +415.0 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 09/15/93 09/17/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-11	60			red, dark gray and black mottled
						CB-12	65			dark gray
						CB-13	40			
						CB-14	20			
							75			Bottom of Boring No. IR-3 ? 71.0 ft.

BORING LOCATION: 44 ft. Lt. Sta. 479+00		DRILLER: Geolabs-Hawaii		BORING IR- 5						
BORING ELEVATION: +424.0 ft		LOGGED BY: J. Brock/C. Isaacson								
DATE(S) DRILLED: 09/17/93 09/21/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-6	75			saturated
						CB-7	90			SAPROLITE, dark gray, soft, weak, extremely weathered, very closely fractured
						CB-8	60			medium gray
						CB-9	60			brownish-gray to dark gray, weak to friable
						CB-10	60			ASH, dark gray, soft to friable, weak, extremely weathered

SURVEY PLOTTED BY _____ DATE _____
 TRACED BY _____
 DESIGNED BY _____
 QUANTITIES BY _____
 CHECKED BY _____
 ORIGINAL PLAN _____
 NOTE BOOK _____
 No. _____



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 OR UNDER MY SUPERVISION
 Paul Colin Weddy
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
BORING LOGS
 INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit I, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)
 SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B36 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	171	470

BORING LOCATION: 44 ft. Lt. Sta. 479+00		DRILLER: Geolabs-Hawaii		BORING IR- 5						
BORING ELEVATION: +424.0 ft		LOGGED BY: J. Brock/C. Isaacson								
DATE(S) DRILLED: 08/17/93 08/21/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			80			CB-16	80			brown to dark gray
							85			Bottom of Boring IR-5 ? 81.5 ft
							90			
							95			
							100			

BORING LOCATION: 23 ft. Rt. Sta. 419+50		DRILLER: Geolabs-Hawaii		BORING OB- 1						
BORING ELEVATION: +233.6 ft		LOGGED BY: H. Clark								
DATE(S) DRILLED: 07/14/93 07/19/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
		43.8			111	DM-5	30			reddish-brown, dense, extremely weathered, saturated
		50.8			95	DM-6	30			SAPROLITE, gray-dark gray, soft, weak, highly weathered, very closely fractured, vesicular, olivine crystals visible in vesicles
			0		121	DM-7	35			gray-brown and gray-green mottled, highly to extremely weathered
			0			CB-8	40			gray-green and orange-brown mottled, weak to moderately strong
		28.3	63			CB-10	45			dark brown-gray, weak to friable, extremely weathered

BORING LOCATION: 23 ft. Rt. Sta. 419+50		DRILLER: Geolabs-Hawaii		BORING OB- 1						
BORING ELEVATION: +233.6 ft		LOGGED BY: H. Clark								
DATE(S) DRILLED: 07/14/93 07/19/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	105	3.8	80			CB-18	80			dark orange-gray to gray-green, weak to moderately strong
			99			CB-19	80			dark gray-brown, gray-green and orange-brown mottled, weak to friable, extremely weathered
	73	55.2	100			CB-20	90			gray-green and orange-gray mottled
			85			CB-21	90			orange-gray to gray-brown
			100			CB-22	95			orange-brown, weak to completely weathered

BORING LOCATION: 23 ft. Rt. Sta. 419+50		DRILLER: Geolabs-Hawaii		BORING OB- 1						
BORING ELEVATION: +233.6 ft		LOGGED BY: H. Clark								
DATE(S) DRILLED: 07/14/93 07/19/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			80			CB-28	130			brown to reddish-brown, extremely to completely weathered
			80			CB-29	135			highly to extremely weathered
	80	23.2	100			CB-30	140			reddish-gray, extremely to completely weathered
							145			
							150			Bottom of Boring OB-1 ? 141.6 ft

BORING LOCATION: 23 ft. Rt. Sta. 419+50		DRILLER: Geolabs-Hawaii		BORING OB- 1						
BORING ELEVATION: +233.6 ft		LOGGED BY: H. Clark								
DATE(S) DRILLED: 07/14/93 07/19/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
		25.3			40	DM-1	5		MH	CLAYEY, GRAVELLY SILT, dark brown, moist, soft, fine to medium gravel, finely disseminated organic matter - Alluvium
		50.9			74	DM-2	10		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, red, gray-green and dark gray mottled, very dense, dry, fine to coarse sand, fine to coarse gravel - Alluvium reddish-brown and gray mottled, moist
		43.8			85	DM-3	15			yellowish-brown to reddish-brown, moist to wet
		52.9			84	DM-4	20			orange-brown, dense to very dense, wet to saturated
							25			CONGLOMERATE: SILTY, CLAYEY, SANDY GRAVEL, brownish-yellow, very dense, highly weathered, saturated, fine to coarse sand, fine to coarse gravel, weakly cemented matrix

BORING LOCATION: 23 ft. Rt. Sta. 419+50		DRILLER: Geolabs-Hawaii		BORING OB- 1						
BORING ELEVATION: +233.6 ft		LOGGED BY: H. Clark								
DATE(S) DRILLED: 07/14/93 07/19/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			79			CB-11	55			dark gray-green, soft to moderately hard, weak to moderately strong, highly weathered
			41			CB-12	55			brownish-gray to gray-green, moderately to highly weathered, closely fractured
			0			CB-13	55			dark brown to gray-green, weak to friable, extremely weathered
	140	3.1	60			CB-14	60			dark brown to orange-gray, soft to moderately hard, weak to moderately strong, highly to extremely weathered, olivine crystals visible in vesicles
			26			CB-15	65			dark brown to gray-green, weak
			80			CB-16	70			gray-brown to orange-brown
			80			CB-17	75			dark gray-brown to orange-brown

BORING LOCATION: 23 ft. Rt. Sta. 419+50		DRILLER: Geolabs-Hawaii		BORING OB- 1						
BORING ELEVATION: +233.6 ft		LOGGED BY: H. Clark								
DATE(S) DRILLED: 07/14/93 07/19/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	88	49.5	100			CB-23	105			brownish-gray to reddish-brown, weak, extremely weathered
			100			CB-24	110			orange-brown, weak to friable, extremely to completely weathered
	83	71.0	100			CB-25	115			brown to orange-brown, weak, extremely weathered
	88	61.3	100			CB-26	120			reddish-brown to brownish-green, closely fractured
			100			CB-27	125			brownish-gray to reddish-brown

ORIGINAL PLAN
 SURVEY PLOTTED BY
 TRACED BY
 DESIGNED BY
 QUANTITIES BY
 CHECKED BY



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
BORING LOGS
 INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit I, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)
 SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B37 OF 59 SHEETS

L.R. STATE VOTV--3V-3037
 LOGS/520 3/21/94 450

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	172	470

BORING LOCATION: 21 ft. Rt. Sta. 421+25		DRILLER: GeoLabs-Hawaii		BORING OB- 2						
BORING ELEVATION: +237.9 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/21/93 08/22/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	110	33.7			63/11'	DM-1	5		MH GM GC	CLAYEY SILT, dark brown, stiff, dry to moist, with gravel and finely disseminated organic matter - Alluvium
							10			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, moist, fine to coarse gravel, fine to coarse sand - Alluvium
	80	62.1			25	DM-2	15		SC GC	CLAYEY, GRAVELLY SAND, mottled orange and reddish-brown, medium-dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
SA							20			SAPROLITE, mottled orange and dark gray, soft, weak, highly to extremely weathered
DS	83	40.0			53	DM-3	25			dark green, highly weathered

BORING LOCATION: 21 ft. Rt. Sta. 421+25		DRILLER: GeoLabs-Hawaii		BORING OB- 2						
BORING ELEVATION: +237.9 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/21/93 08/22/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			67			CB-11	55			dark brown
			57			CB-12	80			dark brown to gray
							85			Bottom of Boring No. OB-2 ? 83.0 ft.
							70			
							75			

BORING LOCATION: 23.5 ft. Rt. Sta. 423+00		DRILLER: GeoLabs-Hawaii		BORING OB- 3						
BORING ELEVATION: +240.8 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/28/93 07/29/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
					100	DM-5	30			dark brown
					15	CB-6	35			dark brown
					40	CB-7	40			dark brown
					20	CB-8	45			SAPROLITE, gray, dark brown and orange mottled, soft, weak, highly to extremely weathered, very closely fractured
					35	CB-9	50			

BORING LOCATION: 23.5 ft. Rt. Sta. 423+00		DRILLER: GeoLabs-Hawaii		BORING OB- 3						
BORING ELEVATION: +240.8 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/28/93 07/29/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	148	1.7	73			CB-15	80			greenish-gray, brown and orange mottled, soft, weak, highly to extremely weathered
						CB-16	85			gray, green, black and brown mottled, soft to moderately hard, weak to moderately strong
						CB-17	90			Bottom of Boring No. OB-3 ? 90.0 ft.
							95			
							100			

BORING LOCATION: 21 ft. Rt. Sta. 421+25		DRILLER: GeoLabs-Hawaii		BORING OB- 2						
BORING ELEVATION: +237.9 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/21/93 08/22/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	70	38.4			65/11'	DM-4	5			dark green and reddish-brown mottled, highly to extremely weathered
						CB-5	10			
						CB-6	20			gray-green, moderately hard, weak to moderately strong, highly weathered
						CB-7	35			gray-green to black, soft to moderately hard
						CB-8	40			gray-green to black, soft to moderately hard
						CB-9	46			gray to dark green, vertical fractures
UC	154	1.6	62			CB-10	50			

BORING LOCATION: 23.5 ft. Rt. Sta. 423+00		DRILLER: GeoLabs-Hawaii		BORING OB- 3						
BORING ELEVATION: +240.8 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/28/93 07/29/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	93	16.8			78	DM-1	5		GM GC	SILTY, CLAYEY GRAVEL, dark brown, loose to medium-dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
							10			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, dark brown, dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
					70	DM-2	15			CONGLOMERATE-SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, dark brown, very dense, wet to saturated, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
					36	DM-3	20			gray-brown, moist
					94	DM-4	25			

BORING LOCATION: 23.5 ft. Rt. Sta. 423+00		DRILLER: GeoLabs-Hawaii		BORING OB- 3						
BORING ELEVATION: +240.8 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/28/93 07/29/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
					80	CB-10	55			green, brown, orange, soft to medium hard
UC	113	13.3	85			CB-11	60			dark gray, green, brown and orange mottled, soft, vesicular
UC	92	28.3	90			CB-12	65			dark gray, black and brown mottled
					90	CB-13	70			gray, green and brown mottled
					90	CB-14	75			green and black mottled, soft to moderately hard, weak to moderately strong

SURVEY PLOTTED BY: _____ DATE: _____
 DESIGNED BY: _____
 CHECKED BY: _____
 ORIGINAL PLAN: _____
 NOTE BOOK: _____
 QUANTITIES BY: _____
 CHECKED BY: _____
 No. _____



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
BORING LOGS
 INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit I, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)
 SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B38 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	173	470

BORING LOCATION: 23.5 ft. Rt. Sta. 425+00		DRILLER: GeoLabs-Hawaii		BORING OB- 4						
BORING ELEVATION: +250.3 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/17/93 06/18/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	69	53.4			50/5*	DM-1	5		MH	CLAYEY SILT, brown, soft to stiff, moist, with fine to coarse gravel - Alluvium
							10		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium
							15		SM GM	SILTY, GRAVELLY SAND, dark gray, medium-dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
							20		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, reddish-brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
							25		GM	SILTY GRAVEL, gray-brown, dense, saturated, fine to coarse gravel, fine to coarse sand - Alluvium
										SAPROLITE, dark gray to green, soft, weak, highly weathered, vesicular
										CLINKER, brown, soft, highly weathered
										SAPROLITE, gray-green, soft, weak, highly to extremely weathered, vesicular

BORING LOCATION: 23.5 ft. Rt. Sta. 425+00		DRILLER: GeoLabs-Hawaii		BORING OB- 4						
BORING ELEVATION: +250.3 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/17/93 06/18/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							72		CB-10	CLINKER, gray brown, soft, weak, moderately weathered
							55			SAPROLITE, dark brown, soft to moderately hard, weak to moderately strong, highly to extremely weathered, vesicular
							40		CB-11	highly weathered
							75		CB-12	
										Bottom of Boring No. OB-4 ? 68.0 ft.

BORING LOCATION: 25 ft. Rt. Sta. 426+62		DRILLER: GeoLabs-Hawaii		BORING OB- 5						
BORING ELEVATION: +258.8 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/12/93 06/14/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	80	39.8					83		DM-5	Alluvium SAPROLITE, green-gray, very soft, very weak, highly to extremely weathered
							79		DM-6	CLINKER, green to brown, soft, highly weathered
							90		DM-7	SAPROLITE, green-gray, moderately hard to hard, highly to extremely weathered, vesicular
							85		DM-8	CLINKER, green to brown, soft, weak, highly weathered
							86		DM-8	SAPROLITE, green-gray to dark gray, soft, weak, highly weathered
							85		DM-8	reddish-brown to dark brown, highly to extremely weathered
							77		DM-9	ASH AND CINDERS, brownish gray-green, soft, weak, highly weathered
										SAPROLITE, green-gray, very soft, weak, highly to extremely weathered

BORING LOCATION: 25 ft. Rt. Sta. 426+62		DRILLER: GeoLabs-Hawaii		BORING OB- 5						
BORING ELEVATION: +258.8 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/12/93 06/14/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							80		CB-16	vesicular
							85			Bottom of Boring No. OB-5 ? 83.0 ft

BORING LOCATION: 23.5 ft. Rt. Sta. 425+00		DRILLER: GeoLabs-Hawaii		BORING OB- 4						
BORING ELEVATION: +250.3 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/17/93 06/18/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	77	43.7			86	DM-4	5		MH	CLAYEY SILT, dark red to brown, stiff to very stiff, moist, with some gravel and cobbles - Alluvium
							30		CB-5	soft to moderately hard, weak to moderately strong, highly weathered
							43		CB-6	gray-green to black, weak, highly to extremely weathered
							82		CB-7	ASH AND CINDERS, dark brown, soft, highly weathered
							40			SAPROLITE, dark gray, soft, weak, highly to extremely weathered, closely fractured
							45		CB-8	soft to moderately hard, weak to moderately strong, highly weathered
							46		CB-9	dark gray to dark green

BORING LOCATION: 25 ft. Rt. Sta. 426+62		DRILLER: GeoLabs-Hawaii		BORING OB- 5						
BORING ELEVATION: +258.8 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/12/93 06/14/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							95		DM-1	gray-brown, hard, dry
							99		DM-2	SILTY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
							77		DM-3	SILTY SANDY, GRAVELLY CLAY, dark brown to gray, stiff to very stiff, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium
							77		DM-3	SILTY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
							67		DM-4	SILTY CLAYEY GRAVEL, brown, dense to very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
										SILTY GRAVEL, COBBLES AND BOULDERS, gray-brown, loose to medium-dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
										SILTY CLAY, mottled orange-brown to reddish-brown and gray, soft, moist to wet

BORING LOCATION: 25 ft. Rt. Sta. 426+62		DRILLER: GeoLabs-Hawaii		BORING OB- 5						
BORING ELEVATION: +258.8 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/12/93 06/14/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	87	55.6			70/8*	DM-10	55			green-gray to reddish-brown, extremely to completely weathered
							79		DM-11	
							99		CB-12	light brown, soft to moderately hard, weak to moderately strong, highly weathered
							97		CB-13	
							50		CB-14	reddish-brown to gray-green
							66		CB-16	gray-green

ORIGINAL PLAN	DATE
TRACED BY	
DESIGNED BY	
QUANTITIES BY	
CHECKED BY	



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit I, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994

SHEET No. B39 OF 59 SHEETS

FOOTING: BASE PT. 0.0

LIC. STATE VECTY--3V-3030V
 LOG#032 3/21/94 HSC

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	174	470

BORING LOCATION: 23.5 ft. Rt. 428+00		DRILLER: GeoLabs-Hawaii		BORING OB- 6						
BORING ELEVATION: +266.8 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/10/93 06/12/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	67	55.7			38	DM-1	5	MH		CLAYEY SILT, dark brown, stiff, moist, with scattered fine to medium gravel - Alluvium
							6	GM GC		SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
PI UC	81	40.0			27	DM-2	10	CH		SILTY, GRAVELLY CLAY, dark brown, very stiff, very moist, with some roots and finely disseminated organic matter, fine to coarse gravel - Alluvium
							10	GM GC		SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
							10	CH		SILTY CLAY, with some rounded gravel, dark brown, stiff, moist, with some roots and organics
DS	78	41.9			16	DM-3	15			CONGLOMERATE SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown to red-brown, very dense, saturated, highly weathered, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix.
							20			
	84	51.1			50/3*	DM-4	25			brown

BORING LOCATION: 23.5 ft. Rt. 428+00		DRILLER: GeoLabs-Hawaii		BORING OB- 6						
BORING ELEVATION: +266.8 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/10/93 06/12/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			40	9		CB-11	55			vesicular, olivine crystals visible in vesicles red-brown to orange-brown
			40	9		CB-12	60			mottled gray and reddish-brown, extremely to completely weathered
			13	13		CB-13	65			ASH AND CINDERS, red-brown to gray-brown, very soft, weak, highly weathered SAPROLITE, gray-green to orange-brown, soft, weak, extremely to completely weathered, vesicular
DS	70	56.8	13	13		CB-14	70			gray-green, soft to moderately hard, weak to moderately strong, highly to extremely weathered
			53	8		CB-15	75			

BORING LOCATION: 23.5 ft. Rt. Sta. 429+70		DRILLER: GeoLabs-Hawaii		BORING OB- 7						
BORING ELEVATION: 282.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 07/21/93 07/24/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	79	37.1			70/9*	DM-1	5	OL		ORGANIC SILT, gray to black, loose, moist - Alluvium
							5	GM GC		SILTY, CLAYEY GRAVEL, gray-brown, dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
							5	CH		SILTY, SANDY, GRAVELLY CLAY, gray-brown to black, stiff to very stiff, moist, fine to coarse sand, fine to coarse gravel - Alluvium
	93	27.2			70/3*	DM-2	10	GM GC		CLAYEY, GRAVELLY SAND, gray to black, very dense, moist, fine to coarse gravel, fine to coarse sand - Alluvium
							10	CB-3		
							10	GM GC		SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
							15	CB-4		
							15	CB-5		
							20	CB-6		
							25	GC		CLAYEY GRAVEL, COBBLES AND BOULDERS, gray, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium

BORING LOCATION: 23.5 ft. Rt. Sta. 429+70		DRILLER: GeoLabs-Hawaii		BORING OB- 7						
BORING ELEVATION: 282.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 07/21/93 07/24/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			95			CB-12	55			weathered, closely fractured gray to dark gray, weak to friable
			40			CB-13	60			medium to dark gray, moderately hard, weak to moderately strong, highly weathered
			98			CB-14	65			medium gray to red, soft to moderately hard, weak to moderately strong, highly weathered
			94			CB-16	70			gray, soft, weak, highly to extremely weathered
153	3.6		52			CB-16	75			medium gray, soft to moderately hard, weak to moderately strong, highly weathered

BORING LOCATION: 23.5 ft. Rt. 428+00		DRILLER: GeoLabs-Hawaii		BORING OB- 6						
BORING ELEVATION: +266.8 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/10/93 06/12/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	70	51.5			41	DM-5	30			brown to red-brown mottled orange-brown, red-brown and dark brown
							35			SAPROLITE, gray, soft, weak, highly weathered
UC	67	55.9			88	DM-6	35			dark gray
							40			CLINKER, gray-brown, very soft, weak, highly weathered
UC	77	42.6			86	DM-7	40			SAPROLITE, mottled gray, orange-brown and reddish-brown, soft, weak, extremely to completely weathered
							45			
							45			CLINKER, gray-brown, very soft, weak, highly weathered
		32.5			50/3*	DM-8	50			SAPROLITE, mottled gray, orange-brown and reddish-brown, soft, weak, highly to extremely
			83	33		CB-9	50			
			83	33		CB-10	60			

BORING LOCATION: 23.5 ft. Rt. 428+00		DRILLER: GeoLabs-Hawaii		BORING OB- 6						
BORING ELEVATION: +266.8 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/10/93 06/12/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							80			Bottom of Boring No. OB-6 ? 79.0 ft.
							85			
							90			
							95			
							100			

BORING LOCATION: 23.5 ft. Rt. Sta. 429+70		DRILLER: GeoLabs-Hawaii		BORING OB- 7						
BORING ELEVATION: 282.5 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 07/21/93 07/24/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			86			CB-7	30	GM GC		SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
			86			CB-8	35			
			90			CB-9	40			gray-brown
			98			CB-10	45			
			100			CB-11	50			SAPROLITE, dark gray, soft to very soft, friable, moderately to highly

SURVEY PLOTTED BY	DATE
ORIGINAL PLAN	
TRACED BY	
DESIGNED BY	
QUANTITIES BY	
CHECKED BY	
No.	



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Paul Colin Weidig
PSC ASSOCIATES, INC.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
North Halawa Valley Highway, Unit 1, Phase 1B
F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994

SHEET No. B40 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	175	470

BORING LOCATION		DRILLER	BORING OB- 7							
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
23.5 ft. Rt. Sta. 429+70	GeoLabs-Hawaii	C. Isaacson								
282.5 ft.		Rotary Wash								
07/21/93 07/24/93										
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			98			CB-17	80			gray-brown, soft, weak to friable, extremely weathered, very closely fractured
						CB-18	85			weak, closely fractured
						CB-19	90			
						CB-20	95			medium gray, highly to extremely weathered
UC	154	3.0	100			CB-21	100			dark gray, soft to moderately hard, weak to moderately strong, highly weathered, brecciated

BORING LOCATION		DRILLER	BORING OB- 8							
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
28 ft. Rt. Sta. 431+80	GeoLabs-Hawaii	J. Brock								
+285.9 ft		Rotary Wash								
07/08/93 07/09/93										
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						MH				CLAYEY SILT, dark brown, soft, moist - Alluvium
						GM GC	5			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, reddish-brown to gray-brown, dense to very dense, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium
						GM GC	10			SILTY GRAVEL, dark gray, dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
						GM GC	15			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, reddish-brown to gray-brown, dense to very dense, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium
						GM GC	20			SILTY GRAVEL, dark gray, dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
						GM GC	25			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, reddish-brown to gray-brown, dense to very dense, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium
			87			GC	25			CLAYEY GRAVEL, COBBLES AND BOULDERS, reddish-brown to gray-brown, dense to very dense, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium

BORING LOCATION		DRILLER	BORING OB- 8							
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
28 ft. Rt. Sta. 431+80	GeoLabs-Hawaii	J. Brock								
+285.9 ft		Rotary Wash								
07/08/93 07/09/93										
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			73			CB-7	55			dark brown
						CB-8	60			
							65			Bottom of Boring No. OB-8 ? 81.0 ft.
							70			
							75			

BORING LOCATION		DRILLER	BORING OB- 9							
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
23.5 ft. Rt. Sta. 433+07	GeoLabs-Hawaii	C. Isaacson								
+287.9 ft		Rotary Wash								
07/15/93 07/20/93										
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			48.0			SP-8	104/18'			SILTY, CLAYEY GRAVEL, brown, very dense, saturated, fine to coarse gravel - Alluvium
						GM GC	30			
						CB-7	35			
						CB-8	40			CONGLOMERATE, SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, very dense, moist, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix saturated
						CB-9	45			
						CB-10	50			
						CB-11	55			
						CB-12	60			

BORING LOCATION		DRILLER	BORING OB- 7							
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
23.5 ft. Rt. Sta. 429+70	GeoLabs-Hawaii	C. Isaacson								
282.5 ft.		Rotary Wash								
07/21/93 07/24/93										
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	99	18.6	100			CB-22	105			brown to gray, soft, weak to moderately strong, highly to extremely weathered, vesicular, olivine and vesicular crystals visible in vesicles, closely fractured
UC	128	4.6	100	100		CB-23	110			BASALT, medium gray, moderately hard, moderately strong to strong, moderately weathered, vesicular - 'A'
			78	50		CB-24	115			olivine crystals visible in vesicles
							120			Bottom of Boring No. OB-7 ? 117.0 ft.
							125			

BORING LOCATION		DRILLER	BORING OB- 8							
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
28 ft. Rt. Sta. 431+80	GeoLabs-Hawaii	J. Brock								
+285.9 ft		Rotary Wash								
07/08/93 07/09/93										
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			57			CB-2	30			gravel - Alluvium
						CB-3	35			CONGLOMERATE, SILTY, CLAYEY GRAVEL AND COBBLES, dark gray, very dense, moist, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix gray-green
						CB-4	40			gray-brown
			73			CB-4	45			
UC	139	2.4	70			CB-5	50			gray-green
						CB-6	55			

BORING LOCATION		DRILLER	BORING OB- 9							
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
23.5 ft. Rt. Sta. 433+07	GeoLabs-Hawaii	C. Isaacson								
+287.9 ft		Rotary Wash								
07/15/93 07/20/93										
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						SC	5			SILTY, CLAYEY SAND, dark brown, loose, moist, fine to medium sand - Alluvium
						GM GC	10			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium brown, very dense
						DM-1	15			
						CB-2	20			
						CB-3	25			brown
						CB-4	30			wet to saturated
						CB-5	35			
							40			
							45			
							50			
							55			very dense, saturated

DATE
SURVEY PLOTTED BY
ORIGINAL PLAN
NOTE BOOK
DESIGNED BY
QUANTITIES BY
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Paul Colin Weidig
PSC ASSOCIATES, INC.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
North Halawa Valley Highway, Unit I, Phase IB
F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994
SHEET No. B41 OF 59 SHEETS

LIB. STATE DOT--3M-2030
LOG#B41 4/21/94 PSC

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1-H3-1(68)	1994	176	470

BORING LOCATION: 23.5 ft. Rt. Sta. 433+07		DRILLER: GeoLabs-Hawaii		BORING OB-9						
BORING ELEVATION: +287.9 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 07/15/93 07/20/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			96			CB-13	55			SAPROLITE, gray, soft, weak, highly to extremely weathered, very closely fractured
			96			CB-14				gray-brown
			98			CB-15	60			gray
						CB-16	65			
						CB-18	70			
			100			CB-17	75			

BORING LOCATION: 23.5 ft. Rt. Sta. 433+07		DRILLER: GeoLabs-Hawaii		BORING OB-9						
BORING ELEVATION: +287.9 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 07/15/93 07/20/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	74	28.9	100			CB-23	105			dark brown to dark gray, weak to friable
						CB-24	75			brown to gray-brown, weak
						CB-25	110			BASALT, brownish-red to dark gray, moderately hard to strong, moderately weathered, vesicular - 'A' moderately strong
UC	164	1.0	100	80			115			
							120			Bottom of Boring No. OB-9 ? 119.5 ft.
							125			

BORING LOCATION: 24 ft. Rt. Sta. 434+80		DRILLER: GeoLabs-Hawaii		BORING OB-10						
BORING ELEVATION: +272.7 ft		LOGGED BY: H. Clark								
DATE(S) DRILLED: 06/26/93 06/26/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100			CB-6	30			to coarse sand, fine to coarse gravel - Alluvium
						CB-7	35			SAPROLITE, dark gray, soft, weak, highly weathered, very closely fractured
						CB-8	40			dark gray to gray-green
						CB-9	45			gray-brown, vesicular
			90			CB-10	50			gray-brown to reddish-brown, highly to extremely weathered

BORING LOCATION: 23.5 ft. Rt. Sta. 436+80		DRILLER: GeoLabs-Hawaii		BORING OB-11						
BORING ELEVATION: +290.0 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/30/93 08/02/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						DM-1	5			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray to black, medium-dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
SA	90	31.9				DM-2	10			gray-brown, dense
						DM-3	15			moist to wet
UC	83	28.2				DM-4	20			dense to very dense, saturated
							25			very dense

BORING LOCATION: 23.5 ft. Rt. Sta. 433+07		DRILLER: GeoLabs-Hawaii		BORING OB-9						
BORING ELEVATION: +287.9 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 07/15/93 07/20/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	76	28.0	100			CB-18	80			greenish-gray to reddish-gray, extremely to completely weathered, vesicular
UC	132	13.7	100			CB-19	85			reddish-gray, extremely weathered, very closely fractured
UC	87	13.7	98			CB-20	90			gray, highly to extremely weathered, closely fractured
UC	117	11.3	100			CB-21	95			gray-brown
						CB-22	100			brownish-gray

BORING LOCATION: 24 ft. Rt. Sta. 434+80		DRILLER: GeoLabs-Hawaii		BORING OB-10						
BORING ELEVATION: +272.7 ft		LOGGED BY: H. Clark								
DATE(S) DRILLED: 08/25/93 08/26/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							5			MH CLAYEY SILT, dark brown, soft, moist - Alluvium
							6			GM GC SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, dry to moist, fine to coarse sand, fine to coarse gravel - Alluvium
							7			MH CLAYEY, GRAVELLY SILT, dark brown, soft, moist, fine to coarse gravel - Alluvium
							8			GM GC SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, dry to moist, fine to coarse sand, fine to coarse gravel - Alluvium
DS	79	41.9			33/4"	DM-1	10			GM SILTY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, wet to saturated, fine to coarse sand, fine to coarse gravel - Alluvium
							15			GM GC SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
							20			GM SILTY GRAVEL, dark gray, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
			75			DM-3	25			GM GC SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, saturated, fine
			8			CB-4				
						CB-5				

BORING LOCATION: 24 ft. Rt. Sta. 434+80		DRILLER: GeoLabs-Hawaii		BORING OB-10						
BORING ELEVATION: +272.7 ft		LOGGED BY: H. Clark								
DATE(S) DRILLED: 08/25/93 08/26/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	61	54.2	100			CB-11	55			dark gray to reddish-brown
						CB-12	60			gray-brown to reddish-brown
						CB-13	65			brown, soft, weak to moderately strong, highly weathered
UC	55	59.2	100	20		CB-14	70			gray, moderately hard, weak to moderately strong
							75			Bottom of Boring No. OB-10 ? 73.0 ft.

DATE _____
 SURVEY PLOTTED BY _____
 ORIGINAL PLANS TRACED BY _____
 NOTE BOOK DESIGNED BY _____
 QUANTITIES BY _____
 CHECKED BY _____



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 Paul Colin Weld
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase IB
 F.A.I. PROJECT NO. 1-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B42 OF 59 SHEETS

SCALE: 1" = 10'
 DATE: 2/21/94

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	177	470

BORING LOCATION: 23.5 ft. Rt. Sta. 436+80		DRILLER: GeoLabs-Hawaii		BORING OB-11						
BORING ELEVATION: +290.0 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/30/93 08/02/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	78	41.9			120/7*	DM-5				
			63			CB-6				gray-brown to reddish-brown, very dense
			54			CB-7	30			
			80			CB-8	35			CONGLOMERATE SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray to reddish-brown, very dense, moist, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
			80			CB-9	40			gray-brown to reddish-brown
			80			CB-10	45			light gray-green
							50			gray-brown to light

BORING LOCATION: 23.5 ft. Rt. Sta. 436+80		DRILLER: GeoLabs-Hawaii		BORING OB-11						
BORING ELEVATION: +290.0 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/30/93 08/02/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			80			CB-16				
			100			CB-17	80			weak
			100			CB-18	85			
			98			CB-19	90			
UC	78	12.0	95			CB-20	95			brownish-gray

BORING LOCATION: 23.5 ft. Rt. Sta. 436+80		DRILLER: GeoLabs-Hawaii		BORING OB-11						
BORING ELEVATION: +290.0 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/30/93 08/02/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			80			CB-26				
							130			Bottom of Boring No. OB-11 ? 129.5 ft.
							135			
							140			
							145			
							150			

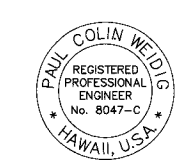
BORING LOCATION: 23.5 ft. Rt. Sta. 436+80		DRILLER: GeoLabs-Hawaii		BORING OB-11						
BORING ELEVATION: +290.0 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/30/93 08/02/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	78	41.9			120/7*	DM-5				
			63			CB-6				
			54			CB-7	30			gray-brown to reddish-brown, very dense
			80			CB-8	36			CONGLOMERATE SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray to reddish-brown, very dense, moist, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
			80			CB-9	40			gray-brown to reddish-brown
			80			CB-10	45			light gray-green
							50			gray-brown to light

BORING LOCATION: 23.5 ft. Rt. Sta. 436+80		DRILLER: GeoLabs-Hawaii		BORING OB-11						
BORING ELEVATION: +290.0 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/30/93 08/02/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	106	20.0	90			CB-11				gray-green
			80			CB-12	55			SAPROLITE, gray, soft, highly weathered, weak, very closely fractured
			100			CB-13	60			brown, friable, vesicular
			98			CB-14	65			
UC	87	51.7	100			CB-15	70			gray-brown, weak, very closely fractured
							75			weak to friable

BORING LOCATION: 23.5 ft. Rt. Sta. 436+80		DRILLER: GeoLabs-Hawaii		BORING OB-11						
BORING ELEVATION: +290.0 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/30/93 08/02/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			80			CB-21				
			85			CB-22	105			gray-brown
			80			CB-23	110			
			80			CB-24	115			dark gray, weak to moderately strong
			75			CB-25	120			gray-brown
							125			

BORING LOCATION: 23.5 ft. Rt. Sta. 436+80		DRILLER: GeoLabs-Hawaii		BORING OB-11						
BORING ELEVATION: +290.0 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/30/93 08/02/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	90	31.9				DM-1	5			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray to black, medium-dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
							10			gray-brown, dense
SA						DM-2	10			moist to wet
							15			
UC	93	29.2				DM-3	15			dense to very dense, saturated
							20			
	86	34.2				DM-4	20			very dense
							25			

ORIGINAL PLAN	DATE
REVISION	
BY	
CHECKED BY	
DATE	



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 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase 1B
 F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994

SHEET No. B43 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	178	470

BORING LOCATION: 23.5 ft. Rt. Sta. 436+80		DRILLER: GeoLabs-Hawaii		BORING OB-11						
BORING ELEVATION: +290.0 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/30/93 08/02/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	106	20.0	90			CB-11	75			gray-green
						CB-12	80			SAPROLITE, gray, soft, highly weathered, weak, very closely fractured
						CB-13	100			brown, friable, vesicular
						CB-14	95			
UC	87	51.7	100			CB-15	70			gray-brown, weak, very closely fractured
							75			weak to friable

BORING LOCATION: 23.5 ft. Rt. Sta. 436+80		DRILLER: GeoLabs-Hawaii		BORING OB-11						
BORING ELEVATION: +290.0 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/30/93 08/02/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-21	125			gray-brown
						CB-22	105			
						CB-23	110			
						CB-24	115			dark gray, weak to moderately strong
						CB-25	120			gray-brown

BORING LOCATION: 23 ft. Rt. Sta. 438+25		DRILLER: GeoLabs-Hawaii		BORING OB-12						
BORING ELEVATION: +288.4 ft		LOGGED BY: H. Clark								
DATE(S) DRILLED: 08/24/93 08/25/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
DS PI UC	74	55.1				BK-1	25			CLAYEY SILT, dark brown, soft to medium-stiff, moist - Alluvium
						DM-2	5			
						DM-3	27			SILTY, GRAVELLY CLAY, dark brown, medium-stiff, moist, fine to coarse gravel - Alluvium
DS	71	44.8				DM-3	15			SILTY GRAVEL, brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
UC	79	42.6				DM-4	99			SILTY GRAVEL, gray, orange and green mottled, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
SA	85	37.2				DM-5	57			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium

BORING LOCATION: 23 ft. Rt. Sta. 438+25		DRILLER: GeoLabs-Hawaii		BORING OB-12						
BORING ELEVATION: +288.4 ft		LOGGED BY: H. Clark								
DATE(S) DRILLED: 08/24/93 08/25/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-12	55			soft to moderately hard, weak to moderately strong, highly weathered
						CB-13	60			weak, highly to extremely weathered
						CB-14	85			yellowish-orange and gray mottled, soft to moderately hard, weak to moderately strong
						CB-15	70			gray to orange-brown and gray-green mottled, highly to completely weathered, closely fractured
						CB-16	75			gray, highly weathered

BORING LOCATION: 23.5 ft. Rt. Sta. 436+80		DRILLER: GeoLabs-Hawaii		BORING OB-11						
BORING ELEVATION: +290.0 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/30/93 08/02/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-16	100			weak
						CB-17	80			
						CB-18	85			
						CB-19	90			
UC	78	12.0	95			CB-20	85			brownish-gray

BORING LOCATION: 23.5 ft. Rt. Sta. 436+80		DRILLER: GeoLabs-Hawaii		BORING OB-11						
BORING ELEVATION: +290.0 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 07/30/93 08/02/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CB-28	130			Bottom of Boring No. OB-11 ? 129.5 ft.
							135			
							140			
							145			
							150			

BORING LOCATION: 23 ft. Rt. Sta. 438+25		DRILLER: GeoLabs-Hawaii		BORING OB-12						
BORING ELEVATION: +288.4 ft		LOGGED BY: H. Clark								
DATE(S) DRILLED: 08/24/93 08/25/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						DM-6	30			SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
						DM-7	75/3*			SAPROLITE, green to reddish-brown, soft, weak, highly to extremely weathered, very closely fractured
						CB-8	35			gray and orange-brown mottled
						CB-9	40			yellowish-gray
						CB-10	45			dark brown to gray-green, vesicular
						CB-11	50			brown to gray-green

SURVEY PLOTTED BY: _____ DATE: _____
 ORIGINAL PLAN DESIGNED BY: _____
 NOTE BOOK QUANTITIES BY: _____
 CHECKED BY: _____
 No. _____



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 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
BORING LOGS
 INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase 1B
 F.A.I. PROJECT NO. I-H3-(68)
 SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B44 OF 59 SHEETS

POSTAGE PAID PERMIT NO. 100
 HONOLULU, HAWAII

U.S. STATE DOT FORM 31-30301
 LOG#0937 3/21/94 150

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	179	470

BORING LOCATION: 23 ft. Rt. Sta. 438+26		DRILLER: GeoLabs-Hawaii		BORING OB-12						
BORING ELEVATION: +288.4 ft		LOGGED BY: H. Clark								
DATE(S) DRILLED: 06/24/93 06/26/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							80			Bottom of Boring No. OB-12 ? 78.0 ft.

BORING LOCATION: 23.5 ft. Rt. Sta. 440+00		DRILLER: GeoLabs-Hawaii		BORING OB-13						
BORING ELEVATION: +290.3 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 06/24/93 06/28/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	81	12.9	80			CB-3	30			SAPROLITE, light brown to reddish-brown, soft, weak, highly to extremely weathered, light gray to gray-green, soft to moderately hard, highly weathered, vesicular
						CB-4	35			reddish-gray, soft, extremely to completely weathered
						CB-5	100			light gray, soft to moderately hard, highly weathered, faint columnar jointing
UC	68	48.3	100			CB-6	40			light gray to dark gray-green, weak to moderately strong
						CB-7	45			dark brown to orange-brown, weak to friable, olivine crystals visible in vesicles

BORING LOCATION: 23.5 ft. Rt. Sta. 441+85		DRILLER: GeoLabs-Hawaii		BORING OB-14						
BORING ELEVATION: +299.6 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 07/26/93 07/29/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							5		GM GC	CLAYEY, SILTY GRAVEL, dark brown, loose to medium-dense, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium
							75			saturated
							77		DM-1	
CN	90	33.4				41	10		CH	SILTY, SANDY, GRAVELLY CLAY, orange-brown and reddish-brown mottled, stiff to very stiff, moist, fine to coarse sand, fine to coarse gravel - Alluvium
							50		DM-3	
							50		SP-4	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, orange-brown to reddish-brown, dense to very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium

BORING LOCATION: 23.5 ft. Rt. Sta. 441+85		DRILLER: GeoLabs-Hawaii		BORING OB-14						
BORING ELEVATION: +299.6 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 07/26/93 07/29/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							90		CB-10	COBBLES AND BOULDERS, orange-brown to reddish brown, dense to very dense, moist, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
							55			SAPROLITE, light to dark brownish-gray and orange-brown mottled, soft, weak, highly weathered, vesicular brown to dark gray, extremely weathered
							50		CB-11	
							87		CB-12	reddish-brown, purple and brown mottled, extremely to completely weathered
							60			
							65			
DS	107	19.8					90		CB-13	orange-brown, dark brown, dark gray and purple mottled
							100		CB-14	violet, brown and black mottled, extremely weathered

BORING LOCATION: 23.5 ft. Rt. Sta. 440+00		DRILLER: GeoLabs-Hawaii		BORING OB-13						
BORING ELEVATION: +290.3 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 06/24/93 06/28/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							5		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, dry to moist, fine to coarse sand, fine to coarse gravel - Alluvium
							5		GM	SILTY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium
							10		GC	CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
			50				15		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
			40				20		GM GC	SILTY, CLAYEY GRAVEL, dark gray, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium

BORING LOCATION: 23.5 ft. Rt. Sta. 440+00		DRILLER: GeoLabs-Hawaii		BORING OB-13						
BORING ELEVATION: +290.3 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 06/24/93 06/28/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							55			dark gray, soft to moderately hard, weak to moderately strong
			98				55		CB-8	
							100		CB-9	
							60			Bottom of Boring No. OB-13 ? 68.5 ft.

BORING LOCATION: 23.5 ft. Rt. Sta. 441+85		DRILLER: GeoLabs-Hawaii		BORING OB-14						
BORING ELEVATION: +299.6 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 07/26/93 07/29/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							44.8		80	SP-5
UC	169	0.9	88				30		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, orange-brown to reddish-brown, dense to very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
							78		CB-7	
							90		CB-8	
UC	94	57.5	93				46		CB-9	CONGLOMERATE, CLAYEY, GRAVELLY SAND, orange-brown to reddish-brown, very dense, saturated, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
							60			CONGLOMERATE, CLAYEY GRAVEL

SURVEY PLOTTED BY: _____ DATE: _____
 ORIGINAL PLAN TRACKED BY: _____
 NOTE BOOK DESIGNED BY: _____
 QUANTITIES BY: _____
 CHECKED BY: _____
 No. _____



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 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
BORING LOGS
 INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)
 SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B45 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1-H3-1(68)	1994	180	470

BORING LOCATION: 23.5 ft. Rt. Sta. 441+85		DRILLER: GeoLabs-Hawaii		BORING OB-14						
BORING ELEVATION: +299.8 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 07/28/93 07/29/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	143	1.6	87			CB-15	80			green-gray, soft to moderately hard, weak to moderately strong, highly weathered, closely fractured
						CB-16	85			highly to extremely weathered
						CB-17	90			purple, black and brown mottled, soft, weak
						CB-18	95			gray-green to brownish-gray, weak to moderately strong, very closely fractured
UC	83	7.0	100			CB-19	100			brownish-gray to gray, soft to moderately hard, closely to very closely fractured black, orange-brown, red, reddish-brown and brown mottled, soft, weak, extremely weathered

BORING LOCATION: 26 ft. Rt. Sta. 443+95		DRILLER: GeoLabs-Hawaii		BORING OB-15						
BORING ELEVATION: +299.9 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/05/93 06/09/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	111	12.8			69	DM-1	5			SANDY, CLAYEY SILT, gray, very stiff, wet, with fine to coarse gravel - Alluvium
SA					120	DM-2	10			CLAYEY GRAVEL COBBLES AND BOULDERS, gray-brown to red-brown matrix, very dense, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium
UC	75	43.8			62	DM-3	15			SILTY, GRAVELLY CLAY, light brown, soft, wet, fine to coarse gravel - Alluvium
							20			CLAYEY GRAVEL COBBLES AND BOULDERS, gray-brown to red-brown matrix, very dense, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium
							25			CLAYEY SILT, mottled red-orange and gray, stiff, wet, with weathered rock fragments - Alluvium

BORING LOCATION: 26 ft. Rt. Sta. 443+95		DRILLER: GeoLabs-Hawaii		BORING OB-15						
BORING ELEVATION: +299.9 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/06/93 06/09/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
DS	66	47.8			30/6"	DM-9	55			violet and gray mottled
							61			dark gray, reddish-brown and violet mottled, highly to extremely weathered
DS	96	34.0			74	DM-11	60			dark gray and violet mottled
							100/6"			dark gray
							70			ASH AND CINDERS, gray, soft to very soft, weak, highly weathered
							75			CLINKER, dark brown, soft, weak, highly weathered

BORING LOCATION: 26 ft. Rt. Sta. 443+95		DRILLER: GeoLabs-Hawaii		BORING OB-15						
BORING ELEVATION: +299.9 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/05/93 06/09/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							105			strong, slightly to moderately weathered, highly vesicular - 'A'a
							110			Bottom of Boring No. OB-15 ? 100.0 ft.
							115			
							120			
							125			

BORING LOCATION: 23.5 ft. Rt. Sta. 441+85		DRILLER: GeoLabs-Hawaii		BORING OB-14						
BORING ELEVATION: +299.8 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 07/28/93 07/29/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							105			Bottom of Boring No. OB-14 ? 101.0 ft.
							110			
							115			
							120			
							125			

BORING LOCATION: 26 ft. Rt. Sta. 443+95		DRILLER: GeoLabs-Hawaii		BORING OB-15						
BORING ELEVATION: +299.9 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/05/93 06/09/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	72	45.2			70	SP-4	30			CONGLOMERATE SILTY, GRAVELLY SAND, gray to gray-brown, medium-dense to dense, saturated, fine to coarse gravel, fine to coarse sand, highly weathered, weakly cemented matrix
DS	68	17.0			55	DM-5	35			CONGLOMERATE SILTY, CLAYEY, GRAVELLY SAND, violet, orange-brown and gray mottled, very dense, saturated, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
							40			SAPROLITE, orange-brown and dark brown mottled, soft, weak, highly to completely weathered
							46			reddish-brown, extremely to completely weathered

BORING LOCATION: 26 ft. Rt. Sta. 443+95		DRILLER: GeoLabs-Hawaii		BORING OB-15						
BORING ELEVATION: +299.9 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/05/93 06/09/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							60/4"			SAPROLITE, dark gray, moderately hard, weak to moderately strong, highly weathered
UC	71	47.5			61.1	CB-15	80			CLINKER, violet and gray mottled, soft, weak, highly weathered
							85			ASH AND CINDERS, gray-brown, soft, weak, highly weathered
UC	77	27.8				CB-16	90			CLINKER, brown, gray-brown and reddish-brown mottled, soft, weak, highly weathered
UC	52	18.1				CB-17	95			BASALT, gray-green, soft, weak, highly weathered, clay partings in joints - 'A'a
							100			gray-green to gray-brown, hard, strong, slightly to moderately weathered, highly vesicular
										CLINKER, gray to violet, soft, weak to friable, highly weathered
										BASALT, gray to gray-brown, moderately hard, moderately

SURVEY PLOTTED BY: _____ DATE: _____
 ORIGINAL PLAN TRACED BY: _____
 NOTE BOOK DESIGNED BY: _____
 QUANTITIES BY: _____
 No. _____



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 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
BORING LOGS
 INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase 1B
 F.A.I. PROJECT NO. 1-H3-(68)
 SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B46 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	181	470

BORING LOCATION		DRILLER		BORING OB-16						
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
26.5 ft. Rt. Sta. 446+95		GeoLabs-Hawaii								
+308.8 ft		J. Brock								
06/01/93 06/05/93		Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S	GEOTECHNICAL DESCRIPTION
CN	120	10.0			17	DM-1	5		MH	CLAYEY SILT, very dark brown, soft to stiff, moist, with fine to coarse gravel - Fill
	71	37.7				DN-2			MH	CLAYEY SILT, dark brown, stiff, wet to saturated, with fine to coarse gravel and small cobbles - Alluvium
		58.2			28	SP-3	10		GM GC	SILTY CLAYEY GRAVEL, COBBLES AND BOULDERS, gray to gray-brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
					50/3'	SP-4	15		GM	SILTY GRAVEL, gray-brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
									GM	SILTY GRAVELLY COBBLES AND BOULDERS, gray-brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
									GM	SILTY GRAVEL, gray-brown, very dense, saturated, fine to coarse sand, fine to coarse gravel, with scattered cobbles and boulders - Alluvium
	48.2				10	SP-5	25		CH	SILTY CLAY, brown to reddish-brown, soft, saturated, with fine to

BORING LOCATION		DRILLER		BORING OB-16						
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
26.5 ft. Rt. Sta. 446+95		GeoLabs-Hawaii								
+308.8 ft		J. Brock								
06/01/93 06/05/93		Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S	GEOTECHNICAL DESCRIPTION
		52.2			40	DM-11				
		51.4			43	DM-12	55			reddish-brown and dark gray mottled, highly to extremely weathered
		32.4			137/6'	DM-13	60			
DS	69	46.2			45	DM-14	85			dark gray to black, highly weathered
		54.3			80	DM-15	70			dark brown, light brown and reddish-brown mottled, vesicular

BORING LOCATION		DRILLER		BORING OB-16						
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
26.5 ft. Rt. Sta. 446+95		GeoLabs-Hawaii								
+308.8 ft		J. Brock								
06/01/93 06/05/93		Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S	GEOTECHNICAL DESCRIPTION
										Bottom of Boring No. OB-16 ? 100.0 ft.

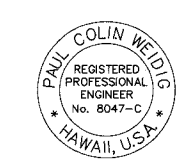
BORING LOCATION		DRILLER		BORING OB-17						
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
23.5 ft. Rt. Sta. 447+95		GeoLabs-Hawaii								
+308.7 ft		C. Isaacson								
06/01/93 06/05/93		Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S	GEOTECHNICAL DESCRIPTION
										BOULDERS, mottled gray-brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
	54.0				24	SP-5	30			CONGLOMERATE CLAYEY, SANDY GRAVEL, gray, dense, saturated, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
					94/7'	DM-6	40			CONGLOMERATE CLAYEY GRAVEL, COBBLES AND BOULDERS, dark gray, very dense, saturated, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
	92	34.7			76	DM-7	45			CONGLOMERATE CLAYEY GRAVEL, COBBLES AND BOULDERS, dark gray, very dense, saturated, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix
	68	53.2					50			

BORING LOCATION		DRILLER		BORING OB-16						
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
26.5 ft. Rt. Sta. 445+95		GeoLabs-Hawaii								
+308.8 ft		J. Brock								
06/01/93 06/05/93		Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S	GEOTECHNICAL DESCRIPTION
	90	34.0			64	DM-6	30		GM	coarse sand and gravel - Alluvium SILTY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
										SAPROLITE, gray-green, soft, weak, highly to extremely weathered, closely fractured
	80	40.8			80/8'	DM-7	35			CLINKER, gray-brown, medium-dense, highly weathered
										SAPROLITE, gray-green, soft, weak, highly weathered, closely fractured
		59.7			24	SP-8	40			ASH AND CINDERS, brown to dark brown, clayey, soft, weak, highly weathered
	66	56.8			71	DM-9	45			SAPROLITE, reddish-brown and dark gray mottled, soft, weak, highly to extremely weathered
	80	37.8			100/7'	DM-10	50			dark brown and dark gray mottled, highly weathered

BORING LOCATION		DRILLER		BORING OB-16						
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
26.5 ft. Rt. Sta. 445+95		GeoLabs-Hawaii								
+308.8 ft		J. Brock								
06/01/93 06/05/93		Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S	GEOTECHNICAL DESCRIPTION
	70	42.7			81	DM-16				dark brown and reddish-brown mottled
		41.8			100/11'	DM-17	80			reddish-brown and gray mottled
	78	39.0			83	DM-18	85			light brown, reddish-brown, gray and violet mottled, highly to extremely weathered
					50/1'	DM-19	90			BASALT, gray, hard, strong, slightly weathered, vesicular - A'a
UC	139	3.0	18	15		CB-20				
						CB-21				
						CB-22				
						CB-23				gray and violet mottled

BORING LOCATION		DRILLER		BORING OB-17						
BORING ELEVATION		LOGGED BY								
DATE(S) DRILLED		TYPE RIG								
23.5 ft. Rt. Sta. 447+95		GeoLabs-Hawaii								
+308.7 ft		C. Isaacson								
06/01/93 06/05/93		Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S	GEOTECHNICAL DESCRIPTION
									SC GC	CLAYEY, GRAVELLY SAND, medium brown-gray, medium-dense, moist to very moist, fine to coarse sand, fine to coarse gravel - Alluvium
	77	28.7			86/8'	DM-1	5		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, dense, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium
	67	46.8			27	DM-2	15			very dense, saturated
DS	78	41.3			110	DM-3	25		GC	CLAYEY GRAVEL, COBBLES AND

SURVEY PLOTTED BY _____ DATE _____
 ORIGINAL PLAN _____
 TRACED BY _____
 DESIGNED BY _____
 QUANTITIES BY _____
 CHECKED BY _____
 No. _____



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 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
BORING LOGS
 INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit I, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)
 SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B47 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1-H3-1(68)	1994	182	470

BORING LOCATION: 23.5 ft. Rt. Sta. 447+95		DRILLER: GeoLabs-Hawaii		BORING OB-17						
BORING ELEVATION: +308.7 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/01/93 08/05/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	85	60.5				DM-8	55			
DS	89	22.7			38	DM-9	55			
	91	30.5			60/7'	DM-10	60			SAPROLITE dark brownish-gray, soft, friable, highly to extremely weathered
	73	41.9			70/6"	DM-11	65			brownish-gray, weak, highly weathered
			45			CB-12	70			very closely fractured, faint jointing, vesicular
						CB-13	75			brown to dark gray, weak to moderately strong

BORING LOCATION: 23.5 ft. Rt. Sta. 447+95		DRILLER: GeoLabs-Hawaii		BORING OB-17						
BORING ELEVATION: +308.7 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/01/93 08/05/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							105			olivine crystals visible in vesicles - 'A'a
							110			Bottom of Boring No. OB-17 ? 100.0 ft.
							115			
							120			
							125			

BORING LOCATION: 23.5 ft. Rt. Baseline 449+55		DRILLER: GeoLabs-Hawaii		BORING OB-18						
BORING ELEVATION: +311.6 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 06/17/93 06/18/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	86	53.0				DM-5	30			dark gray, weak, highly weathered
						CB-6	30			
						CB-7	40			light brownish-gray, weak to friable, very closely fractured
						CB-8	50			CLINKER, brownish-gray, soft, weak, highly to extremely weathered
UC	67	32.3	95			CB-9	40			SAPROLITE, gray, soft, weak to moderately strong, moderately to highly weathered
UC						CB-10	45			
						CB-11	50			

BORING LOCATION: 21 ft. Rt. Sta. 451+08		DRILLER: GeoLabs-Hawaii		BORING OB-19						
BORING ELEVATION: +317.9 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 06/09/93 06/11/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							6		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, dense to very dense, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium
SA	109	21.1			43	DM-1	6		GM	SILTY GRAVEL, COBBLES AND BOULDERS, brown, very dense, wet, fine to coarse sand, fine to coarse gravel - Alluvium
		38.1			61	DEN-2	10		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, dense to very dense, wet, fine to coarse sand, fine to coarse gravel - Alluvium
	112	20.3			84	DM-3	15			gray-brown to reddish-brown, very dense, saturated
	70	47.3			41	DM-4	20			brown to orange-brown, dense to very dense

BORING LOCATION: 23.5 ft. Rt. Sta. 447+95		DRILLER: GeoLabs-Hawaii		BORING OB-17						
BORING ELEVATION: +308.7 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/01/93 08/05/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			80			CB-14	80			dark gray, soft to moderately hard
						CB-15	85			brownish-gray and gray-black mottled
						CB-16	90			medium gray, soft to moderately hard
UC	146	2.5	100			CB-18	100			BASALT, medium gray, soft to moderately hard, weak to moderately strong, highly to moderately weathered, inopiant joints, vesicular,

BORING LOCATION: 23.5 ft. Rt. Baseline 449+55		DRILLER: GeoLabs-Hawaii		BORING OB-18						
BORING ELEVATION: +311.6 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 06/17/93 06/18/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
SA					82	DM-1	5		GC	ASPHALTIC CONCRETE
DS	70	44.8				DM-2	10		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
					50	DM-3	15		GM	SILTY GRAVEL, COBBLES AND BOULDERS, brown, very dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
UC	86	35.2				DM-4	20			SAPROLITE, brownish-gray, soft, weak to friable, highly weathered

BORING LOCATION: 23.5 ft. Rt. Baseline 449+55		DRILLER: GeoLabs-Hawaii		BORING OB-18						
BORING ELEVATION: +311.6 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 06/17/93 06/18/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			60			CB-12	55			brownish-gray, soft to moderately hard, weak to moderately strong, highly to extremely weathered, vesicular
						CB-13	60			highly weathered
						CB-14	65			
							70			Bottom of Boring No. OB-18 ? 68.0 ft.
							75			

DATE _____
 SURVEY CONTROLLED BY _____
 ORIGINAL PLAN _____
 NOTE BOOK _____
 DESIGNED BY _____
 QUANTITIES BY _____
 CHECKED BY _____



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 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase 1B
 F.A.I. PROJECT NO. 1-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994

SHEET No. B48 OF 59 SHEETS

NOTED: BASE PT. 0.0

LEG: STATE VECTY--3/2/94
 L06B0411 3/2/94 480

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	183	470

BORING LOCATION: 21 ft. Rt. Sta. 451+08		DRILLER: GeoLabs-Hawaii		BORING OB-19						
BORING ELEVATION: +317.9 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/09/93 08/11/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
		51.5			42	DM-5	30			gray-brown to yellow-brown, very dense
UC	64	58.4			51	DM-6	35			SAPROLITE, brown to dark gray, soft, weak, highly weathered
							40			
UC	72	49.7			108/8*	DM-7	45			brown to reddish-orange, highly to extremely weathered
							50			

BORING LOCATION: 21 ft. Rt. Sta. 451+08		DRILLER: GeoLabs-Hawaii		BORING OB-19						
BORING ELEVATION: +317.9 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/09/93 08/11/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
		43.8			84	DM-12	80			brownish-gray to violet-gray
					48	DM-13	80			gray-green to brown and reddish-orange mottled, highly to extremely weathered
		47.8			40/1*	DM-14	85			dark brownish-gray, highly weathered
		47.9			53	DM-15	90			brown, purple, reddish-orange and gray-green mottled, weak to moderately strong
		37.1			70/2*	DM-16	95			orange-brown and dark gray-brown mottled
							100			

BORING LOCATION: 21 ft. Rt. Sta. 451+08		DRILLER: GeoLabs-Hawaii		BORING OB-19						
BORING ELEVATION: +317.9 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/09/93 08/11/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							130			Bottom of Boring No. OB-19 ? 125.0 ft.
							135			
							140			
							145			
							150			

BORING LOCATION: 23.5 ft. Rt. Sta. 452+80		DRILLER: GeoLabs-Hawaii		BORING OB-20						
BORING ELEVATION: +323.5 ft		LOGGED BY: H. Clark/S. Hickman								
DATE(S) DRILLED: 08/07/93 08/11/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							30			orange to brown, very dense, saturated
							35			SAPROLITE, brownish gray, soft, weak, highly to extremely weathered, vesicular
							40			
							45			green, gray, and brown mottled

BORING LOCATION: 21 ft. Rt. Sta. 451+08		DRILLER: GeoLabs-Hawaii		BORING OB-19						
BORING ELEVATION: +317.9 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/09/93 08/11/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
		37.4			90/9*	DM-8	55			brown to dark reddish-brown and gray
		34.8			116	DM-9	60			brown, reddish-orange and dark gray mottled, weak to moderately strong, highly weathered
		56.7			32	DM-10	65			brown to dark gray, weak
		41.3			47	DM-11	70			brown, reddish-orange and yellow-brown mottled
							75			

BORING LOCATION: 21 ft. Rt. Sta. 451+08		DRILLER: GeoLabs-Hawaii		BORING OB-19						
BORING ELEVATION: +317.9 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/09/93 08/11/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
		34.4			28/8*	CB-18	105			gray-brown, reddish-orange and dark gray mottled
							110			CLINKER, dark gray-brown, soft to very soft, weak, highly to extremely weathered
UC	76	9.7				CB-20	110			
UC	133	5.0			50	CB-21	115			BASALT, dark gray to brown to gray mottled, moderately hard, moderately strong to strong, moderately weathered, vesicular - 'A's
							120			
							125			moderately hard to hard

BORING LOCATION: 23.5 ft. Rt. Sta. 452+80		DRILLER: GeoLabs-Hawaii		BORING OB-20						
BORING ELEVATION: +323.5 ft		LOGGED BY: H. Clark/S. Hickman								
DATE(S) DRILLED: 08/07/93 08/11/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							5		GM GC	SILTY, CLAYEY GRAVEL, brown, medium-dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
							10		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, dark brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
							15			light gray, dense
							20			orange-brown, moist
							25			

DESIGNED BY	DATE
TRACED BY	
QUANTITIES BY	
CHECKED BY	



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Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit I, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994

SHEET No. B49 OF 59 SHEETS

BORING LOCATION: 23.5 ft. Rt. Sta. 452+80		DRILLER: GeoLabs-Hawaii		BORING OB-20						
BORING ELEVATION: +323.5 ft		LOGGED BY: H. Clark/S. Hickman								
DATE(S) DRILLED: 08/07/93 08/11/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			0			CB-10				dark gray
			0			CB-11				green, highly to extremely weathered
			100			CB-12	56			gray-green, extremely to completely weathered
UC	81	28.4	100			CB-13	60			brown, purple and yellow mottled, extremely to completely weathered
UC	72	38.9	100			CB-14	65			gray-green, highly to extremely weathered
			85			CB-15	70			gray, green, orange, extremely to completely weathered
							75			

BORING LOCATION: 23.5 ft. Rt. Sta. 452+80		DRILLER: GeoLabs-Hawaii		BORING OB-20						
BORING ELEVATION: +323.5 ft		LOGGED BY: H. Clark/S. Hickman								
DATE(S) DRILLED: 08/07/93 08/11/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100			CB-22				gray, purple and brown mottled, extremely weathered
			37			CB-23	105			gray, soft to moderately hard, moderately strong, highly weathered, closely fractured
UC	125	7.1	100			CB-24	110			red, soft, extremely weathered, vesicular
			68			CB-25	115			extremely to completely weathered
			77			CB-26	120			BASALT, red, hard, moderately strong to strong, moderately to highly weathered, moderately fractured, vesicular - 'A'
UC	143	2.2	100				125			gray, soft to moderately hard

BORING LOCATION: 23.5 ft. Rt. Sta. 454+50		DRILLER: GeoLabs-Hawaii		BORING OB-21						
BORING ELEVATION: +328.9 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/05/93 08/08/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100			CB-1				SILTY SAND, dark brown, loose, moist, with scattered cobbles and boulders, fine to coarse sand, fine to coarse gravel - Alluvium
			48			CB-2	5			SILTY CLAYEY GRAVEL, COBBLES AND BOULDERS, dark brown, dense, moist, fine to coarse sand, coarse gravel - Alluvium very dense
			100			CB-3	10			dark orange-brown, dense to very dense
			100			CB-4	15			orange-brown, very dense
			57			CB-5	20			orange-brown and gray-brown mottled, dense to very dense, saturated
			100				25			CONGLOMERATE SILTY CLAYEY SAND, GRAVEL AND COBBLES, gray-green, black and yellow-brown mottled, soft, moist, highly weathered, weakly cemented matrix, fine to coarse sand, fine to

BORING LOCATION: 23.5 ft. Rt. Sta. 454+50		DRILLER: GeoLabs-Hawaii		BORING OB-21						
BORING ELEVATION: +328.9 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/05/93 08/08/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100			CB-11				greenish-gray, soft to moderately hard
			100			CB-12	55			grayish-red to dark brown, highly weathered
			72			CB-13	60			dark brown-gray
			80			CB-14	65			reddish-brown, highly to extremely weathered, closely fractured, vesicular
			97			CB-15	70			reddish-brown and orange-gray mottled, extremely to completely weathered
							75			

BORING LOCATION: 23.5 ft. Rt. Sta. 452+80		DRILLER: GeoLabs-Hawaii		BORING OB-20						
BORING ELEVATION: +323.5 ft		LOGGED BY: H. Clark/S. Hickman								
DATE(S) DRILLED: 08/07/93 08/11/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100			CB-16				gray, black and reddish-brown mottled
			58.0			CB-17	80			red, black and brown mottled
			63			CB-18	85			red, purple and brown mottled
			100			CB-19	90			gray, black and red-brown mottled
UC	95	8.5	80			CB-20	95			gray, green and reddish-brown mottled, highly to extremely weathered
			92			CB-21	100			gray-green

BORING LOCATION: 23.5 ft. Rt. Sta. 452+80		DRILLER: GeoLabs-Hawaii		BORING OB-20						
BORING ELEVATION: +323.5 ft		LOGGED BY: H. Clark/S. Hickman								
DATE(S) DRILLED: 08/07/93 08/11/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										Bottom of Boring No. OB-20 ? 126.0 ft.
							130			
							135			
							140			
							145			
							150			

BORING LOCATION: 23.5 ft. Rt. Sta. 454+50		DRILLER: GeoLabs-Hawaii		BORING OB-21						
BORING ELEVATION: +328.9 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/05/93 08/08/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			78			CB-6				coarse gravel mottled tan and dark gray
			81			CB-7	30			greenish-gray
			104			CB-8	35			mottled tan and dark gray
			100			CB-9	40			SAPROLITE, medium brown-gray, soft, weak, highly weathered, very closely fractured
			87			CB-10	45			moderately to highly weathered
							50			

SURVEY PLOTTED BY _____ DATE _____
 ORIGINAL PLAN _____
 TRACED BY _____
 DESIGNED BY _____
 QUANTITIES BY _____
 CHECKED BY _____
 No. _____



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 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
BORING LOGS
 INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase 1B
 F.A.I. PROJECT NO. I-H3-(68)
 SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B50 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	185	470

BORING LOCATION: 23.5 ft. Rt. Sta. 454+50		DRILLER: GeoLabs-Hawaii		BORING OB-21						
BORING ELEVATION: +328.9 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/05/93 08/06/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			97			CB-16	78			gray-brown and reddish-orange mottled
						CB-17	80			gray-green to brown, soft to moderately hard, highly weathered
			90			CB-18	85			reddish-brown to orange-black
UC 91	19.4		87	50		CB-19	90			BASALT, green-gray to brown, soft to moderately hard, highly weathered, closely fractured, vesicular - 'A'
			100	0		CB-20	95			gray, purple, red, green, brown, blue and black mottled, soft, weak
							100			

BORING LOCATION: 23.5 ft. Rt. Sta. 456+50		DRILLER: GeoLabs-Hawaii		BORING OB-22						
BORING ELEVATION: +334.8 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 07/12/93 07/14/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							5			CLAYEY, SANDY, GRAVELLY SILT, dark gray, loose, moist, fine to coarse sand, fine to coarse gravel, with finely disseminated organic matter - Alluvium
							6			CLAYEY GRAVEL, gray-brown, medium-dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
							10			SILTY CLAYEY GRAVEL, COBBLES AND BOULDERS, reddish-brown to gray-brown, dense, wet, fine to coarse gravel, fine to coarse sand - Alluvium
							15			CLAYEY GRAVEL, COBBLES AND BOULDERS, reddish-brown to gray-brown, dense, wet, fine to coarse gravel, fine to coarse sand - Alluvium
							20			SILTY CLAYEY GRAVEL, COBBLES AND BOULDERS, reddish-brown to gray-brown, dense, wet, fine to coarse gravel, fine to coarse sand - Alluvium
			80			CB-1	25			SAPROLITE, gray-brown, soft, weak, highly weathered, closely fractured, faint jointing

BORING LOCATION: 23.5 ft. Rt. Sta. 456+50		DRILLER: GeoLabs-Hawaii		BORING OB-22						
BORING ELEVATION: +334.8 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 07/12/93 07/14/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							30			gray-green
							100			gray
							60			ASH AND CINDERS, gray, soft, weak, highly weathered
UC 85	21.6		95			CB-9	65			SAPROLITE, gray-brown, soft, weak, highly weathered, closely fractured
							65			gray
UC 87	22.7		95			CB-10	70			gray
							70			gray-brown, soft to moderately hard, weak to moderately strong, highly weathered, vesicular
			97			CB-11	75			

BORING LOCATION: 23.5 ft. Rt. Sta. 456+50		DRILLER: GeoLabs-Hawaii		BORING OB-23						
BORING ELEVATION: +338.1 ft		LOGGED BY: J. Brook								
DATE(S) DRILLED: 08/18/93 08/19/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							5			SILTY CLAYEY GRAVEL, very dark brown, loose to medium-dense, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium
							6			SILTY CLAYEY GRAVEL, COBBLES AND BOULDERS, very dark brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
							10			CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
							15			orange-brown
							20			orange-brown to reddish-brown, very dense, saturated
							25			dense
							95			SAPROLITE, dark green-gray, soft, weak, extremely

BORING LOCATION: 23.5 ft. Rt. Sta. 454+50		DRILLER: GeoLabs-Hawaii		BORING OB-21						
BORING ELEVATION: +328.9 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/05/93 08/06/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							105			red, brown and yellow
							110			gray, black and brown mottled
							115			gray, black and purple mottled, hard to moderately hard
			88	65		CB-23	120			Bottom of Boring No. OB-21 ? 118.0 ft.
							125			

BORING LOCATION: 23.5 ft. Rt. Sta. 456+50		DRILLER: GeoLabs-Hawaii		BORING OB-22						
BORING ELEVATION: +334.8 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 07/12/93 07/14/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							30			gray to brown, vesicular
DS 81	45.6		94			CB-3	35			gray
							40			gray
UC 87	36.5		95			CB-4	45			brown
							50			gray
			30			CB-6	60			gray-brown

BORING LOCATION: 23.5 ft. Rt. Sta. 456+50		DRILLER: GeoLabs-Hawaii		BORING OB-22						
BORING ELEVATION: +334.8 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 07/12/93 07/14/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							80			
UC 95	18.7		98			CB-12	85			
							90			
UC 124	5.2		96			CB-13	95			
							100			Bottom of Boring No. OB-22 ? 88.0 ft.

DATE	
DRY UNIT WEIGHT	
MOISTURE CONTENT	
CORE RECOVERY	
R.Q.D.	
NUMBER OF BLOWS/FT	
SAMPLE TYPE AND NUMBER	
DEPTH IN FEET	
GRAPHIC SYMBOL	
U.S.C.S.	
GEOTECHNICAL DESCRIPTION	



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 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase 1B
 F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B51 OF 59 SHEETS

VERTICAL SCALE: 1" = 10'
 HORIZONTAL SCALE: 1" = 10'

LEGEND: STATE DOT--SV-3009, LOGS-44, 3/21/94, 185

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1-H3-1(68)	1994	186	470

BORING LOCATION: 23.5 ft. Rt. Sta. 458+10		DRILLER: GeoLabs-Hawaii		BORING OB-23						
BORING ELEVATION: +338.1 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/16/93 08/19/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			80			CB-5	30			weathered, very closely fractured, vesicular
			25			CB-6	35			black, gray and dark purple mottled, extremely to completely weathered
			40			CB-7	40			gray to green-gray, extremely weathered
			87			CB-8	45			purple, extremely to completely weathered
UC	81	38.4				CB-9	50			dark gray, extremely weathered
			92							brownish-purple

BORING LOCATION: 23.5 ft. Rt. Sta. 458+10		DRILLER: GeoLabs-Hawaii		BORING OB-23						
BORING ELEVATION: +338.1 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/16/93 08/19/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			83			CB-15	80			brown and purple mottled, extremely to completely weathered
UC	120	4.4	90			CB-16	85			purple, pinkish-brown and black mottled, weak to moderately strong, closely fractured, highly to extremely weathered
			82	0		CB-17	90			dark purple and yellow-orange mottled, extremely to completely weathered, very closely fractured
UC	118	11.1	100	55		CB-18	95			BASALT, brown to gray, moderately hard to hard, weak to moderately strong, slightly weathered, closely fractured, highly vesicular - 'A'a
							100			Bottom of Boring No. OB-23 ? 97.0 ft.

BORING LOCATION: 25 ft. Rt. Sta. 459+71		DRILLER: GeoLabs-Hawaii		BORING OB-24						
BORING ELEVATION: +341.9 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 07/12/93 07/14/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			80			CB-5	30			dark gray-green, highly weathered
UC	71	48.8	97			CB-6	35			dark gray to violet, weak to friable, highly to extremely weathered
			93			CB-7	40			reddish-orange to orange-brown, weak, extremely to completely weathered
			80			CB-8	45			dark gray, soft, highly weathered
			97			CB-9	50			dark blue-gray

BORING LOCATION: 23.5 ft. Rt. Sta. 461+30		DRILLER: GeoLabs-Hawaii		BORING OB-25						
BORING ELEVATION: +350.0 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 08/03/93 08/08/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						DM-1	5			SILTY SANDY CLAY, very dark gray, soft to stiff, moist, fine to medium sand - Alluvium
						CB-2	6			fine to coarse sand
						CB-3	10			
						CB-4	15			
						CB-5	20			
						CB-6	25			
						CB-7	30			
							40			
							60			wet to saturated
							80			saturated

BORING LOCATION: 23.5 ft. Rt. Sta. 458+10		DRILLER: GeoLabs-Hawaii		BORING OB-23						
BORING ELEVATION: +338.1 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/16/93 08/19/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			76			CB-10	55			purple, orange and brown mottled
			85			CB-11	60			
			98			CB-12	65			brown, green and gray mottled, highly to extremely weathered
			90			CB-13	70			purple, brown and gray mottled, extremely weathered
			85			CB-14	75			purple, brown, green and black mottled, highly to extremely weathered

BORING LOCATION: 25 ft. Rt. Sta. 459+71		DRILLER: GeoLabs-Hawaii		BORING OB-24						
BORING ELEVATION: +341.9 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 07/12/93 07/14/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						CH	5			SILTY CLAY, very dark brown, very soft, moist - Alluvium
						GM GC	10			SILTY CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
PI	80	38.3			64/4'	DM-1	15			SANDY, CLAYEY SILT, brown, soft, wet, fine to coarse sand - Alluvium
						GC	20			CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
SA	83	44.0			44	DM-2	25			SILTY GRAVEL, gray-brown, dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
			86			CB-3	30			CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
			82			CB-4	35			SAPROLITE, light green-gray to light brown, soft, weak, highly weathered, vesicular
							40			
							45			
							50			
							55			
							60			
							65			
							70			
							75			
							80			
							85			
							90			
							95			
							100			

BORING LOCATION: 25 ft. Rt. Sta. 459+71		DRILLER: GeoLabs-Hawaii		BORING OB-24						
BORING ELEVATION: +341.9 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 07/12/93 07/14/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	83	48.0	100			CB-10	55			dark gray-brown, soft to moderately hard, weak to moderately strong
			100			CB-11	60			blue-gray
							65			
							70			
							75			
							80			
							85			
							90			
							95			
							100			

DATE: _____
 CHECKED BY: _____
 QUANTITIES BY: _____
 DESIGNED BY: _____
 DRAWN BY: _____
 SURVEY PLATTED BY: _____



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit I, Phase IB
 F.A.I. PROJECT NO. 1-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B52 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1-H3-1(68)	1994	187	470

BORING LOCATION: 23.5 ft. Rt. Sta. 461+30		DRILLER: GeoLabs-Hawaii		BORING OB-25						
BORING ELEVATION: +350.0 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 09/03/93 09/08/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			5			CB-8	30			dark brownish-gray
			70			CB-9	35			brown
						CB-10	40			SAPROLITE, dark gray, soft, weak to friable, closely fractured, extremely weathered
			90			CB-11	45			medium gray, highly to extremely weathered
			80			CB-12	50			brown-black

BORING LOCATION: 23.5 ft. Rt. Sta. 461+30		DRILLER: GeoLabs-Hawaii		BORING OB-25						
BORING ELEVATION: +350.0 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 09/03/93 09/08/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			90			CB-18	80			
UC	74	33.8	90			CB-19	85			
						CB-20	90			
UC	59	57.3	90			CB-21	95			ASH, tan, very soft, highly weathered
							100			Bottom of Boring No. OB-25 ? 97.0 ft.

BORING LOCATION: 23.5 ft. Rt. Sta. 462+90		DRILLER: GeoLabs-Hawaii		BORING OB-26						
BORING ELEVATION: +354.3 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 09/09/93 09/13/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			80			CB-7	30			dark gray
UC	72	34.2	80			CB-8	35			
UC	64	57.7	100			CB-9	40			brownish-gray to gray, weak to friable
						CB-10	45			
UC	63	51.4	98			CB-11	50			dark gray to brownish-gray

BORING LOCATION: 23.5 ft. Rt. Sta. 462+90		DRILLER: GeoLabs-Hawaii		BORING OB-26						
BORING ELEVATION: +354.3 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 09/09/93 09/13/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100			CB-17	80			highly weathered
UC	83	33.0	100			CB-18	85			
						CB-19	90			medium brown, moderately hard, slightly weathered, welded texture
UC	70	47.7	100			CB-20	95			
						CB-21	100			light to dark brown
			80							BASALT, dark gray, hard, strong, slightly weathered, vesicular - 'A'

BORING LOCATION: 23.5 ft. Rt. Sta. 461+30		DRILLER: GeoLabs-Hawaii		BORING OB-25						
BORING ELEVATION: +350.0 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 09/03/93 09/08/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			88			CB-13	55			ASH, brown, very soft, friable, very closely fractured, extremely weathered
	88	42.3	78			CB-14	60			SAPROLITE, brownish-gray, soft, weak to friable, closely fractured, extremely weathered, vesicular
UC	85	24.3	98			CB-15	65			dark gray, olivine crystals visible in vesicles
						CB-16	70			brownish-gray, soft, closely fractured, highly to extremely weathered
			85			CB-17	75			medium gray, olivine crystals visible in vesicles

BORING LOCATION: 23.5 ft. Rt. Sta. 462+90		DRILLER: GeoLabs-Hawaii		BORING OB-26						
BORING ELEVATION: +354.3 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 09/09/93 09/13/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						MH	5			CLAYEY, SANDY SILT, light brown, soft, moist, fine to medium sand - Alluvium
CN	70	52.0			22	DM-1	10			CLAYEY, SILTY SAND, brown, soft, moist, fine to medium sand - Alluvium
SA			0		74	DM-2 CB-3 CB-4	15			CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium moist to wet
			45			CB-5	20			
			80			CB-6	25			SAPROLITE, brownish-gray, soft, weak, highly weathered, very closely fractured, vesicular

BORING LOCATION: 23.5 ft. Rt. Sta. 462+90		DRILLER: GeoLabs-Hawaii		BORING OB-26						
BORING ELEVATION: +354.3 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 09/09/93 09/13/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			86			CB-12	55			
						CB-13	60			CLINKER, brownish-gray, soft, weak to friable, highly weathered
			100			CB-14	65			SAPROLITE, light gray, soft, weak, highly weathered, very closely fractured
						CB-15	70			brownish-gray to gray
			100			CB-16	75			ASH, light brown, soft, weak,

ORIGINAL PLAN	DATE
REVISION	
NO.	

SCALE: AS NOTED
DATE: MAR. 1994



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Paul Colin Weidig
PSC ASSOCIATES, INC.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
North Halawa Valley Highway, Unit I, Phase IB
F.A.I. PROJECT NO. 1-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994

SHEET No. B53 OF 59 SHEETS

LOGBOOK 3/21/94

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	188	470

BORING LOCATION: 23.5 ft. Rt. Sta. 462+90		DRILLER: GeoLabs-Hawaii		BORING OB-26						
BORING ELEVATION: +354.3 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 09/09/93 09/13/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										Bottom of Boring No. OB-26 ? 101.5 ft.

BORING LOCATION: 23.5 ft. Rt. Sta. 464+50		DRILLER: GeoLabs-Hawaii		BORING OB-27						
BORING ELEVATION: +350.8 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 07/03/93 07/06/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			95			CB-6	30			light gray to dark gray and orange-brown mottled, highly to extremely weathered, very closely fractured, vesicular, olivine crystals visible in vesicles
			80			CB-7	35			CLINKER, reddish-brown, soft, weak, highly to extremely weathered
			80			CB-8	40			SAPROLITE, dark gray-brown, soft, weak to moderately strong, highly weathered, vesicular
UC	72	34.2	80			CB-8	45			gray-brown
			95			CB-9	50			
			100			CB-10				ASH AND CINDERS, light gray, soft, weak, highly weathered
			100	20		CB-11				SAPROLITE, light gray, soft,

BORING LOCATION: 20 ft. Rt. Sta. 466+50		DRILLER: GeoLabs-Hawaii		BORING OB-28						
BORING ELEVATION: +363.2 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/16/93 06/16/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										CLAYEY, GRAVELLY SILT, dark brown, very stiff, moist, fine to coarse gravel - Alluvium
SA	78	38.9			23	DM-1	5			SANDY, GRAVELLY SILT, dark brown, medium-dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
										SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, moist to wet, fine to coarse gravel, fine to coarse sand - Alluvium
			42			CB-12	55			reddish-violet to gray
UC	71	44.3			50/2"	DM-2	10			SILTY, GRAVELLY SAND, mottled red-brown and orange, medium-dense, saturated, fine to coarse sand, fine to coarse gravel - Alluvium
										SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, moist to wet, fine to coarse gravel, fine to coarse sand - Alluvium
			53			CB-13	60			dark gray-green, olivine crystals visible in vesicles
			60			DM-4	20			SAPROLITE, brown to reddish-brown, soft, weak to friable, highly to extremely weathered
			61.7							gray-brown, weak, highly weathered
										ASH AND CINDERS, reddish-orange to tan, soft, weak, extremely to completely weathered
										SAPROLITE, dark brown to dark gray and violet mottled, soft to moderately hard, weak to moderately strong, highly to extremely weathered, vesicular
										dark gray to dark reddish-brown, soft, weak to friable, highly to extremely weathered

BORING LOCATION: 20 ft. Rt. Sta. 466+50		DRILLER: GeoLabs-Hawaii		BORING OB-28						
BORING ELEVATION: +363.2 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/15/93 06/16/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										reddish-violet to gray
										dark gray-green, olivine crystals visible in vesicles
										gray-green
										ASH AND CINDERS, reddish-orange to tan, soft, weak, extremely to completely weathered
										SAPROLITE, dark brown to dark gray and violet mottled, soft to moderately hard, weak to moderately strong, highly to extremely weathered, vesicular
										dark gray to dark reddish-brown, soft, weak to friable, highly to extremely weathered

BORING LOCATION: 23.5 ft. Rt. Sta. 464+50		DRILLER: GeoLabs-Hawaii		BORING OB-27						
BORING ELEVATION: +350.8 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 07/03/93 07/06/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										CLAYEY SILT, gray-brown, soft, moist, with finely disseminated organic matter - Alluvium
										SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, gray-brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
										SAPROLITE, gray-brown, soft, weak to moderately strong, highly weathered
UC	73	47.1			74/10"	DM-3	15			ASH AND CINDERS, reddish-orange, soft, weak, highly to extremely weathered
			80			CB-4	20			SAPROLITE, gray-brown, soft, weak to moderately strong, highly weathered, closely fractured, vesicular, olivine crystals visible in vesicles
										very closely fractured

BORING LOCATION: 23.5 ft. Rt. Sta. 464+50		DRILLER: GeoLabs-Hawaii		BORING OB-27						
BORING ELEVATION: +350.8 ft		LOGGED BY: C. Isaacson								
DATE(S) DRILLED: 07/03/93 07/06/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										weak to moderately strong, highly weathered, closely fractured, vesicular
UC	81	30.0	100	80		CB-12	55			dark gray-green, highly to extremely weathered
										gray-green, highly weathered
UC	80	32.5	95	40		CB-13	60			
										Bottom of Boring No. OB-27 ? 81.5 ft.

BORING LOCATION: 20 ft. Rt. Sta. 466+50		DRILLER: GeoLabs-Hawaii		BORING OB-28						
BORING ELEVATION: +363.2 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 06/15/93 06/16/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										brownish-gray, vesicular
UC	70	48.1			29	DM-5	5			
										green-gray, moderately to highly weathered
UC	74	45.6			89/9"	DM-6	30			
										reddish-brown and dark gray mottled, soft, weak to moderately strong, highly to extremely weathered
										gray-green, highly weathered
DS	74	44.1			100/8"	DM-7	35			
										gray-green to dark gray and violet mottled, weak to moderately strong, highly to extremely weathered
			34.9	100		CB-9	40			
UC	84	35.9	100			CB-10	45			
										gray-green to dark gray and violet mottled, weak to moderately strong, highly to extremely weathered

DATE: _____
 SURVEY PLOTTED BY: _____
 ORIGINAL PLAN TRACED BY: _____
 NOTE BOOK DESIGNED BY: _____
 QUANTITIES BY: _____
 CHECKED BY: _____



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 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B54 OF 59 SHEETS

LB STATE DOT--3V-830V
 LOG#B47 3/2/94 188

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	189	470

BORING LOCATION: 20 ft. Rt. Sta. 466+50		DRILLER: GeoLabs-Hawaii		BORING OB-28						
BORING ELEVATION: +363.2 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/15/93 08/16/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
UC	126	3.8	80	40		CB-17	80			dark gray to violet, soft to moderately hard, weak to moderately strong
UC	150	1.7	100	42		CB-18	85			dark gray to violet
Bottom of Boring No. OB-28 ? 88.0 ft.										

BORING LOCATION: 23.5 ft. Rt. Sta. 467+85		DRILLER: GeoLabs-Hawaii		BORING OB-29						
BORING ELEVATION: +373.8 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/18/93 08/17/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
					43	DM-5	30			brown to gray-brown, wet to saturated
							35			gray, yellow and black mottled, saturated
	77	40.4			100	DM-8	35			brown-gray, red, orange and yellow mottled
						CB-7	40			SAPROLITE, green-gray, brown and black mottled, soft, weak, highly to extremely weathered, very closely fractured, vesicular
					65	CB-8	45			gray to brown
					100	CB-9	50			gray
					3	CB-10	60			gray

BORING LOCATION: 23.5 ft. Rt. Sta. 467+85		DRILLER: GeoLabs-Hawaii		BORING OB-29						
BORING ELEVATION: +373.8 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/18/93 08/17/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
					60	0	CB-16	80		red-gray
					60	0	CB-17	85		purple-gray to dark gray, soft to moderately hard
					88	19	CB-18	90		gray-green, soft to moderately hard
Bottom of Boring No. OB-29 ? 92.0 ft.										

BORING LOCATION: 23.5 ft. Rt. Sta. 472+05		DRILLER: GeoLabs-Hawaii		BORING OB-30						
BORING ELEVATION: +377.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 06/28/93 06/30/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							30			weathered
							30			ASH, SPATTER AND CINDERS, mottled light and dark gray, soft, weak, highly weathered
			20				35			SAPROLITE, mottled gray and brown, soft, weak, highly weathered, closely fractured, vesicular
					100		35			gray-brown, moderately hard, moderately strong
					87		40			gray, soft, weak
					77		45			dark gray-brown, soft to moderately hard
					68		50			dark gray-brown

BORING LOCATION: 23.5 ft. Rt. Sta. 467+85		DRILLER: GeoLabs-Hawaii		BORING OB-29						
BORING ELEVATION: +373.8 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/18/93 08/17/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							5		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, dark brown, medium-dense, moist, fine to fine to coarse sand, fine to coarse gravel - Alluvium
	88	32.3			25	DM-1	5			brown to red orange, yellow and gray mottled
		14.0			35	DM-2	10			brown-gray, red, orange and yellow mottled, medium-dense to dense
					74	DM-3	15			very dense, moist to wet
DS	71	49.8			50	DM-4	20			very dense, moist to wet
							25			very dense, moist to wet

BORING LOCATION: 23.5 ft. Rt. Sta. 467+85		DRILLER: GeoLabs-Hawaii		BORING OB-29						
BORING ELEVATION: +373.8 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/18/93 08/17/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
					73		55			gray-green
					72		60			ASH, red, yellow and orange mottled, soft, weak, extremely to completely weathered
					53		65			SAPROLITE, brownish-gray, soft, weak, highly to extremely weathered, very closely fractured, vesicular
					78		70			brownish-gray, highly weathered
UC	73	8.5			70	59	75			BASALT, gray to purple, soft to moderately hard, moderately strong, highly weathered, closely fractured, vesicular - 'A'a

BORING LOCATION: 23.5 ft. Rt. Sta. 472+05		DRILLER: GeoLabs-Hawaii		BORING OB-30						
BORING ELEVATION: +377.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 06/28/93 06/30/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							5		GM	SILTY GRAVEL, COBBLES AND BOULDERS, gray to brown, dense, dry, fine to coarse sand, fine to coarse gravel - Alluvium
					40/7"		5		CH	SILTY CLAY, gray-brown, stiff, moist, with weathered rock fragments - Alluvium
					92		10			SAPROLITE, gray, soft, weak, highly weathered, very closely fractured
					20		15			light gray to gray-green, soft to moderately hard, weak to moderately strong, closely fractured
					100		20			light gray-green to reddish-brown, soft to moderately hard, moderately strong, highly to extremely
					100		25			light gray-green to reddish-brown, soft to moderately hard, moderately strong, highly to extremely
					60		25			light gray-green to reddish-brown, soft to moderately hard, moderately strong, highly to extremely

DATE _____
 DESIGNED BY _____
 CHECKED BY _____
 QUANTITIES BY _____
 NO. _____



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 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B55 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	190	470

BORING LOCATION: 23.5 ft. Rt. Sta. 472+05		DRILLER: GeoLabs-Hawaii		BORING OB-30						
BORING ELEVATION: +377.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 08/29/93 08/30/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			70			CB-12	55			reddish-brown to gray, soft, weak, highly to extremely weathered
			58			CB-13	60			gray, soft to moderately hard, weak to moderately strong, moderately to highly weathered
			20			CB-14	65			moderately strong, highly weathered
			40			CB-15	70			
90	28.0	100	47			CB-16	75			BASALT, gray, hard, moderately strong, moderately weathered, close columnar

BORING LOCATION: 23.5 ft. Rt. Sta. 473+45		DRILLER: GeoLabs-Hawaii		BORING OB-31						
BORING ELEVATION: +374.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 07/04/93 07/08/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	88	31.8			77	DM-1	5	GW GM GC		ASPHALTIC CONCRETE SANDY GRAVEL, gray, dense, moist, fine to coarse sand, fine to coarse gravel - Base Flock SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, mottled gray and dark brown, medium-dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
					16	DM-2	15	CH		SILTY, GRAVELLY CLAY, gray-brown to reddish-brown, very stiff, moist, fine to coarse gravel - Alluvium
					22	DM-3	20	GC		CLAYEY GRAVEL, dark brown, medium-dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
							25			SAPROLITE, dark gray brown, soft, weak to moderately strong, highly weathered brown to dark brown

BORING LOCATION: 23.5 ft. Rt. Sta. 473+45		DRILLER: GeoLabs-Hawaii		BORING OB-31						
BORING ELEVATION: +374.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 07/04/93 07/08/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			20			CB-11	55			moderately hard, weak to moderately strong, highly weathered, very closely fractured, vesicular
			20			CB-12	60			
			40			CB-13	65			gray to gray-green, highly to extremely weathered
			100			CB-14	70			
			100			CB-16	75			gray to reddish-brown, soft, closely fractured

BORING LOCATION: 23.5 ft. Rt. Sta. 473+45		DRILLER: GeoLabs-Hawaii		BORING OB-31						
BORING ELEVATION: +374.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 07/04/93 07/08/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							105			Bottom of Boring No. OB-31 ? 103.0 ft.
							110			
							115			
							120			
							125			

BORING LOCATION: 23.5 ft. Rt. Sta. 472+05		DRILLER: GeoLabs-Hawaii		BORING OB-30						
BORING ELEVATION: +377.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 08/29/93 08/30/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100	41		CB-17	80			fractures, highly vesicular - 'A'a
			90	44		CB-18	85			soft to moderately hard
			87	42		CB-19	90			brown, hard
							95			dark brown to gray-brown
							100			Bottom of Boring No. OB-30 ? 93.0 ft.

BORING LOCATION: 23.5 ft. Rt. Sta. 473+45		DRILLER: GeoLabs-Hawaii		BORING OB-31						
BORING ELEVATION: +374.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 07/04/93 07/08/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
	111	15.8			98	DM-4	30			gray-brown
	78	42.7			98	DM-5	35			reddish-brown to brown
			33		60/3*	DM-6 CB-7	36			gray, soft to moderately hard, weak to moderately strong
			47			CB-8	40			reddish-brown, soft, highly to extremely weathered
			55			CB-9	45			CLINKER, gray, soft, weak, highly weathered
			51			CB-10	50			SAPROLITE, gray, soft to

BORING LOCATION: 23.5 ft. Rt. Sta. 473+45		DRILLER: GeoLabs-Hawaii		BORING OB-31						
BORING ELEVATION: +374.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 07/04/93 07/08/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100			CB-16	80			reddish-gray to gray-brown
			100			CB-17	85			reddish-brown to gray or dark gray
			100	53		CB-18	90			BASALT, gray to gray-green, soft to moderately hard, weak to moderately strong, highly weathered, very closely fractured - 'A'a
			87	42		CB-19	95			gray to gray-green and reddish-orange mottled, moderately weathered
			100	38		CB-20	100			gray to dark gray, highly weathered

REVIEWED BY	DATE
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QUANTITIES BY	
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Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit I, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B56 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1-H3-1(68)	1994	191	470

BORING LOCATION: 23.5 ft. Rt. Sta. 474+85		DRILLER: GeoLabs - Hawaii		BORING OB-32						
BORING ELEVATION: +386.0 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/12/93 09/12/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										ASPHALTIC CONCRETE SANDY GRAVEL, gray, dense, moist, fine to coarse sand, fine to coarse gravel - Base Course GM GC SILTY GRAVEL, brown, dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium SILTY CLAYEY GRAVEL, COBBLES AND BOULDERS, dark brown, dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium dark gray-brown, very dense dark gray, saturated dark gray-brown
					53	DM-1	5			
					30	DM-2	10			
					26	DM-3	15			
					44	DM-4	20			
					100	CB-5				
					50	CB-6				

BORING LOCATION: 23.5 ft. Rt. Sta. 474+85		DRILLER: GeoLabs - Hawaii		BORING OB-32						
BORING ELEVATION: +386.0 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/12/93 09/12/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										brown and dark brown dark gray to brown dark gray, saturated CLINKER, dark brown, soft, weak, highly weathered soft to moderately hard, weak to moderately strong
					60	CB-12	55			
					50	CB-13	60			
					80	CB-14	65			
					80	CB-15	70			
					90	CB-16	75			

BORING LOCATION: 23.5 ft. Rt. Sta. 474+85		DRILLER: GeoLabs - Hawaii		BORING OB-32						
BORING ELEVATION: +386.0 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/12/93 09/12/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										Bottom of Boring OB-32 ? 103.0 ft.

BORING LOCATION: 23.5 ft. Rt. Sta. 476+06		DRILLER: GeoLabs - Hawaii		BORING OB-33						
BORING ELEVATION: +397.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/06/93 09/08/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										SILTY SANDY GRAVEL, COBBLES AND BOULDERS, dark gray brown, dense, moist - Alluvium GM CONGLOMERATE, SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, very dense, moist, fine to coarse sand, fine to coarse gravel, highly weathered, weakly cemented matrix SAPROLITE, gray, soft to moderately hard, weak to moderately strong, highly weathered, very closely fractured
					30	CB-6	30			
					87	CB-7	35			
					60	CB-8	40			
					60	CB-9	45			
					90	CB-10	50			

BORING LOCATION: 23.5 ft. Rt. Sta. 474+85		DRILLER: GeoLabs - Hawaii		BORING OB-32						
BORING ELEVATION: +386.0 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/12/93 09/12/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										CONGLOMERATE, SILTY, CLAYEY GRAVEL, gray, dense, moist, fine to coarse gravel, highly weathered, weakly cemented matrix reddish-brown, very dense gray
					40	CB-7	30			
					80	CB-8	35			
					0	CB-9	40			
					60	CB-10	45			
					50	CB-11	50			

BORING LOCATION: 23.5 ft. Rt. Sta. 474+85		DRILLER: GeoLabs - Hawaii		BORING OB-32						
BORING ELEVATION: +386.0 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/12/93 09/12/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										BASALT, gray, hard, strong, slightly weathered, moderately fractured, vesicular - 'A'a CLINKER gray-brown to reddish-brown, moderately hard, moderately strong, highly weathered BASALT, gray, hard, strong, moderately to slightly weathered, moderately fractured, vesicular - 'A'a slightly weathered to fresh
					103	UC	80			
					98	UC	85			
					149	UC	90			
					100	CB-21	95			
					100	CB-21	100			

BORING LOCATION: 23.5 ft. Rt. Sta. 476+06		DRILLER: GeoLabs - Hawaii		BORING OB-33						
BORING ELEVATION: +397.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/05/93 09/08/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
										ASPHALTIC CONCRETE SANDY GRAVEL, gray, dense, moist, fine to coarse sand, fine to coarse gravel - Base Course GM GC SILTY CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, very dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium brown to dark gray, saturated dark gray-brown brown, moist
					50	CB-1	5			
					80	CB-2	10			
					100	CB-3	15			
					80	CB-4	20			
					30	CB-5	25			

ORIGINAL PLAN	DATE
NO. _____	_____
DESIGNED BY	DATE
CHECKED BY	_____



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 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase 1B
 F.A.I. PROJECT NO. 1-H3-(68)

SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B57 OF 59 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	192	470

BORING LOCATION: 23.5 ft. Rt. Sta. 478+05		DRILLER: GeoLabs - Hawaii		BORING OB-33						
BORING ELEVATION: +397.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/05/93 09/06/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			90			CB-11	55			CLINKER, reddish-brown, moderately hard, moderately strong, highly to extremely weathered
						CB-12	83			SAPROLITE, gray brown, soft to moderately hard, weak to moderately strong, highly to extremely weathered, closely to very closely fractured, vesicular
							60			gray-brown
UC	88	21.8	63			CB-13	66			dark gray, soft, weak, extremely to completely weathered
UC	86	33.1	72			CB-14	70			dark brown, extremely weathered
UC	141	8.2	100			CB-15	75			gray, soft to moderately hard, weak to moderately strong, moderately to highly weathered

BORING LOCATION: 23.5 ft. Rt. Sta. 478+05		DRILLER: GeoLabs - Hawaii		BORING OB-33						
BORING ELEVATION: +397.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/05/93 09/06/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							105			Bottom of Boring OB-33 ? 102.0 ft.

BORING LOCATION: 44 ft. Rt. Sta. 470+00		DRILLER: GeoLabs-Hawaii		BORING OR- 2						
BORING ELEVATION: +395.3 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/20/93 08/26/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			82			CB-7	30			reddish-orange to greenish-brown
						CB-8	78			reddish-orange to reddish-brown, saturated
						CB-9	92			SAPROLITE, red, orange and gray mottled, soft, weak, extremely weathered, very closely fractured
							40			red, gray and brown mottled, highly to extremely weathered, vesicular
UC	74	44.3	100			CB-10	45			brown, black and orange mottled
						CB-11	92			red, gray, brown and purple mottled

BORING LOCATION: 39 ft. Rt. Sta. 478+00		DRILLER: GeoLabs-Hawaii		BORING OR- 4						
BORING ELEVATION: +419.5 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 08/13/93 09/15/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							5			CLAYEY, SANDY GRAVELLY SILT, brown, soft, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium
CN	83	82.7			21	DM-1	5			reddish-brown, wet
							10			brown, soft, moist to wet
						DM-3	16			SILT, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown to orange-brown, dense to very dense, wet to saturated, fine to coarse sand, fine to coarse gravel - Alluvium
UC	73	48.3			99	DM-4	20			SAPROLITE, gray, brown, soft, weak, extremely to completely weathered, very closely fractured
						CB-5	100			brown, dark brown, and gray-brown mottled

BORING LOCATION: 23.5 ft. Rt. Sta. 478+05		DRILLER: GeoLabs - Hawaii		BORING OB-33						
BORING ELEVATION: +397.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/05/93 09/06/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			100			CB-16	80			soft, weak, highly to extremely weathered
						CB-17	85			CLINKER, reddish-brown to gray, soft to moderately hard, moderately strong, highly to extremely weathered
UC	164	8.4	100	90		CB-18	90			BASALT, gray, hard, strong, slightly weathered, slightly fractured, vesicular - A'a
UC	82	40.2	100	73		CB-19	95			gray brown, soft to moderately hard, weak to moderately strong, moderately weathered
						CB-20	100			gray, hard, strong, slightly weathered

BORING LOCATION: 44 ft. Rt. Sta. 470+00		DRILLER: GeoLabs-Hawaii		BORING OR- 2						
BORING ELEVATION: +395.3 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/20/93 08/26/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							5			SILT, CLAYEY GRAVEL, brownish-gray to orange-gray, medium-dense, moist, fine to coarse sand, fine to coarse gravel - Alluvium
						DM-1	6			reddish-brown to gray-brown, very dense
	70	50.0			62	DM-2	24			
	68	49.9					10			
UC	68	53.7			46	DM-3	15			dark gray to gray-brown
						DM-4	20			saturated
	70	50.7			25	DM-4	20			
						CB-5				
						CB-6				
			0				38			

BORING LOCATION: 44 ft. Rt. Sta. 470+00		DRILLER: GeoLabs-Hawaii		BORING OR- 2						
BORING ELEVATION: +395.3 ft		LOGGED BY: S. Hickman								
DATE(S) DRILLED: 08/20/93 08/26/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			87			CB-12	55			green, gray and brown mottled
						CB-13	75			red, orange and brown mottled
						CB-14	85			red, purple and brown mottled
DS	86	59.7	82			CB-15	70			green, gray, brown and yellow mottled
							75			ASH AND CINDERS, light brown and yellow-orange mottled, soft, weak, highly to extremely weathered
										Bottom of Boring No. OR-2 ? 72.5 ft.

SURVEY PLOTTED BY _____ DATE _____
 ORIGINAL PLAN TRACED BY _____
 NOTE BOOK DESIGNED BY _____
 QUANTITIES BY _____
 CHECKED BY _____
 No. _____



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 OR UNDER MY SUPERVISION
 Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
BORING LOGS
 INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit 1, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)
 SCALE: AS NOTED DATE: MAR. 1994
 SHEET No. B58 OF 59 SHEETS

L.B. STATE DOT-311-30301
 LOGBOOK 3/21/94 450

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(68)	1994	193	470

BORING LOCATION: 39 ft. Rt. Sta. 478+00		DRILLER: GeoLabs-Hawaii		BORING OR-4						
BORING ELEVATION: +419.5 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 09/13/93 09/15/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.O.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			42			CB-7	30			purple, brown, orange and red mottled
			35			CB-8	35			purple, very dark gray and gray-green mottled, extremely weathered
			52			CB-9	40			gray-green
			42			CB-10	45			red, orange, purple, brown and green mottled, vesicular, alivine and vesuvianite crystals visible in vesicles
			50			CB-11	50			brownish-green

BORING LOCATION: 44 ft. Rt. Sta. 479+00		DRILLER: GeoLabs-Hawaii		BORING OR-6						
BORING ELEVATION: +427.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/03/93 09/09/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.O.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
					102	DM-1	5		CH	SILTY, SANDY GRAVELLY CLAY, dark brown, soft to medium-stiff, moist, fine to coarse sand, fine to coarse gravel - Alluvium
					85	DM-2	15		GM GC	SILTY, CLAYEY GRAVEL, COBBLES AND BOULDERS, brown, very dense, moist to wet, fine to coarse sand, fine to coarse gravel - Alluvium
					57	DM-3	20			gray and brown mottled, wet to saturated
			50			CB-4	25			saturated

BORING LOCATION: 44 ft. Rt. Sta. 479+00		DRILLER: GeoLabs-Hawaii		BORING OR-6						
BORING ELEVATION: +427.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/03/93 09/09/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.O.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			83			CB-10	55			
			47			CB-11	60			CLINKER, gray, soft to moderately hard, weak, highly weathered
			10			CB-12	65			SAPROLITE, gray, soft to moderately hard, weak to moderately strong, highly weathered, closely fractured
			90			CB-13	70			gray, soft to moderately hard, moderately strong, highly weathered, closely fractured
							75			Bottom of Boring No. OR-6 @ 70.5 ft.

BORING LOCATION: 39 ft. Rt. Sta. 478+00		DRILLER: GeoLabs-Hawaii		BORING OR-4						
BORING ELEVATION: +419.5 ft		LOGGED BY: J. Brock								
DATE(S) DRILLED: 09/13/93 09/15/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.O.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			72			CB-12	55			gray-green
			27			CB-13	60			brownish-orange, purplish-brown and gray mottled
			50			CB-14	65			purplish-brown, black and violet mottled
			10			CB-15	70			gray and reddish-gray mottled
							75			Bottom of Boring No. OR-4 @ 73.5 ft.

BORING LOCATION: 44 ft. Rt. Sta. 479+00		DRILLER: GeoLabs-Hawaii		BORING OR-6						
BORING ELEVATION: +427.7 ft		LOGGED BY: P. Padilla								
DATE(S) DRILLED: 09/03/93 09/09/93		TYPE RIG: Rotary Wash								
OTHER LAB TESTS	DRY UNIT WEIGHT(pcf)	MOISTURE CONTENT(%)	CORE RECOVERY(%)	R.O.D (%)	NUMBER OF BLOWS/FT	SAMPLE TYPE AND NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
			50			CB-5	30			SAPROLITE, reddish-brown, soft, weak, highly weathered, closely fractured
			40			CB-6	35			gray, soft to moderately hard, weak to moderately strong, moderately to highly weathered
			80			CB-7	40			CLINKER, reddish-orange to gray, soft to moderately hard, weak to moderately strong, highly weathered
			40			CB-8	45			CLINKER, reddish-orange to gray, soft to moderately hard, weak to moderately strong, highly weathered
			100			CB-9	50			SAPROLITE, gray, soft to moderately hard, weak to strong, moderately to highly weathered, fractured

DESIGNED BY	DATE
DRAWN BY	
CHECKED BY	
IN CHARGE	



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Paul Colin Weidig
 PSC ASSOCIATES, INC.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 North Halawa Valley Highway, Unit I, Phase IB
 F.A.I. PROJECT NO. I-H3-(68)

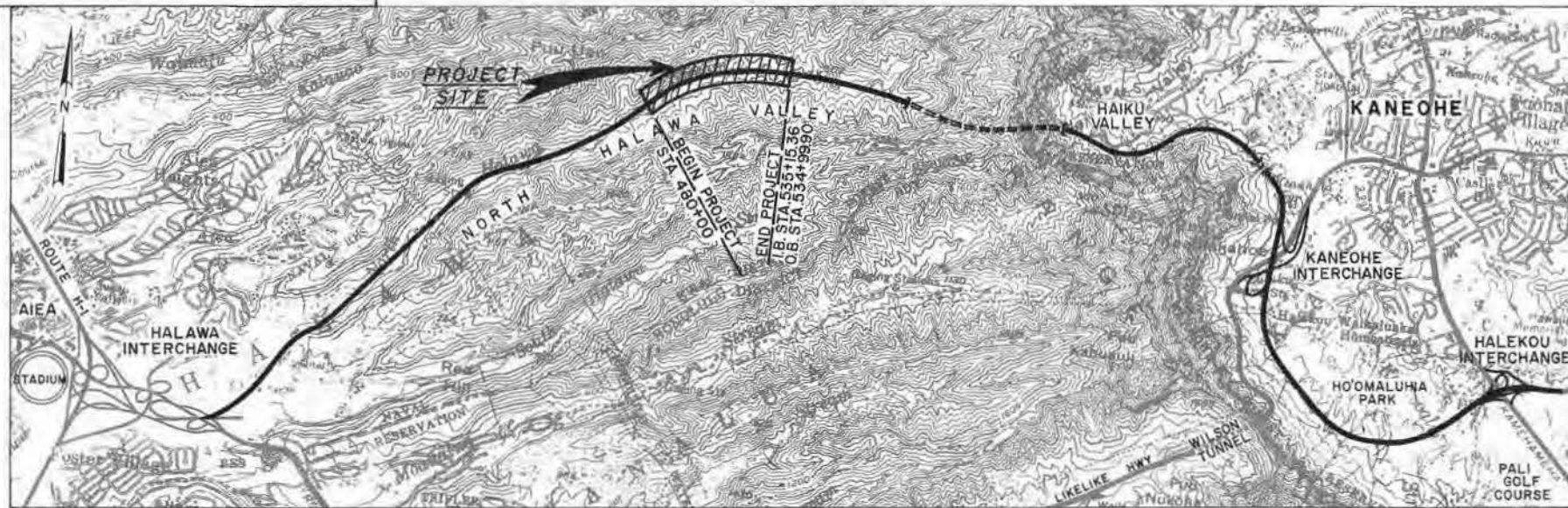
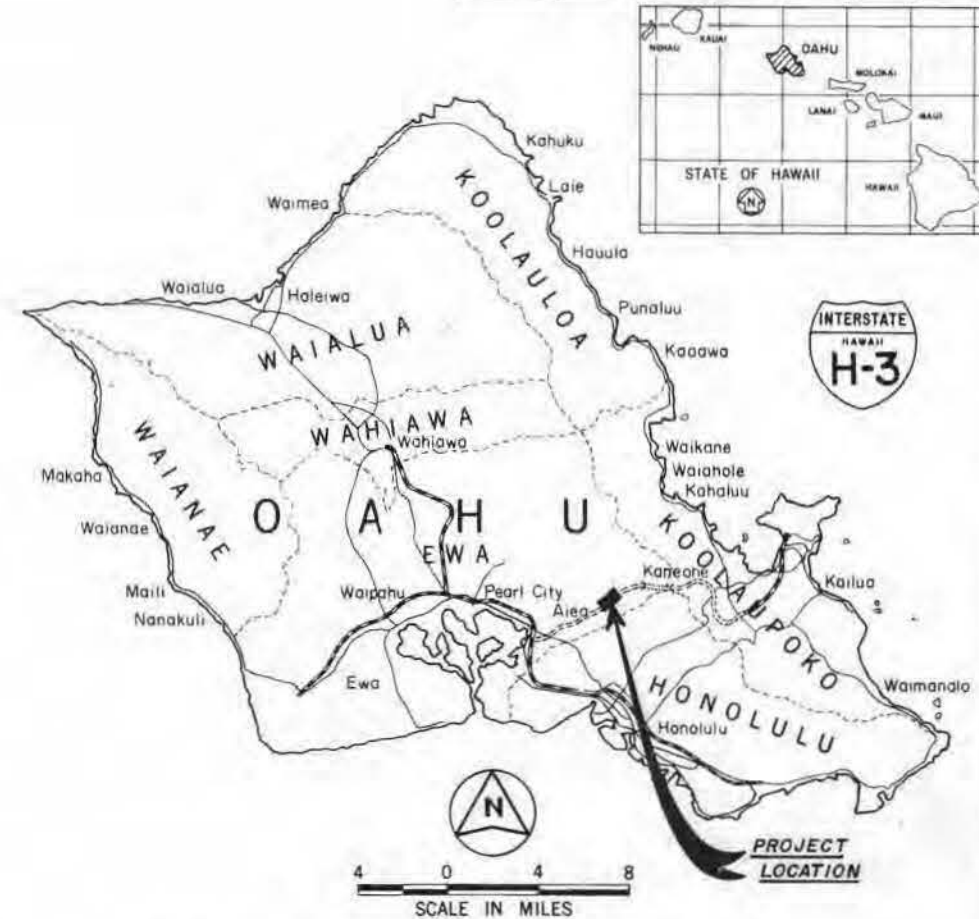
SCALE: AS NOTED DATE: MAR. 1994

SHEET No. B59 OF 59 SHEETS

INDEX TO DRAWINGS	
SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	STANDARD PLANS SUMMARY
3	ABBREVIATIONS
4,5	TYPICAL HIGHWAY SECTIONS
6	UNREINFORCED CONC. PAVT. JOINT DETAILS
① 7	RIGID BARRIER DETAILS
8,9	GENERAL PLANS
10,11	GENERAL PROFILES
② 12	GENERAL GEOMETRIC PLAN
13-18	GEOMETRIC PLANS
19-26	HIGHWAY PROFILES
③ 27,28	SUPERELEVATION DIAGRAMS
④ 29-34	GRADING AND DRAINAGE PLANS
35,36	TYPICAL ACCESS ROAD SECTIONS
37	FILTER FABRIC WALL DETAILS
38-43	ACCESS ROAD PROFILES
44,45	ACCESS RD. SUPERELEVATION DIAGRAM
46	TYPICAL ACCESS RD. WIDENING DETAILS
47	ACCESS RD. SIGNING & STRIPING PLAN
48-55	DRAINAGE PROFILES
56-75	DRAINAGE DETAILS
76	GRADING NOTES EROSION & SEDIMENT CONTROL MEASURES
77-92	DRAINAGE ESTIMATED QUANTITIES
93-98	HIGHWAY SIGNING & STRIPING PLANS
⑪ 99-126	ELECTRICAL DRAWINGS
127-132	BORING LOG LOCATION PLANS
133-165	BORING LOGS
⑫ 166-259	STRUCTURAL DRAWINGS
⑬ 260-310	HIGHWAY CROSS SECTIONS
311-341	ACCESS ROAD CROSS SECTIONS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	1	325

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
HONOLULU, HAWAII
"AS BUILT"
PLANS FOR
CONSTRUCTION OF A PORTION OF
INTERSTATE ROUTE H-3
NORTH HALAWA VALLEY HIGHWAY, UNIT II
FEDERAL AID INTERSTATE PROJECT NO. I-H3-1(69)&(70)
DISTRICT OF EWA
ISLAND OF OAHU



DESIGN CLASSIFICATION :

DESIGN ADT (2008)	45,220
DHV	4,282
D	76/24
T	2.1 %
T24	4.1 %
V	60 MPH

GROSS LENGTH OF PROJECT: INTERSTATE ROUTE H-3 1.04 MILES

CHANGES MADE DURING CONSTRUCTION HAVE BEEN INCORPORATED ON THESE PLANS EXCEPT CHANGES IN THE ORIGINAL THEORETICAL QUANTITIES. FOR ACTUAL QUANTITIES, REFER TO PROJECT LEDGER AND/OR COMPUTATION BOOK.

Robert Chin 4/24/99
RESIDENT ENGINEER DATE

DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION APPROVED: _____ DIVISION ADMINISTRATOR DATE	DEPARTMENT OF TRANSPORTATION STATE OF HAWAII APPROVED: _____ DIR. OF TRANSPORTATION DATE
--	---

By R.M. Towill Corp. DESIGNED BY
KENNETH W.G. WONG 587-2241 AUGUST 1993 DATE
P.S. & E. BY PHONE

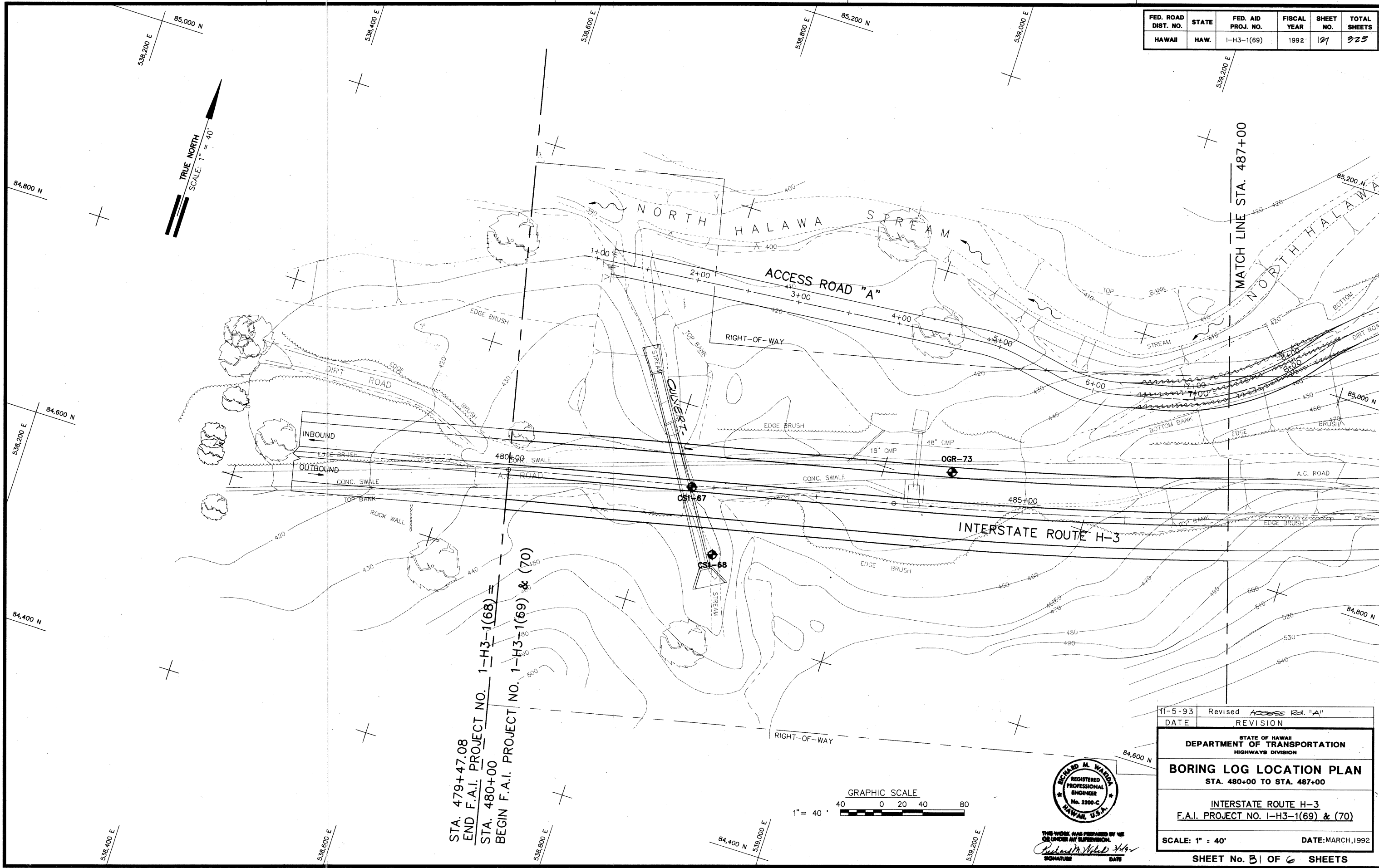
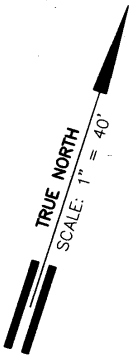
NOTE: PLAN SHEET NOS.

① C07 S-1,	② C012 S-1,	③ C028 S-1,
④ C034 S-1,	⑤ C034 S-2,	⑥ C034 S-3,
⑦ C034 S-4,	⑧ C034 S-5,	⑨ C034 S-6,
⑩ C034 S-7,	⑪ C0105 S-1,	⑫ C0227 S-1,
⑬ C0227 S-2,	⑭ CO ADD235 S-1,	⑮ C0248 S-1,
⑯ C0249 S-1,	⑰ C0249 S-2,	⑱ C0310 S-1,
⑲ C0310 S-2,	⑳ C0310 S-3,	㉑ C0310 S-4,
㉒ C0310 S-5,	㉓ C0310 S-6	

ADDED: ORIGINAL STRUCTURAL SHEETS REPLACED
BY VALUE ENGINEERING STRUCTURAL SHEETS = 87 SHEETS

ARE SUPPLEMENTARY SHEETS TO THIS PROJECT.
TOTAL SHEET COUNT AFTER "AS BUILT" POSTING = 335 SHEETS

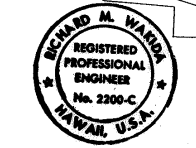
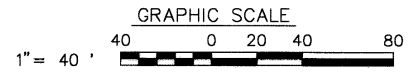
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	121	325



STA. 479+47.08
 END F.A.I. PROJECT NO. 1-H3-1(68) =
 STA. 480+00
 BEGIN F.A.I. PROJECT NO. 1-H3-1(69) & (70)

MATCH LINE STA. 487+00

DATE	
ORIGINAL PLAN	
DESIGNED BY	
TRACED BY	
NOTE BOOK	
QUANTITIES BY	
CHECKED BY	



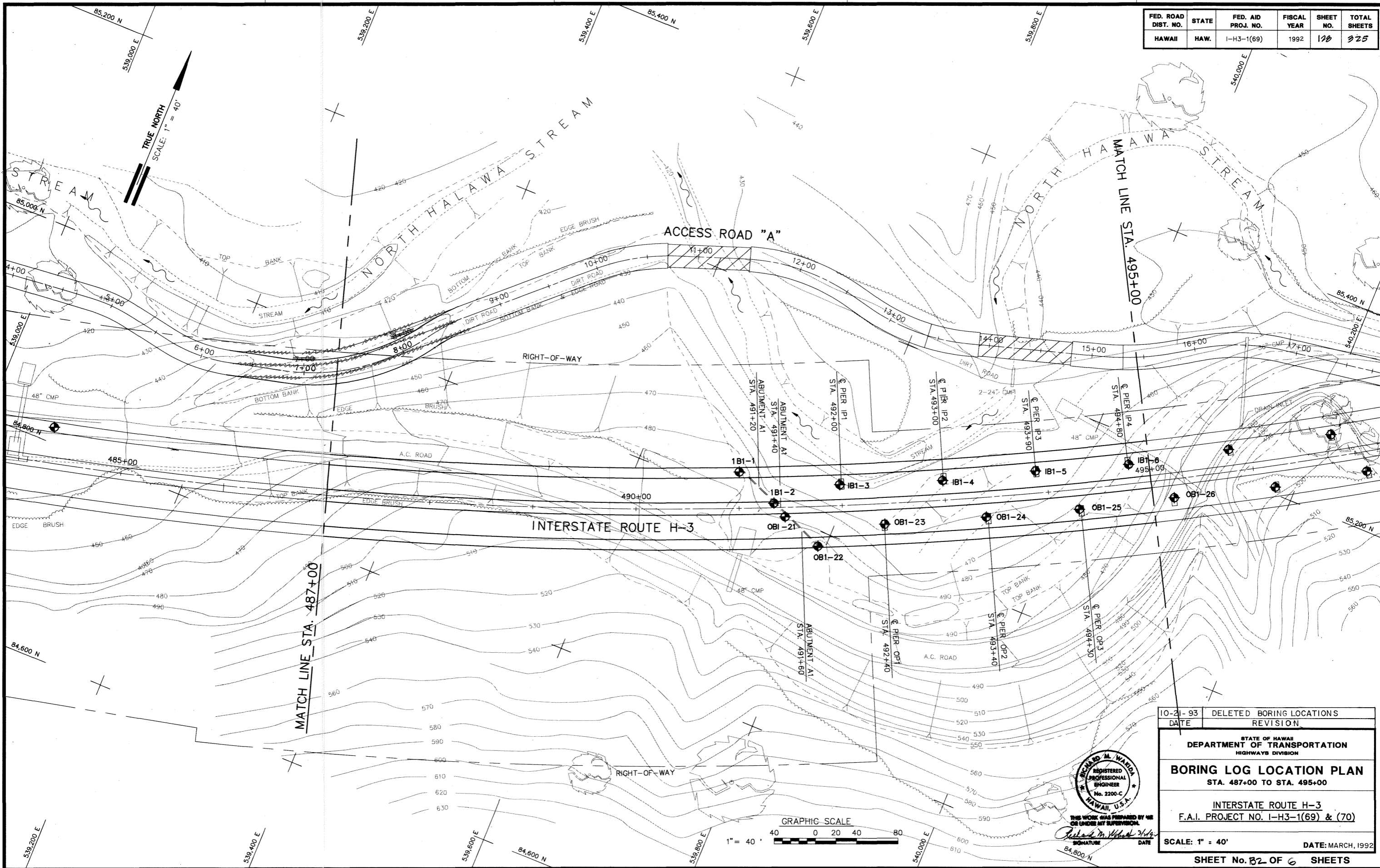
THE WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.
 Signature: Richard M. Ward
 DATE

11-5-93	Revised Access Rd. "A"
DATE	REVISION
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION	
BORING LOG LOCATION PLAN STA. 480+00 TO STA. 487+00	
INTERSTATE ROUTE H-3 F.A.I. PROJECT NO. 1-H3-1(69) & (70)	
SCALE: 1" = 40'	DATE: MARCH, 1992

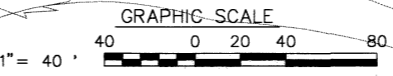
SHEET No. B1 OF 6 SHEETS

ADD. 127

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	128	325



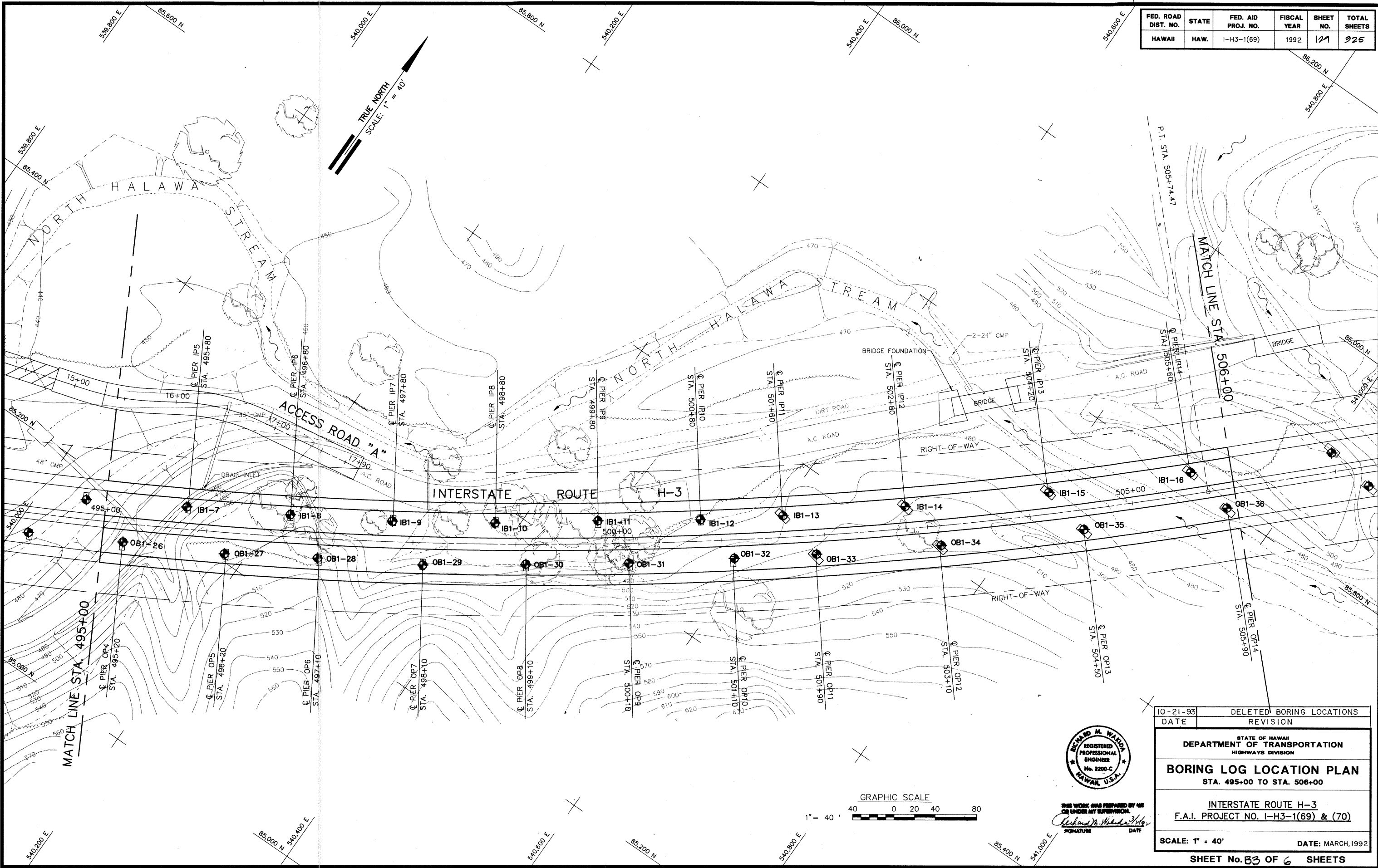
SURVEY PLOTTED BY	DATE
DRAWN BY	
TRACED BY	
QUANTITIES BY	
CHECKED BY	
ORIGINAL PLAN	
NOTE BOOK	
No.	



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10-21-93	DELETED BORING LOCATIONS
DATE	REVISION
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION	
BORING LOG LOCATION PLAN STA. 487+00 TO STA. 495+00	
INTERSTATE ROUTE H-3 F.A.I. PROJECT NO. I-H3-1(69) & (70)	
SCALE: 1" = 40'	DATE: MARCH, 1992
SHEET No. 128 OF 6 SHEETS	

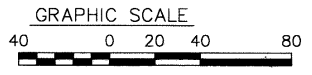
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	121	325



DATE
SURVEY PLOTTED BY
DRAWN BY
NOTE BOOK
QUANTITIES BY
CHECKED BY
No.



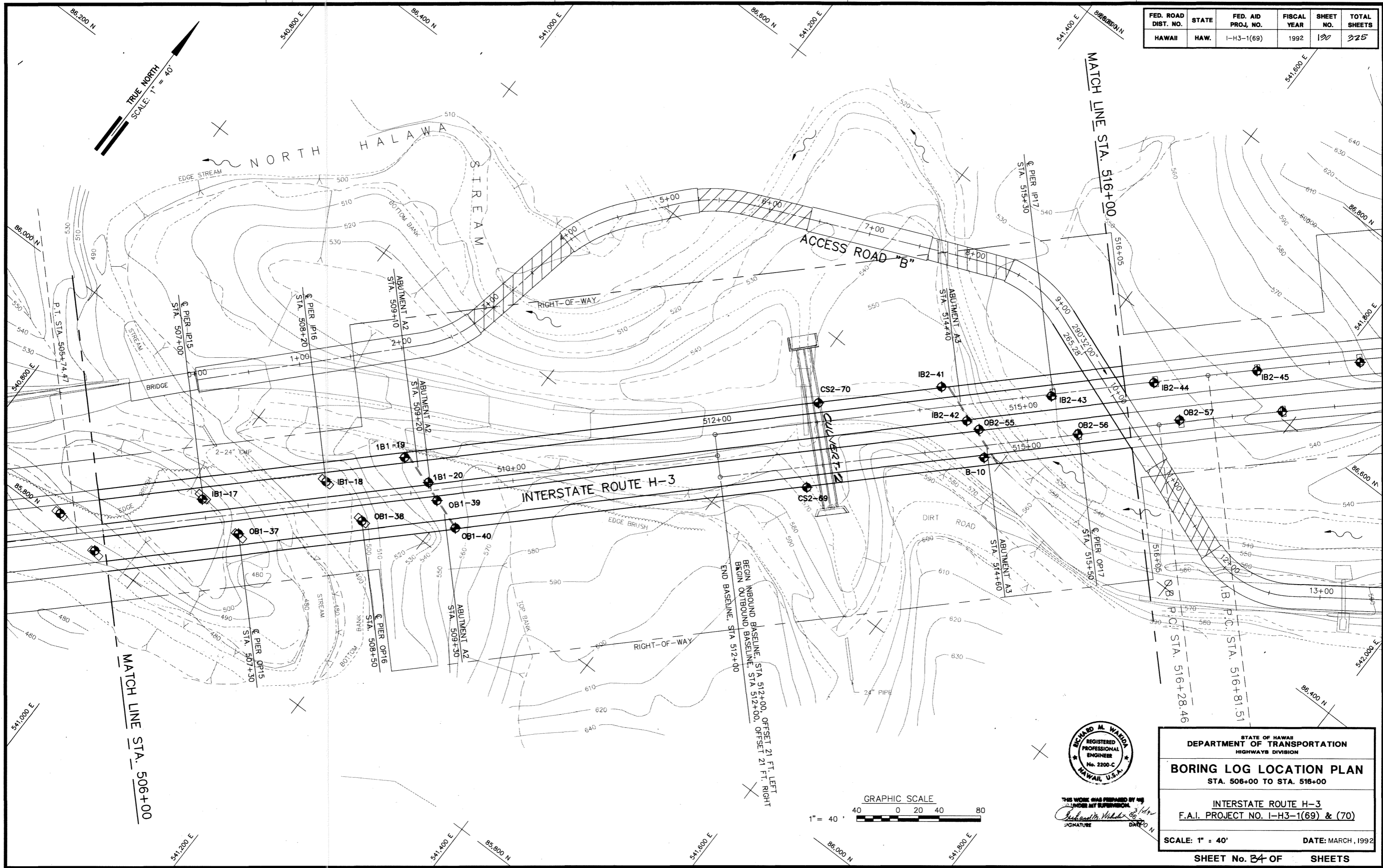
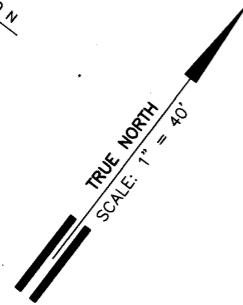
THE WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.
Richard M. Ward
 SIGNATURE DATE



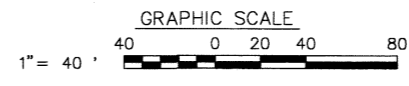
10-21-93	DELETED BORING LOCATIONS
DATE	REVISION
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION	
BORING LOG LOCATION PLAN STA. 495+00 TO STA. 506+00	
INTERSTATE ROUTE H-3 F.A.I. PROJECT NO. I-H3-1(69) & (70)	
SCALE: 1" = 40'	DATE: MARCH, 1992
SHEET No. 83 OF 6 SHEETS	

ADD. 129

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	130	225



DATE	_____
DESIGNED BY	_____
CHECKED BY	_____
QUANTITIES BY	_____
TRACED BY	_____
PLANNED BY	_____
ORIGINAL PLAN	_____
No.	_____



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Richard M. Wilkerson
 SIGNATURE DATE 3/20/92

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

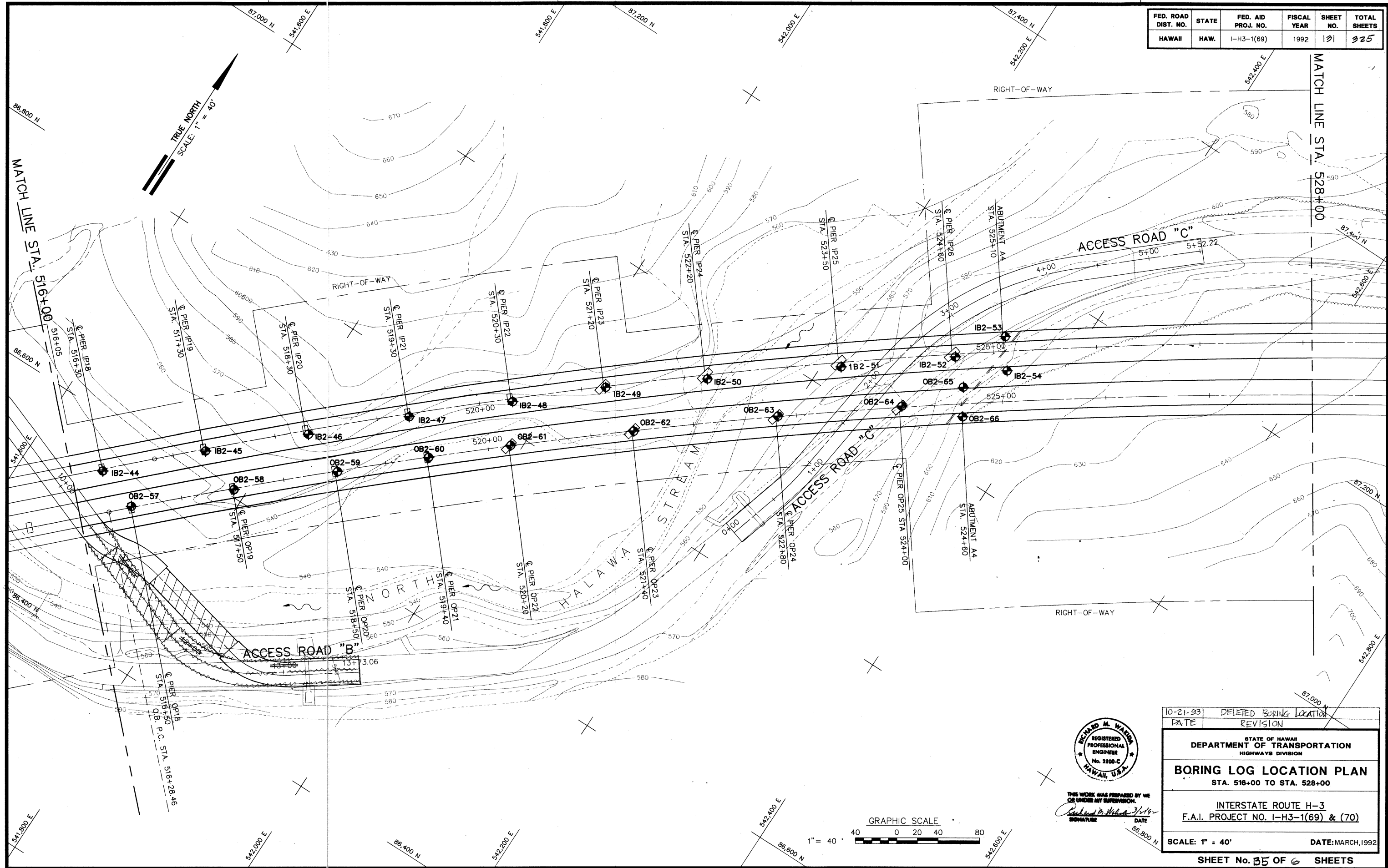
BORING LOG LOCATION PLAN
 STA. 506+00 TO STA. 516+00

INTERSTATE ROUTE H-3
 F.A.I. PROJECT NO. I-H3-1(69) & (70)

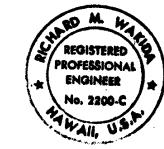
SCALE: 1" = 40' DATE: MARCH, 1992

SHEET No. 34 OF SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	19	325



DATE
SURVEY PLOTTED BY
DESIGNED BY
TRACED BY
NOTE BOOK
DESIGNED BY
QUANTITIES BY
CHECKED BY
No.



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Richard M. Walker
 SIGNATURE DATE

10-21-93	DELETED BORING LOCATION
DATE	REVISION

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOG LOCATION PLAN
 STA. 516+00 TO STA. 528+00

INTERSTATE ROUTE H-3
 F.A.I. PROJECT NO. I-H3-1(69) & (70)

SCALE: 1" = 40' DATE: MARCH, 1992

SHEET No. 35 OF 6 SHEETS

ADL131

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	133	225

	BASALT		GRAVEL
	CLINKER		SAND
	TUFF		SILT
	WEATHERED ROCK		CLAY
	CINDER		SILTY CLAY
	BOULDER		CLAYEY SILT

	2" O.D. STANDARD SPLIT SPOON SAMPLER
	3" O.D. SPLIT TUBE SAMPLER
	SHELBY TUBE
	NX CORING
	ROCK QUALITY DESIGNATION
	WATER LEVEL

W.O. 90-1953	North Halaawa Highway - Unit II
ERNEST K. HIRATA & ASSOCIATES, INC.	BORING LEGEND

LEGEND

GRAPH SOIL DESCRIPTION

	ASPHALT CONCRETE
	BASE
	CLAYEY, WITH CLAY
	CLAY
	SILTY, WITH SILT
	SILT
	SANDY, WITH SAND
	SAND
	GRAVELLY
	GRAVEL, PEBBLES, DECOMPOSED ROCK
	ORGANIC MATERIAL
	COBBLES
	BOULDERS
	BASALT
	CLINKER
	TUFF

BORING LOG LEGEND

MAJOR ROCK TYPES	MAJOR SOIL TYPES		
	BASALT		BOULDERS
	TUFF		GRAVEL
	DECOMPOSED ROCK		SAND
	CLINKER		SILT
	CINDERS		CLAY
	GRAVELLY		
	SANDY		
	SILTY		
	CLAYEY		

SAMPLING SYMBOLS

	SHELBY TUBE SAMPLE		NX-CORE RUN
	3" O.D. CALIFORNIA SAMPLE		
	2" O.D. STANDARD PENETRATION SAMPLE		
	WATER LEVEL		

FEWELL GEOTECHNICAL ENGINEERING, LTD. FILE 953-1	
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CW ASSOCIATES, INC. dba
GEOLABS-HAWAII
 Geology Soils and Foundation Engineering

GENERAL NOTES:

* ELEVATIONS ESTIMATED BY ERNEST K. HIRATA & ASSOCIATES FROM TOPOGRAPHIC MAPS PROVIDED BY R.M. TOWILL CORP. DATED MAY 3, 1989.



FEWELL GEOTECHNICAL ENGINEERING, LTD.
Alan J. Shimamoto



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Boy Y. K. Wong
 SIGNATURE



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Paul S. Morimoto
 SIGNATURE

STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION	
BORING LOGS	
INTERSTATE ROUTE H-3 F.A.I. PROJECT NO. I-H3-1(69) & (70)	
SCALE: NONE	DATE: AS NOTED

SHEET No. 133 OF 225 SHEETS

DATE	
REVIEW PLOTTED BY	
DRAWN BY	
DESIGNED BY	
QUANTITIES BY	
CHECKED BY	
ORIGINAL PLAN	
NOTE BOOK	
No.	

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1-H3-1 (69)	1992	194	325

BORING: IB1-1 ABUT A1 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 485'±
 DATE: 10-30-90 DEPTH TO WATER: 87' DATE: 10-30-90
 PAGE 1 OF 3 WATER ELEV.: 398'± TIME: 10:00 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
LL=80, PI=25	29		12	1	Orange and Brown Clayey SILT (MH) with gravel and cobbles, stiff, moist
	52		17	2	
qu=1940 p.s.f.	55	86	21	4	(ALLUVIUM)
LL=64, PI=25	51		12	5	
Gradation: 42% Gravel 44% Sand 14% Silt/Clay	52		PUSH	6	Brown and Gray Gravelly SAND (SW-SM) with silt, loose to medium dense, moist (WEATHERED CLINKER)

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A1

BORING: IB1-1 ABUT A1 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 485'±
 DATE: 10-30-90 DEPTH TO WATER: 87' DATE: 10-30-90
 PAGE 3 OF 3 WATER ELEV.: 398'± TIME: 10:00 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
			50% REC 0% RQD	RUN # 5	Red Highly Weathered TUFF (WH), soft, extremely broken
	54		33% REC 0% RQD	RUN # 6	Gray and Brown Highly Weathered CLINKER (WH), medium dense to dense
			29	10	
			24% REC 0% RQD	RUN # 7	Gray Moderately Weathered BASALT (WM), medium hard to hard, broken
			60 / .5 R	11	
			78% REC 9% RQD	RUN # 8	Red Highly Weathered TUFF (WH), soft, broken
			89% REC 22% RQD	RUN # 9	
					Brownish and Gray Moderately Weathered CLINKER (WM), dense
					BOH @ 92.0'

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A3

BORING: IB1-2 ABUT A1 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 477'±
 DATE: 10-25-90 DEPTH TO WATER: 47' DATE: 10-26-90
 PAGE 2 OF 3 WATER ELEV.: 430'± TIME: 9:30 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
			63	7	Gray and Brown Silty SAND (ML-SM) with gravel, medium dense, moist (WEATHERED CLINKER)
	56		25	8	
			36	9	Gray Silty GRAVEL (GM) with sand and remnant rock structure, medium dense to dense, moist
	45		64	10	
qu=1640 p.s.f.	45	71	85	11	(SAPROLITE)
	54		27	12	Mottled Orange and Gray Highly Weathered CLINKER (WH), dense
			100 / .9	13	Gray Highly Weathered BASALT (WH), medium hard to hard, extremely broken
			70 / .2	14	Gray Moderately Weathered BASALT (WM), hard, broken

Plate A5

BORING: IB1-1 ABUT A1 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 485'±
 DATE: 10-30-90 DEPTH TO WATER: 87' DATE: 10-30-90
 PAGE 2 OF 3 WATER ELEV.: 398'± TIME: 10:00 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
	58	56	18	7	Brown and Gray Gravelly SAND (SW-SM) with silt, loose to medium dense, moist (WEATHERED CLINKER)
			70	8	
			38	73	Gray Moderately to Highly Weathered BASALT (WM-WH), medium hard to hard, extremely broken
			70% REC 0% RQD	RUN # 1	
			60% REC 0% RQD	RUN # 2	Grayish Brown Highly Weathered CLINKER (WH), dense
			55% REC 0% RQD	RUN # 3	
			98% REC 7% RQD	RUN # 4	Gray Moderately Weathered BASALT (WM) with occasional seams of completely weathered basalt, hard, extremely broken
			50% REC 0% RQD	RUN # 5	
					Red Highly Weathered TUFF (WH), soft, extremely broken

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A2

BORING: IB1-2 ABUT A1 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 477'±
 DATE: 10-25-90 DEPTH TO WATER: 47' DATE: 10-26-90
 PAGE 1 OF 3 WATER ELEV.: 430'± TIME: 9:30 AM

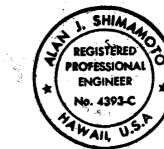
LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
LL=83, PI=23	63		15	1	Brown and Gray Clayey SILT (MH) with cobbles and organics, medium stiff, saturated (FILL)
			10	2	
qu=610 p.s.f.	62	63	28	3	Brownish Gray Silty SAND (GM) with gravel, medium dense, moist (SAPROLITE)
GRADATION: 12% Gravel 52% Sand 36% Silt/Clay	52		52	4	
					Grades to dense @ 20.0'
qu=1710 p.s.f.	57	65	22	5	Gray and Brown Silty SAND (ML-SM) with gravel, medium dense, moist (WEATHERED CLINKER)
	70		18	6	

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A4

BORING: IB1-2 ABUT A1 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 477'±
 DATE: 10-25-90 DEPTH TO WATER: 47' DATE: 10-26-90
 PAGE 3 OF 3 WATER ELEV.: 430'± TIME: 9:30 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
			95% REC 17% RQD	RUN # 1	Gray Moderately Weathered BASALT (WM), hard, broken
			90% REC 40% RQD	RUN # 2	
					Grayish Brown Highly Weathered CLINKER (WH), dense
					Red Highly Weathered TUFF (WH), medium hard, occasionally broken
					Grayish Brown Moderately Weathered Vesicular BASALT (WM), medium hard, massive
					BOH @ 80.0'

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A6



FEWELL GEOTECHNICAL ENGINEERING, LTD.
Alan J. Shimamoto

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. 1-H3-1(69) & (70)

SCALE: NONE DATE: AS NOTED

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	133	325

BORING: IB1-3 IP-1 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 447±
 DATE: 10-10-90 DEPTH TO WATER: 10.5' DATE: 10-10-90
 PAGE 1 OF 2 WATER ELEV.: 436± TIME: 3:00 PM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
	61	61	PUSH	1	0.1	Brown Clayey SILT (MH) with gravel, medium stiff, moist to saturated
					0.5	(FILL.)
LL=73, PI=32	30		33	2	1.0	Gray/Brown Sandy SILT (MH-SM) with decomposed gravel, very stiff, moist
qu=1130 p.s.f.	58	67	44	3	1.5	(WEATHERED CINDERS)
	59		24	4	2.0	Mottled Gray Clayey SILT (MH) with trace sand and remnant rock structure, very stiff, moist
					2.5	(SAPROLITE)
	45		105/8'	5	3.0	Gray Moderately Weathered BASALT (WM), medium hard, extremely broken
			92% REC RUN #1		3.5	Gray Brown Highly Weathered CLINKER (WH), dense
			10% RQD		3.5	Red Highly Weathered TUFF (WH), medium hard, broken
			85% REC RUN #2		3.5	9% RQD

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A7

BORING: IB1-4 IP-2 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 452±
 DATE: 10-2-90 DEPTH TO WATER: 19.0' DATE: 10-4-90
 PAGE 1 OF 3 WATER ELEV.: 433± TIME: 11:15 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
	41	77	PUSH	1	0.1	Brown Clayey SILT (MH) with gravel, sand and cobbles, soft to medium stiff, moist to saturated
					0.5	(ALLUVIUM)
	42		6	2	1.0	(ALLUVIUM)
qu=790 p.s.f.	50	71	PUSH	3	1.5	Brown Gray Clayey SILT (MH) with sand and gravel, soft to medium stiff, saturated
LL=81, PI=37					2.0	(ALLUVIUM)
			90% REC RUN #1		2.0	
			0% RQD		2.0	
			83% REC RUN #2		2.5	
			0% RQD		2.5	
			83% REC RUN #3		3.0	Gray BOULDERS, COBBLES and GRAVEL in a sand matrix, dense, saturated
			0% RQD		3.0	
			85% REC RUN #4		3.5	
			10% RQD		3.5	(ALLUVIUM)

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A9

BORING: IB1-4 IP-2 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 452±
 DATE: 10-2-90 DEPTH TO WATER: 19.0' DATE: 10-4-90
 PAGE 3 OF 3 WATER ELEV.: 433± TIME: 11:15 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
					7.0	Gray Slightly Weathered BASALT (WS) with clinker, hard, broken
					7.5	BOH @ 75.0'
					8.0	
					8.5	
					9.0	
					9.5	
					1.00	
					1.05	

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A11

BORING: IB1-3 IP-1 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 447±
 DATE: 10-12-90 DEPTH TO WATER: 10.5' DATE: 10-12-90
 PAGE 2 OF 2 WATER ELEV.: 436± TIME: 3:00 PM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
			85% REC RUN #2		3.5	Gray Slightly Moderately Weathered Vesicular BASALT (WS-WM), hard, occasionally broken
			9% RQD		3.5	
			87% REC RUN #3		4.0	
			25% RQD		4.0	
			80% REC RUN #4		4.5	Gray Fresh Vugular BASALT (F), very hard, occasionally broken to massive
			30% RQD		4.5	
			100% REC RUN #5		5.0	
			70% RQD		5.0	
			100% REC RUN #6		5.5	Red and Gray Slightly Weathered Welded CLINKER (WS), medium hard, occasionally broken to massive
			88% RQD		5.5	
			100% REC RUN #7		6.0	Gray Fresh Vesicular BASALT (F), very hard, massive
			80% RQD		6.0	
					6.5	
					7.0	BOH @ 62.0'

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A8

BORING: IB1-4 IP-2 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 452±
 DATE: 10-2-90 DEPTH TO WATER: 19.0' DATE: 10-4-90
 PAGE 2 OF 3 WATER ELEV.: 433± TIME: 11:15 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
			85% REC RUN #4		3.5	
			10% RQD		3.5	
			95% REC RUN #5		4.0	Gray Moderately to Highly Weathered BASALT (WM-WH), medium hard, extremely broken
			17% RQD		4.0	
			60% REC RUN #6		4.5	
			0% RQD		4.5	
			68% REC RUN #7		5.0	Brown Gray Highly Weathered CLINKER (WH), medium hard, extremely broken
			10% RQD		5.0	Red Highly Weathered TUFF (WH), medium hard, broken
			50% REC RUN #8		5.5	Gray Brown Moderately to Highly Vesicular BASALT (WM-WH), medium hard, broken
			17% RQD		5.5	
			80% REC RUN #9		6.0	Gray Brown Moderately to Highly Weathered CLINKER (WM-WH), medium hard, extremely broken
			20% RQD		6.0	
			100% REC RUN #10		6.5	Gray Fresh to Slightly Weathered BASALT (F-WS), hard to very hard, broken
			85% RQD		6.5	
			100% REC RUN #11		7.0	Red Gray Moderately Weathered CLINKER (WM), medium hard, broken
			60% RQD		7.0	Gray Slightly Weathered BASALT (WS) with clinker, hard, broken

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A10



FEWELL GEOTECHNICAL ENGINEERING, LTD.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

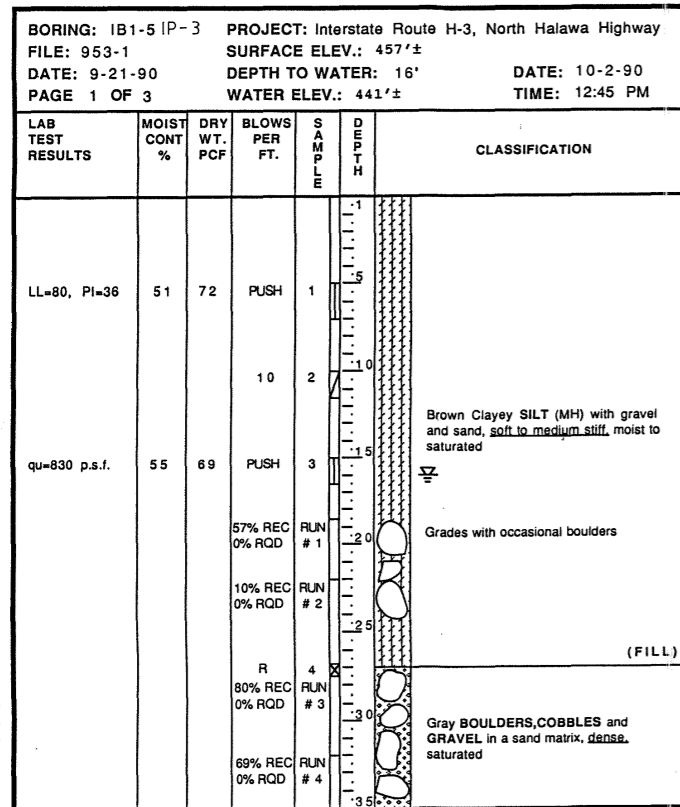
BORING LOGS

INTERSTATE ROUTE H-3
 F.A.I. PROJECT NO. I-H3-1(69) & (70)

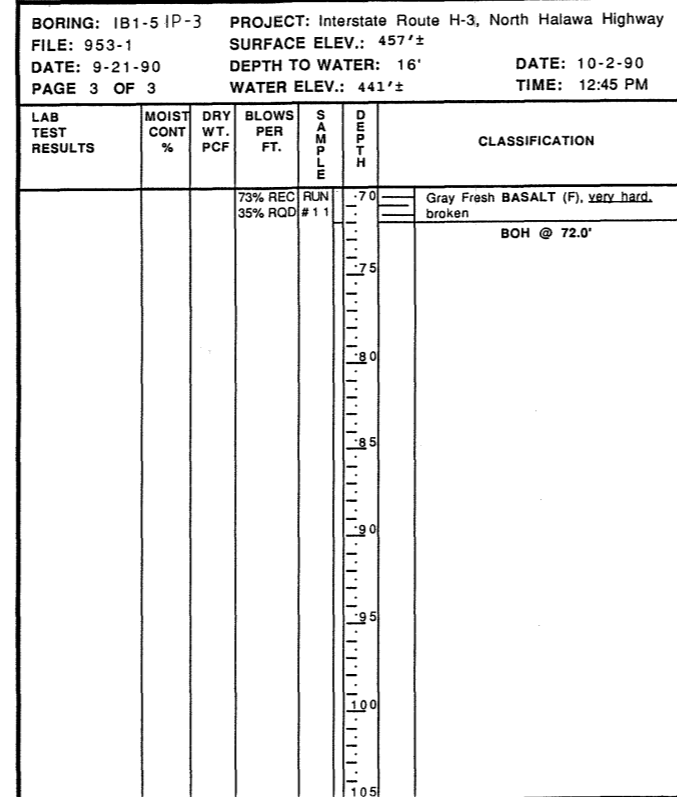
SCALE: NONE DATE: AS NOTED

SHEET No. 133 OF 33 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	136	325



FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A12



FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A14

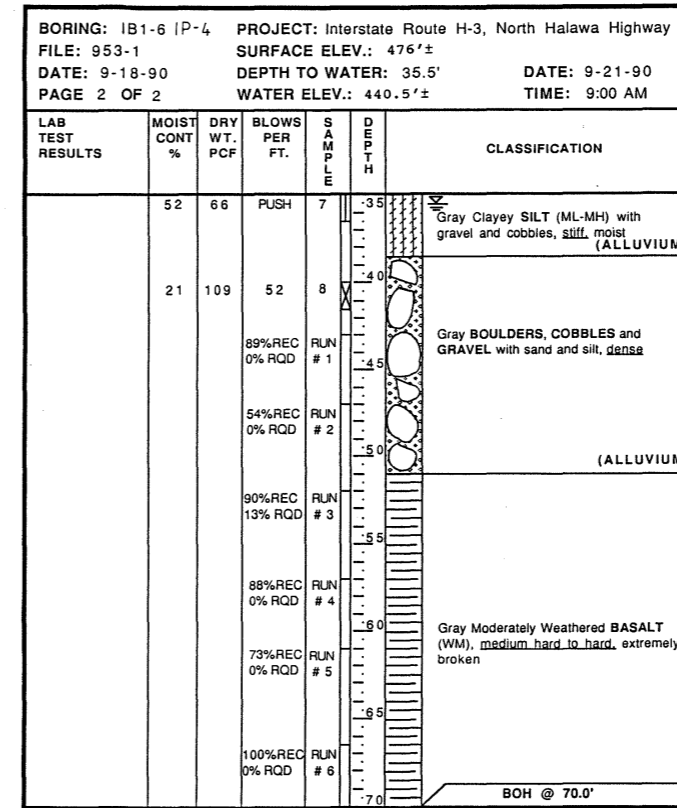
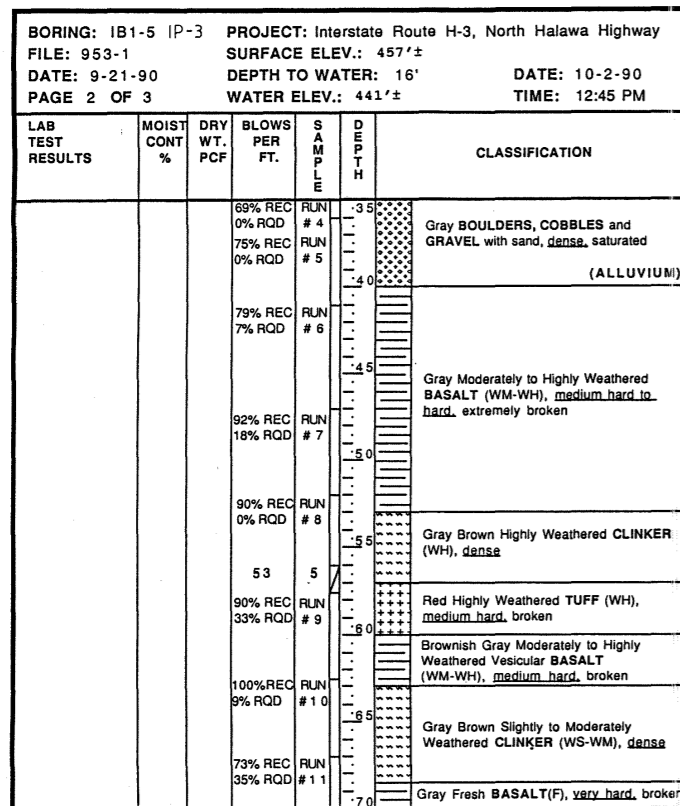
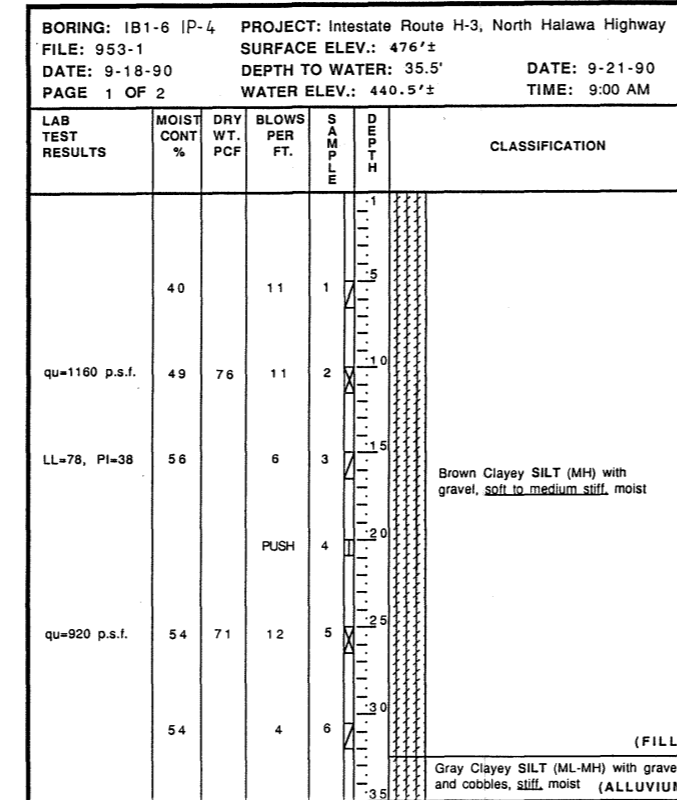


Plate A16



FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A13



FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A15



FEWELL GEOTECHNICAL ENGINEERING, LTD.

Alan J. Shimamoto

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. I-H3-1(69) 8 (70)

SCALE: NONE DATE: AS NOTED

SHEET No. 81 OF 33 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-(69)	1992	137	225



ERNEST K. HIRATA & ASSOCIATES, INC.

Soils and Foundation Engineering
99-1433 Koaha Place • Ala, Hawaii 96701-1028 • Phone 486-0787

BORING LOG W.O. 90-1953

BORING NO. IB1-9 IP-7 DRIVING WT. 140 lb DATE OF DRILLING 5-7-90
SURFACE ELEV. 462± DROP 30 in WATER LEVEL @ 17 ft

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
0		MH					Clayey SILT - Brown, moist, firm to medium stiff, with weathered gravel.
5			71	46			Grading with numerous cobbles and boulders from 8.5 feet.
10							Begin NX coring from 12 feet. 84% Recovery from 12 to 17 feet. RQD = 40%
15							90% Recovery from 17 to 19 feet. RQD = 70%
20							60% Recovery from 19 to 24 feet. RQD = 20%
25			90/9"	30			End NX coring at 24 feet. COMPLETELY WEATHERED ROCK - Mottled gray, brown, dense to medium hard.
30							BASALT - Mottled gray/brown, dense to medium hard, highly fractured, weathered. Begin Dennison coring from 26 feet. 85% Recovery from 26 to 28 feet. 60% Recovery from 29 to 31 feet.

Plate A21



ERNEST K. HIRATA & ASSOCIATES, INC.

Soils and Foundation Engineering
99-1433 Koaha Place • Ala, Hawaii 96701-1028 • Phone 486-0787

BORING LOG W.O. 90-1953

BORING NO. IB1-9 (Cont) IP-7 DRIVING WT. 140 lb DATE OF DRILLING 5-8-90
SURFACE ELEV. 462± DROP 30 in WATER LEVEL @ 17 ft

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
30							End Dennison coring at 31 feet. Begin NX coring from 31 feet. 96% Recovery from 31 to 36 feet. RQD = 14%
35							Grading to moderately vesicular from 33.5 to 42 feet. 100% Recovery from 36 to 41 feet. RQD = 54%
40							78% Recovery from 41 to 45 feet. RQD = 25%
45							64% Recovery from 45 to 50 feet. RQD = 8%
50							58% Recovery from 50 to 55 feet. RQD = 26%
55							60% Recovery from 55 to 59 feet. RQD = 13%
60							End boring at 59 feet.

Plate A22



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
Paul S. Morimoto
Signature



FEWELL GEOTECHNICAL ENGINEERING, LTD.
Alan J. Shimamoto
Signature

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. I-H3-(69) & (70)

SCALE: NONE DATE: AS NOTED

SHEET NO. 137 OF 33 SHEETS

137

BORING: IB1-7 IP-5 PROJECT: Interstate Route H-3, North Halawa Highway
FILE: 953-1 SURFACE ELEV.: 458'±
DATE: 9-5-90 DEPTH TO WATER: 22.0' DATE: 9-5-90
PAGE 1 OF 2 WATER ELEV.: 436'± TIME: 11:00 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
LL=81, PI=41	53	80	16	1	2" A.C. Over Tan Silty CORAL fragments, dense to very dense, damp (FILL)
				5	Brown Clayey SILT (MH) with gravel, very hard, damp
				10	Gray Clayey SILT (ML) with remnant rock structure and seams of highly weathered basalt, stiff, moist
				15	(SAPROLITE)
qu=1490 p.s.f.	41	79	PUSH	20	Reddish Brown Clayey SILT (M) with decomposed gravel, stiff to very stiff, damp (SAPROLITE)
				25	Gray Clayey SILT (MH) with remnant rock structure, very stiff to very hard, damp
				30	(SAPROLITE)
				35	Brown Gray Clayey SILT (MH) with gravel and seams of highly weathered basalt, very stiff, damp

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A17

BORING: IB1-8 IP-6 PROJECT: Interstate Route H-3, North Halawa Highway
FILE: 953-1 SURFACE ELEV.: 495'±
DATE: 11-9-90 DEPTH TO WATER: NONE ENCOUNTERED
PAGE 1 OF 2

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
LL=92, PI=36	42		11	2	Brown Clayey SILT (MH) with gravel and cobbles, very stiff, moist
				3	
qu=1680 p.s.f.	35	87	60	5	BOULDERS, COBBLES, and GRAVEL in Clayey Silt with sand matrix, dense, moist (ALLUVIUM)
				6	

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A19

BORING: IB1-7 IP-5 PROJECT: Interstate Route H-3, North Halawa Highway
FILE: 953-1 SURFACE ELEV.: 458'±
DATE: 9-5-90 DEPTH TO WATER: 22.0' DATE: 9-5-90
PAGE 2 OF 2 WATER ELEV.: 436'± TIME: 11:00 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
	57		32	7	Brown Gray Clayey SILT (MH) with gravel and seams of highly weathered basalt, very stiff, damp
				8	Gray Moderately to Highly Weathered BASALT (WM-WH), medium hard to hard, broken to very broken
				100% REC RUN #1	Gray Slightly Weathered BASALT (WS) hard, very broken
				100% REC RUN #2	
				100% REC RUN #3	
				100% REC RUN #4	Red Moderately Weathered BASALT (WM), medium hard, extremely broken
					Brown Gray Highly Weathered CLINKER (WH), dense
					Gray Slightly Weathered BASALT (WS), hard, occasionally broken
					BOH @ 54.5'

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A18

BORING: IB1-8 IP-6 PROJECT: Interstate Route H-3, North Halawa Highway
FILE: 953-1 SURFACE ELEV.: 495'±
DATE: 11-9-90 DEPTH TO WATER: NONE ENCOUNTERED
PAGE 2 OF 2

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
			85% REC RUN #1	35	BOULDERS, COBBLES, and GRAVEL in Clayey Silt with sand matrix, dense, moist (ALLUVIUM)
			60% REC RUN #2	40	Gray Moderately Weathered BASALT (WM), medium hard, very broken
			30% REC RUN #3	45	
			31	7	Grayish Brown Highly Weathered CLINKER (WH), dense to very dense
			9% REC RUN #4	50	
			57	8	Brownish Gray Moderately Weathered BASALT (WM), medium hard to hard, broken
			85% REC RUN #5	55	
			10% REC RUN #6	60	Brown Gray Highly Weathered CLINKER (WH), dense
			36	9	BOH @ 64.5'

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A20

DATE
SURVEY PLOTTED BY
DRAWN BY
TRACED BY
CHECKED BY
NO. 137218

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	190	325

BORING: IB1-10 IP-8 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 463'±
 DATE: 8-30-90 DEPTH TO WATER: 30' DATE: 9-7-90
 PAGE 1 OF 2 WATER ELEV.: 433'± TIME: 1:30 PM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
LL=67, Pl=24			21	1	Brown Clayey SILT (MH) with gravel, very stiff, damp (ALLUVIUM)
			70/6* 75% REC 0% RQD #1	2	Gray Boulders in Matrix of Brown Clayey SILT (MH) with cobbles and gravel, dense to very dense, damp (ALLUVIUM)
			100% REC 0% RQD #2	3	
			40/4* R	4	(ALLUVIUM)
		99	27	5	Brown Clayey SILT (MH) with cobbles and Gravel, very stiff, damp (ALLUVIUM)
			PUSH	6	Gray/Brown Gravelly SILT (GM-ML) with seams of highly weathered basalt, very stiff, damp (SAPROLITE)

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A23

BORING: IB1-11 IP-9 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 465'±
 DATE: 8-30-90 DEPTH TO WATER: 47' DATE: 9-5-90
 PAGE 1 OF 2 WATER ELEV.: 418'± TIME: 10:00 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
LL=62, Pl=16			12	1	Brown Clayey SILT (MH) with gravel and trace of organic debris, soft to medium stiff, damp (FILL)
			21	2	Brown Clayey SILT (MH) with sand, gravel and trace of roots, medium stiff, damp (ALLUVIUM)
LL=55, Pl=17			54	3	BOULDERS, COBBLES and GRAVEL (GM) in matrix of Brown Clayey Silt, dense to very dense, damp (ALLUVIUM)
			92% REC 0% RQD #1	4	
		21	102	4	(ALLUVIUM)
			70% REC 27% RQD #2	5	(ALLUVIUM)
			72% REC 22% RQD #3	6	Gray Slightly Weathered Vesicular BASALT (WS), hard, very broken
				7	Brown Gray Highly Weathered CLINKER (WH), soft, very broken
				8	Gray Slightly Weathered Vulgar BASALT (F-WS), hard, moderately broken

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A25

BORING: IB1-12 IP-10 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 471'±
 DATE: 9-10-90 DEPTH TO WATER: 29.5' DATE: 9-12-90
 PAGE 1 OF 2 WATER ELEV.: 441.5'± TIME: 3:15 PM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
LL=70, Pl=28			62	1	Brown Clayey SILT (MH) with gravel and cobbles, medium stiff, moist (COLLUVIUM)
			39	2	Brown Clayey SILT (MH) with gravel and cobbles, stiff, moist to wet (ALLUVIUM)
			39	3	
			70	4	Grades to hard @ 20'
LL=81, Pl=41			59	5	Red Brown Clayey SILT (MH) with gravel, very stiff, moist to saturated (RESIDUAL)
			16	6	Gray Moderately Weathered BASALT (WM), medium hard, extremely broken

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A27

BORING: IB1-10 IP-8 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 463'±
 DATE: 8-30-90 DEPTH TO WATER: 30' DATE: 9-7-90
 PAGE 2 OF 2 WATER ELEV.: 433'± TIME: 1:30 PM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
			24	7	Gray/Brown Gravelly SILT (GM-ML) with seams of highly weathered basalt, very stiff, damp
			80% REC 30% RQD #3	8	Gray Moderately to Slightly Weathered BASALT (WM-WS) with vesicles, hard, broken to occasionally broken
			93% REC 31% RQD #4	9	Brown Gray Highly Weathered CLINKER gravel (GM), medium hard, very broken
			70% REC 14% RQD #5	10	
				11	Gray Moderately to Slightly Weathered BASALT (WM-WS), hard, broken to occasionally broken
				12	BOH @ 60.0'

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A24

BORING: IB1-11 IP-9 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 465'±
 DATE: 8-30-90 DEPTH TO WATER: 47' DATE: 9-5-90
 PAGE 2 OF 2 WATER ELEV.: 418'± TIME: 10:00 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
			72% REC 22% RQD #3	13	Gray Slightly Weathered Vulgar BASALT (F-WS), hard, occasionally broken
			75% REC 13% RQD #4	14	Brown Gray Highly Weathered CLINKER (WH), soft, extremely broken
			77% REC 35% RQD #5	15	Gray Slightly Weathered BASALT (F-WS), hard, occasionally broken
			100% REC 84% RQD #8	18	BOH @ 60.0'

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A26

BORING: IB1-12 IP-10 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 471'±
 DATE: 9-10-90 DEPTH TO WATER: 29.5' DATE: 9-12-90
 PAGE 2 OF 2 WATER ELEV.: 441.5'± TIME: 3:15 PM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
			56% REC 9% RQD #1	19	Gray Moderately Weathered BASALT (WM), medium hard, extremely broken
			55% REC 10% RQD #2	20	Brown Gray Highly Weathered CLINKER (WH), medium dense to dense
			100% REC 44% RQD #3	21	Gray Fresh to Slightly Weathered BASALT (F-WS), very hard, occasionally broken
			70% REC 17% RQD #4	22	Brown Gray Moderately to Highly Weathered CLINKER (WM-WH), dense
			100% REC 75% RQD #5	23	Gray Fresh BASALT (F), very hard, occasionally broken to massive
			90% REC 70% RQD #6	24	
				25	BOH @ 62.0'

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A28



FEWELL GEOTECHNICAL ENGINEERING, LTD.

Alan Shimamoto

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 F.A.I. PROJECT NO. I-H3-1(69) & (70)

SCALE: NONE DATE: AS NOTED

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1-H3-1(69)	1992	131	325



ERNEST K. HIRATA & ASSOCIATES, INC.

Soils and Foundation Engineering
99-1433 Koala Place * Aiea, Hawaii 96701-1028 * Phone 486-0787

W.O. 90-1953

BORING LOG
BORING NO. IB1-13 IP-11 DRIVING WT. 140 lb. DATE OF DRILLING 7-18-90
SURFACE ELEV. 489± DROP 30 in. WATER LEVEL @ 24.5 ft.

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT.	DRY DENSITY (PCF.)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
0		MH					Clayey SILT - Mottled brown, moist, firm to medium stiff, with gravel.
18			34				
5			7		No Recovery		
10			57		52		
15			4		41		Boulder at 12.5 feet. Grading with highly weathered rock fragments from 14 feet.
20			43		43		
25			10		36		
30			36		30		COMPLETELY WEATHERED ROCK - Mottled gray, dense.

Plate A29



ERNEST K. HIRATA & ASSOCIATES, INC.

Soils and Foundation Engineering
99-1433 Koala Place * Aiea, Hawaii 96701-1028 * Phone 486-0787

W.O. 90-1953

BORING LOG
BORING NO. IB1-14 IP-12 DRIVING WT. 140 lb. DATE OF DRILLING 5-25-90
SURFACE ELEV. 498± DROP 30 in. WATER LEVEL Not Recorded

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT.	DRY DENSITY (PCF.)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
0		MH					Clayey SILT - Mottled brown, moist, medium stiff to stiff, with weathered gravel. Grading with fine roots at upper 9 feet.
15			50				
5			75		39		
10			8		57		
15			21		50		Grading with gravel and cobbles from 14 feet.
20			84		30		
25			17		46		COMPLETELY WEATHERED ROCK - Mottled grayish brown, moist, medium dense to dense.
30			77		31		

Plate A31



ERNEST K. HIRATA & ASSOCIATES, INC.

Soils and Foundation Engineering
99-1433 Koala Place * Aiea, Hawaii 96701-1028 * Phone 486-0787

W.O. 90-1953

BORING LOG
BORING NO. IB1-14 IP-12 (Cont.) DRIVING WT. 140 lb. DATE OF DRILLING 5-29-90
SURFACE ELEV. 498± DROP 30 in. WATER LEVEL Not Recorded

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT.	DRY DENSITY (PCF.)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
60							45% Recovery from 62 to 64 feet. RQD = 0%
65							56% Recovery from 64 to 69 feet. RQD = 8%
70							End boring at 69 feet.
75							
80							
85							
90							

Plate A33



ERNEST K. HIRATA & ASSOCIATES, INC.

Soils and Foundation Engineering
99-1433 Koala Place * Aiea, Hawaii 96701-1028 * Phone 486-0787

W.O. 90-1953

BORING LOG
BORING NO. IB1-13 IP-11 (Cont.) DRIVING WT. 140 lb. DATE OF DRILLING 7-18-90
SURFACE ELEV. 489± DROP 30 in. WATER LEVEL @ 24.5 ft.

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT.	DRY DENSITY (PCF.)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
30							
35			50/3"		30		Grading to medium hard from 35 feet.
40			20/0"		No Penetration		BASALT - Mottled gray, dense to medium hard, vesicular, fractured, weathered. Begin NX coring from 38 feet. 40% Recovery from 38 to 48 feet. RQD = 5%
45							Grading hard from 48 feet. 95% Recovery from 48 to 58 feet. RQD = 55%
50							
55							
60							End boring at 58 feet.

Plate A30



ERNEST K. HIRATA & ASSOCIATES, INC.

Soils and Foundation Engineering
99-1433 Koala Place * Aiea, Hawaii 96701-1028 * Phone 486-0787

W.O. 90-1953

BORING LOG
BORING NO. IB1-14 IP-12 (Cont.) DRIVING WT. 140 lb. DATE OF DRILLING 5-29-90
SURFACE ELEV. 498± DROP 30 in. WATER LEVEL Not Recorded

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT.	DRY DENSITY (PCF.)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
30							
35			39		46		Grading dense from 35 feet.
40			79		34		
45			28		59		
50					31		
55			50/1"		Tip Recovery		BASALT - Gray, medium hard, slightly vesicular, fractured, weathered. Begin NX coring from 54 feet. 83% Recovery from 54 to 57 feet. RQD = 13%
60							80% Recovery from 57 to 62 feet. RQD = 16%

Plate A32



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.
Paul S. Morimoto
Signature

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

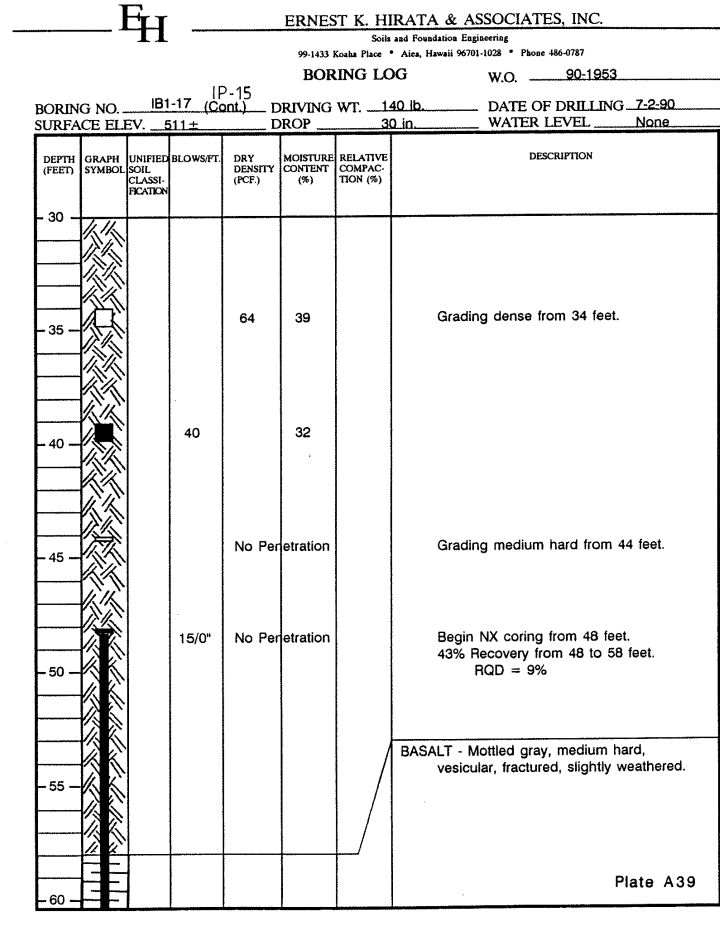
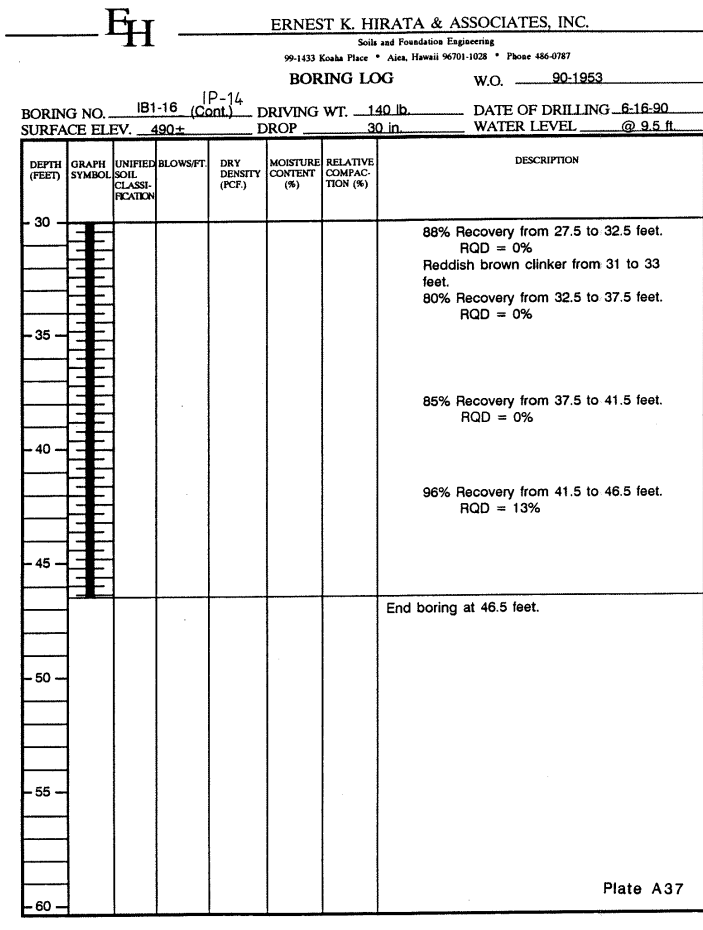
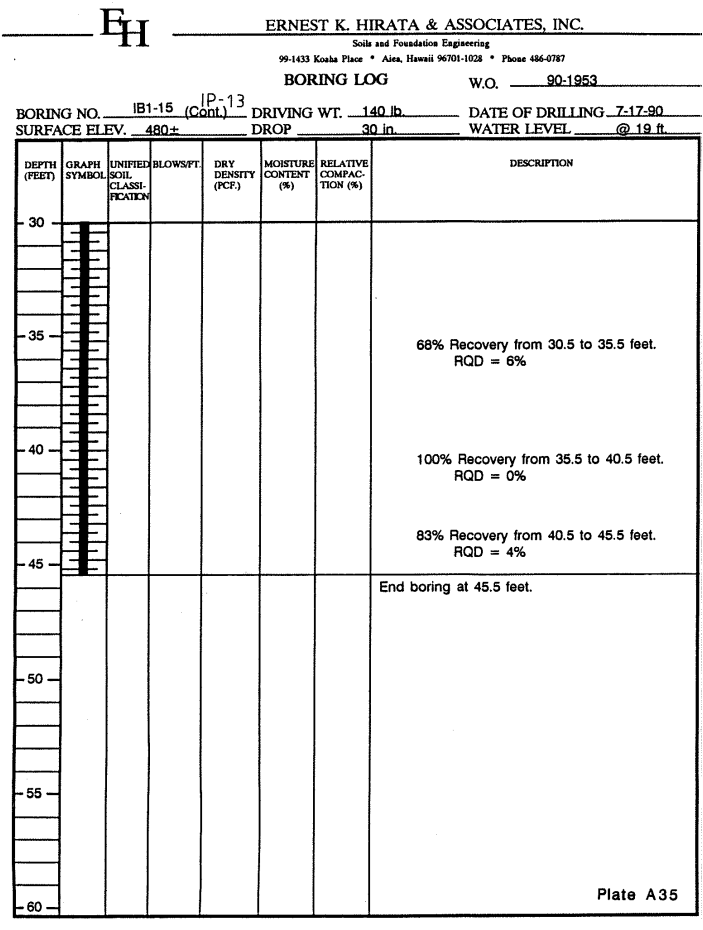
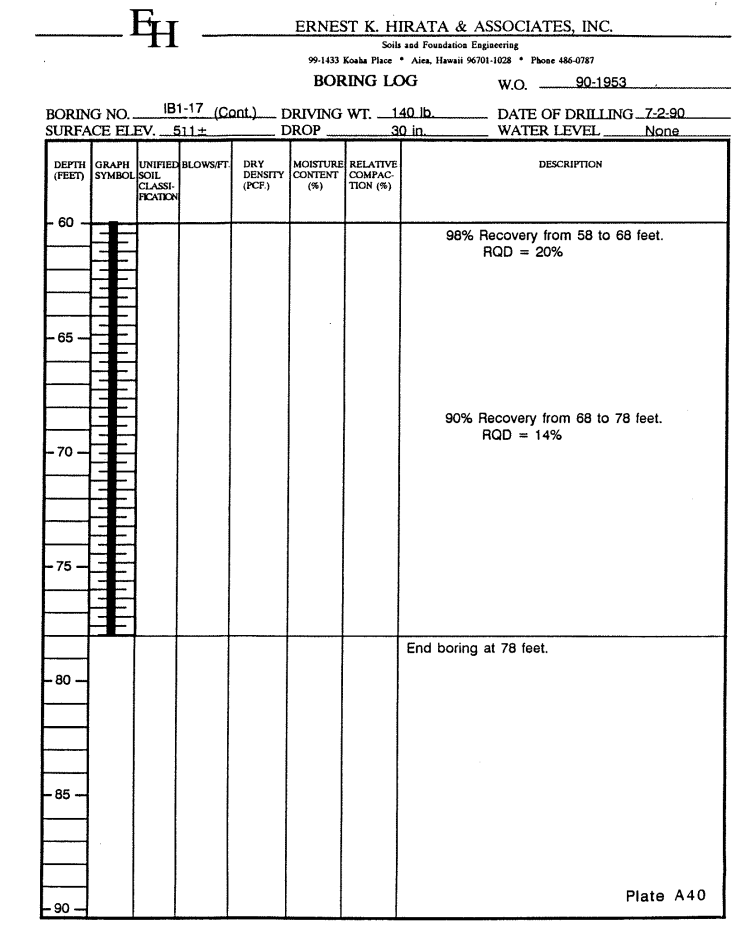
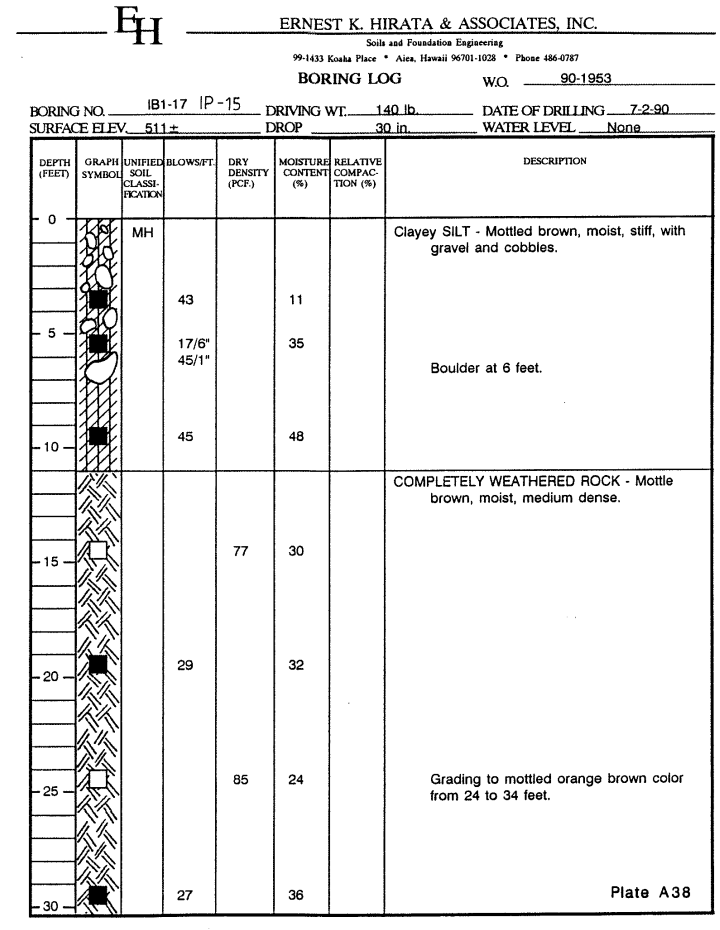
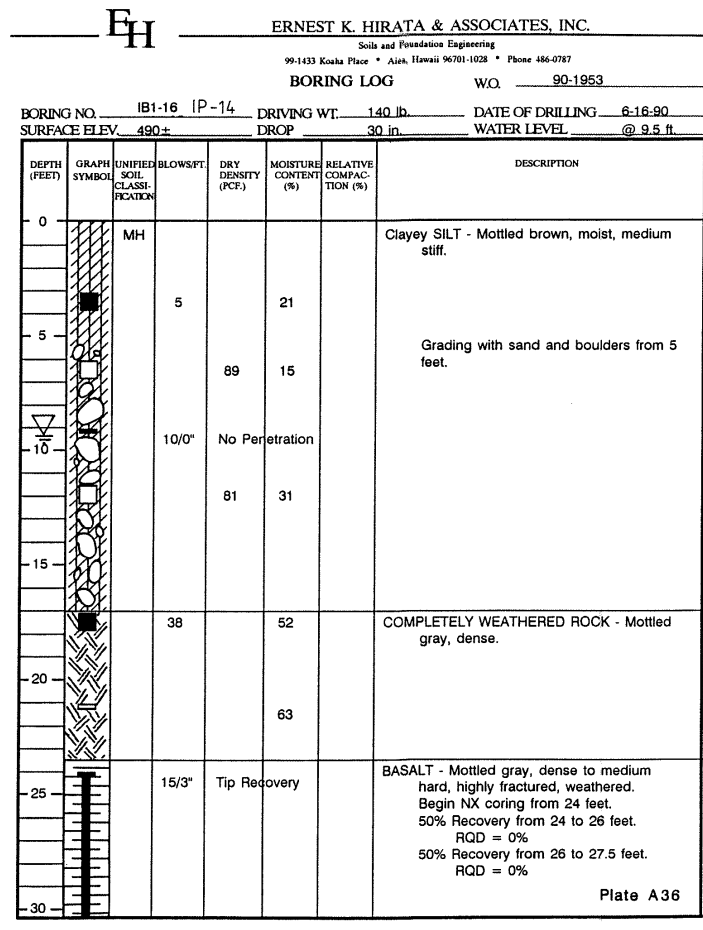
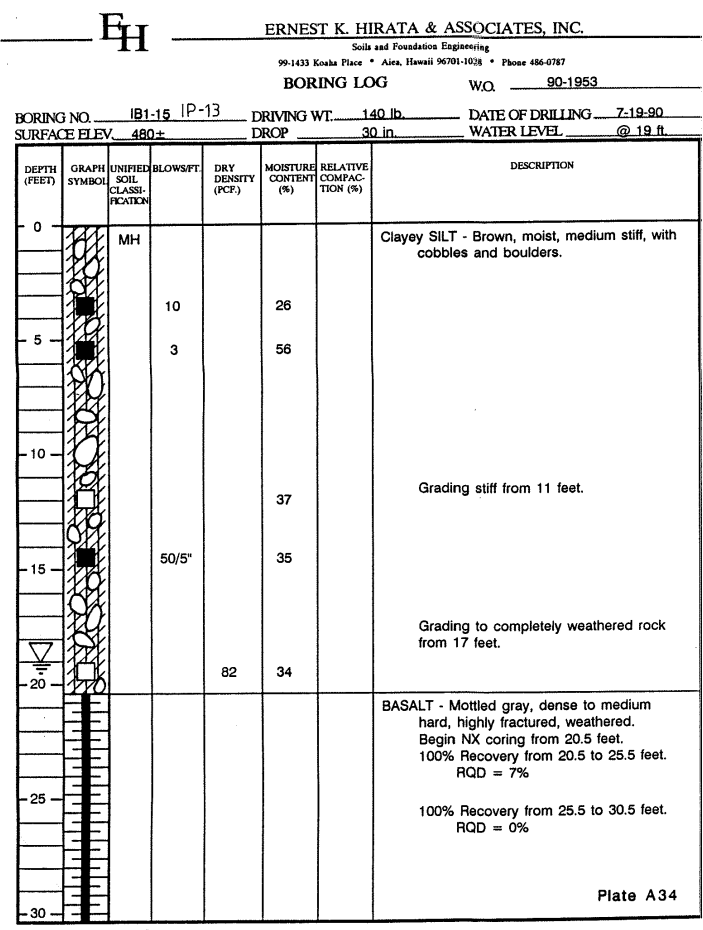
BORING LOGS

INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. 1-H3-1(69) & (70)

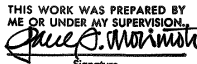
SCALE: NONE DATE: AS NOTED

SHEET No. 131 OF 325 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	140	325



SURVEY PLOTTED BY: _____ DATE: _____
 DRAWN BY: _____
 DESIGNED BY: _____
 QUANTITIES BY: _____
 CHECKED BY: _____
 NO. _____

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

 Signature

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. I-H3-1(69) & (70)

SCALE: NONE DATE: AS NOTED

SHEET NO. 140 OF 33 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	141	325

FH

ERNEST K. HIRATA & ASSOCIATES, INC.

Soils and Foundation Engineering
99-1433 Koala Place * Aiea, Hawaii 96701-1028 * Phone 486-0787

BORING LOG W.O. 90-1953

BORING NO. IB1-18 IP-16 DRIVING WT. 140 lb. DATE OF DRILLING 7-6-90
SURFACE ELEV. 496± DROP 30 in. WATER LEVEL @ 11 ft.

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT.	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
0		MH					Clayey SILT - Mottled brown, moist, stiff, with gravel and cobbles.
5			12		28		Grading with cobbles and boulders from 3 feet.
10			15/1"		No Recovery		
15			15/0"		No Penetration		Begin NX coring from 14 feet. 80% Recovery from 14 to 16.5 feet. RQD = 80% 30% Recovery from 16.5 to 21.5 feet. RQD = 20% End NX coring at 21.5 feet.
20							COMPLETELY WEATHERED ROCK - Mottled grayish brown, medium dense.
25							
30			27		29		

Plate A41

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ERNEST K. HIRATA & ASSOCIATES, INC.

Soils and Foundation Engineering
99-1433 Koala Place * Aiea, Hawaii 96701-1028 * Phone 486-0787

BORING LOG W.O. 90-1953

BORING NO. IB1-18 (Cont.) IP-16 DRIVING WT. 140 lb. DATE OF DRILLING 7-6-90
SURFACE ELEV. 496± DROP 30 in. WATER LEVEL @ 11 ft.

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT.	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
60							80% Recovery from 58 to 63 feet. RQD = 8%
65							100% Recovery from 63 to 68 feet. RQD = 46%
70							End boring at 68 feet.

Plate A43

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ERNEST K. HIRATA & ASSOCIATES, INC.

Soils and Foundation Engineering
99-1433 Koala Place * Aiea, Hawaii 96701-1028 * Phone 486-0787

BORING LOG W.O. 90-1953

BORING NO. IB1-19 (Cont.) ABUT A2 DRIVING WT. 140 lb. DATE OF DRILLING 7-23-90
SURFACE ELEV. 540± DROP 30 in. WATER LEVEL None

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT.	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
30							
35				57	47		
40			51		11		Grading dense to medium hard from 39 feet.
45			25/0"		No Penetration		
50			20/0"		No Penetration		BASALT - Mottled gray, medium hard, vesicular, fractured, slightly weathered.
55							Begin NX coring from 51 feet. 93% Recovery from 51 to 61 feet. RQD = 32%
60							

Plate A45

FH

ERNEST K. HIRATA & ASSOCIATES, INC.

Soils and Foundation Engineering
99-1433 Koala Place * Aiea, Hawaii 96701-1028 * Phone 486-0787

BORING LOG W.O. 90-1953

BORING NO. IB1-18 (Cont.) IP-16 DRIVING WT. 140 lb. DATE OF DRILLING 7-6-90
SURFACE ELEV. 496± DROP 30 in. WATER LEVEL @ 11 ft.

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT.	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
30			25		37		
35			22		35		
40			50/2"		No Recovery		BASALT - Mottled gray, dense to medium hard, highly fractured, weathered. Begin NX coring from 39 feet. 68% Recovery from 39 to 43 feet. RQD = 0% 98% Recovery from 43 to 48 feet. RQD = 0%
45							Grading medium hard from 48 feet. 100% Recovery from 48 to 53 feet. RQD = 32%
50							
55							100% Recovery from 53 to 58 feet. RQD = 14%
60							

Plate A42

FH

ERNEST K. HIRATA & ASSOCIATES, INC.

Soils and Foundation Engineering
99-1433 Koala Place * Aiea, Hawaii 96701-1028 * Phone 486-0787

BORING LOG W.O. 90-1953

BORING NO. IB1-19 ABUT A2 DRIVING WT. 140 lb. DATE OF DRILLING 7-23-90
SURFACE ELEV. 540± DROP 30 in. WATER LEVEL None

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT.	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
0							COMPLETELY WEATHERED ROCK - Mottled grayish brown and red, moist, medium dense to dense.
5			22		34		
10			39		38		
15				69	48		
20			23		36		
25				70	46		
30			26		35		

Plate A44

FH

ERNEST K. HIRATA & ASSOCIATES, INC.

Soils and Foundation Engineering
99-1433 Koala Place * Aiea, Hawaii 96701-1028 * Phone 486-0787

BORING LOG W.O. 90-1953

BORING NO. IB1-19 (Cont.) ABUT A2 DRIVING WT. 140 lb. DATE OF DRILLING 7-23-90
SURFACE ELEV. 540± DROP 30 in. WATER LEVEL None

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT.	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
60							100% Recovery from 61 to 71 feet. RQD = 16%
65							
70							End boring at 71 feet.
75							
80							
85							
90							

Plate A46



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.
Paul S. Morimoto
Signature

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. I-H3-1(69) 8 (70)

SCALE: NONE DATE: AS NOTED

SHEET No. 141 OF 33 SHEETS

DATE _____
SURVEY PLOTTED BY _____
DRAWN BY _____
DESIGNED BY _____
QUANTITIES BY _____
CHECKED BY _____
ORIGINAL PLAN NO. _____

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1-H3-1(69)	1992	142	325

ERNEST K. HIRATA & ASSOCIATES, INC.
Soils and Foundation Engineering
99-1433 Koala Place * Ala, Hawaii 96701-1028 * Phone 486-0787

BORING LOG W.O. 90-1953

BORING NO. IB1-20 ABUT A2 (Cont.) DRIVING WT. 140 lb. DATE OF DRILLING 7-16-90
SURFACE ELEV. 544± DROP 30 in. WATER LEVEL None

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
0			36		42		COMPLETELY WEATHERED ROCK - Mottled grayish brown and red, moist, dense.
5			72		37		
10			31		37		
15			78		26		Grading dense to medium hard from 14 feet.
20			80		31		
25			45		26		
30			47		30		

Plate A47

ERNEST K. HIRATA & ASSOCIATES, INC.
Soils and Foundation Engineering
99-1433 Koala Place * Ala, Hawaii 96701-1028 * Phone 486-0787

BORING LOG W.O. 90-1953

BORING NO. IB1-20 ABUT A2 (Cont.) DRIVING WT. 140 lb. DATE OF DRILLING 7-16-90
SURFACE ELEV. 544± DROP 30 in. WATER LEVEL None

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
60			43		36		
65			68		37		
70			48		38		
75			45		33		
80			110/7'		29		
85							
90			60/0'	No Penetration			BASALT - Gray, dense to medium hard, weathered.

Plate A49

ERNEST K. HIRATA & ASSOCIATES, INC.
Soils and Foundation Engineering
99-1433 Koala Place * Ala, Hawaii 96701-1028 * Phone 486-0787

BORING LOG W.O. 90-1953

BORING: OB1-21 ABUT A1 PROJECT: Interstate Route H-3, North Halawa Highway
FILE: 953-1 SURFACE ELEV.: 480'±
DATE: 10-23-90 DEPTH TO WATER: 65' DATE: 10-24-90
PAGE 1 OF 3 WATER ELEV.: 415'± TIME: 9:40 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMP LE	DEPTH	CLASSIFICATION
	77	58	R 1		-1	Brown Clayey SILT (MH) with gravel and cobbles, stiff, moist to saturated (FILL)
LL=73, PI=23	66		14	2	-1.0	Mottled Orange Brown Clayey SILT (MH), stiff, moist (RESIDUAL)
qu=1930 p.s.f.	57	67	29	3	-1.5	Mottled Orange and Gray Clayey SILT (MH) with decomposed gravel, very stiff, moist (SAPROLITE)
Direct Shear: $\phi=41^\circ$ C=550 p.s.f.	67	60	21	5	-2.5	Mottled Reddish Brown Clayey SILT (ML) with sand and weathered gravel, stiff, moist (WEATHERED CLINKER)
	52		6	6	-3.0	

FEWELL GEOTECHNICAL ENGINEERING, LTD. Plate A51

ERNEST K. HIRATA & ASSOCIATES, INC.
Soils and Foundation Engineering
99-1433 Koala Place * Ala, Hawaii 96701-1028 * Phone 486-0787

BORING LOG W.O. 90-1953

BORING: OB1-21 ABUT A1 PROJECT: Interstate Route H-3, North Halawa Highway
FILE: 953-1 SURFACE ELEV.: 480'±
DATE: 10-23-90 DEPTH TO WATER: 65' DATE: 10-24-90
PAGE 3 OF 3 WATER ELEV.: 415'± TIME: 9:40 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMP LE	DEPTH	CLASSIFICATION
	62% REC 0% RQD		RUN # 7		-7.0	Gray/Brown Highly Weathered CLINKER (MH), medium dense
	90% REC 10% RQD		RUN # 8		-7.5	Red Weathered TUFF (WH), medium hard, broken
	100% REC 45% RQD		RUN # 9		-8.0	Gray Moderately Weathered Vesicular BASALT (WM), medium hard, broken
	87% REC 25% RQD		RUN # 10		-8.5	Gray Slightly Weathered BASALT (WS), hard, massive
	95% REC 50% RQD		RUN # 11		-9.0	Gray/Brown Highly Weathered CLINKER (WH), medium hard, broken
	75% REC 10% RQD		RUN # 12		-9.5	Gray Slightly Weathered Vugula BASALT (WS), hard, broken
					-10.0	
					-10.5	Red/Gray Moderately Weathered Welded CLINKER (WM), medium hard to hard, occasionally broken to massive
						BOH @ 97.0'

FEWELL GEOTECHNICAL ENGINEERING, LTD. Plate A53

ERNEST K. HIRATA & ASSOCIATES, INC.
Soils and Foundation Engineering
99-1433 Koala Place * Ala, Hawaii 96701-1028 * Phone 486-0787

BORING LOG W.O. 90-1953

BORING NO. IB1-20 ABUT A2 (Cont.) DRIVING WT. 140 lb. DATE OF DRILLING 7-16-90
SURFACE ELEV. 544± DROP 30 in. WATER LEVEL None

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
30			50		37		
35			78		30		
40			100/9'		33		
45			25		33		
50			71		39		
55							
60			60/4'		37		

Plate A48

ERNEST K. HIRATA & ASSOCIATES, INC.
Soils and Foundation Engineering
99-1433 Koala Place * Ala, Hawaii 96701-1028 * Phone 486-0787

BORING LOG W.O. 90-1953

BORING NO. IB1-20 ABUT A2 (Cont.) DRIVING WT. 140 lb. DATE OF DRILLING 7-16-90
SURFACE ELEV. 544± DROP 30 in. WATER LEVEL None

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
90							Begin NX coring from 89 feet. 40% Recovery from 89 to 99 feet. RQD = 4%
95							
100							End boring at 99 feet.
105							
110							
115							
120							

Plate A50

ERNEST K. HIRATA & ASSOCIATES, INC.
Soils and Foundation Engineering
99-1433 Koala Place * Ala, Hawaii 96701-1028 * Phone 486-0787

BORING LOG W.O. 90-1953

BORING: OB1-21 ABUT A1 PROJECT: Interstate Route H-3, North Halawa Highway
FILE: 953-1 SURFACE ELEV.: 480'±
DATE: 10-19-90 DEPTH TO WATER: 65' DATE: 10-24-90
PAGE 2 OF 3 WATER ELEV.: 415'± TIME: 9:40 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMP LE	DEPTH	CLASSIFICATION
qu=1990 p.s.f.	40	76	90/1.8'	7	-3.5	Mottled Reddish Brown Clayey SILT (ML) with sand and weathered gravel, stiff, moist (WEATHERED CLINKER)
			97% REC 8% RQD	RUN # 1	-4.0	Gray Moderately Weathered BASALT (WM), hard, extremely broken
			97% REC 0% RQD	RUN # 2	-4.5	Grayish Brown Highly Weathered Welded CLINKER (WH), medium hard, broken
			80% REC 0% RQD	RUN # 3	-5.0	Gray Moderately Weathered BASALT (WM), medium hard to hard, broken
			65% REC 33% RQD	RUN # 4	-5.5	Reddish Gray Highly Weathered Welded CLINKER (WH), medium hard, occasionally broken
			60% REC 17% RQD	RUN # 5	-6.0	
			80% REC 7% RQD	RUN # 6	-6.5	Gray Moderately to Highly Weathered BASALT (WM-WH), medium hard to hard, very broken
			62% REC 0% RQD	RUN # 7	-7.0	

FEWELL GEOTECHNICAL ENGINEERING, LTD. Plate A52

FEWELL GEOTECHNICAL ENGINEERING, LTD.

PAUL S. MORIMOTO
REGISTERED PROFESSIONAL ENGINEER
No. 5299
HAWAII, U.S.A.

ALAN I. SHIMAMOTO
REGISTERED PROFESSIONAL ENGINEER
No. 4393-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.
Paul S. Morimoto
Signature

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. 1-H3-1(69) & (70)

SCALE: NONE DATE: AS NOTED

SHEET NO. 142 OF 33 SHEETS

SURVEY PLOTTED BY _____ DATE _____
 DRAWN BY _____
 DESIGNED BY _____
 QUANTITIES BY _____
 CHECKED BY _____
 ORIGINAL PLAN _____
 NOTE BOOK _____
 No. _____

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	149	325

BORING: OB1-22 ABUT A1 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 502'±
 DATE: 10-12-90 DEPTH TO WATER: 28.5' DATE: 10-18-90
 PAGE 1 OF 3 WATER ELEV.: 473.5'± TIME: 11:30 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
					0.0	
	39		13	1	0.5	Brown Clayey SILT (MH) with gravel and cobbles, stiff, moist (FILL)
qu=10150 p.s.f. LL=86, PI=28	51	68	54	2	1.0	Mottled Grayish Brown Clayey SILT (MH) with gravel and cobbles, hard, damp (ALLUVIUM)
	53		18	3	1.5	
qu=1500 p.s.f. Consol	61	63	17	4	2.0	Mottled Grayish Brown Clayey SILT (MH) with gravel, stiff, moist
	58		17	5	2.5	
				6	3.0	
LL=91, PI=45	57		67	7	3.5	Gray BOULDERS, COBBLES, and GRAVEL with gray Silty Clay matrix, dense (ALLUVIUM)

FEWELL GEOTECHNICAL ENGINEERING, LTD.
 Plate A54

BORING: OB1-22 ABUT A1 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 502'±
 DATE: 10-12-90 DEPTH TO WATER: 28.5' DATE: 10-18-90
 PAGE 3 OF 3 WATER ELEV.: 473.5'± TIME: 11:30 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
					7.0	100% REC RUN # 8 37% RQD
					7.5	75% REC RUN # 9 25% RQD
					7.5	Grayish Brown Moderately Weathered Welded CLINKER (WM), medium hard, occasionally broken
					7.5	Gray Fresh BASALT (F), very hard, massive
						BOH @ 77.0'

FEWELL GEOTECHNICAL ENGINEERING, LTD.
 Plate A56

BORING: OB1-23 OP-1 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 457'±
 DATE: 10-9-90 DEPTH TO WATER: 17.0' DATE: 10-9-90
 PAGE 2 OF 3 WATER ELEV.: 440'± TIME: 12:00 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
qu=850 p.s.f.	57	67	32	7	3.5	Mottled Red Orange Highly Weathered CLINKER (WH), dense, moist
	60		53	8	4.0	Gray Highly Weathered BASALT (WH) with seams of hard clayey silt, medium hard, broken
	27			9	4.5	100% REC RUN # 1 17% RQD
				10	5.0	100% REC RUN # 2 7% RQD
				11	5.5	70% REC RUN # 3 10% RQD
				12	6.0	100% REC RUN # 4 55% RQD
				13	6.5	100% REC RUN # 5 88% RQD
				14	7.0	100% REC RUN # 6 89% RQD

FEWELL GEOTECHNICAL ENGINEERING, LTD.
 Plate A58

BORING: OB1-22 ABUT A1 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 502'±
 DATE: 10-12-90 DEPTH TO WATER: 28.5' DATE: 10-18-90
 PAGE 2 OF 3 WATER ELEV.: 473.5'± TIME: 11:30 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
					3.5	60% REC RUN # 1 60% RQD
					4.0	91% REC RUN # 2 9% RQD
					4.5	100% REC RUN # 3 10% RQD
					4.5	Gray BOULDERS, COBBLES, and GRAVEL in Gray Silty Clay matrix, dense
					5.0	63% REC RUN # 4 0% RQD
					5.5	100% REC RUN # 5 0% RQD
					5.5	(ALLUVIUM)
					6.0	82% REC RUN # 6 25% RQD
					6.0	Brown Gray Moderately Weathered BASALT (WM), hard, broken
					6.5	100% REC RUN # 7 10% RQD
					6.5	Gray Slightly Weathered BASALT (WS), hard, broken
					7.0	100% REC RUN # 8 37% RQD
					7.0	Grayish Brown Moderately Weathered Welded CLINKER (WM), medium hard, occasionally broken

FEWELL GEOTECHNICAL ENGINEERING, LTD.
 Plate A55

BORING: OB1-23 OP-1 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 457'±
 DATE: 10-9-90 DEPTH TO WATER: 17.0' DATE: 10-9-90
 PAGE 1 OF 3 WATER ELEV.: 440'± TIME: 12:00 PM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
					0.5	
qu=660 p.s.f.	40		3	1	0.5	
	56	68			1.0	PUSH 2
					1.0	Brown Clayey SILT (MH) with gravel, cobbles and occasional boulders, soft to medium stiff, moist
	61		6	3	1.5	
qu=520 p.s.f.	63	65			2.0	PUSH 4
					2.5	
					2.5	(FILL)
					3.0	Brown Gray Clayey SILT (MH) with gravel, medium stiff, moist (ALLUVIUM)
					3.0	Mottled Gray Highly Weathered BASALT (WH), medium hard, broken
					3.5	Mottled Red Orange Highly Weathered CLINKER (WH), dense, moist

FEWELL GEOTECHNICAL ENGINEERING, LTD.
 Plate A57

BORING: OB1-23 OP-1 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 457'±
 DATE: 9-7-90 DEPTH TO WATER: 17.0' DATE: 10-9-90
 PAGE 3 OF 3 WATER ELEV.: 440'± TIME: 12:00 PM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
					7.0	100% REC RUN # 6 89% RQD
					7.5	100% REC RUN # 7 90% RQD
					7.5	Gray Fresh Vugular BASALT (F), very hard, occasionally broken to massive
					7.5	Red Gray Slightly Weathered Welded CLINKER (WS), hard, occasionally broken to massive
						BOH @ 77.0'

FEWELL GEOTECHNICAL ENGINEERING, LTD.
 Plate A59

SURVEY PLOTTED BY: _____ DATE: _____
 DRAWN BY: _____
 DESIGNED BY: _____
 CHECKED BY: _____
 NO. _____



FEWELL GEOTECHNICAL ENGINEERING, LTD.
Alan J. Shimamoto

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 F.A.I. PROJECT NO. I-H3-1(69) & (70)

SCALE: NONE DATE: AS NOTED

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	144	225

BORING: OB1-24 OP-2 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 460'±
 DATE: 9-26-90 DEPTH TO WATER: 27.0' DATE: 10-2-90
 PAGE 1 OF 3 WATER ELEV.: 433'± TIME: 11:00 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
	44	73	10	1	0.5	Brown Clayey SILT (MH) with gravel, sand and cobbles, soft to medium stiff, moist to saturated
qu=580 p.s.f.					1.0	
	64	73	2	3	1.5	Brownish Gray Sandy SILT (ML-SM) with trace gravel, medium stiff, saturated
qu=800 p.s.f. LL=88, PI=43					2.0	
	47	73	12	5	2.5	Gray BOULDERS, COBBLES and GRAVEL in sand matrix, dense, saturated
					3.0	
	44% REC 0% RQD			RUN # 1	3.0	
	45% REC 0% RQD			RUN # 2	3.5	

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A60

BORING: OB1-24 OP-2 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 460'±
 DATE: 9-26-90 DEPTH TO WATER: 27.0' DATE: 10-2-90
 PAGE 3 OF 3 WATER ELEV.: 433'± TIME: 11:00 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
				RUN # 8	7.0	Gray Fresh BASALT (F), very hard, broken
					7.5	BOH @ 72.0'
					8.0	
					8.5	
					9.0	
					9.5	
					1.00	
					1.05	

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A62

BORING: OB1-25 OP-3 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 480'±
 DATE: 9-17-90 DEPTH TO WATER: 40.5' DATE: 9-18-90
 PAGE 2 OF 3 WATER ELEV.: 439.5'± TIME: 9:00 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
				RUN # 3	3.5	Brown Clayey SILT (MH) with cobbles, soft to medium stiff, moist (FILL)
				RUN # 4	4.0	Gray BOULDERS, COBBLES and GRAVEL with sand and silt, dense
				RUN # 5	4.5	
				RUN # 6	5.0	(ALLUVIUM)
				RUN # 7	5.5	
				RUN # 8	6.0	Mottles Gray Highly Weathered BASALT (WH), soft to medium hard, extremely broken
				RUN # 9	6.5	Gray Moderately Weathered BASALT (WM), medium hard to hard, extremely broken
				RUN # 10	7.0	

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A64

BORING: OB1-24 OP-2 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 460'±
 DATE: 9-26-90 DEPTH TO WATER: 27.0' DATE: 10-2-90
 PAGE 2 OF 3 WATER ELEV.: 433'± TIME: 11:00 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
				RUN # 2	3.5	Gray BOULDERS, COBBLES and GRAVEL in sand matrix, dense, saturated (ALLUVIUM)
				RUN # 3	4.0	
				RUN # 4	4.5	Gray Moderately to Highly Weathered BASALT (WM-WH), medium hard, extremely broken
				RUN # 5	5.0	
				977.7'	6	Gray Brown Highly Weathered CLINKIER (WH), soft to medium hard, extremely broken
				RUN # 6	6.0	
				RUN # 7	7.0	Red Highly Weathered TUFF (WM), medium hard, broken
				RUN # 8	8.0	Gray Brown Moderately to Highly Weathered Vesicular BASALT (WM-WH), medium hard, broken
				RUN # 2	9.5	Gray Brown Moderately Weathered CLINKIER (WM), medium hard, extremely broken
				RUN # 8	10.0	Gray Fresh BASALT (F), very hard, broken

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A61

BORING: OB1-25 OP-3 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 480'±
 DATE: 9-17-90 DEPTH TO WATER: 40.5' DATE: 9-18-90
 PAGE 1 OF 3 WATER ELEV.: 439.5'± TIME: 9:00 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
LL=78, PI=32 qu=1410 p.s.f.	48	74	PUSH	1	0.5	Brown Clayey SILT (MH) with gravel, cobbles and occasional boulders, soft to medium stiff, moist
					1.0	
					1.5	BOH @ 81.0'
					2.0	
					2.5	
					3.0	
					3.5	
					4.0	
					4.5	
					5.0	
					5.5	
					6.0	
					6.5	
					7.0	
					7.5	
					8.0	
					8.5	
					9.0	
					9.5	
					10.0	
					10.5	

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A63

BORING: OB1-25 OP-3 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 480'±
 DATE: 9-17-90 DEPTH TO WATER: 40.5' DATE: 9-18-90
 PAGE 3 OF 3 WATER ELEV.: 439.5'± TIME: 9:00 AM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
				RUN # 10	7.0	Gray Moderately Weathered BASALT (WM), medium hard to hard, extremely broken
				RUN # 11	7.5	Drades to broken
				RUN # 12	8.0	
					8.5	Red Highly Weathered TUFF (WH), medium hard, broken
					9.0	Gray Slightly Weathered BASALT (WS), hard, occasionally broken
					9.5	BOH @ 81.0'
					10.0	
					10.5	

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A65

SURVEY PLOTTED BY: _____ DATE: _____
 ORIGINAL PLAN DRAWN BY: _____
 NOTE BOOK TRACED BY: _____
 NO. CHECKED BY: _____



FEWELL GEOTECHNICAL ENGINEERING, LTD.
Alan J. Shimamoto

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. I-H3-1(69) & (70)

SCALE: NONE DATE: AS NOTED

SHEET NO. 81 OF 33 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1 (69)	1992	145	325

BORING: OB1-26 OP-4 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 462'±
 DATE: 9-7-90 DEPTH TO WATER: 46.0' DATE: 9-7-90
 PAGE 1 OF 2 WATER ELEV.: 416'± TIME: 3:00 PM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
qu=930 p.s.f.	43	69	PUSH	1	Brown Clayey SILT (MH) with gravel, medium stiff to stiff, moist
	49		27	2	(RESIDUAL)
			85% REC RUN #1 0% RQD	1.5	Gray Slightly Weathered BASALT (WS), hard, extremely broken
			0% REC RUN #2 0% RQD	2.0	Red Brown Highly Weathered CLINKER (WH), medium dense
			78% REC RUN #3 0% RQD	2.5	Gray Slightly to Moderately Weathered BASALT (WS-WM), medium hard to hard, extremely broken
			30% REC RUN #4 9% RQD	3.5	

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A66

BORING: OB1-27 OP-5 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 498'±
 DATE: 11-2-90 DEPTH TO WATER: NONE ENCOUNTERED
 PAGE 1 OF 2

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
LL=80, PI=21	62	57	13	1	Brown Clayey SILT (MH) with gravel, medium stiff to stiff, moist
qu=1490 p.s.f.	67		6	2	
	63	61	PUSH	3	Brown Clayey SILT (MH) with gravel, medium stiff to stiff, moist
	67		8	4	
qu=1740 p.s.f.	63	61	PUSH	5	
	32		66	6	(ALLUVIUM) Gray BOULDERS, COBBLES and GRAVEL with sand in brown clayey silt matrix, very dense, moist

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A68

BORING: OB1-28 OP-6 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 505'±
 DATE: 11-5-90 DEPTH TO WATER: NONE ENCOUNTERED
 PAGE 1 OF 2

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
LL=93, PI=40	49		23	1	Brown Clayey SILT (MH) with gravel and cobbles, very stiff, moist
qu=1930 p.s.f.	45	74	34	2	
	55		11	3	Grades to stiff @ 15.0'
			PUSH	4	
	46	70	68	5	
	58	60	29	6	(ALLUVIUM)

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A70

BORING: OB1-26 OP-4 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 462'±
 DATE: 9-7-90 DEPTH TO WATER: 46.0' DATE: 9-7-90
 PAGE 2 OF 2 WATER ELEV.: 416'± TIME: 3:00 PM

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
			30% REC RUN #4 9% RQD	3.5	Gray Slightly Moderately Weathered BASALT (WS-WM), medium hard to hard, extremely broken
				4.0	Brown Gray Highly Weathered CLINKER (WH), dense, moist
			100% REC RUN #5 20% RQD	4.5	Gray Slightly Weathered BASALT (WS), medium hard to hard, extremely broken
			79% REC RUN #6 30% RQD	5.5	Brown Gray Highly Weathered CLINKER (WH), dense, moist
				5.8	Red Slightly Weathered TUFF, medium hard to hard
				6.0	Gray Fresh BASALT (F), hard, occasionally fractured
					BOH @ 60.0'

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A67

BORING: OB1-27 OP-5 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 498'±
 DATE: 11-2-90 DEPTH TO WATER: NONE ENCOUNTERED
 PAGE 2 OF 2

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
	32	85	70/5' R	7	Gray BOULDERS, COBBLES and GRAVEL with sand in matrix, very dense, moist (ALLUVIUM)
			100% REC RUN #1 60% RQD	4.0	Gray Slightly Weathered BASALT (WS), hard, broken
			80% REC RUN #2 25% RQD	4.5	Brownish Gray Slightly to Moderately Weathered Welded CLINKER (WS-WM), medium hard to hard, occasionally broken
			100% REC RUN #3 45% RQD	5.0	Gray Fresh BASALT (F), very hard, massive
					BOH @ 50.0'

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A69

BORING: OB1-28 OP-6 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 505'±
 DATE: 11-5-90 DEPTH TO WATER: NONE ENCOUNTERED
 PAGE 2 OF 2

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE DEPTH	CLASSIFICATION
			50/5' R	7	Brown Clayey SILT (MH) with gravel and cobbles, very stiff, moist
			88% REC RUN #1 0% RQD	4.0	Gray and Brown BOULDERS, COBBLES, and GRAVEL in silt matrix, very dense, moist
			65% REC RUN #2 0% RQD	4.5	
			40% REC RUN #3 0% RQD	5.0	(ALLUVIUM)
	32		50/5' R	8	Gray Moderately Weathered BASALT (WM), medium hard to hard, very broken
			100% REC RUN #4 24% RQD	5.5	Gray Slightly Weathered Vesicular BASALT (WS), very hard, occasionally broken to massive
			80% REC RUN #5 25% RQD	6.0	Gray Brown Moderately Weathered Welded CLINKER (WM), medium hard, broken
					BOH @ 62.0'

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Plate A71



FEWELL GEOTECHNICAL ENGINEERING, LTD.

Alan J. Shimamoto

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 F.A.I. PROJECT NO. I-H3-1(69) & (70)

SCALE: NONE DATE: AS NOTED

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	140	225

BORING: OB1-29 OP-7 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 469'±
 DATE: 11-29-90 DEPTH TO WATER: NONE ENCOUNTERED
 PAGE 1 OF 2

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
LL=40, Pl=21	11		29	1	0-1	BOULDERS, COBBLES AND GRAVEL (GM) in a matrix of Brown Clayey Silt, medium dense, moist
qu=910 p.s.f.	32	92	57.4' R	2	1-2	(FILL)
			48% REC 17% RQD	RUN # 1	1.5	Gray Slightly Weathered BASALT (WS), hard, broken to occasionally broken
			100% REC 0% RQD	RUN # 2	2.0	Gray and Brown Highly Weathered Welded CLINKER (WH), medium hard, broken
			100% REC 28% RQD	RUN # 3	2.5	Brown Moderately Weathered Vesicular BASALT (WM), medium hard, occasionally broken to massive
			100% REC 71% RQD	RUN # 4	3.0	Gray Moderately to Slightly Weathered Vesicular BASALT (WM-WS), hard, massive to occasionally broken
			87% REC 73% RQD	RUN # 5	3.5	Brown/Gray Moderately Weathered Welded CLINKER (WH), medium hard, massive to occasionally broken
			81% REC 47% RQD	RUN # 6	4.0	

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A72

BORING: OB1-30 OP-8 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 463'±
 DATE: 8-8-90 DEPTH TO WATER: 23'
 WATER ELEV.: 440'± DATE: 9-5-90 TIME: 9:00 AM
 PAGE 1 OF 3

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
					0-1	Brown Clayey SILT (MH) with boulders, stiff, moist (ALLUVIUM)
					1-2	
			83% REC 0% RQD	RUN # 1	2.0	BOULDERS, COBBLES and GRAVEL in clayey silt matrix, dense, moist to saturated
			60% REC 0% RQD	RUN # 2	2.5	
LL=57, Pl=9	38		42	2	2.5-3.0	Mottles Gray Brown Clayey SILT (MH) with gravel and sand, hard, saturated
					3.0-3.5	Gray Fresh Vesicular BASALT (F), very hard, moderately broken
			36	3	3.5-4.0	

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A74

BORING: OB1-30 OP-8 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 463'±
 DATE: 8-8-90 DEPTH TO WATER: 23'
 WATER ELEV.: 440'± DATE: 9-5-90 TIME: 9:00 AM
 PAGE 3 OF 3

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
			65% REC 0% RQD	RUN # 6	7.0	Red Gray Moderately Weathered BASALT (WM) with seams of clinker, soft to medium hard, extremely broken
					7.5	
					8.0	
					8.5	
					9.0	
					9.5	
					10.0	
					10.5	

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A76

BORING: OB1-29 OP-7 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 469'±
 DATE: 11-29-90 DEPTH TO WATER: NONE ENCOUNTERED
 PAGE 2 OF 2

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
			81% REC 47% RQD	RUN # 6	3.5	Brown/Gray Moderately Weathered Welded CLINKER (WH), medium hard, massive to occasionally broken
			100% REC 100% RQD	RUN # 7	4.0	Gray Slightly Weathered BASALT (WS), very hard, massive to occasionally broken
			50% REC 50% RQD	RUN # 8	4.5	Gray/Brown Moderately to Slightly Weathered Welded CLINKER (WM-WS), hard, broken
			70% REC 17% RQD	RUN # 9	5.0	Gray/Brown Moderately Weathered CLINKER (WM), dense, damp
			70% REC 21% RQD	RUN # 10	5.5	Gray Slightly Weathered BASALT (WS), hard, occasionally broken
					6.0	
					6.5	
					7.0	

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A73

BORING: OB1-30 OP-8 PROJECT: Interstate Route H-3, North Halawa Highway
 FILE: 953-1 SURFACE ELEV.: 463'±
 DATE: 8-8-90 DEPTH TO WATER: 23'
 WATER ELEV.: 440'± DATE: 9-5-90 TIME: 9:00 AM
 PAGE 2 OF 3

LAB TEST RESULTS	MOIST CONT %	DRY WT. PCF	BLOWS PER FT.	SAMPLE	DEPTH	CLASSIFICATION
					3.5	
			0% REC 0% RQD	RUN # 3	4.0	Gray Fresh Vesicular BASALT (F), very hard, occasionally broken
					4.5	
			79% REC 22% RQD	RUN # 4	5.0	Gray Brown Moderately Weathered CLINKER (WL), soft, extremely broken
					5.5	
					6.0	Gray Fresh Vesicular BASALT (F), very hard, occasionally broken
					6.5	
			93% REC 44% RQD	RUN # 5	7.0	Red Gray Highly Weathered CLINKER (WH), soft to friable, extremely broken
					7.5	
					8.0	Gray Fresh Vugular BASALT (F-WS), very hard, occasionally broken
					8.5	
			65% REC 0% RQD	RUN # 6	9.0	Red Gray Moderately Weathered BASALT (WM) with seams of clinker, soft to medium hard, extremely broken

FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A75



FEWELL GEOTECHNICAL ENGINEERING, LTD.

Alan Shimamoto

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 F.A.I. PROJECT NO. I-H3-1(69) & (70)

SCALE: NONE DATE: AS NOTED

SHEET NO. 144 OF 225 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1-H3-1(69)	1992	147	325



ERNEST K. HIRATA & ASSOCIATES, INC.
Soils and Foundation Engineering
99-1433 Koala Place * Aiea, Hawaii 96701-1028 * Phone 486-0787

BORING LOG W.O. 90-1953

BORING NO. OB1-31 OP-9 DRIVING WT. 140 lb. DATE OF DRILLING 7-11-90
SURFACE ELEV. 466± DROP 30 in. WATER LEVEL @ 7.7 ft.

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
0	MH						Clayey SILT - Brown, moist, stiff, with gravel.
15					33		Grading with cobbles from 5 feet.
87				19			
8/6" 45/6"					47		
91					40		
70/8"					31		COMPLETELY WEATHERED ROCK - Mottled orange brown, dense to medium hard.
85/11"					33		
50/1"					No Recovery		BASALT - Gray, hard, slightly weathered.

Plate A77



ERNEST K. HIRATA & ASSOCIATES, INC.
Soils and Foundation Engineering
99-1433 Koala Place * Aiea, Hawaii 96701-1028 * Phone 486-0787

BORING LOG W.O. 90-1953

BORING NO. OB1-32 OP-10 DRIVING WT. 140 lb. DATE OF DRILLING 6-28-90
SURFACE ELEV. 494± DROP 30 in. WATER LEVEL None

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
0	MH						Clayey SILT - Mottled brown, moist, firm to medium stiff, with gravel and cobbles.
12					65		Grading with cobbles from 5 feet.
56				42			
3					44		
15					50		
69					44		
6					45		
75					38		BASALT - Mottled gray, dense to medium hard, vesicular, fractured, weathered to slightly weathered.

Plate A79



ERNEST K. HIRATA & ASSOCIATES, INC.
Soils and Foundation Engineering
99-1433 Koala Place * Aiea, Hawaii 96701-1028 * Phone 486-0787

BORING LOG W.O. 90-1953

BORING NO. OB1-33 OP-11 DRIVING WT. 140 lb. DATE OF DRILLING 6-25-90
SURFACE ELEV. 502± DROP 30 in. WATER LEVEL Not Recorded

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
0	MH						Clayey SILT - Dark brown, moist, firm to medium stiff, with gravel.
3					45		Grading to mottled brown color from 2 feet.
52				53			
3					62		
25/0"					No Penetration		
25					17		COMPLETELY WEATHERED ROCK - Mottled grayish brown, moist, medium dense to dense
43					38		
20					58		

Plate A81



ERNEST K. HIRATA & ASSOCIATES, INC.
Soils and Foundation Engineering
99-1433 Koala Place * Aiea, Hawaii 96701-1028 * Phone 486-0787

BORING LOG W.O. 90-1953

BORING NO. OB1-31 (Cont.) OP-9 DRIVING WT. 140 lb. DATE OF DRILLING 7-19-90
SURFACE ELEV. 466± DROP 30 in. WATER LEVEL @ 7.7 ft.

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
30							Begin NX coring from 30 feet. 100% Recovery from 30 to 34 feet. RQD = 96%
35							92% Recovery from 34 to 39 feet. RQD = 35%
							Grading highly fractured from 36.5 feet.
40							100% Recovery from 39 to 44 feet. RQD = 73%
45							100% Recovery from 44 to 49 feet. RQD = 40%
50							End boring at 49 feet.

Plate A78



ERNEST K. HIRATA & ASSOCIATES, INC.
Soils and Foundation Engineering
99-1433 Koala Place * Aiea, Hawaii 96701-1028 * Phone 486-0787

BORING LOG W.O. 90-1953

BORING NO. OB1-32 (Cont.) OP-10 DRIVING WT. 140 lb. DATE OF DRILLING 6-28-90
SURFACE ELEV. 494± DROP 30 in. WATER LEVEL None

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
30							Grading medium hard from 30 feet.
50/3"					No Recovery		Begin NX coring from 34 feet. 84% Recovery from 34 to 44 feet. RQD = 35%
45							78% Recovery from 44 to 53 feet. RQD = 21%
50							End boring at 53 feet.

Plate A80



ERNEST K. HIRATA & ASSOCIATES, INC.
Soils and Foundation Engineering
99-1433 Koala Place * Aiea, Hawaii 96701-1028 * Phone 486-0787

BORING LOG W.O. 90-1953

BORING NO. OB1-33 (Cont.) OP-11 DRIVING WT. 140 lb. DATE OF DRILLING 6-25-90
SURFACE ELEV. 502± DROP 30 in. WATER LEVEL Not Recorded

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
30					75	40	
15/0"					No Penetration		BASALT - Gray, medium hard, vesicular, fractured, weathered. Begin NX coring from 34 feet. 96% Recovery from 34 to 42 feet. RQD = 40%
42							94% Recovery from 42 to 52 feet. RQD = 68%
45							Grading hard from 45 feet.
50							End boring at 52 feet.

Plate A82



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Signature

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

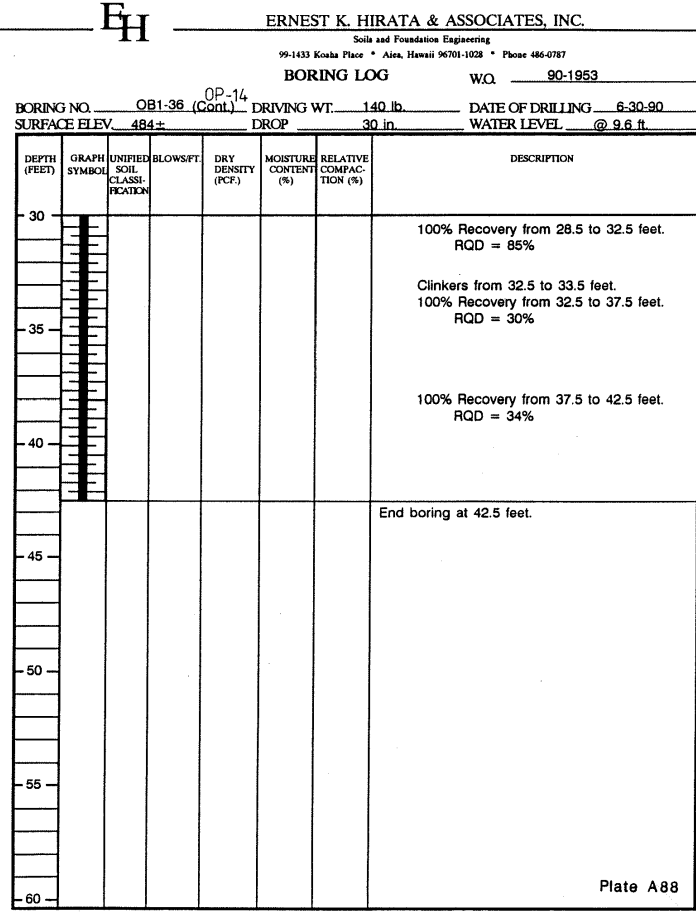
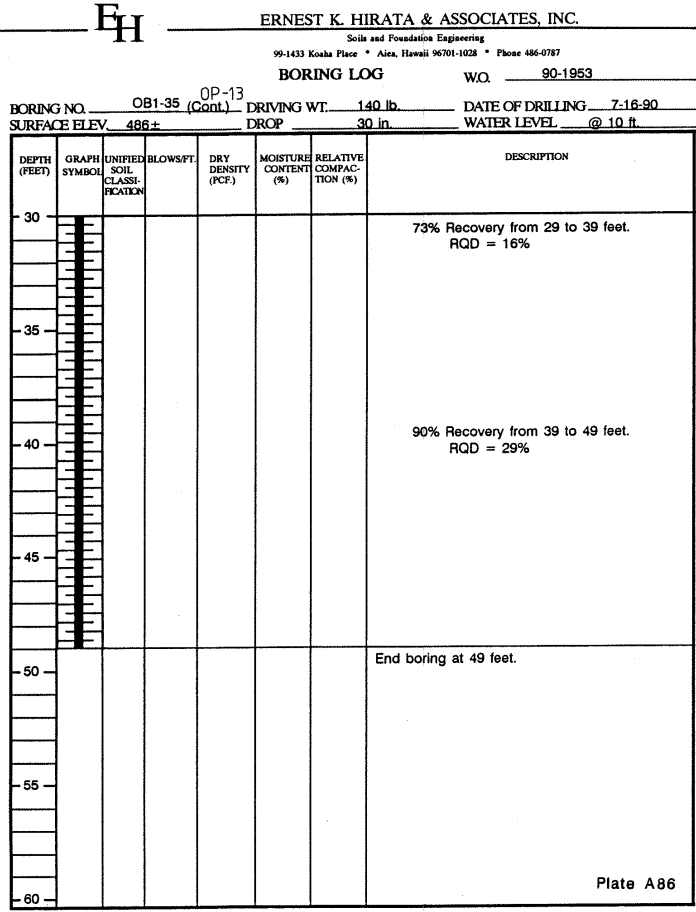
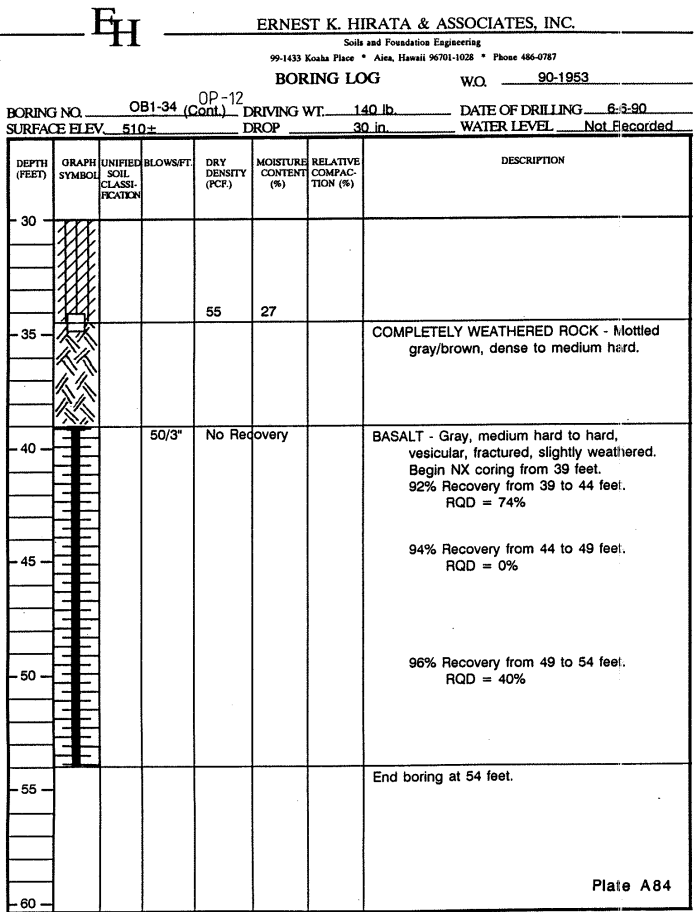
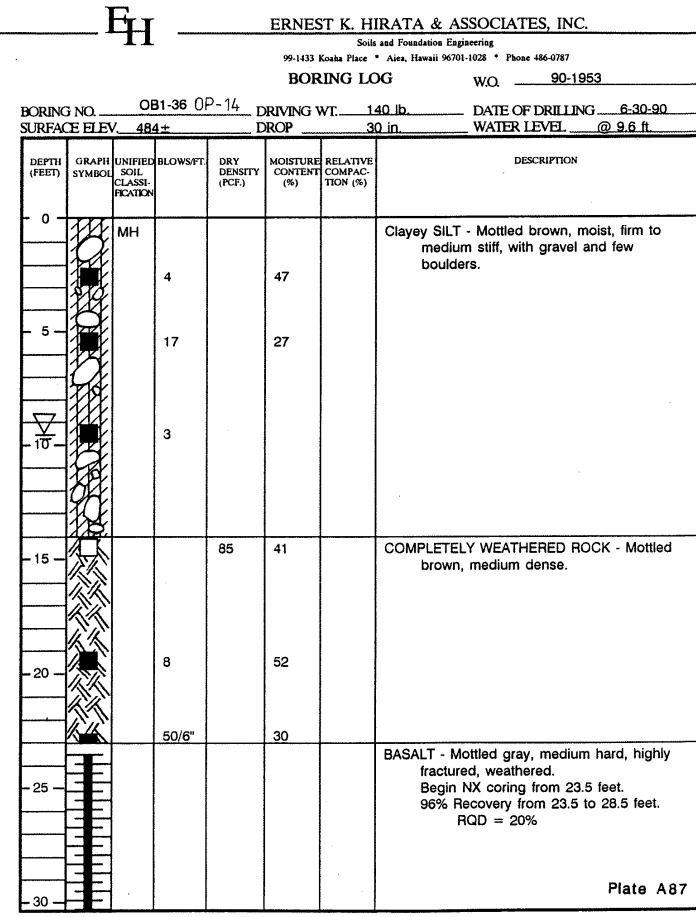
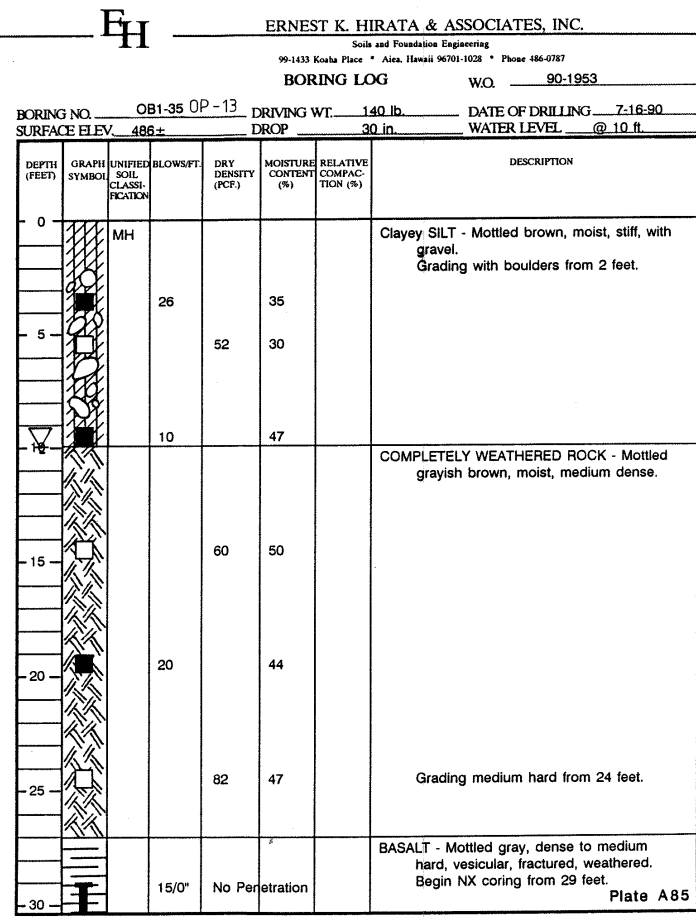
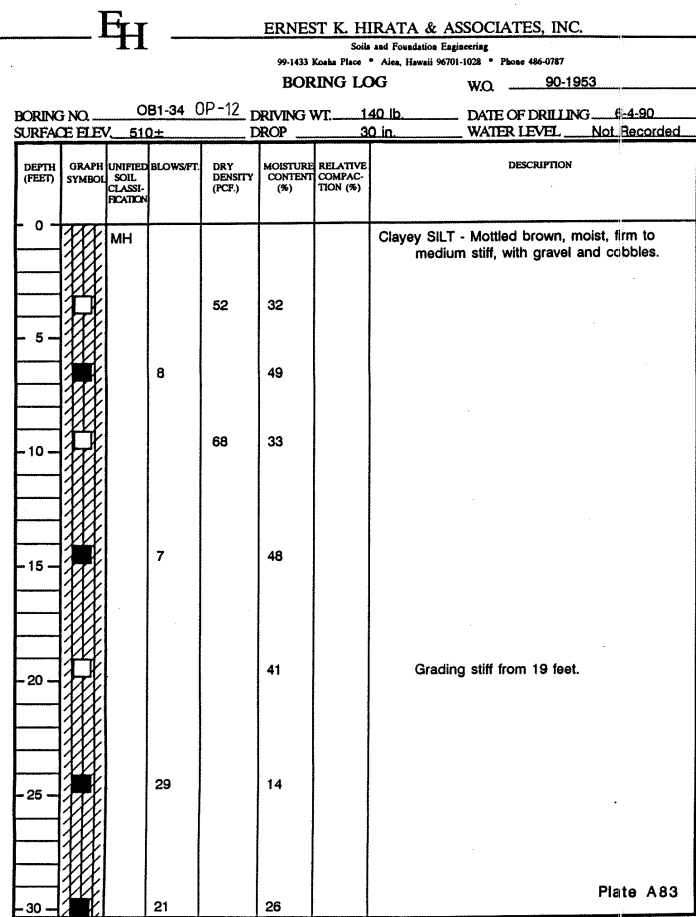
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INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. 1-H3-1(69) & (70)

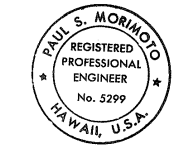
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SHEET NO. 86 OF 33 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	140	325



SURVEY PLOTTED BY _____ DATE _____
 DRAWN BY _____
 DESIGNED BY _____
 QUANTITIES BY _____
 CHECKED BY _____
 No. _____



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Paul S. Morimoto
Signature

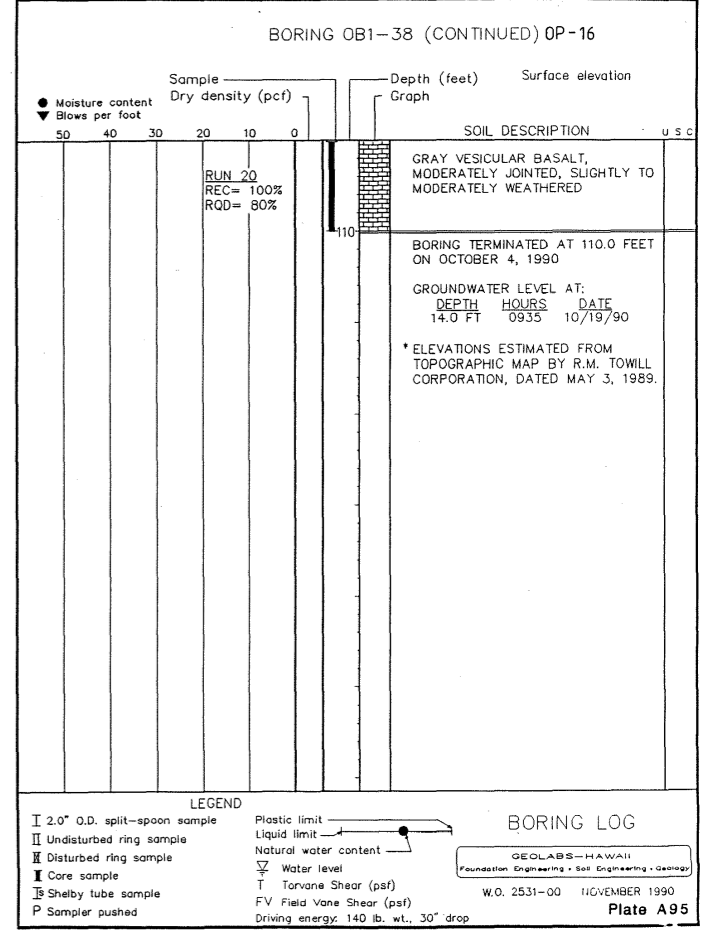
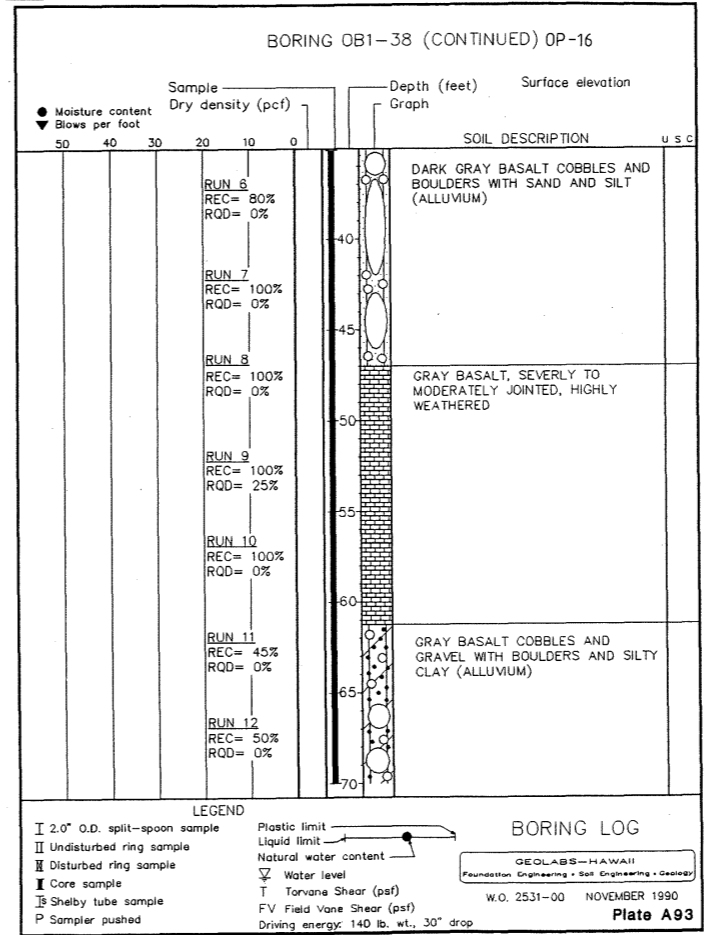
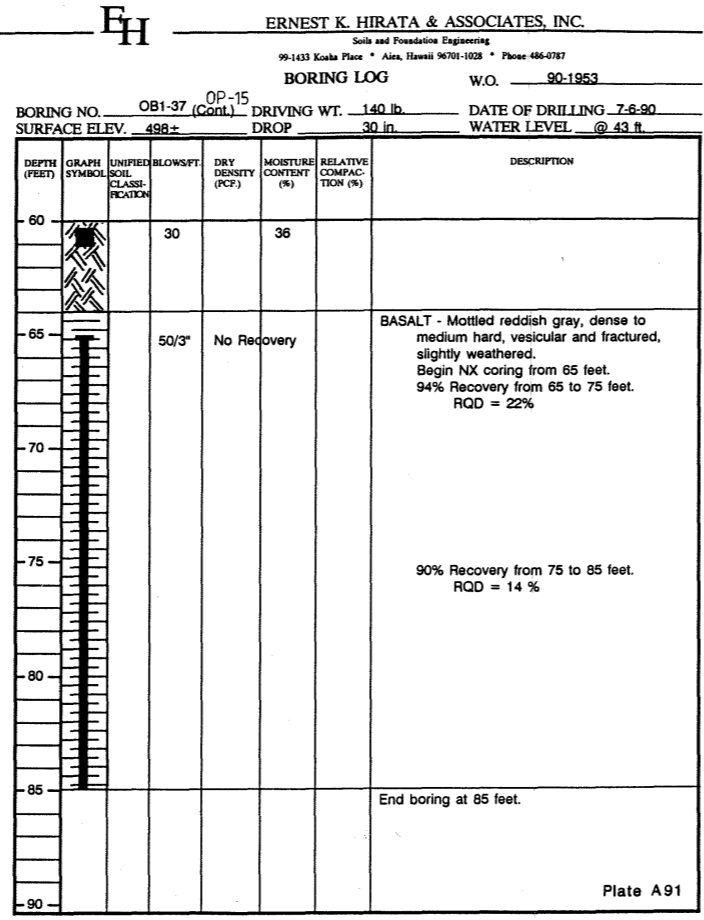
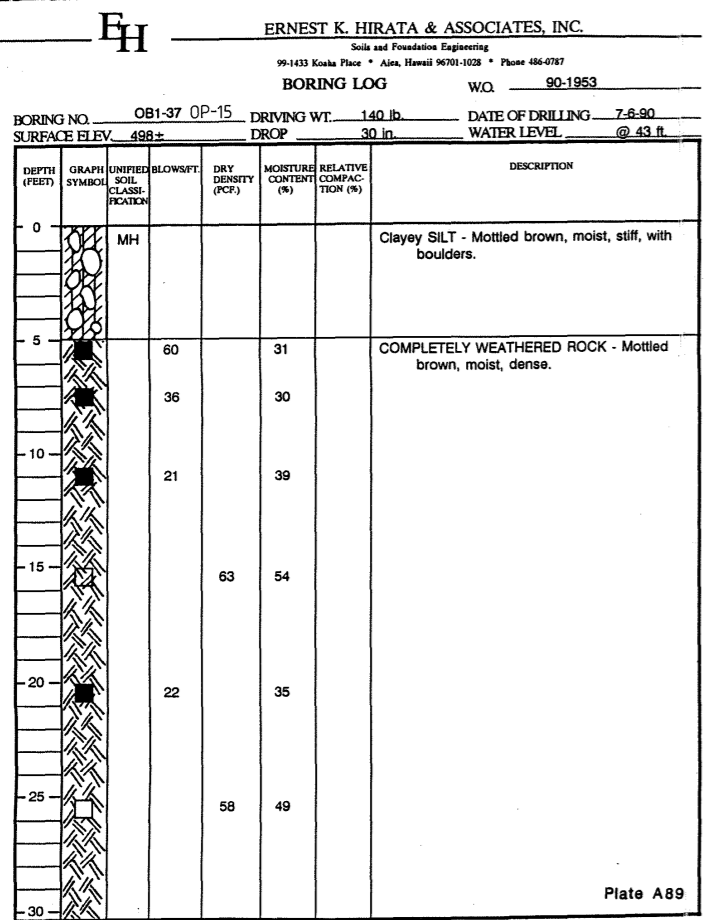
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. I-H3-1(69) & (70)

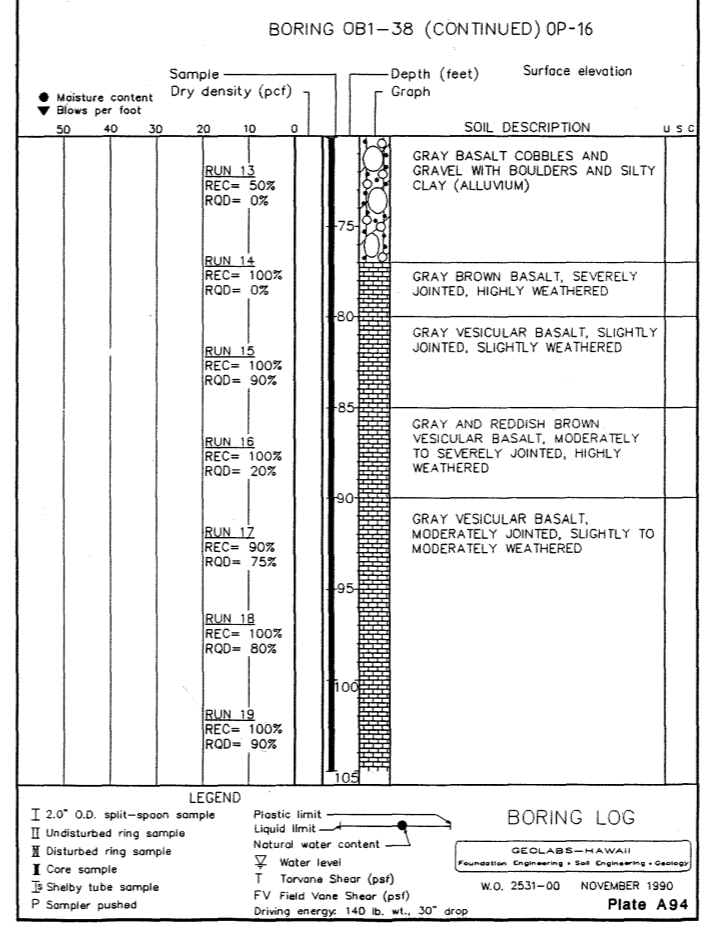
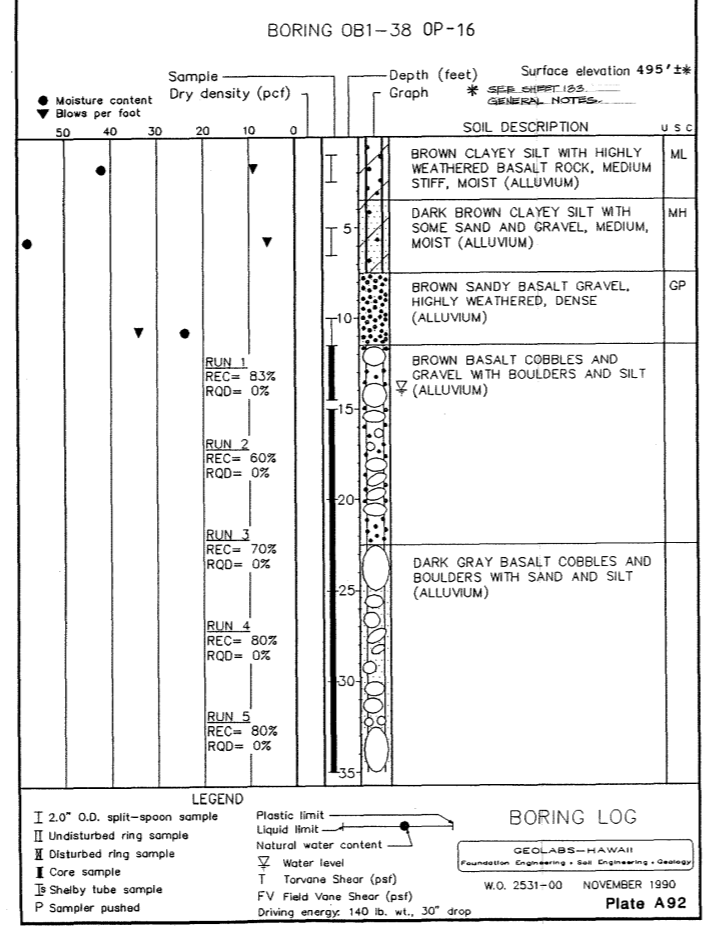
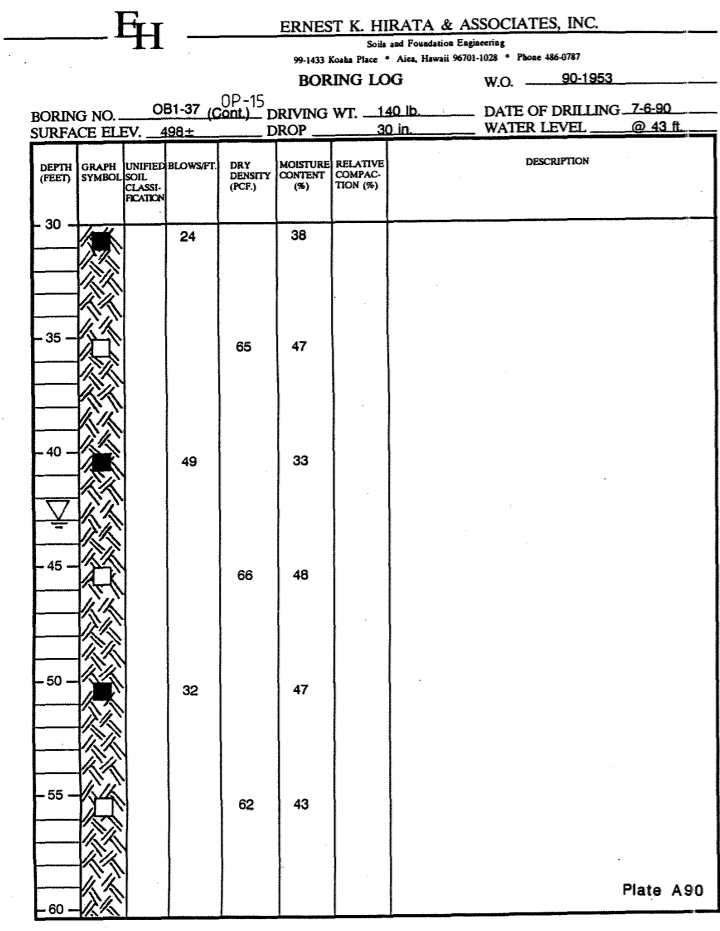
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FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	149	325



PAUL S. MORIMOTO
REGISTERED PROFESSIONAL ENGINEER
No. 5299
HAWAII, U.S.A.

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Paul S. Morimoto
Signature



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Bob V. K. Wong
SIGNATURE

BOB V. K. WONG
REGISTERED PROFESSIONAL ENGINEER
No. 3862
HAWAII, U.S.A.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. I-H3-1(69) & (70)

SCALE: NONE DATE: AS NOTED

SHEET No. 149 OF 33 SHEETS

DATE _____

SURVEY PLOTTED BY _____

DRAWN BY _____

DESIGNED BY _____

QUANTITIES BY _____

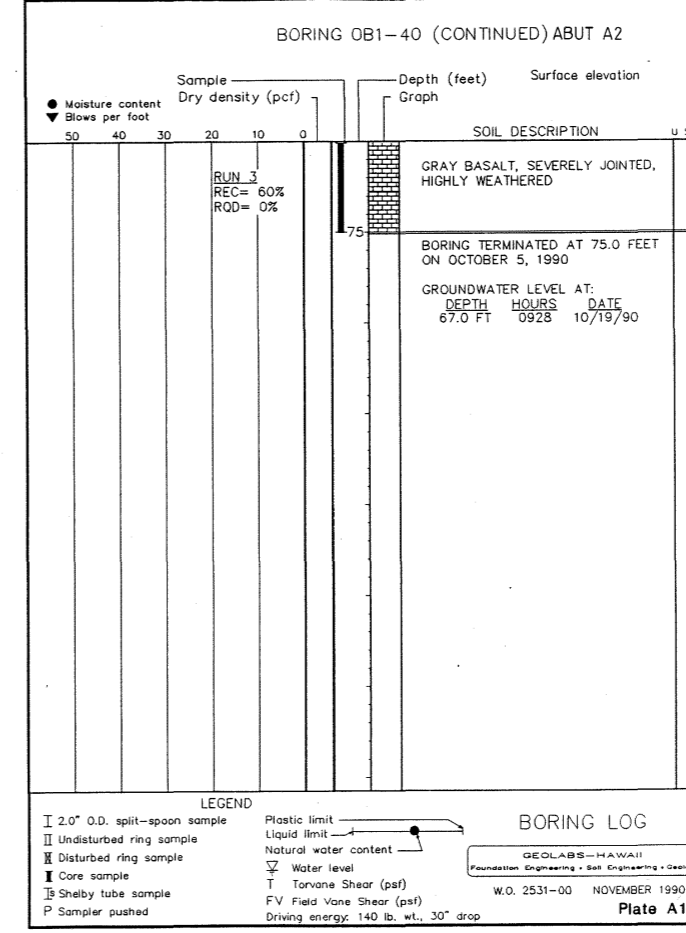
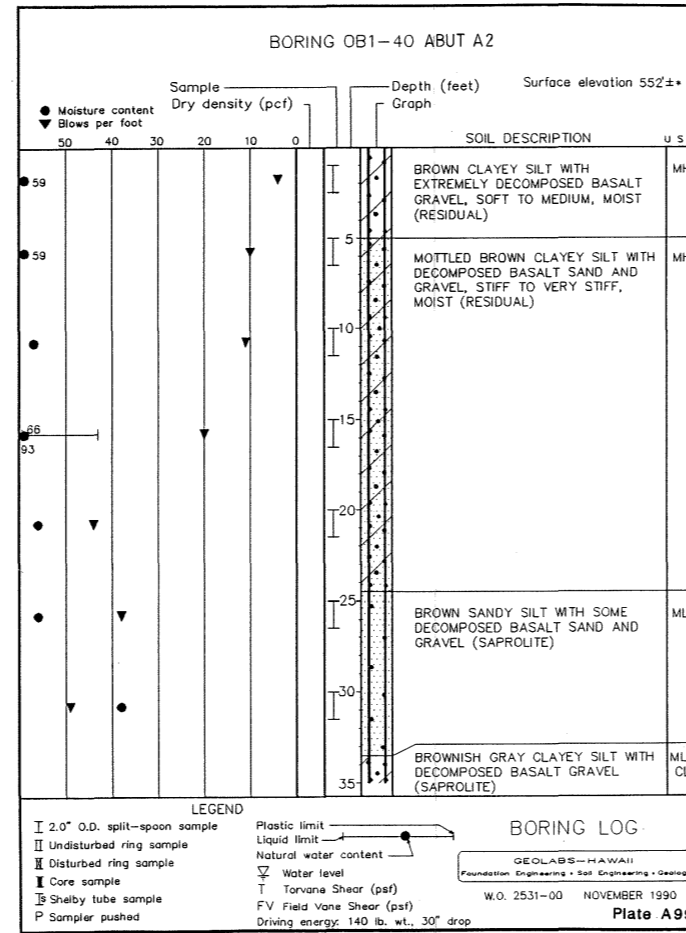
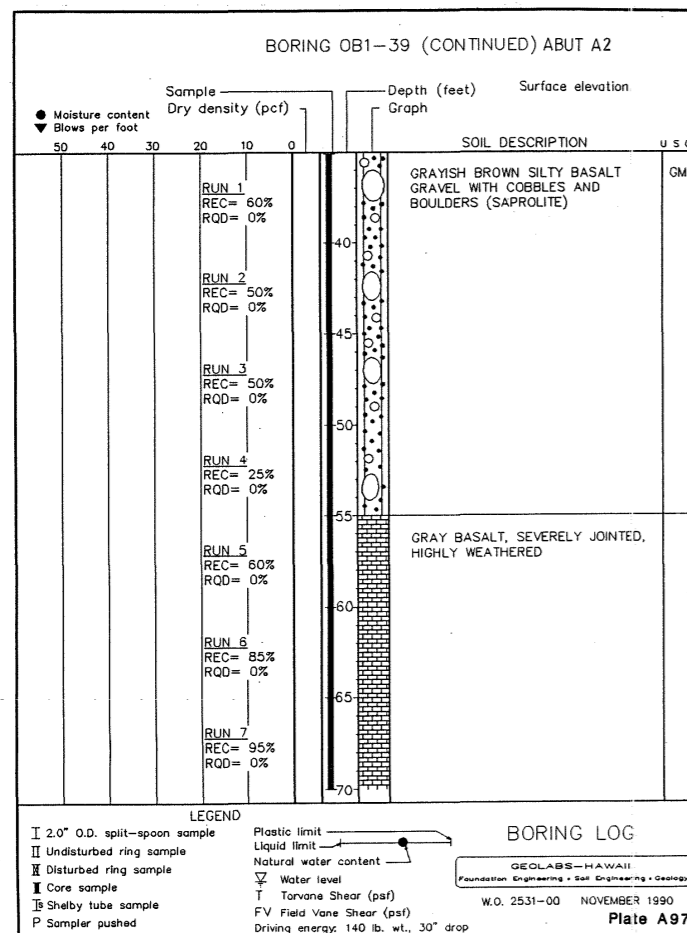
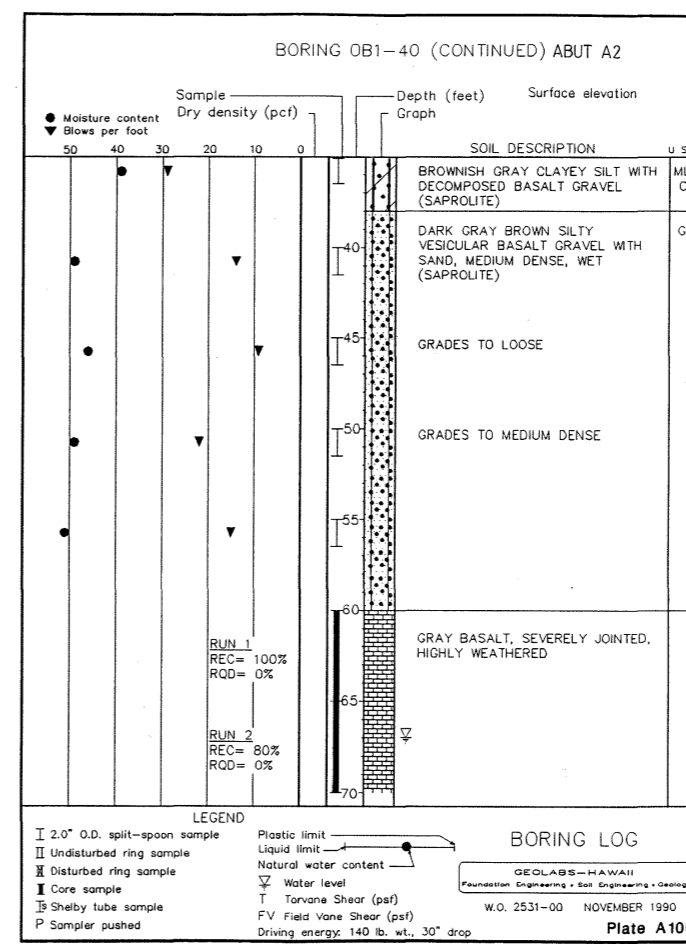
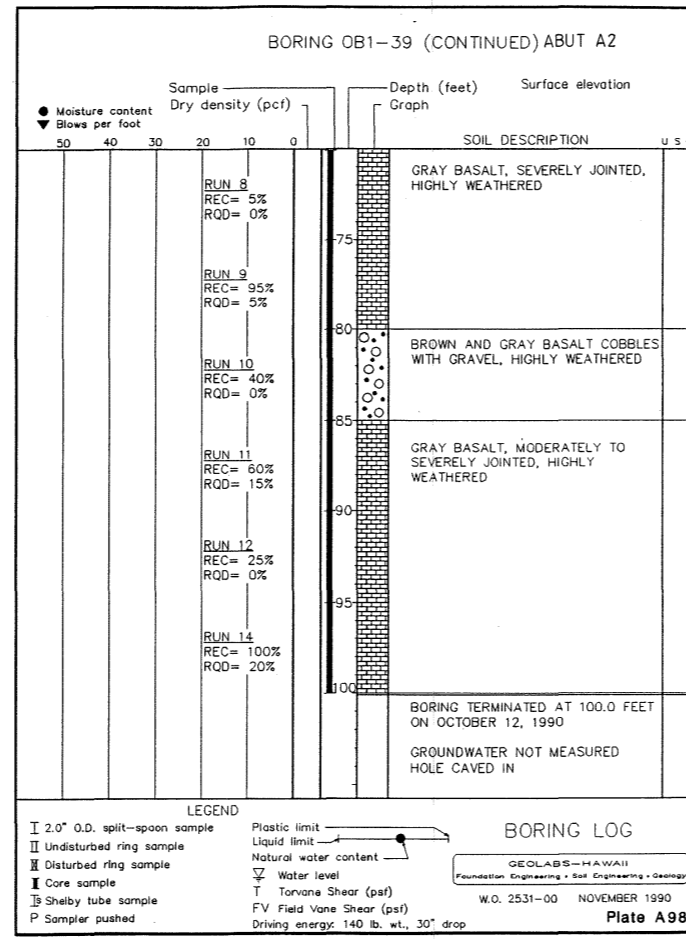
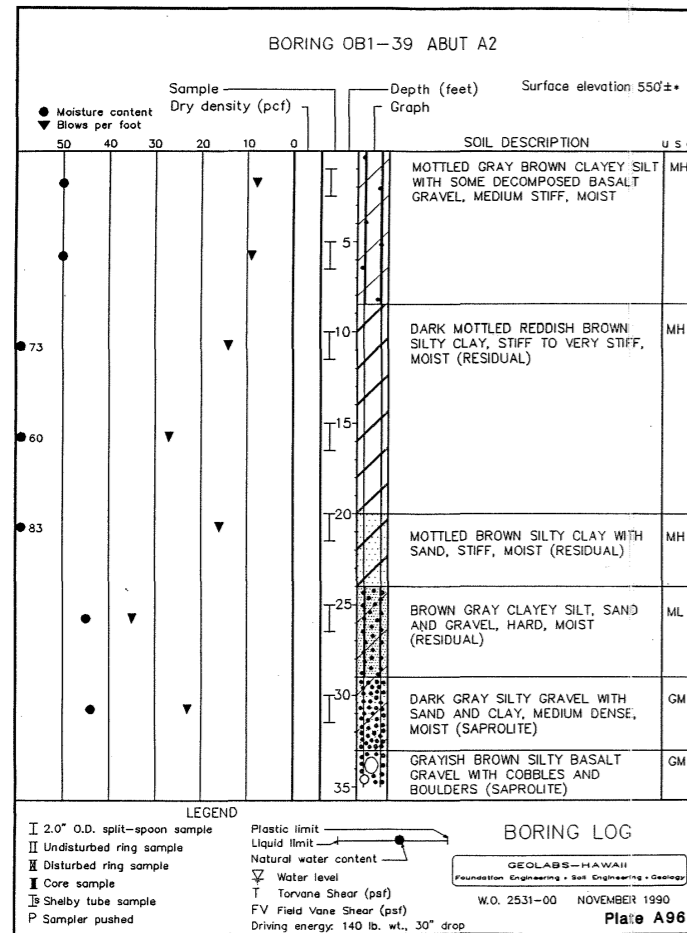
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ORIGINAL PLAN _____

NOTE BOOK _____

NO. _____

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	150	225



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Rob Y. K. Wong
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

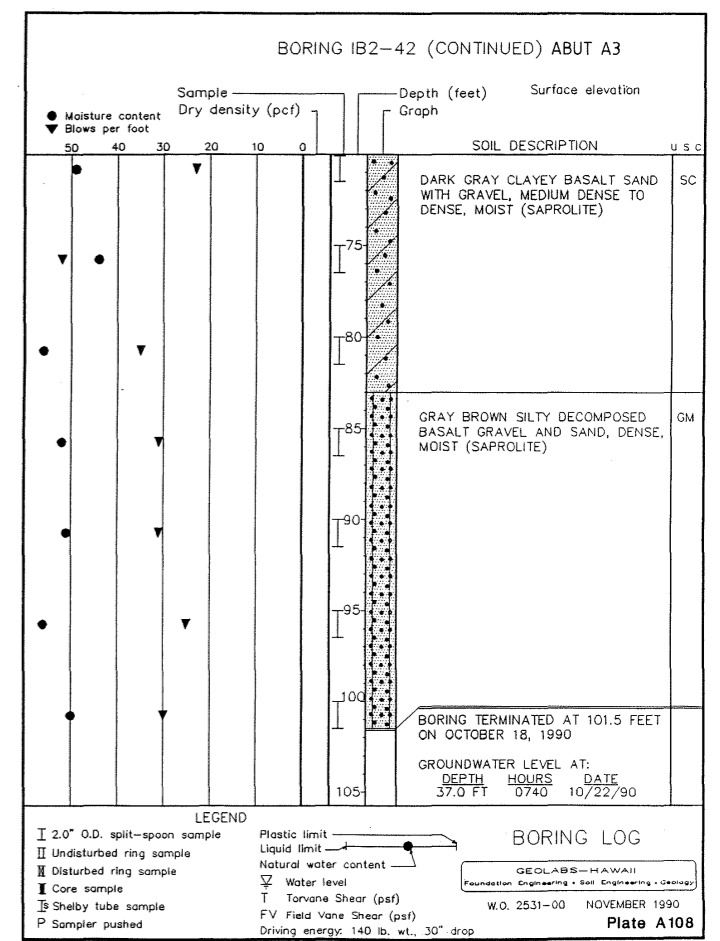
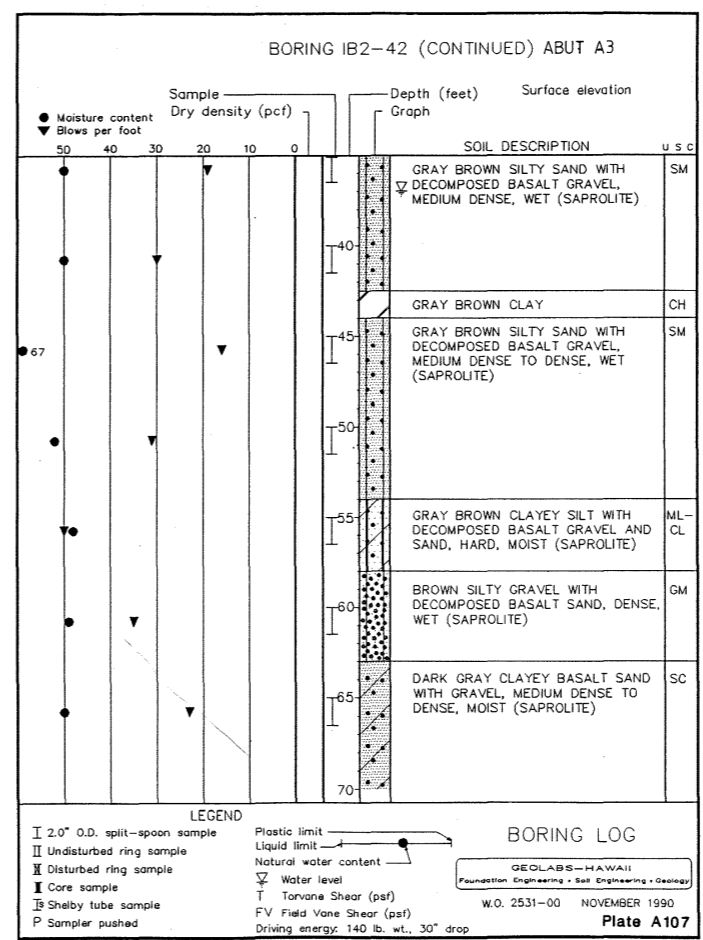
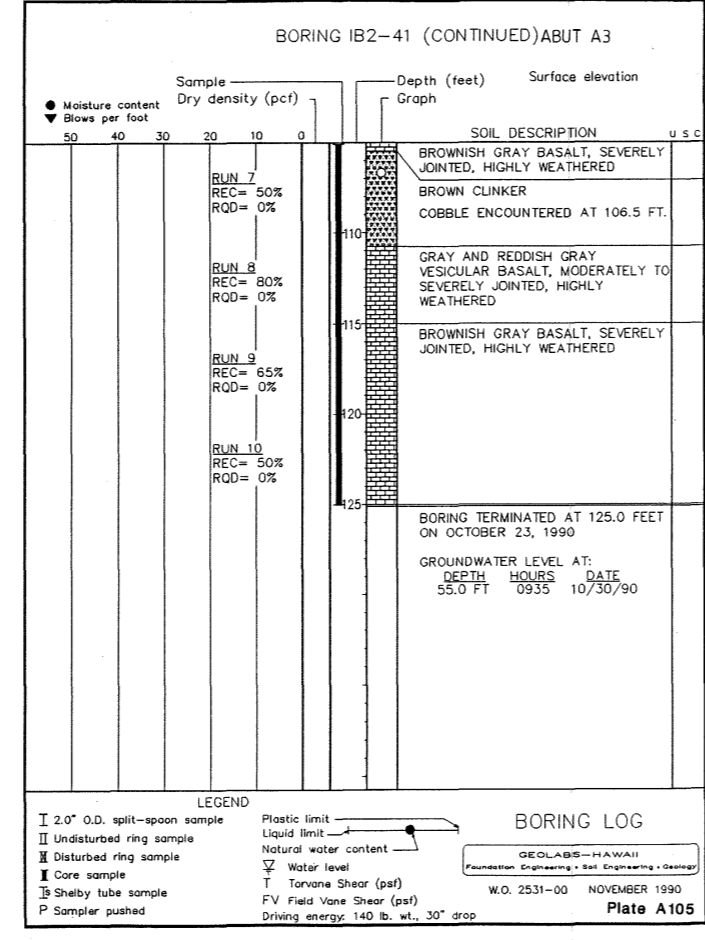
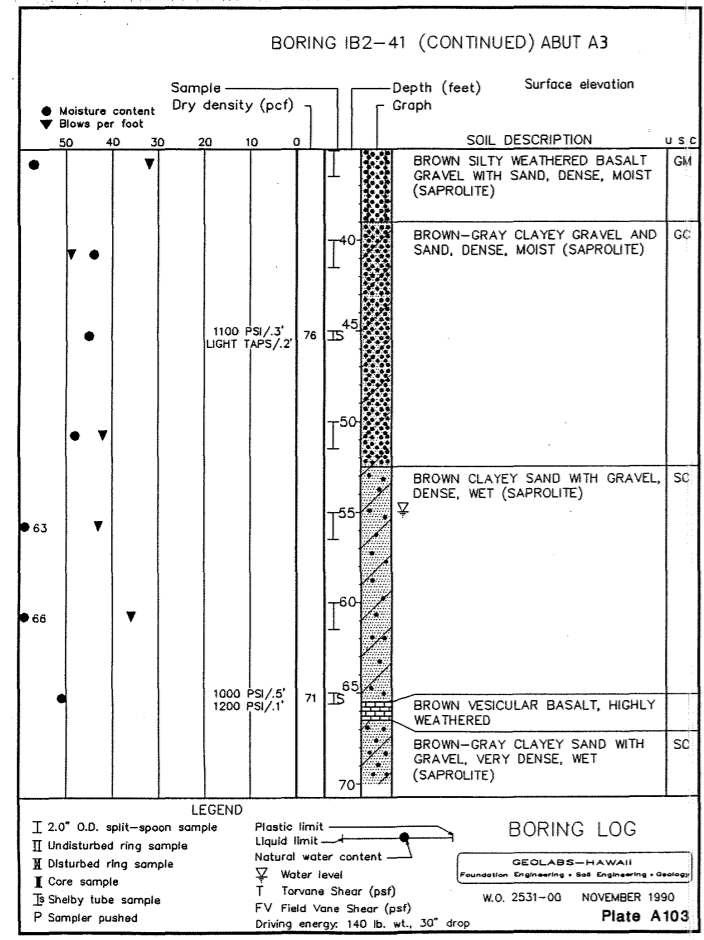
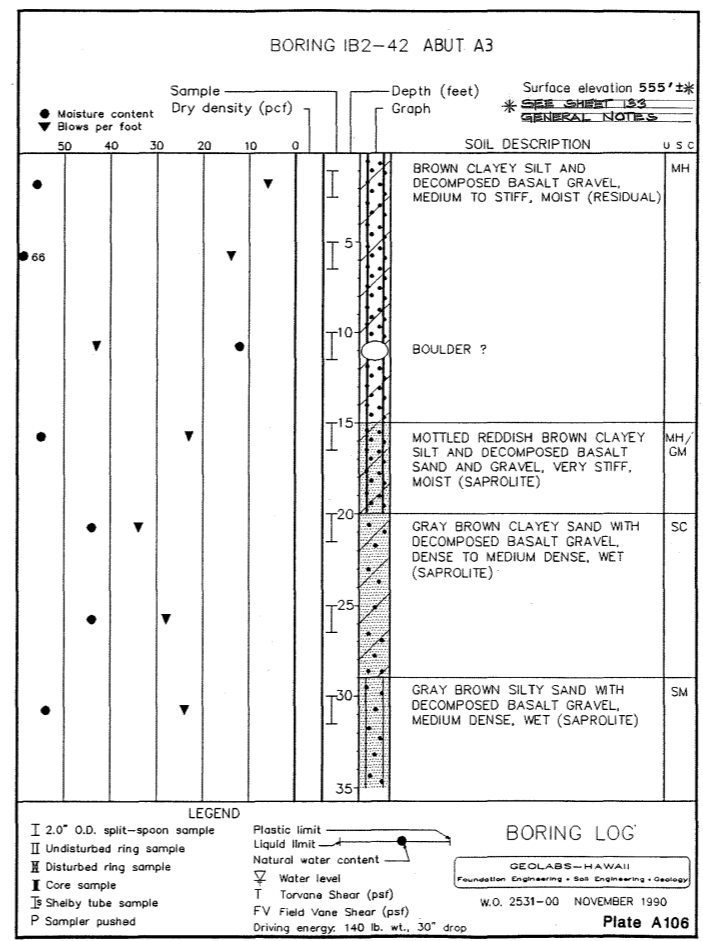
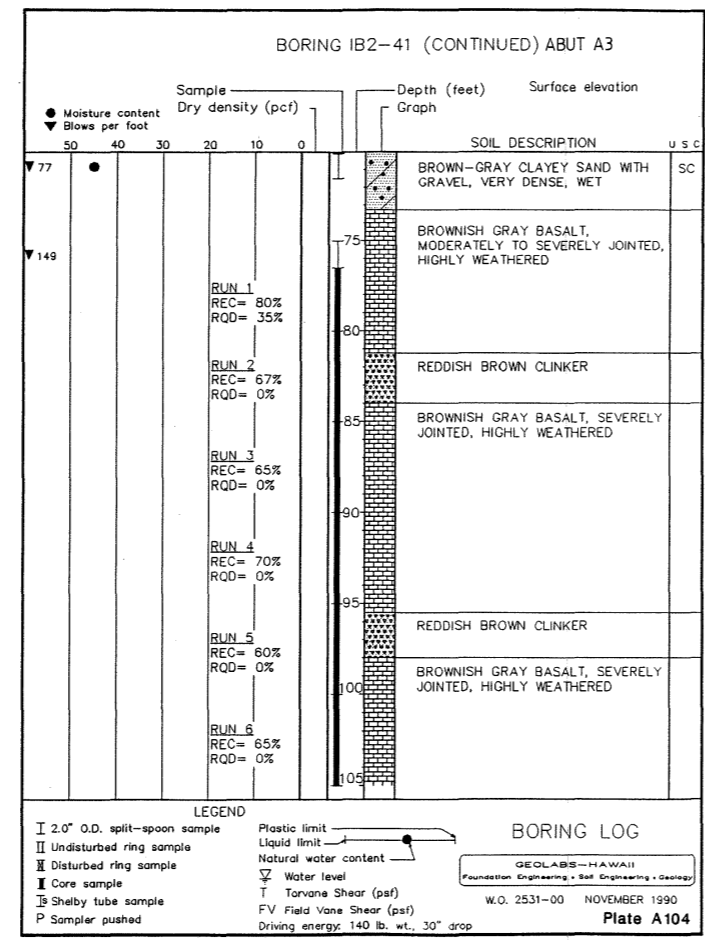
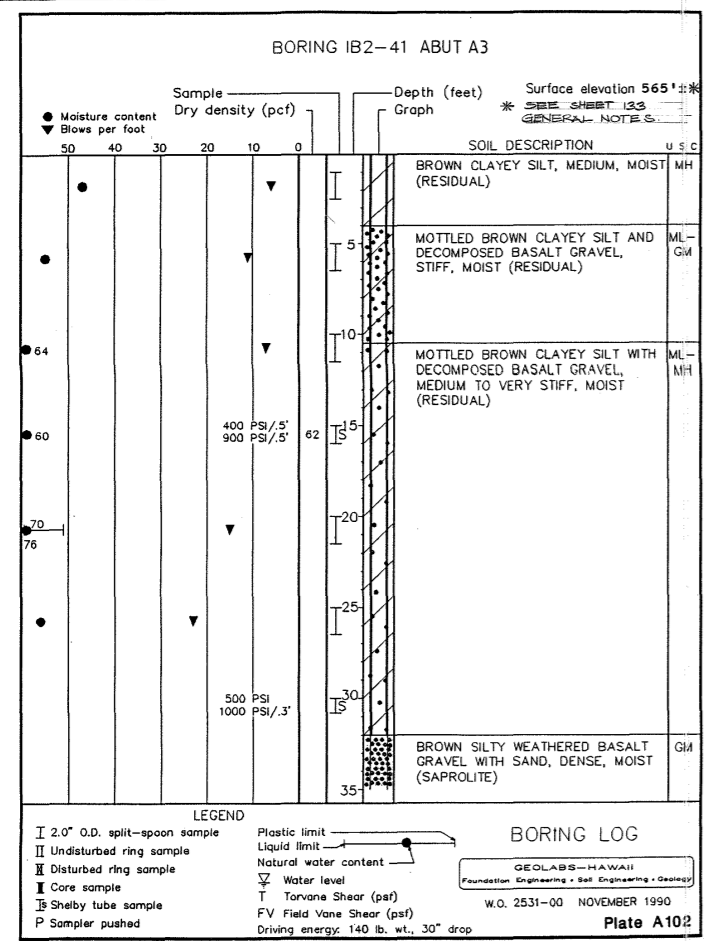
BORING LOGS

INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. I-H3-1(69) & (70)

SCALE: NONE DATE: AS NOTED

SHEET NO. 150 OF 225 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-(169)	1992	19	25



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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

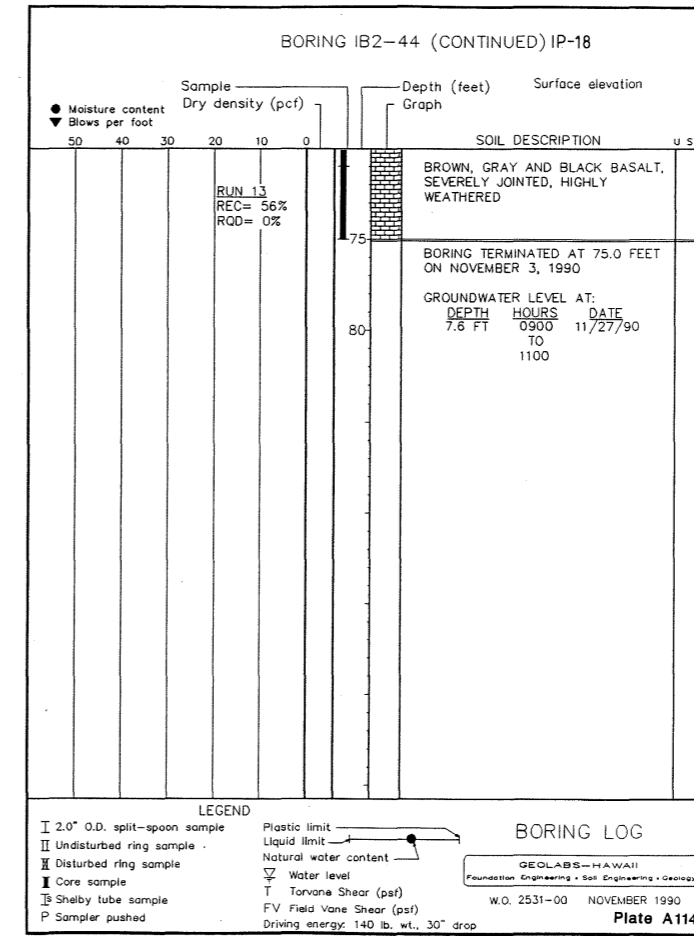
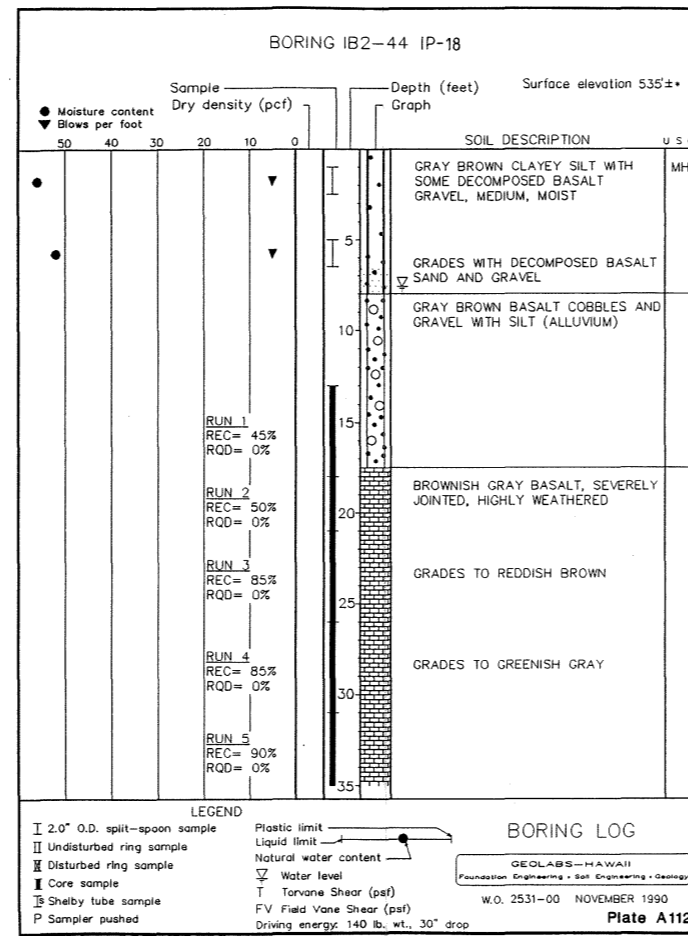
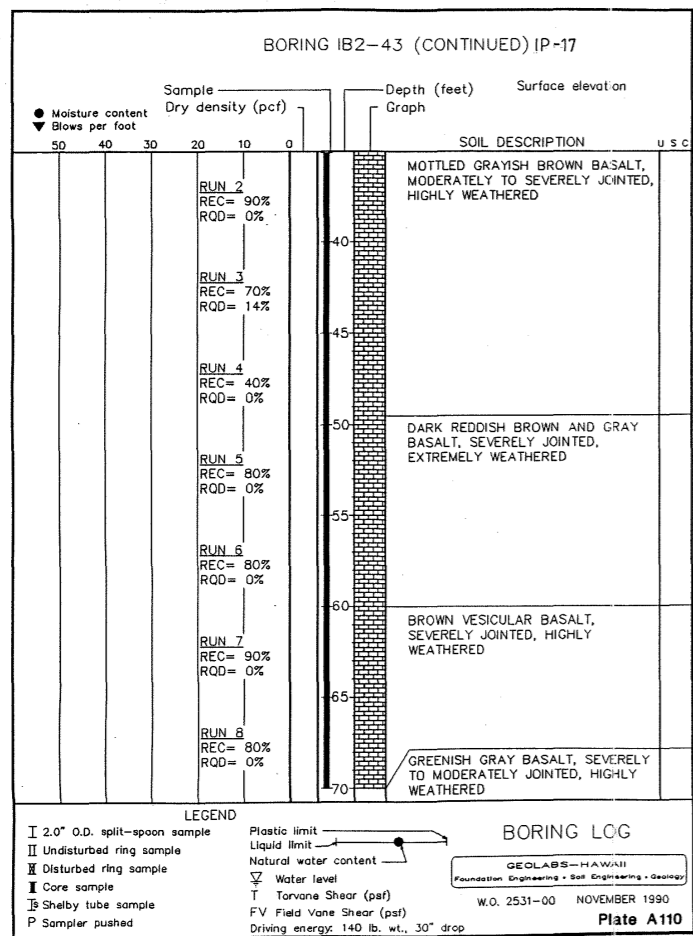
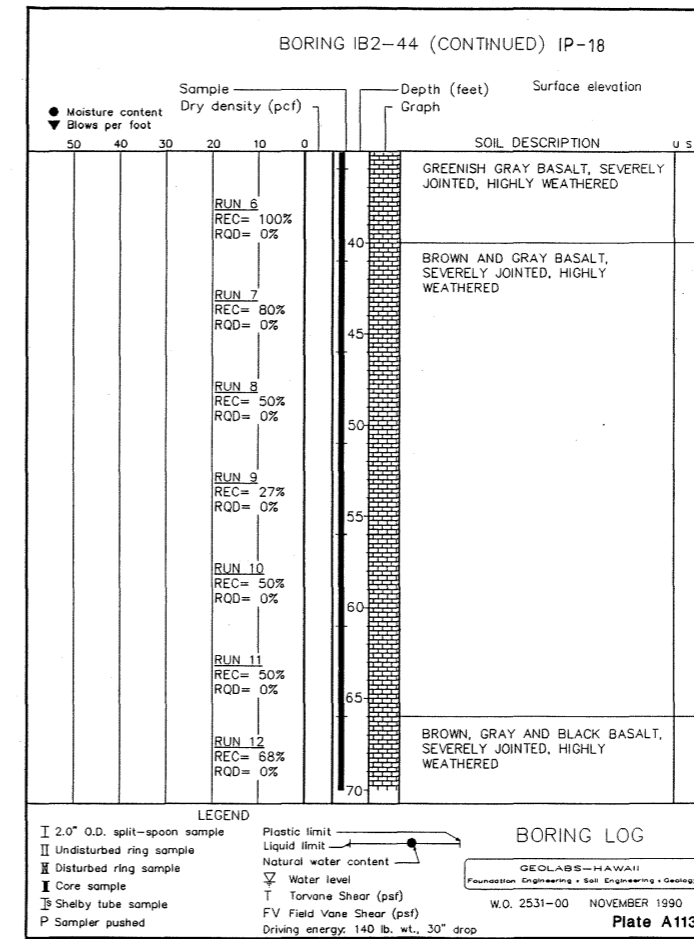
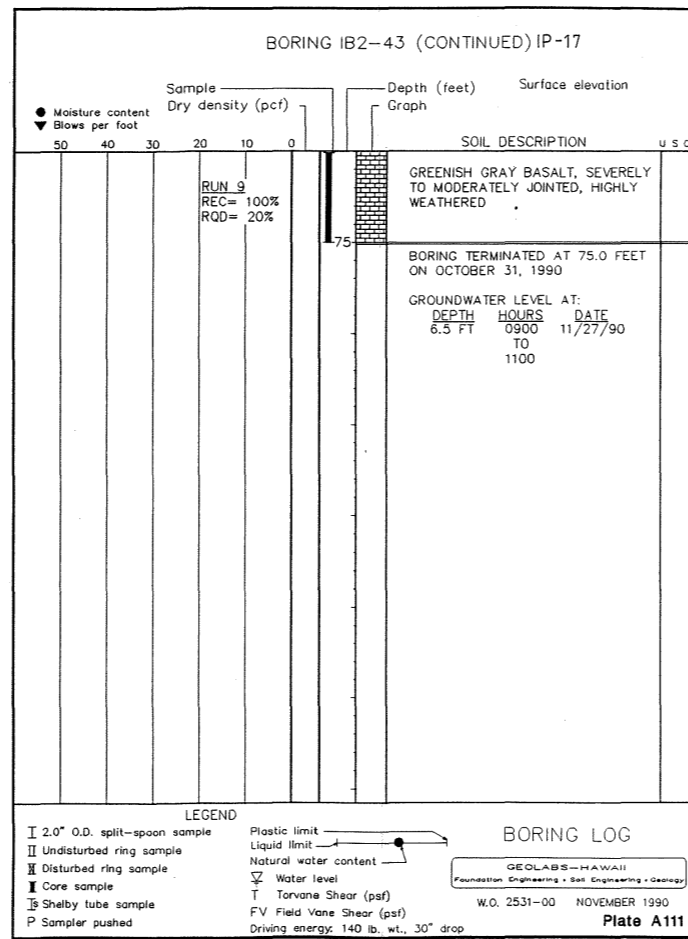
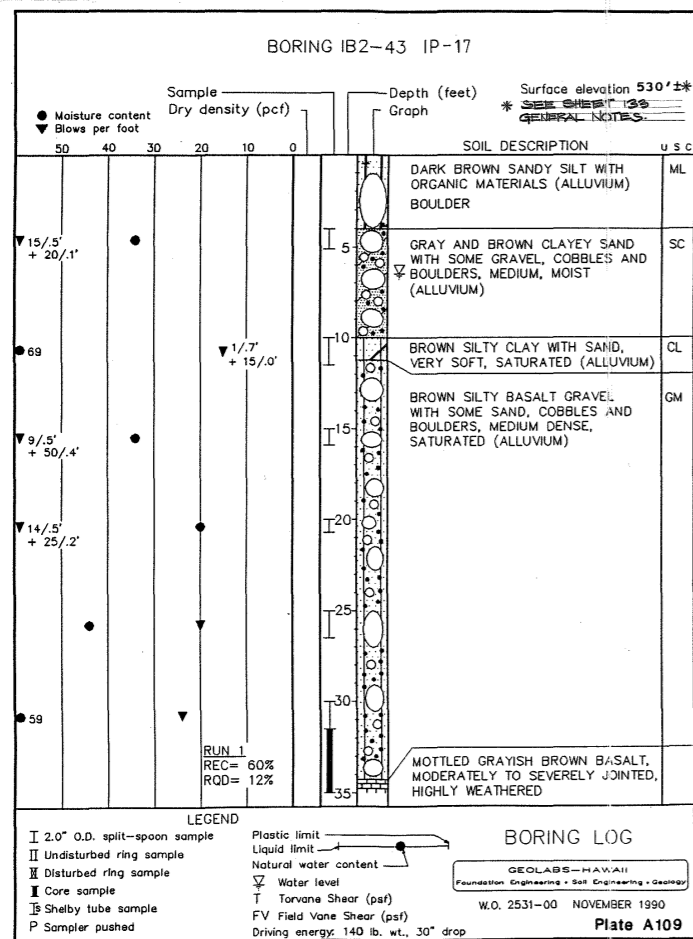
INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. I-H3-(169) & (70)

SCALE: NONE DATE: AS NOTED

SHEET NO. 19 OF 33 SHEETS

DATE
SURVEY PLOTTED BY
DRAWN BY
TRACED BY
DESIGNED BY
CHECKED BY
NO.

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	192	325



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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

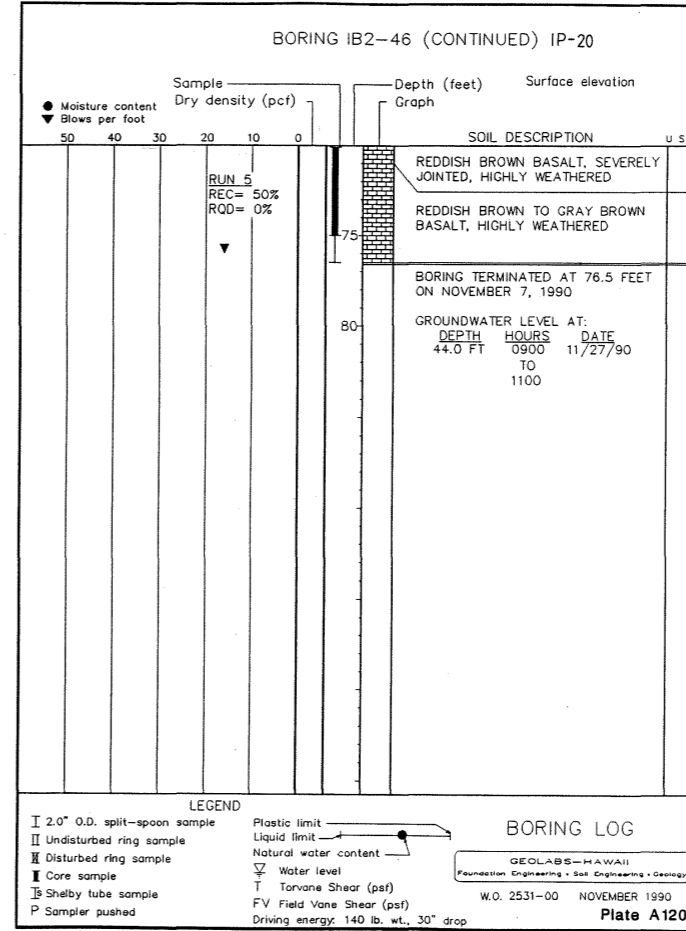
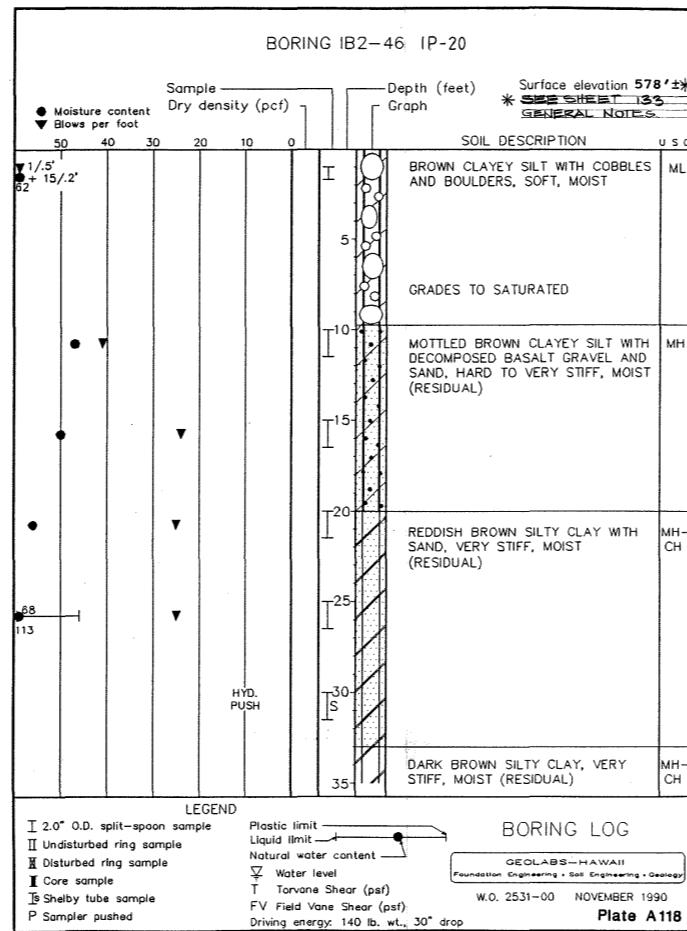
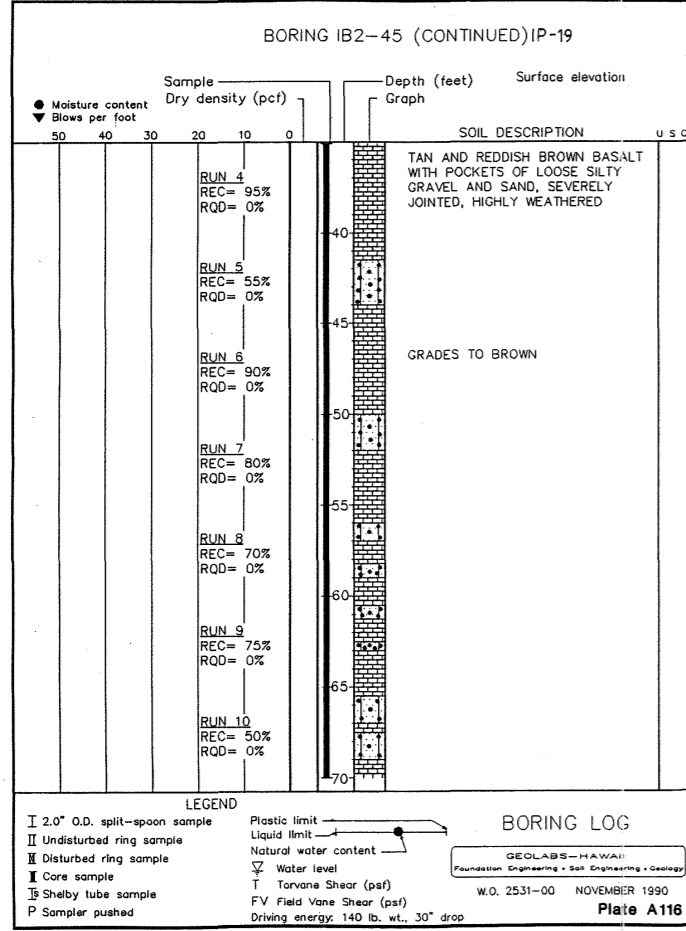
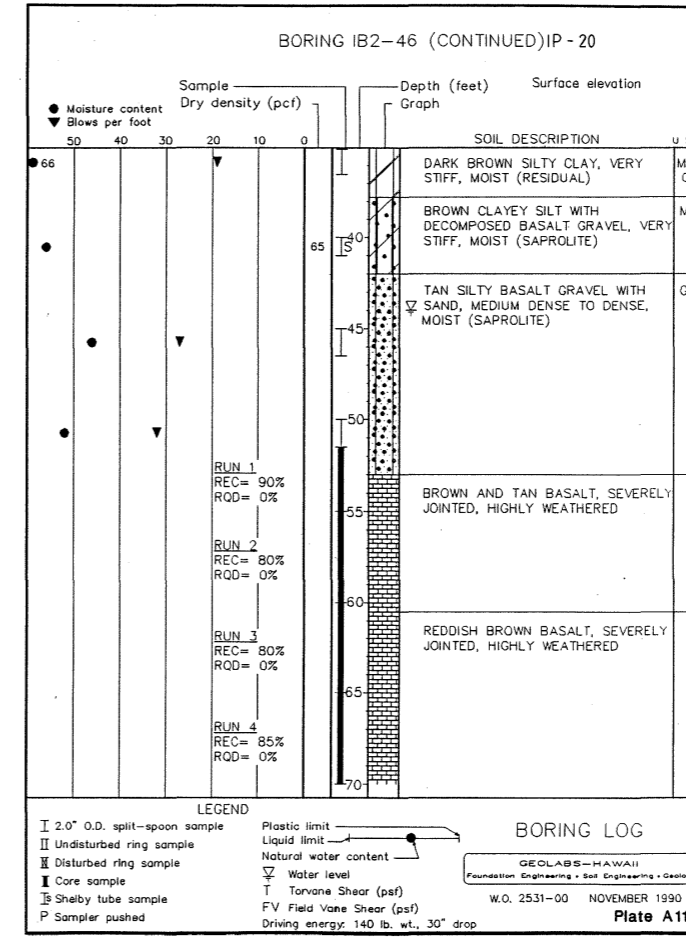
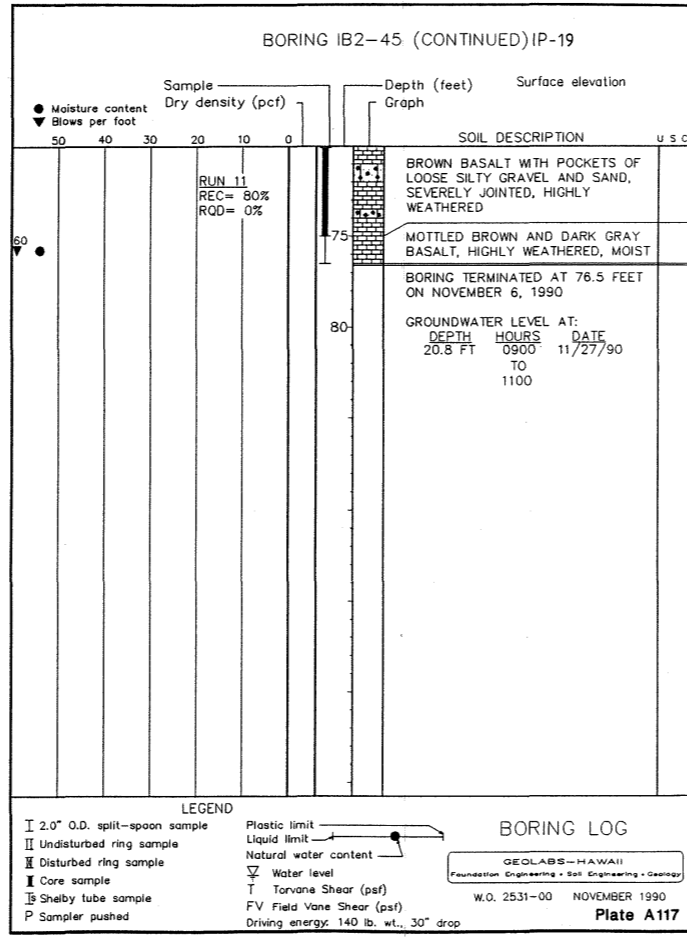
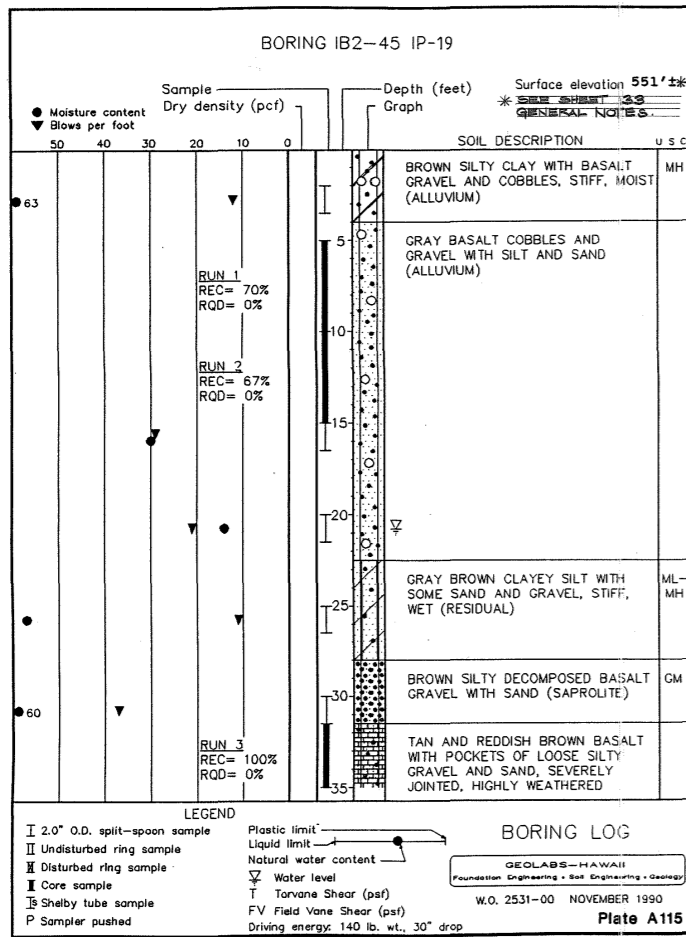
BORING LOGS

INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. I-H3-1(69) & (70)

SCALE: NONE DATE: AS NOTED

SHEET NO. 192 OF 325 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1-H3-1(69)	1992	122	325



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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

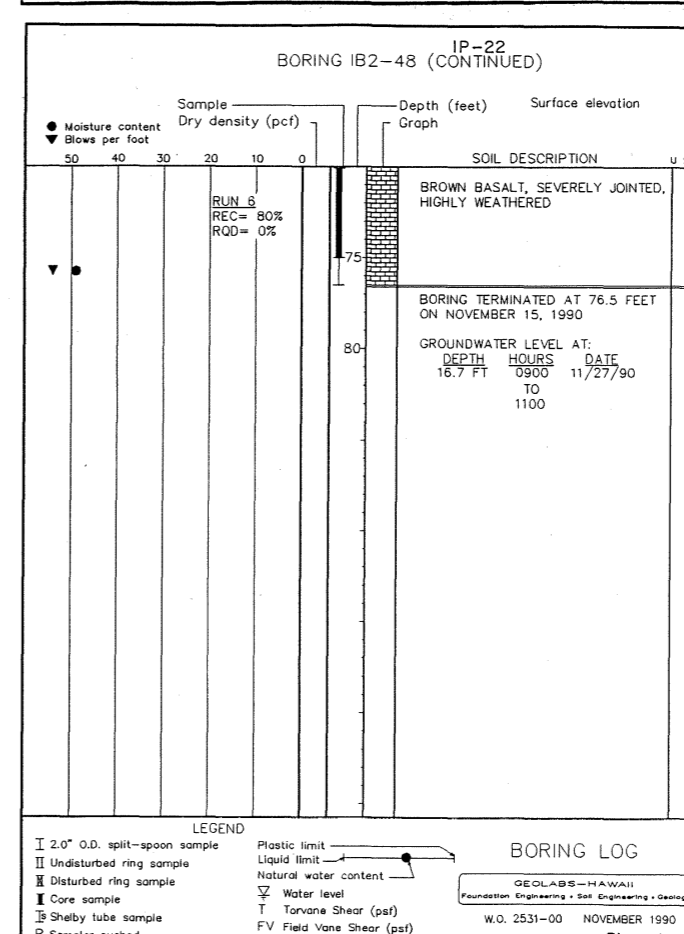
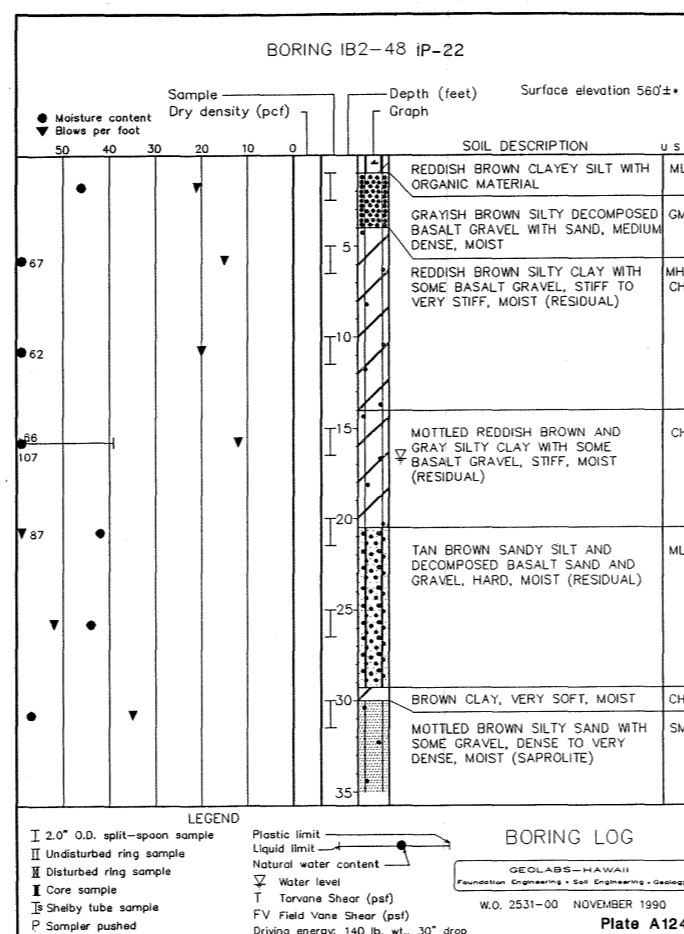
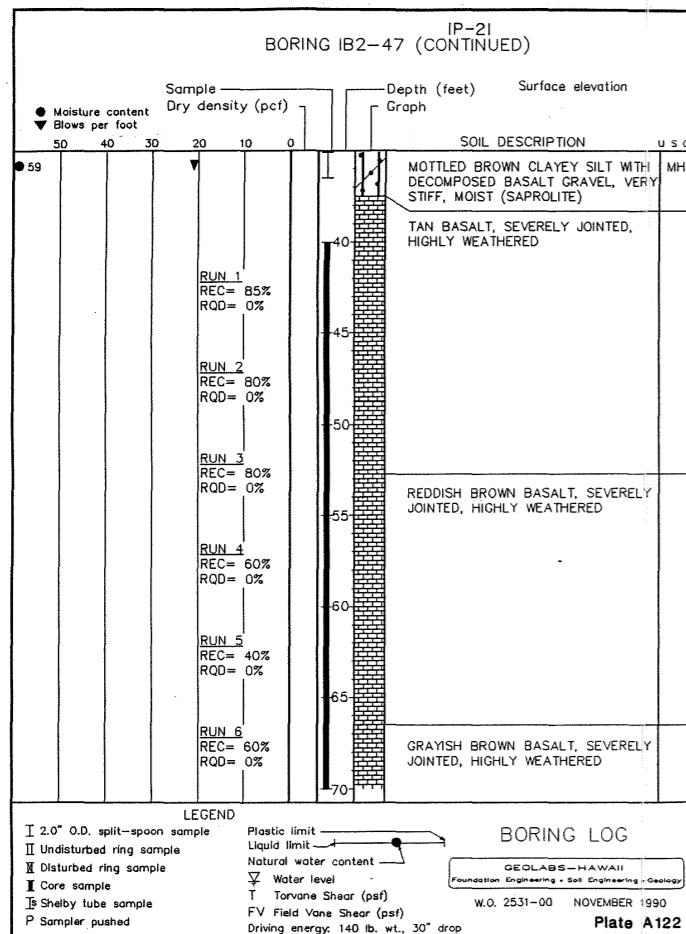
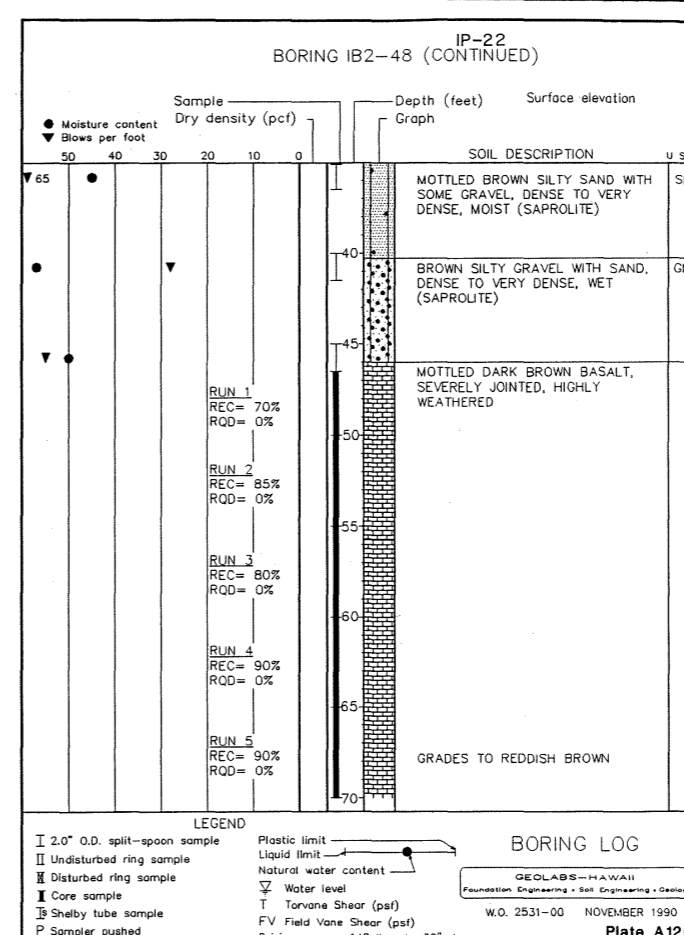
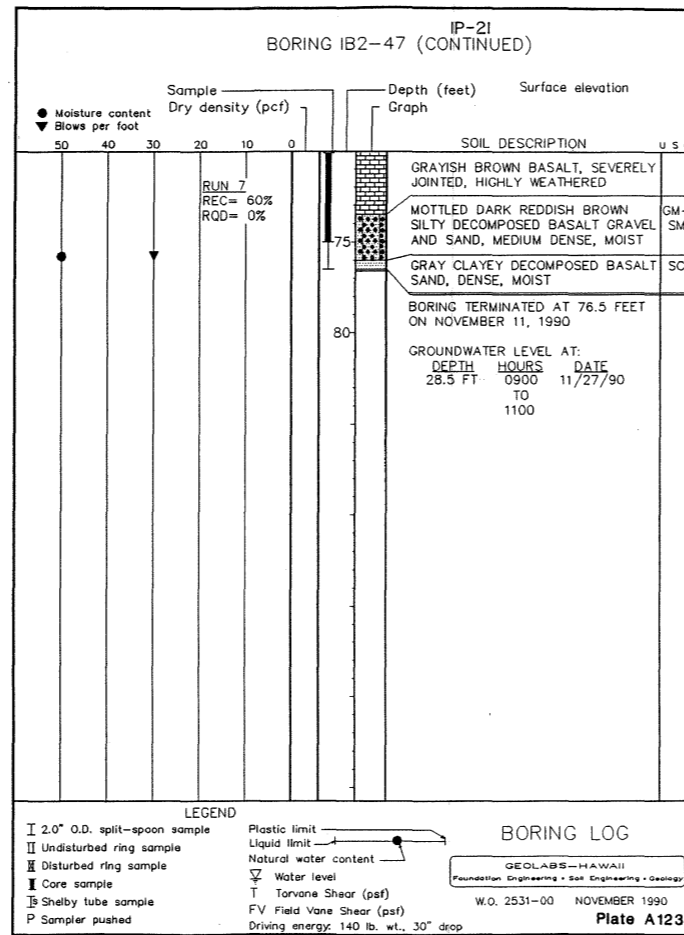
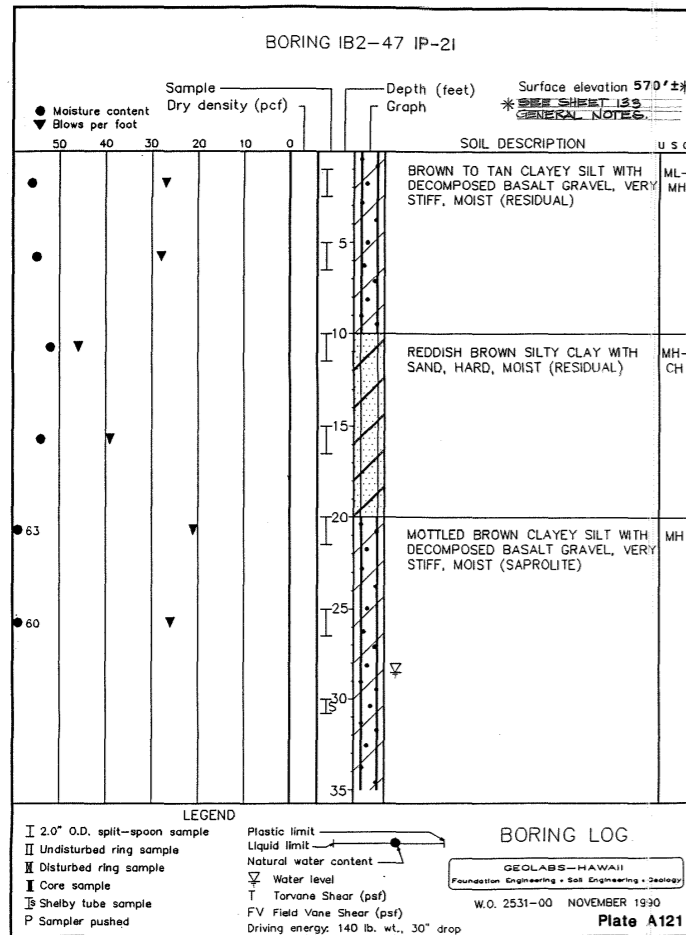
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F.A.I. PROJECT NO. 1-H3-1(69) & (70)

SCALE: NONE DATE: AS NOTED

SHEET No. 122 OF 325 SHEETS

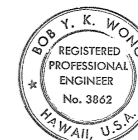
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DESIGNED BY	_____
NOTE BOOK	_____
QUANTITIES BY	_____
CHECKED BY	_____
NO.	_____

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	134	325



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SIGNATURE



STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

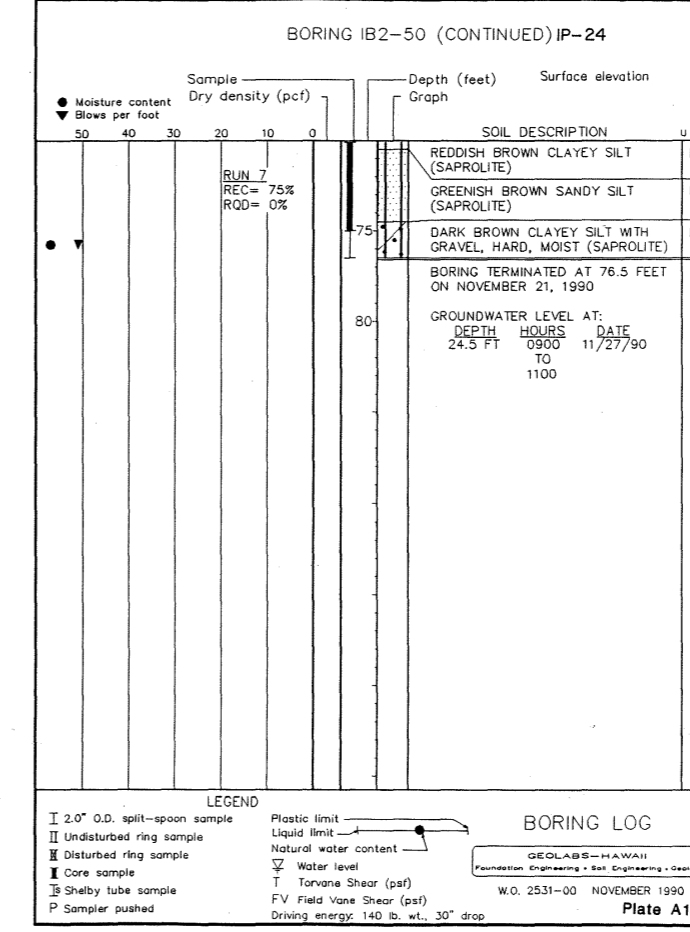
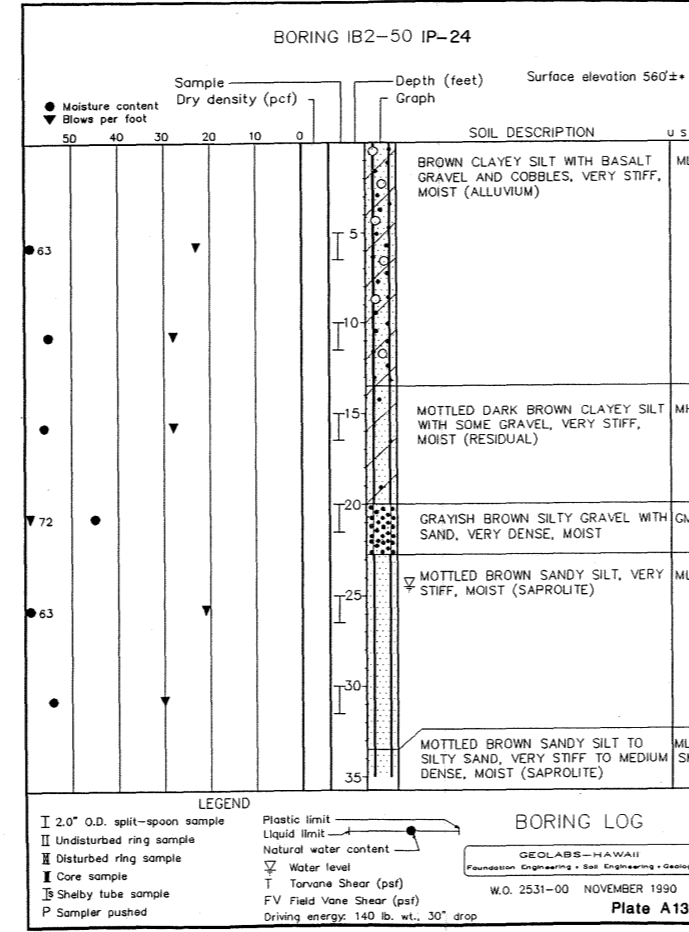
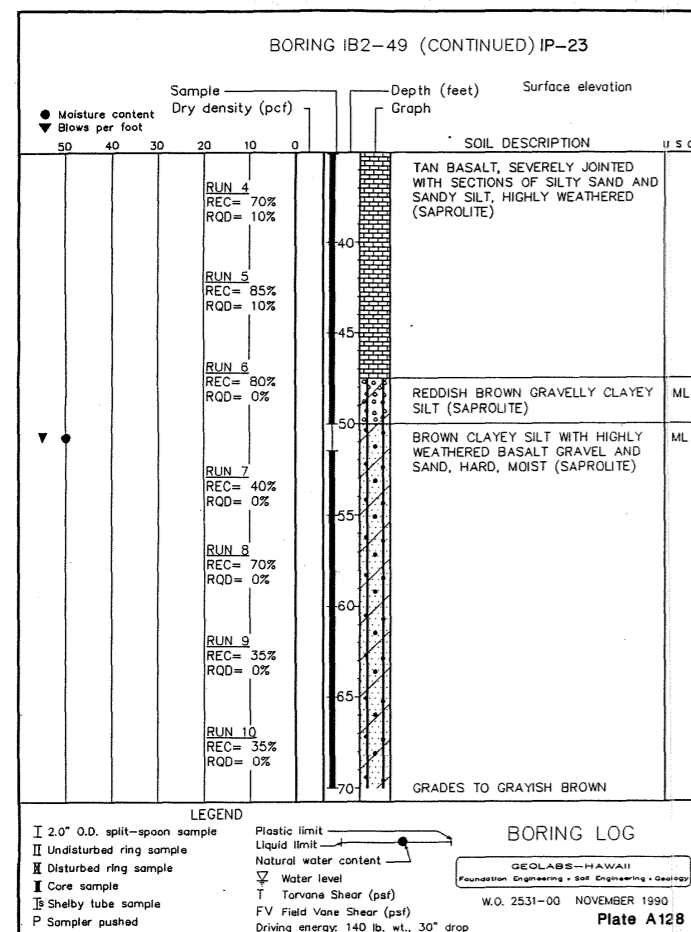
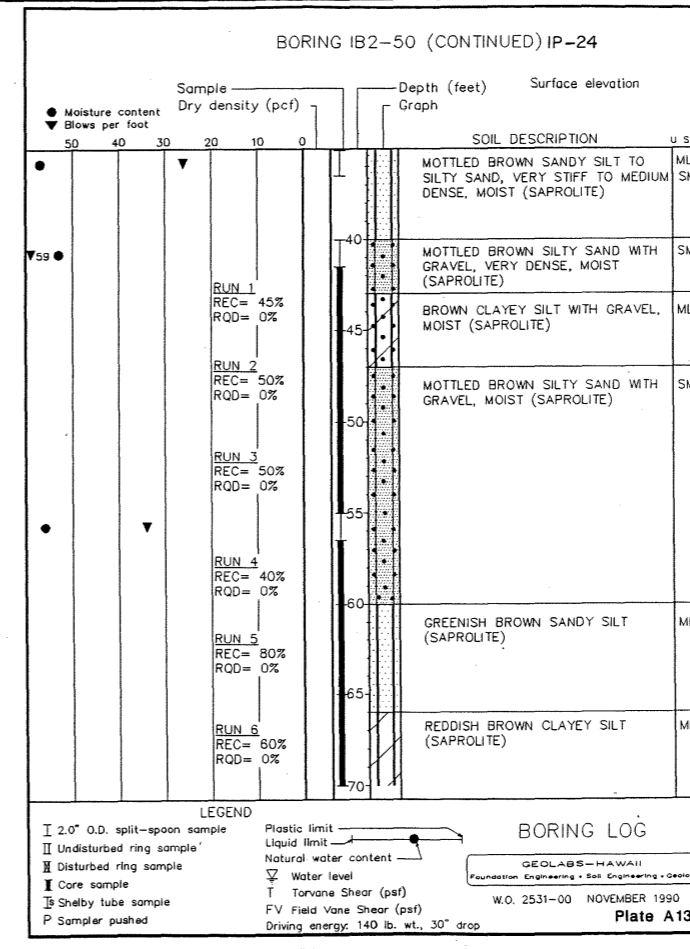
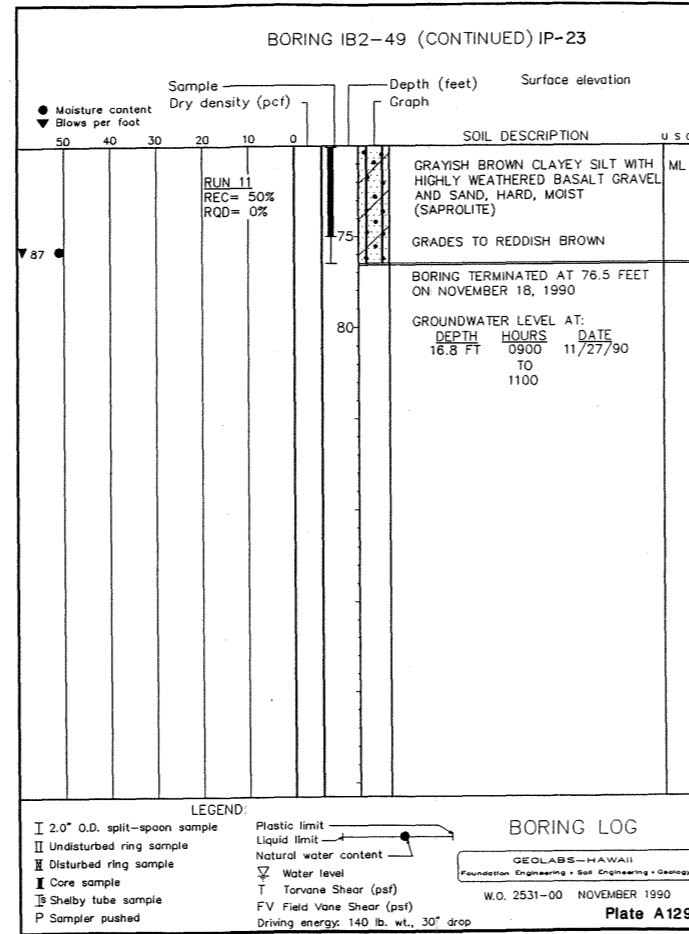
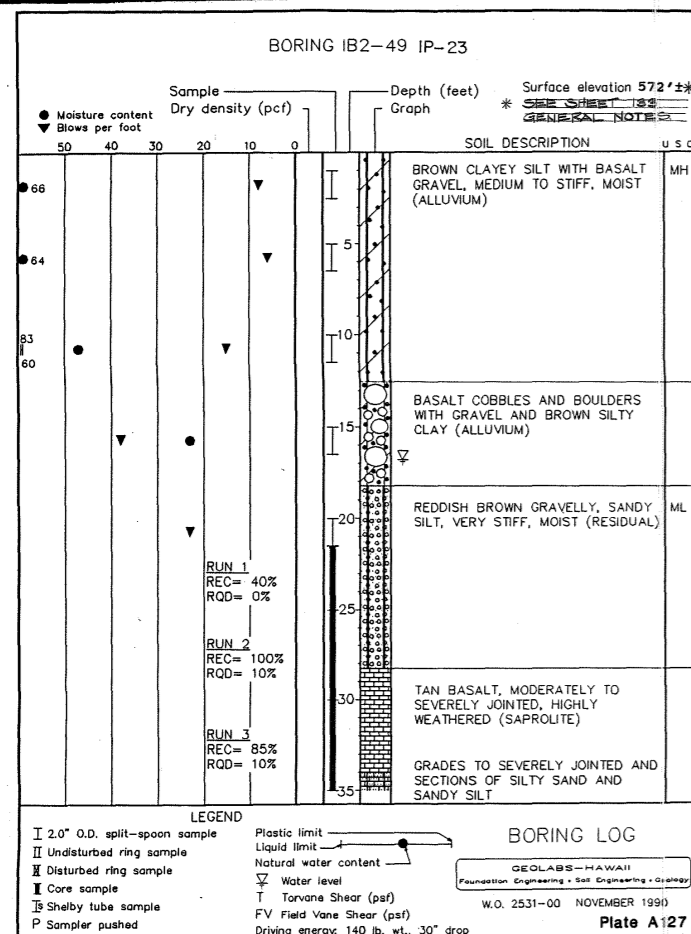
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INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. I-H3-1(69) & (70)

SCALE: NONE DATE: AS NOTED

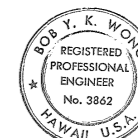
SHEET No. 134 OF 325 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	158	325



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Boyd K. Wong
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

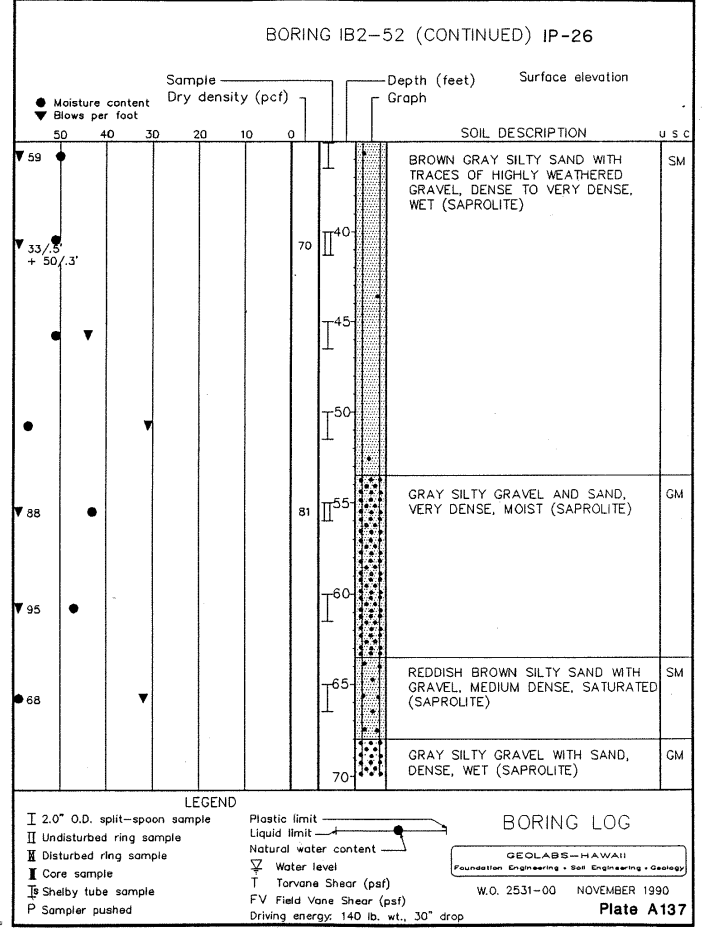
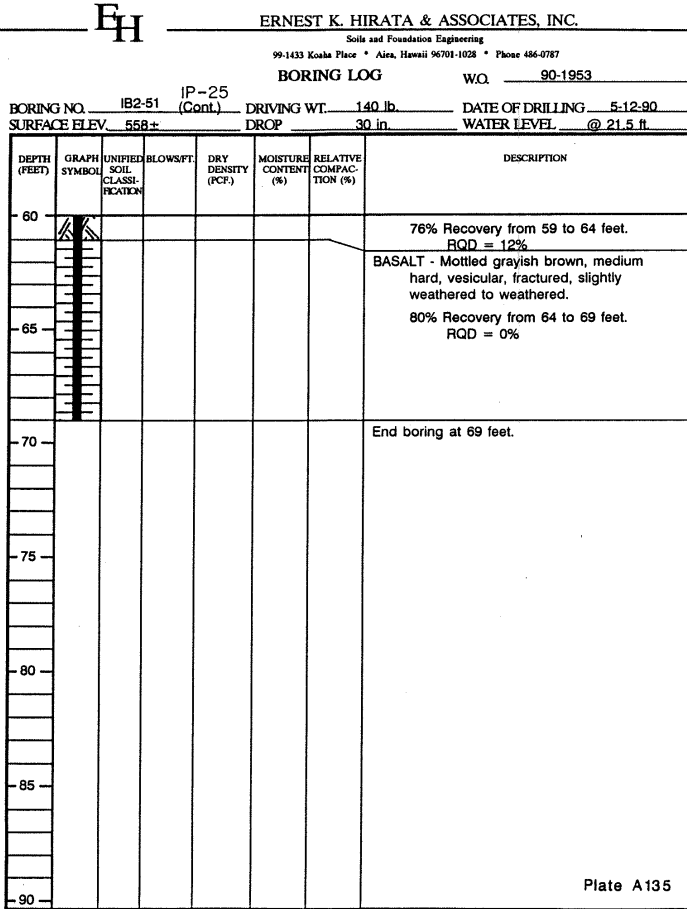
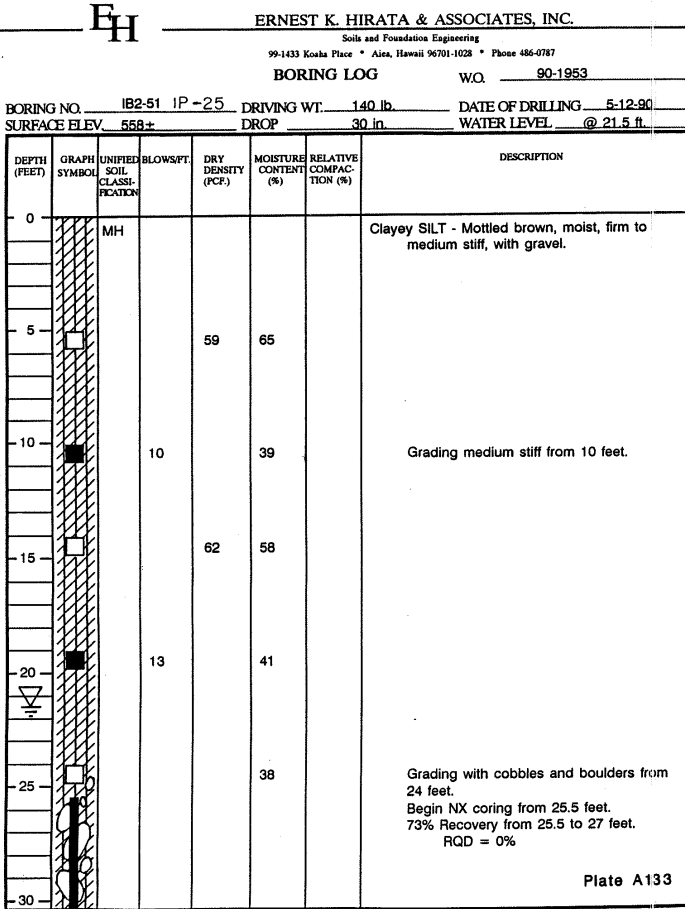
INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. I-H3-1(69) & (70)

SCALE: NONE

DATE: AS NOTED

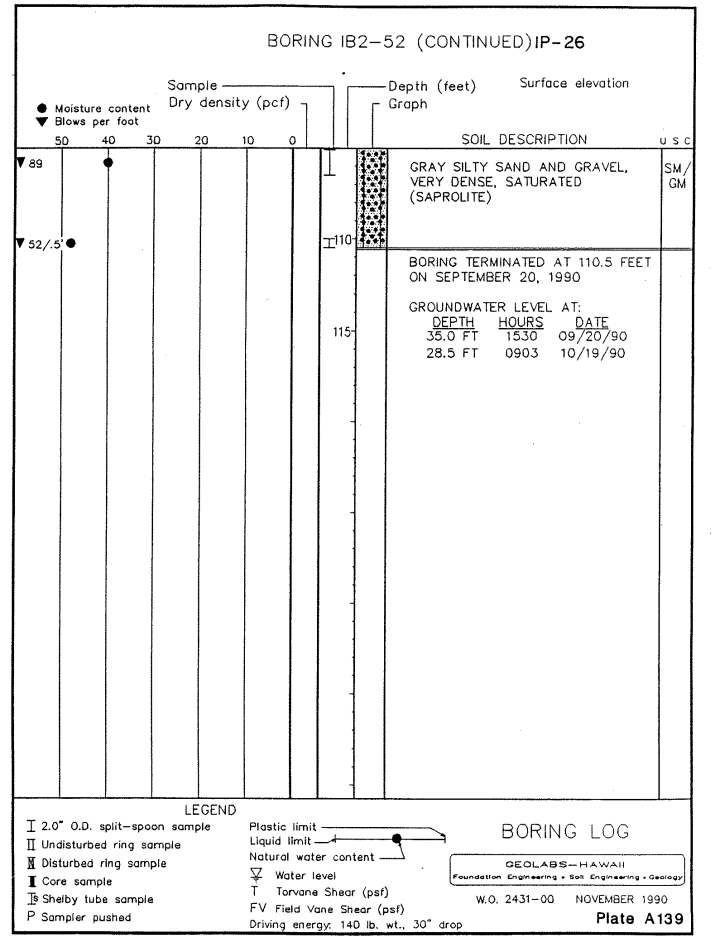
SHEET No. 158 OF 325 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	156	325



PAUL S. MORIMOTO
REGISTERED PROFESSIONAL ENGINEER
No. 5299
HAWAII, U.S.A.

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Paul S. Morimoto
Signature



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SIGNATURE

BOB Y. K. WONG
REGISTERED PROFESSIONAL ENGINEER
No. 3862
HAWAII, U.S.A.

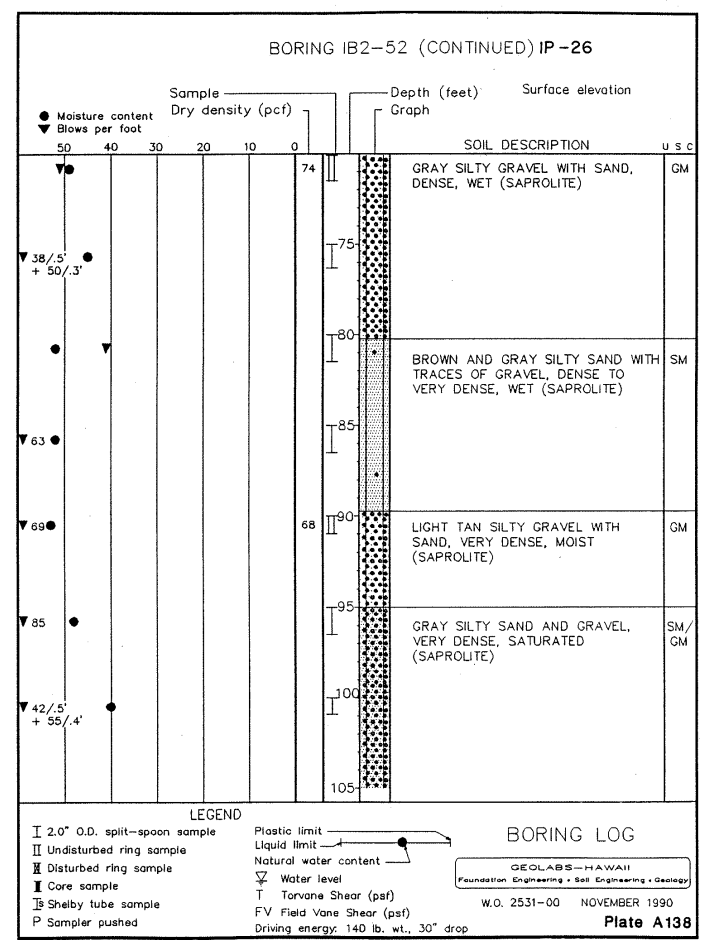
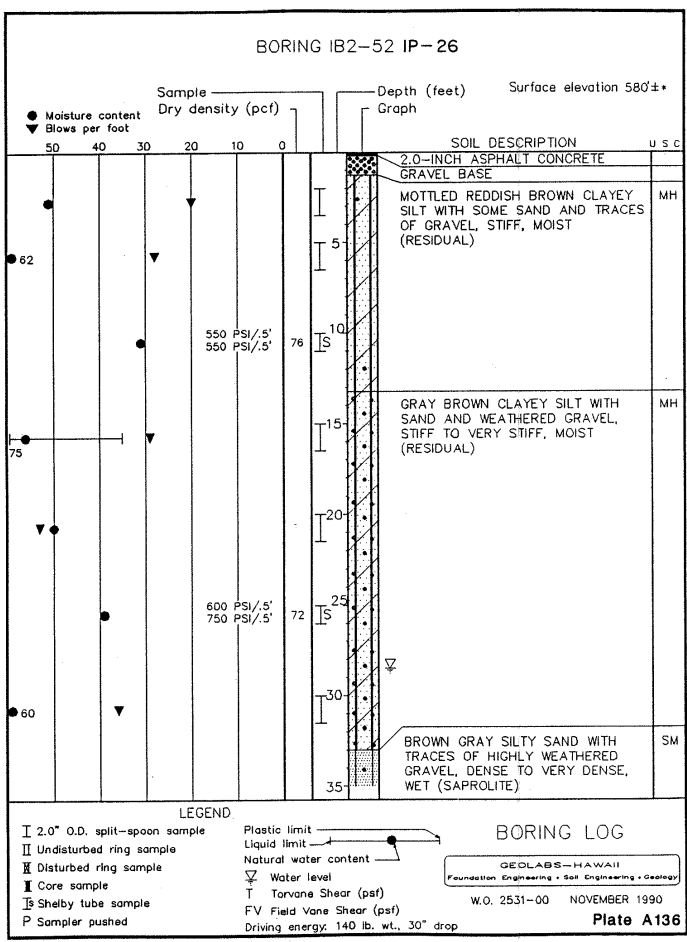
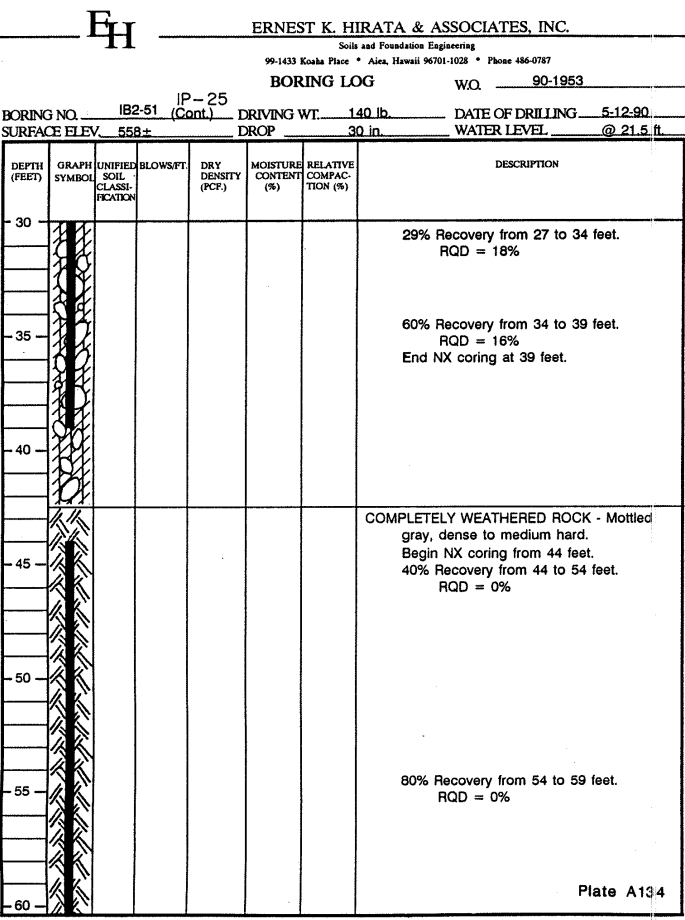
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. I-H3-1(69) & (70)

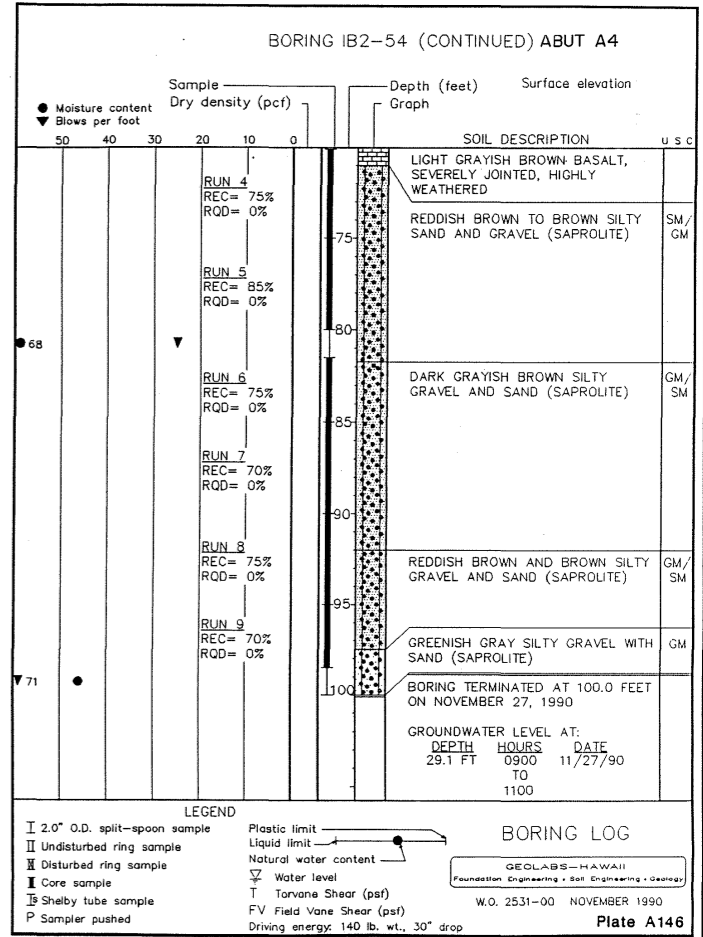
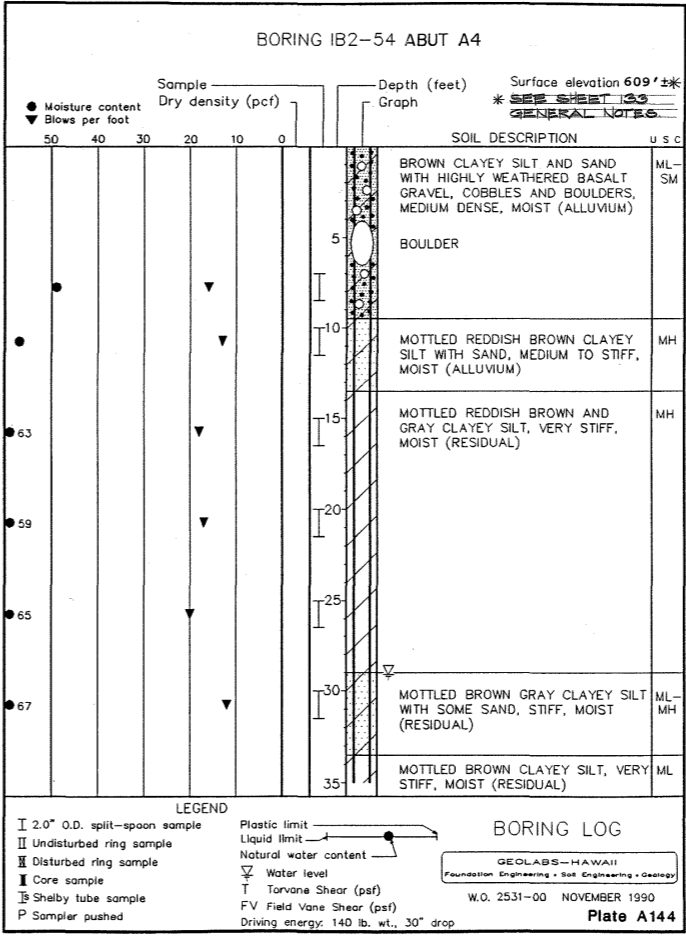
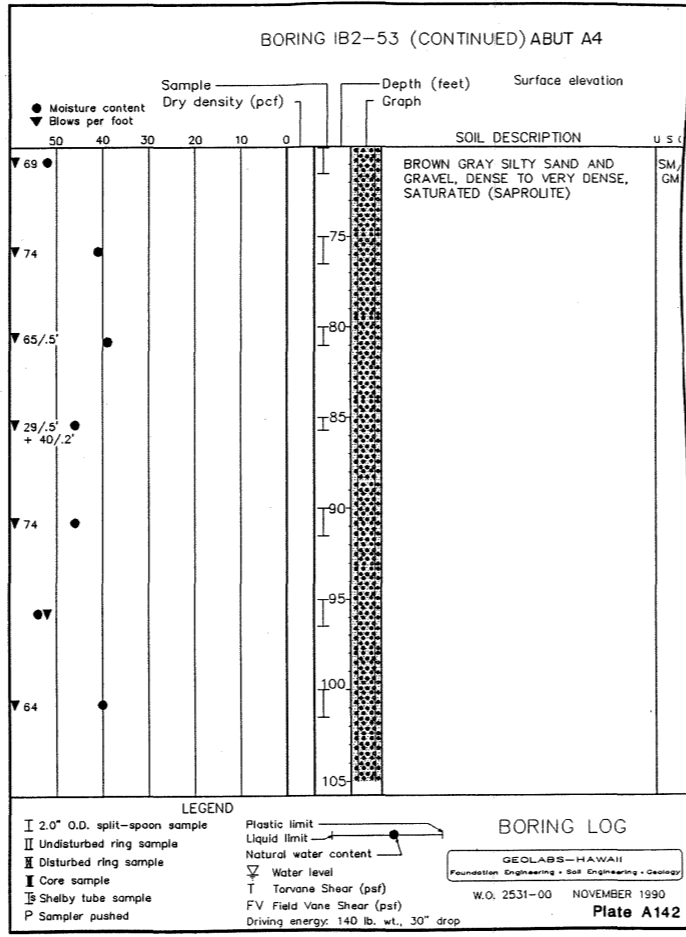
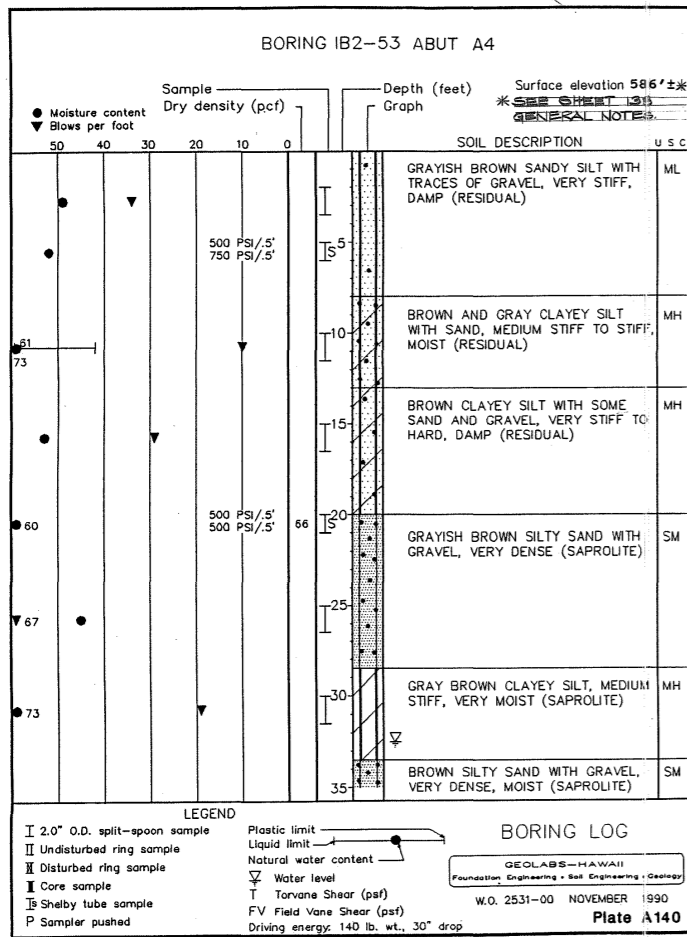
SCALE: NONE DATE: AS NOTED

SHEET NO. 156 OF 33 SHEETS



DATE _____
SURVEY PLOTTED BY _____
DRAWN BY _____
TRACED BY _____
DESIGNED BY _____
CHECKED BY _____
NOTE BOOK _____
NO. _____

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	187	325



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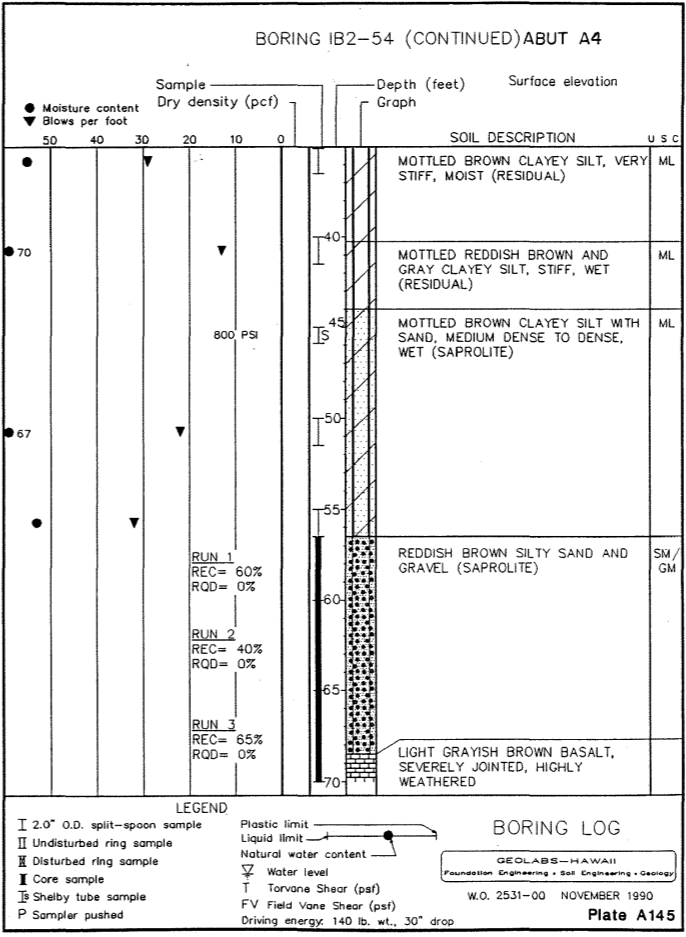
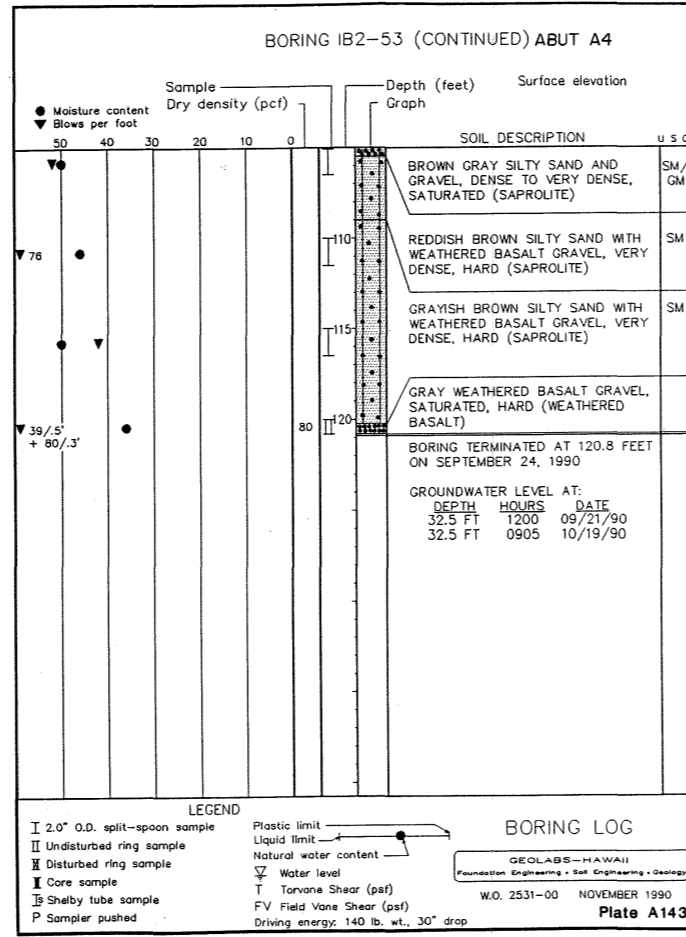
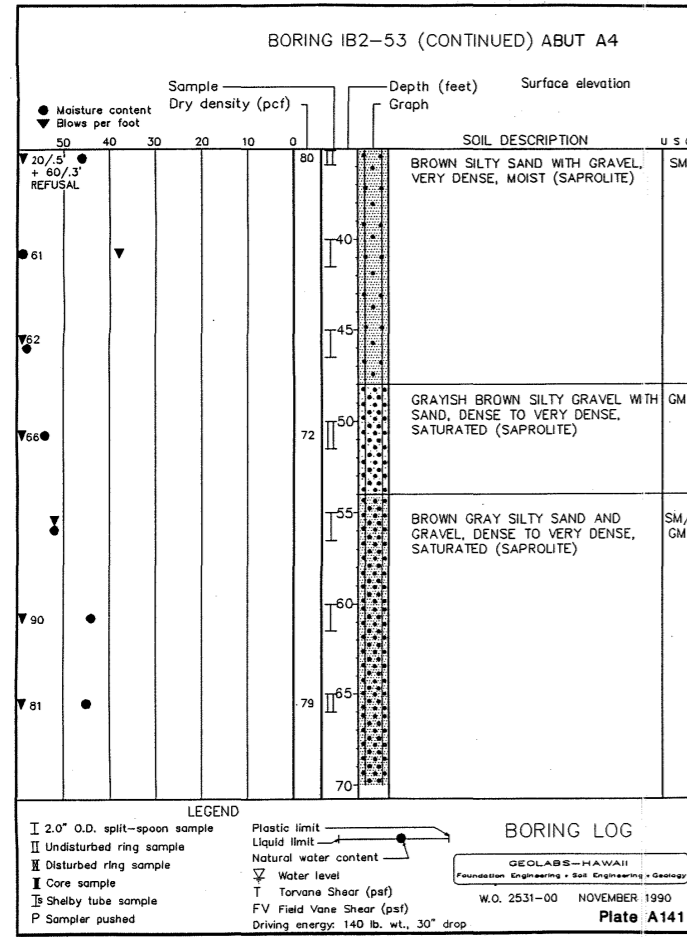
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. I-H3-(169) & (70)

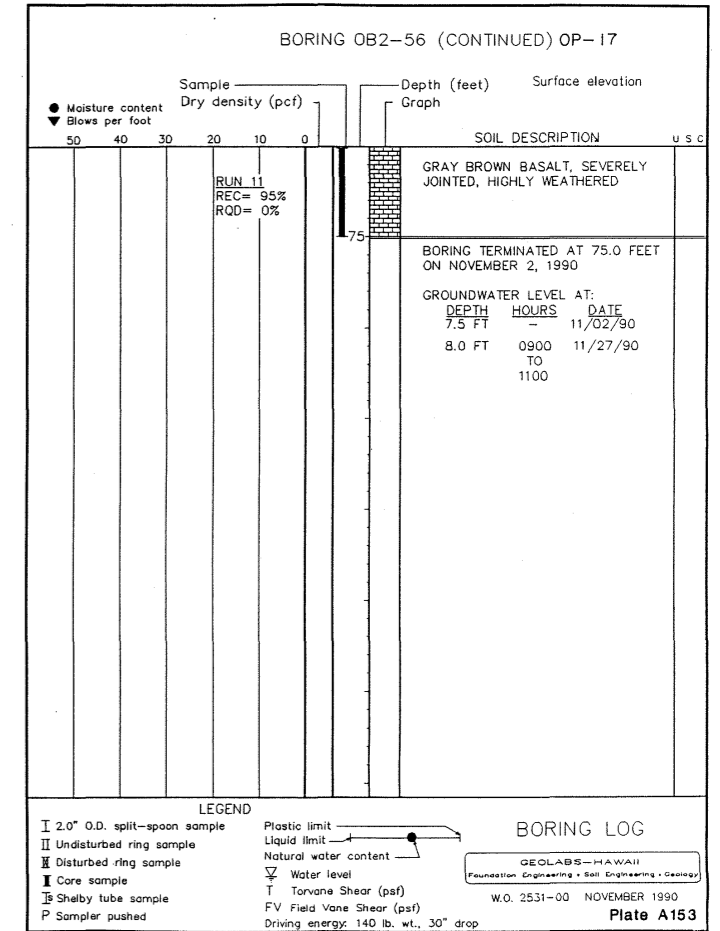
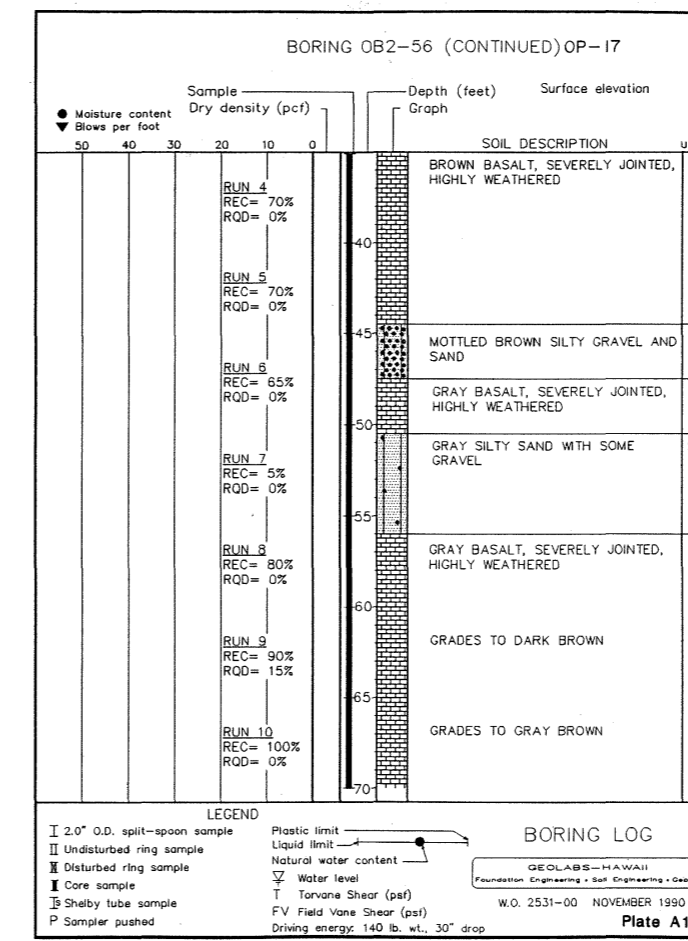
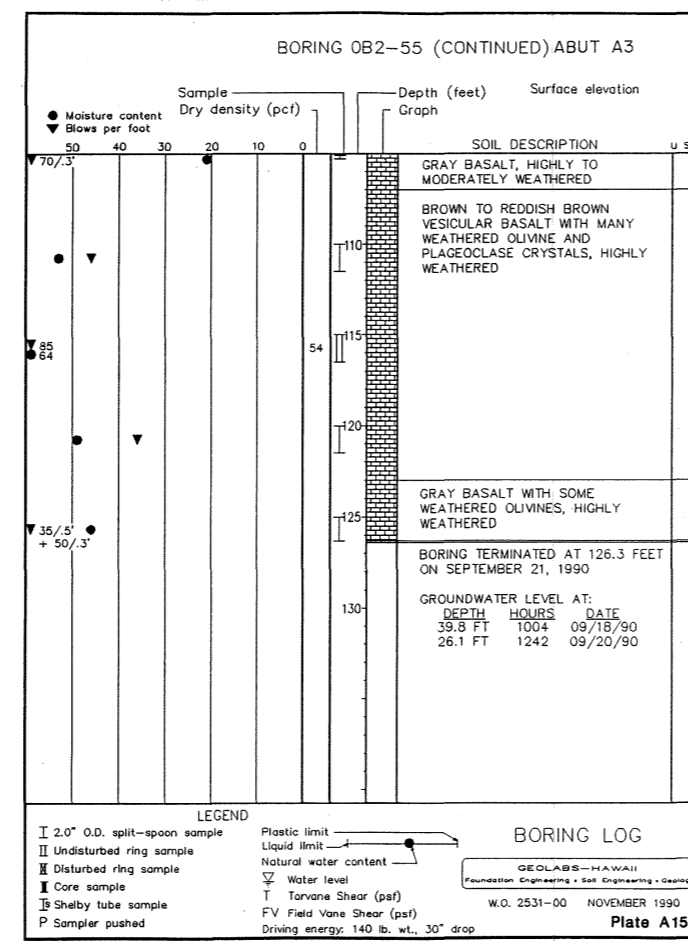
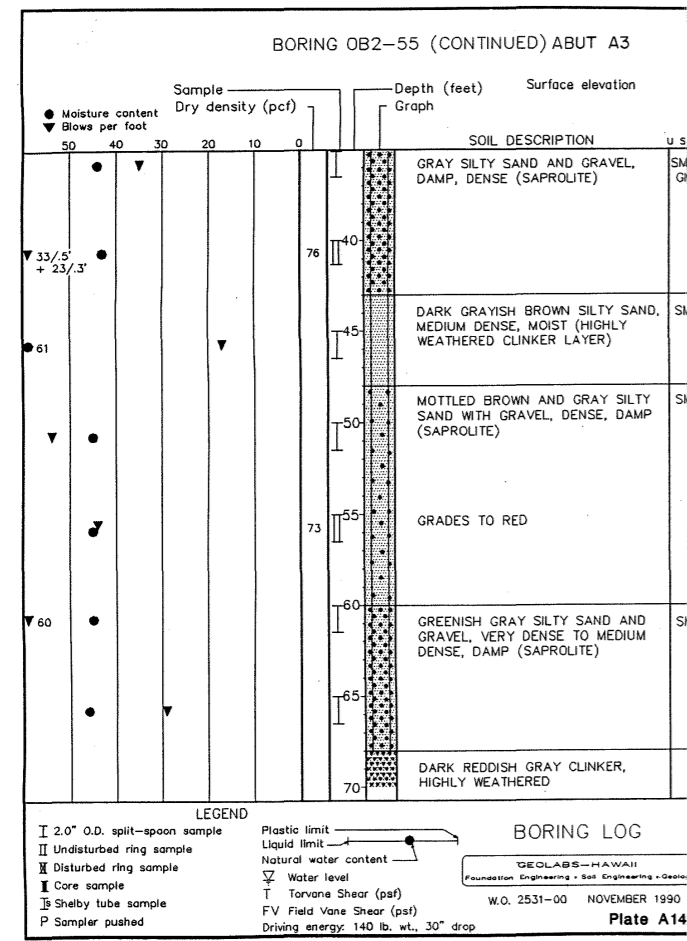
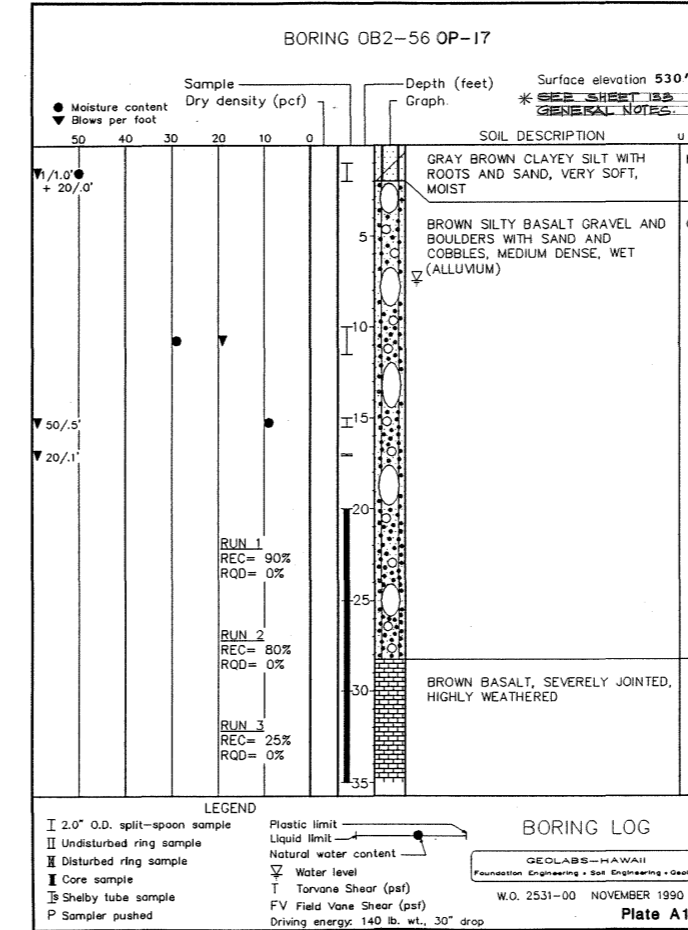
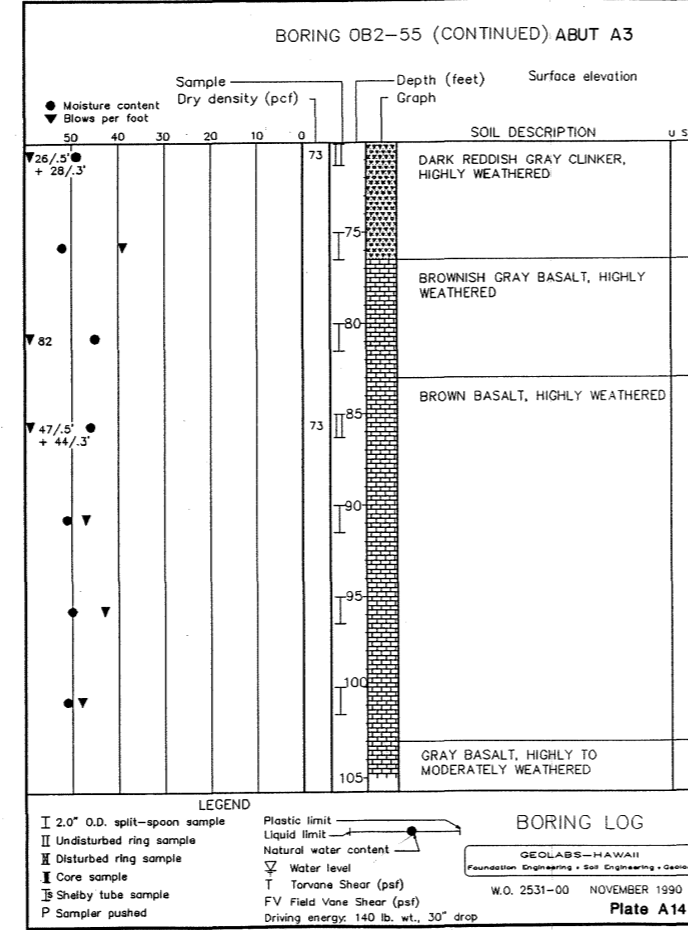
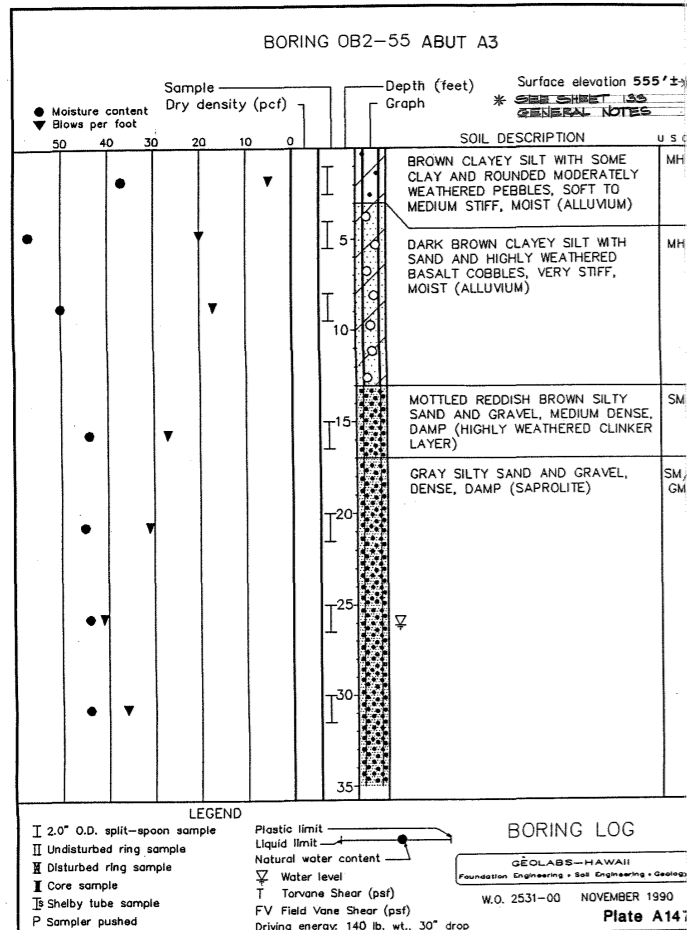
SCALE: NONE DATE: AS NOTED

SHEET NO. 187 OF 325 SHEETS



DATE: _____
SURVEY PLOTTED BY: _____
DRAWN BY: _____
TRACED BY: _____
NOTE BOOK: _____
QUANTITIES BY: _____
CHECKED BY: _____
No. _____

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	150	325



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DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

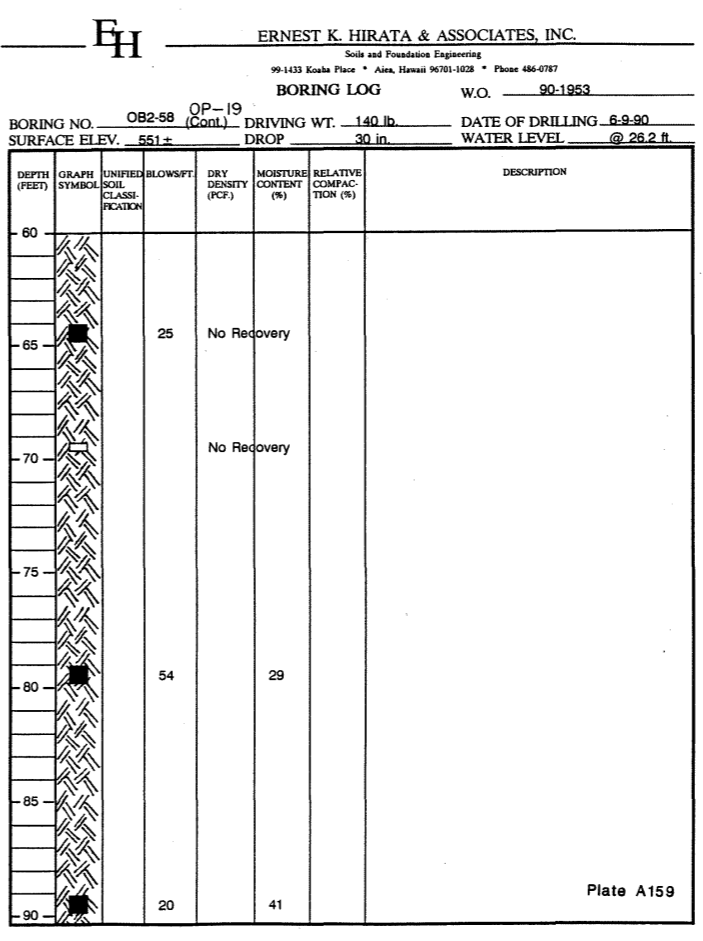
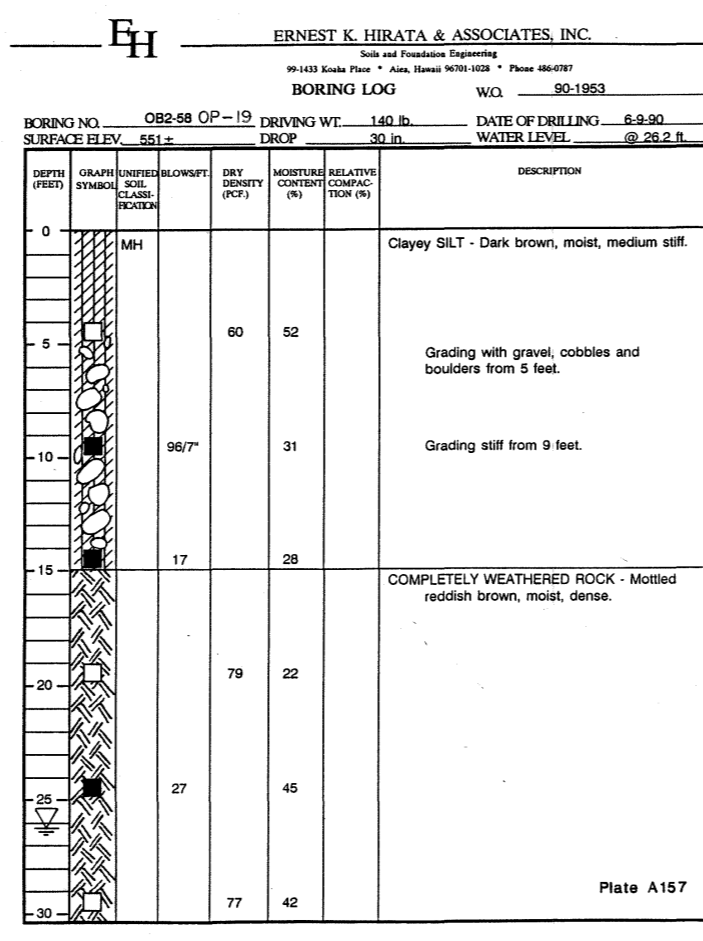
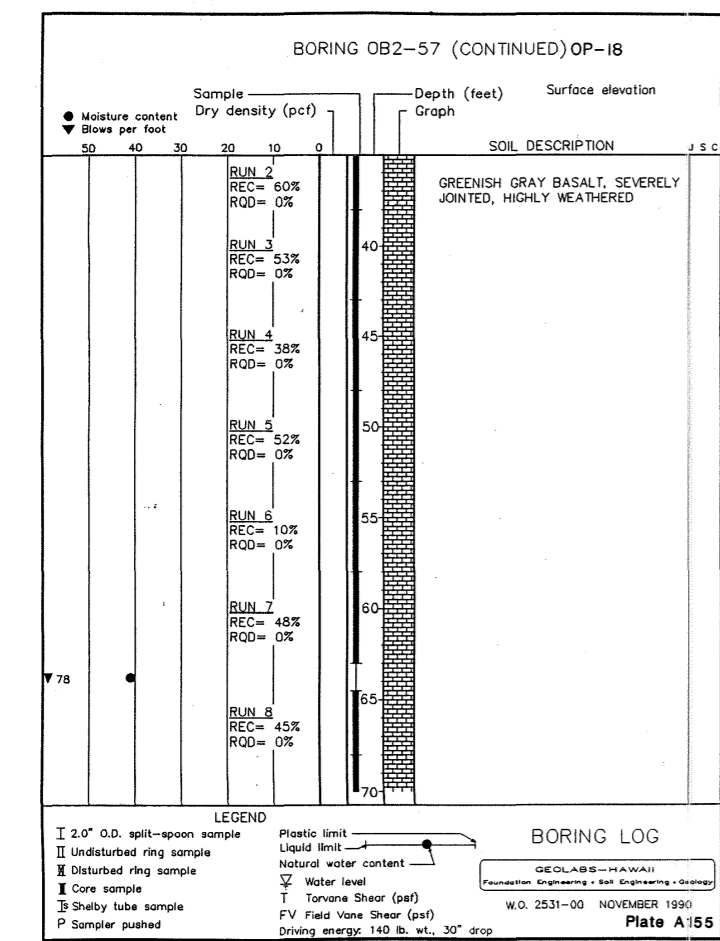
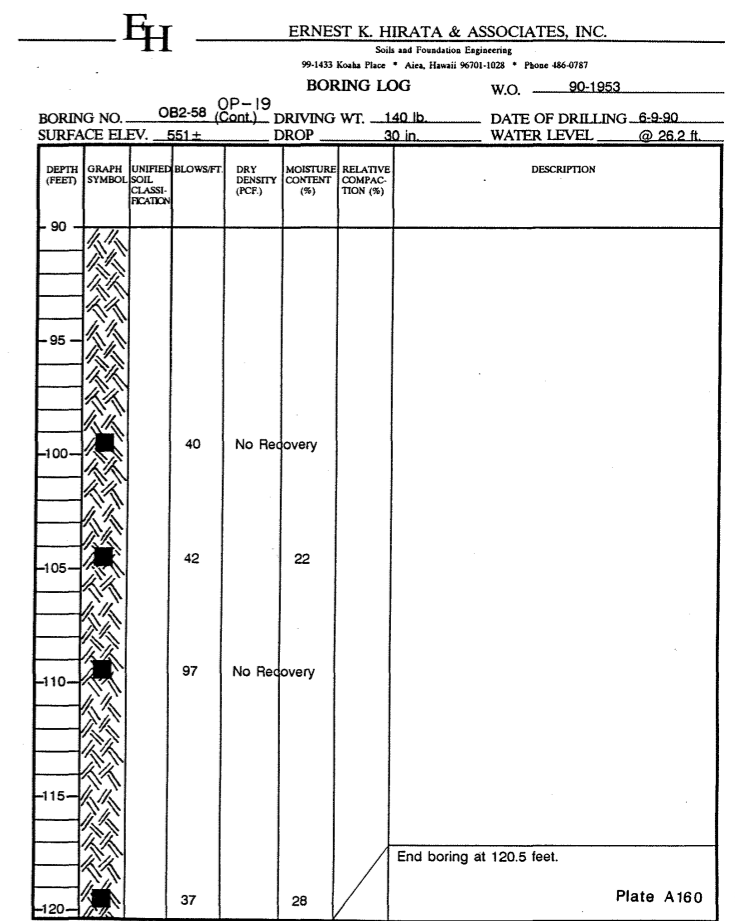
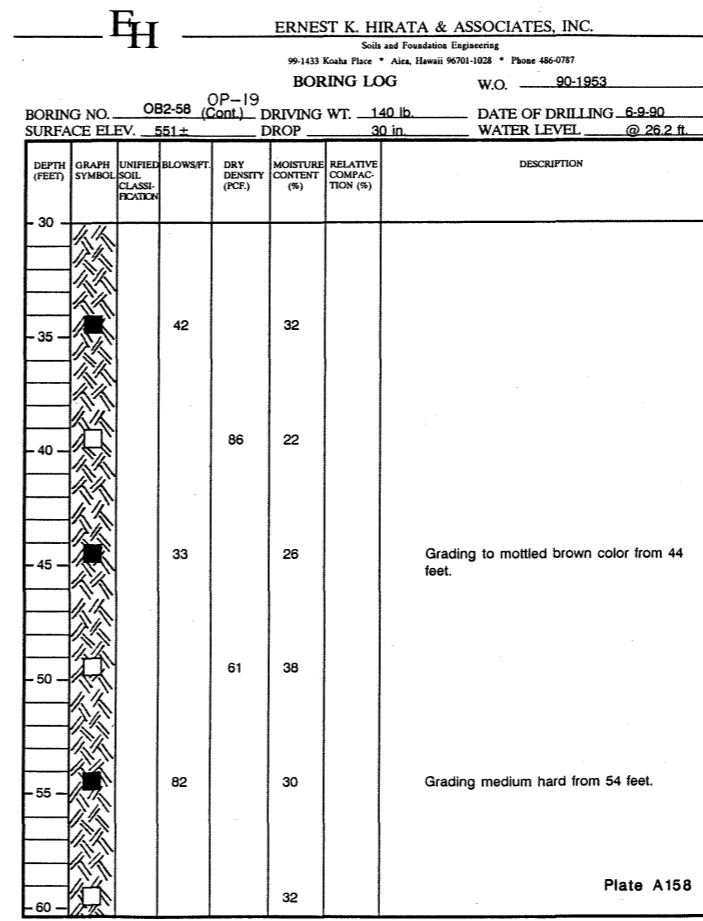
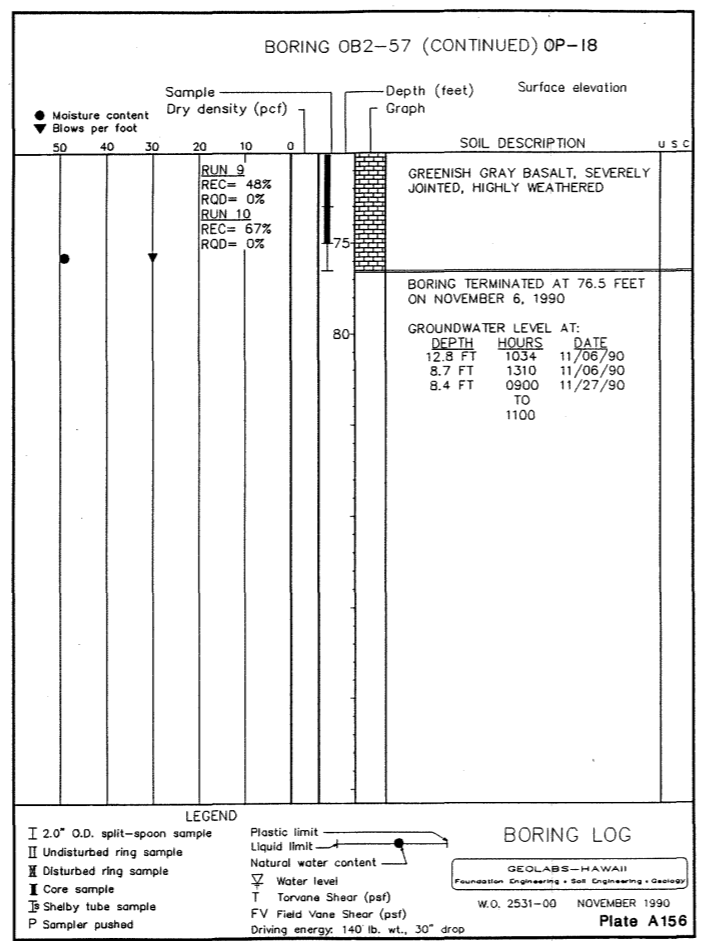
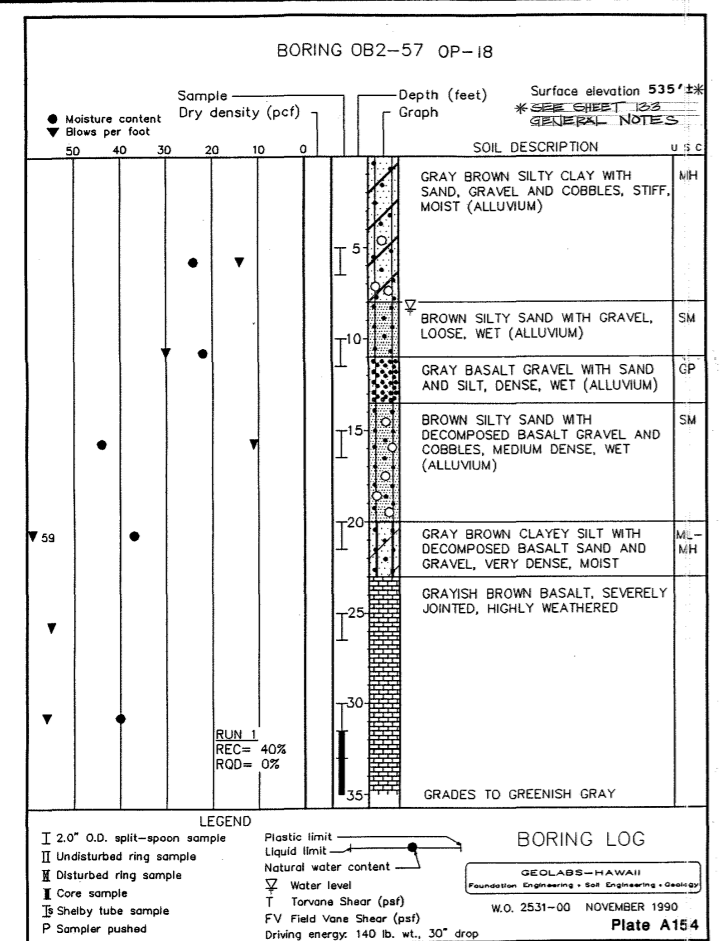
BORING LOGS

INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. I-H3-1(69) & (70)

SCALE: NONE DATE: AS NOTED

SHEET No. 150 OF 325 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	159	325



PAUL S. MORIMOTO
REGISTERED PROFESSIONAL ENGINEER
No. 5299
HAWAII, U.S.A.

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Signature

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BOB Y. K. WONG
REGISTERED PROFESSIONAL ENGINEER
No. 3862
HAWAII, U.S.A.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

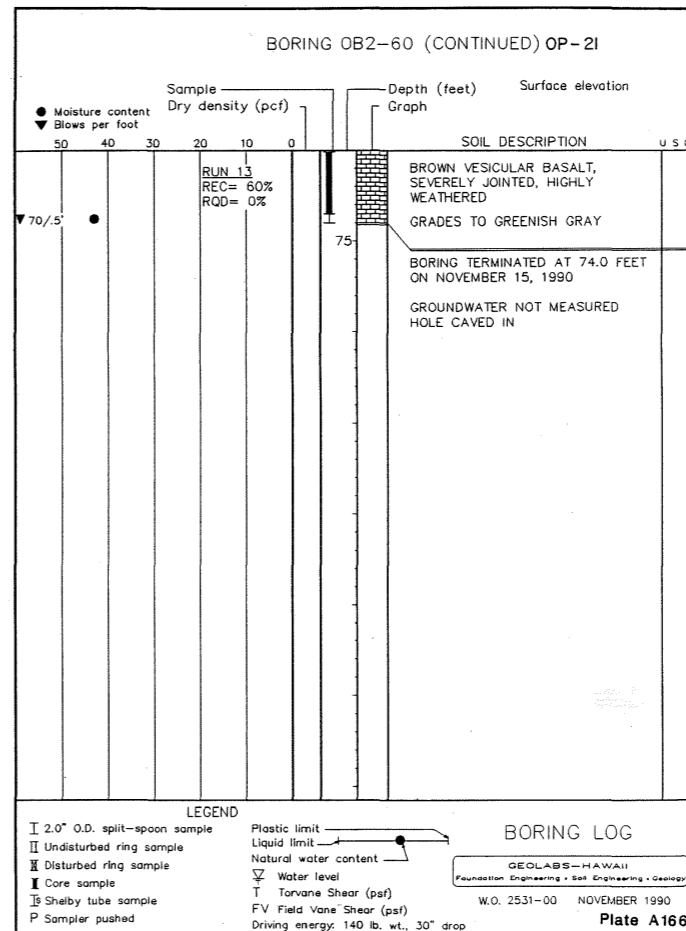
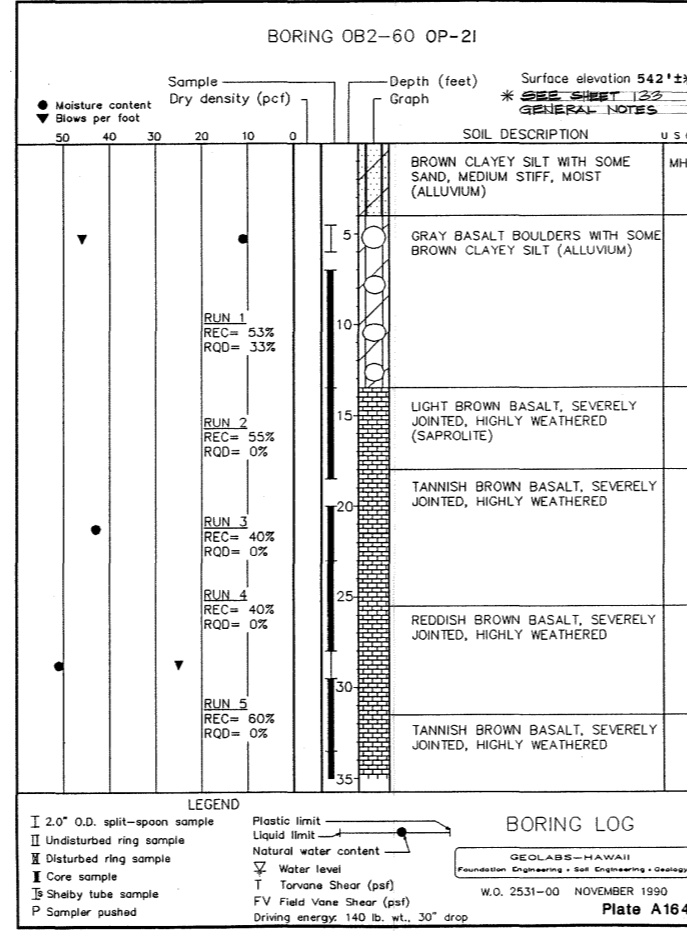
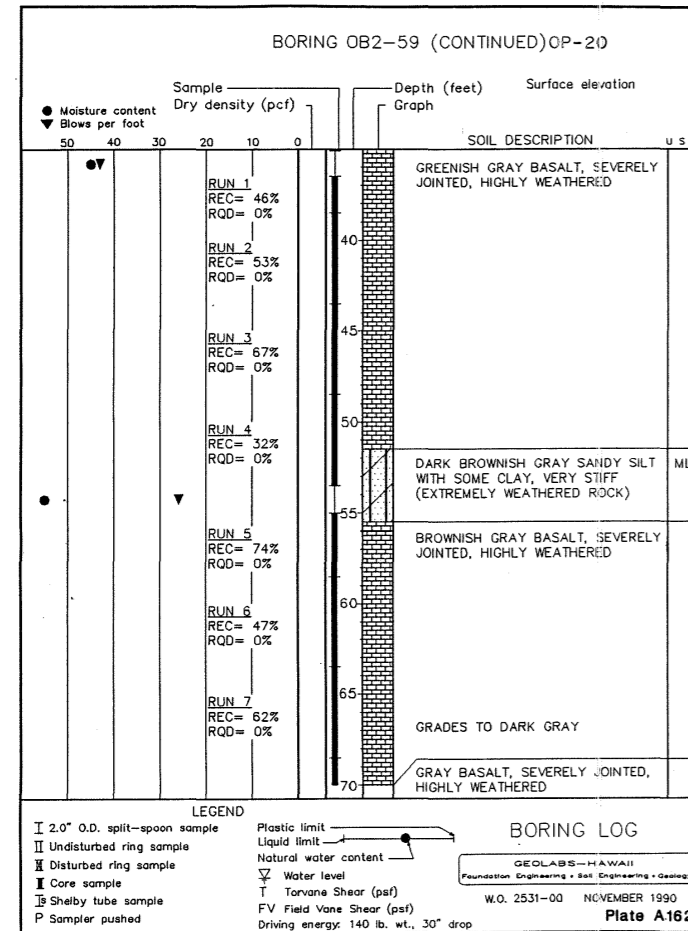
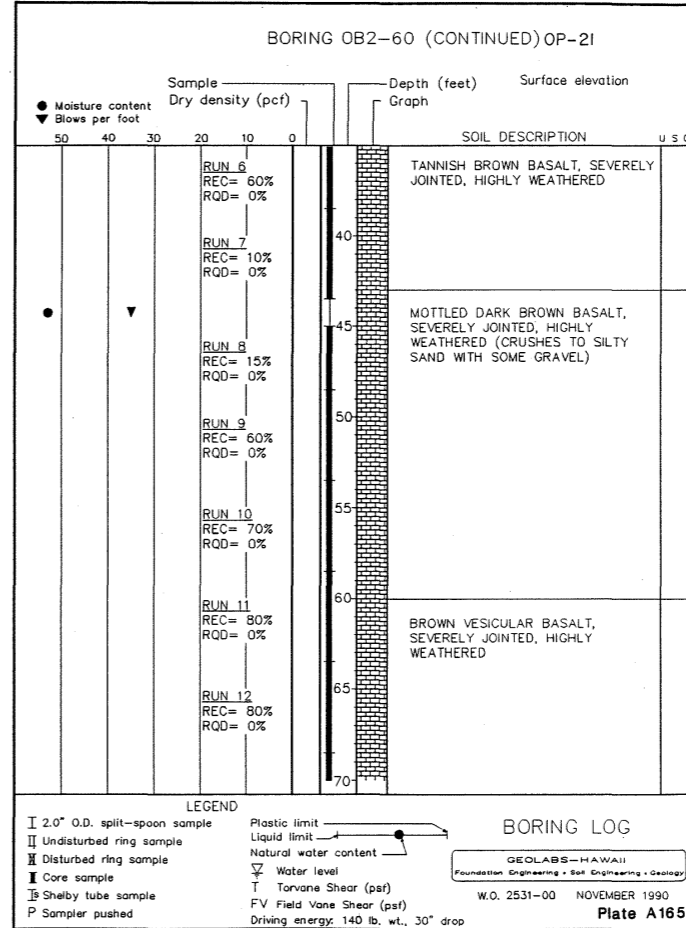
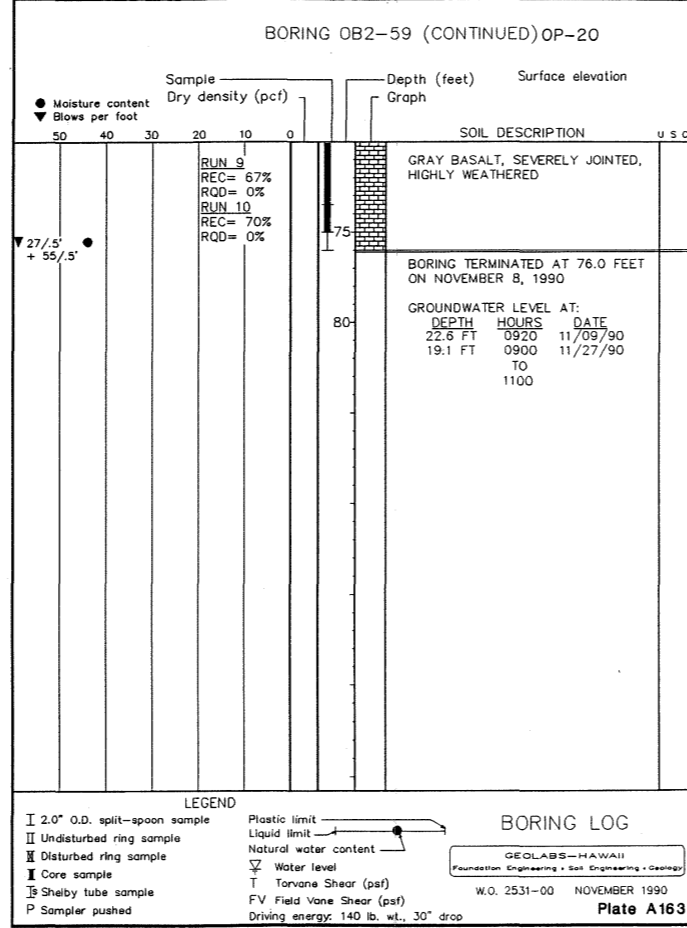
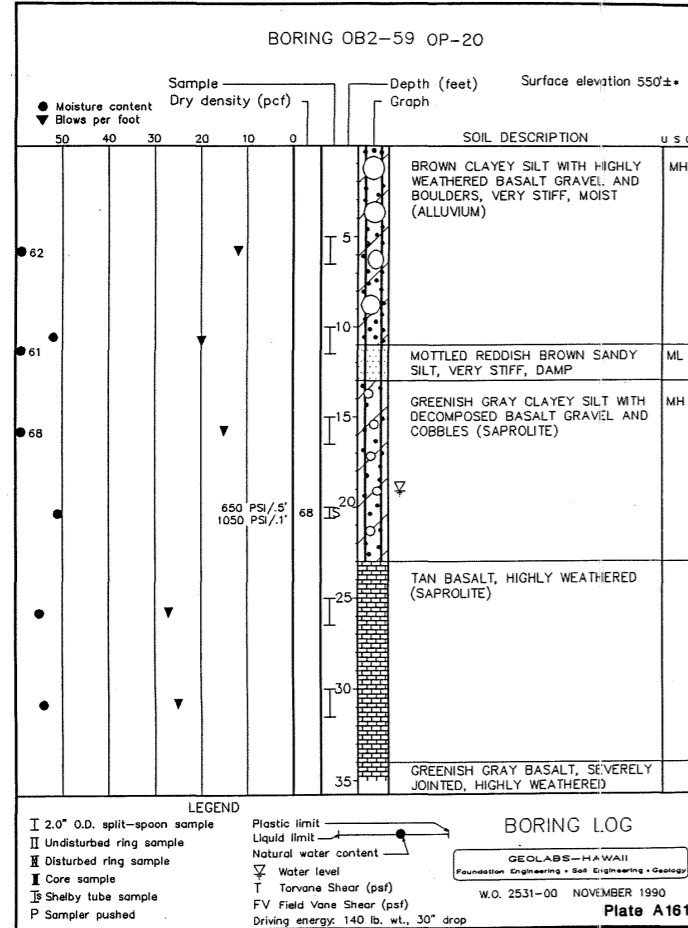
INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. I-H3-1(69) & (70)

SCALE: NONE DATE: AS NOTED

SHEET No. 159 OF 33 SHEETS

DATE _____
SURVEY PLOTTED BY _____
DRAWN BY _____
DESIGNED BY _____
CHECKED BY _____
NO. _____

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	160	225



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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

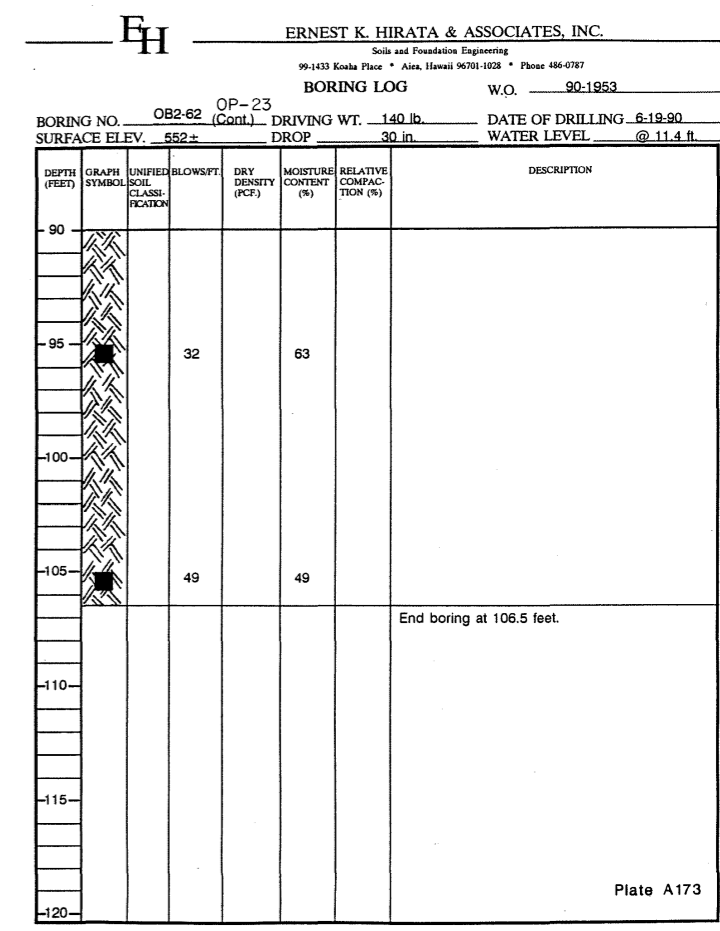
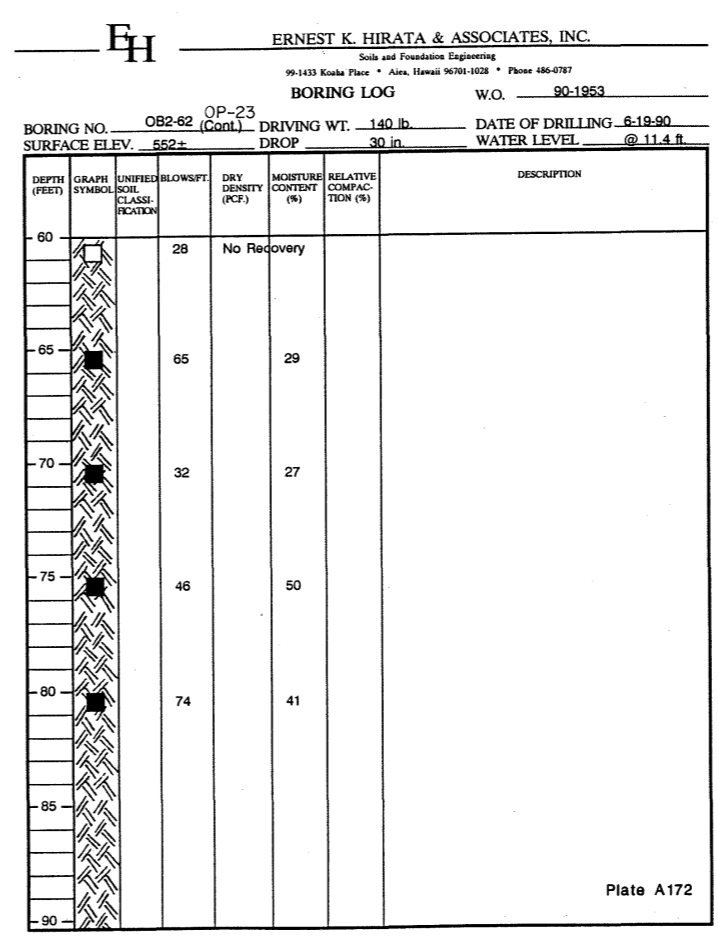
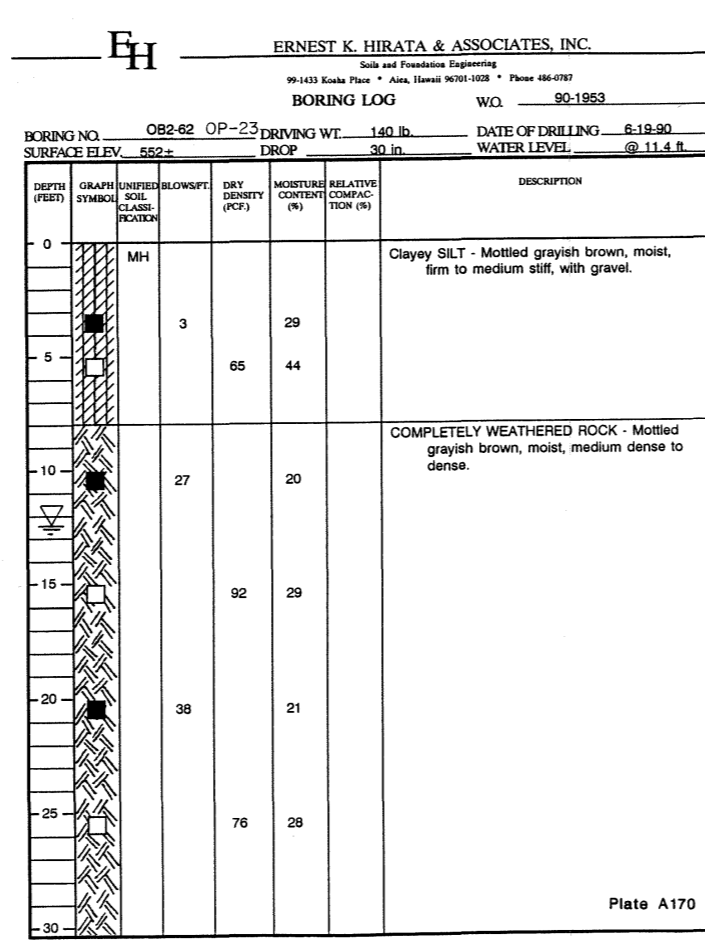
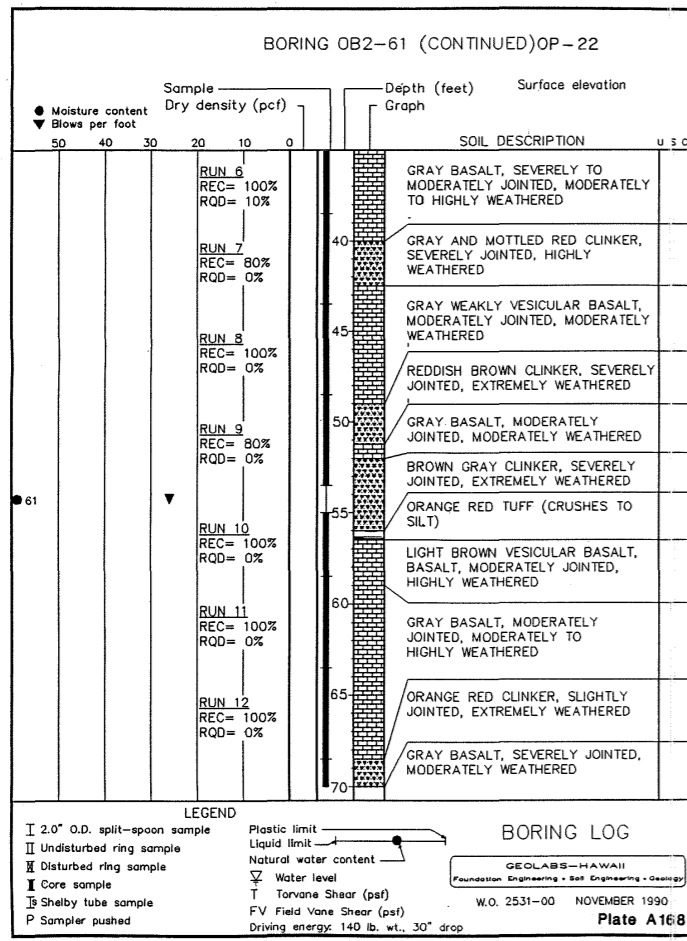
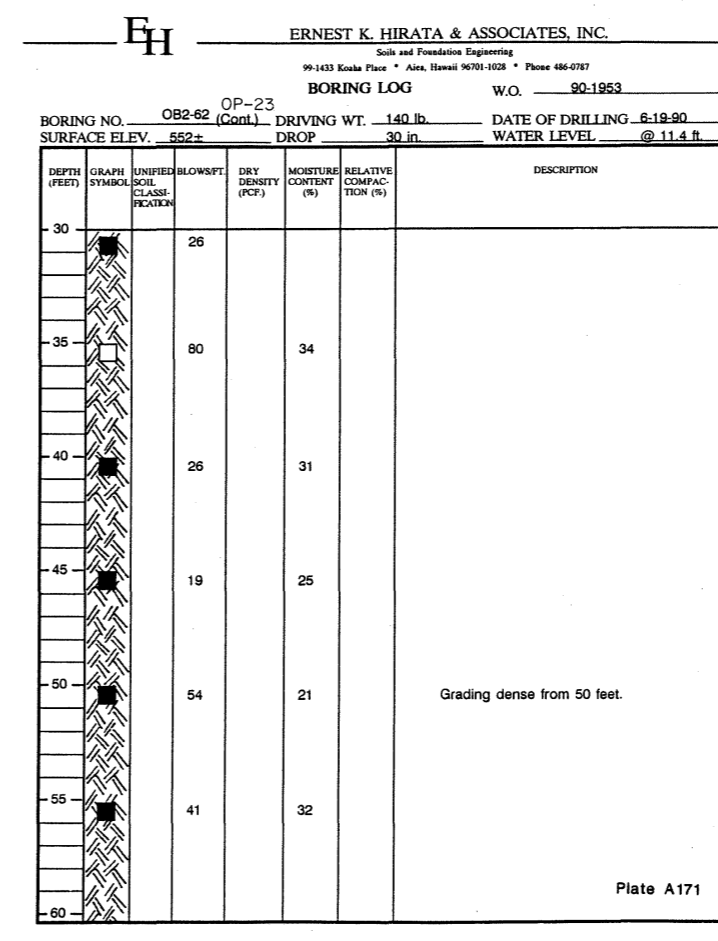
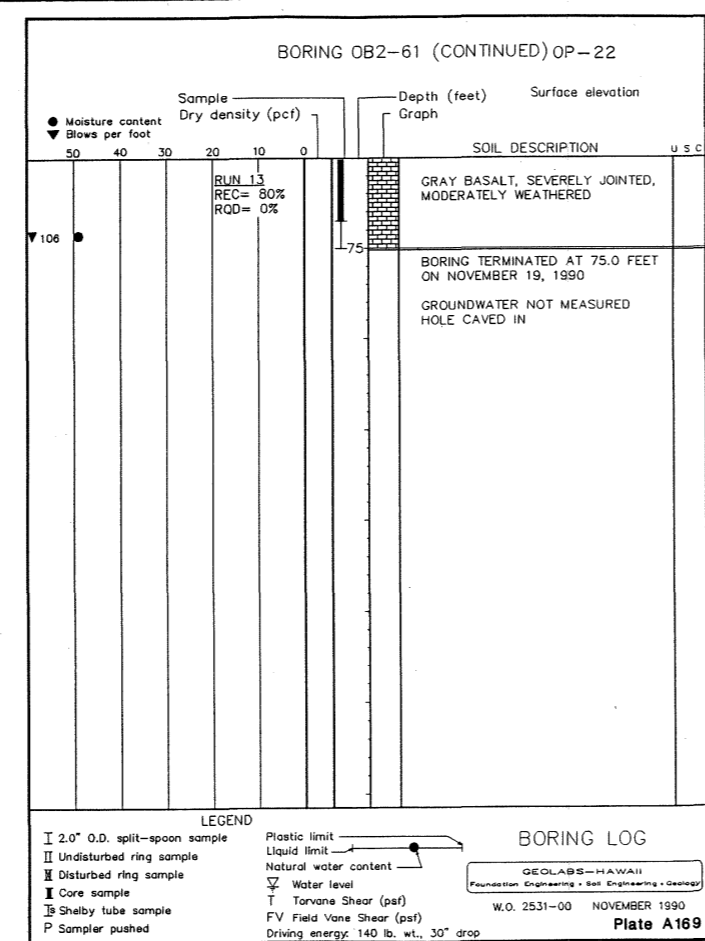
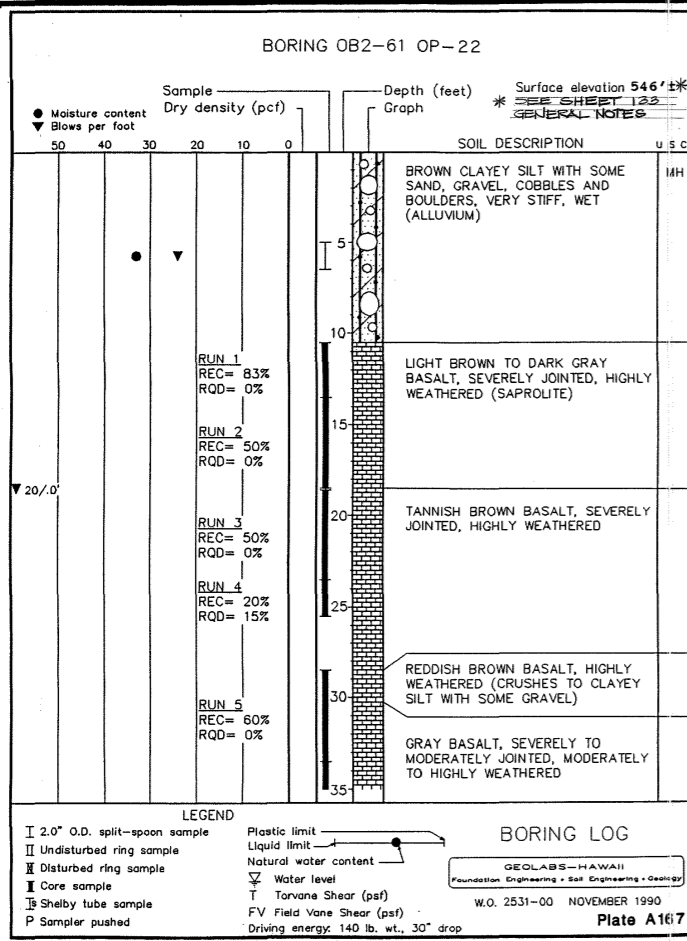
BORING LOGS

INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. I-H3-1(69) & (70)

SCALE: NONE DATE: AS NOTED

SHEET NO. 160 OF 225 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1-H3-1(69)	1992	161	325



PAUL S. MORIMOTO
REGISTERED PROFESSIONAL ENGINEER
No. 5299
HAWAII, U.S.A.

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BOB Y. K. WONG
REGISTERED PROFESSIONAL ENGINEER
No. 3862
HAWAII, U.S.A.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

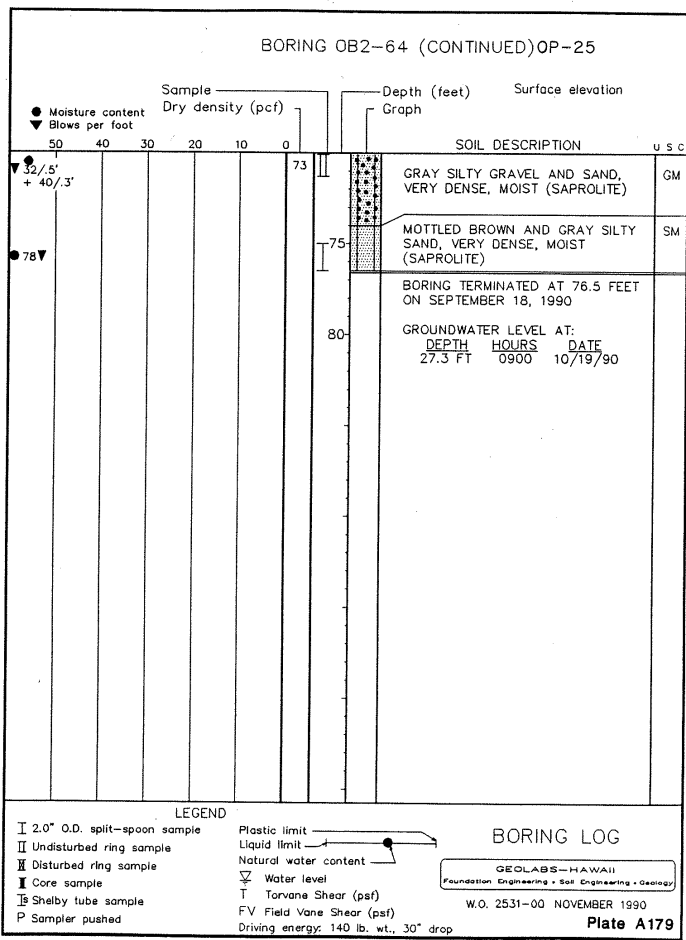
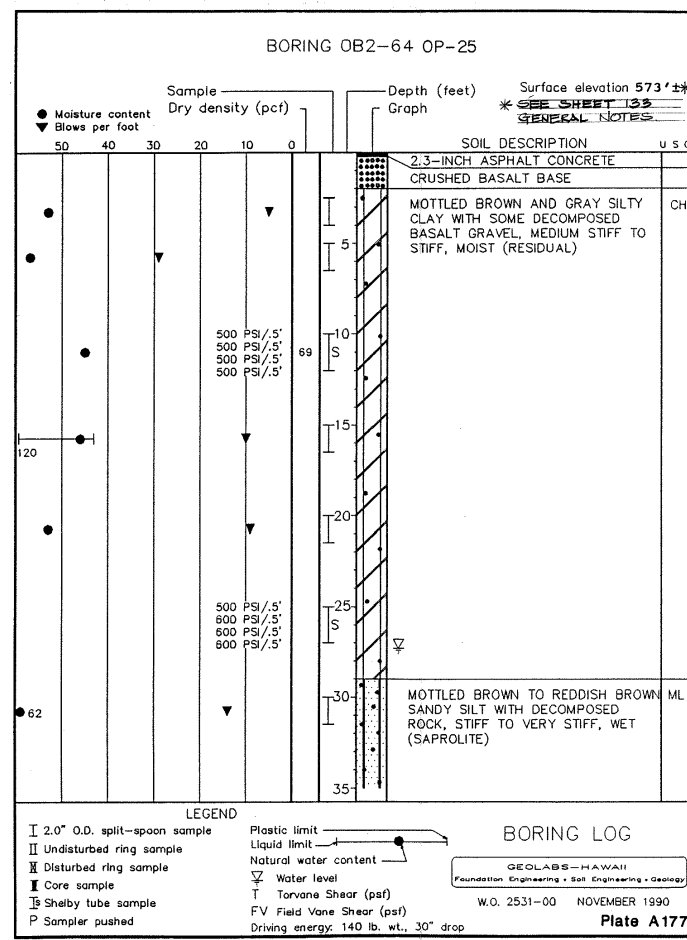
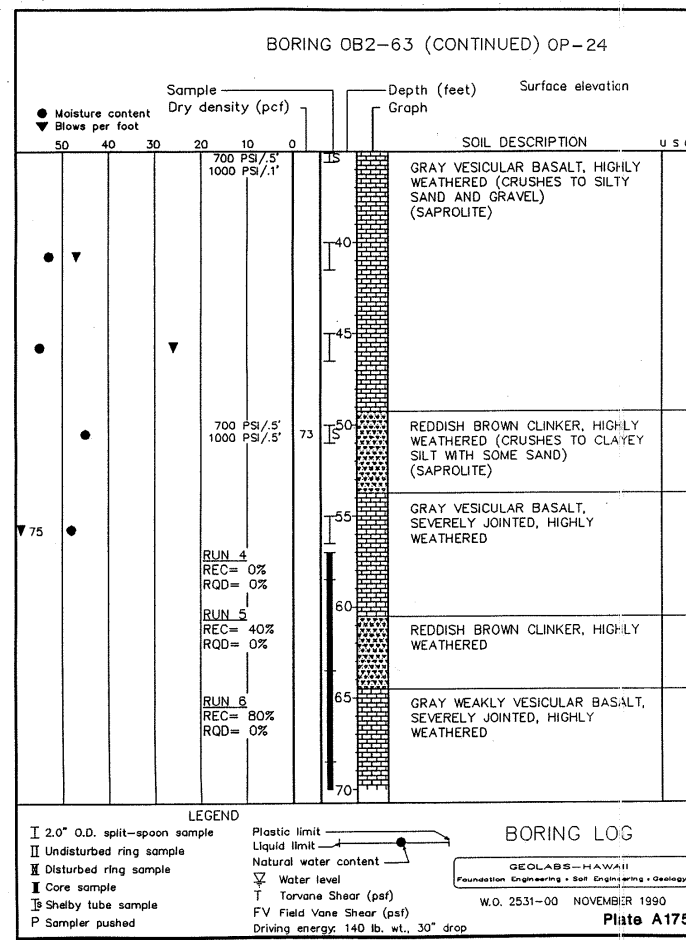
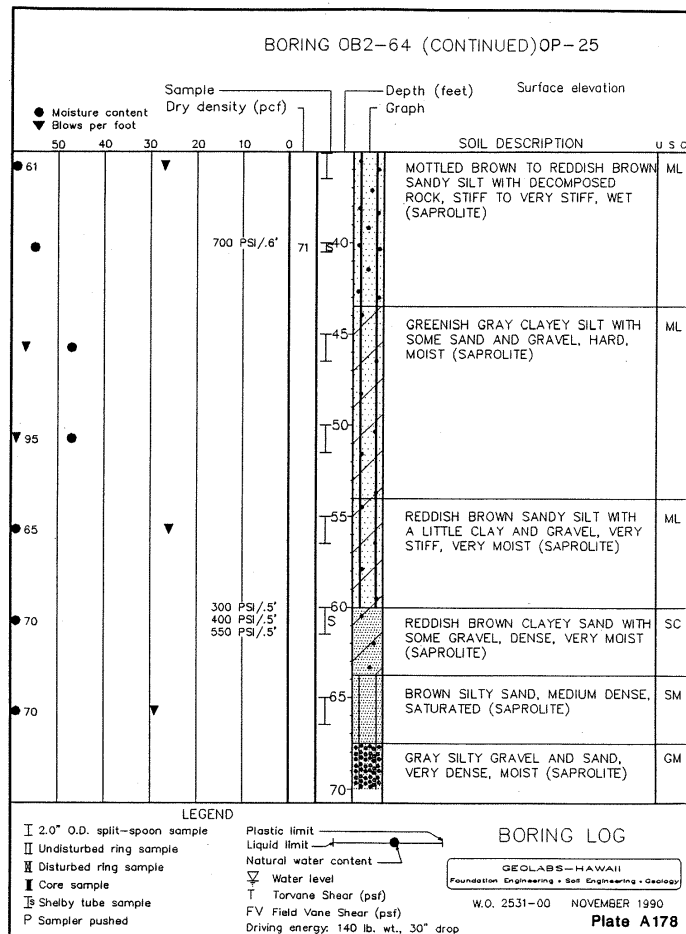
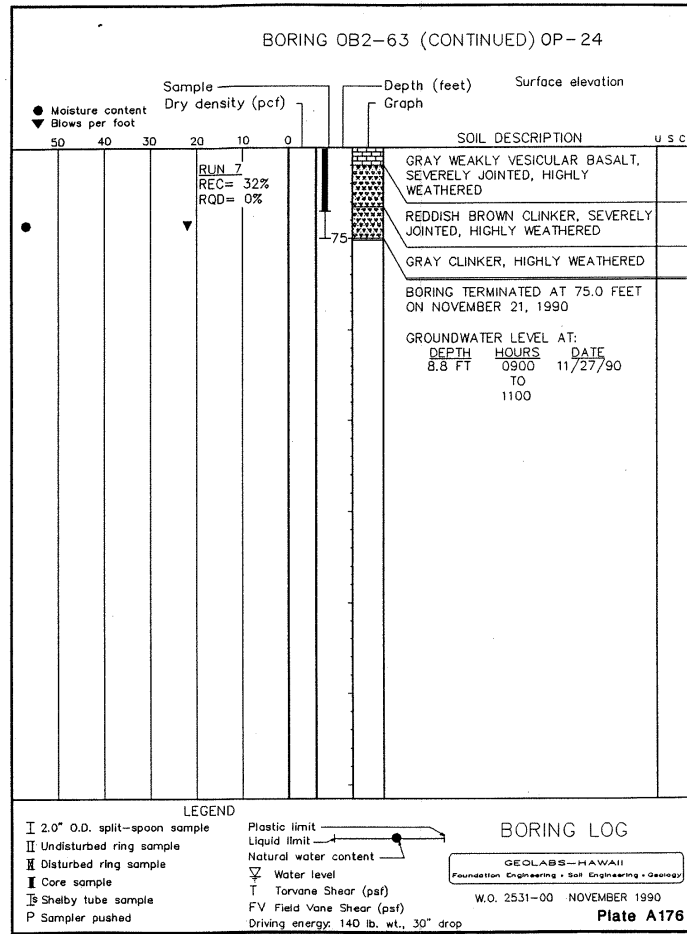
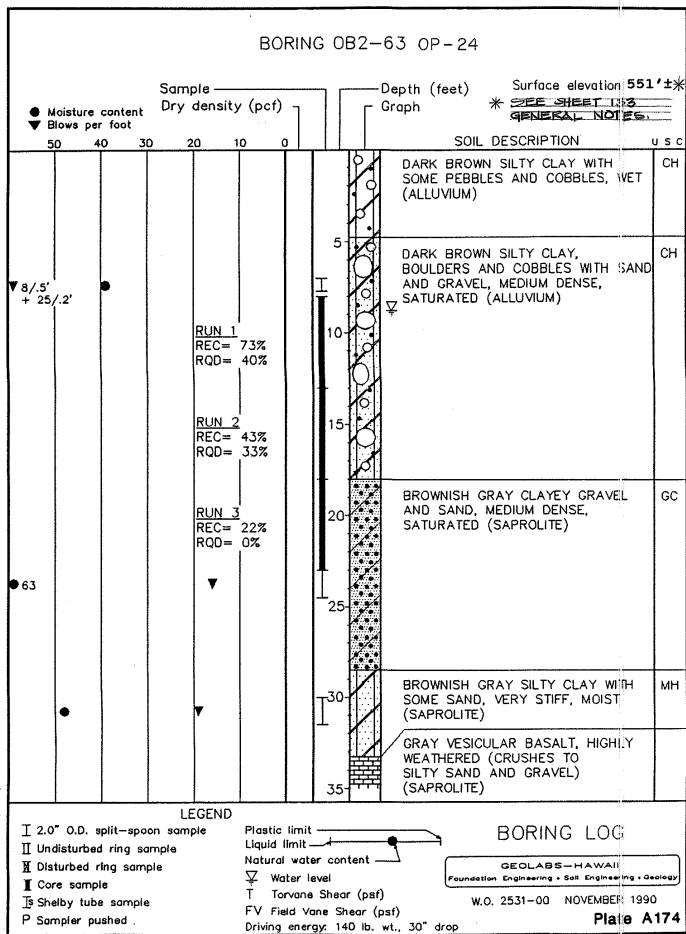
BORING LOGS

INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. 1-H3-1(69) & (70)

SCALE: NONE DATE: AS NOTED

SHEET No. 161 OF 33 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	162	325



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HIGHWAYS DIVISION

BORING LOGS

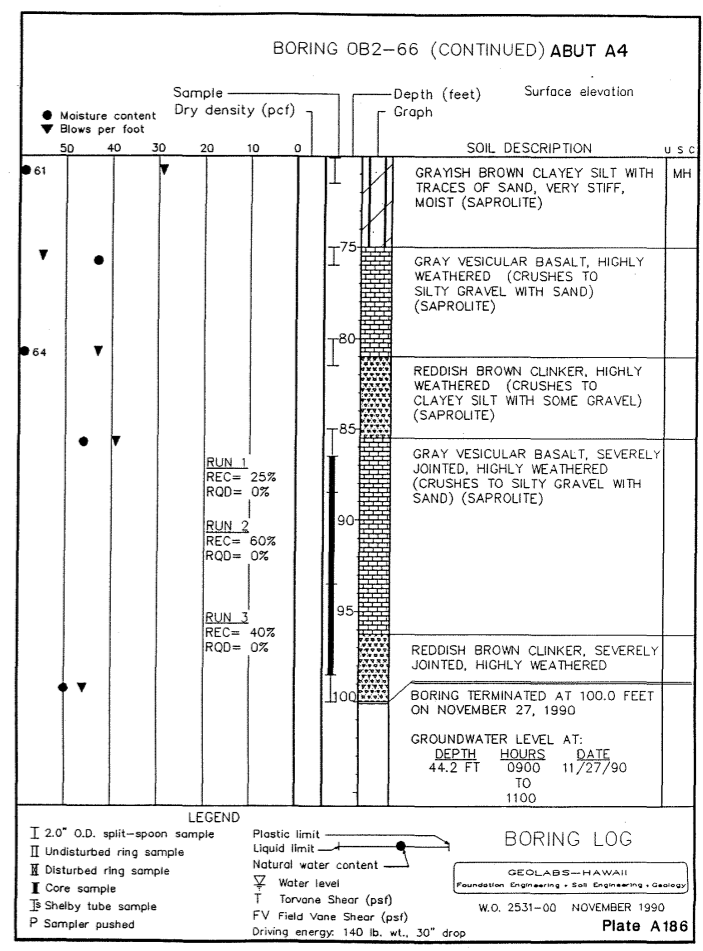
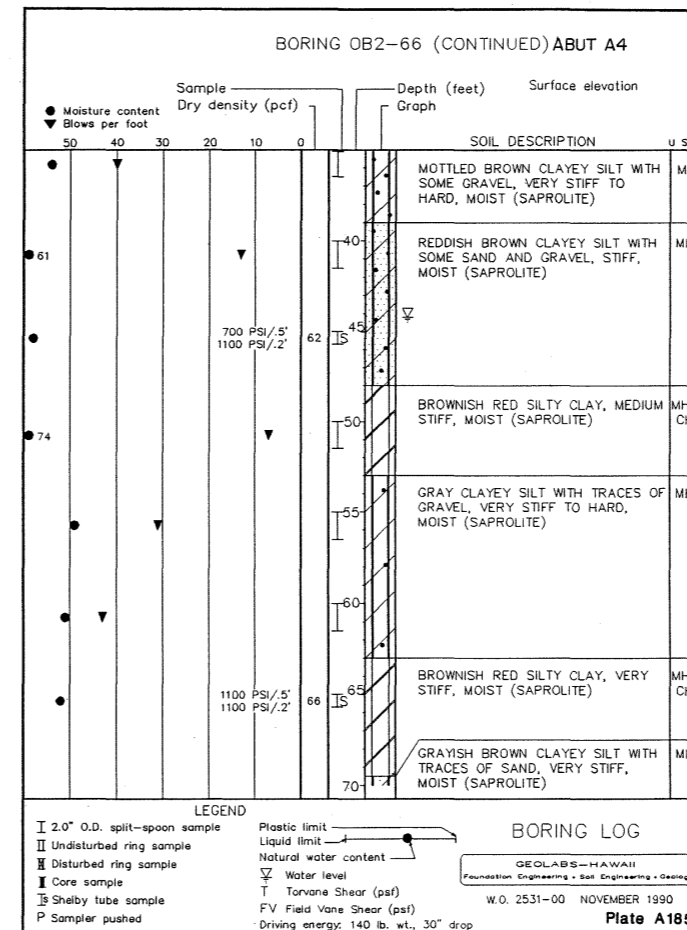
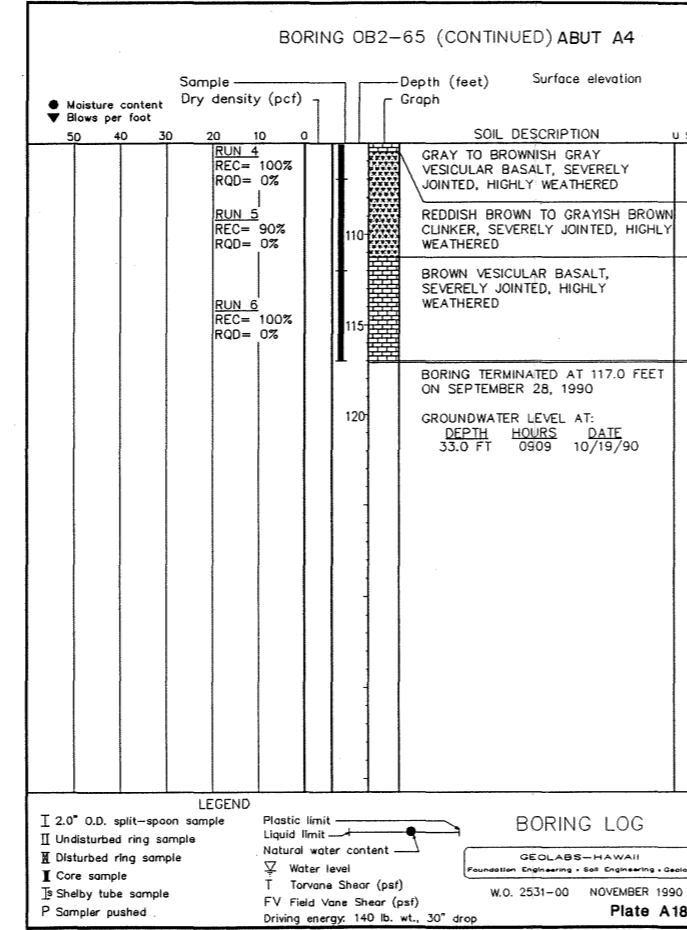
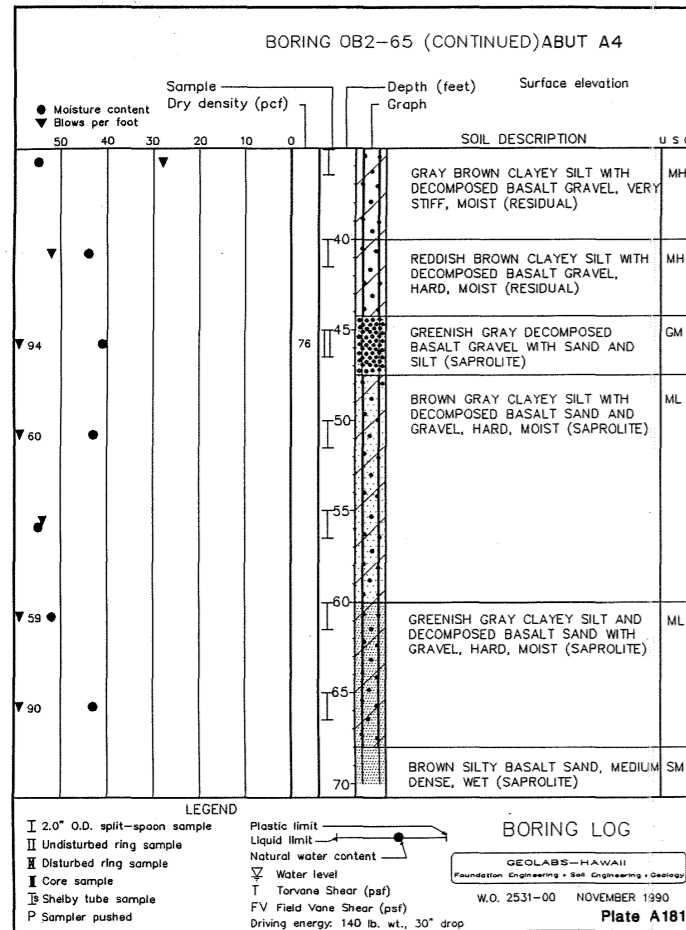
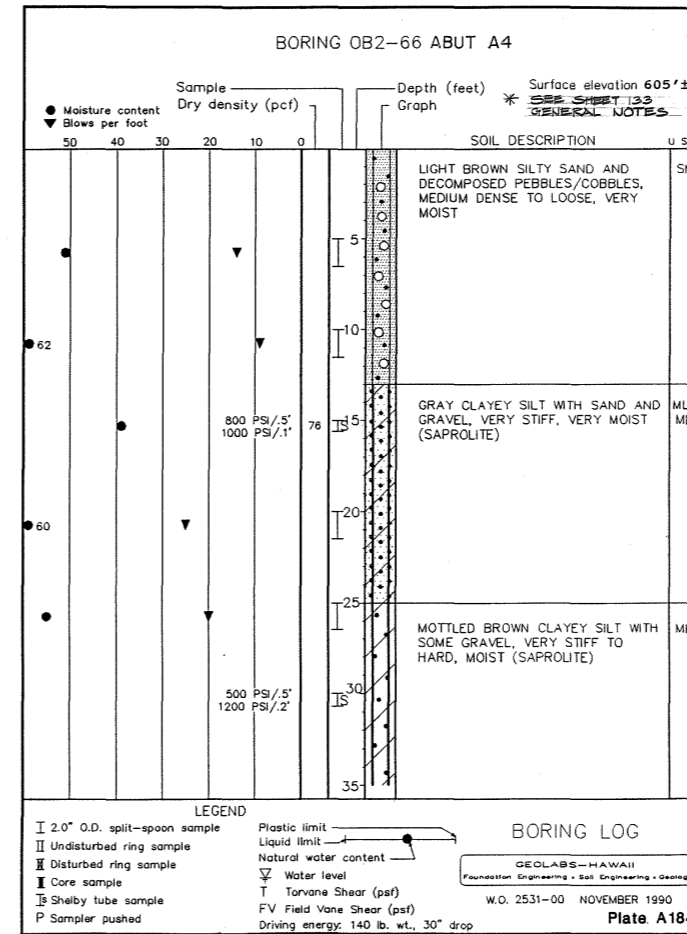
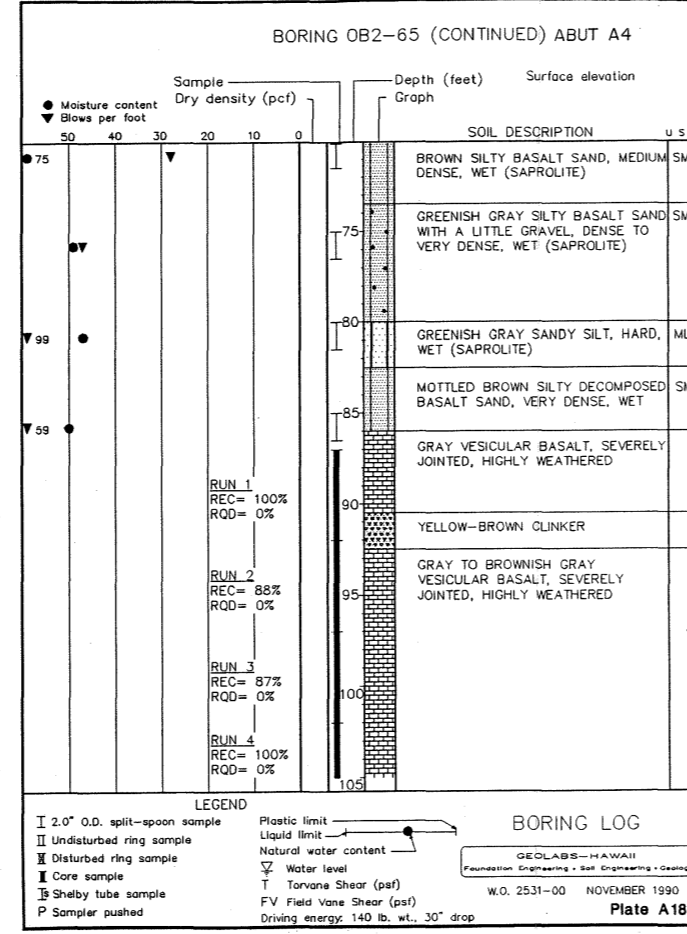
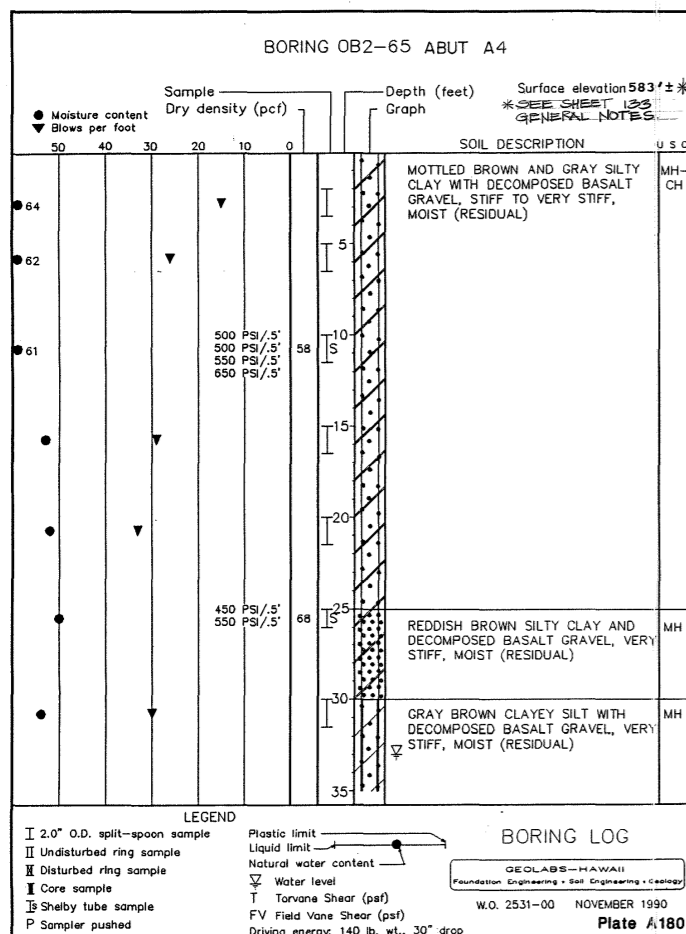
INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. I-H3-1(69) & (70)

SCALE: NONE DATE: AS NOTED

SHEET No. 162 OF 325 SHEETS

DATE
DESIGNED BY
CHECKED BY
NO. 162

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	109	325



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DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. I-H3-1(69) & (70)

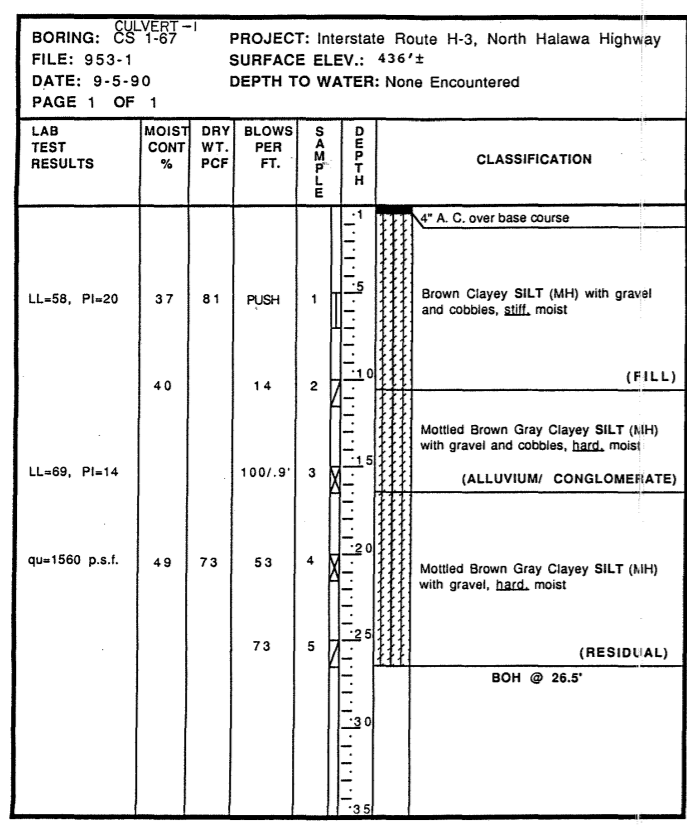
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SHEET No. 109 OF 325 SHEETS

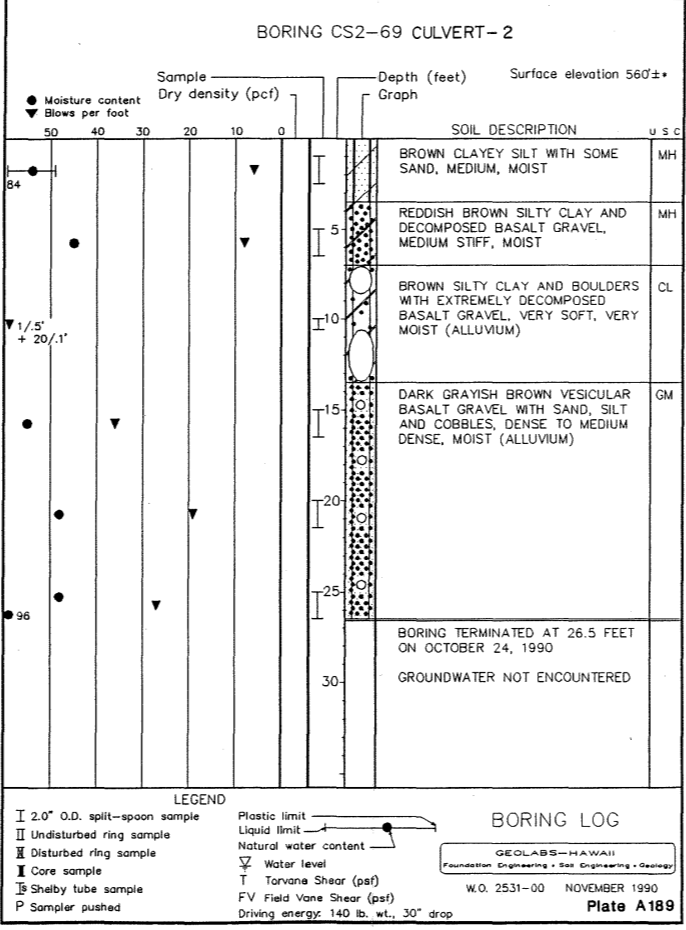
163

SURVEY PLOTTED BY: _____ DATE: _____
 DRAWN BY: _____
 TRACED BY: _____
 DESIGNED BY: _____
 QUANTITIES BY: _____
 CHECKED BY: _____
 NO. _____

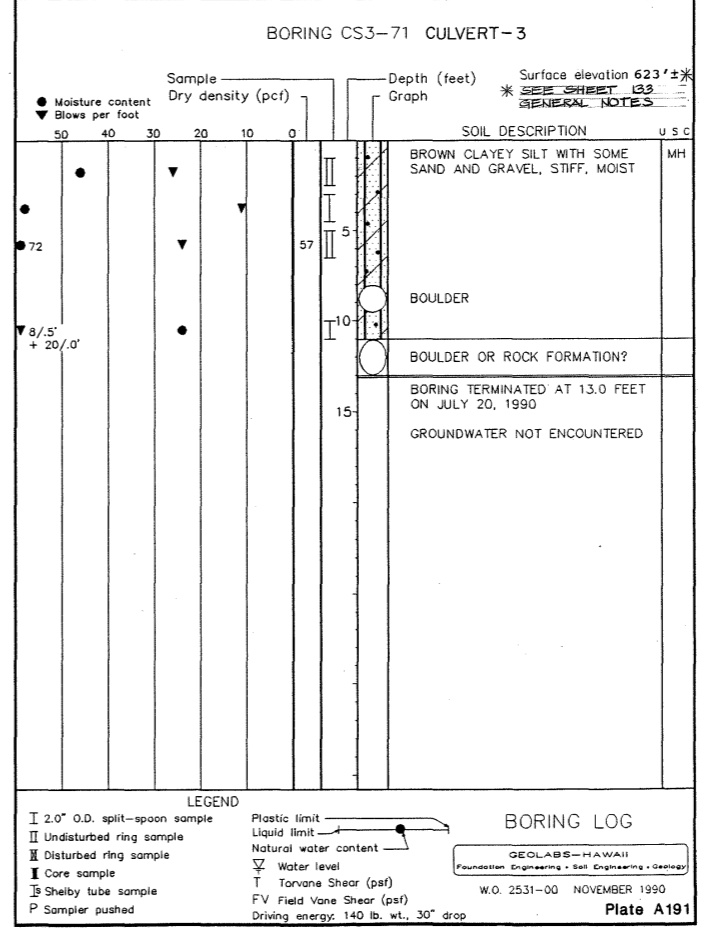
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-H3-1(69)	1992	164	225



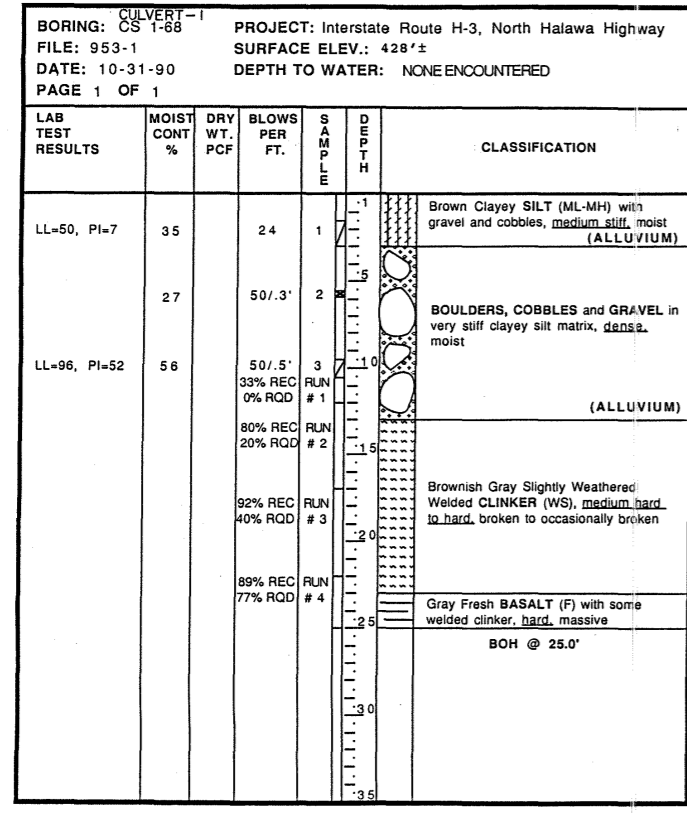
FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A187



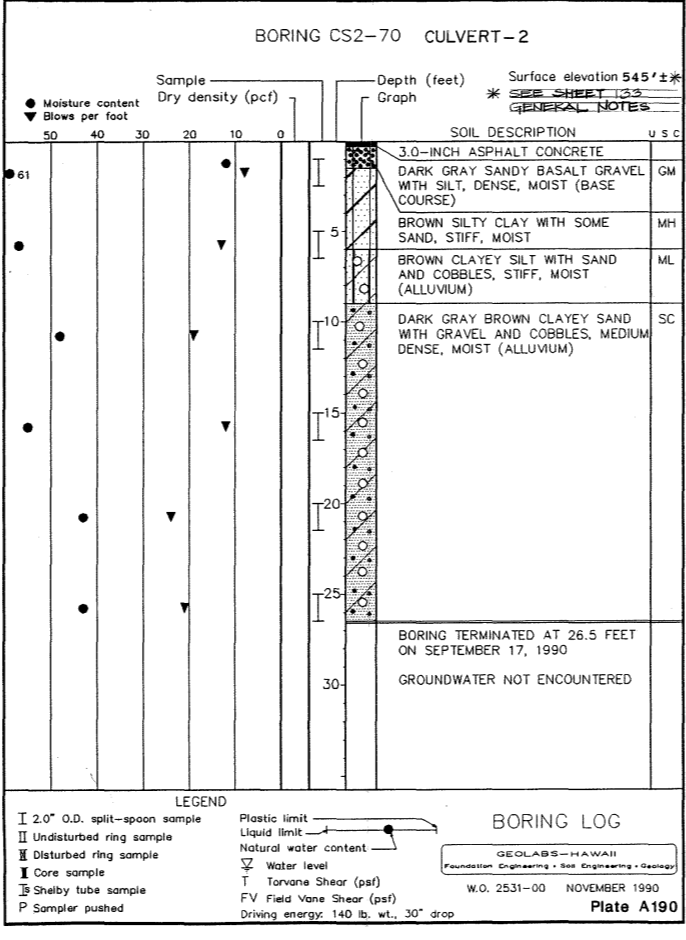
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Plate A189



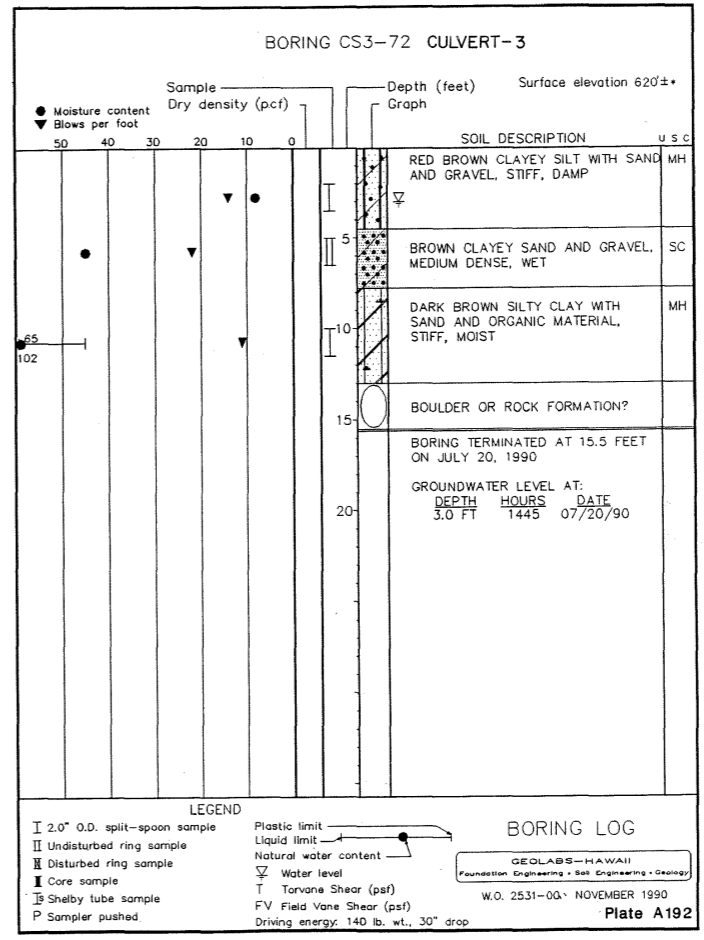
FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A191



FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A188



FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A190



FEWELL GEOTECHNICAL ENGINEERING, LTD.
Plate A192

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 SIGNATURE



STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
 F.A.I. PROJECT NO. I-H3-1(69) & (70)

SCALE: NONE DATE: AS NOTED

SHEET NO. 164 OF 33 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1-H3-1 (69)	1992	108	325



ERNEST K. HIRATA & ASSOCIATES, INC.

Soils and Foundation Engineering
99-1433 Koala Place • Aiea, Hawaii 96701-1028 • Phone 486-0787

BORING LOG W.O. 90-1953

370'± FROM CULVERT-1
BORING NO. OGB-73 DRIVING WT. 140 lb. DATE OF DRILLING 6-22-90
SURFACE ELEV. 436± DROP 30 in. WATER LEVEL None

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT.	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
0		MH					Clayey SILT - Mottled brown, moist, firm to medium stiff, with gravel and roots at upper 5 feet. Covered by 4 inches of asphaltic concrete and 8 inches of base course material.
0-6			15/0' 6	No Penetration	51		
5-6			75	42			
6-9			6/6'		52		Grading with cobbles and boulders from 9 feet.
9-15			72	39			
15-20			4	66			
20-26			68	41			
26							End boring at 26 feet.

Plate A193



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BORING LOG W.O. 90-1953

220'± FROM CULVERT-3
BORING NO. OGB-74 DRIVING WT. 140 lb. DATE OF DRILLING 7-25-90
SURFACE ELEV. 640± DROP 30 in. WATER LEVEL None

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT.	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
0		MH					Clayey SILT - Mottled brown, moist, medium stiff to stiff, with gravel.
0-11			11	47			
11-19			74	30			
19-25			19	54			
25-27			69	42			
27-30			12	52			
30-33			72	43			
33-30			25/0'	No Penetration			COMPLETELY WEATHERED ROCK - Mottled grayish brown, moist, dense.

Plate A194



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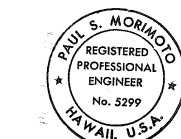
BORING LOG W.O. 90-1953

220'± FROM CULVERT-4
BORING NO. OGB-74 (Cont.) DRIVING WT. 140 lb. DATE OF DRILLING 7-25-90
SURFACE ELEV. 640± DROP 30 in. WATER LEVEL None

DEPTH (FEET)	GRAPH SYMBOL	UNIFIED SOIL CLASSIFICATION	BLOWS/FT.	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	DESCRIPTION
0-30							
30-35				74	51		
35-40							
40-40.5			43	37			
40.5							End boring at 40.5 feet.

Plate A195

SURVEY PLOTTED BY	DATE
DRAWN BY	
DESIGNED BY	
CHECKED BY	
ORIGINAL PLAN	
NOTE BOOK	
No.	



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.
Paul S. Morimoto
Signature

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

INTERSTATE ROUTE H-3
F.A.I. PROJECT NO. 1-H3-1(69) & (70)

SCALE: NONE DATE: AS NOTED

SHEET No. 108 OF 325 SHEETS

CLIENT PACNAVFACENGCOM
 PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1019-0145
 DATE/TIME STARTED 8/13/96 / 0850
 DATE/TIME FINISHED 8/14/96 / 0925
 COORDINATES 522960.65, 77300.13
 ELEVATION AND DATUM 75.71 ft. MSL (BRASS MARKER)
 TOP OF CASING ELEVATION 75.15 ft.

BORING NUMBER SB01/MW01
 COMPLETION DEPTH 73.5 ft.
 BOREHOLE DIAMETER 6 inch/10 inch
 DRILLER/COMPANY Dean McLure, John Chism/Valley Well Drilling
 DRILLING METHOD/FLUID Hollow Stem Auger/none
 DRILLING EQUIPMENT MOBILE B-90
 GEOLOGIST Bruce Tsutsui CHECKED BY Wendy Zayac

DEPTH feet	SAMPLE	RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HNU (ppm)	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
3		40		48		87.3	[SW Pattern]	SW	GRAVELLY SAND, dark brown, 10 YR 3/3, dry, soft, crumbly fill soil - middle of recovery is coral base course, SW (30% gravel, 50% sand, 20% silt, trace clay).		
		88		32		0.5*	[IE Pattern]	IE	SAPROLITE, dark brown, 7.5 YR 3/4, dry, medium stiff, friable, (wet) low plasticity, no toughness, visible vesicles and semi-preserved structure, IE (trace silt, 100% clay).		3
		88		17		0.5*	[IE Pattern]	IE	SAPROLITE, as above, IE.		
		88		20		0.5*	[CH Pattern]	CH	CLAY, dark brown, 10 YR 3/3, dry, very stiff, (wet) high plasticity, medium toughness, no dilatancy, CH (trace silt, 100% clay).		
		75		12		0.5*	[CH Pattern]	CH	CLAY, dark brown, 10 YR 3/3, similar to above, lens of beige/brown clay - root?, CH (trace silt, 100% clay).		
		75		18		0.5*	[CL Pattern]	CL	SILTY CLAY, dark grayish brown, 10 YR 4/2, dry, medium stiff, crumbly, (wet) low plasticity, no toughness, no dilatancy, CL (30% silt, 70% clay).		
9		88		7		0.5*	[CL Pattern]	CL	SANDY SILTY CLAY, brown, 10 YR 4/3, dry, hard, (wet) low to non-plastic, no toughness, no dilatancy, CL (10% sand, 30% silt, 80% clay).		
		50		21		0.5*	[SM/SC Pattern]	SM/SC	SANDY SILT, dark grayish brown, 10 YR 4/2, dry, stiff to very stiff, (wet) non-plastic, no toughness, sand fraction very poorly distributed, SM/SC (30% sand, 60% silt, 10% clay).		
12		88		28		0.5*	[SM/SC Pattern]	SM/SC	SANDY SILT, as above, SM/SC.		
		50		15		0.5*	[CH Pattern]	CH	CLAY, dark yellowish brown, 10 YR 3/4, dry, stiff to very stiff, (wet) medium plasticity, no toughness, no dilatancy, CH (trace silt, 100% clay).		
		40		27		0.5*	[CL Pattern]	CL	SILTY CLAY, dark yellowish brown, 10 YR 4/4, dry, hard, (wet) non-plastic, no toughness, no dilatancy, CL (30% silt, 70% clay).		
15		40		20		0.5*	[CL Pattern]	CL	SILTY CLAY, as above, extensive Mn staining, CL.		
		40		32		0.5*	[CH Pattern]	CH	CLAY, brown, 10 YR 4/3, dry, hard, (wet) medium to high plasticity, medium toughness, no dilatancy, extensive Mn staining, CH (trace silt, 100% clay).		
18		33		3		0.5*	[CH Pattern]	CH	CLAY, brown, 7.5 YR 4/3, dry, medium stiff to stiff, (wet) medium to high plasticity, medium toughness, no dilatancy, extensive Mn staining, CH (trace silt, 100% clay).		
		40		18		0.5*	[CH Pattern]	CH			
21		33		21		0.5*	[CH Pattern]	CH			
		33		24		0.5*	[CH Pattern]	CH			
		33		50/8'		0.5*	[CH Pattern]	CH			

CLIENT PACNAVFACEGCOM

BORING/WELL NUMBER SB01/MW01

PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1019-0145

COMPLETION DEPTH 73.5 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
40	40		40	0.5*	[Hatched]	CH	CLAY, as above, CH (trace silt, 100% clay).		
24	88	ALSBOIG01	50/3'	0.5*	[Hatched]	CH	CLAY, as above, CH.		
	75		50/2'	0.5*	[Hatched]	CH	CLAY, olive brown, 2.5 Y 4/3, slightly moist, stiff to very stiff, (wet) high plasticity, medium toughness, no dilatancy, CH (trace silt, 100% clay).		
27	100		50/8'	0.5*	[Hatched]	CH	CLAY, very dark brown, 7.5 YR 2.5/2, slightly moist, very stiff, medium plasticity, high toughness, no dilatancy, sporadic basalt gravel - rounded to 1/8", CL (5% gravel, trace silt, 95% clay).		
	75	ALSBOIS01	14	4.8	[Hatched]	CL	CLAY, pale olive, 5 Y 8/3, slightly moist, medium stiff, low plasticity, medium toughness, no dilatancy, greenish grayish hue - may be saprolite, grades into weathered basalt, CL (5% gravel, trace silt, 95% clay).		
30	75		13	0.5*	[Hatched]	CH	CLAY, brown, 7.5 YR 4/4, slightly moist, stiff, (wet) medium to high plasticity, medium toughness, no dilatancy, saprolite?, remnant vesicles, structure, CH (5% silt, 95% clay).		
	100		13	0.5*	[Hatched]	CH	CLAY, dark grayish brown, 2.5 Y 4/2, moist, stiff, high plasticity, high toughness, no dilatancy, CH (trace silt, 100% clay).		
33	80		12	0.5*	[Hatched]	CH	GRAVELLY CLAY, dark yellowish brown, 10 YR 4/4, moist, stiff to very stiff, high plasticity, medium toughness, no dilatancy, gravel is angular basalt grading into clay matrix, CH (25% gravel, trace sand, 10% silt, 85% clay).		
	75		14	0.5*	[Hatched]	CH	CLAY, dark grayish brown, 2.5 Y 4/2, moist, stiff, high plasticity, medium toughness, no dilatancy, CH (trace silt, 100% clay).		
36	88		8	0.5*	[Hatched]	CH	CLAY, grayish brown, 10 YR 5/2, moist, stiff to very stiff, high plasticity, low toughness, no dilatancy, CH (trace silt, 100% clay).		
	75		8	0.5*	[Hatched]	CH	CLAY, dark brown, 10 YR 3/3, moist, stiff, high plasticity, low toughness, no dilatancy, common Mn staining, remnant structure saprolite, CH (trace silt, 100% clay).		
39	80	ALSBOIS02	12	0.5*	[Hatched]	CH	CLAY, as above, CH (trace silt, 100% clay).		
	80		4	1.8	[Hatched]	CL	CLAY, dark brown, 7.5 YR 3/3, moist to dry, stiff to medium stiff, low to medium plasticity, low toughness, no dilatancy, remnant structure - probably saprolite, CL (10% silt, 90% clay).		
42	88		3	0.5*	[Hatched]	CH	CLAY, dark brown, 10 YR 3/3, moist, stiff, high plasticity, medium toughness, no dilatancy, gravel (angular basalt) in clay matrix, CH (5% gravel, 5% silt, 90% clay).		
	70		8	0.5*	[Dotted]	SM	SILTY SAND, dark yellowish brown, 10 YR 3/4, moist, stiff to very stiff, matrix with lightly weathered basalt fragments, SM (50% sand, 40% silt, 10% clay).		
45	80		10	0.5*	[Dotted]	SP	GRAVELLY SAND, dark brown, 7.5 YR 3/4, moist, very stiff to hard, non-plastic, no toughness, no dilatancy, SP (30% gravel, 50% sand, 5% silt, 5% clay).		
			18	0.5*	[Dotted]	SP			
			24	0.5*	[Dotted]	SP			
			24	0.5*	[Dotted]	SP			
			30	0.5*	[Dotted]	SP			
			30	0.5*	[Dotted]	SP			

CLIENT PACNAVFACENCOM

BORING/WELL NUMBER SB01/MW01

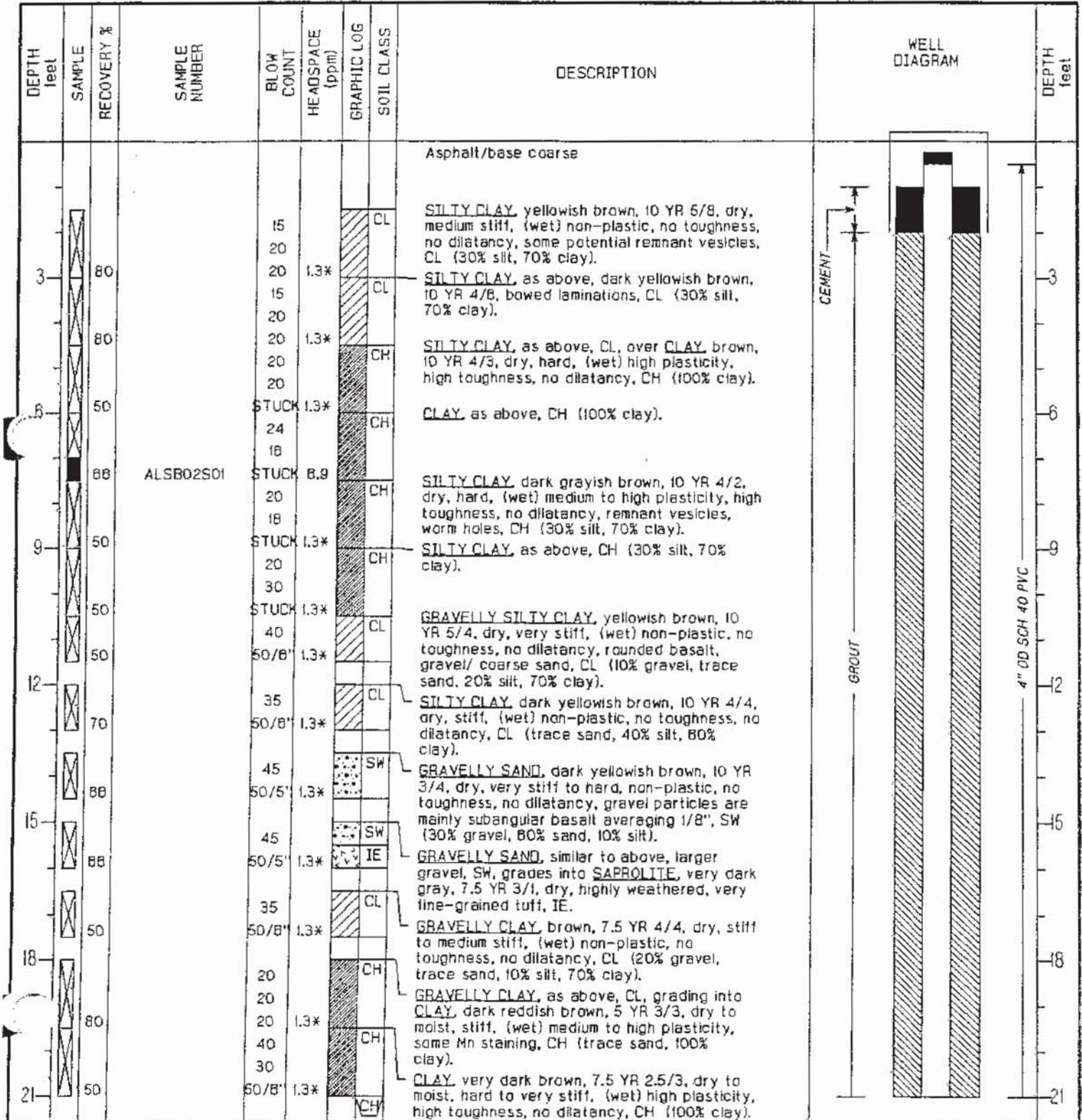
PROJECT NAME/NUMBER AJEA LAUNDRY RI/FS, NO. I-1018-0145

COMPLETION DEPTH 73.5 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
48	100		7		[Hatched]	CL	CLAY, dark brown, 10 YR 3/3, moist, stiff to soft, low plasticity, no toughness, no dilatancy, weak signs of remnant basalt vesicles, structure, CL (trace silt, 100% clay).	<p>WELL DIAGRAM</p> <p>4" OD SCH 40 PVC</p> <p>4" OD STAINLESS STEEL SCREEN (0.02" SLOT)</p> <p>GROUT</p> <p>BENTONITE</p> <p>LONESTAR #3 SAND PACK</p>	48
	40		10	0.5*	[Hatched]	CL	CLAY, dark yellowish brown, 10 YR 3/4, moist, very stiff to hard, low plasticity, no toughness, no dilatancy, shoe contains moderately weathered tuff, CL (trace silt, 100% clay).		51
	33		10	0.5*	[Hatched]	CL	CLAY, as above, matrix with fragments of tuff - shoe contains lens of moderately weathered tuff, CL.		54
	33		17		[Hatched]	CL	CLAY, very dark grayish brown, 10 YR 3/2, very moist, medium stiff to stiff, low plasticity, no toughness, no dilatancy, shoe contains lightly weathered tuff, CL (trace silt, 100% clay).		57
	66		50/2"	0.5*	[Hatched]	CL	CLAY, dark yellowish brown, 10 YR 3/4, moist, stiff, low plasticity, low toughness, no dilatancy, reddish brown infilling, staining, CL (trace silt, 100% clay).		60
	80		50/4"	0.5*	[Hatched]	CL	CLAY, very dark grayish brown, 10 YR 3/2, moist, medium stiff to very stiff, low to non-plastic, no toughness, no dilatancy, remnant basalt-type structures, CL (5% gravel, 5% silt, 90% clay).		63
	75		3		[Hatched]	CL	CLAY, as above, finer - no gravel, CL (trace silt, 100% clay).		66
	40	ALSB01D03	3	0.5*	[Hatched]	CL	CLAY, very dark gray, 10 YR 3/1, moist, soft to medium stiff, no to low plasticity, no toughness, no dilatancy, distinct odor, CL (5% silt, 95% clay).		69
	66	ALSB01S03	3	0.5*	[Hatched]	CL	CLAY, as above, distinct odor, CL (5% silt, 95% clay), fractured basalt in shoe, IE.		
			11	0.5*	[Hatched]	CL	CLAY, as above, distinct odor, CL (5% silt, 95% clay).		
			18	0.5*	[Hatched]	CL	CLAY, as above, distinct odor, CL (5% silt, 95% clay).		
			50/8"	53.9	[Hatched]	IE			
			D&D		[Hatched]	CL	CLAY, as above, distinct odor, CL (5% silt, 95% clay).		
60	88	ALSB01G02	25.5		[Hatched]	CH	CLAY, very dark grayish brown, 10 YR 3/2, moist, very stiff, medium to high plasticity, medium toughness, no dilatancy, discernible odor, CH (trace silt, 100% clay).		60
	50		30	9.1	[Hatched]	CH	CLAY, very dark grayish brown, 10 YR 3/2, moist, very stiff, medium to high plasticity, medium toughness, no dilatancy, discernible odor, CH (trace silt, 100% clay).		63
	33		50/8"	7.0	[Hatched]	IE	TUFF, fractured, very fine-grained, odor, fractured tuff in shoe, IE.	66	
			60/8"	7.0	[Hatched]	IE	TUFF, fractured, very fine-grained, odor, fractured tuff in shoe, IE.	69	
63	33		40		[Hatched]	IE	TUFF, very dark grayish brown, 2.5 Y 3/2, fractured, very fine-grained, breaks across plane of surface, massive, fresh, not much weathering, IE.	63	
	33		50/2"	4.8	[Hatched]	IE	TUFF, as above, fractured, moist, IE.	66	
	33		60/5"	8.9	[Hatched]	IE	TUFF, as above, fractured, moist, IE.	69	
66	10		60/2"	4.8	[Hatched]	IE	TUFF, as above, fractured, moist to wet, coatings along fracture surfaces, IE.	66	
	10		D&D	2.0	[Hatched]	IE	TUFF, fractured, rock is extremely fine-grained, very lightly weathered, some microcrystalline glitter, IE.	69	

CLIENT PACNAVFACEGCOM
 PROJECT NAME/NUMBER AJEA LAUNDRY RI/FS, NO. 1-1019-0145
 DATE/TIME STARTED 8/8/96 / 0821
 DATE/TIME FINISHED 8/8/96 / 1821
 COORDINATES 523049.40, 77350.57
 ELEVATION AND DATUM 78.60 ft. MSL (BRASS MARKER)
 TOP OF CASING ELEVATION 75.98 ft.

BORING/WELL NUMBER SB02/MW02
 COMPLETION DEPTH 78.5 ft.
 BOREHOLE DIAMETER 4 inch/10 inch
 DRILLER/COMPANY John Surigao, John Chism/Valley Well Drilling
 DRILLING METHOD/FLUID Hollow Stem Auger/none
 DRILLING EQUIPMENT MOBILE B-90
 GEOLOGIST Bruce Tsutsui CHECKED BY Wendy Zavac



CLIENT PACNAVFACENGCOM

BORING/WELL NUMBER SB02/MW02

PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1019-0145

COMPLETION DEPTH 76.5 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
15			15			CH	GRAVELLY CLAY , very dark brown, 7.5 YR 2.5/3, dry to moist, very stiff, (wet) high plasticity, medium toughness, CH.		
30			30			CH			
45	50		45	1.3*		CL	CLAY , grayish brown, 2.5 Y 5/2, moist, stiff, (wet) medium plasticity, medium toughness, no dilatancy, distinct gray tone, white mottle, some lenses of silt, CL (trace silt, 100% clay).		
24	100		20			CL			24
			20	1.3*		CL	CLAY , grayish brown, 10 YR 5/2, moist, very stiff to stiff, (wet) medium plasticity, low toughness, no dilatancy, CL (100% clay).		
	100		27			CH			
27	70		10	1.3*		CH	CLAY , brown, 7.5 YR 5/2, moist, stiff to very stiff, (wet) high plasticity, medium toughness, no dilatancy, some potential remnant vesicles, CH (100% clay).		27
			20			CH	CLAY , as above, CH.		
	88		15	1.3*		CH	CLAY , brown, 7.5 YR 4/4, moist, stiff to medium stiff, (wet) high plasticity, low toughness, no dilatancy, very homogeneous, CH (100% clay).		
30	88		10			CH			
			12	1.3*		CH	CLAY , as above, CH.		30
			10			CH			
	70		10	1.3*		CH	CLAY , brown, 7.5 YR 5/2, moist, stiff, (wet) high plasticity, medium toughness, no dilatancy, CH (100% clay).		
33	80		18			CH			33
			10	1.3*		CH	CLAY , grayish brown, 10 YR 5/2, moist, stiff, (wet) high plasticity, medium toughness, no dilatancy, CH (100% clay).		
	80		10	1.3*		CL	GRAVELLY CLAY , as above, with angular gravel/cobble fragments, CH (20% gravel, 80% clay).		
36	70		10			CL			
			10	1.3*		CL	SILTY CLAY , dark brown, 7.5 YR 3/3, moist, medium stiff to soft, (wet) low plasticity, remnant vesicles (?), large elongate, angular, irregular, CL (30% silt, 70% clay).		36
	80		8			CL			
			8	1.3*		CL	SILTY CLAY , as above, larger remnant vesicles, CL.		
39	88		10			CH			
			10	1.3*		CH	CLAY , strong brown, 7.5 YR 4/6, moist, medium stiff to soft, (wet) medium to high plasticity, low toughness, no dilatancy, some gray inclusions, no vesicles, CH (100% clay).		39
			3			ML			
	70		10	1.3*		ML	CLAYEY SILT , brown, 7.5 YR 4/3, moist, stiff to very stiff, (wet) low plasticity, low toughness, no dilatancy, ML (80% silt, 40% clay), grades to SAPROLITE , angular, fractured tuff fragments, highly weathered, IE.		39
	0		25						
			75/3"						
42	88		35			SW	GRAVELLY SAND , dark brown, 10 YR 3/3, dry to moist, soft to medium stiff, non-plastic, no toughness, no dilatancy, gravel consists of rounded basalt or tuff, ranging from 1/8" to 1", possibly alluvial. SW (30% gravel, 65% sand, 5% silt).		42
			80/8"	1.3*		SW			
			D&D			SW			
45	88	ALS02S02	4.1			SW	SAND , dark grayish brown, 2.5 Y 4/2, moist to dry, soft, black volcanic sand with few gravel fragments, sand is fine to medium grained, SW (10% gravel, 90% sand).		45

GROUT

4" OD SCH 40 PVC

CLIENT PACNAVFACEGCOM

BORING/WELL NUMBER SBO2/MW02

PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1019-0145

COMPLETION DEPTH 78.5 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet	
33	33		150/8"		[SW]	SW	SAND, as above, with lightly cemented portions, SW.	<p>WELL DIAGRAM</p> <p>4" OD SCH 40 PVC</p> <p>4" OD STAINLESS STEEL SCREEN (0.02" SLOT)</p> <p>GROUT</p> <p>BENTONITE</p> <p>LONESTAR #3 SAND PACK</p>		
48	80	ALSB02G01	100/5"		[SW]	SW	SAND, as above, including tuff cookies, SW.			48
			75/5"	1.3*	[SW]	SW	GRAVELLY SAND, similar to above, slightly coarser, SW (20% gravel, 80% sand).			
90		ALSB02S03	60/3"	4.1	[SW]	SW	GRAVELLY SAND, as above, slightly coarser size distribution, sand size borders on gravel, SW.			
51	80		50/2"	1.3*	[SW]	SW	GRAVELLY SAND similar to above, some large well cemented fragments, SW.			51
			60/2"	1.3*	[SM]	SM	GRAVELLY SILTY SAND, similar to above, black, 2.5 Y 2.5/1, finer grain size distribution, portions of sand border on silt, SM (10% gravel, 80% sand, 10% silt).			
80	33		60/2"	1.3*	[SM]	SM	GRAVELLY SILTY SAND, similar to above, SM.			54
			100/2"	1.3*	[IE]	IE	TUFF, dry, very fine-grained, fractured, fragments mainly massive, hard (scratches spatula), almost unweathered, IE.			
57			15		[CH]	CH	CLAY, dark grayish brown, 10 YR 4/2, dry to moist, hard, (wet) medium to high plasticity, medium toughness, no dilatancy, CH (100% clay).			57
			20	1.3*	[CH]	CH	CLAY, as above, CH.			
60	100	ALSB02G02	25	1.3*	[CL]	CL	CLAY, brown, 7.5 YR 4/4, moist, medium stiff, (wet) low plasticity, no toughness, no dilatancy, CL (100% clay).			60
			7		[CL]	CL	GRAVELLY CLAY, brown, 7.5 YR 4/4, moist to wet, medium stiff, low to medium plasticity, low toughness, no dilatancy, gravel consists of rounded basalt fragments to 1/2", CL (10% gravel, 90% clay).			
63	100		10	1.3*	[CL]	CL	GRAVELLY CLAY, as above, smaller gravel fragments to 1/4", CL.			63
			15		[CL]	CL	CLAY, dark brown, 7.5 YR 3/4, moist to wet, medium stiff, (wet) low plasticity, no toughness, no dilatancy, CL (100% clay).			
66	60		30	1.3*	[IE]	IE	TUFF, light yellowish brown, 2.5 Y 8/4, dry to moist, hard, very fine-grained, well cemented, IE.			66
			15	1.3*	[CL]	CL	GRAVELLY CLAY, brown, 7.5 YR 4/4, moist, stiff, (wet) low plasticity, no toughness, no dilatancy, scattered gravel fragments, angular to subrounded tuff, CL (10% gravel, trace silt, 90% clay).			
69	68		25	1.3*	[CH]	CH				69

CLIENT PACNAVFACENGCOM

BORING/WELL NUMBER SB02/MW02

PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1018-0145

COMPLETION DEPTH 76.5 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
72	80	ALSB02G03	9	1.3*	CH	<p>CLAY, dark brown, 7.5 YR 3/4, moist to wet, stiff, high plasticity, high toughness, no dilatancy, water on sampler, CH (100% clay).</p> <p>GRAVELLY CLAY, reddish brown, 5 YR 4/3, moist to wet, stiff, low to medium plasticity, medium toughness, no dilatancy, gravel consists of varying sizes (1/8" to 1/2") tuff fragments, CH (20% gravel, trace silt, 80% clay).</p> <p>CLAY, as above, CH.</p>		72
	17		CH		72			
	26		CH		72			
	15		CH		72			
75	80	ALSB02S04	50	1.3*	CL	<p>CLAY, brown, 7.5 YR 4/4, moist to wet, soft, low plasticity, no toughness, no dilatancy, CL (100% clay).</p>		75
	10		CL		75			
78			10			<p>End of boring at 76.5 ft bgs @1821 on 9/8/88. Ground water first encountered at approx. 89 ft bgs @1800 on 9/8/88. Borehole advanced to 75 ft bgs with 8" HSAs, and sampling conducted to 78.5 ft bgs. Borehole reamed to 75.5 ft bgs with 10" HSAs prior to monitoring well installation. Monitoring well MW02 installed on 9/8/88.</p> <p>Note: For headspace, * = ambient air.</p>		78
81			20				81	
84			10				84	
87							87	
90							90	
93							93	

CLIENT PACNAVFACENGCOM
 PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1019-0145
 DATE/TIME STARTED 8/8/96 / 0925
 DATE/TIME FINISHED 8/7/96 / 1005
 COORDINATES 523020.H, 77236.48
 ELEVATION AND DATUM 76.08 ft. MSL (BRASS MARKER)
 TOP OF CASING ELEVATION 75.52 ft.

BORING/WELL NUMBER SB03/MW03
 COMPLETION DEPTH 80 ft.
 BOREHOLE DIAMETER 6 inch
 DRILLER/COMPANY Dean McLure, John Chism/Valley Well Drilling
 DRILLING METHOD/FLUID Hollow Stem Auger/none
 DRILLING EQUIPMENT MOBILE B-90
 GEOLOGIST Bruce Tsutsui CHECKED BY Wendy Zayac

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
12			12			CL	GRAVELLY CLAY, dark yellowish brown, 10 YR 3/4, dry to moist, soft to medium stiff, medium plasticity, medium toughness, no dilatancy, angular basalt to 3/4", CL (30% gravel, trace sand, 10% silt, 80% clay).		
17			17						
19	88		19	0.0		CL	CLAY, brown, 10 YR 4/3, dry to moist, soft to medium stiff, low to medium plasticity, no to low toughness, no dilatancy, CL (trace silt, 100% clay).		
10			10						
12	80	ALS803601	12			CL	CLAY, brown, 10 YR 4/3, dry to moist, stiff to medium stiff, medium plasticity, medium toughness, no dilatancy, CL (trace silt, 100% clay).		
18			18	0.0		CL			
4			4			CL	CLAY, as above, CL (trace silt, 100% clay).		
8			8			CL			
9	70		9	0.0		CL	CLAY, dark yellowish brown, 10 YR 4/4, moist, stiff to medium stiff, high plasticity, medium toughness, no dilatancy, yellowish mottling, some gray Mn staining, CH (trace silt, 100% clay).		
7			7			CH			
9	40		9	0.0		CH	CLAY, dark grayish brown, 10 YR 4/2, similar to above, no mottling or Mn staining, CH.		
9			9			CH			
40			40	0.0		CH	CLAY, as above, CH.		
40			40			CH			
9	100		9	0.0		CH	SILTY CLAY, brown, 7.5 YR 4/2, dry, medium stiff to stiff, non-plastic, no toughness, no dilatancy, reddish mottling, CL (30% silt, 70% clay).		
25			25			CL			
40			50/5'	0.0		CH	CLAY, dark yellowish brown, 10 YR 3/4, moist, stiff, medium to high plasticity, medium toughness, no dilatancy, CH (trace silt, 100% clay).		
14			14			CH			
16			16				CLAYEY SILT, yellowish brown, 10 YR 5/8, moist to dry, soft to medium stiff, non-plastic, no toughness, low dilatancy, crumbly, ML (80% silt, 20% clay).		
24			24	0.0		ML			
18			18				SILTY CLAY, dark yellowish brown, 10 YR 4/4, dry, soft to medium stiff, non-plastic, no toughness, no dilatancy, crumbly, CL (30% silt, 70% clay).		
22			22			CL			
26			26	0.0			CLAY, dark brown, 10 YR 3/3, moist to dry, very stiff, low to non-plastic, no toughness, no dilatancy, crumbly, CL (10% silt, 90% clay).		
28			28			CL			
29			29	0.0			CLAY, brown, 7.5 YR 4/4, moist to dry, medium stiff to soft, low to medium plasticity, low to no toughness, crumbly, CL (10% silt, 90% clay).		
50/3'			50/3'	0.0		CL			
21			21				SILTY CLAY, dark brown, 10 YR 3/3, moist to dry, medium stiff, low to non-plastic, no toughness, no dilatancy, crumbly, grayish black staining, CL (20% silt, 80% clay).		
28			28			CL			
34			34	0.0					
15	70		15						
18	70		18						
21	75		21						

CLIENT PACNAVFACENGCOM

BORING/WELL NUMBER SB03/MW03

PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1019-0145

COMPLETION DEPTH 80 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
24	60	ALS03S01 (HOLD)	38	0.0	[Hatched]	CL	SILTY CLAY , dark brown, 10 YR 3/3, moist to dry, medium stiff to soft, low to non-plastic, no toughness, no dilatancy, crumbly. CL (30% silt, 70% clay).		24
	75		41	0.0	[Dotted]	SW	GRAVELLY SAND , dark reddish brown, 5 YR 2.5/2, moist to dry, medium stiff, non-plastic, no toughness, no dilatancy, may be pulverized tuff, SW (30% gravel, 50% sand, 10% silt).		
	100		28	0.0	[Hatched]	CL	SILTY SANDY CLAY , light olive brown, 2.5 Y 5/3, moist, stiff to medium stiff, low to non-plastic, no toughness, no dilatancy, CL (trace gravel, 20% sand, 20% silt, 80% clay).		
27	100		17	0.0	[Hatched]	CL	SILTY SANDY CLAY , top as above, CL, bottom is CLAY , dark grayish brown, 2.5 Y 4/2, moist to dry, (wet) medium plasticity, low toughness, no dilatancy, CL (100% clay).		
	100		21	0.0	[Hatched]	CL	SILTY CLAY , light olive brown, 2.5 Y 5/3, moist, very stiff to hard, low to medium plasticity, low toughness, no dilatancy, somewhat friable, top has fragments of scoria, bottom grades to complete clay, CL (10% silt, 90% clay).		
	100		18	0.0	[Hatched]	CL	SILTY CLAY , as above, CL (100% clay).		
30	100		24	0.0	[Hatched]	CL	SILTY CLAY , grayish brown, 2.5 Y 5/2, top of sample similar to above, CL (100% clay), bottom 6" CLAY , dark brown, 7.5 YR 3/3, dry to moist, (wet) low to medium plasticity, no toughness, no dilatancy, CL (100% clay).		
	100		10	0.0	[Hatched]	CL	CLAY , as above, CL (100% clay).		
33	100		15	0.0	[Hatched]	CL	SILTY CLAY , dark brown, 7.5 YR 3/4, dry to moist, medium stiff, (wet) low to medium plasticity, no toughness, no dilatancy, white precipitate/infilling, rootlets and possible worm casts, CL (30% silt, 70% clay).		
	50		12	0.0	[Hatched]	CL	CLAY , brown, 10 YR 4/3, moist, very stiff, (wet) medium plasticity, no toughness, no dilatancy, CL (5% silt, 95% clay).		
36	80		18	0.0	[Hatched]	CL	CLAY , brown, 10 YR 5/3, moist, stiff to very stiff, (wet) medium plasticity, low toughness, no dilatancy, yellowish mottling, CL (5% silt, 95% clay).		
	100		14	0.0	[Hatched]	CL	SILTY CLAY , dark brown, 7.5 YR 3/3, moist, very stiff to hard, (wet) low plasticity, low toughness, no dilatancy, grades to saprolite - remnant structure pores, vesicles, CL (10% silt, 90% clay).		
39	75		7	0.0	[Hatched]	CH	CLAY , brown, 7.5 YR 4/4, moist, stiff, medium to high plasticity, low toughness, no dilatancy, CH (100% clay).		
	75		12	0.0	[Hatched]	CL	SILTY CLAY , brown, 7.5 YR 4/4, moist, stiff to medium stiff, low plasticity, low toughness, no dilatancy, grades into saprolite, remnant vesicles (small), angular shaped, CL (10% silt, 90% clay).		
42	50		2	0.0	[Dotted]	IE/CL	GRAVELLY SANDY CLAY , brown, 7.5 YR 4/4, moist, stiff to very stiff, low to non-plastic, saprolite - remnant vesicles, fractures, yellowish infilling, some Mn infilling, IE/CL (30% gravel, 20% sand, 50% clay).		
	88	10	0.0	[Dotted]	IE/CL	GRAVELLY SANDY CLAY , similar to above, more consolidated, yellowish infilling in remnant vesicles, vesicles approximately 1/8" and smaller, angular, elongate, IE/CL.			
45	100	11	0.0	[Dotted]	CL				

CLIENT PACNAVFACENGCOM

BORING/WELL NUMBER SB03/MW03

PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1019-0145

COMPLETION DEPTH 80 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
48	100		7		[CL]	CL	<u>SILTY CLAY</u> , dark yellowish brown, 10 YR 4/4, moist to dry, stiff to medium stiff, low plasticity, low toughness, no dilatancy, crumbly, saprolite remnant vesicles smaller, CL (30% silt, 70% clay).	<p>4" OD SCH 40 PVC</p> <p>4" OD STAINLESS STEEL SCREEN (0.02" SLOT)</p> <p>GROUT</p> <p>BENTONITE</p> <p>LONESTAR #3 SAND PACK</p>	48
48	80		10	0.0	[CL]	CL	<u>SILTY SANDY CLAY</u> , dark yellowish brown, 10 YR 4/4, moist, very stiff, non-plastic, no toughness, no dilatancy, saprolite - larger remnant vesicles, to 1/8", Mn infilling, CL (20% sand, 30% silt, 50% clay).		48
48	80		10	0.0	[ML]	ML	<u>SANDY SILT</u> , dark brown, 10 YR 3/3, moist, stiff to medium stiff, non-plastic, no toughness, no dilatancy, remnant round vesicles to 1/8", Mn infilling, yellowish infilling, crumbly, some gravel, ML (10% gravel, 30% sand, 50% silt, 10% clay).		48
51	75	ALSB03S02 (HOLD)	10	0.0	[ML]	ML	<u>SANDY SILT</u> , very dark gray, 10 YR 3/1, moist, very stiff, decomposed tuff, semi-consolidated, fine-grained, very few rock fragments, ML (40% sand, 80% silt).		51
51	80		10	0.0	[ML]	ML	<u>SANDY SILT</u> , as above, evidence of decomposed bomblets, outlines - some gravel sized (to 1/2") chunks of semi-consolidated fragments, ML.		51
54	80		10	0.0	[ML]	ML	<u>SANDY SILT</u> , as above, evidence of decomposed bomblets, outlines - some gravel sized (to 1/2") chunks of semi-consolidated fragments, ML.		54
54	80		10	0.0	[ML]	ML	Samplers meeting refusal.		54
57	80		10	0.0	[ML]	ML	Drilling to 80 ft bgs.		57
57	80		10	0.0	[ML]	ML	Softer material at 58.5 ft bgs.		57
60	85		18		[CL]	CL	<u>SANDY CLAY</u> , dark brown, 10 YR 3/3, moist, very stiff to hard, non-plastic, no toughness, no dilatancy, decomposed rock/saprolite, some gravel cobbles, vesicular basalt tuff fragments, CL (10% gravel, 30% sand, 20% silt, 40% clay).		60
63	100	ALSB03S03	21	2.8	[CL]	CL	<u>SILTY CLAY</u> , very dark grayish brown, 10 YR 3/2, moist, stiff to very stiff, (wet) low plasticity, low toughness, no dilatancy, some fragments, decomposed basalt, grades into saprolite, CL (30% silt, 70% clay).	63	
63	80		26	0.0	[CL]	CL	<u>GRAVELLY SILTY CLAY</u> , very dark grayish brown, 10 YR 3/2, moist, stiff to medium stiff, low plasticity, low toughness, no dilatancy, grades into saprolite - angular vesicles, basalt, CL (10% gravel, trace sand, 30% silt, 80% clay).	63	
66	75	ALSB03S04	27	0.8	[IE]	IE	<u>SAPROLITE</u> , dry to moist, semi-consolidated, very weathered fragments of vesicular basalt in clay matrix, vesicles infilled with white and yellowish material, IE.	66	
66	50		100/4"	10.5	[IE]	IE	<u>TUFF</u> , very dark grayish brown, 10 YR 3/2, dry to moist, semi-consolidated, fine-grained, crumbly, fragmented, no basalt fragments, moderately weathered, IE.	66	
69	88	ALSB03G02	100/4"	0.0	[IE]	IE	<u>TUFF</u> , grayish brown, 10 YR 5/2, similar to above, IE.	69	

CLIENT PACNAVFACEGCOM
 PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1019-0145
 DATE/TIME STARTED 9/12/86 / 0750
 DATE/TIME FINISHED 9/12/86 / 1430
 COORDINATES 523105.34, 77344.86
 ELEVATION AND DATUM 77.84 ft. MSL (BRASS MARKER)
 TOP OF CASING ELEVATION 76.81 ft.

BORING/WELL NUMBER SBO4/MW04
 COMPLETION DEPTH 76.5 ft.
 BOREHOLE DIAMETER 8 inch/10 inch
 DRILLER/COMPANY John Surigao, John Chism/Valley Well Drilling
 DRILLING METHOD/FLUID Hollow Stem Auger/none
 DRILLING EQUIPMENT MOBILE B-90
 GEOLOGIST Bruce Tsutsui CHECKED BY Wendy Zayac

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
							Asphalt, base coarse.		
3	100		3			CH	CLAY, dark brown, 7.5 YR 3/4, moist, soft, high plasticity, medium toughness, no dilatancy, homogeneous, CH (100% clay).		3
			2			CH	CLAY, brown, 10 YR 4/3, moist, soft, similar to above, CH (100% clay).		
			3	1.3*		CH			
			3			CH	CLAY as above, CH.		
			4			CH			
			8	1.3*		CH			
6			4			CH			
			8	1.3*		CH	CLAY, dark brown, 7.5 YR 3/3, moist, soft to medium stiff, medium plasticity, high toughness, no dilatancy, CH (100% clay).		6
			8			CH			
			15	1.3*		CH			
			18	1.3*		CH	SILTY CLAY, dark brown, 7.5 YR 3/2, moist, medium stiff, medium plasticity, medium toughness, no dilatancy, CH (20% silt, 80% clay).		
			15			CH	SILTY CLAY, as above, brown, 10 YR 4/3, CH.		
9			20	4.0		CH			9
			15			CH			
			50/8'	1.3*		CL	SILTY CLAY, brown, 10 YR 4/3, moist, medium stiff, non-plastic, no toughness, no dilatancy, CL (trace sand, 40% silt, 80% clay).		
			25			CL			
			25	1.3*		CL	SILTY CLAY, brown, 10 YR 4/3, moist, stiff, low plasticity, low toughness, no dilatancy, some minor Mn staining, CL (trace sand, 20% silt, 80% clay).		12
12			20			CL			
			20			CL	SILTY CLAY, as above, moist to dry, CL.		
			25	1.3*		CL			
			15			CL			
			25			CL			
			36	1.3*		SW SP	GRAVELLY SAND, very pale brown, 10 YR 8/3, moist to dry, pulverized limestone, probably coralline, SW/SP (30% gravel, 70% sand).		15
15			20			SW SP			
			50/8'	1.3*		CL	CLAY, brown, 10 YR 4/3, moist to dry, medium stiff, low plasticity, low toughness, no dilatancy, CL (100% clay).		
			15			CL			
			50/4'	1.3*		CL	GRAVELLY CLAY, dark brown, 7.5 YR 3/4, moist to dry, stiff, non-plastic, no toughness, no dilatancy, inclusions of pale clay, CL (20% gravel, trace sand, trace silt, 80% clay).		18
			20			CL			
18			25			CL	CLAY, dark brown, 7.5 YR 3/3, moist to dry, medium stiff, (wet) medium plasticity, high toughness, no dilatancy, inclusions of pale clay, dark grayish brown, 2.5 Y 4/2, CH (100% clay).		18
			30	1.3*		CH			
			15			CH			
			25			CH			
			30	1.3*		CH			21

CLIENT PACNAVFACENCOM

BORING/WELL NUMBER SBO4/MW04

PROJECT NAME/NUMBER AJEA LAUNDRY RI/FS, NO. 1-101B-0145

COMPLETION DEPTH 76.5 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
10			10			CH	CLAY, as above, overlying CLAY, brown to olive brown, 10 YR 4/3 to 2.5 Y 4/3, medium to high plasticity, high toughness, no dilatancy, mottled, color range is evenly distributed, CH (100% clay).		
20			20		CH				
24	100		30	1.3*		CH	CLAY, as above, overlying CLAY, grayish brown, 2.5 Y 5/2, moist to dry, very stiff, medium plasticity, high toughness, no dilatancy, some limonite (?) inclusions, CH (100% clay).		24
24	100		11		CH				
			25	1.3*		CH	CLAY, gray, 2.5 Y 5/1, moist to dry, very stiff, (wet) medium to high plasticity, high toughness, no dilatancy, appears similar to backyard surface material, CH (100% clay).		
27	70		10		CH				
			17			CH	CLAY, dark gray to dark yellowish brown, 2.5 Y 4/1 to 10 YR 4/4, moist to dry, stiff to very stiff, (wet) high plasticity, medium toughness, no dilatancy, mottled, CH (100% clay).		
27	70		30	1.3*		CH			
			10			CH	CLAY, dark yellowish brown, 10 YR 3/4, moist to dry, stiff, (wet) high plasticity, medium toughness, no dilatancy, CH (100% clay).		
			15		CH				
			18			CH	CLAY, as above, CH.		
30	100		27	1.3*		CH			
			4			CH	CLAY, as above, overlying CLAY, grayish brown, 2.5 Y 5/2, moist to dry, stiff, high plasticity, low toughness, no dilatancy, CH (100% clay).		
			8		CH				
		ALSBO4G01	15	1.3*		CH	CLAY, as above, grayish brown, 2.5 Y 5/2, CH.		
			15		CH				
			18			CH	CLAY, as above, light olive brown, 2.5 Y 5/3, CH.		
33	100		30	1.3*		CH			
			10			CH	CLAY, brown, 10 YR 4/3, moist to dry, stiff, (wet) medium to high plasticity, medium toughness, no dilatancy, remnant vesicles, CH (100% clay).		
			15	1.3*		CH			
			7			CH	CLAY, similar to above, brown, 7.5 YR 4/3, CH (100% clay).		
			8		CH				
			12	1.3*		CH	SILTY CLAY, dark yellowish brown, 10 YR 3/4, moist to dry, stiff, (wet) non-plastic, no toughness, no dilatancy, CL (30% silt, 70% clay).		
36	100		4		CH				
			8			CH	CLAY, dark brown, 7.5 YR 3/3, moist to dry, stiff, (wet) medium to low plasticity, no toughness, no dilatancy, CL (trace sand, trace silt, 100% clay).		
			12	1.3*		CH			
			15			CL	GRAVELLY SAND, brown, 10 YR 4/3, moist to dry, stiff to hard, SW/SP (20% gravel, 80% sand, trace silt), grades into TUFF, degree of cementing increasing with depth, borderline gravel, IE.		
39	100		5		CL				
			10			CL	SAND, similar to above, brown, 10 YR 4/3, varying degrees of cementing, slightly smaller grain sizes, SP (10% gravel, 90% sand, trace silt).		
			12	1.3*		CL			
		ALSBO4S01	25	1.3*		SW	SANDY SILT, brown to olive brown, 10 YR 4/3 to 2.5 Y 4/3, moist to dry, soft, non-plastic, no toughness, no dilatancy, possibly pulverized tuff, ML (trace gravel, 40% sand, 80% silt, trace clay).		
42	40		12		SW				
			50/5'	1.3*		IE			
			25		SP				
			50/3'	1.3*		ML			
45	15		25		IE				

CLIENT PACNAVFACENGCOM

BORING/WELL NUMBER SB04/MW04

PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1019-0145

COMPLETION DEPTH 76.5 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
48	33		50/5'	1.3*		IE	TUFF , very dark grayish brown, 2.5 Y 3/2, moist to dry, sand to silt-sized grains, friable/crumby, some ash and crystalline material, very lightly weathered, IE.	<p>WELL DIAGRAM</p> <p>4" OD SCH 40 PVC</p> <p>4" OD STAINLESS STEEL SCREEN (0.02" SLOT)</p> <p>GROUT</p> <p>BENTONITE</p> <p>LONESTAR #3 SAND PACK</p>	48
48	50		50/3'	1.3*		SP	SAND , very dark gray, 2.5 Y 3/1, moist to dry, medium stiff to stiff, non-plastic, no toughness, no dilatancy, some cementation and particles of tuff, material is probably pulverized tuff, SP (100% sand, trace silt).		48
51			100/1"				No recovery 48.0-48.5 ft bgs. Drilling and driving becoming difficult.		51
51			150/3"				No recovery 48.5-51.0 ft bgs.		51
54			100/3"	1.3*		SP	SAND , very dark grayish brown, 2.5 Y 3/2, moist to dry, soft to hard, very fine-grained, probably pulverized tuff, SP (trace gravel, 100% sand, trace silt), grades to TUFF , some material cemented, friable, IE.		54
54		ALSB04S02	100/3"	1.3*		SM	SILTY SAND , very dark grayish brown, 2.5 Y 3/2, moist to dry, similar to above, SM (80% sand, 20% silt), grades to TUFF , cementing increasing with depth in sampler, some tuff cookies, IE.		54
57			D&D	4.0		IE	TUFF , very dark grayish brown, 2.5 Y 3/2, moist to dry, very fine-grained, primarily silt sized, very hard, almost scratches steel, very lightly weathered, massive, some inclusions, IE.		57
57			150/8"	1.3*		CL	GRAVELLY CLAY , very dark grayish brown, 10 YR 3/2, moist to dry, low to non-plastic, no toughness, no dilatancy, subangular to angular tuff to 1", CL (40% gravel, 10% sand, 50% clay).		57
60			100/8"	1.3*		CH	GRAVELLY CLAY , very dark grayish brown, 10 YR 3/2, moist, stiff, high plasticity, medium toughness, no dilatancy, gravel fragments very rounded, range from 1/8" to 1.5", CH (40% gravel, 80% clay).		60
60		ALSB04G02	D&D	1.3*		CH	GRAVELLY CLAY , very dark grayish brown, 10 YR 3/2, dry to moist, stiff, similar to above, less gravel, CH (30% gravel, 70% clay).		60
63			10	1.3*		CH	GRAVELLY CLAY , as above, overlying CLAY , brown, 7.5 YR 4/4, moist to dry, stiff, (wet) high plasticity, high toughness, no dilatancy, CH (100% clay).		63
63			25	1.3*		CH	CLAY , brown, 7.5 YR 4/4, moist to dry, very stiff, (wet) high plasticity, medium toughness, no dilatancy, CH (100% clay).		63
63			40	1.3*		CH	CLAY , brown, 7.5 YR 4/4, moist to dry, stiff, (wet) medium to high plasticity, medium toughness, no dilatancy, CH (100% clay).		63
66			35	1.3*		CH	CLAY , brown, 10 YR 4/3, moist, medium stiff, low to medium plasticity, low toughness, no dilatancy, CL (100% clay).		66
66		ALSB04S03	50/5'	1.3*		CH	GRAVELLY CLAY , dark brown, 10 YR 3/3, wet, soft to medium stiff, medium to high plasticity, medium toughness, no dilatancy, CH (20% gravel, 80% clay).		66
66			50/8'	1.3*		CH	Drill to 75 ft bgs.		66
69		ALSB04G03	10	4.0		CH			69
69			20	1.3*		CH			69
69			20	1.3*		CH		69	

CLIENT PACNAVFACENGCOM
 PROJECT NAME/NUMBER AJEA LAUNDRY RI/FS, NO. I-1019-0145
 DATE/TIME STARTED 8/15/86 / 1410
 DATE/TIME FINISHED 8/19/86 / 1802
 COORDINATES 523108.83, 77272.88
 ELEVATION AND DATUM 78.22 ft. MSL (BRASS MARKER)
 TOP OF CASING ELEVATION 77.79 ft.

BORING/WELL NUMBER SB05/MW05
 COMPLETION DEPTH 76 ft.
 BOREHOLE DIAMETER 8 inch/10 inch
 DRILLER/COMPANY Dean McLure, John Chism/Valley Well Drilling
 DRILLING METHOD/FLUID Hollow Stem Auger/none
 DRILLING EQUIPMENT MOBILE B-90
 GEOLOGIST Bruce Tsutsui CHECKED BY Wendy Zayac

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
0			8			GC	CLAYEY GRAVEL, dark brown, 10 YR 3/3, dry to moist, soft to medium stiff, non-plastic, no toughness, no dilatancy, GC (50% gravel, 10% sand, 5% silt, 35% clay).		0
8			15	3.3		CH	CLAY, dark brown, 10 YR 3/3, moist, soft, high plasticity, medium toughness, no dilatancy, CH (100% clay).		3
15	40		11			CH	CLAY, dark brown, 10 YR 3/3, moist, soft to medium stiff, medium to high plasticity, medium toughness, no dilatancy, distinct odor and staining in bottom 8", CH (100% clay).		3
3	88		3	4.3		CH	CLAY, as above, distinct diesel odor and staining throughout, CH (100% clay).		3
3	88		3	582		CH	CLAY, as above, only partially stained, CH (100% clay).		3
5	50		8	194		CH	No recovery 7.5-8.0 ft bgs, may have hit perched water.		6
5	50	ALSB05S01	5						6
5	50		10	881					6
9			8			CH	CLAY, dark grayish brown, 10 YR 4/2, moist to wet, medium stiff to stiff, high plasticity, high toughness, low dilatancy, no discernible odor, staining, CH (100% clay).		9
9	75		8	8.3		CL	SILTY CLAY, very dark gray, 10 YR 3/1, dry to moist, stiff to very stiff, non-plastic, no toughness, no dilatancy, slight odor, CL (trace sand, 40% silt, 80% clay).		9
12	40		50/4	130.8		IE/CL	SAPROLITE/SILTY CLAY, very dark grayish brown, 10 YR 3/2, dry to moist, very stiff to hard, non-plastic, no toughness, no dilatancy, no staining, odor, IE/CL (40% silt, 80% clay).	12	
12	70		28	27.8		CL	SILTY CLAY, dark grayish brown, 10 YR 4/2, dry, stiff, (wet) low to medium plasticity, high toughness, no dilatancy, CL (20% silt, 80% clay).	12	
15			20	111.8		CL	SILTY CLAY, as above, top 8", CL, distinct margin with SILTY CLAY, very pale brown, 10 YR 8/2, dry to moist, medium stiff, (wet) low plasticity, medium toughness, no dilatancy, coralline material, CL (20% silt, 80% clay).	15	
15	70	ALSB05S02	20					15	
17			17			CH	CLAY, dark brown, 10 YR 3/3, dry to moist, hard to very stiff, (wet) high plasticity, high toughness, no dilatancy, top 8" contains white material, as above, CH (100% clay).	17	
27			27	10.8		CH	CLAY, similar to above, dark brown, 7.5 YR 3/2, very stiff, CH (100% clay).	18	
30	90		18			CH		18	
18	100		21	0.8*		CH		18	
18			37			CH		18	
7	70		7	0.8*		CH		18	
18			18			CH		18	
24			24	0.8*		CH		21	
7			7			CH		21	
21			12					21	

CLIENT PACNAVFACENGCOM

BORING/WELL NUMBER SB05/MW05

PROJECT NAME/NUMBER AJEA LAUNDRY RI/FS, NO. 1-1019-0145

COMPLETION DEPTH 78 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
24	100		29	0.6*	[Hatched]	CH	CLAY, very dark grayish brown, 10 YR 3/2, dry to moist, stiff, low to medium plasticity, high toughness, no dilatancy, CL (100% clay).	[Well Diagram]	24
			16		[Hatched]	CL			
	50		23		[Hatched]	CL	Top 3" similar to above overlying CLAY, grayish brown, 2.5 Y 5/2, dry to moist, stiff, low to medium plasticity, low toughness, no dilatancy, slightly crumbly, CL (100% clay).	[Well Diagram]	24
			35		[Hatched]	CL			
	100		9		[Hatched]	CL	Top 8"-9" CLAY as above, CL, grades to SILTY CLAY, dark grayish brown, 2.5 Y 4/2, dry to moist, very stiff, medium to high plasticity, low toughness, no dilatancy, crumbly, CH (20% silt, 80% clay).	[Well Diagram]	24
			13		[Hatched]	CL			
	70		16	0.6*	[Hatched]	CL	CLAY, grayish brown, 2.5 Y 5/2, dry to moist, stiff to very stiff, medium plasticity, high toughness, no dilatancy, CH (100% clay).	[Well Diagram]	27
			17		[Hatched]	CL			
	100		23		[Hatched]	CH	CLAY similar to above, gray, 2.5 Y 5/1, stiff, medium plasticity, high toughness, no dilatancy, CH (100% clay).	[Well Diagram]	27
			24	0.6*	[Hatched]	CH			
	70		10		[Hatched]	CH	Top 8" CLAY as above, CH, overlying CLAY brown, 10 YR 4/3, dry to moist, medium stiff, (wet) medium plasticity, high toughness, no dilatancy, scattered rounded basalt to 1/2", CL (trace gravel, 10% silt, 90% clay).	[Well Diagram]	27
			10	0.6*	[Hatched]	CH			
	100		20		[Hatched]	CH	CLAY, dark grayish brown, 10 YR 4/2, dry to moist, medium stiff, (wet) low plasticity, low to no toughness, no dilatancy, CL (100% clay).	[Well Diagram]	30
			7	0.6*	[Hatched]	CH			
	50		9		[Hatched]	CH	CLAY, dark grayish brown, 10 YR 4/2, dry to moist, medium stiff, (wet) low plasticity, low to no toughness, no dilatancy, CL (100% clay).	[Well Diagram]	30
			14	0.6*	[Hatched]	CH			
	88		11		[Hatched]	CH	CLAY, light brownish gray, 2.5 Y 8/2, dry to moist, stiff to very stiff, medium to high plasticity, high toughness, no dilatancy, crumbly, some small (1/16") remnant vesicles with whitish coatings, CH (100% clay).	[Well Diagram]	30
			18		[Hatched]	CL			
	40		15	1.8*	[Hatched]	CL	CLAY, dark grayish brown, 10 YR 4/2, dry to moist, medium stiff to soft, low plasticity, low to no toughness, no dilatancy, CL (100% clay).	[Well Diagram]	33
			24		[Hatched]	CL			
	88		26		[Hatched]	CL	CLAY, light brownish gray, 2.5 Y 8/2, dry to moist, stiff to very stiff, medium to high plasticity, high toughness, no dilatancy, crumbly, some small (1/16") remnant vesicles with whitish coatings, CH (100% clay).	[Well Diagram]	33
			28	3.1*	[Hatched]	CL			
	40		4		[Hatched]	CL	CLAY, brown, 10 YR 4/3, dry to moist, medium stiff, medium to high plasticity, low toughness, no dilatancy, grades into clay similar to 33.5 to 35 ft bgs, CH (100% clay).	[Well Diagram]	36
			7		[Hatched]	CL			
	88		20		[Hatched]	CH	CLAY, dark grayish brown, 10 YR 4/2, dry to moist, medium stiff, (wet) low plasticity, no toughness, no dilatancy, CL (5% silt, 95% clay).	[Well Diagram]	36
			9	3.1*	[Hatched]	CH			
	70		12	0.6*	[Hatched]	CH	CLAY, dark yellowish brown, 10 YR 3/4, dry to moist, medium stiff, (wet) low to medium plasticity, low toughness, no dilatancy, gravel rock fragments to 1", CL (trace gravel, 10% silt, 90% clay).	[Well Diagram]	39
			10		[Hatched]	CH			
	88		10		[Hatched]	CL	CLAY, as above, some remnant vesicles, CL.	[Well Diagram]	39
			7	0.6*	[Hatched]	CL			
	70		14		[Hatched]	CL	CLAYEY SILT, dark brown, 7.5 YR 3/3, dry to moist, medium stiff, (wet) non-plastic, no toughness, no dilatancy, some remnant vesicles, rock particles (small - 1/16"), ML (10% sand, 80% silt, 30% clay).	[Well Diagram]	42
			7	0.6*	[Hatched]	CL			
	88		10		[Hatched]	CL	SILTY CLAY, brown, 10 YR 4/3, dry to moist, medium stiff to stiff, (wet) low plasticity, low toughness, no dilatancy, CL (10% sand, 30% silt, 60% clay).	[Well Diagram]	42
			13		[Hatched]	CL			
	70		11	0.6*	[Hatched]	CL	SILTY CLAY, as above, CL, grading to SILTY SAND, dark olive gray, 5 Y 3/2, with fractured rock fragments, possibly tuff, SM (trace gravel, 70% sand, 30% silt).	[Well Diagram]	45
			7		[Hatched]	CL			
	88		12	14.4	[Hatched]	SM		[Well Diagram]	45
5	30		35	3.1	[Hatched]	SM		[Well Diagram]	45

GROUT

4" OD SCH 40 PVC

CLIENT PACNAVFACENGCOM

BORING/WELL NUMBER SB05/MW05

EJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1019-0145

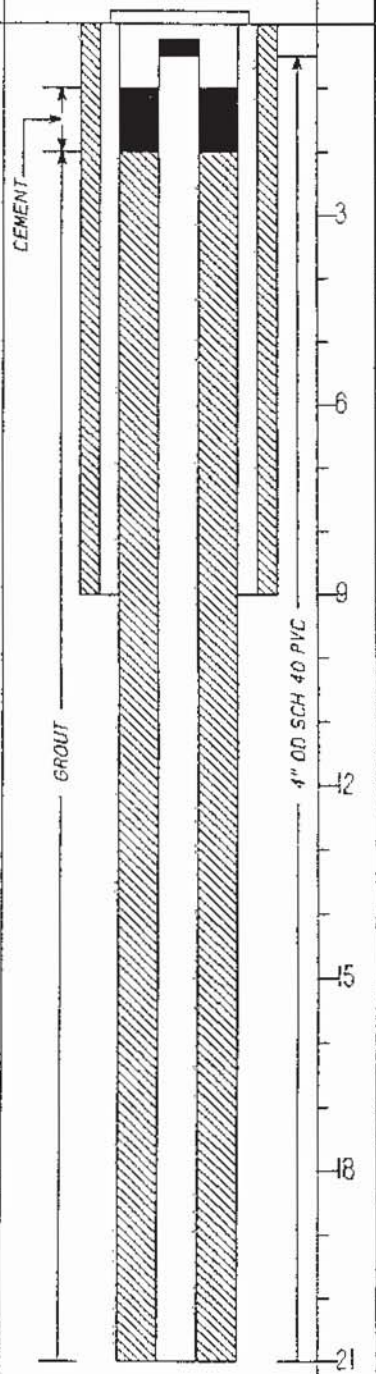
COMPLETION DEPTH 76 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
48	15		80/8'	1.8	[SM]	SM	SILTY SAND, as above, sand slightly finer grained, more silt, no gravel, some lightly cemented, very crumbly, SM (80% sand, 40% silt).	<p>WELL DIAGRAM</p> <p>4" OD SCH 40 PVC</p> <p>GROUT</p> <p>BENTONITE</p> <p>LONESTAR #3 SAND PACK</p>	48
	15		80/8'	5.8	[SM]	SM	SILTY SAND, similar to above, black, 2.5 Y 2.5/1, cementation, SM (80% sand, 40% silt).		48
	15		80/8'	37.4	[SM]	SM	SILTY SAND, as above, slightly finer grained, SM (80% sand, 40% silt).		51
51	35	ALSB05G01	120/7"	9.4	[IE/SM]	IE/SM	SILTY SAND, as above, shoe contains BASALT, vesicles elongate, irregular, rock lightly weathered, fragmented, largest is 1", IE/SM.		51
	15	ALSB05G01	100/4"	123.1	[IE/SM]	IE/SM	SILTY SAND/BASALT, as above, IE/SM.		54
54	15		100/2.5"		[IE/SM]	IE/SM	SILTY SAND/BASALT, as above, IE/SM.		54
	100	ALSB05G01	D&D	9.4	[IE/ML]	IE/ML	SANDY SILT/BASALT, similar to above, slightly finer distribution, sand borders on silt size, IE/ML (trace gravel, 40% sand, 80% silt, trace clay).		57
57	20		100/6"	4.3	[IE/ML]	IE/ML	SANDY SILT/BASALT, black, 5 Y 2.5/1, as above, more moist, IE/ML (trace gravel, 40% sand, 80% silt, trace clay).		57
	40	ALSB05S03	80/8'	45.1	[IE/ML]	IE/ML	SANDY SILT/BASALT, as above, shoe contains fragments of basalt, mostly massive, lightly weathered, angular, ranging from 1/8" to 1", hydrocarbon odor, IE/ML.		60
60	15		80/8'	9.4	[GC]	GC	SANDY GRAVEL, very dark gray, 2.5 Y 3/1, moist, loose, angular fragments of basalt, mostly massive, from 1/8" to 1", GC (80% gravel, 40% sand, trace silt).		60
	88		38	18.9	[CL]	CL	Top 4" SANDY GRAVEL, as above, GC, overlying SILTY SANDY CLAY, very dark gray, 2.5 Y 3/1, no to low plasticity, no toughness, no dilatancy, some rounded basalt gravel, distinct odor, CL (trace gravel, 30% sand, 30% silt, 40% clay).		63
63	80		31	1.8	[CL]	CL	GRAVELLY SILTY CLAY, very dark grayish brown, 10 YR 3/2, moist, medium stiff, (wet) low to no plasticity, no toughness, no dilatancy, gravel to cobble sized subangular basalt (?) in clay matrix, CL (10% gravel, trace sand, 20% silt, 70% clay).		63
	70		29	0.8*	[CH]	CH	CLAY, very dark grayish brown, 10 YR 3/2, moist, very stiff to hard, (wet) medium to high plasticity, low toughness, no dilatancy, CH (5% silt, 95% clay).		66
66	90	ALSB05G02	18	0.8*	[CH]	CH	CLAY, brown, 10 YR 4/3, moist, very stiff, (wet) medium to high plasticity, low toughness, no dilatancy, CH (100% clay).	66	
	70		28	0.8*	[CH]	CH	CLAY, similar to above, dark brown, 10 YR 3/3, some remnant vesicles (?), scattered rounded basalt fragments 1/4" to 1/8", CH (5% gravel, 95% clay).	69	
69			20		[CH]	CH	CLAY, as above, no remnant structure, Mn staining and yellowish (limonite?) staining, CH	69	

CLIENT PACNAVFACENGCOM
 PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. I-1019-0145
 DATE/TIME STARTED 8/23/96 / 1250
 DATE/TIME FINISHED 8/26/96 / 1428
 COORDINATES 523104.95, 77172.06
 ELEVATION AND DATUM 77.14 ft. MSL (BRASS MARKER)
 TOP OF CASING ELEVATION 76.53 ft.

BORING/WELL NUMBER SB06/MW06
 COMPLETION DEPTH 76.5 ft.
 BOREHOLE DIAMETER 6 and 5 inch
 DRILLER/COMPANY Dean McLure, John Chism/Valley Well Drilling
 DRILLING METHOD/FLUID Hollow Stem Auger/none
 DRILLING EQUIPMENT MOBILE B-90
 GEOLOGIST Bruce Tsutsui CHECKED BY Wendy Zayac

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
7						CL	Cut through asphalt.		
8						CH	GRAVELLY CLAY, very dark gray, 5 Y 3/1, dry to moist, medium stiff to stiff, (wet) low plasticity, low toughness, no dilatancy, diesel (?) odor, possible staining. CL (40% gravel, 5% sand, 5% silt, 50% clay).		
11	80			0.0	CH				
13					CH				
18	30			0.0	CH	GRAVELLY CLAY, very dark grayish brown, 10 YR 3/2, dry to moist, medium stiff, high plasticity, medium toughness, no dilatancy, subangular basalt gravel to 1", CH (30% gravel, trace sand, trace silt, 70% clay).		3	
22	70			0.0	CH	GRAVELLY CLAY, very dark grayish brown, 2.5 Y 3/2, moist, medium stiff to soft, high plasticity, medium toughness, no dilatancy, slight odor, CH (10% gravel, 5% silt, 85% clay).			
23					CH				
28	80			0.0	GC	GRAVELLY CLAY, as above, CH.		6	
33		ALSB06S01		84.7	GC	CLAYEY GRAVEL, black, 2.5 Y 2.5/1, saturated, loose/soft, subangular to subrounded basalt, strong odor, GC (70% gravel, 5% sand, 5% silt, 20% clay).			
38	50				CH	CLAY, brown, 10 YR 4/3, dry to moist, stiff, high plasticity, high toughness, no dilatancy, may be confining layer, CH (100% clay).			
42				5.3	CH				
48	50				CH	CLAY, very dark grayish brown, 10 YR 3/2, dry to moist, stiff to very stiff, high plasticity, high toughness, no dilatancy, CH (5% silt, 95% clay).		9	
50			50/5'	9.9	CH				
55	50				CH	CLAY, dark brown, 7.5 YR 3/2, dry to moist, very stiff, (wet) high plasticity, high toughness, no dilatancy, slight odor, possible staining, CH (100% clay).			
58			50/2'		CH				
62					CL	SILTY CLAY, dark gray, 10 YR 4/1, dry to moist, very stiff, (wet) medium plasticity, medium toughness, no dilatancy, slight odor, CL (10% silt, 90% clay).			
65	88		24	30/7'	CL				
68		ALSB08G04		9.9	SM	SILTY SAND, very dark gray, 10 YR 3/1, dry, stiff to very stiff, (wet) non-plastic, no toughness, no dilatancy, gravel is small, angular basalt to 1/8", SM (5% gravel, 50% sand, 45% silt).			
70	88		28	50/4'	SM				
75	50				ML	CLAYEY SILT, dark grayish brown, 10 YR 4/2, dry, stiff, (wet) no to low plasticity, no toughness, no dilatancy, no discernible odor, ML (80% silt, 40% clay).			
78			23	50/5'	ML				
82	50				ML	CLAYEY SILT, similar to above, dark grayish brown, 10 YR 4/2, ML (80% silt, 40% clay).			
85			18	50/4'	ML				
90	50				SW	GRAVELLY SAND, very dark gray, 10 YR 3/1, dry to moist, non-plastic, no toughness, no dilatancy, strong odor, SW (40% gravel, 50% sand, 10% silt).			
95			40	50/5'	SW				
100	50				ML	SANDY SILT, similar to above, very dark gray, 10 YR 3/1, finer grain size distribution, ML (trace gravel, 40% sand, 60% silt).			
105			14	50/5'	ML				
110	50				ML				



CLIENT PADNAVFACENGCOM

BORING/WELL NUMBER SB06/MW06

PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1019-0145

COMPLETION DEPTH 76.5 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
24	50		44			ML	CLAYEY SILT, very dark grayish brown, 10 YR 3/2, dry to moist, stiff to medium stiff, low plasticity, low toughness, no dilatancy, ML (trace sand, 80% silt, 40% clay).		24
	50		50/8"	39.3		ML			
	50		25			ML	CLAYEY SILT, similar to above, very dark grayish brown, 10 YR 3/2, signs of remnant structure, weathered tuff?, ML.		24
	50		50/5"	57.6		ML			
	80		21			CL	SILTY CLAY, very dark gray, 10 YR 3/1, dry to moist, stiff to very stiff, (wet) low plasticity, low toughness, no dilatancy, CL (40% silt, 60% clay).		24
	80		24			CL			
	80		25	16.7		CH	CLAY, dark gray, 10 YR 4/1, dry to moist, stiff, (wet) high plasticity, medium toughness, no dilatancy, distinct odor, CH (5% silt, 95% clay).		27
	80		14			CH			
	80		27			CH	CLAY, very dark gray, 10 YR 3/1, dry to moist, stiff, (wet) high plasticity, medium toughness, no dilatancy, ashy feeling similar to backyard surface, odor, CH (5% silt, 95% clay).		27
	80		28	37.0		CH			
	80		7			CH	CLAY, as above, CH.		27
	80		14			CH			
	80		18	124.1		CH	SILTY CLAY, dark grayish brown, 10 YR 4/2, dry to moist, stiff, (wet) non-plastic, no toughness, low dilatancy, distinct odor, CL (10% silt, 90% clay).		30
	80		060			CH			
	70	ALSBO6G01	70	104.7		CL	CLAY, dark grayish brown, 10 YR 4/2, dry to moist, stiff to very stiff, (wet) non-plastic, no toughness, no dilatancy, alluvial (?) material in bottom 8". CL (trace gravel, 5% silt, 95% clay).		30
	70		14			CL			
	70		22			CL	GRAVELLY CLAY, dark grayish brown, 10 YR 4/2, moist, stiff, (wet) high plasticity, high toughness, no dilatancy, gravel rounded to subrounded basalt, mostly massive to 1.5", CH (30% gravel, trace silt, 70% clay).		33
	70		22	102.9		CL			
	70		10			CL	CLAY, very dark grayish brown, 10 YR 3/2, moist, stiff, (wet) low plasticity, low toughness, no dilatancy, distinct odor, CL (100% clay).		33
	70		17			CL			
	70		21	97.8		CH	CLAY, similar to above, dark gray, 10 YR 4/1, CL.		33
	70		10			CH			
	70		10			CH	SILTY CLAY, dark brown, 10 YR 3/3, moist, stiff to medium stiff, (wet) low plasticity, low toughness, no dilatancy, possible remnant vesicles, CL (20% silt, 80% clay).		36
	70		10			CH			
	80		18	148		CL	CLAYEY SILT, black, 10 YR 2/1, moist, medium stiff, (wet) non-plastic, no toughness, no dilatancy, distinct odor, ML (70% silt, 30% clay).		36
	80		28	193.4		CL			
	80		9			CL	CLAY, brown, 7.5 YR 4/3, dry to moist, medium stiff, (wet) low plasticity, low to no toughness, no dilatancy, CL (100% clay).		36
	80		28	183.4		CL			
	70		10			CL	SAND, dark gray, 10 YR 4/1, moist, loose to medium dense, lightly cemented, crumbly, friable, some segments of well cemented tuff, SW (5% gravel, 90% sand, 5% silt, trace clay).		39
	70		14	212.0		CL			
	80		7			CL	SAND, dark gray, 10 YR 4/1, moist, loose to medium dense, lightly cemented, crumbly, friable, some segments of well cemented tuff, SW (5% gravel, 90% sand, 5% silt, trace clay).		39
	80		14			CL			
	80		21	171.1		ML	SAND, dark gray, 10 YR 4/1, moist, loose to medium dense, lightly cemented, crumbly, friable, some segments of well cemented tuff, SW (5% gravel, 90% sand, 5% silt, trace clay).		39
	80		4			ML			
	70		7			CL	SAND, dark gray, 10 YR 4/1, moist, loose to medium dense, lightly cemented, crumbly, friable, some segments of well cemented tuff, SW (5% gravel, 90% sand, 5% silt, trace clay).		42
	70		19	131.4		CL			
	70		7			CL	SAND, dark gray, 10 YR 4/1, moist, loose to medium dense, lightly cemented, crumbly, friable, some segments of well cemented tuff, SW (5% gravel, 90% sand, 5% silt, trace clay).		42
	70		10			CL			
	70		10	118.8		SM	SAND, dark gray, 10 YR 4/1, moist, loose to medium dense, lightly cemented, crumbly, friable, some segments of well cemented tuff, SW (5% gravel, 90% sand, 5% silt, trace clay).		42
	70		10			SM			
	70		12			SW	SAND, dark gray, 10 YR 4/1, moist, loose to medium dense, lightly cemented, crumbly, friable, some segments of well cemented tuff, SW (5% gravel, 90% sand, 5% silt, trace clay).		42
	70		15	192.1		SW			
	70		18			SW	SAND, dark gray, 10 YR 4/1, moist, loose to medium dense, lightly cemented, crumbly, friable, some segments of well cemented tuff, SW (5% gravel, 90% sand, 5% silt, trace clay).		45
	70		50/5"	97.2		SW			
						NE			

CLIENT PACNAVFACENGCOM

BORING/WELL NUMBER SB06/MW06

PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. I-1016-0145

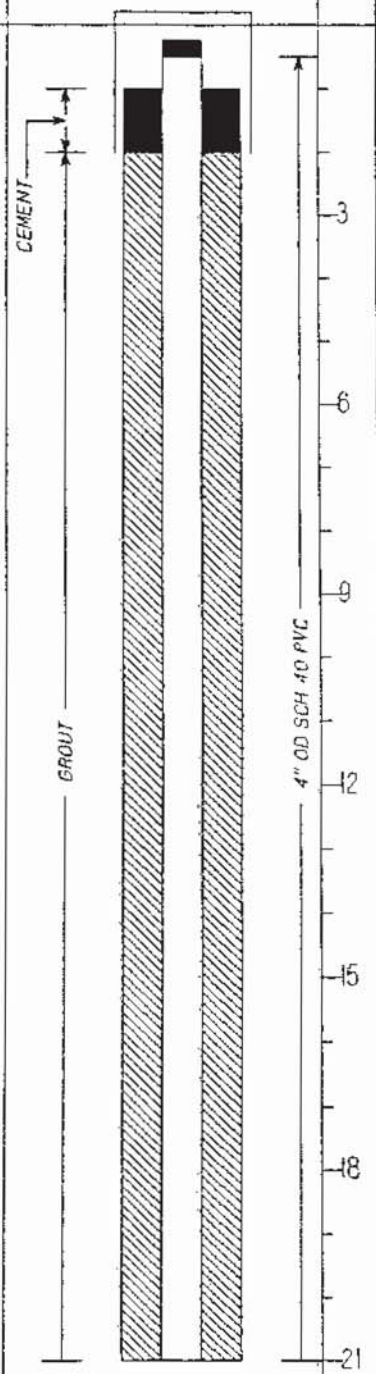
COMPLETION DEPTH 76.5 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
48	90	ALSB06S02	21			IE	TUFF, very dark brown, 10 YR 2/2, dry to moist, lightly cemented, friable, some vesicles, maybe worm holes, IE.		48
	70		30	183.7		IE	First 8" TUFF as above, IE, overlying CLAY, dark yellowish brown to strong brown, 10 YR 4/6 to 7.5 YR 4/6, moist, very stiff to stiff, high plasticity, medium toughness, no dilatancy, very orange brown limonite?, CH (100% clay).		
	70		28			CH			
	15		31	107.1		CH			
51	33		36	95.2		SM	GRAVELLY CLAY, black, 10 YR 2/1, moist, soft to medium stiff, (wet) high plasticity, low toughness, low dilatancy, overlying highly weathered tuff, CH (20% gravel, trace sand, trace silt, 80% clay).		
			21	78.2		IE	SILTY SAND, black, 10 YR 2/1, moist, soft/loose, non-plastic, no toughness, no dilatancy, very well distributed - narrow range of particle sizes around silt limit, SM (70% sand, 30% silt).		
			22	39.3		CL	SILTY SAND, as above, SM, overlying TUFF, black, 2.5 Y 2.5/1, extremely fine-grained, (basalt?), slaty fracture, IE.		
54			20	12.2		CL	TUFF, as above, IE, grading into GRAVELLY CLAY, dark grayish brown, 10 YR 4/2, dry to moist, hard, (wet) non-plastic, no toughness, no dilatancy, CL (40% gravel, trace sand, trace silt, 60% clay).		
			37			CL			
			17			IE	GRAVELLY SANDY CLAY, as above, very dark grayish brown, 10 YR 3/2, with sand, less gravel, grades to SILTY CLAY, dark grayish brown, 10 YR 4/2, low plasticity, no toughness, no dilatancy, CL (20% gravel, trace sand, trace silt, 80% clay).		
57	40	25	21.1		CL	TUFF, olive brown, 2.5 Y 4/3, very fine-grained, hard, slaty fracture, lower 8" composed of tuff fragments in silty clay, IE.			
		14			CL	SILTY CLAY, dark brown, 10 YR 3/3, dry to moist, stiff to very stiff, low to non-plastic, no toughness, no dilatancy, CL (30% silt, 70% clay).			
		18			CL	CLAY, dark reddish brown, 2.5 YR 3/3, moist, stiff, (wet) low plasticity, no toughness, no dilatancy, CL (5% silt, 95% clay).			
		30	14.4		IE	CLAY, brownish yellow to gray, 10 YR 8/8 to 10 YR 5/1, dry to moist, stiff to very stiff, (wet) low plasticity, no toughness, no dilatancy, odor, possible staining, CL (trace gravel, 5% silt, 95% clay).			
60	70	7	1.1*		IE	TUFF similar to 55.5"-57.0", black, 10 YR 2/1, moist, fine-grained hard, slaty fracture, microcrystalline plagioclase, IE.			
		29			IE	TUFF, similar to above, dark gray, 10 YR 4/1, IE, partial GRAVELLY CLAY matrix, very dark gray, 10 YR 3/1, moist, stiff, low plasticity, no toughness, no dilatancy, gravel angular tuff to 1/4", CL (40% gravel, trace sand, trace silt, 80% clay).			
		25	55.3		IE	TUFF, similar to above, brown, 10 YR 4/3, IE.			
63	40	100/3"	12.2		IE	TUFF, similar to above, brown, 10 YR 4/3, IE.			
		80/5"	78.3		IE	TUFF, similar to above, saturated, IE.			
66	88	D&D	7.7		IE				
		80/2"	1.1*		IE				
69	33	70/3"			IE				

CLIENT PACNAVFACENGCOM
 PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1019-0145
 DATE/TIME STARTED 9/10/96 / 0915
 DATE/TIME FINISHED 9/10/96 / 1518
 COORDINATES 523153.91, 77230.66
 ELEVATION AND DATUM 78.23 ft. MSL (BRASS MARKER)
 TOP OF CASING ELEVATION 77.82 ft.

BORING/WELL NUMBER SB07/MW07
 COMPLETION DEPTH 76.5 ft.
 BOREHOLE DIAMETER 8/8/10 inch
 DRILLER/COMPANY John Surigao, John Chism/Valley Well Drilling
 DRILLING METHOD/FLUID Hollow Stem Auger/none
 DRILLING EQUIPMENT MOBILE E-90
 GEOLOGIST Bruce Tsutsui CHECKED BY Wendy Zayac

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
							Cut through asphalt/base coarse.		
3	80		10			CL	GRAVELLY CLAY , very dark gray, 5 Y 3/1, dry to moist, medium stiff, low to non-plastic, no toughness, no dilatancy, probably base coarse, CL (40% gravel, 5% sand, 5% silt, 50% clay).		3
	80		25	15.7		CH	CLAY , dark gray, 5 Y 4/1, moist, medium stiff to soft, high plasticity, high toughness, no dilatancy, strong odor, CH (10% gravel, trace sand, trace silt, 90% clay).		
			13			CH	CLAY , as above, CH.		
			3	28.9		CH			
			3			CH			
6	88		2			CH			6
			5	13.0		CH	CLAY , very dark grayish brown, 10 YR 3/2, moist, medium stiff, high plasticity, high toughness, no dilatancy, moderate odor, CH (100% clay).		
			2			CH			
			7			CH			
			12	7.8		CL	CLAY , very dark gray, 5 Y 3/1, moist, medium stiff to stiff, medium plasticity, low toughness, no dilatancy, strong odor, CL (100% clay).		
		ALSB07D01	4			CL			
9	90	ALSB07S01	10			CL			9
			15	20.9		CL	SILTY CLAY , dark grayish brown, 10 YR 4/2, dry to moist, medium stiff to stiff, (wet) medium plasticity, medium toughness, no dilatancy, little odor, some trace borderline sand, CL (trace sand, 20% silt, 80% clay).		
			15			CL			
			50/B"	15.7		ML	GRAVELLY SILT , very dark grayish brown, 10 YR 3/2, dry to moist, stiff, non-plastic, no toughness, no dilatancy, gravel is angular to subround rock, alluvial, ML (20% gravel, 5% sand, 75% silt).		
			25			ML			
12	50		50/5"	97.2		ML	GRAVELLY SILT , similar to above, ML (25% gravel, trace sand, 75% silt).		12
			30			ML			
			50/3"	72.4		SM	SILTY SAND , very dark grayish brown, 10 YR 3/2, similar to above, no gravel, SM (trace gravel, 70% sand, 30% silt).		
			20			SM			
			50/5"	72.2		SM			
15	88		25			SP	GRAVELLY SAND , very dark grayish brown, 10 YR 3/2, dry to moist, stiff, non-plastic, no toughness, no dilatancy, SP (15% gravel, 80% sand, 5% silt).		15
		ALSB07G01	100/8"	111.2		SP	GRAVELLY SAND , as above, more moist, subrounded to rounded gravel fragments, may be alluvial, SP (10% gravel, 85% sand, 5% silt).		
			30			SP			
		ALSB07G01	100/5"	74.9		SM			
18	88		31			SM	SILTY SAND , dark brown, 10 YR 3/3, dry to moist, medium stiff, (wet) non-plastic, no toughness, no dilatancy, some angular gravel to 1/8", some rounded pebbles, SM (5% gravel, 75% sand, 20% silt).		18
			50/4"	58.5		SM			
			13			SM	SILTY SAND , similar to above, less gravel, SM (trace gravel, 75% sand, 25% silt).		
			50/8"	58.5		SM			
21	88					NCL			21



CLIENT PACNAVFACENCOM

BORING/WELL NUMBER SB07/MW07

PROJECT NAME/NUMBER AJEA LAUNDRY RI/FS, NO. 1-1019-0145

COMPLETION DEPTH 76.5 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
24	50		15	28.2		CL	CLAY, dark brown, 7.5 YR 3/2, moist, stiff, (wet) medium plasticity, high toughness, no dilatancy, mild odor, CL (100% clay).	<p>GROUT</p> <p>4" OD SCH 40 PVC</p>	24
	88		25	13.0		CL	CLAY, dark brown, 7.5 YR 3/3, moist to dry, medium stiff to stiff, (wet) medium to high plasticity, medium toughness, no dilatancy, CL (100% clay).		24
	70		10			CL	CLAY, dark gray, 2.5 Y 4/1, dry to moist, stiff, (wet) low plasticity, low toughness, no dilatancy, grayish color may be staining, odor present, CL (100% clay).		27
	80		25	88.4		CL	SILTY CLAY, grayish brown, 10 YR 5/2, dry to moist, medium stiff to stiff, (wet) low plasticity, no toughness, grayish tone may be staining, CL (trace sand, 40% silt, 80% clay).		27
	80		15			CL	SILTY CLAY, dark brown, 7.5 YR 3/3, dry to moist, medium stiff, (wet) low plasticity, no toughness, no dilatancy, CL (trace sand, 30% silt, 70% clay), overlying GRAVELLY SAND.		30
	80		18			CL	SILTY CLAY, dark brown, 7.5 YR 3/3, dry to moist, medium stiff, (wet) low plasticity, no toughness, no dilatancy, CL (trace sand, 30% silt, 70% clay), overlying GRAVELLY SAND.		30
	80		18			CL	SILTY CLAY, dark brown, 7.5 YR 3/3, dry to moist, medium stiff, (wet) low plasticity, no toughness, no dilatancy, CL (trace sand, 30% silt, 70% clay), overlying GRAVELLY SAND.		30
	80		35	77.7		CL	SILTY CLAY, dark brown, 7.5 YR 3/3, dry to moist, medium stiff, (wet) low plasticity, no toughness, no dilatancy, CL (trace sand, 30% silt, 70% clay), overlying GRAVELLY SAND.		30
	80		10			CL	CLAY, brown, 10 YR 4/3, moist to dry, stiff, (wet) medium plasticity, no toughness, no dilatancy, CL, grading into SAPROLITE.		30
	80		35	83.9		IE	weathered basalt fragments, angular to subrounded, IE.		30
	80		13			SM	weathered basalt fragments, angular to subrounded, IE.		30
	80		18			SM	weathered basalt fragments, angular to subrounded, IE.		30
	80		25	55.8		SM	SILTY GRAVELLY SAND, very dark gray, 10 YR 3/1, moist to dry, medium stiff, (wet) non-plastic, no toughness, no dilatancy, subrounded basalt pebbles to 1/2", very strong odor, SM (10% gravel, 70% sand, 20% silt).		33
	100		10			SM	SILTY GRAVELLY SAND, very dark gray, 10 YR 3/1, moist to dry, medium stiff, (wet) non-plastic, no toughness, no dilatancy, subrounded basalt pebbles to 1/2", very strong odor, SM (10% gravel, 70% sand, 20% silt).		33
	80		20			CL	SILTY GRAVELLY SAND, as above, some remnant vesicles (?) in shoe and lower portions of sampler, may be worm borings, SM (10% gravel, 70% sand, 20% silt).		33
	70		25	53.1		CL	SILTY GRAVELLY SAND, as above, some remnant vesicles (?) in shoe and lower portions of sampler, may be worm borings, SM (10% gravel, 70% sand, 20% silt).		33
	80		8			CL	SILTY CLAY, dark grayish brown, 10 YR 4/2, moist to dry, stiff, (wet) non-plastic, no toughness, no dilatancy, CL (20% silt, 80% clay).		36
	80		12			CL	SILTY CLAY, dark grayish brown, 10 YR 4/2, moist to dry, stiff, (wet) non-plastic, no toughness, no dilatancy, CL (20% silt, 80% clay).		36
	80		30	108.4		CL	SILTY CLAY, dark grayish brown, 10 YR 4/2, moist to dry, stiff, (wet) non-plastic, no toughness, no dilatancy, CL (20% silt, 80% clay).		36
	80		12			CL	SILTY CLAY, dark grayish brown, 10 YR 4/2, moist to dry, stiff, (wet) non-plastic, no toughness, no dilatancy, CL (20% silt, 80% clay).		36
	80		17			CL	SILTY CLAY, dark grayish brown, 10 YR 4/2, moist to dry, stiff, (wet) non-plastic, no toughness, no dilatancy, CL (20% silt, 80% clay).	36	
	80		25	97.2		CL	SILTY CLAY, dark grayish brown, 10 YR 4/2, moist to dry, stiff, (wet) non-plastic, no toughness, no dilatancy, CL (20% silt, 80% clay).	36	
	80		10			CL	GRAVELLY CLAY, dark brown, 7.5 YR 3/4, moist to dry, soft to stiff, low plasticity, low toughness, no dilatancy, CL (20% gravel, 10% silt, 70% clay), grades into SAPROLITE, some remnant vesicles up to 1/8", rounded basalt fragments, IE.	39	
	80		15			CL	GRAVELLY CLAY, dark brown, 7.5 YR 3/4, moist to dry, soft to stiff, low plasticity, low toughness, no dilatancy, CL (20% gravel, 10% silt, 70% clay), grades into SAPROLITE, some remnant vesicles up to 1/8", rounded basalt fragments, IE.	39	
	80		20	108.4		CL	GRAVELLY CLAY, dark brown, 7.5 YR 3/4, moist to dry, soft to stiff, low plasticity, low toughness, no dilatancy, CL (20% gravel, 10% silt, 70% clay), grades into SAPROLITE, some remnant vesicles up to 1/8", rounded basalt fragments, IE.	39	
	80		17			CL	GRAVELLY CLAY, dark brown, 7.5 YR 3/4, moist to dry, soft to stiff, low plasticity, low toughness, no dilatancy, CL (20% gravel, 10% silt, 70% clay), grades into SAPROLITE, some remnant vesicles up to 1/8", rounded basalt fragments, IE.	39	
	70	ALSBO7S02	23			CL	GRAVELLY CLAY, dark brown, 7.5 YR 3/4, moist to dry, soft to stiff, low plasticity, low toughness, no dilatancy, CL (20% gravel, 10% silt, 70% clay), grades into SAPROLITE, some remnant vesicles up to 1/8", rounded basalt fragments, IE.	39	
	80		31	188.4		IE	SILTY CLAY, dark gray, 10 YR 4/1, moist to dry, medium stiff, (wet) low to non-plastic, low toughness, no dilatancy, very strong odor, CL (20% silt, 80% clay).	39	
	80		8			IE	SILTY CLAY, dark gray, 10 YR 4/1, moist to dry, medium stiff, (wet) low to non-plastic, low toughness, no dilatancy, very strong odor, CL (20% silt, 80% clay).	39	
	80		10			IE	SILTY CLAY, dark gray, 10 YR 4/1, moist to dry, medium stiff, (wet) low to non-plastic, low toughness, no dilatancy, very strong odor, CL (20% silt, 80% clay).	39	
	80		25	119.1		ML	SILTY CLAY, dark brown, 10 YR 3/3, moist to dry, medium stiff to soft, (wet) low to non-plastic, no toughness, no dilatancy, gravel to 1", CL (trace gravel, trace sand, 30% silt, 70% clay).	42	
	80		8			ML	SILTY CLAY, dark brown, 10 YR 3/3, moist to dry, medium stiff to soft, (wet) low to non-plastic, no toughness, no dilatancy, gravel to 1", CL (trace gravel, trace sand, 30% silt, 70% clay).	42	
	80		10			ML	SILTY CLAY, dark brown, 10 YR 3/3, moist to dry, medium stiff to soft, (wet) low to non-plastic, no toughness, no dilatancy, gravel to 1", CL (trace gravel, trace sand, 30% silt, 70% clay).	42	
	80		15	111.8		ML	SAPROLITE, dark brown, 7.5 YR 3/2, moist to dry, very stiff to hard, remnant vesicles, rounded, may be worm holes, IE.	42	
	80		5			ML	SAPROLITE, dark brown, 7.5 YR 3/2, moist to dry, very stiff to hard, remnant vesicles, rounded, may be worm holes, IE.	42	
	80		10			ML	SAPROLITE, dark brown, 7.5 YR 3/2, moist to dry, very stiff to hard, remnant vesicles, rounded, may be worm holes, IE.	42	
	80		15	114.8		ML	CLAYEY SILT, black, 7.5 YR 2.5/1, moist to dry, soft to stiff, (wet) non-plastic, no toughness, no dilatancy, strong odor, ML (80% silt, 40% clay).	45	
	80		5			ML	CLAYEY SILT, black, 7.5 YR 2.5/1, moist to dry, soft to stiff, (wet) non-plastic, no toughness, no dilatancy, strong odor, ML (80% silt, 40% clay).	45	
	80		10			ML	CLAYEY SILT, black, 7.5 YR 2.5/1, moist to dry, soft to stiff, (wet) non-plastic, no toughness, no dilatancy, strong odor, ML (80% silt, 40% clay).	45	
	75		12	74.4		SM	CLAYEY SILT, as above, ML.	45	
	75		12	74.4		ML	CLAYEY SILT, as above, very strong odor, ML.	45	

CLIENT PACNAVFACENGCOM

BORING/WELL NUMBER SB07/MW07

ECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1018-0145

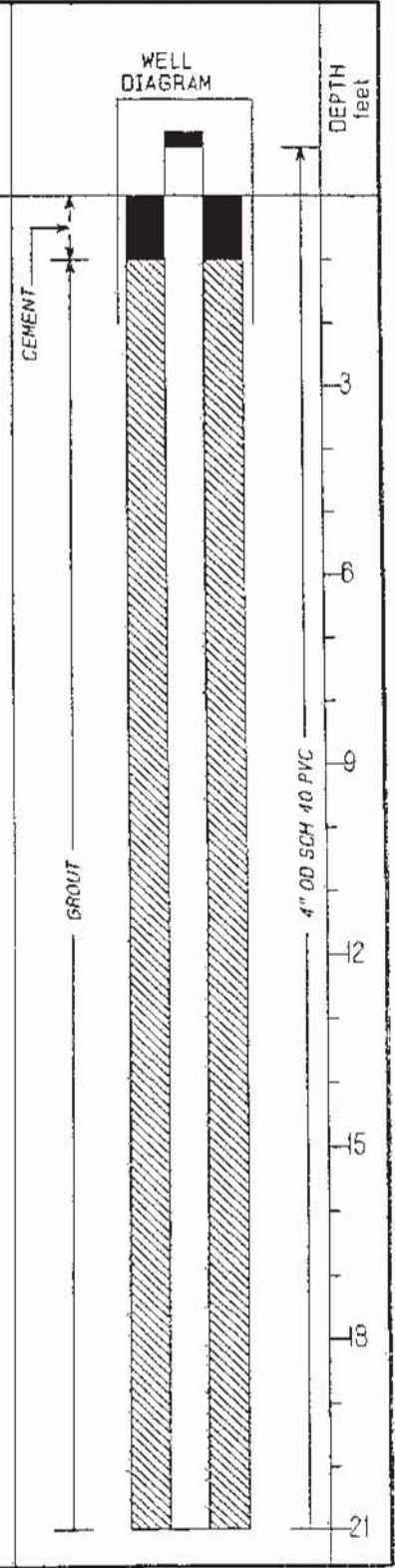
COMPLETION DEPTH 78.5 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet	
48	88		23 50/5"	86.0		SM	CLAYEY SILT, as above, ML, overlying 10" of SAND, black, 10 YR 2/1, moist to dry, soft to hard, (wet) non-plastic, no toughness, no dilatancy, portions well cemented, SM (85% sand, 15% silt).	<p>4" OD SCH 40 PVC</p> <p>GROUT</p> <p>BENTONITE</p> <p>LONESTAR #3 SAND PACK</p> <p>4" STAINLESS STEEL SCREEN (0.02" SLOT)</p>	48	
	88		35 50/3"			SM	SAND, as above, lower portions well cemented, SM (95% sand, 5% silt).			
	50		D&D 50/8"	119.8		SM	SAND, as above, slightly finer, SM (90% sand, 10% silt).			
			D&D	119.8			No recovery, 49.5 to 51.0 ft bgs.			
51	0		100/ 8"			SM	SAND, as above, some lightly cemented portions, SM (90% sand, 10% silt).			51
	90		D&D 100/ 8"	125.4		SM	SAND, as above, scattered well-cemented portions, SM (90% sand, 10% silt).			
	80	ALSBO7S03	D&D 100/ 8"	226.4		SW	SAND, black, 10 YR 2/1, moist, soft, cemented, potential product, sand in shoe is well cemented and hard, very strong odor, SW (100% sand).			54
			D&D 100/ 4"	148.8		SW	SAND, as above, more widely cemented, SW (100% sand).			
57	80		D&D 100/ 3"			IE	TIFF, brown, 10 YR 4/3, moist to dry, fine-grained, lightly weathered, fractured, pulverized by drilling, IE.			57
	70		D&D 100/ 3"	214.2		IE	TIFF, as above, IE.			
60	70		D&D 15	86.7		CH	SILTY CLAY, brown, 10 YR 4/3, dry to moist, very stiff to hard, (wet) medium to high plasticity, medium toughness, no dilatancy, some staining, strong odor, CH (20% silt, 80% clay).			60
	80		20			CH	SILTY CLAY, as above, CH.			
			35	52		CH				
63	90	ALSBO7G02	8	2.8*		CH	CLAY, dark yellowish brown, 10 YR 3/4, moist, stiff to medium stiff, (wet) high plasticity, medium toughness, no dilatancy, CH (100% clay).			63
			13			CH				
			20	2.8*		CL	CLAY, dark brown, 7.5 YR 3/4, moist, stiff to medium stiff, medium plasticity, no toughness, no dilatancy, staining, CL (5% silt, 95% clay).			
			20			CL				
			35			CL				
66	70		50/3"	18.3		CL	SILTY CLAY, dark brown, 10 YR 3/3, moist, stiff, (wet) low plasticity, low toughness, no dilatancy, CL (20% silt, 80% clay).		66	
			20			CL				
	70		50/5"	53.1		CL				
			28			CH	CLAY, dark yellowish brown, 10 YR 3/4, moist, stiff, (wet) high plasticity, medium toughness, no dilatancy, CH (100% clay).			
69	88		50/8"	28.2		CH			69	
						CH				

CLIENT PACNAVFACEGCOM
 PROJECT NAME/NUMBER AJEA LAUNDRY RI/FS, NO. 1-1019-0145
 DATE/TIME STARTED 8/26/98 / 0840
 DATE/TIME FINISHED 8/29/98 / 1455
 COORDINATES 523312.74, 77470.60
 ELEVATION AND DATUM 78.01 ft. MSL (BRASS MARKER)
 TOP OF CASING ELEVATION 78.57 ft.

BORING/WELL NUMBER SB08/MW08
 COMPLETION DEPTH 70.4 ft.
 BOREHOLE DIAMETER 8 inch/10 inch
 DRILLER/COMPANY D McLure, J Chism, J Surigao/Valley Well Drilling
 DRILLING METHOD/FLUID Hollow Stem Auger/none
 DRILLING EQUIPMENT MOBILE B-90
 GEOLOGIST Bruce Tsutsui CHECKED BY Wendy Zayac

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
3	70		17		SP	Cut through asphalt.		
			22			GRAVELLY SAND, white, 10 YR 8/1, dry to moist, soft, non-plastic, no toughness, no dilatancy, some cobble-sized gravel to 1.5", SP (40% gravel, 80% sand, trace fines).		
	70		32	1.0*	CH	CLAY, brown, 7.5 YR 4/2, dry to moist, hard, high plasticity, high toughness, no dilatancy, CH (100% clay).		
			10					
	70		7	1.0*	CL	SILTY CLAY, very dark grayish brown, 10 YR 3/2, dry to moist, hard to very stiff, low to medium plasticity, medium toughness, no dilatancy, CL (10% silt, 90% clay).		
			9					
	88		12	1.0*	CL	SILTY CLAY, brown, 10 YR 5/3, dry to moist, stiff to medium stiff, (wet) low plasticity, no toughness, no dilatancy, silt is coarser, borders on sand, CL (trace sand, 20% silt, 80% clay).		
			30	1.0*	CL			
	50		50/5'	1.0*	SW	GRAVELLY SAND, brown, 7.5 YR 4/2, moist, medium stiff to soft, non-plastic, no toughness, no dilatancy, gravel is weathered angular rock fragments 1/8" to 3/4", tuft? SW (40% gravel, 80% sand, trace fines).		
			29	1.0*	SW			
	50		50/5'	1.0*	SM	SAND, brown, 10 YR 4/3, dry, hard, (wet) non-plastic, no toughness, no dilatancy, SW/SM (10% gravel, 80% sand, 10% silt).		
			9					
	88		11	1.0*	SW	GRAVELLY SAND, brown, 10 YR 4/3, moist, hard to very stiff, loose, non-plastic, no toughness, no dilatancy, very poorly sorted, SW (40% gravel, 80% sand).		
			22	1.0*	CH	SILTY CLAY, dark yellowish brown, 10 YR 4/4, dry to moist, hard, (wet) high plasticity, high toughness, no dilatancy, common Mn throughout, CH (10% silt, 90% clay).		
			9					
	70		16	1.0*	CL	CLAY, dark brown, 10 YR 3/3, dry to moist, very stiff, low to medium plasticity, high toughness, no dilatancy, CL (100% clay).		
			22	1.0*	CL	CLAY, as above, CL.		
			8					
	88		17	1.0*	CH	CLAY, dark brown, 7.5 YR 3/4, dry to moist, very stiff to hard, high plasticity, high toughness, no dilatancy, common Mn in upper portions, CH (100% clay).		
			22	1.0*	CH	CLAY, strong brown to dark gray, 7.5 YR 4/8 to 7.5 YR 4/1, dry to moist, stiff, high plasticity, medium toughness, no dilatancy, two toned, CH (100% clay).		
			17					
	80		22	1.0*	CH	CLAY, as above, dry to moist, stiff, high plasticity, medium toughness, no dilatancy, CH (100% clay).		
			26	1.0*	CL	CLAY, dark brown, 7.5 YR 3/2, dry to moist, very stiff to hard, medium plasticity, low toughness, no dilatancy, CL (100% clay).		
			8					
	100		24	1.0*	CL			
			29	1.0*	CL			
	80		4	1.0*	CL			
			12	1.0*	CL			
	80		26	1.0*	CL			
			100/	1.0*	CL			
	80	AL SB08G01	18"	1.0*	CL			
			10					
			19					
	80		26	1.0*	CL			
			14					
			22					
	80		28	1.0*	CL			
21								21



CLIENT PACNAVFACENGCOM

BORING/WELL NUMBER SB08/MW08

PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1018-0145

COMPLETION DEPTH 70.4 ft.

DEPTH feet	SAMPLE	RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet	
24		50	ALSBO8D01 ALSBO8S01	28	1.0*		CL	<u>SILTY CLAY</u> , brown, 7.5 YR 4/3, dry to moist, stiff, (wet) medium to low plasticity, low toughness, no dilatancy, very sticky, CL (10% silt, 90% clay).		24	
		70		7				CH		<u>SILTY CLAY</u> , as above, grading to <u>SILTY CLAY</u> , gray, 10 YR 5/1, moist, medium stiff, high plasticity, low toughness, no dilatancy, some portions very powdery, like talcum, CH (10% silt, 90% clay).	
		70		9				CH		<u>SILTY CLAY</u> , as above, coarsening with depth in sampler to silty clay with scattered coarse sand, rounded basalt fragments to 1/8", CH (trace sand, 20% silt, 80% clay).	
		70		28	1.0*			CH		<u>CLAY</u> , dark gray, 2.5 Y 4/1, dry to moist, stiff to very stiff, high plasticity, high toughness, no dilatancy, scattered lenses of sand, gravel/sand particles, lots of air space, CH (100% clay).	
		70		9				CH		<u>CLAY</u> , as above, CH.	
		70		17				CH		<u>CLAY</u> , dark gray, 2.5 Y 4/1, dry to moist, stiff to very stiff, high plasticity, high toughness, no dilatancy, scattered lenses of sand, gravel/sand particles, lots of air space, CH (100% clay).	
		70		20				CH		<u>CLAY</u> , dark gray, 2.5 Y 4/1, dry to moist, stiff to very stiff, high plasticity, high toughness, no dilatancy, scattered lenses of sand, gravel/sand particles, lots of air space, CH (100% clay).	
		70		9				CH		<u>CLAY</u> , as above, CH.	
		70		16				CH		<u>CLAY</u> , as above, CH.	
		70		27	1.0*			CH		<u>CLAY</u> , as above, CH.	
30		50		28	1.0*		ML	<u>CLAYEY SILT</u> , brown, 7.5 YR 4/3, dry to moist, medium stiff, (wet) low to non-plastic, no toughness, ML (trace sand, 80% silt, 40% clay).			
		88		9			CH	<u>CLAY</u> , brown, 7.5 YR 4/4, dry to moist, stiff, (wet) medium to high plasticity, high toughness, no dilatancy, scattered rock fragments to 3/4", CH (100% clay).			
		80		28	1.0*		CH	<u>CLAY</u> , brown, 7.5 YR 4/4, dry to moist, stiff to very stiff, (wet) medium to high plasticity, medium toughness, no dilatancy, CH (5% silt, 95% clay).			
		50		8			CH	<u>CLAY</u> , brown, 7.5 YR 4/4, dry to moist, stiff to very stiff, (wet) medium to high plasticity, medium toughness, no dilatancy, CH (5% silt, 95% clay).			
		50		14			CH	<u>CLAY</u> , brown, 7.5 YR 4/4, dry to moist, stiff to very stiff, (wet) medium to high plasticity, medium toughness, no dilatancy, CH (5% silt, 95% clay).			
		50		32	1.0*		CH	<u>CLAY</u> , dark reddish brown, 5 YR 3/3, dry to moist, very stiff to hard, (wet) medium to high plasticity, medium toughness, no dilatancy, CH (trace sand, 5% silt, 95% clay).			
		80		22			CH	<u>CLAY</u> , dark reddish brown, 5 YR 3/3, dry to moist, very stiff to hard, (wet) medium to high plasticity, medium toughness, no dilatancy, CH (trace sand, 5% silt, 95% clay).			
		50		50/5'	1.0*		CL	<u>SILTY CLAY</u> , dark brown, 7.5 YR 3/3, dry to moist, medium stiff, (wet) low plasticity, no toughness, no dilatancy, CL (10% silt, 90% clay).			
		50		8			CL	<u>SILTY CLAY</u> , dark brown, 7.5 YR 3/3, dry to moist, medium stiff, (wet) low plasticity, no toughness, no dilatancy, CL (10% silt, 90% clay).			
		50		14			CL	<u>SILTY CLAY</u> , dark brown, 7.5 YR 3/3, dry to moist, medium stiff, (wet) low plasticity, no toughness, no dilatancy, CL (10% silt, 90% clay).			
		50		22	1.0*		ML	<u>CLAYEY SILT</u> , dark reddish brown, 5 YR 3/3, dry to moist, soft to medium stiff, (wet) non-plastic, no toughness, no dilatancy, ML (80% silt, 40% clay).			
		50		18			ML	<u>CLAYEY SILT</u> , dark reddish brown, 5 YR 3/3, dry to moist, soft to medium stiff, (wet) non-plastic, no toughness, no dilatancy, ML (80% silt, 40% clay).			
		50		50/5'	1.0*		CL	<u>CLAYEY SILT</u> , as above, ML, grading to <u>SILTY CLAY</u> , some lenses of silty material, CL (40% silt, 80% clay).			
		50		24			CL	<u>CLAYEY SILT</u> , as above, ML, grading to <u>SILTY CLAY</u> , some lenses of silty material, CL (40% silt, 80% clay).			
		50		50/5'	1.0*		CL	<u>SILTY CLAY</u> , as above, some faint signs of remnant vesicles, CL.			
		50		28			CL	<u>SILTY CLAY</u> , as above, some faint signs of remnant vesicles, CL.			
		50		50/5'	1.0*		CH	<u>CLAY</u> , dark brown, 10 YR 3/3, dry to moist, very stiff, high to medium plasticity, high toughness, no dilatancy, some spaces - possible lamination, CH (100% clay).			
		50		18			CH	<u>CLAY</u> , dark brown, 10 YR 3/3, dry to moist, very stiff, high to medium plasticity, high toughness, no dilatancy, some spaces - possible lamination, CH (100% clay).			
		80		21	1.0*		SM	<u>SILTY SAND</u> , dark reddish brown, 5 YR 3/3, dry to moist, stiff, non-plastic, no toughness, no dilatancy, sand size medium to fine, some rounded (almost spherical) basalt fragments to 1/4", SM (5% gravel, 80% sand, 35% silt).			
		50		50/5'	1.0*		SM	<u>SILTY SAND</u> , dark reddish brown, 5 YR 3/3, dry to moist, stiff, non-plastic, no toughness, no dilatancy, sand size medium to fine, some rounded (almost spherical) basalt fragments to 1/4", SM (5% gravel, 80% sand, 35% silt).			
		50		28			SM	<u>SILTY SAND</u> , as above, possible remnant vesicles, common Mn staining, SM.			
		50		50/5'	1.0*		SM	<u>SILTY SAND</u> , as above, possible remnant vesicles, common Mn staining, SM.			
45							CL			45	

CLIENT PACNAVACENCOM

BORING/WELL NUMBER SB08/MW08

PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1019-0145

COMPLETION DEPTH 70.4 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet	
50	50	ALSB08G04	25	50/5'		CL	<u>CLAY</u> , dark reddish brown, 5 YR 3/3, dry to moist, stiff, non-plastic, no toughness, no dilatancy, CL (100% clay).			
48	80		100/18"	1.0*		CL	<u>CLAY</u> , as above, CL.			
			28	50/5'	1.0*		CL		<u>CLAY</u> , dark reddish brown, 2.5 YR 2.5/3, dry to moist, soft to medium stiff, low plasticity, no toughness, no dilatancy, CL (100% clay).	48
	88		25	50/5'	1.0*		CL		<u>CLAY</u> , similar to above, soft, CL.	51
51		ALSB08S03	12			CH	<u>CLAY</u> , dark reddish brown, 2.5 YR 3/3, moist, medium stiff, high plasticity, high toughness, no dilatancy, CH (100% clay).		51	
	80		16							
	80		28	50/5'	1.0*		CH		<u>CLAY</u> , dark reddish brown, 5 YR 3/3, moist, medium stiff, medium to high plasticity, high toughness, no dilatancy, CH (100% clay).	54
54			23	50/5'	1.0*		CL		<u>CLAY</u> , dark reddish brown, 2.5 YR 3/4, moist, medium stiff, medium plasticity, medium toughness, no dilatancy, CL (100% clay).	54
	88	ALSB08G02	19	50/5'		CH	<u>CLAY</u> , dark reddish brown, 2.5 YR 3/3, dry to moist, stiff, (wet) medium plasticity, medium toughness, no dilatancy, CH (100% clay).		57	
57			19	50/5'	1.0*		CH		<u>CLAY</u> , dark red, 2.5 YR 3/8, dry to moist, stiff to very stiff, (wet) medium to high plasticity, high toughness, no dilatancy, very homogenous, CH (100% clay).	57
	88	ALSB08S04	21	50/5'		IE	<u>SAPROLITE</u> , very dark grayish brown to dark reddish brown, 10 YR 3/2 to 5 YR 3/3, moist to wet, vesicular, decomposed, heavily weathered rock, scoria in clay matrix, as above, shoe contains highly weathered, fractured basalt, vesicular, vesicles are small, irregular, elongate, and angular; rock is weathered, friable, and crumbly, IE.		60	
60			18							
	80	ALSB08G03	24	1.0*		CL	<u>CLAY</u> , brown to black, 7.5 YR 4/2 to 10 YR 2/1, moist, very stiff to hard, medium plasticity, high toughness, no dilatancy, Mn staining, limonite (?) present, CL (trace gravel, trace silt, 100% clay).		60	
63			12							
	80	ALSB08S04	14			IE/CH	<u>SAPROLITE</u> , weathered tuff or flow margin - <u>GRAVELLY CLAY</u> , very dark gray to yellowish brown, 10 YR 3/1 to 10 YR 5/4, moist, stiff to medium stiff, high plasticity, medium toughness, no dilatancy, rock fragments from 1/8" to 1", wide variety, highly weathered, angular to subrounded, some scoria, some weathered vesicular basalt - vesicle patterns vary - Mn staining, limonite infilling - sample may represent flow margin, IE/CH (40% gravel, trace sand, trace silt, 80% clay).		63	
	100		10							
		ALSB08G03	12			IE/CH	<u>SAPROLITE</u> , weathered tuff or flow margin - <u>GRAVELLY CLAY</u> , very dark gray to yellowish brown, 10 YR 3/1 to 10 YR 5/4, moist, stiff to medium stiff, high plasticity, medium toughness, no dilatancy, rock fragments from 1/8" to 1", wide variety, highly weathered, angular to subrounded, some scoria, some weathered vesicular basalt - vesicle patterns vary - Mn staining, limonite infilling - sample may represent flow margin, IE/CH (40% gravel, trace sand, trace silt, 80% clay).		63	
66			13	1.0*						
		ALSB08G03	12			IE/CH	<u>SAPROLITE</u> , weathered tuff or flow margin - <u>GRAVELLY CLAY</u> , very dark gray to yellowish brown, 10 YR 3/1 to 10 YR 5/4, moist, stiff to medium stiff, high plasticity, medium toughness, no dilatancy, rock fragments from 1/8" to 1", wide variety, highly weathered, angular to subrounded, some scoria, some weathered vesicular basalt - vesicle patterns vary - Mn staining, limonite infilling - sample may represent flow margin, IE/CH (40% gravel, trace sand, trace silt, 80% clay).		66	
			18	1.0*						
69							<u>SAPROLITE</u> and <u>GRAVELLY CLAY</u> , as above, white infilling in some vesicles, wet, IE/CH.		69	
							<u>SAPROLITE</u> and <u>GRAVELLY CLAY</u> , as above, saturated, IE/CH.		69	

CLIENT PACNAVFACENCOM
 SITE NAME/NUMBER AJEA LAUNDRY RI/FS, NO. 1-1019-0145
 DATE/TIME STARTED 8/21/96 / 0840
 DATE/TIME FINISHED 8/22/96 / 1222
 COORDINATES 523421.83, 77422.48
 ELEVATION AND DATUM 81.92 ft. MSL (BRASS MARKER)
 TOP OF CASING ELEVATION NA

BORING/WELL NUMBER 5B09
 COMPLETION DEPTH 84.5 ft.
 BOREHOLE DIAMETER 8 inch
 DRILLER/COMPANY Dean McLure, John Chism/Valley Well Drilling
 DRILLING METHOD/FLUID Hollow Stem Auger/none
 DRILLING EQUIPMENT MOBILE B-90
 GEOLOGIST Bruce Tsutsui CHECKED BY Wendy Zayac

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
						AS	Cut through asphalt - 18" thick. Base coarse - coral gravel.		
2			12			CH	CLAY, dark brown, 10 YR 3/3, dry, hard, (wet) high plasticity, high toughness, no dilatancy, may be weathered tuff - scattered clumps of black Mn inclusions/staining, CH (100% clay).		2
	33		20	0.7*		CH	CLAY, as above, CH (100% clay).		
			12			CH			
			14			CH			4
	40		14	0.7*		CH	CLAY, brown, 7.5 YR 4/2, dry to moist, hard, high plasticity, high toughness, no dilatancy, recovery was in one large cylinder (photos), CH (100% clay).		
			5			CH			
			9			CH			
6	100		20	0.7*		CH	Top CLAY, as above, CH, grades to SILTY SAND, dark grayish brown, 10 YR 4/2, dry, hard, non-plastic, no toughness, no dilatancy, may be weathered tuff, SM (5% gravel, 50% sand, 40% silt, 5% clay).		6
			7			CH			
			12			SM			
	70		32	0.7*		SM	SILTY SAND, brown, 10 YR 5/3, dry, hard, non-plastic, no toughness, no dilatancy, gravel and sand seem to be angular basalt/scoria fragments, SM (10% gravel, 50% sand, 40% silt).		8
8			25			SM			
			28			SM			
	70		28	0.7*		SM	SILTY SAND, as above, SM.		
			38			SM			
10	50		50/5'	0.7*		SM	SILTY SAND, as above, SM.		10
						SM			
			100/			SM			
	66		18"	0.7*		ML	SANDY SILT, grayish brown, 10 YR 5/2, dry, hard, non-plastic, no toughness, no dilatancy, looks like weathered rock, ML (trace gravel, 40% sand, 80% silt, trace clay).		12
			30			ML			
	50	ALSBO9G01	100/	0.7*		ML			
			8"			ML			
	33	ALSBO9S01	150/	0.7*		ML	SANDY SILT, similar to above, yellowish brown, 10 YR 5/4, dry, hard, non-plastic, no toughness, no dilatancy, ML (trace gravel, 40% sand, 80% silt, trace clay).		14

CLIENT PACNAVFACENCOM

BORING/WELL NUMBER SB09

PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1019-0145

COMPLETION DEPTH 64.5 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
8			8"						
16	88		12	80/5'	0.7*	CL	<u>GRAVELLY CLAY</u> , yellowish brown, 10 YR 5/6, dry, very stiff, low to medium plasticity, low toughness, no dilatancy, some rounded basalt gravel fragments, CL (10% gravel, trace sand, 10% silt, 80% clay).		16
18	50		12		0.7*	CL	<u>GRAVELLY CLAY</u> , as above, grades to <u>CLAY</u> , very dark grayish brown, 10 YR 3/2, dry to moist, very stiff to hard, some remnant vesicles, abundant Mn clumps, CL (trace sand, 100% clay).		18
20	100		30		0.7*	CL	<u>CLAY</u> , similar to above, brown, 7.5 YR 4/3, CL (trace sand, 100% clay).		20
22	100		40		0.7*	CL	<u>CLAY</u> , brown, 7.5 YR 4/4, dry to moist, very stiff to hard, (wet) medium to high plasticity, low toughness, abundant Mn staining, CH (100% clay).		22
24	70		15		0.7*	CH	<u>CLAY</u> , pinkish gray and brown, 7.5 YR 8/2 and 7.5 YR 5/3, dry to moist, stiff to very stiff, (wet) high plasticity, low toughness, no dilatancy, two colors mixed in same matrix, CH (100% clay).		24
26	100		30		0.7*	CH	<u>CLAY</u> , similar to above, grayish clay more prevalent, CH (100% clay).		26
28	70		25		0.7*	CH	<u>CLAY</u> , brown, 7.5 YR 4/4, moist, stiff, (wet) low to medium plasticity, low to no toughness, no dilatancy, CL (100% clay).		28
30	100		45		0.7*	CH	<u>CLAY</u> , similar to above, dark reddish brown, 5 YR 3/4, moist, stiff to medium stiff, CL, grades to <u>CLAY</u> , dark reddish brown, 5 YR 3/4, moist, very stiff, (wet) high plasticity, medium toughness, no dilatancy, abundant greenish gray, black stain, CH (100% clay).		30
		ALSB09G04	20		0.7*	CL	<u>CLAY</u> , as above, CH, grades to <u>CLAY</u> , grayish brown, 10 YR 5/2, moist, stiff, high plasticity, high toughness, no dilatancy, CH (100% clay), shoe contains sharp boundary with <u>CLAY</u> , brownish yellow, 10 YR 8/8, dry to moist, soft, powdery, low plasticity, low toughness, no dilatancy, very yellow orange, similar coloring to staining found sporadically throughout site samples, limonite (?), CL.		
		ALSB09S04	20		0.7*	CL	Top 8" <u>CLAY</u> , as above, CL, grades to <u>CLAY</u> , dark gray, 10 YR 4/1, dry to moist, very stiff, (wet) high plasticity, high toughness, no dilatancy, brownish staining increases with depth, CH (100% clay).		
			25		0.7*	CH			
			32		0.7*	CH			

CLIENT PACNAVFACENCOM

BORING/WELL NUMBER SB09

CT NAME/NUMBER AIEA LAUNDRY RJ/F.S. NO. 1-1019-0145

COMPLETION DEPTH 64.5 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
80		ALSB09G05	10		[Hatched]	CH	CLAY, brown, 7.5 YR 4/2, moist, very stiff, high plasticity, high toughness, no dilatancy, brownish staining increases with depth, CH (100% clay).	[Well Diagram: Hatched column from 80 to 46 ft]	
32	80		30		[Hatched]	CH			
50	50		50/5'	0.7*	[Diagonal]	CL	GRAVELLY CLAY, brown, 7.5 YR 4/2, dry to moist, stiff, low to medium plasticity, low toughness, no dilatancy, brownish staining prevalent, subangular basalt fragments to 1/2", shoe contains basalt cobbles, elongate ovoid, vesicles 1/8" to 1/2" long dimension - basalt moderately weathered - basalt particles increase in size with depth, CL (20% gravel, trace sand, trace silt, 80% clay).		32
34	50		70	0.7*	[Hatched]	CH	SILTY CLAY, moist, very stiff, (wet) high plasticity, low toughness, no dilatancy, CH (10% silt, 90% clay).		34
70	70		50/4'	0.7*	[Hatched]	CH	CLAY, reddish brown, 5 YR 4/3, dry, stiff to very stiff, (wet) high plasticity, low toughness, no dilatancy, CH (100% clay).		
36	70		25		[Hatched]	CH			
38	70		70/8'	0.7*	[Hatched]	CH	CLAY, dark brown, 7.5 YR 3/3, moist, stiff, (wet) high plasticity, medium toughness, no dilatancy, sporadic basalt gravel to 1/2", subangular, CH (5% gravel, trace sand, trace silt, 95% clay).		36
88	70		14		[Hatched]	CH			
40	88	ALSB09S05	42		[Diagonal]	CL	SILTY CLAY, dark brown, 10 YR 3/3, dry to moist, stiff to very stiff, (wet) medium plasticity, medium toughness, no dilatancy, CL (trace sand, 10% silt, 90% clay).		38
42	70	ALSB08G08	50/5'	0.7*	[Diagonal]	CL	SILTY CLAY, dark brown, 7.5 YR 3/2, dry to moist, stiff, (wet) medium plasticity, low toughness, no dilatancy, common Mn clumps, CL (trace gravel, trace sand, 10% silt, 90% clay).		40
44	70		10		[Diagonal]	CL	CLAY, brown, 7.5 YR 4/4, dry to moist, stiff, (wet) low to medium plasticity, low toughness, no dilatancy, CL (100% clay).		
50	50		20		[Diagonal]	CL			
42	70		75	0.7*	[Diagonal]	CL	CLAY, dark reddish brown, 2.5 YR 2.5/3, moist, stiff to very stiff, low to medium plasticity, low toughness, no dilatancy, CL (100% clay).	42	
44	50		20		[Diagonal]	CL	CLAY, as above, CL (100% clay).		
46	70		25		[Diagonal]	CL		44	
	50		50/8'	0.7*	[Diagonal]	CL	CLAY, as above, CL (100% clay).		
	70		20		[Diagonal]	CL		46	
			50/8'	0.7*	[Diagonal]	CL	CLAY, as above, CL (100% clay).		

CLIENT PACNAVFACENGCOM
 PROJECT NAME/NUMBER AJEA LAUNDRY RI/FS, NO. 1-1019-0145

BORING/WELL NUMBER SB09
 COMPLETION DEPTH 64.5 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet	
48	50	ALSBO9S08	25			CL	CLAY, as above, CL (100% clay).		48	
50	68		50/8'	0.7*		CL	CLAY, similar to above, dark reddish brown, 2.5 YR 3/3, CL (100% clay).		50	
52	70		20			CL	CLAY, dark reddish brown, 2.5 YR 3/3, moist to wet, medium stiff, medium plasticity, medium toughness, no dilatancy, soil in shoe getting fairly wet, CL (100% clay).		52	
54	50		50/3'	0.7*		CH	CLAY, dark reddish brown, 5 YR 3/3, dry to moist, stiff, (wet) medium to high plasticity, medium toughness, no dilatancy, CH (100% clay).		54	
56	88	ALSBO9S02	20			CH	CLAY, dark reddish brown, 2.5 YR 3/3, dry to moist, medium stiff, (wet) medium plasticity, medium toughness, no dilatancy, CH (100% clay).		56	
58	50		50/5'	0.7*		CH	CLAY, dark reddish brown, 2.5 YR 3/3, dry to moist, medium stiff, (wet) medium plasticity, medium toughness, no dilatancy, CH (100% clay).		58	
60	100	ALSBO9G02	18			CH	CLAY, dark reddish brown, 2.5 YR 3/3, dry to moist, medium stiff, (wet) medium plasticity, medium toughness, no dilatancy, CH (100% clay).		▽	60
62	88		25			CH	Top 8" CLAY, as above, CH, shoe contains GRAVELLY CLAY, light yellowish brown to dark reddish brown, 2.5 Y 8/4 to 2.5 YR 3/3, moist to wet, soft to medium stiff, medium plasticity, medium toughness, no dilatancy, gravel is angular basalt fragments 1/8" to 1/4". CL.			62
64	88		50/8'	0.7*		CL	SILTY CLAY, dark reddish brown to light brownish gray, 5 YR 3/4 to 2.5 Y 8/2, moist to wet, medium stiff, medium to high plasticity, high toughness, no dilatancy, shoe contained vesicular basalt fragments, grayish material slightly silty, similar in appearance and texture to backyard surface ashy material, CH (trace gravel, 10% silt, 90% clay).			64
66	88		4			CL	GRAVELLY CLAY, dark grayish brown, 2.5 Y 4/2, moist to wet, soft to medium stiff, low to non-plastic, no toughness, no dilatancy, CL (30% gravel, trace silt, 70% clay), grades to BASALT, vesicular, highly weathered, shoe contains gravel fragments of highly weathered basalt range from 1/8" to 2", dark yellowish brown to black, 10 YR 4/8 to 10 YR 2/1, 1/16" vesicles, some scoria particles, IE.			66
68	88	ALSBO9G03	20	0.7*		IE	BASALT, vesicular, highly weathered, shoe contains gravel fragments of highly weathered basalt range from 1/8" to 2", dark yellowish brown to black, 10 YR 4/8 to 10 YR 2/1, 1/16" vesicles, some scoria particles, IE.		68	
70	88		10			IE	BASALT, similar to above, wet, bottom rock is very fractured, friable, extremely vesicular, wet, IE.		70	
72	88		30			IE	BASALT, similar to above, bottom fragments contain white/yellow infilling, IE.		72	
74	88		50	0.7*		IE	Drill to 84.5 ft bgs to take final sample.		74	

CLIENT PACNAVFACENGCOM
 PROJECT NAME/NUMBER AJEA LAUNDRY RI/FS, NO. 1-1019-0145
 START TIME 8/1/96 / 0820
 DATE/TIME FINISHED 8/5/96 / 1015
 COORDINATES 523673.30, 77578.37
 ELEVATION AND DATUM 85.74 ft. MSL (BRASS MARKER)
 TOP OF CASING ELEVATION 85.40 ft.

BORING/WELL NUMBER SB10/MW10
 COMPLETION DEPTH 80.5 ft.
 BOREHOLE DIAMETER 6 inch/10 inch
 DRILLER/COMPANY Dean McLure, John Chism/Valley Well Drilling
 DRILLING METHOD/FLUID Hollow Stem Auger/none
 DRILLING EQUIPMENT MOBILE B-90
 GEOLOGIST Bruce Tsutsui CHECKED BY Wendy Zayac

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
28						CL	<u>GRAVELLY CLAY</u> , brown, 7.5 YR 4/4, dry, hard, (wet) medium plasticity, low toughness, no dilatancy, crumbly, CL (40% gravel, trace sand, 10% silt, 50% clay).		
32									
40	80	ALSB10S01 (HOLD)	50/5'	5.9		CL	<u>GRAVELLY CLAY</u> , similar to above, shoe contains compacted clay with larger particles of weathered basalt, approximately 1" to 1.5", CL (40% gravel, 10% silt, 50% clay).		
33						CL			
50	50	ALSB10S02 (HOLD)	50/5'	3.1			Concrete from 3.0 to 4.5 ft bgs.		
12						CL	<u>CLAY</u> , dark brown, 7.5 YR 3/3, dry, hard, (wet) medium plasticity, medium to low toughness, no dilatancy, some small gravel, CL (trace gravel, trace sand, 10% silt, 90% clay).		
17									
18	50	ALSB10S03 (HOLD)	50/4'	1.8		CL	<u>CLAY</u> similar to above, no gravel, CL (10% silt, 80% clay).		
18						CL			
28									
32	50	ALSB10G01	50/4'	0.0		CL	<u>CLAY</u> , as above, brown, 7.5 YR 4/2, CL (10% silt, 90% clay).		
38						CL			
50/4'	40								
50/4'	15					CL	<u>SILTY CLAY</u> , brown, 10 YR 5/3, dry, medium stiff to hard, (wet) low plasticity, low toughness, no dilatancy, crumbly, CL (20% silt, 80% clay).		
40						ML	<u>SILT</u> , brown, 10 YR 4/3, dry, medium stiff, (wet) non-plastic, no toughness, no dilatancy, crumbly, ML (trace sand, 90% silt, 10% clay).		
50/2'	15					ML			
40						ML	<u>SANDY SILT</u> , brown, 10 YR 4/3, dry, medium stiff, crumbly, similar to above with larger particles, ML (20% sand, 70% silt, 10% clay).		
50/4'	15					ML			
38						ML	<u>SANDY SILT</u> , brown, 7.5 YR 4/4, dry, medium stiff, similar to above with some gravel fragments, ML (10% gravel, 20% sand, 80% silt, 10% clay).		

CLIENT PACNAVFACENGCOM

BORING/WELL NUMBER SB10/MW10

PROJECT NAME/NUMBER AJEA LAUNDRY RJ/FS, NO. I-1019-0145

COMPLETION DEPTH 80.5 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
16	50		50/4"	0.0		ML		<p style="writing-mode: vertical-rl; transform: rotate(180deg);">GROUT</p> <p style="writing-mode: vertical-rl; transform: rotate(180deg);">4" OD SCH 40 PVC</p>	16
			32			CL	<u>SILTY CLAY</u> , dark reddish brown, 5 YR 3/2, dry, medium stiff to stiff, (wet) medium plasticity, medium toughness, no dilatancy, crumbly, CL (30% silt, 70% clay).		
	50		50/4"	0.0		CL			
			39			CL	<u>GRAVELLY CLAY</u> , brown and light gray, 7.5 YR 4/3 and 7.5 YR 7/1, (wet) low plasticity, no toughness, no dilatancy, particles of a'a (round vesicle) basalt, CL (10% gravel, 10% silt, 80% clay).		
	50		50/3"	0.0		CL			
18			37			CL	<u>GRAVELLY SILTY CLAY</u> , yellowish brown, 10 YR 5/6, dry, medium stiff, (wet) medium plasticity, no toughness, no dilatancy, crumbly, CL (10% gravel, 20% silt, 70% clay).		
	88		50/4"	0.0		CL			
20			41			CL	<u>SILTY CLAY</u> , reddish brown, 5 YR 4/3, dry, medium stiff, (wet) medium plasticity, low toughness, no dilatancy, crumbly, very red, some Mn staining, CL (30% silt, 70% clay).		
	50		50/2"	0.0		CL			
			50/5"	0.0		CL	<u>SILTY CLAY</u> , as above, some grayish powdery material similar to surface powder, Mn staining, CL (30% silt, 70% clay).		
22			50/5"	0.0		CL	<u>SILTY CLAY</u> , similar to above, low to non-plastic, no toughness, no dilatancy, silt borders on fine sand size, no gray material or Mn, CL (30% silt, 70% clay).		
	33		50/4"	0.1		CL	<u>SILTY CLAY</u> , as above, with gray material and Mn, CL (30% silt, 70% clay).		
24			50/4"	0.1		CL			
	33		50/4"	0.1		CL			
26			50/5"	0.0		CL	<u>CLAY</u> , dark reddish brown, 5 YR 3/4, moist, medium stiff, low plasticity, no toughness, low dilatancy, CL (20% silt, 80% clay).		
	40		50/5"	0.0		CL			
28			28			CL	<u>CLAY</u> , dark red, 2.5 YR 3/6, dry, very stiff to stiff, (wet) medium plasticity, medium toughness, no dilatancy, crumbly, CL (20% silt, 80% clay).		
	88		50/5"	0.0		CL			
			38			ML	<u>CLAYEY SILT</u> , dark brown, 7.5 YR 3/4, slightly moist, stiff to medium stiff, (wet) non-plastic, no toughness, no dilatancy, Mn staining, ML (80% silt, 40% clay).		
	88	ALSBIOS04	50/4"	1.8		ML			
30						CL			

CLIENT PACNAVFACENGBOM

BORING/WELL NUMBER SB10/MW10

PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1019-0145

COMPLETION DEPTH 80.5 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
31	33		50/5'	0.1		CL	<u>CLAYEY SILT</u> , as above, ML, bottom 8" contains <u>CLAY</u> , gray, dry, hard, CL (5% silt, 95% clay).	<p style="text-align: center;">GROUT</p> <p style="text-align: center;">4" OD SCH 40 PVC</p>	
32		ALSBIOS05	28			CL	<u>CLAY</u> , brown, 7.5 YR 4/4, slightly moist, very stiff, medium plasticity, low toughness, no dilatancy, CL, bottom of sampler contains		32
	70		34			ML	<u>SILT</u> , yellowish brown, 10 YR 5/8, slightly moist, stiff, non-plastic, no toughness, no dilatancy, ML (90% silt, 10% clay).		
			28	0.0		SP	<u>GRAVELLY SAND</u> , dark reddish brown, 5 YR 3/2, dry, stiff to medium stiff, non-plastic, no toughness, no dilatancy, crumbly, Mn staining, SP (30% gravel, 40% sand, 10% silt, 20% clay), shoe contains <u>BASALT/SAPROLITE</u> , heavily weathered, IE.		
34	50		50/5'	0.3*		IE	<u>BASALT</u> , at top, highly weathered, crumbly, white infillings, pahoehoe weathering to clay with depth, shoe contains weathered basalt a/a vesicles to 1/4", IE.		34
		ALSBIOS06	30			IE			
		ALSBIO006	31	1.0		IE	<u>BASALT</u> , at top, dry, medium to heavy weathering, pahoehoe fractures, crumbly, tiny vesicles, weathering increases with depth in sampler, <u>SAPROLITE</u> , at bottom, Mn staining, IE.		36
36	88		50/5'	1.0		IE			
		ALSBIOS07	28	0.3*		IE			
			50/5'	0.3*		IE	<u>BASALT/SAPROLITE</u> , highly weathered, changing to gravel, some pumice and scoria fragments, IE.		38
38			18			IE			
	70		28			CL	<u>GRAVELLY CLAY</u> , dark brown, 10 YR 3/3, slightly moist, medium stiff, medium plasticity, medium toughness, no dilatancy, looks like pulverized rock fragments, CL (10% gravel, trace silt, 90% clay).		40
			31	0.3*		CL			
40			18			CH	<u>CLAY</u> , very dark brown, 7.5 YR 2.5/3, slightly moist, medium stiff to stiff, (wet) medium to high plasticity, medium toughness, no dilatancy, grades into highly weathered basalt, CH (5% gravel, trace silt, 95% clay).		42
	70		28	0.0		CH			
			10			CH	<u>CLAY</u> , as above, moist, abundant white infilling in elongate vesicles, sand-like appearance, CH (5% gravel, trace silt, 95% clay).		44
			10			CH			
42	80		18	0.1		CH	<u>CLAY</u> , similar to above, dry, with gravel, pervasive white infilling, common Mn staining, CH (5% gravel, trace silt, 95% clay).	46	
			10			CH			
			11			CH			
44			17	0.1		CH			
			11			CH			
			13			CH			
			31	0.0		CL	<u>GRAVELLY SANDY CLAY</u> , very dark brown, 7.5 YR 2.5/3, moist, stiff, low to non-plastic, low toughness, no dilatancy, pervasive Mn staining, CL (20% gravel, 30% sand, trace silt, 50% clay).	46	
46			20			CL			
			20			CL			

CLIENT PACNAVFACEGCOM

BORING/WELL NUMBER SB10/MW10

PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. I-1019-0145

COMPLETION DEPTH 80.5 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
48	75		20	0.0		CL	GRAVELLY CLAY, similar to above infilling fractures in SAPROLITE, or weathered TUFF, IE/CL.	<p>4" OD SCH 40 PVC</p> <p>GROUT</p> <p>BENTONITE</p>	48
48	68		10			IE/CL			48
48			11			IE/CL			48
48			18	0.0		IE/CL	GRAVELLY CLAY/SAPROLITE OR TUFF, similar to above, IE/CL.		48
48			9			IE/CL			48
48			11			IE/CL			48
50	50		28	0.0		IE	BASALT, weathered, particles are friable and brittle, IE.		50
50	25		100/			IE			50
50			3"						50
52	25		100/	1.8		CL	GRAVELLY CLAY, dark gray, 2.5 Y 4/1, dry, gravel subrounded to rounded from 1/2"-1", mostly massive, lightly weathered, CL (50% gravel, 50% clay).		52
52			2"					52	
54	25			0.3		CL	GRAVELLY CLAY, gray, 2.5 Y 5/1, dry, hard, fragmented, gravel as above, CL (50% gravel, 50% clay).	54	
54								54	
54			100/			CL	GRAVELLY CLAY, as above, CL.	54	
54			2"				Difficult drilling. Switch from hollow stem auger to air rotary drilling @ 1200 on 8/2/98.	54	
56	15		NA			IE	BASALT, fine-grained, microcrystalline, fresh, moderately vesicular, pahoehoe type elongated vesicles, IE.	56	
58								58	
60								60	
62							Possible first occurrence of ground water at B1 to B2 ft bgs.	62	

CLIENT PACNAVFACENGCOM

BORING/WELL NUMBER SB10/MW10

PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1019-0145

COMPLETION DEPTH 80.5 ft.

DEPTH feet	SAMPLE	RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
64	☒	15		80/8"		☒ IE	IE	<p>BASALT, highly weathered, moist to wet, very crumbly, friable with gravelly clay matrix, large irregular vesicles, most coated with beige greenish precipitate, one rock fragment with attached root, IE.</p>	<p>BENTONITE</p>	64
66							Drill to 70 ft bgs.	4" OD SCH 40 PVC		66
70	■	15	ALSB10S08			☒ IE	IE	<p>BASALT, moist, very hard, microcrystalline, fresh, small irregular elongate vesicles, no infilling, small xenoliths of scoriaceous material, IE.</p>	<p>LONESTAR #3 SAND PACK</p> <p>4" OD STAINLESS STEEL SCREEN (0.02" SLOT)</p>	70
72										72
74										74
76	☒	50		50/8"	0.0	☒ IE	IE	<p>TUFF, brown, 7.5 YR 4/4, highly weathered, IE, SANDY CLAYEY GRAVEL, infilling between fractures, saturated gravel ranging from 3/4" to 2", GC (50% gravel, 20% sand, 30% clay).</p>		76
78	☒			17		☒ IE	IE	<p>TUFF, very dark grayish brown, 10 YR 3/2, weathered, IE, with SANDY CLAYEY GRAVEL infilling, saturated gravel ranging from 3/4" to 1", infilling may not be in-situ, may be slough</p>		78

CLIENT PACNAVFACENCOM
 PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1019-0145
 DATE/TIME STARTED 8/16/86 / 0930
 DATE/TIME FINISHED 8/16/86 / 1630
 COORDINATES 523565.08, 77536.38
 ELEVATION AND DATUM 83.65 ft. MSL
 TOP OF CASING ELEVATION NA

BORING/WELL NUMBER SB11
 COMPLETION DEPTH 63 ft.
 BOREHOLE DIAMETER 6 inch
 DRILLER/COMPANY Dean McLure, John Chism/Valley Well Drilling
 DRILLING METHOD/FLUID Hollow Stem Auger/none
 DRILLING EQUIPMENT MOBILE B-90
 GEOLOGIST Bruce Tsutsui CHECKED BY Wendy Zayac

DEPTH feet	SAMPLE	RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
							AS	Asphalt/base coarse to 1.5 feet bgs.		
3	BB		ALSBI1G01	18		GM	GM	GRAVEL white, 5 Y 8/1, dry, hard, non-plastic, no toughness, no dilatancy, base coarse, GM (80% gravel, 20% sand, trace silt), overlying		3
				23		CL	CL	CLAY, brown, 7.5 YR 4/4, dry, hard, (wet) low to medium plasticity, high toughness, no dilatancy, CL (100% clay).		
				41	0.7%	CL	CL	CLAY, as above, dark brown, 7.5 YR 3/3, CL (100% clay).		
				9		CL	CL			
				10		CH	CH	SANDY CLAY brown, 7.5 YR 4/4, dry, hard, (wet) medium to high plasticity, low toughness, no dilatancy, white sand coral (?) grains throughout (looks speckled), CH (10% gravel, 20% sand, trace silt, 70% clay).		
6	BB			16	0.7%	CH	CH	SANDY CLAY, as above, no gravel, CH.		
				14		CH	CH			
				18		CH	CH			
				27	0.7%	CH	CH			
				27		CH	CH			
				50/3'	18.5	CH	CH			
9	BB		ALSBI1S01	27		CH	CH	SILTY CLAY, yellowish brown, 10 YR 5/4, dry, medium stiff to stiff, medium to high plasticity, medium toughness, no dilatancy, somewhat crumbly, grades slightly coarser with depth, CH (20% silt, 80% clay).		
				50/8'	2.1	CH	CH	SILTY CLAY, as above, CH.		
				27		CH	CH			
				50/5'	422.7	CL	CL	SILTY CLAY, dark yellowish brown, 10 YR 4/4, dry, very stiff, (wet) low plasticity, low toughness, no dilatancy, odor, CL (trace sand, 40% silt, 80% clay).		
				31		CL	CL			
				50/5'	254.7	SM	SM	SILTY SAND, brown, 10 YR 4/3, dry, stiff to very stiff, (wet) non-plastic, no toughness, no dilatancy, odor, possible staining, SM (80% sand, 40% silt, trace clay).		
12	BB			28		SM	SM	SILTY SAND, as above, odor, SM (80% sand, 40% silt, trace clay).		
				50/5'	12.1	SM	SM			
				23		SM	SM			
				50/5'	110.4	SM	SM	SILTY SAND, as above, dark yellowish brown, 10 YR 4/4, dry, medium stiff, SM (80% sand, 40% silt, trace clay).		
15	BB		ALSBI1S02	35		SM	SM			
				50/8'		SM	SM			
				30		ML	ML	CLAYEY SILT, dark yellowish brown, 10 YR 4/4, dry, stiff, (wet) low to non-plastic, no toughness, no dilatancy, ML (80% silt, 40% clay).		
				50/5'	2.1	ML	ML			
18	BB		ALSBI1G02	80/3'	3.5	IE/GM	IE/GM	SANDY GRAVEL, dark reddish brown, 5 YR 3/3, dry, hard, gravel is probably fragmented rock, rock is vesicular (elongate, irregular), decomposed, may be basalt, tuff cookies, IE/GM (80% gravel, 20% sand, trace silt, trace clay).		
				70/3'	0.7%	GM	GM	GRAVEL similar to above, no tuff cookies, GM (80% gravel, 10% sand, trace silt, trace clay).		
21	BB					GM	GM			

CLIENT PACNAVFACEGCOM

BORING/WELL NUMBER SB11

PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS. NO. 1-1018-0145

COMPLETION DEPTH 63 ft.

DEPTH feet	SAMPLE	RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
24	33	33	ALSBIIG03	65/5"	0.7%		GM	<u>SANDY GRAVEL</u> , as above, strong brown, 7.5 YR 4/6, no rock fragments, GM (90% gravel, 10% sand, trace silt, trace clay).		24
24	50	37		50/5"	0.7%		CL	<u>SILTY CLAY</u> , dark brown, 7.5 YR 3/4, dry, stiff to medium stiff, (wet) low plasticity, no toughness, no dilatancy, CL (20% silt, 80% clay).		24
24	50	24		50/5"			CL	<u>GRAVELLY CLAY</u> , brown, 7.5 YR 4/4, dry, medium stiff, (wet) medium plasticity, low toughness, low dilatancy, small rounded gravel fragments to 1/8" mostly basalt, Mn (?) stained, CL (30% gravel, trace sand, 10% silt, 60% clay).		24
27	20	70/4"		2.1			IE	<u>SAPROLITE</u> , strong brown, 7.5 YR 5/6, fragmented, highly weathered tuff, particles of vesicular basalt, moist in fractures, basalt fragments have common Mn coating, IE.		27
27	88	50/8"		0.7%			CL	Top 8" <u>SAPROLITE</u> , as above, grades to <u>CLAY</u> , brown, 7.5 YR 4/4, dry to moist, medium stiff, (wet) low plasticity, low to no toughness, no dilatancy, grayish staining similar to surface "ash", CL (100% clay).		27
30	40	50/3"		0.7%			CL	<u>CLAY</u> , as above, CL.		30
30	100	16					CL	<u>CLAY</u> , as above, brown, 7.5 YR 4/4, lenses of stiff material increase, CL.		30
30	100	28					CL			30
30	100	34					CL			30
30	100	12					CL	<u>CLAY</u> , dark yellowish brown, 10 YR 4/4, dry, medium stiff, (wet) low plasticity, low toughness, no dilatancy, CL (trace silt, 100% clay).		30
33									33	
36	88	50/5"	0.7%				CL	<u>CLAY</u> , brown, 7.5 YR 4/4, dry to moist, hard, (wet) medium to low plasticity, high toughness, no dilatancy, CL (100% clay).		36
36	50	50/4"	0.7%				CH	<u>CLAY</u> , dark red, 2.5 YR 3/6, dry, stiff to very stiff, (wet) medium to high plasticity, low toughness, no dilatancy, CH (100% clay).		36
39	50	50/5"	0.7%				CL	<u>GRAVELLY CLAY</u> , dark reddish brown, 5 YR 3/3 to 2.5 YR 3/4, dry to moist, stiff, (wet) low plasticity, no toughness, no dilatancy, scoria, basalt fragments in clay matrix, common white yellow infilling, CL (30% gravel, 10% sand, trace silt, 60% clay).		39
39	50	50/5"	0.7%				CL	<u>CLAY</u> , dark reddish brown, 5 YR 3/4, moist, stiff, (wet) low to medium plasticity, no toughness, no dilatancy, clumps of tougher grayish clay imbedded within, CL (5% gravel, trace sand, trace silt, 95% clay).		39
42	50	50/5"	0.7%				CH	<u>CLAY</u> , red, 2.5 YR 4/6, dry to moist, very stiff to hard, high plasticity, high toughness, no dilatancy, clumps of grayish material, may be ashy stuff on surface, CH (100% clay).		42
42	33	50/5"	0.7%				IE	Top <u>CLAY</u> , as above, grades into <u>BASALT/SAPROLITE</u> , dry, moderately to highly weathered basalt fragments in clay matrix, basalt has angular, elongate, small vesicles, IE.		42
45	88	50/5"	0.7%				IE	<u>SAPROLITE</u> , dry, highly weathered, vesicular basalt, friable, vesicles spheroidal, irregular, reddish/yellow infilling, IE.		45

CLIENT PACNAVFACENGCOM

BORING/WELL NUMBER SB11

CT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1019-0145

COMPLETION DEPTH 63 ft.

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet	
70		ALSBIIS05	31			IE	SAPROLITE , moist, highly weathered, vesicles spheroidal, small 1/16" to 1/8", yellowish coating and infilling pervasive, rock is highly friable, no large fractures, IE.		63	
	40		0.7*		IE					
48	40		50/5"	0.7*		IE				SAPROLITE , as above, infilling is more pervasive, vesicles coalesce, IE.
	48		50/5"	0.7*		IE				BASALT , lightly weathered, vesicles spheroidal, dense, average 1/16", shoe contains more massive basalt, fewer vesicles, elongate, angular, and larger, IE.
	88	ALSBIIS08	50/5"	0.7*		IE	GRAVEL , vesicular basalt rubble, contains coarser fragments to 2", lightly weathered and highly weathered coarse sand/gravel, with pervasive infilling, IE (100% gravel, trace sand).			51
51	10		60/5"	0.7*		IE	Top GRAVEL , as above, grading into SAPROLITE/BASALT , intermingling, various stages of weathering, IE.			
	70	18	0.7*				Top GRAVEL , slough, similar to 4.0'-5.5' sample, shoe contains fragmented basalt/basalt gravel (pulverized), moderately weathered, few vesicles, rare infilling, IE.			54
	40	60/8"	0.7*		IE	BASALT , as above, IE.				
54	20	60/4"	8.4							
	20	60/8"	0.7*		IE	SAPROLITE , highly weathered, pervasive infilling, vesicles merged, rock is highly friable and identified as rock only by remnant structures, IE.				
57	30	70/8"	0.7*		IE	SAPROLITE , as above, some less weathered fragments to 2" imbedded within, IE.				
	30	60/8"	0.7*		IE	SAPROLITE , as above, overlying lightly weathered, nearly massive BASALT , slightly moist, almost no vesicles, fresh fractures, IE.				
60	5	180/1"	0.7*		IE	BASALT , massive, fragments in shoe, IE.				
		60/8"	0.7*		IE	BASALT , as above, IE.				
63		Drill refusal. End of boring at 63 feet bgs.								63
		Note: For headspace, * = ambient air.								
66										66
69										69

CLIENT PACNAVFACEGCOM
 PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1019-0145
 DATE/TIME STARTED 7/31/96 / 0827
 DATE/TIME FINISHED 7/31/96 / 1700
 COORDINATES 523572.21, 77447.78
 ELEVATION AND DATUM 83.02 ft. MSL
 TOP OF CASING ELEVATION NA

BORING/WELL NUMBER SB12
 COMPLETION DEPTH 64.5 ft.
 BOREHOLE DIAMETER 8 inch
 DRILLER/COMPANY Dean McLure, John Chism/Valley Well Drilling
 DRILLING METHOD/FLUID Hollow Stem Auger/none
 DRILLING EQUIPMENT MOBILE B-90
 GEOLOGIST Bruce Tsutsui CHECKED BY Wendy Zeyac

DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet
19			19			CL	GRAVELLY CLAY, dark reddish brown, 5 YR 3/3, dry, very soft, (wet) medium plasticity, no toughness, no dilatancy, crumbly, gravel-sized concrete fragments, CL (15% gravel, 5% sand, 10% silt, 70% clay).		
20			20						
25	80		25	7.2					
11			11			CL	GRAVELLY CLAY, as above, no concrete.		
15			15						
20	40	ALSBI2G01	20			CL	GRAVELLY CLAY, as above, with small basalt fragments, CL (20% gravel, trace sand, 10% silt, 70% clay).		3
10			10						
17			17			CL	GRAVELLY CLAY, as above.		
11	50	ALSBI2G01	11			CL			
12			12			CL			
12			12						
15	83		15	0.0		CL	CLAY, dark yellowish brown, 10 YR 4/4, slightly moist, very stiff, (wet) medium plasticity, low toughness, no dilatancy, some grayish mottling, CL (trace sand, 10% silt, 90% clay).		6
11			11						
18			18			CL	CLAY, yellowish brown, 10 YR 5/6, dry, very stiff to medium stiff, (wet) medium plasticity, low toughness, no dilatancy, no mottling, CL (trace sand, 10% silt, 90% clay).		
23	88		23	2.2		CL			
21			21			CL	CLAY, yellowish brown, 10 YR 5/6, dry, very stiff to medium stiff, (wet) medium plasticity, low toughness, no dilatancy, no mottling, CL (trace sand, 10% silt, 90% clay).		
28			28						
34	83		34	3.4		CL	CLAY, as above.		9
10			10						
14			14						
17	88		17	0.4		CL	CLAY, yellowish brown, 10 YR 5/6, dry, medium stiff, (wet) medium plasticity, low toughness, low dilatancy, CL (5% gravel, 5% sand, 10% silt, 80% clay).		
24			24						
30			30						
34	33		34	2.2		CL	CLAY, yellowish brown, 10 YR 5/6, dry, medium stiff, (wet) medium plasticity, medium toughness, no dilatancy, CL (trace sand, 10% silt, 90% clay).	12	
34			34						
50/5'	50		50/5'	0.8		CL	SILTY CLAY, dark brown, 7.5 YR 3/3, dry, medium stiff, (wet) medium plasticity, medium toughness, no dilatancy, CL (5% gravel, 5% sand, 30% silt, 80% clay).		
28			28			CL	SILTY CLAY, dark brown, 7.5 YR 3/3, dry, medium stiff to stiff, (wet) medium plasticity, medium toughness, no dilatancy, CL (5% sand, 35% silt, 80% clay).		
50/4'	50		50/4'	0.1					
50/4'	50	ALSBI2S01	50/4'	0.2		CL	SILTY CLAY, dark brown, 7.5 YR 3/3, dry, medium stiff to stiff, (wet) medium plasticity, medium toughness, no dilatancy, CL (5% sand, 35% silt, 80% clay).	15	
40			40			CL	SILTY CLAY, dark yellowish brown, 10 YR 3/4, dry, medium stiff to stiff, (wet) medium plasticity, medium toughness, no dilatancy, CL (trace sand, 30% silt, 70% clay).		
50/3'	50		50/3'	1.3		CL	SILTY CLAY, as above, CL.	18	
42			42			CL			
50/5'	50		50/5'						
50/4'	33	ALSBI2S02	50/4'			ML	SANDY SILT, very dark grayish brown, 2.5 Y 3/2, dry, very stiff to hard, (wet) non-plastic, no toughness, no dilatancy, sand is borderline coarse silt, ML (10% gravel, 40% sand, 50% silt, trace clays).	21	
						SW			

CLIENT PACNAVFACENGCOM

BORING/WELL NUMBER SB12

PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1019-0145

COMPLETION DEPTH 64.5 ft.

DEPTH feet	SAMPLE	RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet	
24	88	50	ALSBI2S03	50/4"	0.7	SW	SW	GRAVELLY SAND, slightly moist, very stiff to hard, (wet), non-plastic, no toughness, no dilatancy, gravel fragments are cemented, SW (30% gravel, 80% sand, 10% silt, trace clays).	WELL DIAGRAM	24	
				17			SM	SM		STILTY SAND, dark yellowish brown, 10 YR 4/4, dry, medium stiff to soft, (wet) non-plastic, no toughness, no dilatancy, SM (trace gravel, 80% sand, 30% silt, 10% clay).	
				21							
				32	0.0		CL	CL		CLAY, dark brown, 7.5 YR 3/3, slightly moist, very stiff to stiff, (wet) low plasticity, low toughness, no dilatancy, some gray mottling, CL (5% silt, 95% clay).	
				22							
27	83	50	ALSBI2S04	50/5"	0.0	CL	CL	CLAY, dark gray and dark brown, 10 YR 4/1 and 7.5 YR 3/3, slightly moist, hard to very stiff, may be saprolite, CL (100% clay). BASALT, in shoe.			27
				21			CL	CL			
				40							
				50/3"	0.1		IE	IE		BASALT, vesicular, pahoehoe vesicle pattern, rubble is GRAVELLY CLAY, dark reddish brown, 5 YR 3/2, crumbly, CL (20% gravel, 5% sand, 10% silt, 85% clay).	
				50/5"	0.3		CL	CL			
				17			CH	CH		CLAY, dark yellowish brown, 10 YR 4/8, slightly moist, medium stiff, (wet) medium plasticity, medium toughness, no dilatancy, shiny particles, crystal? glass?, CH/CL (5% silt, 95% clay).	
				14			CL	CL			
				20	0.2		CH	CH	CLAY, as above, CH/CL.		
				21			CL	CL			
				28							
30	88		ALSBI2S04	54	0.1	CH	CH	CLAY, dark gray and dark brown, 10 YR 4/1 and 7.5 YR 3/4, slightly moist, hard to very stiff, two tone, top 8" to 6" is grayish clay with white inclusions, (wet) high plasticity, high toughness, no dilatancy, bottom 1/2 is brownish, CH, (100% clay).	WELL DIAGRAM	30	
				7			CH	CH			
				14							
				21	0.2		CH	CH		CLAY, dark grayish brown, 10 YR 4/2, slightly moist, very stiff, similar to grayish clay above, shoe has brownish clay similar to above, dark brown, 7.5 YR 3/4, CH (100% clay).	
				12			CH	CH			
				25							
				37	0.3		CH	CH		CLAY, dark reddish brown, 5 YR 3/3, slightly moist, hard, (wet) high plasticity, high toughness, no dilatancy, some yellowish inclusions, CH (100% clay).	
				7							
				15							
				21	0.4		CH	CH		CLAY, as above, some yellowish inclusions, CH (100% clay).	
33	83		ALSBI2S04	17						WELL DIAGRAM	33
				21			CH	CH	CLAY, as above, CH.		
				7							
				15							
				21	0.4		CH	CH	CLAY, as above, CH.		
				17							
				21							
				7	0.3		CH	CH	CLAY, as above, CH.		
				18							
				50/5"	0.3						
36	50		ALSBI2S04	50/3"	0.3	CH	CH	CLAY, as above, CH.	WELL DIAGRAM		36
				11			CH	CH		CLAY, as above, more mottles, CH (100% clay).	
				14							
				21	0.4		CH	CH		CLAY, brown, 7.5 YR 4/4, slightly moist, hard, CH (100% clay).	
				14							
				23							
				36	0.4		IE	IE		BASALT, wet, fractured, very weathered, round a'a vesicles, Mn infilling vesicles, IE.	
				8							
				12							
				28	0.1		CL	CL			
39	33		ALSBI2G02	50/3"	0.3	CH	CH	CLAY, as above, CH.		WELL DIAGRAM	39
				11			CH	CH	CLAY, as above, more mottles, CH (100% clay).		
				14							
				21	0.4		CH	CH	CLAY, brown, 7.5 YR 4/4, slightly moist, hard, CH (100% clay).		
				14							
				23							
				36	0.4		IE	IE	BASALT, wet, fractured, very weathered, round a'a vesicles, Mn infilling vesicles, IE.		
				8							
				12							
				28	0.1		CL	CL			
42	100		ALSBI2G02	50/3"	0.3	CH	CH	CLAY, as above, CH.	WELL DIAGRAM		42
				11			CH	CH		CLAY, as above, more mottles, CH (100% clay).	
				14							
				21	0.4		CH	CH		CLAY, brown, 7.5 YR 4/4, slightly moist, hard, CH (100% clay).	
				14							
				23							
				36	0.4		IE	IE		BASALT, wet, fractured, very weathered, round a'a vesicles, Mn infilling vesicles, IE.	
				8							
				12							
				28	0.1		CL	CL			
45	100		ALSBI2G02	50/3"	0.3	CH	CH	CLAY, as above, CH.		WELL DIAGRAM	45
				11			CH	CH	CLAY, as above, more mottles, CH (100% clay).		
				14							
				21	0.4		CH	CH	CLAY, brown, 7.5 YR 4/4, slightly moist, hard, CH (100% clay).		
				14							
				23							
				36	0.4		IE	IE	BASALT, wet, fractured, very weathered, round a'a vesicles, Mn infilling vesicles, IE.		
				8							
				12							
				28	0.1		CL	CL			

CLIENT PACNAVFACENGCOM

BORING/WELL NUMBER SB12

PROJECT NAME/NUMBER AIEA LAUNDRY RI/FS, NO. 1-1018-0145

COMPLETION DEPTH 84.5 ft.

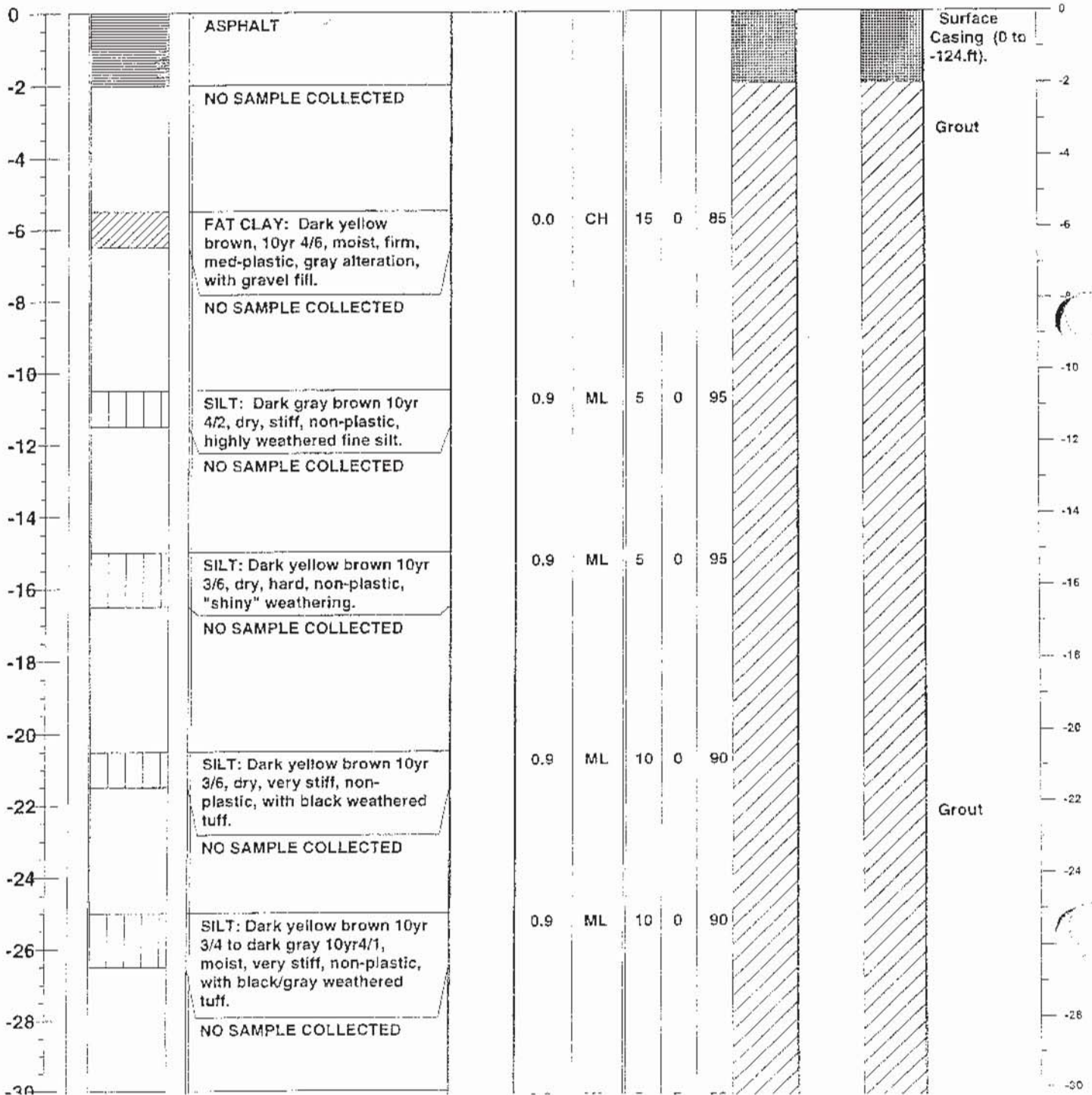
DEPTH feet	SAMPLE RECOVERY %	SAMPLE NUMBER	BLOW COUNT	HEADSPACE (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION	WELL DIAGRAM	DEPTH feet	
48	88	ALSBI2S05	14			CL	Top 8" <u>GRAVELLY CLAY</u> , dark yellowish brown, 10 YR 3/8, moist, low moist, low plasticity, low toughness, no dilatancy, CL (30% gravel, 10% sand, 10% silt, 50% clay), grades to <u>BASALT</u> , very weathered, rubble, IE.		48	
	88		24			IE				
			45			IE				
			10			CL				
			50/5"	0.3		IE/CL	<u>GRAVELLY CLAY</u> , very wet, white infilling, highly weathered basalt, Mn infilling, basalt as above, IE/CL (30% gravel, 10% sand, 10% silt, 50% clay).			
			7			IE	<u>BASALT</u> , slightly moist, highly weathered, much reiness, crumbly, more Mn staining, bottom 8" may be weathered tuff, IE.			
			21			IE	<u>BASALT</u> , highly weathered, overlying weathered <u>TUFF</u> , shoe contains consolidated <u>BASALT</u> , moderately weathered, IE.			
			28	0.3		IE				
			21			IE	<u>BASALT</u> , as above, saturated/moist (?), IE.			
			50/1"			IE				
51	50	ALSBI2G03	28			IE	<u>BASALT</u> , as above, saturated/moist (?), breaks to gravel-sized particles, no white infilling, round vesicles, IE.	51		
	17		50/5"	0.2		IE				
			50/4"	0.1		IE	<u>BASALT</u> , saturated, vesicular, lightly weathered, rounded a'a vesicles, IE.			
				0.3		IE				
54	17					IE	<u>BASALT</u> , very weathered, IE, weathering into <u>GRAVELLY CLAY</u> , rounded vesicles (a'a), white infillings in approximately 50% vesicles, white tuff is nonreactive with HCl, CL.		54	
			50/4"	0.0		IE/CL				
						IE/CL	<u>BASALT/GRAVELLY CLAY</u> , as above, IE/CL.			
			42			IE/CL	<u>BASALT</u> , moist but not saturated, very weathered, as above, larger percentage of white infilling, IE.			
			50/3"	0.8		IE/CL				
			43			IE	<u>BASALT</u> , moist to saturated, very weathered, pahoehoe vesicles, smaller, abundant white infilling, also may be palagonite, IE.			60
			50/3"	0.3*		IE				
			38			IE	<u>BASALT</u> , as above, moist to saturated, IE.			
			50/3"	0.3*		IE				
			23			IE	<u>BASALT</u> , as above, saturated, IE.			
			50/4"	0.3*		IE				
63	17		18			IE	End of boring at 84.5 feet bgs.	63		
			50/2"	0.3*		IE				
66							Note: For headspace, * = ambient air.		66	
69										

SOIL BORING AND WELL LOG

BOREHOLE NO **SB-16**
 TOTAL DEPTH **138.5' bgs**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	AIEA LAUNDRY RI	DRILLING CO.:	Valley Well
CLIENT:	NAVY	DRILLER:	Dean M./ W. H.
JOB NO.:	1-1019-0145	RIG TYPE:	HSA B-90
SITE:	HONOLULU, HAWAII	METHOD OF DRILLING:	HSA/Air.R
LOGGED BY:	Dolan Eversole	SIZE/TYPE OF BIT:	4"Auger/10"
CHECKED BY:	Wendy Zayac	SAMPLING EQUIPMENT:	2" Split Spoon
DATE COMPLETED:	2/17/99		

Depth Feet bgs	Initial H ₂ O	Soil Lith.	Sample	Soil Description Observations	Sample No.	PID ppm	USCS	Estimated Percent of			Well MW-16 Construction	Well Description
								GR	SA	FI		



SOIL BORING AND WELL LOG

BOREHOLE NO **SB-16**
 TOTAL DEPTH **138.5' bgs**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	AIEA LAUNDRY RI	DRILLING CO.:	Valley Well
CLIENT:	NAVY	DRILLER:	Dean M. / W. H.
JOB NO.:	1-1019-0145	RIG TYPE:	HSA B-90
SITE:	HONOLULU, HAWAII	METHOD OF DRILLING:	HSA/Air.R
LOGGED BY:	Dolan Eversole	SIZE/TYPE OF BIT:	4"Auger/10"
CHECKED BY:	Wendy Zayac	SAMPLING EQUIPMENT:	2" Split Spoon
DATE COMPLETED:	2/17/99		

Depth Feet bgs	Initial H ₂ O	Soil Lith.	Sample	Soil Description Observations	Sample No.	PID ppm	USCS	Estimated Percent of			Well MW-16 Construction	Well Description
								GR	SA	FI		
-32				SILT: Dark gray 10yr 4/1, dry to moist, stiff to v stiff, non-plastic, with minor weathered clay/tuff gravel (5%), gray/white alteration of tuff and clay.		0.9	ML	5	5	90		
-34				NO SAMPLE COLLECTED								Grout
-36				SILT: Brown 10yr 4/3 to gray 10yr 5/1, dry to moist, soft, non-plastic, with minor -5% tuff gravel at 36.0ft.	HE832	0.0	ML	5	0	95		
-38				NO SAMPLE COLLECTED								
-40				ELASTIC SILT: Brown 10yr 4/6, moist, soft, low plasticity, with -10% vesicles.		0.9	MH	5	0	95		
-42				NO SAMPLE COLLECTED								
-44				ELASTIC SILT: Dark yellow brown 10yr 4/6, moist, stiff, non-plastic.		0.9	MH	5	20	75		
-46				SANDY ELASTIC SILT: Dark yellow brown, moist, stiff, non-plastic, fine basalt sand and ash.			MH	5	30	65		
-48				TUFF: Dark yellow brown, highly weathered vesiculated tuff, with >30% silt.		0.9	MH	40	5	55		
-50				NO SAMPLE COLLECTED			MH	35	5	60		
-52				GRAVELLY ELASTIC SILT: Very dark gray 10yr 3/1, v moist, hard, non-plastic, with highly weathered vesiculated tuff.								
-54				NO SAMPLE COLLECTED								
-56				ELASTIC SILT: Highly weathered tuff, very dark gray brown 10yr 3/2, soft, moist, with slight odor and orange/black staining/alteration.		56.5	MH	5	0	95		Grout
-58				NO SAMPLE COLLECTED								
-60				SILTY CLAY: Very dark gray		10.7	CL	5	0	95		Basal Aquifer Level

SOIL BORING AND WELL LOG

BOREHOLE NO **SB-16**
TOTAL DEPTH **138.5' bgs**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	AIEA LAUNDRY RI	DRILLING CO.:	Valley Well
CLIENT:	NAVY	DRILLER:	Dean M. / W. H.
JOB NO.:	1-1019-0145	RIG TYPE:	HSA B-90
SITE:	HONOLULU, HAWAII	METHOD OF DRILLING:	HSA/Air.R
LOGGED BY:	Dolan Eversole	SIZE/TYPE OF BIT:	4"Auger/10"
CHECKED BY:	Wendy Zayac	SAMPLING EQUIPMENT:	2" Split Spoon
DATE COMPLETED:	2/17/99		

Depth Feet bgs	Initial H ₂ O	Soil Lith.	Sample	Soil Description Observations	Sample No.	PID ppm	USCS	Estimated Percent of			Well MW-16 Construction	Well Description
								GR	SA	FI		
-92				TUFF: Welded, dark gray 10yr 4/1, wet, hard, very fine grained, no vesicles, no odor, alteration along fractures, sub-angular gravel, "sandstone-like" properties.								
-94												
-96				NO SAMPLE COLLECTED								
-98				TUFF: Welded with fractured coarse gravel, saturated sluff, poor recovery in sampler, some rounded basalt gravel, highly vesiculated basalt cobble at 100 ft taken from bucket auger.								
-100												
-100				FAT CLAY: Basalt saponite? reddish brown 2.5yr 4/3, wet, high plasticity, with coarse basalt gravel.								
-102												Grout
-104				GRAVELY CLAY: Fat, reddish brown, saturated/wet, fractured/weathered basalt gravel, saponite?								
-106												
-106				VESICULAR BASALT: Medium dark gray N4, fractured and weathered, aphanitic.								
-108												
-108				GRAVELY CLAY: As above.								
-110				VESICULAR BASALT: As above.								
-110				GRAVELY CLAY: As above.								
-112												
-112				VESICULAR BASALT: Highly weathered, medium dark gray N4, fractured and weathered, aphanitic, some hydrothermal alteration.								
-114												
-116												
-118												
-120												Grout

CH 25 5 70

CH 40 5 55

CH 40 5 55

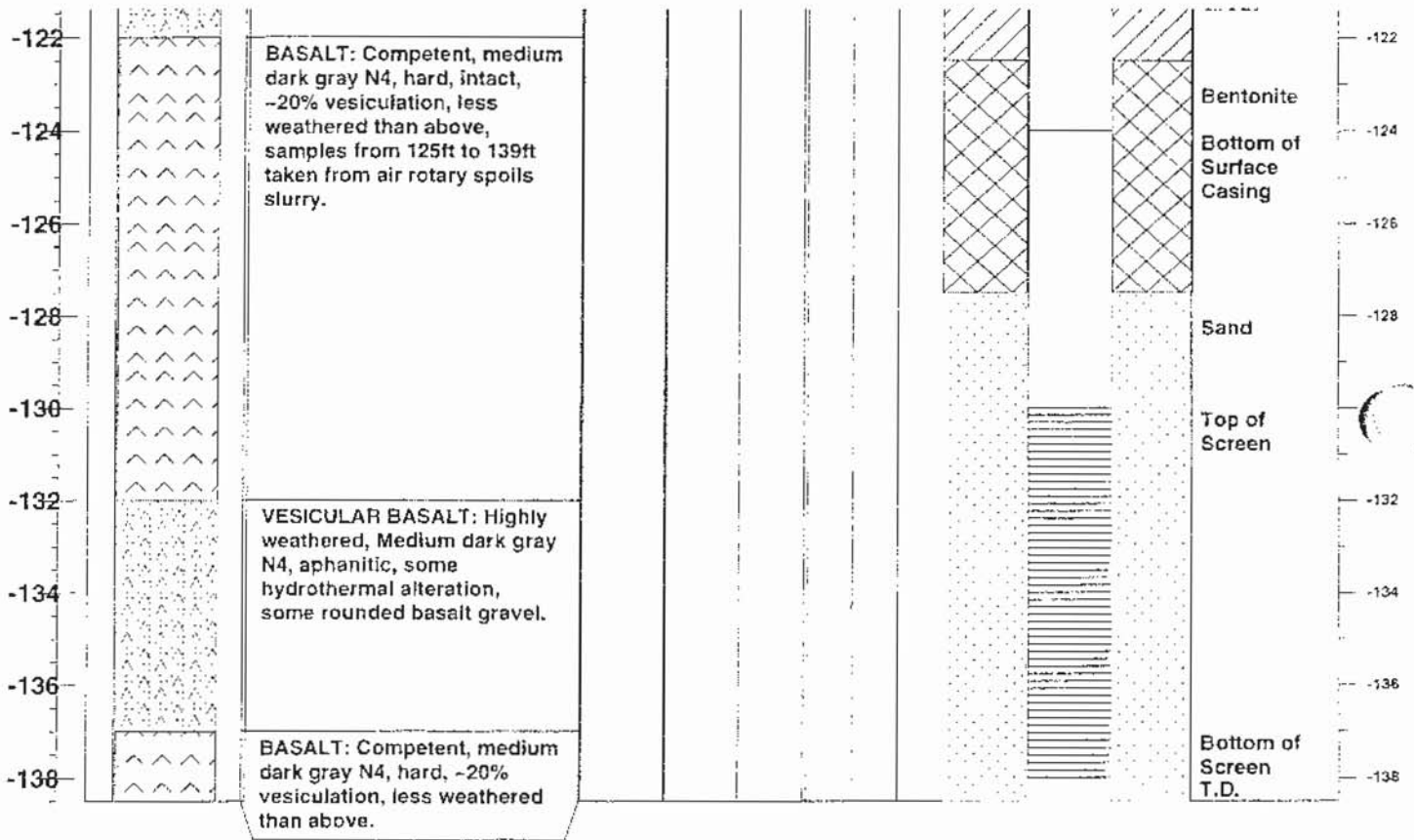
CH 40 5 55

SOIL BORING AND WELL LOG

BOREHOLE NO **SB-16**
 TOTAL DEPTH **138.5' bgs**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	AIEA LAUNDRY RI	DRILLING CO.:	Valley Well
CLIENT:	NAVY	DRILLER:	Dean M./ W. H.
JOB NO.:	1-1019-0145	RIG TYPE:	HSA B-90
SITE:	HONOLULU, HAWAII	METHOD OF DRILLING:	HSA/Air.R
LOGGED BY:	Dolan Eversole	SIZE/TYPE OF BIT:	4"Auger/10"
CHECKED BY:	Wendy Zayac	SAMPLING EQUIPMENT:	2" Split Spoon
DATE COMPLETED:	2/17/99		

Depth Feet bgs	Initial H ₂ O	Soil Lith.	Soil Description Observations	Sample No.	PID ppm	USCS	Estimated Percent of			Well MW-16 Construction	Well Description
							GR	SA	FI		



Borehole Log

Project Name: RI/FS Addendum, Former Aiea Laundry Facility		Project Number: CTO-0009, 83571		Borehole/ Well Number: MW-26-1	
Borehole Location: MW-26-1				Sheet 1 of 1	
Drilling Agency: Geolabs		Driller: Dan		Total Depth of Well TOC (feet):	
Drilling Equipment: CME		Date & Time Started: 3/7/2007 9:15:00 AM		Total Depth of Boring BGS (feet): 17.0	
Drilling Method: Hollow Stem Auger		Date & Time Finished:		Depth to Water (During Drilling): 10.65 ft.	
Depth to Water (Static): 10.65 ft.		Size and Type of Bit: 10"		Sample Type: Drive	
Drilling Fluid: None		Borehole Diameter (in.) 10		Logged By: T. McManus	
				Checked By:	

Completion Information: Completed as a monitoring well

Depth (feet)	Samples			Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks	
	Number	Type	Blow Count	Percent Recovery	Analytical Samples & ID	Gravel	Sand	Fines				Graphic
1									ML/GM	SANDY SILT WITH TRACE GRAVEL; reddish brown 5YR 5/4; dry; medium hard compaction; ML/GM; gravels are subangular to well rounded approximately 12mm in diameter.		No odor.
2												
3												
4												
5												
6									ML	CLAYEY SILT; dark reddish brown 5YR 3/3; firm; ribbons; trace gravel is well rounded to angular.		No odor.
7												
8												
9												
10									ML/CL	CLAYEY SILT WITH SAND; reddish brown 5YR 4/3; wet to moist; firm.		
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												

PS_BORE LOG W/ WELL AIEA LAUNDRY BORING LOGS2.GPJ\FORD.GPJ\4/25/07



at 1020 on 3/7/07

Borehole Log

Project Name: RI/FS Addendum, Former Aiea Laundry Facility		Project Number: CTO-0009, 83571	Borehole/ Well Number: MW-33
Borehole Location: MW-33			Sheet 1 of 2
Drilling Agency: Geolabs		Driller: Dan	Total Depth of Well TOC (feet):
Drilling Equipment: CME		Date & Time Started: 3/8/2007 8:00:00 AM	Total Depth of Boring BGS (feet): 49.5
Drilling Method: Hollow Stem Auger		Date & Time Finished: 3/21/2007 10:30:00 AM	Depth to Water (During Drilling): ft.
Depth to Water (Static): ft.		Size and Type of Bit: 10"	Sample Type: Drive
Drilling Fluid: None		Borehole Diameter (in.) 10	Logged By: T. McManus
Checked By:			

Completion Information: Completed as a monitoring well

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Analytical Samples & ID	Gravel	Sand	Fines	Graphic			
1						10	25	65		/SM	SANDY SILT; dark brown 10YR 3/3; dry; loose; trace gravel up to 25mm in diameter; gravel subangular to subrounded; trace root material in top 6".	
2												
3												
4												
5						5	25	70		SM	SANDY SILT WITH TRACE GRAVEL; dark brown 10YR 3/3; moist; loose; gravels up to 30mm in diameter.	
6												
7											Same as above. Soils become wet between 6' bgs and 7' bgs. Color grades to very dark grayish brown, 10YR 3/2.	
8						5	25	70		SM		
9												
10											CLAYEY SILT WITH TRACE SAND; very dark gray, 10YR 3/1; wet; loose.	
11												
12						5	25	70		SM		
13												
14											CLAYEY SILT WITH TRACE SAND; very dark gray, 10YR 3/1; wet; loose.	
15												
16											CLAYEY SILT WITH TRACE SAND; very dark gray, 10YR 3/1; wet; loose.	
17												
18						0	10	90		ML		
19											CLAYEY SILT WITH TRACE SAND; very dark gray, 10YR 3/1; wet; loose.	
20						0	10	90		ML		
21											CLAYEY SILT WITH TRACE SAND; very dark gray, 10YR 3/1; wet; loose.	
22												
23											CLAYEY SILT WITH TRACE SAND; very dark gray, 10YR 3/1; wet; loose.	
24												
25											CLAYEY SILT WITH TRACE SAND; very dark gray, 10YR 3/1; wet; loose.	

PS_BORE LOG W/WELL/AIEA/LAUNDRY BORING LOGS2.GPJ\FORD.GPJ\4/25/07

Borehole Log (Continuation Sheet)

Project Name: RI/FS Addendum, Former Aiea Laundry Facility					Project Number: CTO-0009, 83571			Borehole Number: MW-33				
Borehole Location: MW-33								Sheet 2 of 2				
Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Gravel	Sand	Fines	Graphic	USCS or Rock Type			
26					0	10	90		ML	Very easy drilling, ET personnel attempted to take water level reading at 1010.		
27										Same as above.		
28										CLAYEY SILT WITH TRACE SAND; very dark gray, 10YR 3/1; very wet; loose.		
29												
30												
31												
32												
33					0	10	90		ML			
34												
35										Driller encounters hard drilling; possible tuff layer.		
36												
37												
38												
39												
40												
41					0	10	90		ML	Same as above. CLAYEY SILT WITH TRACE CLAY; very dark gray 10YR 3/1; very wet; loose.		
42												
43										Driller encounters harder drilling at approximately 43 feet, bgs.		
44												
45												
46												
47					0	10	90		ML	CLAYEY SILT WITH SAND; very dark gray 2.5YR 3/1; very wet; loose; drillers encounter hard drilling, possible tuff layer. Rig breaks down at 1220 on 3/8/07 with augers at approximately 48 feet, bgs. Continued drilling on 3/20/07.		
48												
49												
											Boring terminated at 49.5 feet bgs.	

Borehole Log

Project Name: RI/FS Addendum, Former Aiea Laundry Facility		Project Number: CTO-0009, 83571		Borehole/ Well Number: MW-34	
Borehole Location: MW-34				Sheet 1 of 2	
Drilling Agency: Geolabs		Driller: Dan		Total Depth of Well TOC (feet):	
Drilling Equipment: CME		Date & Time Started: 3/21/2007 11:00:00 AM		Total Depth of Boring BGS (feet): 49.5	
Drilling Method: Hollow Stem Auger		Date & Time Finished: 4/2/2007		Depth to Water (During Drilling): ft.	
Depth to Water (Static): ft.		Size and Type of Bit: 10"		Sample Type: Drive	
Drilling Fluid: None		Borehole Diameter (in.) 10"		Logged By: T. McManus	
				Checked By:	

Completion Information: Completed as a monitoring well

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks	
	Number	Type	Blow Count	Percent Recovery	Analytical Samples & ID	Gravel	Sand	Fines	Graphic				USCS or Rock Type
1						5	25	70		SM	SANDY SILT; dark brown 10YR 3/3; dry; loose; trace gravel up to 30mm in diameter; gravel subrounded; trace root material in top two feet. Hand digging		
2													
3													
4													
5						5	25	70		SM	SANDY SILT WITH TRACE GRAVEL AND CLAY; Dark brown 10YR 3/3; moist; loose; gravel up to 25mm in diameter; gravel subrounded.		
6													
7													
8													
9													
10						5	25	70		SM	Same as above. Soil becomes wet at approximately 7 feet below ground surface. color change to very dark grayish brown, 10YR 3/2.		
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21						15		85		ML	CLAYEY SILT WITH TRACE SAND; very dark gray 10YR 3/2; wet; loose.		
22													
23													
24													
25													

Borehole Log

Project Name: RI/FS Addendum, Former Aiea Laundry Facility		Project Number: CTO-0009, 83571		Borehole/ Well Number: MW-35	
Borehole Location: MW-35				Sheet 1 of 3	
Drilling Agency: Geolabs		Driller: Dan		Total Depth of Well TOC (feet):	
Drilling Equipment: CME		Date & Time Started: 4/9/2007 10:40:00 AM		Total Depth of Boring BGS (feet): 60.0	
Drilling Method: Hollow Stem Auger		Date & Time Finished: 4/13/2007 9:15:00 AM		Depth to Water (During Drilling): ft.	
Depth to Water (Static): ft.		Size and Type of Bit: 10"		Sample Type: Drive	
Drilling Fluid: None		Borehole Diameter (in.) 10"		Logged By: T. McManus	
				Checked By:	

Completion Information: Completed as a monitoring well

Depth (feet)	Samples			Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Analytical Samples & ID	Gravel	Sand	Fines			
1										Asphalt	PID = 0.0
2										No soil logged	
3											
4											
5						5	25	70		ML	PID = 0.0
6										SANDY SILT WITH TRACE GRAVEL; dark yellowish brown 10YR 3/4; fine grained sand; gravel up to 25mm in diameter; subrounded; dry; loose.	
7											PID = 0.0
8											
9											PID = 0.0
10						5	25	70		ML	
11										Same as above, grading to moist.	PID = 0.0
12											
13											PID = 0.0
14											
15						5	15	80		ML	PID = 0.0
16			1	100						Same as above. Soil color grades to dark brown 10YR 3/3; moisture grades to wet at approximately 12 feet below ground surface. Trace clay present. Geotech lab sample taken at 15 feet below ground surface at 1120.	
17			6								PID = 0.0
18			9								
19			10								PID = 0.0
20											
21											PID = 0.0
22						5		95		CL	
23										SILTY CLAY WITH TRACE SAND; brown 10YR 3/2; sand is medium to fine grained; very wet; loose.	PID = 0.0
24											
25											

PS_BORE LOG W/WELL/AIEA LAUNDRY BORING LOGS2.GPJ\FORD.GPJ\4/25/07

Borehole Log (Continuation Sheet)

Project Name: RI/FS Addendum, Former Aiea Laundry Facility				Project Number: CTO-0009, 83571				Borehole Number: MW-35				
Borehole Location: MW-35								Sheet 3 of 3				
Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Gravel	Sand	Fines	Graphic	USCS or Rock Type			
55												PID = 0.0
56												
57												
58												
59												
60										Boring terminated at 60 feet below ground surface at 1510.		PID = 0.0

Borehole Log

Project Name: RI/FS Addendum, Former Aiea Laundry Facility		Project Number: CTO-0009, 83571		Borehole/ Well Number: MW-36	
Borehole Location: MW-36				Sheet 1 of 2	
Drilling Agency: Geolabs		Driller: Dan		Total Depth of Well TOC (feet):	
Drilling Equipment: CME		Date & Time Started: 4/4/2007 12:15:00 PM		Total Depth of Boring BGS (feet): 50.0	
Drilling Method: Hollow Stem Auger		Date & Time Finished: 4/4/2007 4:40:00 PM		Depth to Water (During Drilling): ft.	
Depth to Water (Static): ft.		Size and Type of Bit: 10"		Sample Type: Drive	
Drilling Fluid: None		Borehole Diameter (in.) 10"		Logged By: T. McManus	
				Checked By:	

Completion Information: Completed as a monitoring well

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Analytical Samples & ID	Gravel	Sand	Fines	Graphic			
1												Topsoil, tree roots, silty sand to sandy silt; dry.
2												
3												
4												
5						25	5	70		CL		SILTY CLAY WITH SAND AND GRAVEL; very dark grayish brown 10YR 3/2; gravels up to 30mm in diameter; subrounded to subangular; moist.
6												
7												
8												
9												
10						30		70		CL		Soil grades to loose and very wet.
11												
12												
13												
14												
15												
16			27	75		20		80		CL		Geotech sample taken at 15 feet below ground surface.
17												
18												
19												
20						20		80		CL		Shell fragments present
21												
22												
23												
24												
25												

PS_BORE LOG W/WELL/AIEA LAUNDRY BORING LOGS2.GPJ\FORD.GPJ\4/25/07

Borehole Log (Continuation Sheet)

Project Name: RI/FS Addendum, Former Aiea Laundry Facility	Project Number: CTO-0009, 83571	Borehole Number: MW-36	
--	---------------------------------	------------------------	--

Borehole Location: MW-36	Sheet 2 of 2
--------------------------	--------------

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Gravel	Sand	Fines	Graphic	USCS or Rock Type			
26												
27												
28												
29												
30												
31	◇		71	50	5		95		CH	CLAY; dark gray 10YR 4/1; fat clay ribbons with trace gravel; moist; dense. Geotech sample taken at 30 feet below ground surface.		
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46	◇		70	50	5		95		CH	CLAY; very dark grayish brown; trace silt and gravel; fat clay ribbons and shell fragments present; moist; very dense. Geotech sample taken at 45 feet below ground surface.		
47												
48												
49												
50												
										Boring terminated at 50 feet below ground surface at 1640.		

Borehole Log

Project Name: RI/FS Addendum, Former Aiea Laundry Facility		Project Number: CTO-0009, 83571		Borehole/ Well Number: MW-37	
Borehole Location: MW-37				Sheet 1 of 2	
Drilling Agency: Geolabs		Driller: Dan		Total Depth of Well TOC (feet):	
Drilling Equipment: CME		Date & Time Started: 3/23/2007 10:30:00 AM		Total Depth of Boring BGS (feet): 50.0	
Drilling Method: Hollow Stem Auger		Date & Time Finished: 3/23/2007 2:00:00 PM		Depth to Water (During Drilling): ft.	
Depth to Water (Static): ft.		Size and Type of Bit: 10"		Sample Type: Drive	
Drilling Fluid: None		Borehole Diameter (in.) 10"		Logged By: T. McManus	
				Checked By:	

Completion Information: Completed as a monitoring well

Depth (feet)	Samples					Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Analytical Samples & ID	Gravel	Sand	Fines	Graphic	USCS or Rock Type			
1						10	90	0		SP	Asphalt		PID - 0.0
2										ML	POORLY GRADED SAND WITH GRAVEL; very pale brown, 10YR 7/3; loose, hard cemented pieces; medium grained coralline sand with pieces cemented up to 25mm in diameter.		
3											Soils grade to SANDY SILTY CLAY; very dark gray, 10YR 3/1; trace gravel up to 150mm, gravel appears as cemented coral; clay ribbons present.		PID = 1.4
4						0	5	95		ML	SANDY SILTY CLAY; very dark grayish brown, 10YR 3/2; moist; loose; clay ribbons present.		
5													PID = 0.0
6						0	10	90		ML	Same as above. Soils become very wet at approximately 10 feet bgs.		
7													PID = 0.0
8						0	10	90		ML	Same as above.		
9													PID = 0.0
10						0	10	90		ML	Same as above.		
11													PID = 0.0
12						0	10	90		ML	Same as above.		
13													PID = 0.0
14						0	10	90		ML	Same as above.		
15													PID = 0.0
16						0	10	90		ML	Same as above.		
17													PID = 0.0
18						0	10	90		ML	Same as above.		
19													PID = 0.0
20						0	10	90		ML	Same as above.		
21													PID = 0.0
22						0	10	90		ML	Same as above.		
23													PID = 0.0
24						0	10	90		ML	Same as above.		
25													PID = 0.0

PS_BORE LOG W/ WELL AIEA LAUNDRY BORING LOGS2.GPJ\FORD.GPJ\4/25/07

Borehole Log (Continuation Sheet)

Project Name: RI/FS Addendum, Former Aiea Laundry Facility Project Number: CTO-0009, 83571 **Borehole Number:** MW-37

Borehole Location: MW-37 Sheet 2 of 2

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Gravel	Sand	Fines	Graphic	USCS or Rock Type			
26					0	10	90		ML	Same as above.		PID = 0.0
27												
28												
29												
30					0	10	90		ML	Same as above.		PID = 0.0
31												
32										Hard drilling at approximately 32' bgs.		
33												
34												
35					10	0	90		ML	Similar to above. GRAVELLY CLAY.		PID = 0.0
36												
37												
38												
39												
40					0	10	90		CL	Similar to above. SANDY FAT CLAY; dense.		
41												
42												
43												
44												
45					0	10	90		CL	Same as above.		
46												
47												
48												
49												
50					10	0	90		CL	Boring terminated at 50 feet bgs at 14:00 on 3/23/07.		




Table B.4-1: Nearshore Area/Intertidal Zone Monitoring Well Land Survey Results (Meters)

Monitoring Well	North	East	Top Cover Elevation	Top Casing Elevation
MW-26	23126.021	506935.610	5.799	5.639
MW-26-1	23131.971	506930.615	5.559	5.368
MW-27	22998.695	506879.402	2.145	2.017
MW-28	23204.229	506868.139	1.854	1.786
MW-33	23171.840	506877.795	3.174	3.036
MW-34	23147.454	506897.061	3.393	3.292
MW-35	23065.684	506913.159	5.946	5.586
MW-36	23016.094	506864.781	2.769	2.662
MW-37	22962.950	506858.961	1.797	1.477

Table B.4-2: Nearshore Area/Intertidal Zone Monitoring Well Land Survey Results (Feet)

Monitoring Well	North	East	Top Cover Elevation	Top Casing Elevation
MW-26	75872.621	1663171.248	19.024	18.501
MW-26-1	75892.140	1663154.858	18.237	17.613
MW-27	75454.887	1662986.837	7.039	6.617
MW-28	76129.208	1662949.885	6.083	5.861
MW-33	76022.943	1662981.567	10.414	9.962
MW-34	75942.937	1663044.775	11.131	10.800
MW-35	75674.664	1663097.589	19.507	18.328
MW-36	75511.968	1662938.870	9.086	8.735
MW-37	75337.610	1662919.773	5.895	4.847

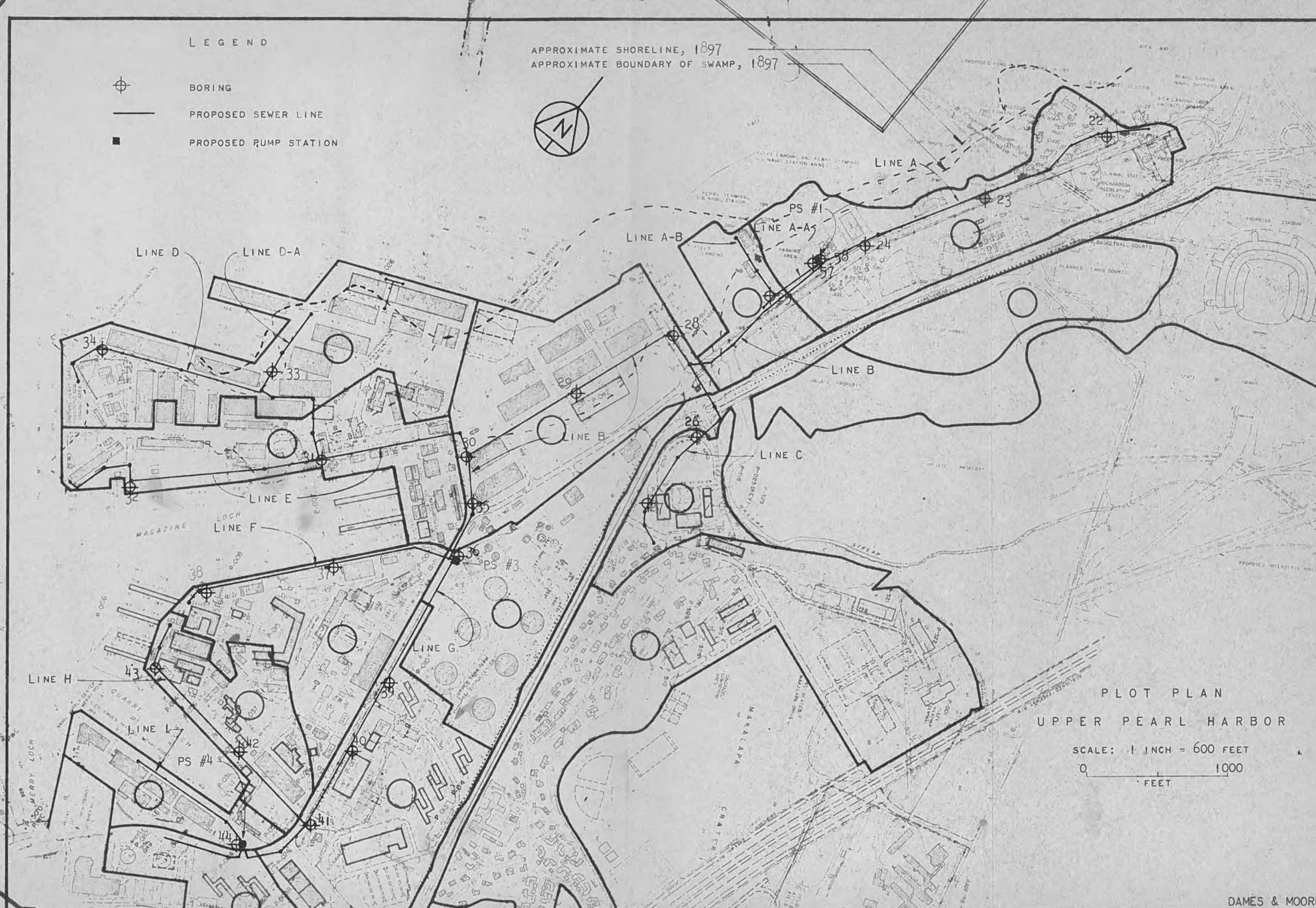
LEGEND

-  BORING
-  PROPOSED SEWER LINE
-  PROPOSED PUMP STATION

APPROXIMATE SHORELINE, 1897
 APPROXIMATE BOUNDARY OF SWAMP, 1897



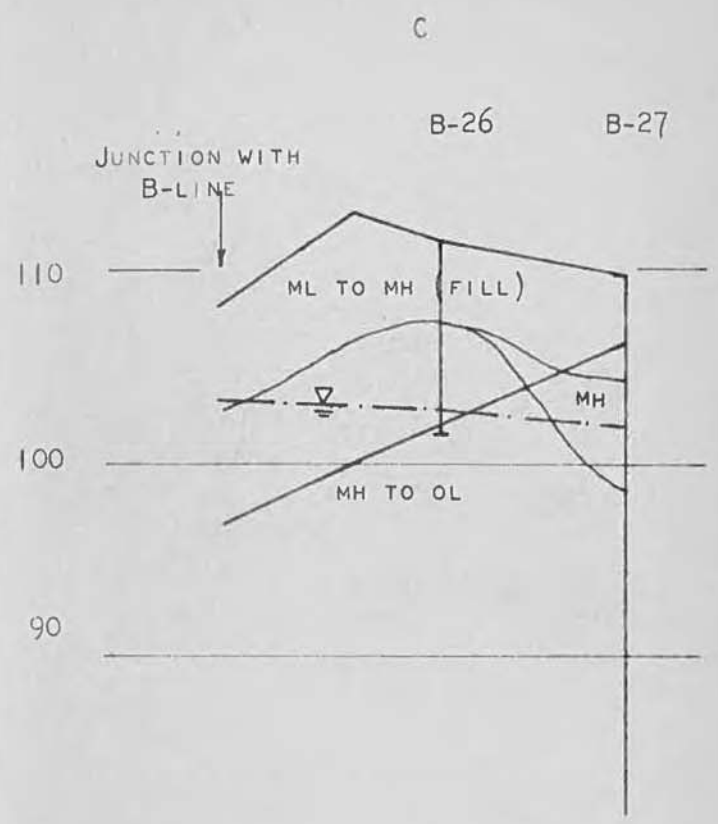
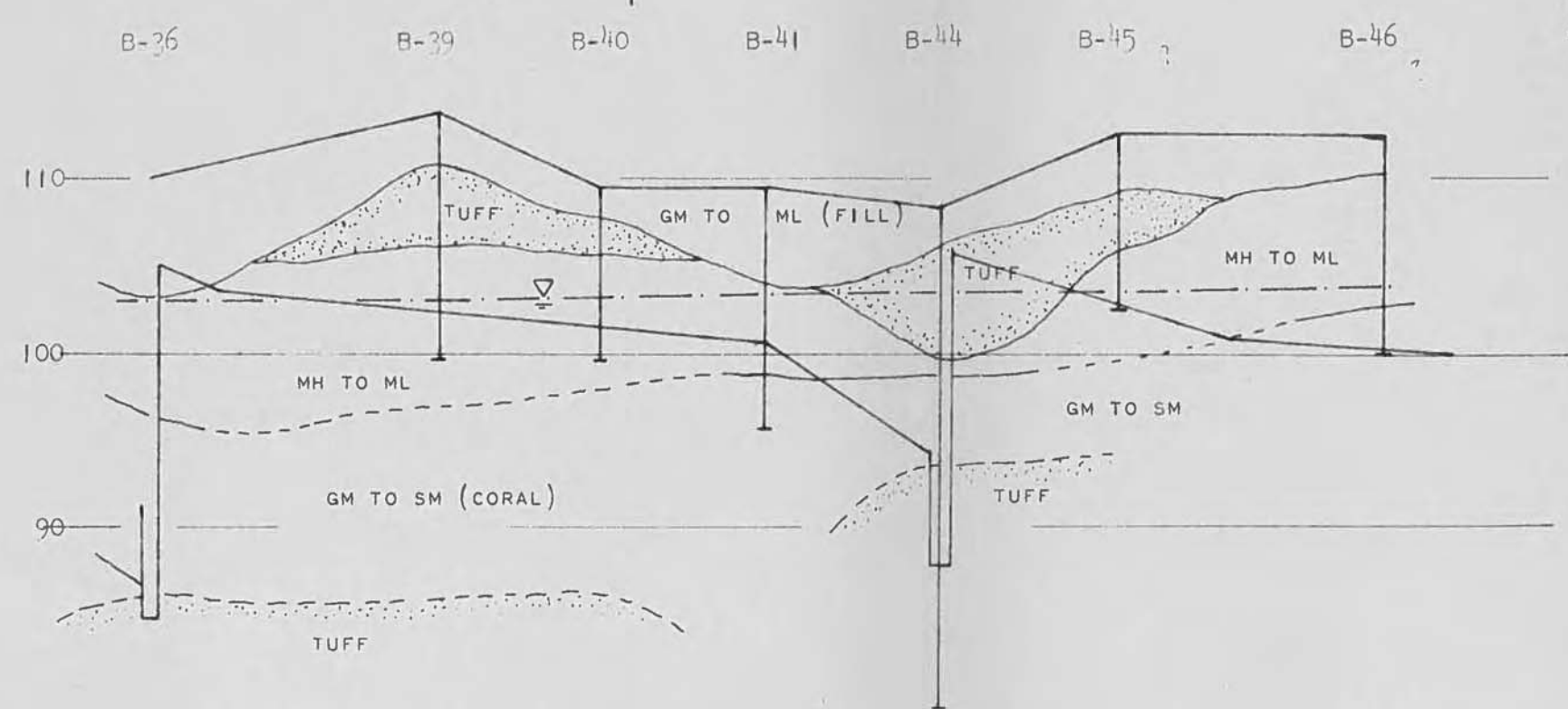
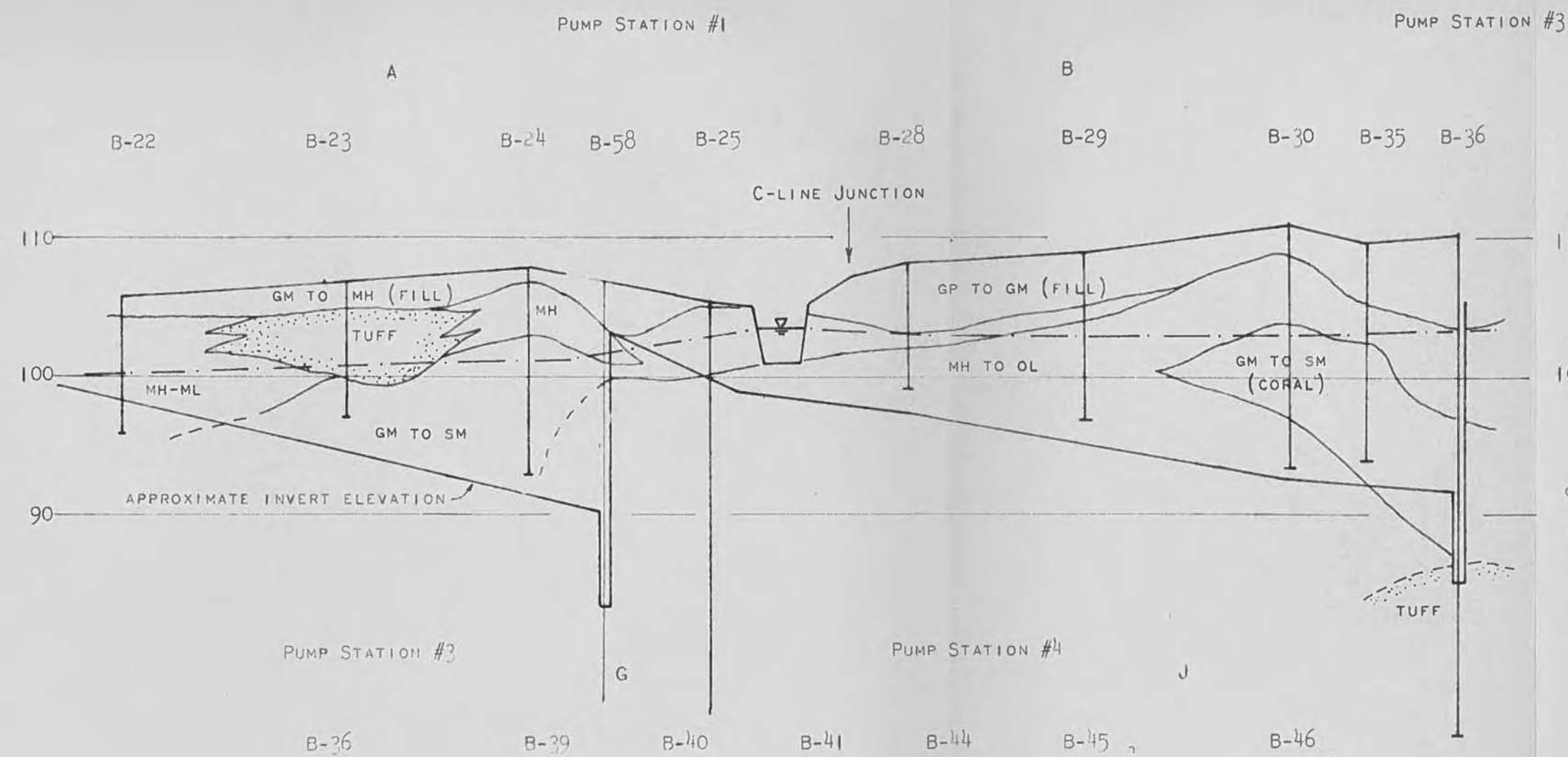
2702-029



PLOT PLAN
 UPPER PEARL HARBOR
 SCALE: 1 INCH = 600 FEET
 0 1000
 FEET

REVISIONS BY DATE
 2702-029
 456.12 (4.64)

ELEVATION IN FEET, U. S. NAVY DATUM

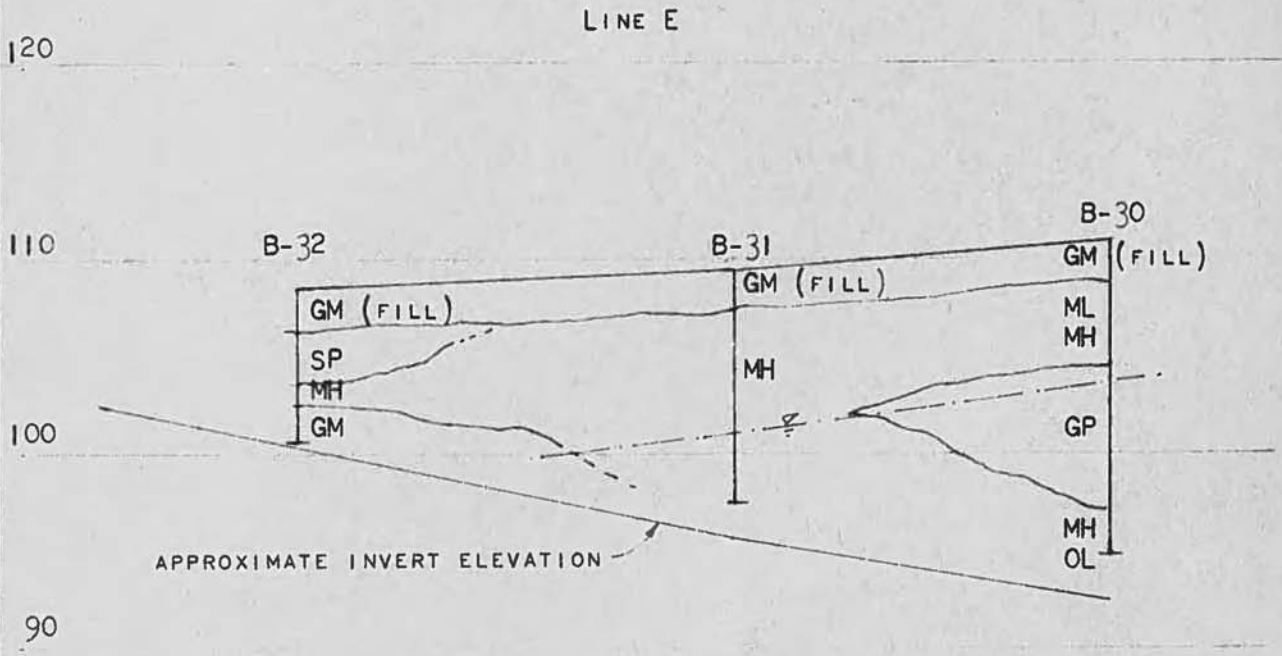


GENERALIZED SUBSURFACE SECTIONS, LINES A,B,C,
 G & J
 SCALE: HORIZONTAL 1" = 600'
 VERTICAL 1" = 10'

BY RH DATE 9/22/67
CHECKED BY _____

FILE 2702-029-11

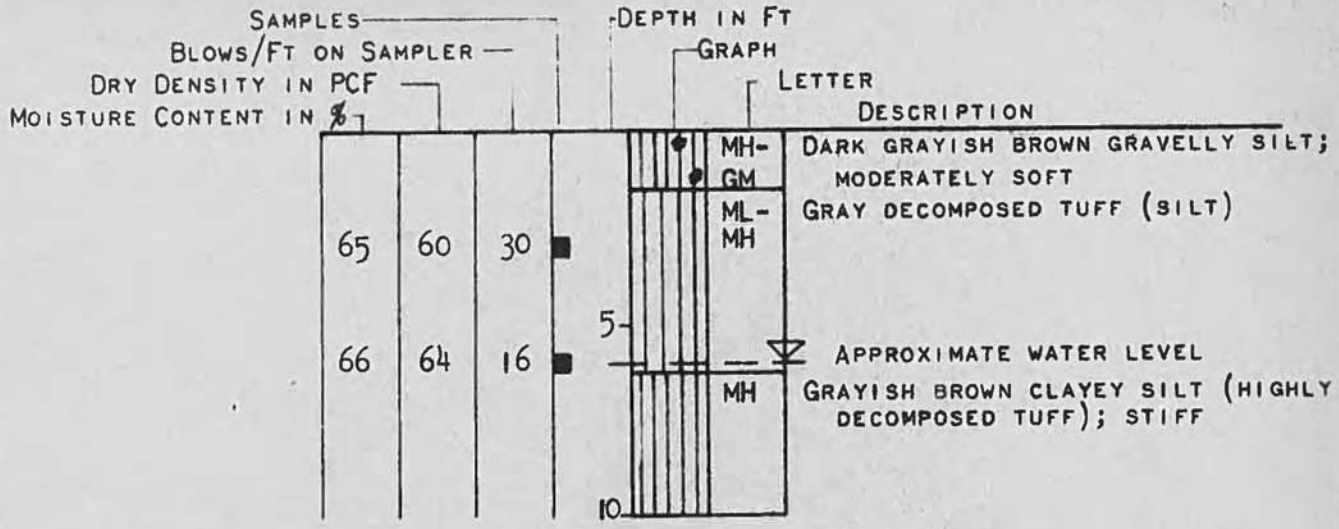
REVISIONS
BY _____ DATE _____



GENERALIZED SUBSURFACE SECTIONS, LINE E
 HORIZONTAL 1" = 600'
 VERTICAL 1" = 10'

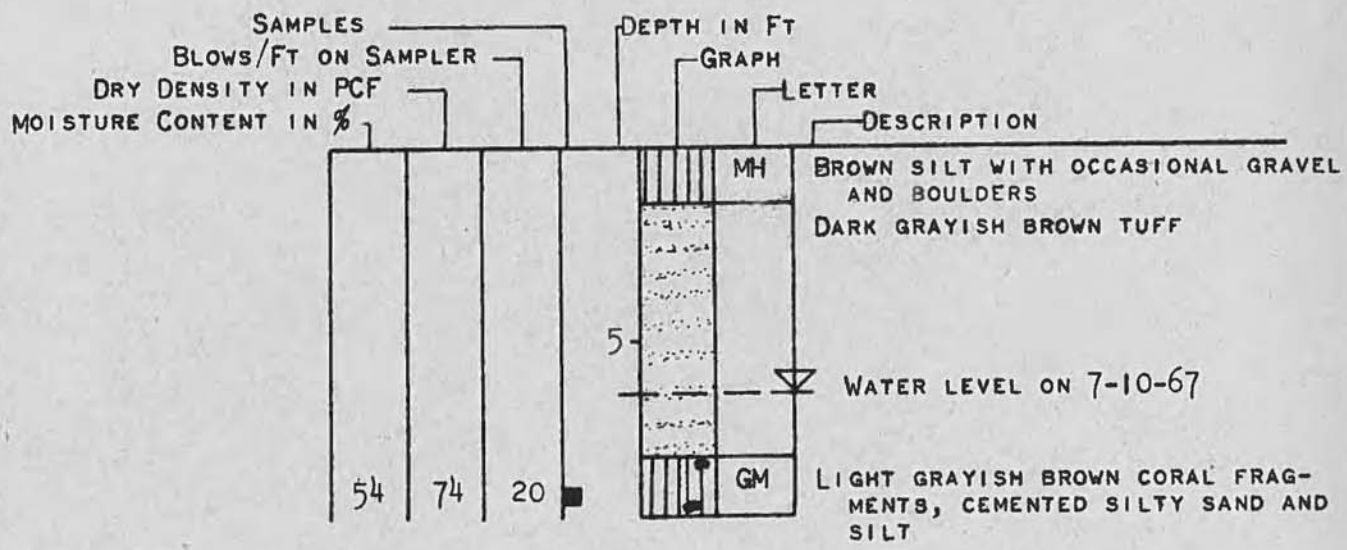
REVISIONS BY _____ DATE _____
 BY _____ DATE 8/8/67
 CHECKED BY Dr. 9/26/67
 FILE _____

BORING 22 SURFACE ELEV. 106' U.S. NAVY DATUM



BORING COMPLETED ON 7-10-67

BORING 23 SURFACE ELEV. 107' U.S. NAVY DATUM



BORING COMPLETED ON 7-10-67

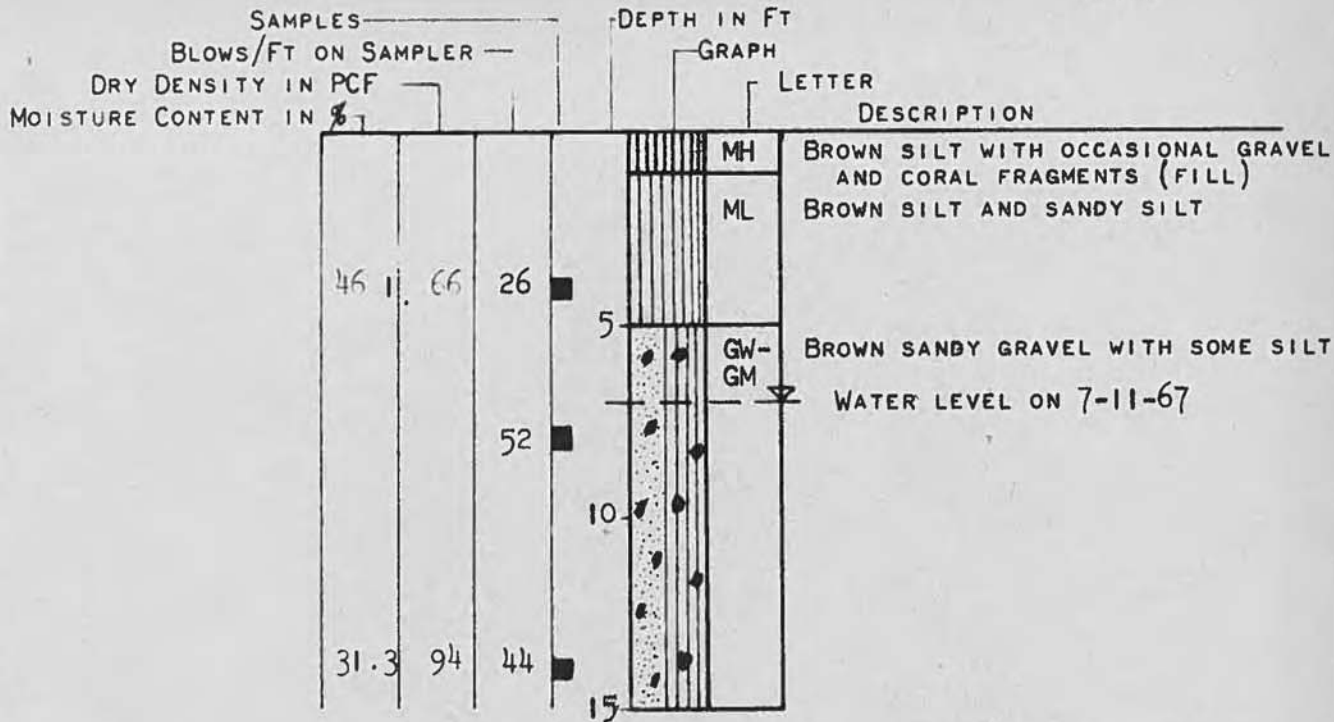
LOG OF BORINGS

- NOTES:
- - DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
 - ☒ - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
 - - DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
 - P - SAMPLER PUSHED INTO SOIL
- DRIVING ENERGY = 140-LB WEIGHT DROPPING 30 IN.

DAMES & MOORE
 APPLIED EARTH SCIENCES

946.7 (REV. 6-61)

BORING 24 SURFACE ELEV. 108' U.S. NAVY DATUM



BORING COMPLETED ON 7-11-67

LOG OF BORINGS

NOTES:

- - DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
- ⊗ - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
- - DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
- P - SAMPLER PUSHED INTO SOIL

DRIVING ENERGY = 140 LB WEIGHT DROPPING 30 IN.

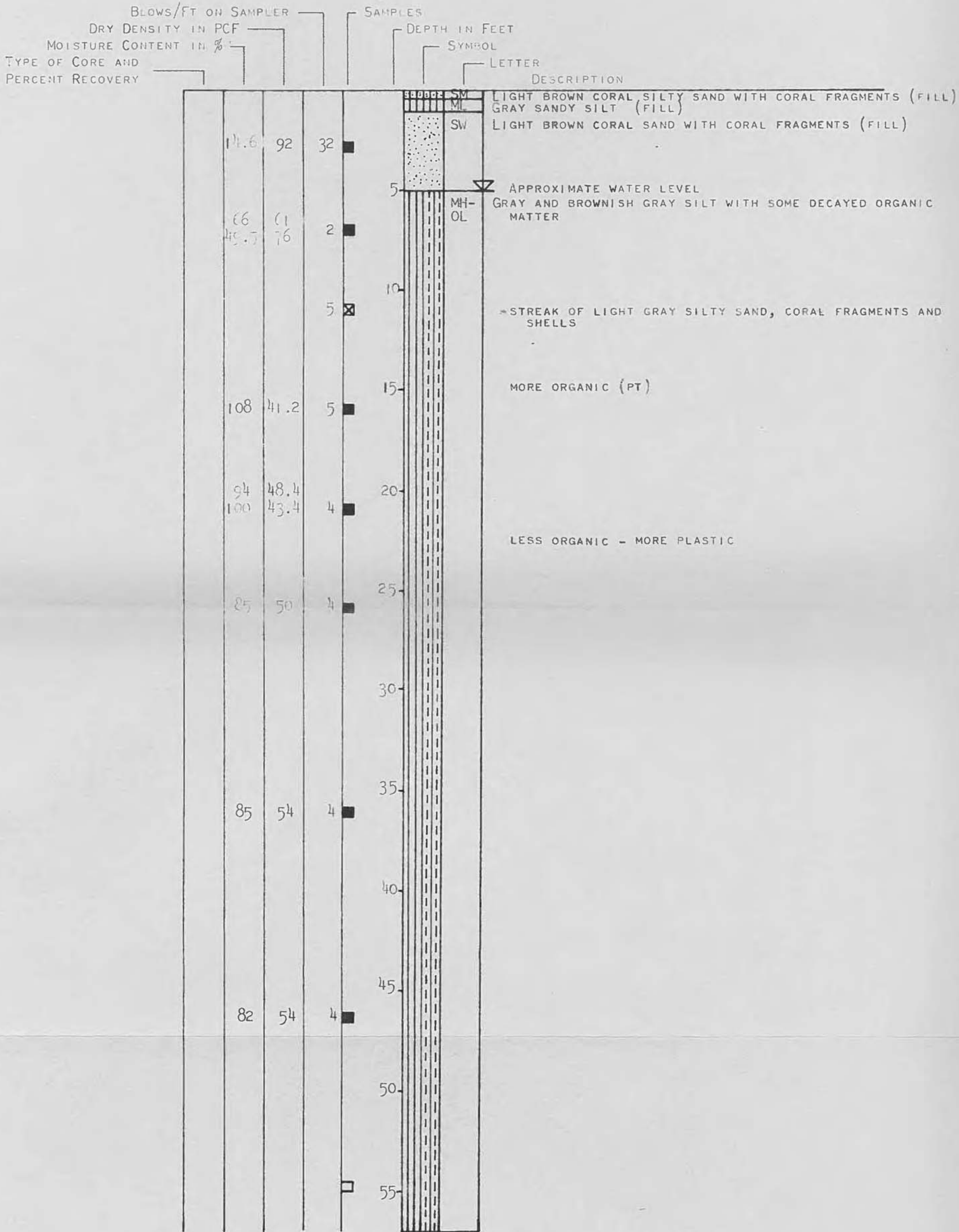
DAMES & MOORE
APPLIED EARTH SCIENCES

REVISIONS BY DATE

FILE

BY RHLW DATE 8/8/67
CHECKED BY DC 9-28-67

BORING 25 SURFACE ELEVATION 105.5' U.S. NAVY DATUM

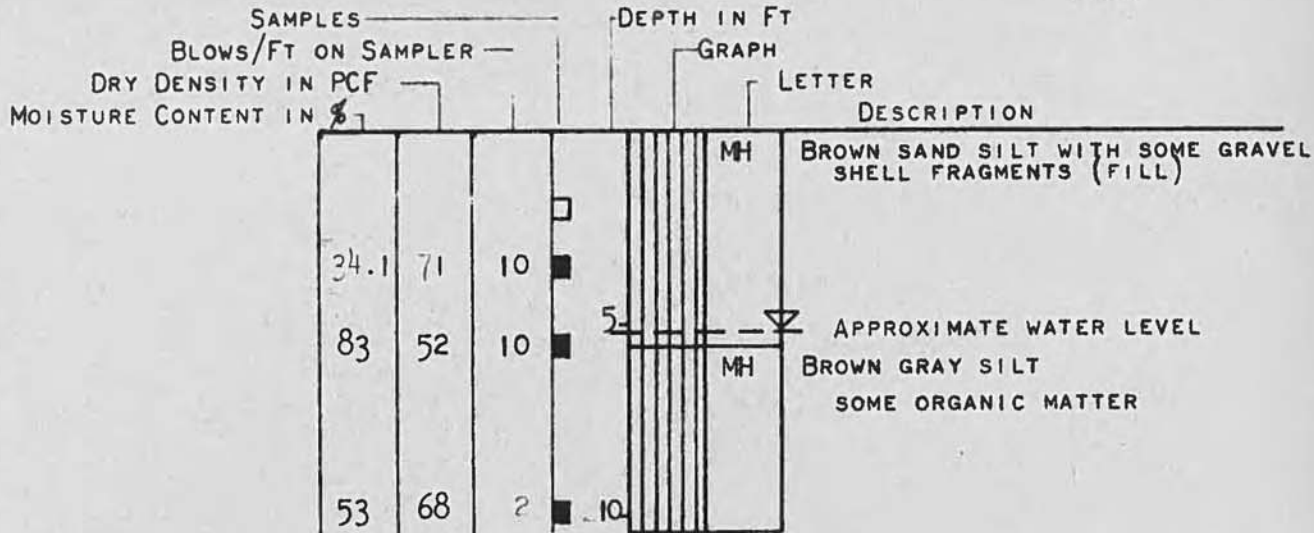


BORING COMPLETED ON 7-17-67

NOTES:

- - DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN.
- ⊗ - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN.
- - DEPTH AT WHICH SAMPLE WAS LOST
- I - DEPTH AND LENGTH OF CORING RUN
- DRIVING ENERGY - 140 -LB WEIGHT DROPPING 30 INCHES.
- P - SAMPLER PUSHED INTO THE SOIL.

BORING 26 SURFACE ELEV. 109' U.S. NAVY DATUM



BORING COMPLETED ON 7-17-67

LOG OF BORINGS

NOTES:

- - DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
 - ⊗ - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
 - - DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
 - P - SAMPLER PUSHED INTO SOIL
- DRIVING ENERGY = 140 -LB WEIGHT DROPPING 30 IN.

DAMES & MOORE
APPLIED EARTH SCIENCES

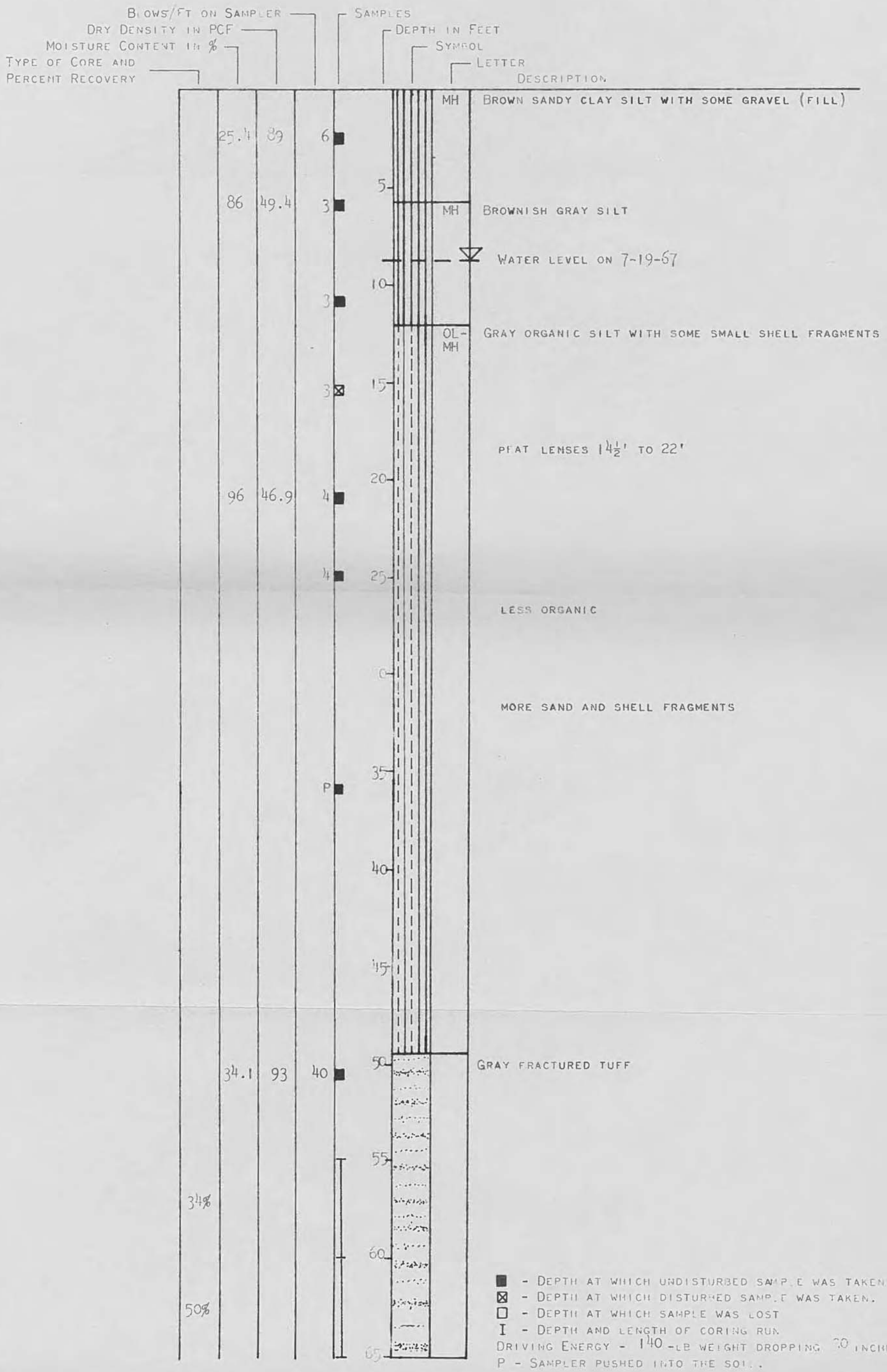
REVISIONS BY DATE

FILE

CHECKED BY DL 9/28/67

Y46.7 (REV. 6-61)

BORING 27 SURFACE ELEVATION 111' U.S. NAVY DATUM



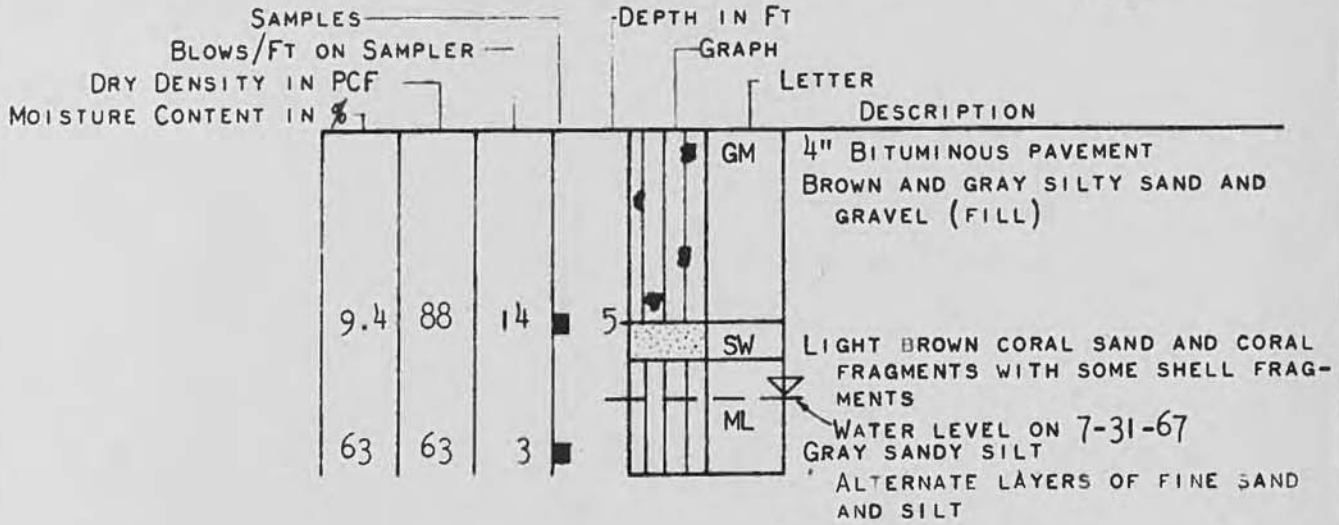
- - DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN.
- ⊗ - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN.
- - DEPTH AT WHICH SAMPLE WAS LOST
- I - DEPTH AND LENGTH OF CORING RUN
- DRIVING ENERGY - 140-LB WEIGHT DROPPING 30 INCHES.
- P - SAMPLER PUSHED INTO THE SOIL.

REVISIONS
BY _____ DATE _____

FILE _____

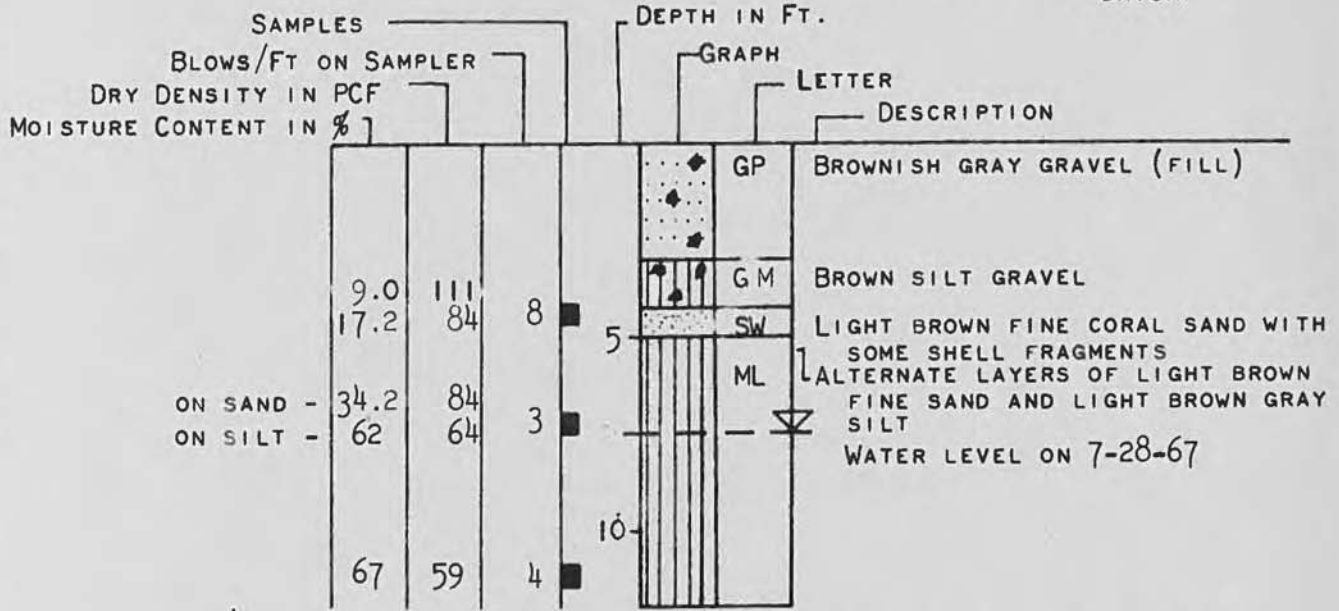
BY R.H.W. DATE 8/8/67
CHECKED BY OR 92867

BORING 28 SURFACE ELEV. 108' U.S. NAVY DATUM



BORING COMPLETED ON 7-31-67

BORING 29 SURFACE ELEV. 110' U.S. NAVY DATUM



BORING COMPLETED ON 7-28-67

LOG OF BORINGS

NOTES:

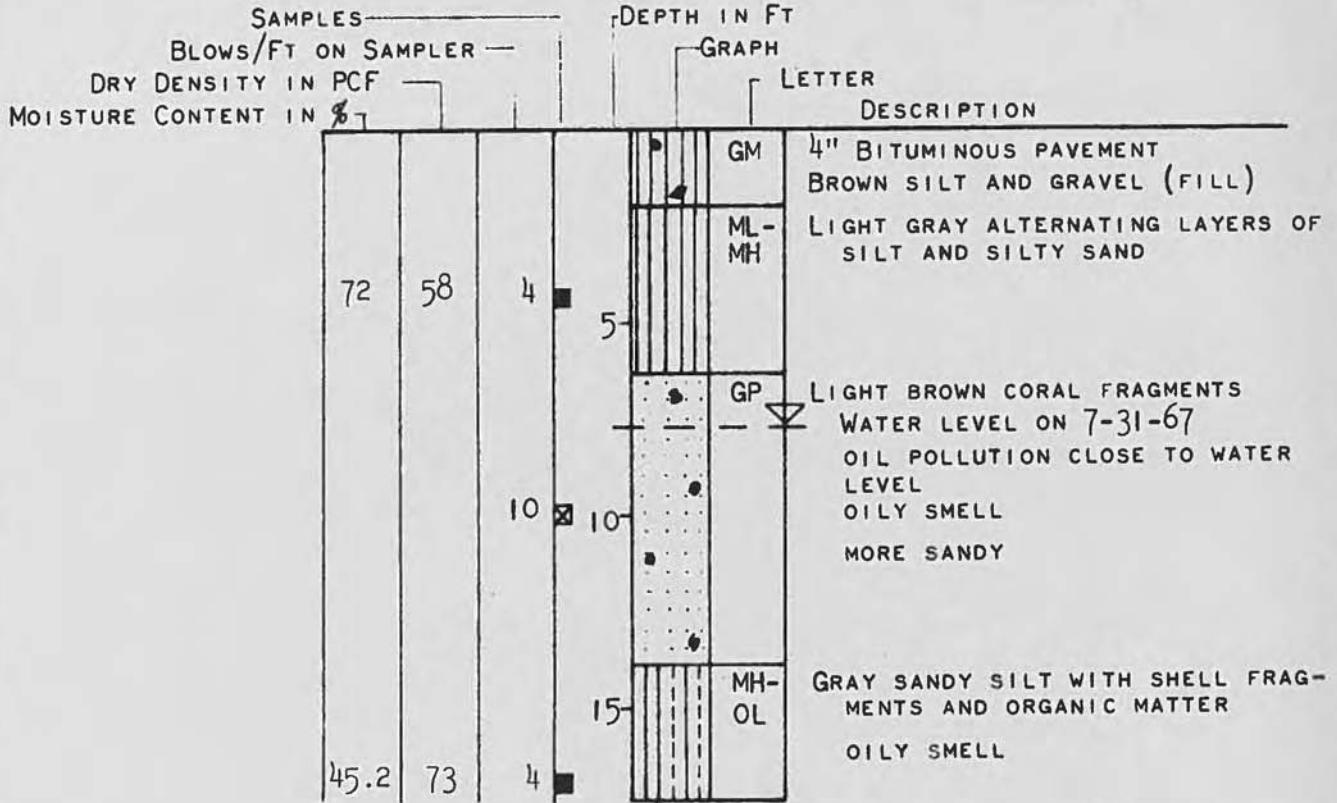
- - DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
 - ⊗ - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
 - - DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
 - P - SAMPLER PUSHED INTO SOIL
- DRIVING ENERGY = 140-LB WEIGHT DROPPING 30 IN.

REVISIONS
BY _____ DATE _____

FILE 2702-029-11

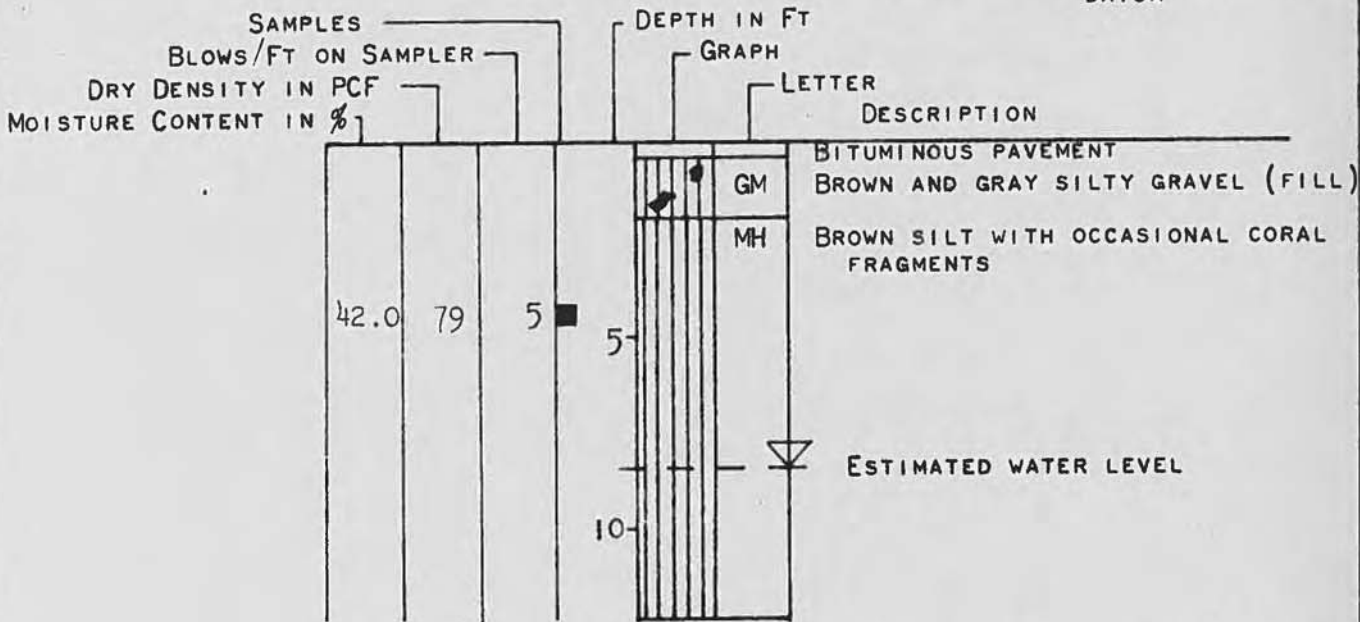
BY RHW DATE 8/9/67
CHECKED BY W 9/8/67

BORING 30 SURFACE ELEV. 111' U.S. NAVY DATUM



BORING COMPLETED ON 7-31-67

BORING 31 SURFACE ELEV. 109.5' U.S. NAVY DATUM



LOG OF BORINGS BORING COMPLETED ON 8-1-67

NOTES:

- - DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
 - ⊗ - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
 - - DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
 - P - SAMPLER PUSHED INTO SOIL
- DRIVING ENERGY = 140-LB WEIGHT DROPPING 30 IN.

REVISIONS
BY _____ DATE _____

FILE 2702029

CHECKED BY RM DATE 9-28-67

BORING 32 SURFACE ELEV. 108.5' U.S. NAVY DATUM

SAMPLES			DEPTH IN FT	GRAPH	LETTER	DESCRIPTION
BLOWS/FT ON SAMPLER	DRY DENSITY IN PCF	MOISTURE CONTENT IN %				
16.8	95	8	5	[Pattern: Dotted]	SP	BROWN SAND (FILL)
					MH	BROWN SILT (FILL)
24.4	99	24		[Pattern: Dotted]	GM	BROWN AND GRAY GRAVEL, SAND AND SILT (FILL)
				[Pattern: Vertical Lines]	GM	BITUMINOUS PAVEMENT
				[Pattern: Horizontal Lines]		BROWN SILTY GRAVEL (FILL)

BORING COMPLETED ON 8-1-67
NO WATER ENCOUNTERED

BORING 33 SURFACE ELEV. 109.5' U.S. NAVY DATUM

SAMPLES			DEPTH IN FT	GRAPH	LETTER	DESCRIPTION
BLOWS/FT ON SAMPLER	DRY DENSITY IN PCF	MOISTURE CONTENT IN %				
				[Pattern: Vertical Lines]	GM	3" BITUMINOUS PAVEMENT
				[Pattern: Horizontal Lines]		BROWN SILT GRAVEL (FILL)
				[Pattern: Dotted]	GP	BROWN GRAVEL AND BOULDERS (WEATHERED TUFF FILL)
				[Symbol: Inverted Triangle]		WATER LEVEL ON 7-31-67

BORING COMPLETED ON 7-31-67

LOG OF BORINGS

- NOTES:
- - DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
 - ⊗ - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
 - - DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
 - P - SAMPLER PUSHED INTO SOIL
- DRIVING ENERGY = 140-LB WEIGHT DROPPING 30 IN.

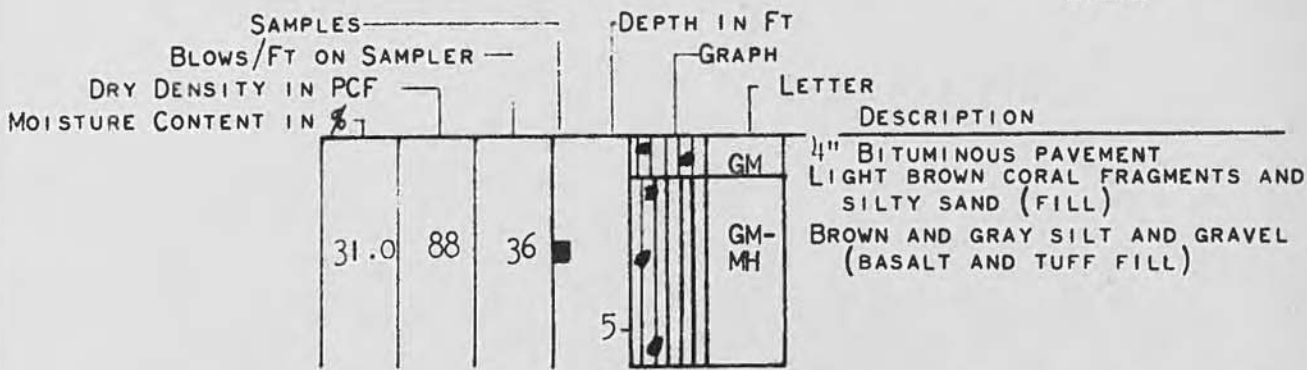
EV. 6-61)

REVISIONS
BY _____ DATE _____

FILE 2702029

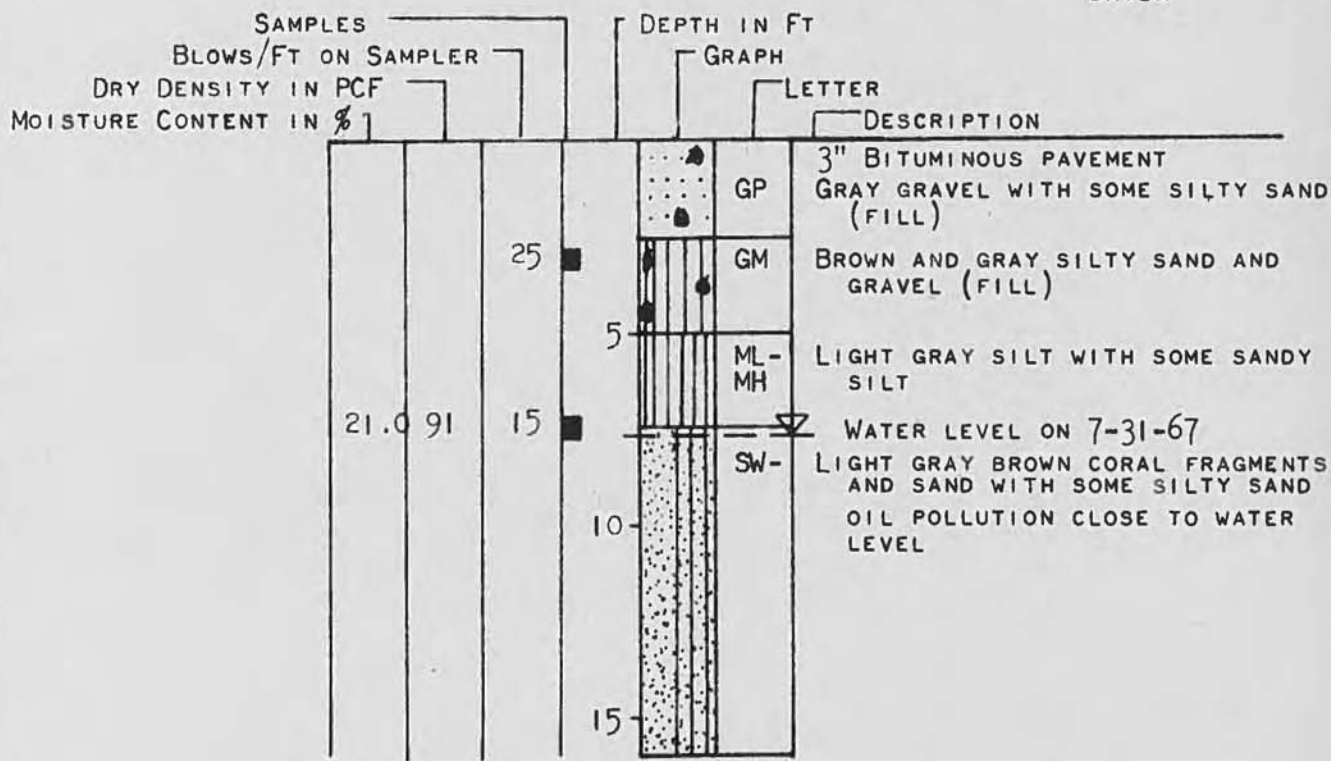
BY R.H.W. DATE 8/18/67
CHECKED BY Sw 9/24/67

BORING 34 SURFACE ELEV. 109' U.S. NAVY DATUM



BORING COMPLETED ON 7-31-67
NO WATER ENCOUNTERED

BORING 35 SURFACE ELEV. 110' U.S. NAVY DATUM



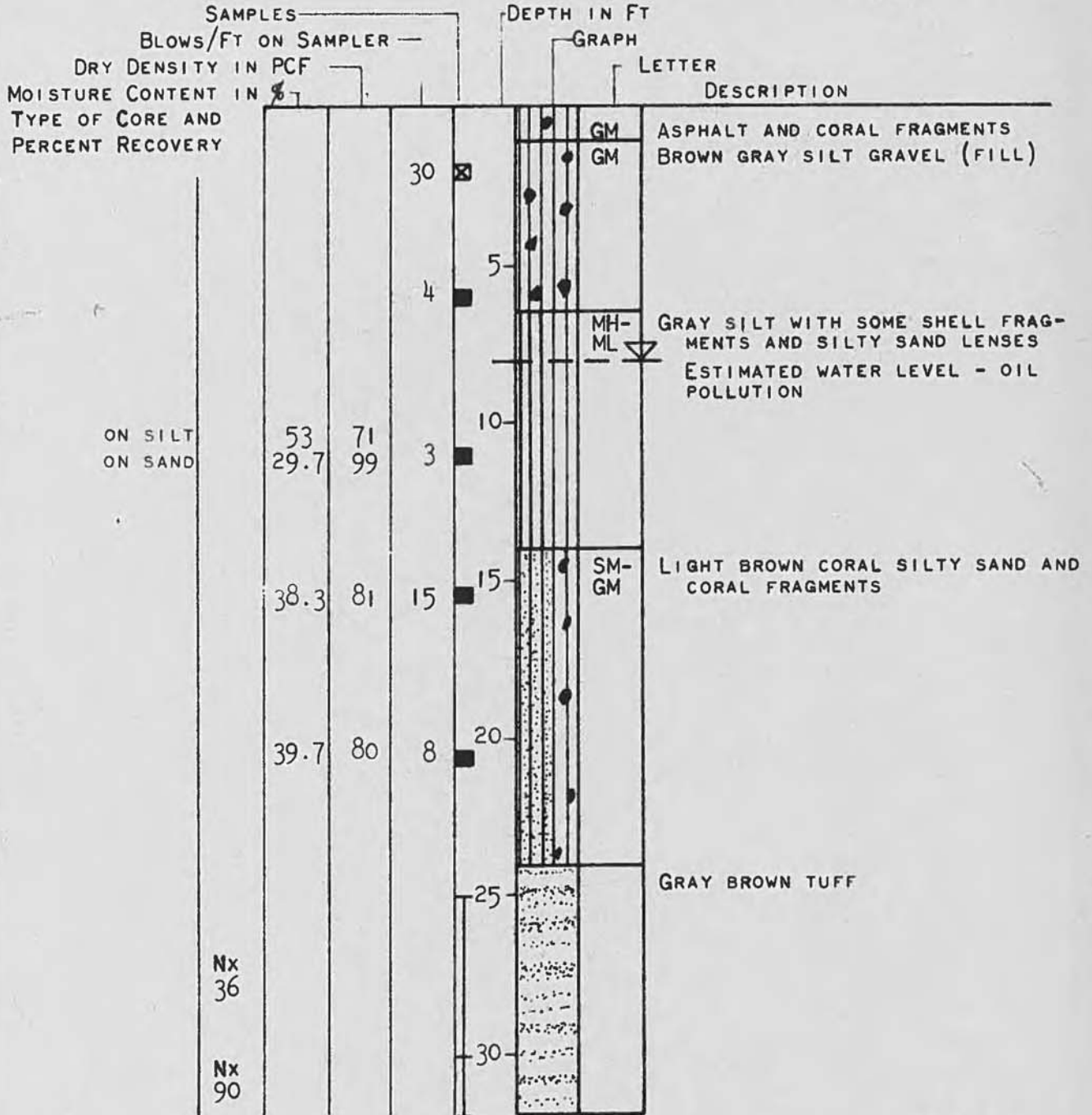
BORING COMPLETED ON 7-31-67

LOG OF BORINGS

- NOTES:
- - DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
 - ⊗ - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
 - - DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
 - P - SAMPLER PUSHED INTO SOIL
- DRIVING ENERGY = 140 -LB WEIGHT DROPPING 30 IN.

46.7 (REV. 6-61)

BORING 36 SURFACE ELEV. 110.3' U.S. NAVY DATUM



BORING COMPLETED ON 7-20-67

LOG OF BORINGS

NOTES:

- - DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
 - ⊗ - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
 - - DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
 - P - SAMPLER PUSHED INTO SOIL
- DRIVING ENERGY = 140 -LB WEIGHT DROPPING 30 IN.

DANES & MOORE
APPLIED EARTH SCIENCES

PLATE A-10

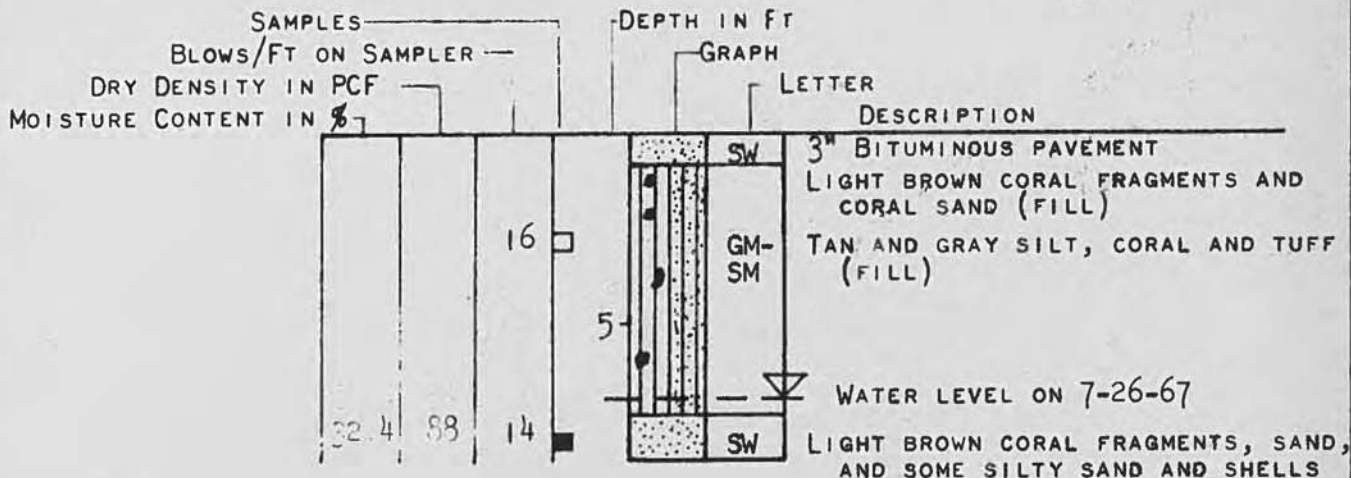
REVISIONS BY DATE

FILE

BY *RHW* DATE *8/9/67*
CHECKED BY *DR* *9/2/67*

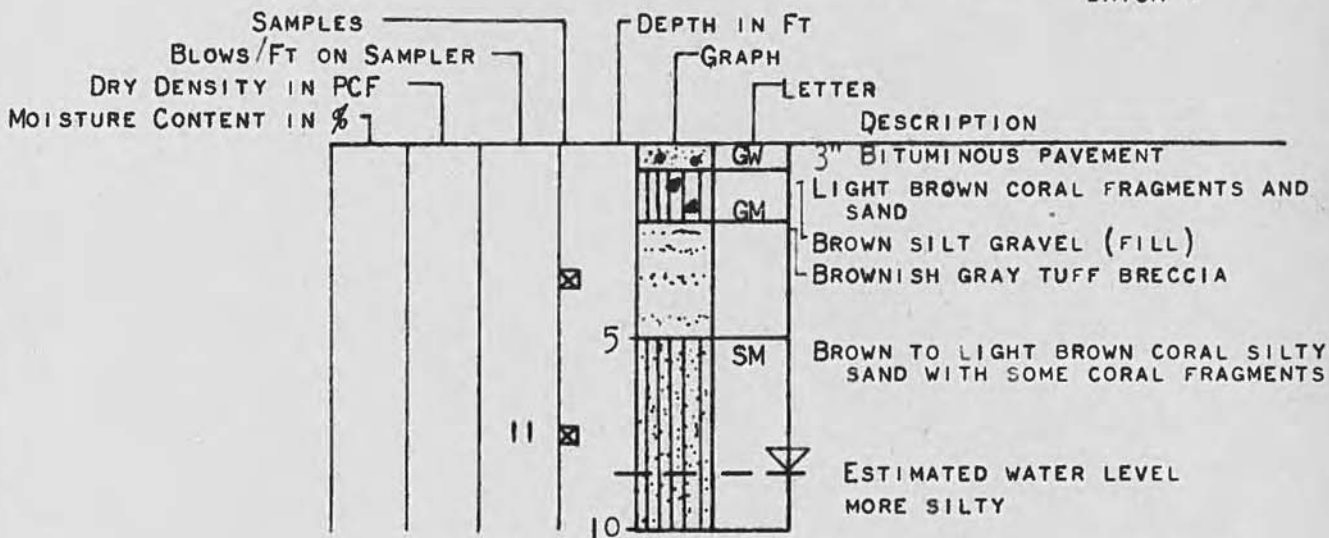
REVISIONS BY _____ DATE _____
 BY RHW DATE 8/9/67
 CHECKED BY W. 9/26/67
 FILE 2702 029

BORING 37 SURFACE ELEV. 107' U.S. NAVY DATUM



BORING COMPLETED ON 7-26-67

BORING 38 SURFACE ELEV. 108.5' U.S. NAVY DATUM



BORING COMPLETED ON 7-21-67

LOG OF BORINGS

NOTES:

- - DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
- ⊗ - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
- - DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
- P - SAMPLER PUSHED INTO SOIL

DRIVING ENERGY = 140-LB WEIGHT DROPPING 30 IN.

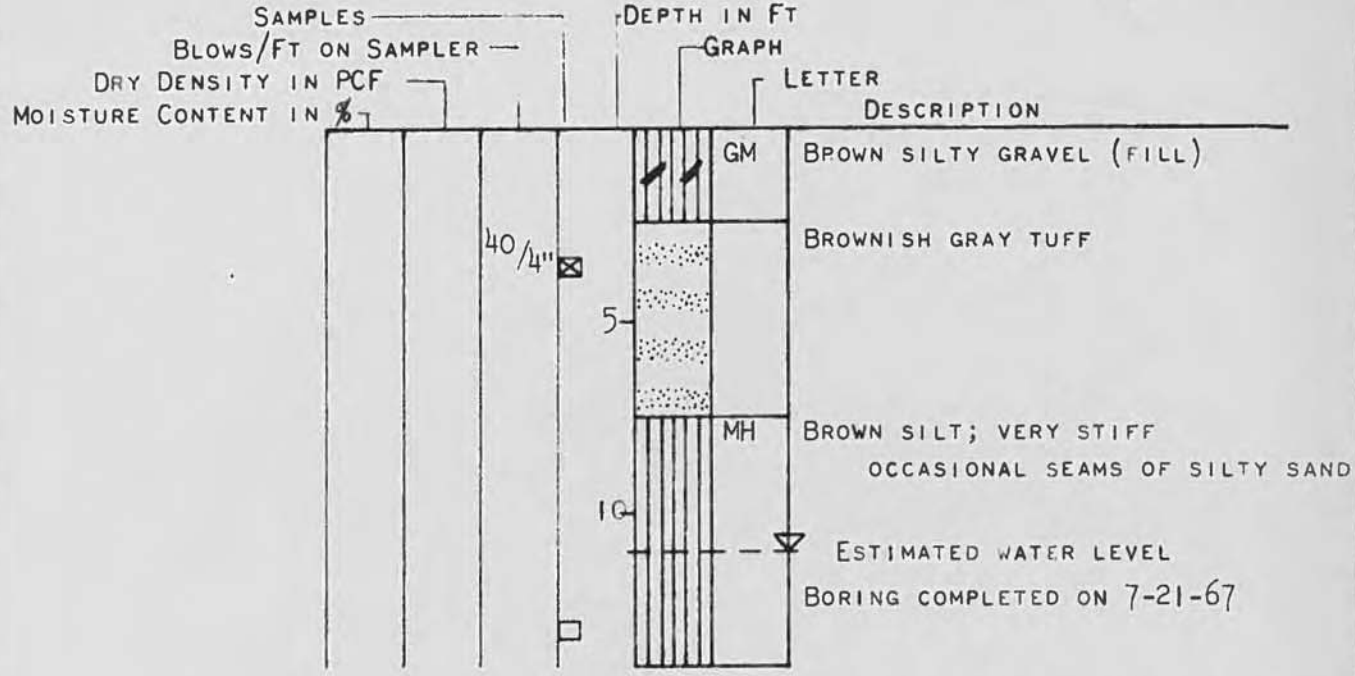
REVISIONS
BY _____ DATE _____

FILE 2702-029

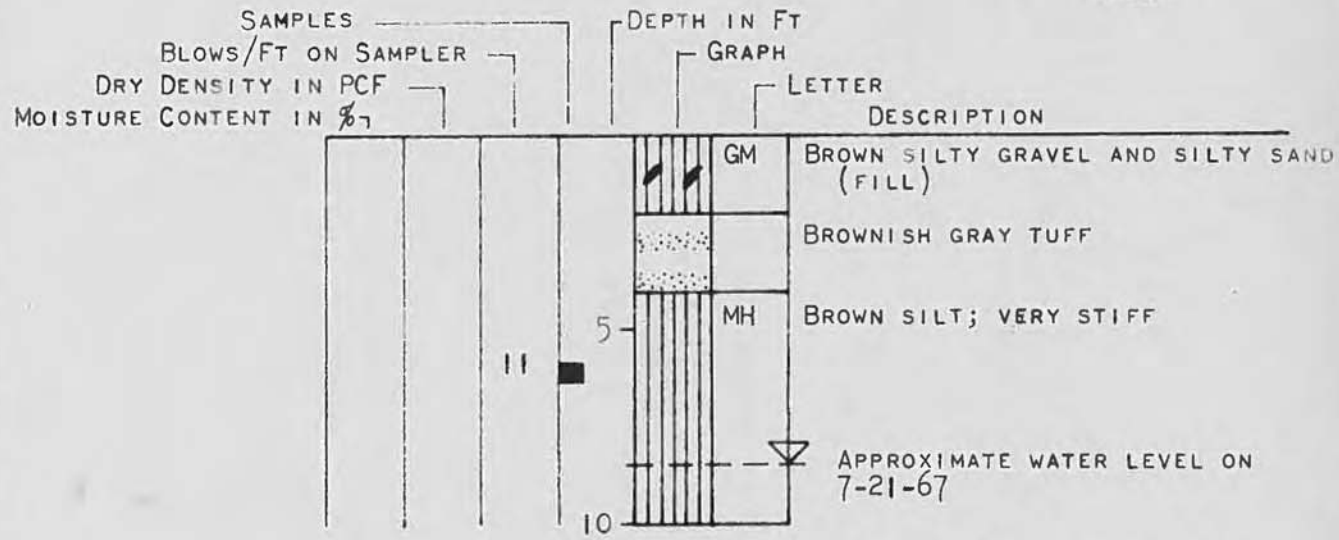
FILE

BY S. Y. DATE 8-28-67
CHECKED BY - M. 92867

BORING 39 SURFACE ELEV. 114' U. S. NAVY DATUM



BORING 40 SURFACE ELEV. 110' U. S. NAVY DATUM

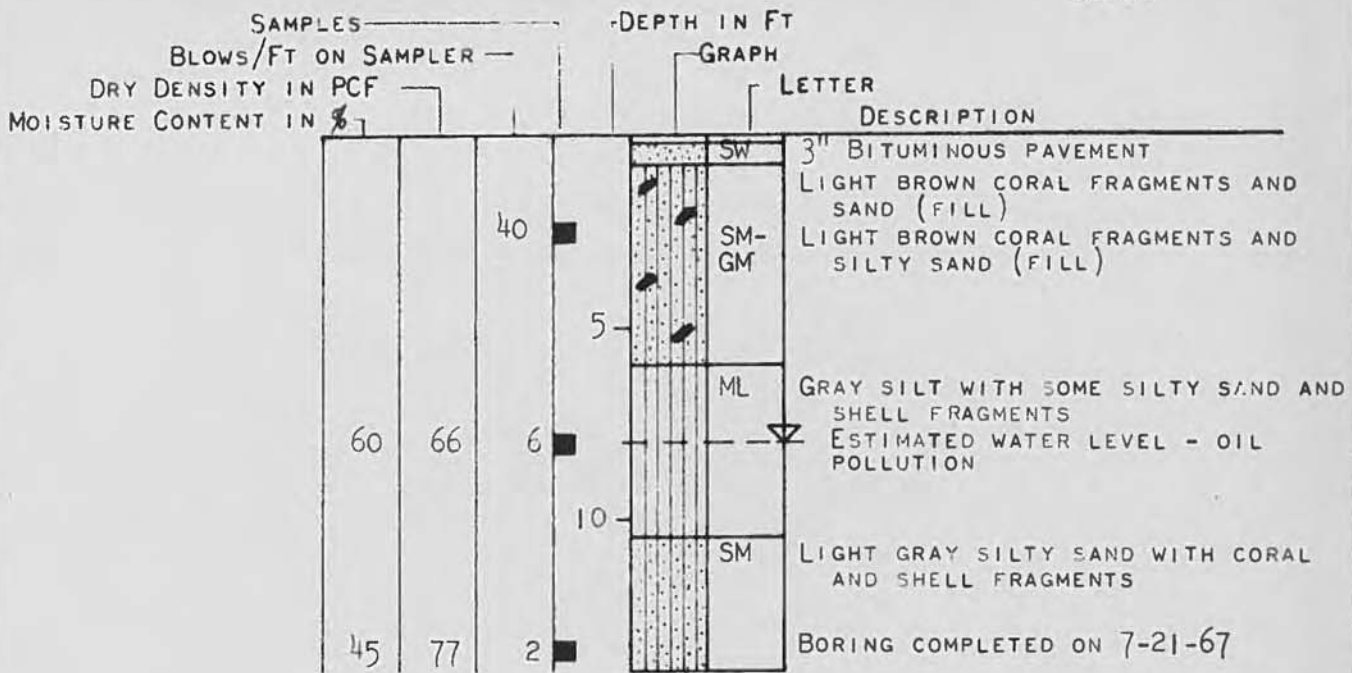


LOG OF BORINGS

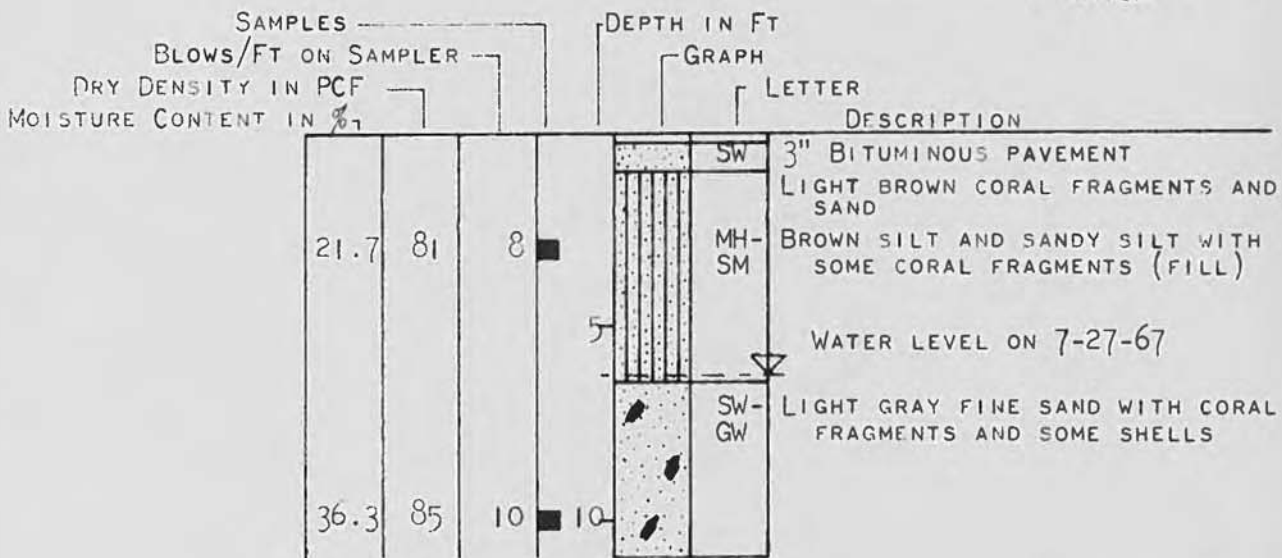
NOTES:

- - DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
 - ⊗ - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
 - - DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
 - P - SAMPLER PUSHED INTO SOIL
- DRIVING ENERGY = 140-LB WEIGHT DROPPING 30IN.

BORING 41 SURFACE ELEV. 109.5' U. S. NAVY DATUM



BORING 42 SURFACE ELEV. 108.5' U. S. NAVY DATUM



BORING COMPLETED ON 7-27-67

LOG OF BORINGS

NOTES:

- - DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
- ⊗ - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
- - DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
- P - SAMPLER PUSHED INTO SOIL

DRIVING ENERGY = 140-LB WEIGHT DROPPING 30 IN.

DAMES & MOORE
APPLIED EARTH SCIENCES

REVISIONS BY _____ DATE _____

2702-029

FILE

BY S. Y. DATE 8-28-67
CHECKED BY [Signature] 9/2/67

BORING 43

SURFACE ELEV. 108' U. S. NAVY DATUM

MOISTURE CONTENT IN %	DRY DENSITY IN PCF	BLOWS/FT ON SAMPLER	DEPTH IN FT	GRAPH	LETTER	DESCRIPTION
33.9	89	11	■		SW	3" BITUMINOUS PAVEMENT
					MH	LIGHT BROWN CORAL FRAGMENTS AND SAND
						BROWN SILT WITH SOME CORAL AND SHELL FRAGMENTS (FILL)
25.7	89	9	■	5		BROWN SILTY SAND WITH GRAVEL (TUFACEOUS FILL)

BORING COMPLETED 7-26-67

NO WATER ENCOUNTERED

REVISIONS BY _____ DATE _____

FILE 2702-029

FILE

BY S. Y. _____ DATE 8-28-67
CHECKED BY PC 9/28/67

LOG OF BORINGS

NOTES:

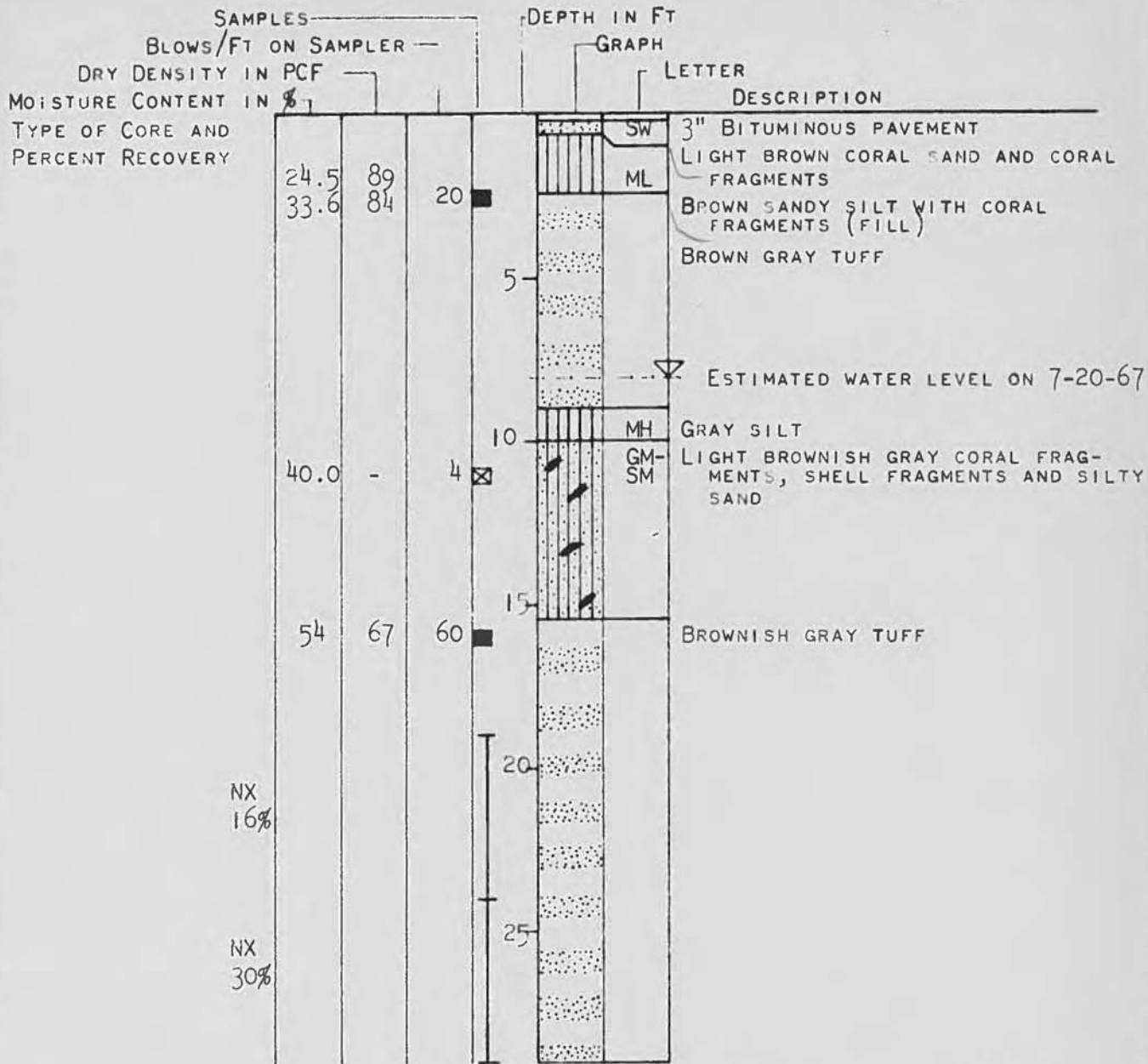
- - DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
- ⊗ - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
- - DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
- P - SAMPLER PUSHED INTO SOIL

DRIVING ENERGY = 140-LB WEIGHT DROPPING 30IN.

DAMES & MOORE
APPLIED EARTH SCIENCES

PLATE A-14

BORING 44 SURFACE ELEV. 109' U. S. NAVY DATUM



NX
16%

NX
30%

BORING COMPLETED ON 7-20-67

LOG OF BORINGS

NOTES:

- - DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
- ⊗ - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
- - DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
- P - SAMPLER PUSHED INTO SOIL

DRIVING ENERGY = 140-LB WEIGHT DROPPING 30IN.

DAMES & MOORE
APPLIED EARTH SCIENCES

PLATE A-15

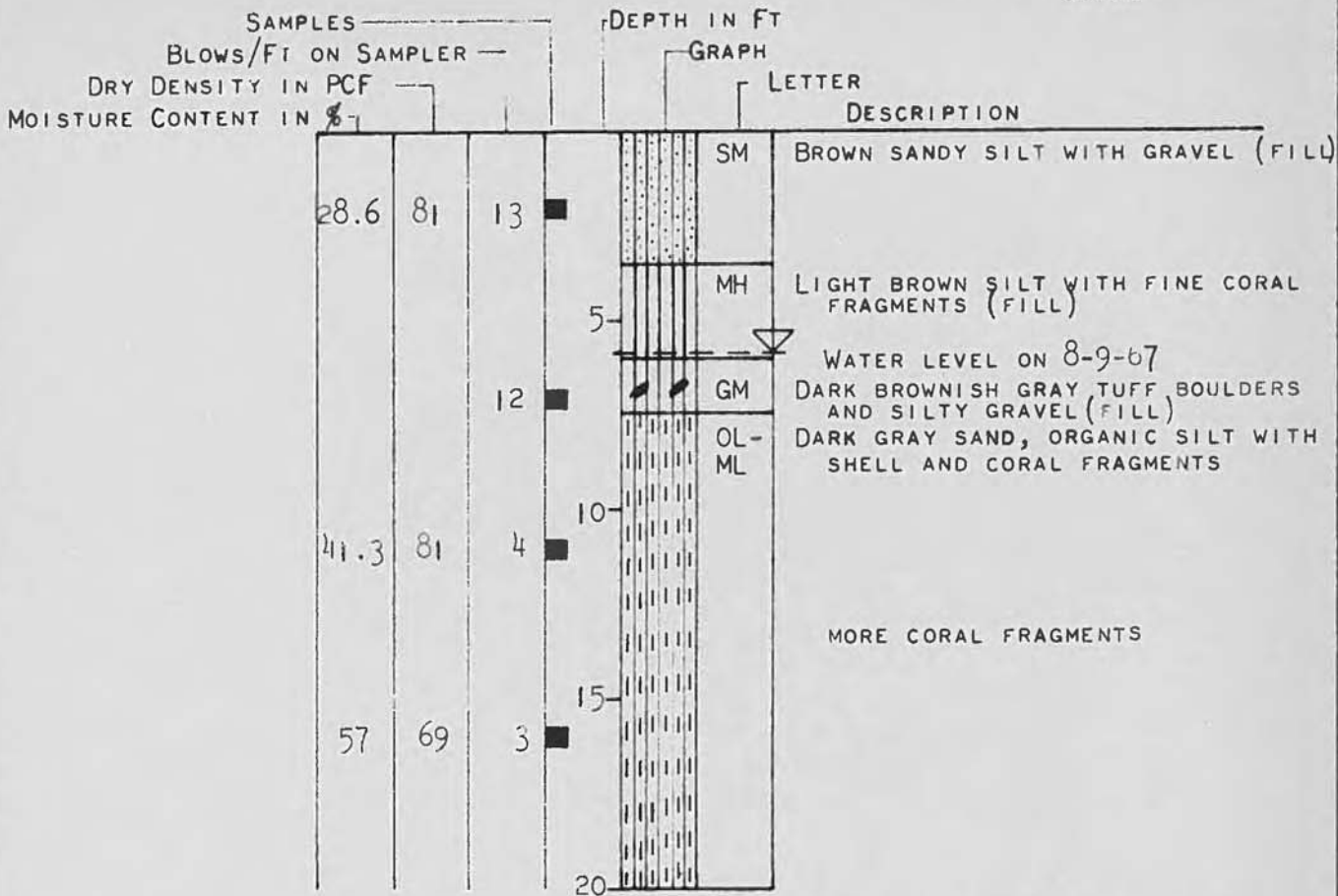
REVISIONS
BY _____ DATE _____

FILE 2702-029

BY S.X. DATE 8-28-67
CHECKED BY Q.A. 9-28-67

946.7 (REV. 6-61)

BORING 57 SURFACE ELEV. 107' U.S. NAVY DATUM



BORING COMPLETED ON 8-10-67

LOG OF BORINGS

NOTES:

- - DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
 - ⊗ - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
 - - DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
 - P - SAMPLER PUSHED INTO SOIL
- DRIVING ENERGY = 140-LB WEIGHT DROPPING 30 IN.

DAMES & MOORE
APPLIED EARTH SCIENCES

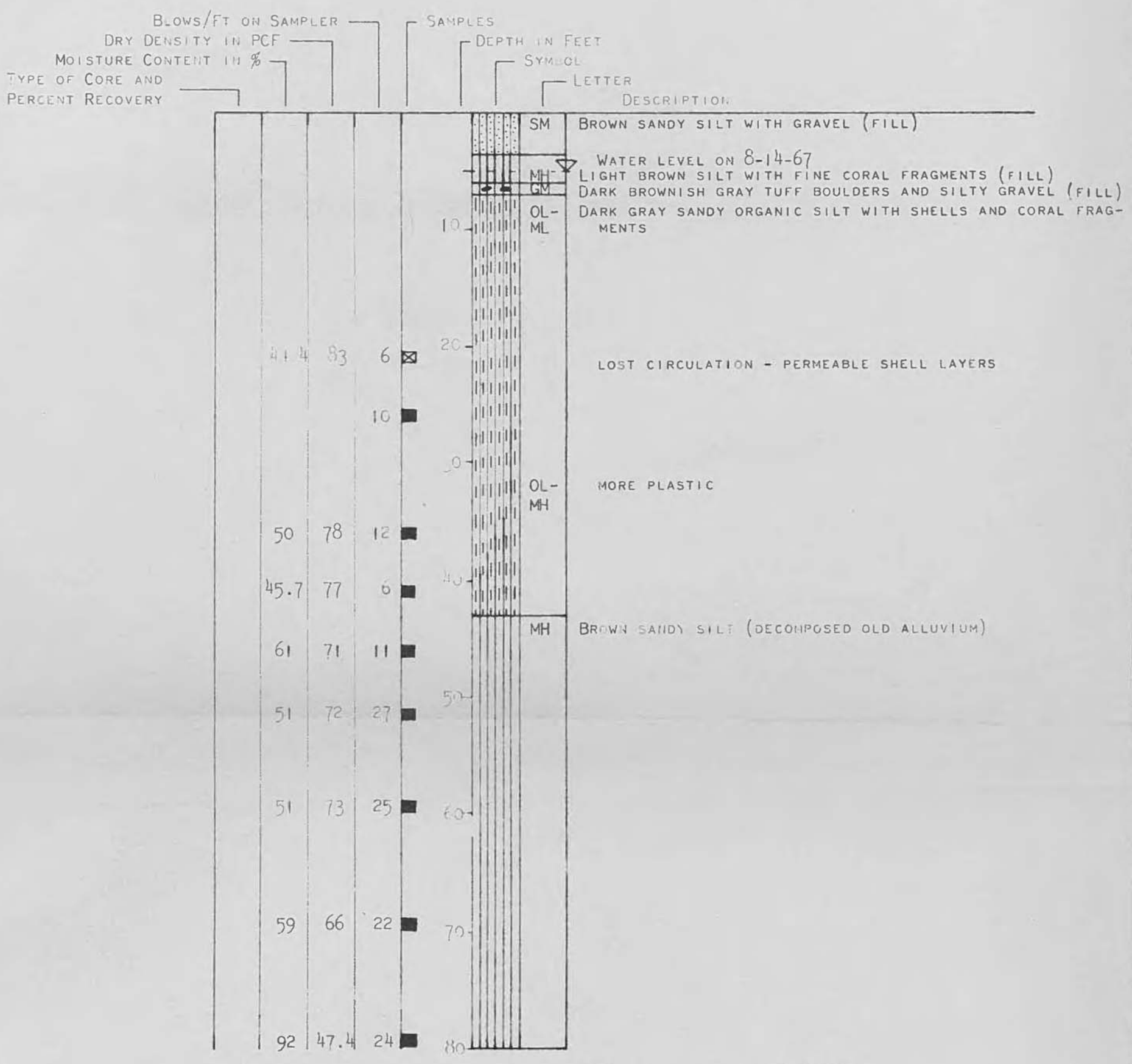
REVISIONS BY DATE

FILE 2702-029

FILE

BY S.X. DATE 8-22-67
CHECKED BY DL 9-18-67

BORING 58 SURFACE ELEVATION: 107' U.S. NAVY DATUM

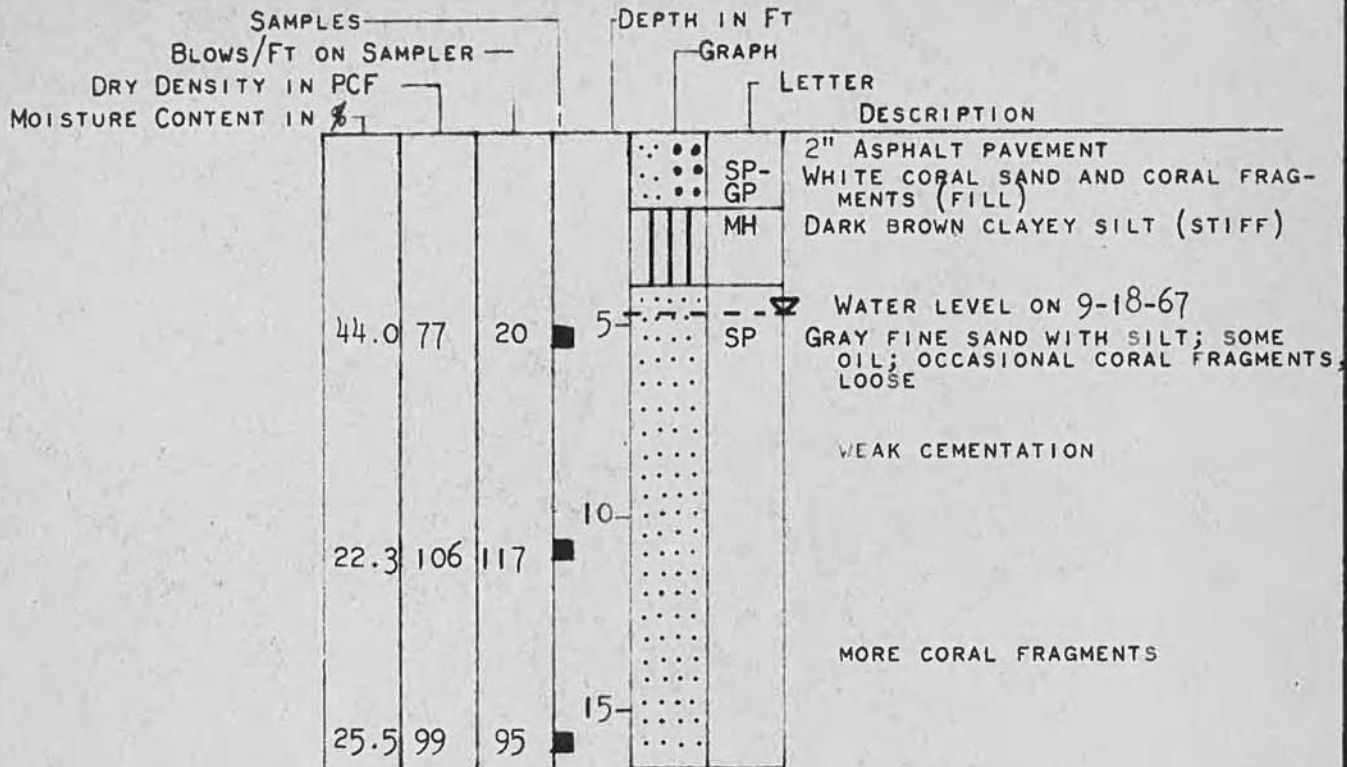


BORING COMPLETED ON 8-14-67

NOTES:

- - DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN.
- ☒ - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN.
- - DEPTH AT WHICH SAMPLE WAS LOST
- I - DEPTH AND LENGTH OF CORING RUN
- DRIVING ENERGY - 140 - LB WEIGHT DROPPING 30 INCHES.
- P - SAMPLER PUSHED INTO THE SOIL.

BORING 61 SURFACE ELEV. 106.0 FEET
(U.S. NAVY DATUM)



BORING COMPLETED ON 9-18-67

LOG OF BORINGS

NOTES:

- - DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
- ⊗ - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
- - DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
- P - SAMPLER PUSHED INTO SOIL

DRIVING ENERGY = 140 -LB WEIGHT DROPPING 30 IN.

DAMES & MOORE
APPLIED EARTH SCIENCES

REVISIONS
BY _____ DATE _____

FILE 2701-034

BY OR DATE 9-29-67
CHECKED BY OR

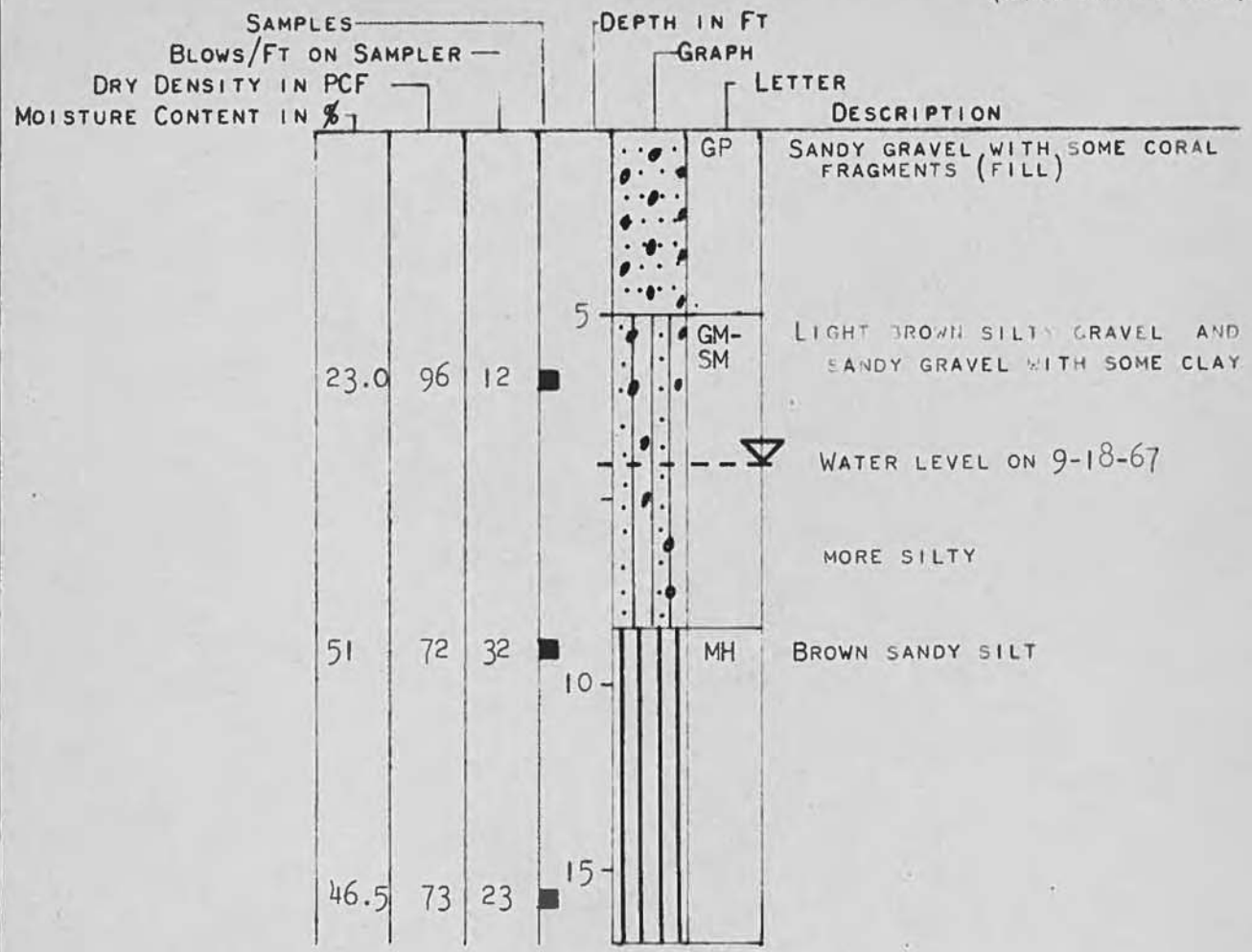
140.7 (REV. 0-01)

REVISIONS
BY _____ DATE _____

FILE 2702-034

BY DL DATE 02 9-19-67
CHECKED BY _____ DATE _____

BORING 62 SURFACE ELEV. 110.0 FEET
(U.S. NAVY DATUM)



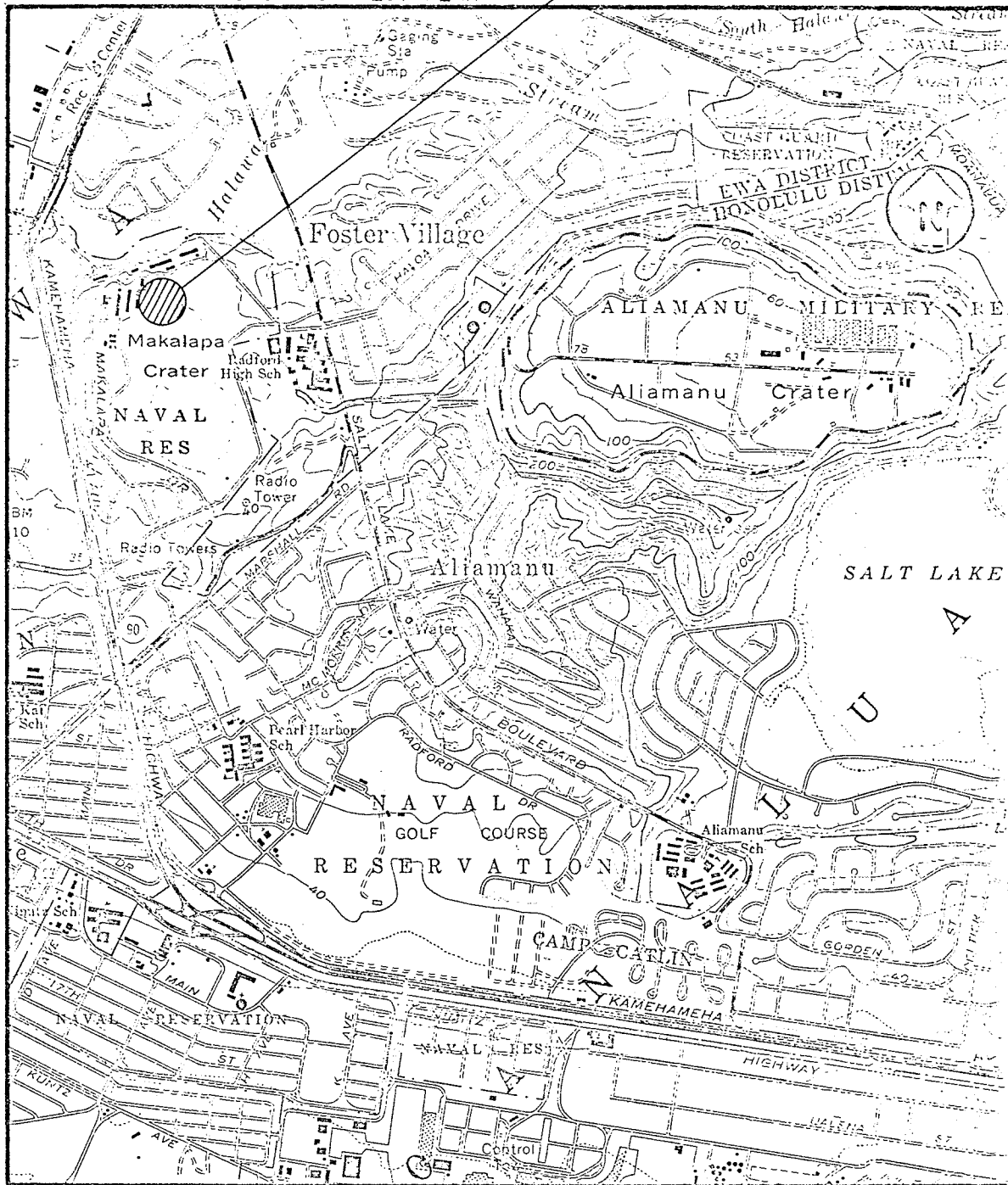
BORING COMPLETED ON 9-18-67

LOG OF BORINGS

- NOTES:
- - DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
 - ☒ - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
 - - DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
 - P - SAMPLER PUSHED INTO SOIL
- DRIVING ENERGY = 140-LB WEIGHT DROPPING 30 IN.

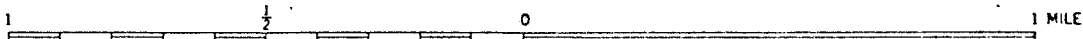
DAMES & MOORE

GENERAL AREA AS SHOWN ON PLOT PLAN



MAP OF AREA

SCALE 1:24000



1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 5 0 1 KILOMETER

REFERENCE:

U.S.G.S. QUADRANGLE MAP

PUUOIA, HAWAII

DATED 1968

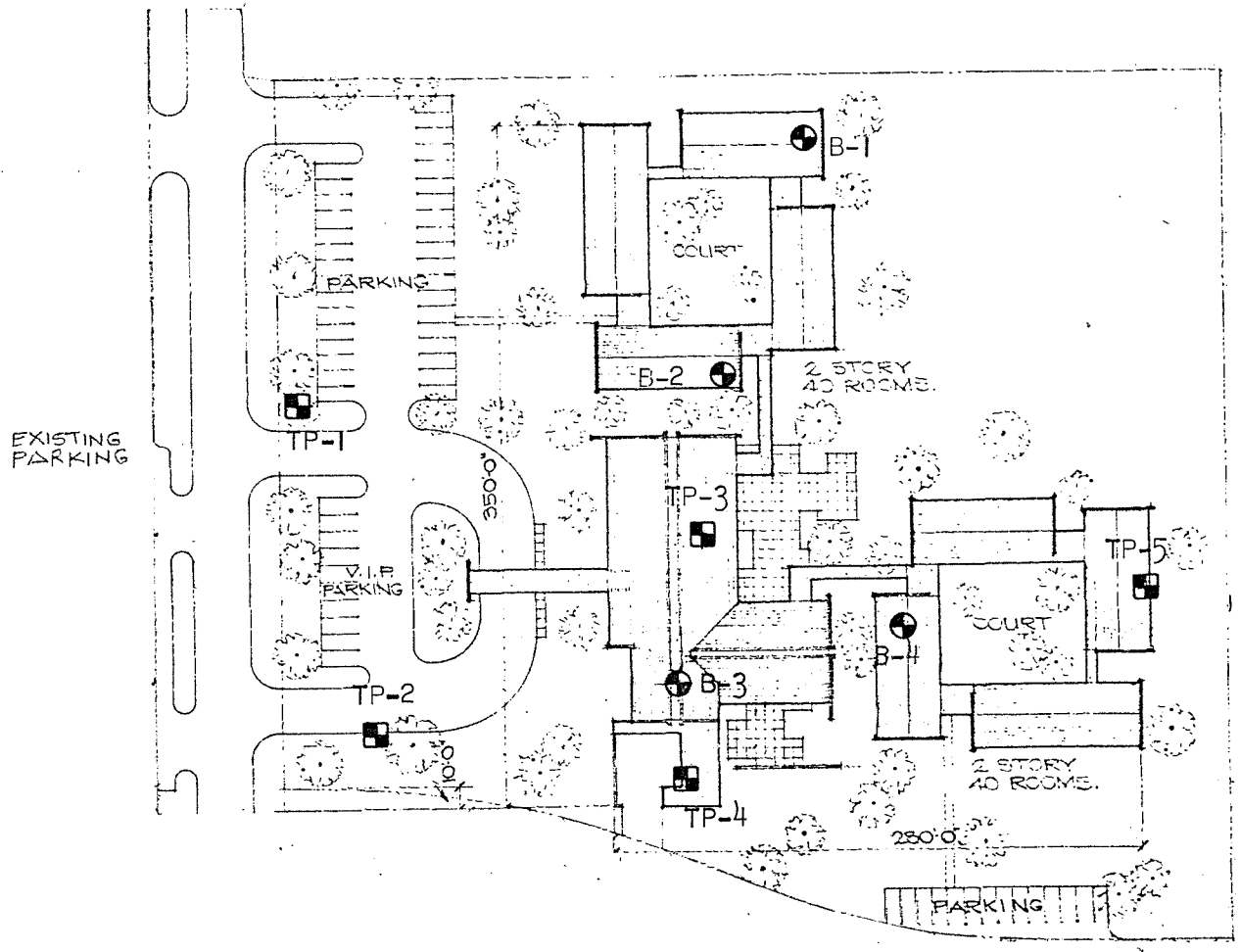
GRAPHIC SCALE

CHECKED BY _____ DATE _____
 FILE 2702-056
 BY _____ DATE _____

REVISIONS BY DATE

FILE 2702-05%

CHECKED BY DATE 3



BLDG. 271

REFERENCE:
SITE & FIRST FLOOR PLAN
BACHELOR OFFICER QUARTERS & MESS
BY HOGAN & CHAPMAN
DATED 7-15-71

LEGEND:
⊕ DAMES & MOORE BORING
⊞ DAMES & MOORE TEST PIT

PLOT PLAN



61)

BORING 1

SURFACE ELEVATION 136.0 FEET

MOISTURE CONTENT IN %	DRY DENSITY IN PCF	BLOWS/FT. ON SAMPLER	CORE AND % RECOVERY	SAMPLES AND/OR CORES	DEPTH IN FEET	GRAPH SYMBOL	LETTER SYMBOL	DESCRIPTION
					0			BASALT COBBLES, BRICKS AND BROWN SILT (MISCELLANEOUS FILL)
		6			5			
50	72	3			10		MH	GRAY-BROWN CLAYEY SILT, SOFT TO MEDIUM STIFF (HYDRAULIC FILL)
					15			
63	65	4			20			
					25			
78	55	4			30			TRACE OF BROKEN SHELLS, MEDIUM STIFF
					35			
72	59	P 200 PSI			40		MH	BROWN CLAYEY SILT, STIFF WITH SOME SAND (NATURAL SOIL)
					45		SM	TAN SILTY FINE TO MEDIUM SAND WITH CORAL FRAGMENTS, MEDIUM DENSE
32	87	21			50		MH- ML	TAN-GRAY SILT WITH SOME SAND, STIFF
					55		MH	BROWN CLAYEY SILT, VERY STIFF
38	88	37			60			GRADES WITH SOME WEATHERED TUFF FRAGMENTS

BORING COMPLETED AT 61.5 FEET ON 8-3-71

LOG OF BORINGS

NOTES:

- -DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
 - ⊠ -DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
 - -DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
 - I -DEPTH AND LENGTH OF CORE RUN
- DRIVING ENERGY- 300 -LB WEIGHT DROPPING 30 INCHES

DAMERS & MOORE
 PLATE A-1A

BORING 2

SURFACE ELEVATION 144.0 FEET

MOISTURE CONTENT IN %	DRY DENSITY IN PCF	BLOWS/FT. ON SAMPLER	CORE AND % RECOVERY	SAMPLES AND/OR CORES	DEPTH IN FEET	GRAPH SYMBOL	LETTER SYMBOL	DESCRIPTION
					0			BRICKS, CONCRETE BLOCKS, BOULDERS AND OTHER DEBRIS (MISCELLANEOUS FILL)
58	60	4			5		MH	BROWN CLAYEY SANDY SILT, SOFT TO MEDIUM STIFF (HYDRAULIC FILL) BECOMES GRAY
54	67	P 300 PSI			10			
55	67	P 300 PSI			15			
		P 320 PSI			20			
71	59	P 300 PSI			25			BECOMES LESS SANDY, TO MEDIUM STIFF
62	63	P 245 PSI			30			SOME VERY FINE SAND TRACE OF BROKEN SHELLS
65	62	P 300 PSI			35			
77	55	P 350 PSI			40			LESS SAND AND SHELLS

BORING COMPLETED AT 41.5 FEET ON 8-3-71

LOG OF BORINGS

NOTES:

- - DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
 - ⊗ - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
 - - DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
 - I - DEPTH AND LENGTH OF CORE RUN
- DRIVING ENERGY - 300-LB WEIGHT DROPPING 30 INCHES

BORING 3

SURFACE ELEVATION 150.0 FEET

MOISTURE CONTENT IN %	DRY DENSITY IN PCF	BLOWS/FT. ON SAMPLER	CORE AND % RECOVERY	SAMPLES AND/OR CORES	DEPTH IN FEET	GRAPH SYMBOL	LETTER SYMBOL	DESCRIPTION
							MH	BROWN SILT WITH TUFF FRAGMENTS TO $\frac{1}{4}$ " , STIFF (FILL)
29	72	7						
46	62	8			5		MH	LIGHT BROWN SILT WITH SOME SAND, MEDIUM STIFF (HYDRAULIC FILL)
69	61	P 160 PSI			10		MH- CH	DARK GRAY SILT AND CLAY WITH SOME FINE TO MEDIUM SAND AND SHELL FRAGMENTS, MEDIUM STIFF (HYDRAULIC FILL)
82	52	P 190 PSI			15		MH	DARK GRAY CLAYEY SILT, SOFT TO MEDIUM STIFF (HYDRAULIC FILL)
65	62	P 220 PSI			20			
58	68	P 300 PSI			25		SM	DARK BROWN SILTY FINE SAND WITH SOME SHELL FRAGMENTS, MEDIUM DENSE (HYDRAULIC FILL)
					30			LESS SILTY BECOMES DARK GRAY AND SILTY
69	62	6						
40	69	10			35		GP	SHELL AND CORAL FRAGMENTS WITH SOME DARK GRAY SILT, LOOSE (HYDRAULIC FILL)
54	70	12			40		MH	DARK GRAY CLAYEY SILT WITH TRACE OF SHELLS, STIFF (HYDRAULIC FILL)
69	54	13			45			
49	77	19			50		MH	BROWN CLAYEY SILT, VERY STIFF (NATURAL SOIL)
		39			55			GRADING WITH DECOMPOSED TUFF
35	87	23			60		SM	BROWN SILTY MEDIUM SAND, MEDIUM DENSE

BORING COMPLETED AT 62.0 FEET ON 8-5-71

LOG OF BORINGS

NOTES:

- -DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
 - ⊠ -DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
 - -DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
 - I -DEPTH AND LENGTH OF CORE RUN
- DRIVING ENERGY- 300 -LB WEIGHT DROPPING 30 INCHES

BORING 4

SURFACE ELEVATION 148.0 FEET

MOISTURE CONTENT IN %	DRY DENSITY IN PCF	BLOWS/FT. ON SAMPLER	CORE AND % RECOVERY	SAMPLES AND/OR CORES	DEPTH IN FEET	GRAPH SYMBOL	LETTER SYMBOL	DESCRIPTION
25	64	9					MH	LIGHT BROWN SILT WITH SOME SAND, MEDIUM STIFF (FILL)
55	61	4			5			
75	57	P 100 PSI			10		MH	DARK GRAY CLAYEY SILT, SOFT TO MEDIUM STIFF (HYDRAULIC FILL)
73	59	P 100 PSI			15			
66	62	P 180 PSI			20			
58	68	P 160 PSI			25		SM	GRAY SILTY FINE SAND, LOOSE TO MEDIUM DENSE (HYDRAULIC FILL)
		P 210 PSI			30			BECOMES STIFF GRADES TO MEDIUM SAND AND MEDIUM DENSE
65	63	9			35		MH	DARK GRAY CLAYEY SILT, MEDIUM STIFF (HYDRAULIC FILL)
57	86	6			40			GRADES SANDY, MEDIUM STIFF TO STIFF
75	97	10			45			LESS SANDY
46	76	24			50		MH	BROWN CLAYEY SILT, STIFF TO VERY STIFF (NATURAL SOIL)
47	78	23						
54	69	25			55			

BORING COMPLETED AT 57.0 FEET ON 8-10-71

LOG OF BORINGS

NOTES:

- - DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
 - ⊠ - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
 - - DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
 - I - DEPTH AND LENGTH OF CORE RUN
- DRIVING ENERGY- 300 -LB WEIGHT DROPPING 30 INCHES

REVISIONS BY DATE
 FILE
 DATE 1-71
 CHECKED BY 20

TEST PIT 1

SURFACE ELEVATION 150.0 FEET
 NAVY DATUM

MOISTURE CONTENT IN %	DRY DENSITY IN PCF	BLOWS/FT. ON SAMPLER	SAMPLES AND/OR CORES	DEPTH IN FEET	GRAPH SYMBOL	LETTER SYMBOL	DESCRIPTION
				5			BROWN SILTY FINE SAND, CONCRETE BLOCKS, METALS, WOOD AND OTHER WASTE MATERIAL (MISCELLANEOUS FILL)
TEST PIT COMPLETED AT 5.0 FEET ON 8-10-71 WHERE A LARGE CONCRETE BLOCK WAS ENCOUNTERED							

TEST PIT 2

SURFACE ELEVATION 150.0 FEET
 NAVY DATUM

MOISTURE CONTENT IN %	DRY DENSITY IN PCF	BLOWS/FT. ON SAMPLER	SAMPLES AND/OR CORES	DEPTH IN FEET	GRAPH SYMBOL	LETTER SYMBOL	DESCRIPTION
				5			BROWN CORAL AND BASALTIC GRAVELS, SANDY SILT WITH OTHER DEBRIS, MEDIUM DENSE (MISCELLANEOUS FILL)
36	71	10		5		SM	BROWN SILTY SAND WITH SOME CLAY, MEDIUM DENSE
				5		MH	BROWN CLAYEY SILT, SOFT (HYDRAULIC FILL)
				10		SM	BROWN CORAL FINE SAND WITH SILT, MEDIUM DENSE
				10		MH	GRAY CLAYEY SILT, SOFT (HYDRAULIC FILL)
TEST PIT COMPLETED AT 14.0 FEET ON 8-10-71							

LOG OF TEST PITS

- NOTES:
- -DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
 - ⊗ -DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
 - DRIVING ENERGY- 40 -LB WEIGHT DROPPING 15+ INCHES

TEST PIT 3

SURFACE ELEVATION 147.0 FEET
NAVY DATUM

MOISTURE CONTENT, IN %	DRY DENSITY IN PCF	BLOWS/FT. ON SAMPLER	SAMPLES AND/OR CORES	DEPTH IN FEET	GRAPH SYMBOL	DESCRIPTION
						BROWN SILTY SAND, SCRAP METAL, CEMENT BLOCK, AND WOOD DEBRIS, LOOSE (MISCELLANEOUS FILL)
				5	SM	LIGHT BROWN SILTY FINE SAND, MEDIUM DENSE
58	58	6	■		MH	GRAY SANDY CLAYEY SILT, SOFT (HYDRAULIC FILL)
				10		GRADING LESS CLAYEY

TEST PIT COMPLETED AT 11.0 FEET ON 8-10-71

LOG OF TEST PITS

NOTES:

- -DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
 - ⊗ -DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
- DRIVING ENERGY- 40 -LB WEIGHT DROPPING 15± INCHES

CHECKED BY _____ DATE _____
 FILE _____
 REVISIONS BY _____ DATE _____

TEST PIT 4

SURFACE ELEVATION 149.0 FEET
NAVY DATUM

MOISTURE CONTENT, IN %	DRY DENSITY IN PCF	BLOWS/FT. ON SAMPLER	SAMPLES AND/OR CORES	DEPTH IN FEET	GRAPH SYMBOL	LETTER SYMBOL	DESCRIPTION
					[Diagonal lines]	SM	BROWN SILTY FINE SAND, MEDIUM DENSE (FILL)
					[Cross-hatch]	CH	BROWN SILTY CLAY, MEDIUM STIFF
32	64	30	■		[Diagonal lines]	SM	BROWN SILTY FINE SAND, MEDIUM DENSE
				5	[Vertical lines]	MH	GRAY CLAYEY SILT, SOFT (HYDRAULIC FILL)
71	65	6	■		[Vertical lines]		
				10	[Diagonal lines]	SM	GRAY SILTY FINE SAND WITH SOME SHELLS, LOOSE (HYDRAULIC FILL)

TEST PIT COMPLETED AT 12.0 FEET ON 8-10-71
(CAVED IN AT 10.0 FEET)

LOG OF TEST PITS

NOTES:

- -DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
 - ⊗ -DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
- DRIVING ENERGY- 40 -LB WEIGHT DROPPING 15± INCHES

CHECKED BY SC DATE 8-10-71 FILE 1789.001 REVIEWS BY DATE

TEST PIT 5

SURFACE ELEVATION 144.0 FEET
NAVY DATUM

MOISTURE CONTENT IN %	DRY DENSITY IN PCF	BLOWS/FT. ON SAMPLER	SAMPLES AND/OR CORES	DEPTH IN FEET	GRAPH SYMBOL	LETTER SYMBOL	DESCRIPTION
					[Diagonal lines]	SM	BROWN SILTY FINE SAND WITH SOME BOULDERS AND DEBRIS, LOOSE TO MEDIUM DENSE (FILL)
57	61	10	■	5	[Vertical lines]	MH	GRAY BROWN CLAYEY SILT WITH SOME FINE SAND, MEDIUM STIFF (HYDRAULIC FILL)
54	70	10	■	10	[Vertical lines]	[Symbol]	

TEST PIT COMPLETED AT 12.0 FEET ON 8-10-71

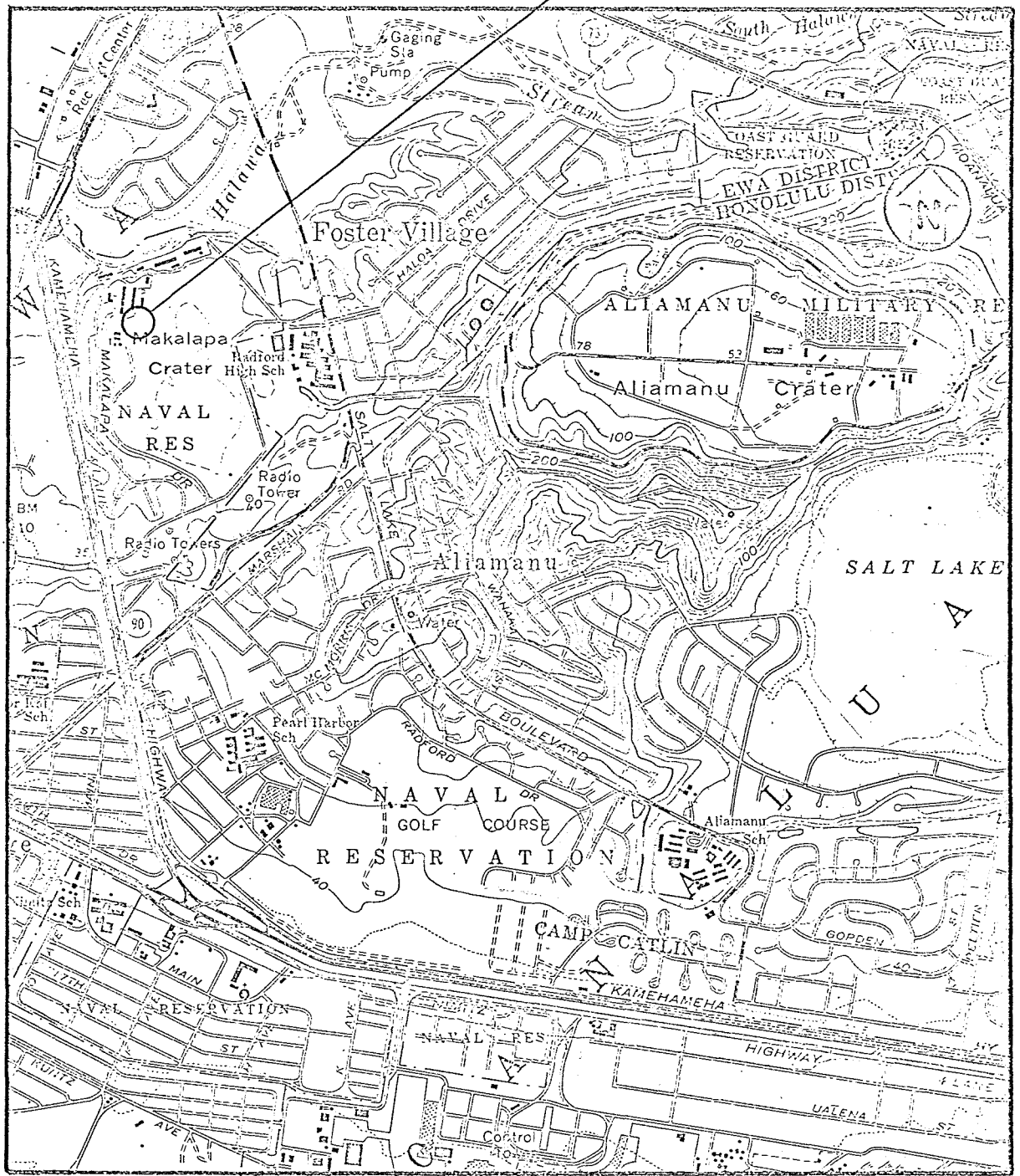
LOG OF TEST PITS

NOTES:

- -DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
- ⊗ -DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
- DRIVING ENERGY- 40 -LB WEIGHT DROPPING 15± INCHES

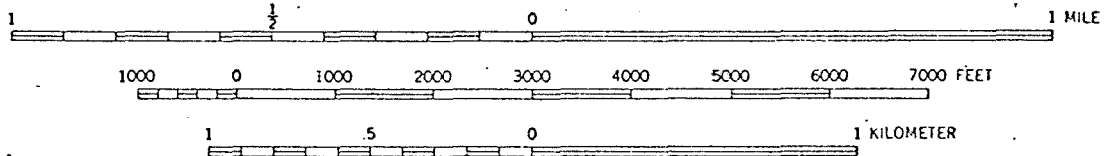
CHECKED BY _____ DATE 4/1/71
 FILE _____
 BY _____ DATE _____

GENERAL AREA AS SHOWN ON PLOT PLAN



MAP OF AREA

SCALE 1:24000



REFERENCE:
 U.S.G.S. QUADRANGLE MAP
 PUULOA, HAWAII
 DATED 1968

GAMES & MOORE

PLATE 1

REVISIONS BY DATE

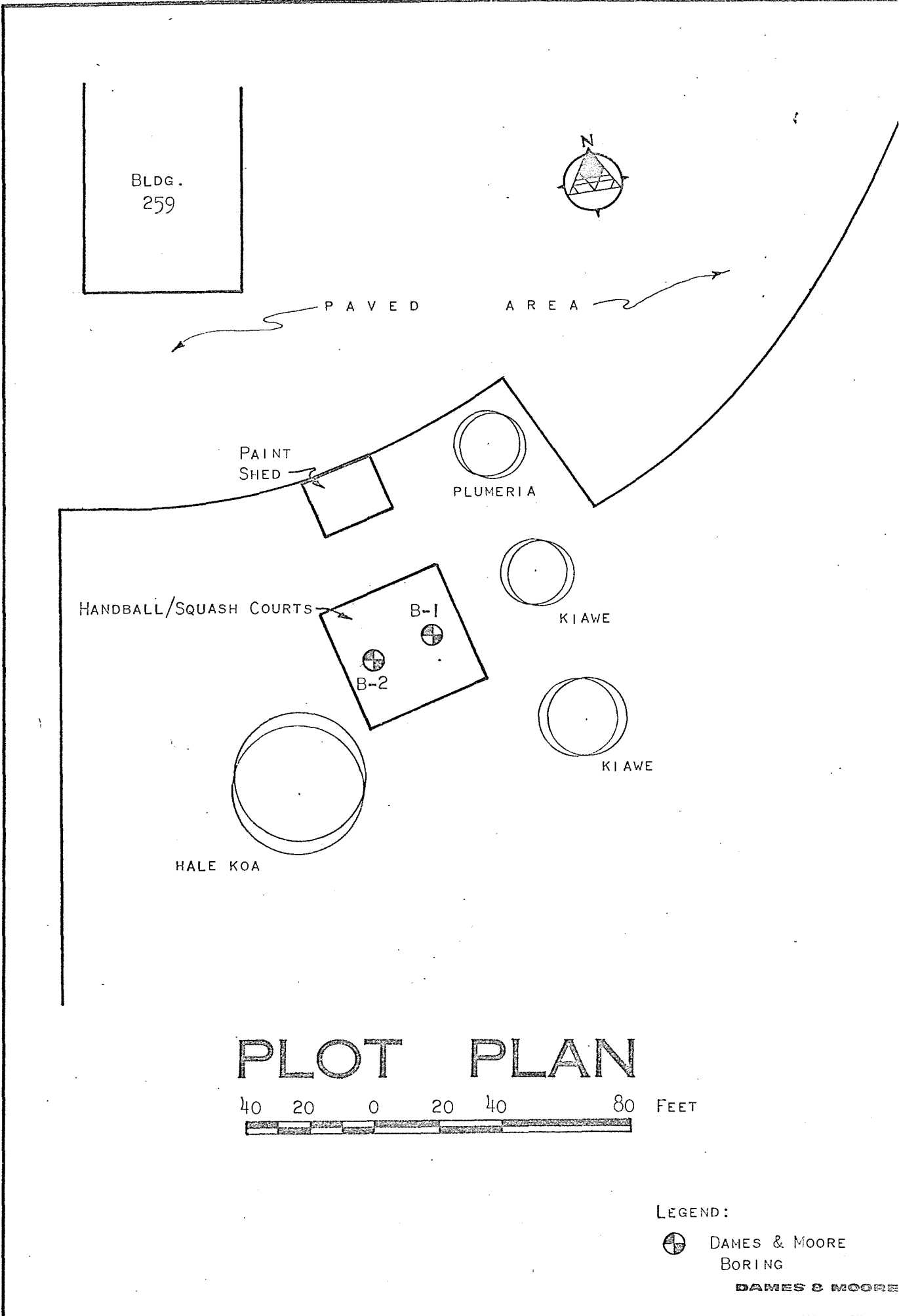
FILE 2702-055


CHECKED BY DATE

BY LAU DATE 1.4.71
CHECKED BY _____

FILE 2702-053

REVISIONS BY _____ DATE _____



LEGEND:
 DAMES & MOORE BORING
 DAMES & MOORE

DIVISION _____ BY _____ DATE _____
 FILE 2702-05-055
 CHECKED BY SC 8/1/71

BORING I

SURFACE ELEVATION +152.0 FEET
NAVAL DATUM

MOISTURE CONTENT IN %	DRY DENSITY IN PCF	BLOWS/FT. ON SAMPLER	CORE AND % RECOVERY	SAMPLES AND/OR CORES	DEPTH IN FEET	GRAPH SYMBOL	LETTER SYMBOL	DESCRIPTION
24.6	72.1	7			0-5		SP-SM	LIGHT BROWN SILTY FINE SAND, WITH ROOTS, MEDIUM DENSE, (FILL) SOME CORAL AND SHELL FRAGMENTS, LOOSE
12.7	82.1	6			5-10			OCCASIONAL LENSES OF STIFF CLAYEY SILT
47.8	71.8	4			10-17		SM	GRAY SILTY FINE SAND WITH SHELL FRAGMENTS, VERY LOOSE WATER LEVEL AT 1250 HOURS ON 7-15-71
		2			17-19			

BORING COMPLETED AT 17.0 FEET ON 7-15-71

LOG OF BORINGS

NOTES:

- -DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
 - ▣ -DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
 - -DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
 - I -DEPTH AND LENGTH OF CORE RUN
- DRIVING ENERGY - 300-LB WEIGHT DROPPING 30 INCHES
ON A DAMES & MOORE U-TYPE SAMPLER

BORING 2

SURFACE ELEVATION +152.5 FEET
NAVAL DATUM

MOISTURE CONTENT IN %	DRY DENSITY IN PCF	BLOWS/FT. ON SAMPLER	CORE AND % RECOVERY	SAMPLES AND/OR CORES	DEPTH IN FEET	GRAPH SYMBOL	LETTER SYMBOL	DESCRIPTION
-----------------------	--------------------	----------------------	---------------------	----------------------	---------------	--------------	---------------	-------------

					9			SP- SM LIGHT BROWN SILTY FINE SAND, MEDIUM DENSE (FILL) LESS SILTY, LOOSE SOME SHELL FRAGMENTS OCCASIONAL LENSES OF CLAYEY SILT
7.8	87.8	9	9	5	5	5	SM	10
47.6	69.3	3	3	10	10	10	SM	15
69.5	59.5	2	2	15	15	15	SM	17.0

WATER LEVEL AT 1134 HOURS ON 7-15-71

BORING COMPLETED AT 17.0 FEET ON 7-15-71

LOG OF BORINGS

NOTES:

- DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
- DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
- DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
- I** -DEPTH AND LENGTH OF CORE RUN

DRIVING ENERGY - 300-LB WEIGHT DROPPING 30 INCHES
ON A DAMES & MOORE U-TYPE SAMPLER

DAMES & MOORE
PLATE A-1B

REVISIONS
BY _____ DATE _____

FILE 2702-1-5

CHECKED BY _____ DATE _____

Borehole Log

Project Name: CTO HCO1 Remedial Investigation RAA 12		Project Number: 91020		Borehole/ Well Number: RAA12-06	
Borehole Location: Pearl Harbor, RAA 12		North (m): 21322.541 East (m): 505870.986		Sheet: 1 of 1	
Drilling Agency: Valley Well Drilling		Driller: B. Meacham		Total Depth of Well TOC (ft. bgs.): 30.0	
Drilling Equipment: B-61		Date & Time Started: 11/8/2007 8:00:00 AM		Total Depth of Boring (ft. bgs.): 30.0	
Drilling Method: Hollow-Stem Auger		Top of Casing Elevation (ft msl) : 20.25		Date & Time Finished: 11/8/2007 10:00:00 AM	
Depth to Water Static (ft. bgs.): 19.58		Ground Surface Elevation (ft. msl) : 20.57		Depth to Water During Drilling (ft. bgs.): 20.1	
Drilling Fluid: None		Borehole Diameter (in.): 8		Size and Type of Bit: 1.5 ft. split spoon	
		Logged By: M.Ward		Sample Type: Drive	
				Checked By: B. Alspaugh	

Completion Information: Completed as a monitoring well (RAA 12-06)

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	EPA ID	Type	Blow Count	Percent Recovery	Gravel	Sand	Fines	Graphic	USCS or Rock Type			
1								[Graphic: Tuff Breccia]	IE	Tuff Breccia; same as borehole RAA12-04.	[Well Construction Diagram: Tuff Breccia]	
2								[Graphic: Tuff Breccia]			[Well Construction Diagram: Tuff Breccia]	
3								[Graphic: Tuff Breccia]			[Well Construction Diagram: Tuff Breccia]	
4								[Graphic: Tuff Breccia]			[Well Construction Diagram: Tuff Breccia]	
5								[Graphic: Tuff Breccia]			[Well Construction Diagram: Tuff Breccia]	
6								[Graphic: Tuff Breccia]			[Well Construction Diagram: Tuff Breccia]	PID = 5.3 ppm
7								[Graphic: Tuff Breccia]			[Well Construction Diagram: Tuff Breccia]	
8								[Graphic: Tuff Breccia]			[Well Construction Diagram: Tuff Breccia]	
9								[Graphic: Tuff Breccia]			[Well Construction Diagram: Tuff Breccia]	
10								[Graphic: Tuff Breccia]			[Well Construction Diagram: Tuff Breccia]	
11								[Graphic: Tuff Breccia]			[Well Construction Diagram: Tuff Breccia]	PID = 8.3 ppm
12								[Graphic: Tuff Breccia]			[Well Construction Diagram: Tuff Breccia]	
13					10	10	80	[Graphic: Clay]	CH	Clay; dark yellowish brown (10 YR 4/3); moist to dry; stiff; high plasticity; mottled black sand; calcium carbonate white spots at contact of Tuff and clay.	[Well Construction Diagram: Clay]	Driller states that drilling becomes easier at this depth.
14								[Graphic: Clay]		Same as above; brown (7.5 YR 4/2); moist; stiff; high plasticity; hard.	[Well Construction Diagram: Clay]	
15		EM048	10	60				[Graphic: Clay]		Same as above; wet.	[Well Construction Diagram: Clay]	EM048 (1000)
16			10					[Graphic: Clay]		Same as above; dry.	[Well Construction Diagram: Clay]	Potential small confining layer or perched layer
17			5	30				[Graphic: Clay]		Same as above; wet.	[Well Construction Diagram: Clay]	sample collected above saturated zone.
18			10	100				[Graphic: Clay]			[Well Construction Diagram: Clay]	
19								[Graphic: Clay]			[Well Construction Diagram: Clay]	
20								[Graphic: Clay]			[Well Construction Diagram: Clay]	
21								[Graphic: Clay]			[Well Construction Diagram: Clay]	
22								[Graphic: Clay]			[Well Construction Diagram: Clay]	
23								[Graphic: Clay]			[Well Construction Diagram: Clay]	
24								[Graphic: Clay]			[Well Construction Diagram: Clay]	
25								[Graphic: Clay]			[Well Construction Diagram: Clay]	
26								[Graphic: Clay]			[Well Construction Diagram: Clay]	
27								[Graphic: Clay]			[Well Construction Diagram: Clay]	
28								[Graphic: Clay]			[Well Construction Diagram: Clay]	
29								[Graphic: Clay]			[Well Construction Diagram: Clay]	
30								[Graphic: Clay]			[Well Construction Diagram: Clay]	
31								[Graphic: Clay]		End of borehole. Install permanent 2.0 inch monitoring well.	[Well Construction Diagram: Clay]	
32								[Graphic: Clay]			[Well Construction Diagram: Clay]	

TO-0104CTO HCO1 BOREHOLE LOGS.GPJFORD.GDT4/29/08

Borehole Log

Project Name: CTO HCO1 Remedial Investigation RAA 12		Project Number: 91020	Borehole/ Well Number: RAA12-06A
Borehole Location: Pearl Harbor, RAA 12		Northing: 69937.33 Easting: 1659680.64	Sheet 1 of 2
Drilling Agency: Valley Well Drilling		Driller: Steve Surigao	Total Depth of Well TOC (feet): 60.0
Drilling Equipment: B-61		Date & Time Started: 3/16/2009 9:55:00 AM	Total Depth of Boring BGS (feet): 61.0
Drilling Method: Hollow-Stem Auger		Date & Time Finished: 3/24/2009 9:30:00 AM	Depth to Water (During Drilling): 22.5 ft. bgs
Depth to Water (Static): 20.63 ft. bgs	Ground Surface Elevation (feet msl) : 20.35	Size and Type of Bit: 8 in hollow stem auger	Sample Type: Drive
Drilling Fluid: None	Borehole Diameter (in.) 8	Logged By: P. LaPlaca	Checked By: P. Gates

Completion Information: Completed as a monitoring well

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks	
	Number	Type	Blow Count	Percent Recovery	Analytical Samples & ID	Gravel	Sand	Fines	Graphic				USCS or Rock Type
1						50	10	30		GC	Groundsurface: Asphalt		
2											Clayey Gravel Fill Material, 2.5 YR 4/3 (dark reddish-brown), moist, no staining or odor		
3							10	90		CH	Fat Clay, 10 YR 3/3 (dark brown), moist to dry, firm, high plasticity, no staining or odor		
4			5	70									
5			5	80									
6			11	80									
7			12	10		70	30			IE	Weathered Tuff With Volcanic Breccia 5 YR 4/1 (dark gray) weathered to 10 YR 3/3 (dark brown) clay, moist, hard, no staining or odor		
8			10	60									
9			7	60									
10			8	60									
11			4	50									
12			4	60									
13			4	60									
14			6	50									
15			6	50									
16			8	20			100			CH	Fat Clay, mottled 10 YR 3/3 (dark brown) and 5 Y 7/2 (light gray), moist, firm, med plasticity, no staining or odor		
17			12	30									
18			7	30									
19			12	60									
20			11	10		30	10			CL	Sandy Gravelly Clay 10 YR 3/3 (dark brown) with some patched of 5 Y 7/2 (light gray), moist, low plasticity, no staining or odor		
21			19	20									
22			23	20									
23			14	40		40	60			CL	Gravelly Coralline Clay, 10 YR 7/2 (light gray), wet, soft, no staining or odor		
24			7	20									
25			14	20									
26			12	10									
27			13	10									
28			38	30		60	40			GC	Clayey Coralline Gravel, 10 YR 7/2 (light gray), wet, med density, no staining or odor		
29			50/4	30									
30			10	30									
31			30	30									
32			50/6	30									
			30	30									
			6	20									
			50/6	20									
			30	20									
			50/3	20									

CTO 9 BORELOG W/ WELLCTO HCO1 BOREHOLE LOGS.GPJ\FORD.GDTG\1609

Borehole Log (Continuation Sheet)

Project Name: CTO HCO1 Remedial Investigation RAA 12 Project Number: 91020 Borehole Number: RAA12-06A

Borehole Location: RAA12-06A Sheet 2 of 2

Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Gravel	Sand	Fines	Graphic	USCS or Rock Type			
33			50/3	10			100		CH	Fat Clay, 10 YR 4/3 (brown), dry, firm, high plasticity, no staining or odor		
34			12 18	90								
35			50/5	100								
36			25 35 45	50		20						
37			20									
38			50/5	80			80		CH	Sandy Fat Clay, 10 YR 6/3 (pale brown) with some 10 YR 4/6 (dark yellowish brown), dry, firm, med plasticity, no staining or odor		
39			20 40 30	50								
40			30									
41			50/4	70								
42			20 30									
43			50/4									
44			15	80								
45			25 50/3									
46												
47												
48												
49												
50												
51			17	60			100		CL-ML	Slity Clay, 10 YR 3/3 (dark brown) to 10 YR 2/1 (black), dry, firm, med plasticity, no staining or odor		
52			13 12									
53												
54												
55												
56			10	80								
57			20 50/6									
58												
59												
60												
61										End of borehole. Installed permanent 2.0 inch monitoring well.		



Borehole Log

Project Name: CTO HC01 Remedial Investigation RAA 12		Project Number: CTO HC01		Borehole/ Well Number: RAA12-06BR	
Borehole Location: RAA12, Halawa-Gate GSA, JBPHH, Oahu, Hawaii				Northing: 69921.04 Easting: 1659689.57	
Sheet 1 of 6		Drilling Agency: Valley Well Drilling		Driller: Jon Surigao	
Total Depth of Well TOC (feet): 120.0		Drilling Equipment: Mobile B59 HSA/HX Core System		Date & Time Started: 10/6/2011 1:25:00 PM	
Total Depth of Boring BGS (feet): ~120		Drilling Method: HSA (Top 62')/Air Rotary w/Line Coring 62 to 120'		Top of Casing Elevation (feet msl) : 20.18	
Depth to Water (Static): 17.66 ft		Ground Surface Elevation (feet msl) : 20.61		Date & Time Finished: 10/18/2011 3:23:00 PM	
Drilling Fluid: N/A		Borehole Diameter (in) : 8" (62' to 120')		Size and Type of Bit: 8" Cutter Head	
Completed as a monitoring well		Logged By: K. Robertson		Checked By: P. Gates	

Depth (feet)	Samples					Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Analytical Samples & ID	Gravel	Sand	Fines	Graphic	USCS or Rock Type			
1											Asphalt.		Borehole augered to 15 feet.
2									GP		Aggregate gravel and coarse sand.		
3									IE		Tuff, weathered, with volcanic breccia, dark gray mottled with dark brown (5YR 4/1 with 10YR 3/3), hard, brittle, pisolitic, bedded.		
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15	1												
16			8	100		-	1	99		CH	Silty Clay, medium yellow-brown (10YR 4/4), damp, hard, high plasticity, residual tuff texture (including pisolites). Tuff saprolite, some vertical heavy mineral stringers (FeO CrO).		
17	2		25	72		-	-	100			Same as above, less silt, softer.		
18	3		15			-	30	70		CL	Same as above (could be slough). Abrupt lower contact with a fine sandy silt with some clay, light grey (10YR 7/2), damp, crumbly, soft, scattered iron staining in zones that are brittle, massive.		
19			5	94									
20	4		12	100		-	30	70					

HC01 BORING LOGS AND MONITORING WELLS.GPJ 3/2/12



Borehole Log (Continuation Sheet)

Project Name: CTO HC01 Remedial Investigation RAA 12	Project Number: CTO HC01	Borehole Number: RAA12-06BR
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Borehole Location: RAA12, Halawa-Gate GSA, JBPHH, Oahu, Hawaii	Sheet 3 of 6
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Gravel	Sand	Fines	Graphic	USCS or Rock Type			
44	20		20	50	-	10	90		CL	Same as above. Lithic zones contain shell molds		PID = 4.0 ppm
45	21		-	44						Fining to a silty clay, same color, very dense, hard, low plasticity, scattered induration, damp.		PID = 3.3 ppm
46	22		20	39						Mottled light grey (10YR 7/1) and light yellow-brown (10YR 6/4) silty clay, some fine sand, damp, crumbly, granular. 4-inch lithified zone in the center.		PID = 7.4 ppm
47	23		15	36						Same as above (top 3.5 inches). Abrupt contact with a mottled black and varied browns silty clay, hard, brittle, finely laminated, scattered organic material, low plasticity, damp, calcite-filled vertical fracture.		PID = 19.3 ppm
48	24		30	33						Same as above.		PID = 13.6 ppm
49	25		19	22	-	-	100		Shale	Completely lithified to a calcareous shale, hard, brittle, damp, calcite-filled fractured, vaguely laminated.		PID = 0.0 ppm
50	26		25	0						No recovery.		PID = 0.0 ppm
51	27		-	67						1.5-inch broken limestone pebble atop a silty clay, medium yellow-brown (10YR 4/4), damp, hard, brittle, blocky.		PID = 53.6 ppm
52	28		10	94						Interbedded medium brown (10YR 5/3) and medium yellow-brown (10YR 5/6), clayey silt/silty clay with variable plasticity (low to no), damp, to moist, hard to firm, with some calcite-filled fractures.		PID = 43 ppm
53	29		15	50						Same as above, almost completely indurated. Proto-shale.		PID = 13.2 ppm
54	30		17	25						Same as above, silty clay/shale dark grey (10YR 4/1).		PID = 7.0 ppm
55	31		20	50						Same as above.		Auger refusal. Geotechnical sample EM111 collected at 0850.
56	32		19	100	-	-	-		IE	Lithified/vitrified tuff, finely textured, massive. Several cross-cutting fractures (30-450 from vertical) with faces coated with zeolite microcrystals		Line coring employed at 62 feet.
57			26									
58			35									
59			35									
60			55									
61			85									
62			150									
63			-									
64			-									
65			-									
66			-									



Borehole Log (Continuation Sheet)

Project Name: CTO HC01 Remedial Investigation RAA 12	Project Number: CTO HC01	Borehole Number:	RAA12-06BR
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Borehole Location: RAA12, Halawa-Gate GSA, JBPHH, Oahu, Hawaii	Sheet 5 of 6
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Gravel	Sand	Fines	Graphic	USCS or Rock Type			
91	39	-	-	57	-	-	10	GS	-	Same as above (top 16 inches). Abrupt lower contact with a loose hash of shell fragments, very coarse carbonate sand, fine gravel (gravelly sand), moderately sorted, saturated, grains subangular up to 0.4 inch. Layer 11-inch thick material fines with depth so that by 27 inches, little shell or coarse material remains, and has returned to a silty clay/ash, greenish grey (GLEY 1 4/1), firm, sectile.	-	-
92								IE				
93								-				
94								-				
95	40	-	-	70	-	-	100	PT	-	Same as above (top 3 inches). Abrupt lower contact with an organic clay, dark gray brown (7.5YR 2/1) with some peat laminae (black). Materials very finely laminated (0.2 inch). Grades to the bottom 6 inches is a dark gray claylash, massive, sectile, firm.	-	-
96								-				
97								-				
98								-				
100	41	-	-	0	-	-	-	-	-	No recovery.	-	-
101								-				
102								-				
103								-				
105	42	-	-	77	-	-	100	CH	-	Fat Clay, organic-rich, greenish gray (GLEY 2 2.5/1 BG), massive, moderately firm, with some soft (spongy) zones, sticky. Material coarsens with depth so at base it is a silty clay, dark greenish gray (GLEY 1 3/1 5GY), medium dense, crumbly, medium plasticity, firm, massive.	-	-
106								-				
107								-				
108								-				
110	43	-	-	93	-	-	-	-	-	Same as above.	-	-
111								-				
112								-				
113								-				



Borehole Log (Continuation Sheet)


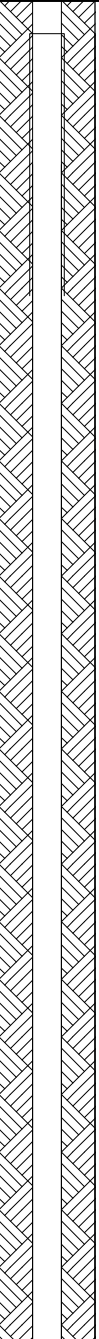








Project Name: CTO HC01 Remedial Investigation RAA 12	Project Number: CTO HC01	Borehole Number: RAA12-06BR
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Borehole Location: RAA12, Halawa-Gate GSA, JBPHH, Oahu, Hawaii	Sheet 6 of 6
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Depth (feet)	Samples				Estimated %			Log		Lithologic Description	Well Construction Diagram	Remarks
	Number	Type	Blow Count	Percent Recovery	Gravel	Sand	Fines	Graphic	USCS or Rock Type			
114 115 116 117 118 119 120	44		12	-	30	70		SC	Sandy Clay, only 7" recovery, material is a fine with scattered coarse sand, firm, blocky, low plasticity, saturated, scattered small disarticulated bivalve shells, sticky, greenish gray (GLEY 1 4/N). Refusal at 7 inches.		Geotechnical sample EM116 collected (113-114 feet) at 1600.	
									End of Boring @ 120' bgs		Boring completed as monitoring well RAA12-06BR.	

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CLIENT NAVFAC Hawaii **NORTHING** 70227.347572 ft. **EASTING** 1660330.02707 ft. **DATUM** NAD83 State Plane (Zone 3) MSL
PROJECT NAME RI, RAA12 **PROJECT LOCATION** Halawa Main Gate, JBPHH, Oahu, HI
DATE STARTED 2/25/2013 2:40:00 PM **COMPLETED** 2/26/2013 3:10:00 PM **GROUND ELEVATION** 9 ft **HOLE SIZE** in.
DRILLING CONTRACTOR B. Meacham; Valley Well Drilling **GROUND WATER LEVELS:** _____
DRILLING METHOD HSA **AT TIME OF DRILLING** ---
LOGGED BY C. Begeal **CHECKED BY** K. Robertson **END OF DRILLING** ---
NOTES _____ **24 HOURS AFTER DRILLING** ---






DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	Depth (ft bgs)	MATERIAL DESCRIPTION	Elevation (ft amsl)	Environmental Data	WELL DIAGRAM
0													
	SS	70	36-23-14 (37)	30	70		AF		0.5	(AF), black (10YR 2/1), hard, ASPHALT.	8.5	PID = 1 ppm	
							AF		2.0	FAT CLAY, (AF), brown (10YR 4/4), moist, medium stiff, subangular, pisolitic, with fine to medium gravel, fill, gravel is basaltic, tuffaceous and coralline.	7.0		
5	SS	70	10-31-39 (70)							GRAVELLY FAT CLAY, (CH), fine to medium grained, gray (10YR 5/1), moist, medium stiff, subangular, with gravel, hydrocarbon odor, hydrocarbon staining, staining is near 6 ft bgs; gravel is coralline and calcareous.		PID = 7.8 ppm	
				30	70		CH						
10	SS	10	18-20-25 (45)							petroleum product within sample			
									10.5		-1.5		
										POORLY GRADED SAND WITH GRAVEL, (SP), fine to coarse grained, gray (10YR 5/1), wet, medium dense, subangular, some fine to medium gravel, trace clay, hydrocarbon odor, reduced; 20% shell fragments; sand is calcareous; gravel is calcareous and coralline.			
15	SS	50	14-47-23 (70)	20	70	10	SP						
20													

(Continued Next Page)

ENVIRONMENTAL BOREHOLE - GINT STD US GDT - 4/2/13 23:37 - C:\USERS\BEGEAL\DESKTOP\KBO8\GINT\GINT\KB08.GPJ - C:\USERS\BEGEAL\DESKTOP\PMRF\GINT\GINT\HC56.GLB

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CLIENT NAVFAC Hawaii **NORTHING** 70227.347572 ft. **EASTING** 1660330.02707 ft. **DATUM** NAD83 State Plane (Zone 3) MSL
PROJECT NAME RI, RAA12 **PROJECT LOCATION** Halawa Main Gate, JBPHH, Oahu, HI

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	Depth (ft bgs)	MATERIAL DESCRIPTION	Elevation (ft amsl)	Environmental Data	WELL DIAGRAM
20	MC	80	30-62-44 (106)	20	70	10	SP		20	POORLY GRADED SAND WITH GRAVEL, (SP), fine to coarse grained, gray (10YR 5/1), wet, medium dense, subangular, some fine to medium gravel, trace clay, hydrocarbon odor, reduced; 20% shell fragments; sand is calcareous; gravel is calcareous and coralline. (continued)	-15.5		
25	SS	30	8-9-4 (13)	15	85		CH		24.5	FAT CLAY, (CH), brown (10YR 5/4), wet, soft, little fine sand, hydrocarbon odor.	-15.5		
30	SS	90	8-10-12 (22)						29.5	FAT CLAY, (CH), dark gray (10YR 3/2), moist, medium stiff, concoidal-like texture; trace coarse sand size black inclusions (weathered to clay).	-20.5		
35	SS	90	5-6-8 (14)		100		CH			some gray, 10YR 5/1, mottling, becomes fine sandy fat clay/clayey fine sand at 35.5; wood fragments at 35.7 ft, returning to fat clay with 20% shell fragments			
40	SS	90	4-4-8 (12)							40% shell fragments; pockets of clayey fine sand with 30% shells at 40 ft bgs; becomes clayey fine sandy, medium dense, subangular with 30% shell fragments at 40.6 ft bgs			

← 55 gallons of bentonite grout

(Continued Next Page)

ENVIRONMENTAL BOREHOLE - GINT STD US GDT - 4/2/13 23:37 - C:\USERS\BEGEALC\DESKTOP\KB08\GINT\GINT\KB08.GPJ - C:\USERS\BEGEALC\DESKTOP\PMRF\GINT\GINT\HC56.GLB

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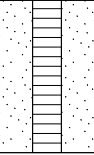
CLIENT NAVFAC Hawaii **NORTHING** 70227.347572 ft. **EASTING** 1660330.02707 ft. **DATUM** NAD83 State Plane (Zone 3) MSL
PROJECT NAME RI, RAA12 **PROJECT LOCATION** Halawa Main Gate, JBPHH, Oahu, HI

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	Depth (ft bgs)	MATERIAL DESCRIPTION	Elevation (ft amsl)	Environmental Data	WELL DIAGRAM	
45	SS	80	25-37-48 (85)			100	CH		44.5	FAT CLAY, (CH), dark gray (10YR 3/2), moist, medium stiff, conoidal-like texture; trace coarse sand size black inclusions (weathered to clay). (continued)	-35.5			
											FAT CLAY, (CH), brown and gray (10YR 4/4), moist, stiff, pisolitic, mottled, saprolite, slightly indurated in places; few reddish, 5YR 5/8, inclusions and streaks.			
50	SS	90	14-20-54 (74)											
55	SS	90	10-16-20 (36)			100	CH				includes thin 2.5Y 5/6 light olive brown mottling, medium stiff			
60	SS	90	5-12-18 (30)								increases in silt content			
	SS	80	4-10-15 (25)								some orangish-brown, 7.5YR 5/8, weathering (FeO)			
	SS	90	8-16-21 (37)								becomes stiff			
65	SS	90	11-15-27 (42)								40-50% fine sand- to fine gravel-sized shell fragments			
														2 buckets of PEL PLUG Time-Release Wyoming bentonite pellets
														3 bags of Lapis Lustre #3 Monterey Sand 0.010 slot

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ENVIRONMENTAL BOREHOLE - GINT STD US GDT - 4/2/13 23:37 - C:\USERS\BEGEALC\DESKTOP\KB08\GINT\GINT\KB08.GPJ - C:\USERS\BEGEALC\DESKTOP\PMRF\GINT\GINT\HC56.GLB

CLIENT NAVFAC Hawaii **NORTHING** 70227.347572 ft. **EASTING** 1660330.02707 ft. **DATUM** NAD83 State Plane (Zone 3) MSL
PROJECT NAME RI, RAA12 **PROJECT LOCATION** Halawa Main Gate, JBPHH, Oahu, HI

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	Depth (ft bgs)	MATERIAL DESCRIPTION	Elevation (ft. amsl)	Environmental Data	WELL DIAGRAM
	SS	80	12-19-50 (69)							FAT CLAY, (CH), brown and gray (10YR 4/4), moist, stiff, pisolitic, mottled, saprolite, slightly indurated in places; few reddish, 5YR 5/8, inclusions and streaks. (continued)			
	SS	100	31-100		100	CH							
									69.0		-60.0		

Bottom of borehole at 69.0 feet.

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CLIENT NAVFAC Hawaii **NORTHING** 70225.097948 ft. **EASTING** 1660350.91043 ft. **DATUM** NAD83 State Plane (Zone 3) MSL
PROJECT NAME RI, RAA12 **PROJECT LOCATION** Halawa Main Gate, JBPHH, Oahu, HI
DATE STARTED 1/3/2013 **COMPLETED** 1/8/2013 **GROUND ELEVATION** 9 ft **HOLE SIZE** 6 in.
DRILLING CONTRACTOR J. Surigao; Valley Well Drilling, Inc **GROUND WATER LEVELS:** _____
DRILLING METHOD HSA **AT TIME OF DRILLING** ---
LOGGED BY C. Begeal **CHECKED BY** K. Robertson **END OF DRILLING** 9.30 ft / Elev -0.30 ft
NOTES _____ **24 HOURS AFTER DRILLING** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	Depth (ft bgs)	MATERIAL DESCRIPTION	Elevation (ft amsl)	Environmental Data	WELL DIAGRAM
0									0.3		8.7		
					100		AF		0.6	(AF), black (10YR 2/1), dry, hard, ASHPALT.	8.4		
										FAT CLAY, (AF), light yellowish brown (10YR 4/6), moist, soft, saprolite, pisolitic, cuttings.			
										FAT CLAY, (CH), light brown (10YR 5/3), dry, soft, subangular, little gravel, trace fine to coarse sand, saprolite, pisolitic, little gravel-sized shell fragments, cuttings.			
5				15	10	75	CH						
10									10.0		-1.0		
	SS	100	7-11-32 (43)	20	25	55	CH			SANDY FAT CLAY WITH GRAVEL, (CH), gray (N6), wet, soft, subangular, well graded, some fine gravel, some fine to coarse sand, hydrocarbon odor, reduced, sticky.		PID = 10.9 ppm	
	SS	75	15-16-21 (37)							WELL GRADED SAND WITH GRAVEL, (SW), fine to medium grained, gray (N4), wet, medium dense, subangular, well graded, with fine to medium gravel, hydrocarbon odor, reduced, with oyster and bivalve shell fragments.		PID = 1 ppm	
	SS	60	13-11-13 (24)							becomes less reduced to 10YR 5/2 grayish brown		PID = 1.1 ppm	
	SS	60	13-16-12 (28)	20	75	5	SW			increases in basaltic gravel content; contains autochthonous gravel of fine-medium sand		PID = 3.2 ppm	
	NR	0	7-10-10 (20)							becomes fine to medium sand, medium dense, poorly graded			
	SS	25	12-24-12 (36)							becomes well graded with 40% shell fragments		PID = 1.2 ppm	
20	SS	40	8-11-16 (27)									PID = 0.9 ppm	

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ENVIRONMENTAL BOREHOLE - GINT STD US GDT - 4/2/13 23:37 - C:\USERS\BEGEAL\DESKTOP\GINT\KB08.GPJ - C:\USERS\BEGEAL\DESKTOP\PMRF\GINT\GINT\HC56.GLB

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CLIENT NAVFAC Hawaii **NORTHING** 70225.097948 ft. **EASTING** 1660350.91043 ft. **DATUM** NAD83 State Plane (Zone 3) MSL
PROJECT NAME RI, RAA12 **PROJECT LOCATION** Halawa Main Gate, JBPHH, Oahu, HI

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	Depth (ft bgs)	MATERIAL DESCRIPTION	Elevation (ft amsl)	Environmental Data	WELL DIAGRAM
20													
	NR	0	15-16-21 (37)							WELL GRADED SAND WITH GRAVEL, (SW), fine to medium grained, gray (N4), wet, medium dense, subangular, well graded, with fine to medium gravel, hydrocarbon odor, reduced, with oyster and bivalve shell fragments. (continued)			
	SS	30	8-9-10 (19)	20	75	5	SW			becomes thinly interbedded gray 10YR 5/1, and dark gray, 10YR 3/1, fine sand, poorly graded	-16.3	PID = 2.4 ppm	
	SS	100	2-2-8 (10)							increase in shells to approximately 40%, trace lean clay		PID = 5 ppm	
25	SS	100	3-7-8 (15)						25.3		-16.3	PID = 29 ppm	
	SS	50	5-7-10 (17)	0	20	80	CH			SANDY FAT CLAY, (CH), dark gray (10YR 2/1), wet, medium stiff, some fine sand, hydrocarbon odor, reduced, slight sheen on exterior.		PID = 19.9 ppm	
	SS	100	11-16-17 (33)						28.0		-19.0	PID = 3.1 ppm	
30	SS	60	11-11-15 (26)							FAT CLAY, (CH), black (10YR 2/1), wet, medium stiff, trace fine sand, hydrocarbon odor, reduced, slight sheen on exterior, contains trace (10%) coarse sand-sized shell fragments.		PID = 5.5 ppm	
	SS	10	11-12-17 (29)	0	10	90	CH						
	SS	100	8-11-13 (24)									PID = 18.3 ppm	
35	SS	100	8-18-25 (43)							approximately 25% shell fragments		PID = 13.4 ppm	
	SS	50	16-17-28 (45)							becomes fine sandy for 0.25 ft		PID = 13.3 ppm	
	SS	75	20-25-30 (55)						38.5	10% shell fragments		PID = 14.9 ppm	
40	SS	5	15-21-38 (59)	30	70		CH			SANDY FAT CLAY, (CH), black (10YR 2/1), wet, medium stiff, some fine sand, hydrocarbon odor, reduced, slight sheen on exterior, sand constituent includes shell fragments.	-29.5	PID = 5 ppm	
										40% shell fragments and fine sandy		PID = 1.4	

ENVIRONMENTAL BOREHOLE - GINT STD US GDT - 4/2/13 23:37 - C:\USERS\BEGEALC\DESKTOP\KB08\GINT\GINT\KB08.GPJ - C:\USERS\BEGEALC\DESKTOP\PMRF\GINT\GINT\HC56.GLB

← Bentonite-

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CLIENT NAVFAC Hawaii **NORTHING** 70225.097948 ft. **EASTING** 1660350.91043 ft. **DATUM** NAD83 State Plane (Zone 3) MSL
PROJECT NAME RI, RAA12 **PROJECT LOCATION** Halawa Main Gate, JBPHH, Oahu, HI

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	Depth (ft bgs)	MATERIAL DESCRIPTION	Elevation (ft amsl)	Environmental Data	WELL DIAGRAM
	SS	100	25-50/5"		30	70	CH		44.0		-35.0	ppm	grout
45	SS	70	25-38-50 (88)							FAT CLAY, (CH), black and brown (10YR 3/3), moist, stiff, little fine sand, saprolite, trace shell fragments, pisolitic, colors are mottled and interbedded.		PID = 1.5 ppm	
	SS	70	32-40-50/5"							few reddish orange brown, weathered zeolites in dark brown clay		PID = 1.4 ppm	
	SS	70	10-30-36 (66)									PID = 0.1 ppm	
50	SS	100	10-30-50/3"							thin nodules of greenish yellow, 2.5Y 6/6		PID = 0.7 ppm	
	SS	100	10-29-45 (74)							contains fine hard gravel zenoliths or basalt breccia		PID = 0 ppm	
	SS	100	13-8-25 (33)									PID = 0.4 ppm	
55	SS	100	10-17-29 (46)		15	85	CH			contains few boudenage-like nodules of greenish yellow clay through to 57 ft bgs		PID = 0.4 ppm	
	SS	100	17-29-50/4"									PID = 0.2 ppm	
	SS	100	7-17-29 (46)							few dark reddish brown zenoliths and trace black regions approximately 1 sq. cm.		PID = 2 ppm	
	SS	100	7-32									PID = 0.3 ppm	
60	SS	100	8-17-25 (42)							few areas of reddish brown and black mottling (Fe and Mn oxidation)		PID = 0.6 ppm	
	SS	100	10-17-31 (48)									PID = 1 ppm	
	SS	100	7-17-39 (56)									PID = 0.5 ppm	
65	SS	100	17-38-45 (83)						65.0		-56.0		
				0	0	100	CL						

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ENVIRONMENTAL BOREHOLE - GINT STD US GDT - 4/2/13 23:37 - C:\USERS\BEGEALC\DESKT\OP\KB08\GINT\GINT\KB08.GPJ - C:\USERS\BEGEALC\DESKT\OP\MPRF\GINT\GINT\HC56.GLB

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CLIENT NAVFAC Hawaii **NORTHING** 70225.097948 ft. **EASTING** 1660350.91043 ft. **DATUM** NAD83 State Plane (Zone 3) MSL
PROJECT NAME RI, RAA12 **PROJECT LOCATION** Halawa Main Gate, JBPHH, Oahu, HI

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	Depth (ft bgs)	MATERIAL DESCRIPTION	Elevation (ft amsl)	Environmental Data	WELL DIAGRAM
	SS	60	8-17-50/2"							FAT CLAY, (CL), brown (10YR 4/6), moist, stiff, approximately 50% shell fragments. (continued)		PID = 0.6 ppm	
	SS	100	17-30-45 (75)	0	0	100	CL					PID = 0.4 ppm	
70	SS	100	17-50/5"						68.5	GRAVELLY FAT CLAY, (CH), pale brown (10YR 5/4), moist, stiff, subangular, some fine to coarse gravel, gravel is tuffaceous and autochthonous clay.	-59.5	PID = 0.5 ppm	
	SS	60	50/5"							tuff includes reddish inclusions		PID = 0.8 ppm	
	SS	70	27-50/5"									PID = 1.1 ppm	
75	RC	20		30	5	65	CH						
	SS	0	100/3"										
80													
	SS	100	100-50-75 (125)						81.5	FAT CLAY, (CH), gray and brown (10YR 4/1), moist, very stiff, little fine gravel, saprolite, gravel is tuffaceous and autochthonous, mottled, contains small regions of white, 10YR 8/2, and reddish orange, 5YR 5/8 (Fe oxidation) mottling, pisolitic.	-72.5		
	SS	100	8-23-90 (113)	10		90	CH						
85	SS	100	16-28-72 (100)						84.5	FAT CLAY, (CH), brown (10YR 4/3), moist, very stiff, little silt, saprolite, contains 1 ft sections that are blocky; pisolitic, little white and reddish brown mottling; bluish gray mottling throughout.	-75.5		
	SS	100	23-47-90 (137)			100	CH						
	SS	100	25-47-100/5"							very stiff, some blockiness when broken			

← PEL-PLUG Time-Release Wyoming Bentonite Pellets

ENVIRONMENTAL BOREHOLE - GINT STD US GDT - 4/2/13 23:38 - C:\USERS\BEGEALC\DESKTOP\KIB08\GINT\GINT\KB08.GPJ - C:\USERS\BEGEALC\DESKTOP\MRF\GINT\GINT\HC56.GLB

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CLIENT NAVFAC Hawaii **NORTHING** 70225.097948 ft. **EASTING** 1660350.91043 ft. **DATUM** NAD83 State Plane (Zone 3) MSL

PROJECT NAME RI, RAA12 **PROJECT LOCATION** Halawa Main Gate, JBPHH, Oahu, HI

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	Depth (ft bgs)	MATERIAL DESCRIPTION	Elevation (ft amsl)	Environmental Data	WELL DIAGRAM
90	SS	100	24-47-100/5"			100	CH		90.5	FAT CLAY, (CH), brown (10YR 4/3), moist, very stiff, little silt, saprolite, contains 1 ft sections that are blocky; pisolitic, little white and reddish brown mottling; bluish gray mottling throughout. <i>(continued)</i>	-81.5		
95	RC	50					IE		95.0	TUFF; Extrusive, (IE), dark gray (10YR 4/2), thickly laminated moderately weathered; damp; horizontal bedding, fine, hard, highly fractured with clay matrix and solid vitrified in alternating 1 ft sections; little evidence of pearly oyster shells; little Fe oxidation to orange brown with Mn oxidation evident on surfaces.	-86.0		
100	RC	80					IE		100.0	TUFF; Extrusive, (IE), dark gray (10YR 4/2), laminated moderately weathered; damp; inclined bedding, medium, hard, highly fractured with clay matrix and solid vitrified in alternating 1 ft sections; little evidence of pearly oyster shells; few high medium angle welded fractures with gypsum or calcite; bedding is approximately 45 degrees.	-91.0		
105	RC	80				100	CH		105.0	FAT CLAY, (CH), dark purpleish gray and pale brown (10R 2.5/2), moist, very stiff, saprolite, dark purpleish gray contains reddish brown 5YR 5/8 (Fe oxidation) and brown, 10YR 4/4, mottling; pale grey contains small areas of greenish-brown, 2.5Y 5/4 mottling, specks of Fe oxidation, little calcareous fine gravel from 102.5 to 103 ft bgs.	-96.0		

Bottom of borehole at 105.0 feet.

← Lapis Lustre #3 Monterey Sand
← 0.010-slot Schedule 40 PVC

ENVIRONMENTAL BOREHOLE - GINT STD US GDT - 4/2/13 23:38 - C:\USERS\BEGEALC\DESKTOP\KIB08\GINT\KIB08.GPJ - C:\USERS\BEGEALC\DESKTOP\MRF\GINT\GINT\HC86.GLB

Monitoring Wells
Remedial Action Area 12
Pearl Harbor Naval Complex
Coordinates are referred to NAD83 State Plane (Zone 3).
Elevations are referred to Mean Sea Level (M.S.L.).
Units: U.S. Feet

<u>Well</u>	<u>Northing</u>	<u>Easting</u>	<u>Elevation</u>	<u>Note</u>	<u>Date</u>	<u>Comment</u>
444-08	69618.47	1659126.96	18.57	Top of AC	3/14/2014	Temporary boreholes
444-09	69688.34	1659172.72	21.16	Top of Concrete	3/14/2014	Temporary boreholes
444-10	69685.04	1659124.18	21.19	Top of Concrete	3/14/2014	Temporary boreholes
444-11	69778.36	1659255.86	21.18	Top of Concrete	3/14/2014	Temporary boreholes
444-12	69891.74	1659394.15	17.82	Top of AC	3/14/2014	Temporary boreholes
Boring 444-05	69647.80	1659069.02	17.15	Top of Conc.	10/9/2013	Temporary boreholes
Boring 444-06	69676.66	1659183.72	18.83	Top of Conc.	10/9/2013	Temporary boreholes
Boring 444-07	69733.81	1659149.98	17.58	Top of Conc.	10/9/2013	Temporary boreholes
LOCH PT	69798.11	1659776.96	10.74	Top of 2" PVC	4/5/2013	Temporary for Tidal Study
MW25	70014.04	1659838.76	7.93	Ground	4/5/2013	Revised due to road work
MW25	70014.04	1659838.76	7.59	Top of 4" PVC	4/5/2013	
MW-640	70019.19	1659911.14	8.19	Ground	6/15/2009	
MW-640	70019.19	1659911.14	7.91	Top of 2" Casing	6/15/2009	
RAA12-01	69900.55	1659849.36	8.06	Ground	6/15/2009	
RAA12-01	69900.55	1659849.36	7.89	Top of 2" Casing	6/15/2009	
RAA12-02	70050.94	1659880.79	8.24	Ground	6/15/2009	abandoned
RAA12-02	70050.94	1659880.79	8.09	Top of 2" Casing	6/15/2009	
RAA12-03	70122.88	1659836.06	8.41	Ground	6/15/2009	
RAA12-03	70122.88	1659836.06	8.29	Top of 2" Casing	6/15/2009	
RAA12-04	70147.23	1659674.91	19.02	Ground	6/15/2009	abandoned
RAA12-04	70147.23	1659674.91	18.78	Top of 2" Casing	6/15/2009	
RAA12-05	70097.94	1659979.28	8.24	Ground	6/15/2009	
RAA12-05	70097.94	1659979.28	8.08	Top of 2" Casing	6/15/2009	
RAA12-06	69952.29	1659677.09	20.57	Ground	4/5/2013	
RAA12-06	69952.29	1659677.09	20.25	Top of 2" Casing	4/5/2013	Revised due to cutting TOC
RAA12-06	69952.29	1659677.09	21.27	Riser	4/5/2013	Temporary for Tidal Study
RAA12-06A	69937.33	1659680.64	20.35	Ground	6/15/2009	
RAA12-06A	69937.33	1659680.64	20.03	Top of 2" PVC	4/5/2013	
RAA12-06A	69937.33	1659680.64	21.06	Riser	4/5/2013	Temporary for Tidal Study
RAA12-06B	69921.04	1659689.57	20.61	Ground	6/15/2009	
RAA12-06B	69921.04	1659689.57	20.18	Top of 2" Casing	6/15/2009	
RAA12-06B	69921.04	1659689.57	21.20	Riser	4/5/2013	Temporary for Tidal Study
RAA12-07	69841.47	1659749.31	8.11	Ground	6/15/2009	formally RAA12-07B
RAA12-07	69841.47	1659749.31	8.07	Top of 2" Casing	6/15/2009	
RAA12-07A	69875.42	1659772.36	8.42	Top of Nail	6/15/2009	abandoned
RAA12-08	70082.51	1660026.69	8.38	Ground	6/15/2009	
RAA12-08	70082.51	1660026.69	8.29	Top of 2" Casing	6/15/2009	
RAA12-09	70334.40	1660082.18	9.25	Ground	6/15/2009	
RAA12-09	70334.40	1660082.18	9.22	Top of 2" Casing	6/15/2009	
RAA12-09	70334.40	1660082.18	10.22	Riser	4/5/2013	Temporary for Tidal Study
RAA12-09	70334.40	1660082.18	9.25	Ground	6/15/2009	
RAA12-09	70334.40	1660082.18	9.22	Top of 2" Casing	6/15/2009	
RAA12-09A	70337.53	1660073.90	8.94	Ground	6/15/2009	
RAA12-09A	70337.53	1660073.90	8.68	Top of 2" Casing	6/15/2009	
RAA12-09A	70337.53	1660073.90	9.70	Riser	4/5/2013	Temporary for Tidal Study
RAA12-10	70141.58	1660082.17	8.64	Ground	6/15/2009	
RAA12-10	70141.58	1660082.17	8.58	Top of 2" Casing	6/15/2009	
RAA12-11	69962.30	1659584.69	19.21	Ground	6/15/2009	
RAA12-11	69962.30	1659584.69	18.91	Top of 2" Casing	6/15/2009	
RAA12-12	69861.52	1659649.64	17.88	Ground	6/15/2009	
RAA12-12	69861.52	1659649.64	17.58	Top of 2" Casing	6/15/2009	
RAA12-13	70362.68	1659622.49	19.18	Ground	6/15/2009	
RAA12-13	70362.68	1659622.49	18.75	Top of 2" Casing	6/15/2009	



<u>Well</u>	<u>Northing</u>	<u>Easting</u>	<u>Elevation</u>	<u>Note</u>	<u>Date</u>	<u>Comment</u>
RAA12-13A	70354.21	1659625.73	19.29	Ground	6/15/2009	
RAA12-13A	70354.21	1659625.73	18.92	Top of 2" Casing	6/15/2009	
RAA12-13A	70354.21	1659625.73	19.93	Riser	4/5/2013	Temporary for Tidal Study
RAA12-14A	69903.51	1659840.94	7.98	Ground	6/15/2009	
RAA12-14A	69903.51	1659840.94	7.48	Top of 2" Casing	6/15/2009	
RAA12-15A	69854.41	1659659.27	17.87	Ground	6/15/2009	
RAA12-15A	69854.41	1659659.27	17.50	Top of 2" Casing	6/15/2009	
RAA12-16A	69472.92	1659300.36	9.30	Top of Well	10/9/2013	
RAA12-16A	69472.92	1659300.36	8.84	Top of 2" PVC	10/9/2013	
RAA12-16A	69472.92	1659300.36	9.28	Top of A.C.	10/9/2013	
RAA12-17A	70223.85	1660342.86	8.09	Top of Well	10/9/2013	
RAA12-17A	70223.85	1660342.86	7.71	Top of 2" PVC	10/9/2013	
RAA12-17A	70223.85	1660342.86	8.07	Top of A.C.	10/9/2013	
RAA12-17B	70234.24	1660342.98	8.09	Top of Well	4/5/2013	
RAA12-17B	70234.24	1660342.98	7.78	Top of 2" PVC	4/5/2013	
RAA12-17B	70234.24	1660342.98	8.78	Riser	4/5/2013	Temporary for Tidal Study
RAA12-18A	70644.41	1660202.39	9.94	Top of Well	4/5/2013	
RAA12-18A	70644.41	1660202.39	9.54	Top of 2" PVC	4/5/2013	
RAA12-18A	70644.41	1660202.39	10.53	Riser	4/5/2013	Temporary for Tidal Study
RAA12-19A	70636.82	1659751.77	10.20	Top of Well	4/5/2013	
RAA12-19A	70636.82	1659751.77	9.85	Top of 2" PVC	4/5/2013	
RAA12-19A	70636.82	1659751.77	10.85	Riser	4/5/2013	Temporary for Tidal Study
RAA12-20A	70433.18	1659491.50	10.07	Top of Well	4/5/2013	
RAA12-20A	70433.18	1659491.50	9.65	Top of 2" PVC	4/5/2013	
RAA12-20A	70433.18	1659491.50	10.66	Riser	4/5/2013	Temporary for Tidal Study
RAA12-21	70079.34	1659489.93	17.44	Top of Well	4/5/2013	
RAA12-21	70079.34	1659489.93	16.87	Top of 2" PVC	4/5/2013	
RAA12-21	70079.34	1659489.93	17.94	Riser	4/5/2013	Temporary for Tidal Study
RAA12-21A	70072.23	1659496.04	17.56	Top of Well	4/5/2013	
RAA12-21A	70072.23	1659496.04	17.04	Top of 2" PVC	4/5/2013	
RAA12-21A	70072.23	1659496.04	18.10	Riser	4/5/2013	Temporary for Tidal Study
RAA12-22	70307.92	1660496.57	8.21	Top of Well	4/5/2013	
RAA12-22	70307.92	1660496.57	7.88	Top of 2" PVC	4/5/2013	
RAA12-22	70307.92	1660496.57	8.89	Riser	4/5/2013	Temporary for Tidal Study
RAA12-22A	70312.17	1660505.65	7.91	Top of Well	4/5/2013	
RAA12-22A	70312.17	1660505.65	7.63	Top of 2" PVC	4/5/2013	
RAA12-22A	70312.17	1660505.65	8.62	Riser	4/5/2013	Temporary for Tidal Study
RAA12-23A	70225.32	1660172.33	8.04	Top of Well	4/5/2013	
RAA12-23A	70225.32	1660172.33	7.60	Top of 2" PVC	4/5/2013	
RAA12-23A	70225.32	1660172.33	8.60	Riser	4/5/2013	Temporary for Tidal Study
RAA12-24A	70103.67	1659152.25	8.62	Top of Well	4/5/2013	
RAA12-24A	70103.67	1659152.25	8.33	Top of 2" PVC	4/5/2013	
RAA12-24A	70103.67	1659152.25	9.35	Riser	4/5/2013	Temporary for Tidal Study
RAA12-25A	69867.72	1658955.64	8.02	Top of Well	4/5/2013	
RAA12-25A	69867.72	1658955.64	7.72	Top of 2" PVC	4/5/2013	
RAA12-25A	69867.72	1658955.64	8.71	Riser	4/5/2013	Temporary for Tidal Study
RAA12-26A	70783.20	1660651.44	10.55	Top of Well	4/5/2013	
RAA12-26A	70783.20	1660651.44	10.24	Top of 2" PVC	4/5/2013	
RAA12-26A	70783.20	1660651.44	11.25	Riser	4/5/2013	Temporary for Tidal Study
SW29	70636.72	1659804.50	10.80	Ground	6/15/2009	
SW29	70636.72	1659804.50	10.62	Top of 1" Casing	6/15/2009	
SW30	70200.94	1660015.34	9.25	Ground	6/15/2009	abandoned
SW30	70200.94	1660015.34	9.07	Top of 1" Casing	6/15/2009	

CLIENT NAVFAC Hawaii **NORTHING** 69397.82 ft. **EASTING** 1663364.81 ft. **DATUM** NAD 1983 Hawaii State Plane Zone 4
PROJECT NAME HC26 - Makalapa Crater GSA **PROJECT LOCATION** JBPHH, Makalapa, Oahu, HI
DATE STARTED 3/6/2013 3:00:00 PM **COMPLETED** 3/27/2013 4:30:00 PM **GROUND ELEVATION** 27.22 ft **HOLE SIZE** 2.25 in.
DRILLING CONTRACTOR J. Shjegstad; Geotek Hawaii **GROUND WATER LEVEL:**
DRILLING METHOD: Direct Push **AT TIME OF DRILLING** 63.00 ft / Elev -35.78 ft
LOGGED BY P. LaPlaca **CHECKED BY** P. LaPlaca **END OF DRILLING** ---
SAMPLER TYPE/ADVANCEMENT **24 HOURS AFTER DRILLING** 44.00 ft / Elev -16.78 ft

ENV: BH-1 - GINT STD US.GDT - 4/11/14 08:55 - P:\ENV\FEDERAL\NAVY\CLEAN - 411114 08:55 - P:\ENV\FEDERAL\NAVY\CLEAN - I:\ICTO HC26 (60134474)\50_DATA\GINT\LIBRARY\HC26.GLB

DEPTH (ft)	SAMPLE TYPE NUMBER	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	Elevation (ft amsl)
0								
5	AL FX125	0	0	100	ML		SILT , (ML), brown (7.5YR 5/3 (brown)), dry, soft, low plasticity, with clay, no odor, no staining, 60% silt, 40% clay.	22.2
10	AL FX126	0	0	100	CL		LEAN CLAY , (CL), brown (7.5YR 5/3 (brown)), dry, soft, low plasticity, with silt, no odor, no staining, 60% clay, 40% silt.	14.2
15	AL FX127	0	0	100	CL		LEAN CLAY , (CL), brown (7.5YR 5/3 (brown)), moist, medium dense, medium plasticity, with silt, no odor, no staining, 70% clay, 30% silt.	11.2
20		0	0	100	CL		LEAN CLAY , (CL), dark brown (7.5YR 3/2 (dark brown)), moist, medium dense, medium plasticity, trace silt, no odor, no staining, 90% clay, 10% silt.	


CLIENT NAVFAC Hawaii NORTHING 69397.82 ft. EASTING 1663364.81 ft. DATUM NAD 1983 Hawaii State Plane Zone 4
 PROJECT NAME HC26 - Makalapa Crater GSA PROJECT LOCATION JBPBH, Makalapa, Oahu, HI

DEPTH (ft)	SAMPLE TYPE NUMBER	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	Depth (ft bgs)	MATERIAL DESCRIPTION	Elevation (ft amsl)
25		0	0	100	CL		26.0	LEAN CLAY , (CL), dark brown (7.5YR 3/2 (dark brown)), moist, medium dense, medium plasticity, trace silt, no odor, no staining, 90% clay, 10% silt. <i>(continued)</i>	1.2
30	AL FX128							FAT CLAY , (CH), dark brown (7.5YR 3/2), moist, medium dense, high plasticity, trace silt, no odor, no staining, 90% clay, 10% silt.	
35		0	0	100	CH				
40									
45									

(Continued Next Page)

CLIENT NAVFAC Hawaii NORTHING 69397.82 ft. EASTING 1663364.81 ft. DATUM NAD 1983 Hawaii State Plane Zone 4
 PROJECT NAME HC26 - Makalapa Crater GSA PROJECT LOCATION JBPBH, Makalapa, Oahu, HI







ENV/BH-1 - GINT STD US.GDT - 4/11/14 08:55 - P:\ENV\FEDERAL\NAVY\CLEAN_I\IIC TO HC26 (60134474)\50_DATA\GINT\LIBRARY\HC26.GLB

DEPTH (ft)	SAMPLE TYPE NUMBER	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	Depth (ft bgs)	MATERIAL DESCRIPTION	Elevation (ft amsl)	
50		0	0	100	CH			FAT CLAY , (CH), dark brown (7.5YR 3/2), moist, medium dense, high plasticity, trace silt, no odor, no staining, 90% clay, 10% silt. <i>(continued)</i>		
55										
60		0	0	100	CH		60.0	FAT CLAY , (CH), dark gray (10YR 4/2), dry, firm, high plasticity, no odor, no staining, 100% Clay.	-32.8	
65							62.0	Clay heaving up center of hollow-stem augers; no sample could be collected.	-34.8	
							69.0		-41.8	

Bottom of borehole at 69.0 feet.




CLIENT NAVFAC Hawaii **NORTHING** 70504.42 ft. **EASTING** 1663867.10 ft. **DATUM** NAD 1983 Hawaii State Plane Zone 4
PROJECT NAME HC26 - Makalapa Crater GSA **PROJECT LOCATION** JBPHH, Makalapa, Oahu, HI
DATE STARTED 3/1/2013 1:40:00 PM **COMPLETED** 3/21/2013 2:45:00 PM **GROUND ELEVATION** 48.92 ft **HOLE SIZE** 8.25 in.
DRILLING CONTRACTOR J. Shjegstad; Geotek Hawaii **GROUND WATER LEVEL:**
DRILLING METHOD: Direct Push **AT TIME OF DRILLING** ---
LOGGED BY D. Coulombe **CHECKED BY** P. LaPlaca **END OF DRILLING** ---
SAMPLER TYPE/ADVANCEMENT _____ **24 HOURS AFTER DRILLING** ---

ENV/BH-1 - GINT STD US.GDT - 4/11/14 09:04 - P:\ENV\FEDERAL\NAVY\CLEAN - 41\1114 09:04 - P:\ENV\FEDERAL\NAVY\CLEAN - I\ICTO HC26 - 60134474\50 - DATA\GINT\LIBRARY\HC26.GLB


DEPTH (ft)	SAMPLE TYPE NUMBER	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	Elevation (ft amsl)	REMARKS
0									
	AL FX082	20	20	60	CL		GRAVELLY LEAN CLAY WITH SAND (CL), brown (7.5YR 4/2 (brown)), dry, medium dense, low plasticity, little gravel, little sand, no odor, no staining.	43.9	
5							Void Space	40.9	No sample collected; sample 8-11 ft
	AL FX083	0	0	100	ML		SILT (ML), dark reddish brown with pale green (5YR 3/4 (dark reddish brown / moderate brown)), no odor, 5YR 3/4 to Gley 6/2 (pale green) debris and possible copper staining; 50% silt, 50% debris (rusted metal, wood, fibrous material and concrete).	36.4	
		100	0	0	GP		POORLY GRADED GRAVEL (GP), dark reddish brown with pale green (5YR 3/4 (dark reddish brown / moderate brown)), dry, no odor, 50% coralline gravel, 50% debris (rusted metal, wood, fibrous material and concrete); possible copper staining.	35.9	
		0	0	100	ML		SILT (ML), dark reddish brown with pale green (5YR 3/4 (dark reddish brown / moderate brown)), no odor, 50% silt, 50% debris (rusted metal, wood, fibrous material and concrete); possible copper staining.	34.9	
15	AL FX084	0	0	100	CH		FAT CLAY (CH), dark brown (7.5YR 3/3 (dark brown)), no odor.	31.9	
							FAT CLAY (CH), dark brown (7.5YR 3/3 (dark brown)), dry, hard, high plasticity, no odor, no staining.		
20		0	0	100	CH				

CLIENT NAVFAC Hawaii NORTHING 70504.42 ft. EASTING 1663867.10 ft. DATUM NAD 1983 Hawaii State Plane Zone 4
 PROJECT NAME HC26 - Makalapa Crater GSA PROJECT LOCATION JBPHH, Makalapa, Oahu, HI

ENV\BH-1 - GINT STD US.GDT - 4/11/14 09:04 - P:\ENV\FEDERAL\NAVY\CLEAN_I\IIC\TO HC26 (60134474)\50_DATA\GINT\LIBRARY\HC26.GLB

DEPTH (ft)	SAMPLE TYPE NUMBER	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	Depth (ft bgs)	MATERIAL DESCRIPTION	Elevation (ft amsl)	REMARKS
25	AL FX085	0	0	100	CH			FAT CLAY , (CH), dark brown (7.5YR 3/3 (dark brown)), dry, hard, high plasticity, no odor, no staining. <i>(continued)</i>		
30										
35							35.0	POORLY GRADED SAND WITH GRAVEL , (SP), pale green (5Y 6/2 (light olive gray)), no odor.	13.9	
40		10	90	0	SP					
45					IE		40.0	TUFF ; Extrusive, (IE), (7.5YR 4/3), massive completely weathered; fine to medium, Saprolite; IE.	8.9	

CLIENT NAVFAC Hawaii NORTHING 70504.42 ft. EASTING 1663867.10 ft. DATUM NAD 1983 Hawaii State Plane Zone 4
 PROJECT NAME HC26 - Makalapa Crater GSA PROJECT LOCATION JBPHH, Makalapa, Oahu, HI

DEPTH (ft)	SAMPLE TYPE NUMBER	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	Elevation (ft amsl)	REMARKS
					IE		TUFF ; Extrusive, (IE), (7.5YR 4/3), massive completely weathered; fine to medium, Saprolite; IE. (continued)		
49.0								-0.1	






Bottom of borehole at 49.0 feet.

Refusal at 49 ft; hard grinding

ENV\BH-1 - GINT STD US.GDT - 4/11/14 09:04 - P:\ENV\FEDERAL\NAVY\CLEAN_I\ICTO HC26 (60134474)\50_DATA\GINT\HC26.GPJ - \USHNL\IFP003\DATA\PROJECTS\ENV\FEDERAL\NAVY\CLEAN_I\ICTO HC26 (60134474)\50_DATA\GINT\LIBRARY\HC26.GLB

CLIENT NAVFAC Hawaii **NORTHING** 70311.18 ft. **EASTING** 1663374.07 ft. **DATUM** NAD 1983 Hawaii State Plane Zone 4
PROJECT NAME HC26 - Makalapa Crater GSA **PROJECT LOCATION** JBPHH, Makalapa, Oahu, HI
DATE STARTED 2/27/2013 1:20:00 PM **COMPLETED** 4/1/2013 12:45:00 PM **GROUND ELEVATION** 46.99 ft **HOLE SIZE** 2.25 DP, 8.25 HSA in.
DRILLING CONTRACTOR T. Robertson; Geotek Hawaii **GROUND WATER LEVEL:**
DRILLING METHOD: Direct Push **AT TIME OF DRILLING** ---
LOGGED BY P. LaPlaca **CHECKED BY** P. LaPlaca **END OF DRILLING** ---
SAMPLER TYPE/ADVANCEMENT **24 HOURS AFTER DRILLING** ---

ENV: BH-1 - GINT STD US.GDT - 4/11/14 09:07 - P:\ENV\FEDERAL\NAVY\CLEAN - 411114 09:07 - P:\ENV\FEDERAL\NAVY\CLEAN - I:\ICTO HC26 (60134474)\50 - DATA\GINT\LIBRARY\HC26.GLB

DEPTH (ft)	SAMPLE TYPE NUMBER	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	Depth (ft bgs)	MATERIAL DESCRIPTION	Elevation (ft amsl)	REMARKS
0										
4.0	AL FX046/047	20	0	80	ML		4.0	GRAVELLY SILT , (ML), dark reddish brown (10YR 6/3 (pale brown)), fine to medium grained, dry, soft, angular, low plasticity, little gravel, with clay, no odor, no staining, 50% silt, 30% basalt gravel.	43.0	2/27/2013: Refusal at 10ft with direct push; 3/18/2013: SSA (4inch diameter) to approximately 10ft to get past area of concrete debris; 4/1/2013: Sampled with direct push to 32ft
5	AL FX048	20	0	80	ML			GRAVELLY SILT , (ML), light brown (7.5YR 6/3 (light brown)), dry, soft, low plasticity, little gravel, with clay, no odor, no staining.		
10							10.0	GRAVELLY LEAN CLAY , (CL), light brown (7.5YR 6/3 (light brown)), fine to medium grained, dry, angular, low plasticity, little gravel, and silt, some clay, no odor, no staining, 50% silt, 30% clay; gravel (5-25mm concrete and basalt).	37.0	Refusal at 10ft (concrete) with direct push ; Classified during DP sampling to 10ft
15	AL FX336/FX337				CL		15.0	FAT CLAY , (CH), dark brown (7.5YR 4/3 (brown)), moist to wet, medium dense, high plasticity, and clay, trace silt, no odor, no staining.	32.0	Perched water
20		0	0	100	CH					







CLIENT NAVFAC Hawaii NORTHING 70311.18 ft. EASTING 1663374.07 ft. DATUM NAD 1983 Hawaii State Plane Zone 4
 PROJECT NAME HC26 - Makalapa Crater GSA PROJECT LOCATION JBPHH, Makalapa, Oahu, HI

ENV/BH-1 - GINT STD US.GDT - 4/11/14 09:07 - P:\ENV\FEDERAL\NAVY\CLEAN_I\IIC\TO HC26 (60134474)\50_DATA\GINT\LIBRARY\HC26.GLB

DEPTH (ft)	SAMPLE TYPE NUMBER	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	Depth (ft bgs)	MATERIAL DESCRIPTION	Elevation (ft amsl)	REMARKS
25						[Hatched Pattern]				
30	AL FX338							FAT CLAY , (CH), dark brown (7.5YR 4/3 (brown)), moist to wet, medium dense, high plasticity, and clay, trace silt, no odor, no staining. (continued)		
35		0	0	100	CH					32ft TD with direct push
40										Perched water 35-40ft moist, but not saturated from 40-61ft
45										

CLIENT NAVFAC Hawaii NORTHING 70311.18 ft. EASTING 1663374.07 ft. DATUM NAD 1983 Hawaii State Plane Zone 4
 PROJECT NAME HC26 - Makalapa Crater GSA PROJECT LOCATION JBPBH, Makalapa, Oahu, HI














ENV\BH-1 - GINT STD US.GDT - 4/11/14 09:07 - P:\ENV\FEDERAL\NAVY\CLEAN - I\IIC\TO HC26 (60134474)\50 - DATA\GINT\HC26.GPJ - \USHNL\FP003\DATA\PROJECTS\ENV\FEDERAL\NAVY\CLEAN - I\IIC\TO HC26 (60134474)\50 - DATA\GINT\LIBRARY\HC26.GLB

DEPTH (ft)	SAMPLE TYPE NUMBER	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	Depth (ft bgs)	MATERIAL DESCRIPTION	Elevation (ft amsl)	REMARKS
50		0	0	100	CH			FAT CLAY , (CH), dark brown (7.5YR 4/3 (brown)), moist to wet, medium dense, high plasticity, and clay, trace silt, no odor, no staining. <i>(continued)</i> FAT CLAY , (CH), very dark gray (10YR 3/1 (very dark gray)), moist to wet, high plasticity, no odor, no staining.		
55		0	0	100	CH			FAT CLAY , (CH), very dark gray (7.5YR 3/1 (very dark gray)), high plasticity, no silt, no odor, no staining, 100% clay.		
60		0	0	100	CH					
61.0							61.0		-14.0	
65		20	70	10	SW			WELL GRADED SAND , (SW), pale brown (10YR 8/3 (very pale brown)), wet, little gravel, trace clay, no odor, no staining, Coralline sand and gravel.		Water filled in after punching through clay at 62ft
65.0							65.0		-18.0	

Bottom of borehole at 65.0 feet.

CLIENT NAVFAC Hawaii **NORTHING** 69574.94 ft. **EASTING** 1662526.32 ft. **DATUM** NAD 1983 Hawaii State Plane Zone 4
PROJECT NAME HC26 - Makalapa Crater GSA **PROJECT LOCATION** JBPHH, Makalapa, Oahu, HI
DATE STARTED 2/28/2013 1:40:00 PM **COMPLETED** 2/28/2013 2:30:00 PM **GROUND ELEVATION** 51.23 ft **HOLE SIZE** 2.25 in.
DRILLING CONTRACTOR J. Shjegstad; Geotek Hawaii **GROUND WATER LEVEL:**
DRILLING METHOD: Direct Push **AT TIME OF DRILLING** ---
LOGGED BY D. Coulombe **CHECKED BY** P. LaPlaca **END OF DRILLING** ---
SAMPLER TYPE/ADVANCEMENT **24 HOURS AFTER DRILLING** ---

ENV: BH-1 - GINT STD US.GDT - 4/11/14 09:10 - P:\ENV\FEDERAL\NAVY\CLEAN - 411114 09:10 - P:\ENV\FEDERAL\NAVY\CLEAN - I:\ICTO HC26 (60134474)\50 - DATA\GINT\LIBRARY\HC26.GLB
 I:\ICTO HC26 (60134474)\50 - DATA\GINT\LIBRARY\HC26.GLB
 I:\USHNL\F003\DATA\PROJECTS\ENV\FEDERAL\NAVY\CLEAN - I:\USHNL\F003\DATA\PROJECTS\ENV\FEDERAL\NAVY\CLEAN - I:\USHNL\F003\DATA\PROJECTS\ENV\FEDERAL\NAVY\CLEAN - I:\USHNL\F003\DATA\PROJECTS\ENV\FEDERAL\NAVY\CLEAN

DEPTH (ft)	SAMPLE TYPE NUMBER	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	Depth (ft bgs)	MATERIAL DESCRIPTION	Elevation (ft amsl)	REMARKS
0										
	AL FX065/FX066	10	30	60	ML		2.0	GRAVELLY SILT WITH SAND. (ML), brown (7.5YR 4/3), dry, soft, low plasticity, little gravel, with sand, no odor, no staining, Coral gravel and wood debris.	49.2	
		10	30	60	ML		3.0	GRAVELLY SILT WITH SAND. (ML), grayish brown (10YR 5/2), dry, soft, low plasticity, little gravel, with sand, no odor, no staining, Same as above, more sand.	48.2	
		10	40	50	ML		5.0	GRAVELLY SILT WITH SAND. (ML), reddish brown (10YR 4/3), dry, soft, low plasticity, trace gravel, with sand, no odor, no staining.	46.2	
5	AL FX067	0	40	60	ML		6.0	SANDY SILT. (ML), brown (10YR 5/3 (brown)), dry, soft, low plasticity, with sand, no odor, no staining.	45.2	
		90	10	0	GP		6.5	POORLY GRADED GRAVEL WITH SAND. (GP), pale brown (10YR 6/3), dry, hard, trace sand, no odor, no staining, Coral gravel.	44.7	
								GRAVELLY LEAN CLAY WITH SAND. (CL), brown (10YR 5/3), dry, medium dense, medium plasticity, trace gravel, with sand.		
		10	25	65	CL		10.0		41.2	
10		20	30	50	ML		11.0	GRAVELLY SILT WITH SAND. (ML), dark brown (10YR 3/3), dry, medium dense, low plasticity, little gravel, with sand, trace organics, no odor, no staining, Trace organic material.	40.2	
		30	40	30	GP		14.0	SILTY GRAVEL WITH SAND. (GP), dark brown (10YR 3/3), dry, medium dense, with gravel, with sand, no odor, no staining, Coralline gravel.	37.2	
		30	40	30	GP		15.0	SILTY GRAVEL WITH SAND. (GP), reddish brown (5YR 4/3), dry, medium dense, with gravel, with sand, no odor, no staining.	36.2	
15	AL FX068				IE		16.0	TUFF; Extrusive, (IE), (10YR 6/2), bedded moderately weathered; dry, medium hard; IE.	35.2	
								TUFF; Extrusive, (IE), (7.5YR 4/3), bedded slightly weathered; dry; very hard, Stack of 1/4 inch "poker chips" in sampler; IE.		
20					IE					Refusal at 18ft

CLIENT NAVFAC Hawaii NORTHING 69574.94 ft. EASTING 1662526.32 ft. DATUM NAD 1983 Hawaii State Plane Zone 4
 PROJECT NAME HC26 - Makalapa Crater GSA PROJECT LOCATION JBPHH, Makalapa, Oahu, HI

DEPTH (ft)	SAMPLE TYPE NUMBER	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	Depth (ft bgs)	MATERIAL DESCRIPTION	Elevation (ft amsl)	REMARKS
25										
30										
35					IE					
40										
45										
								TUFF ; Extrusive, (IE), (7.5YR 4/3), bedded slightly weathered; dry; very hard, Stack of 1/4 inch "poker chips" in sampler; IE. <i>(continued)</i>		

CLIENT NAVFAC Hawaii NORTHING 69574.94 ft. EASTING 1662526.32 ft. DATUM NAD 1983 Hawaii State Plane Zone 4
 PROJECT NAME HC26 - Makalapa Crater GSA PROJECT LOCATION JBPHH, Makalapa, Oahu, HI

DEPTH (ft)	SAMPLE TYPE NUMBER	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	Elevation (ft amsl)	REMARKS
50					IE		TUFF ; Extrusive, (IE), (7.5YR 4/3), bedded slightly weathered; dry; very hard, Stack of 1/4 inch "poker chips" in sampler; IE. (continued)		
55								55.0	

Bottom of borehole at 55.0 feet.

ENV/BH-1 - GINT STD US.GDT - 4/11/14 09:10 - P:\ENV\FEDERAL\NAVY\CLEAN_I\IIC\TO HC26 (60134474)\50_DATA\GINT\LIBRARY\HC26.GLB






CLIENT NAVFAC Hawaii **NORTHING** 71046.71 ft. **EASTING** 1662971.64 ft. **DATUM** NAD 1983 Hawaii State Plane Zone 4
PROJECT NAME HC26 - Makalapa Crater GSA **PROJECT LOCATION** JBPBH, Makalapa, Oahu, HI
DATE STARTED 3/22/2013 9:08:00 AM **COMPLETED** 3/25/2013 2:45:00 PM **GROUND ELEVATION** 52.27 ft **HOLE SIZE** 2 in.
DRILLING CONTRACTOR J. Shjegstad; Geotek Hawaii **GROUND WATER LEVEL:**
DRILLING METHOD: Direct Push **AT TIME OF DRILLING** ---
LOGGED BY T. Ashton **CHECKED BY** P. LaPlaca **END OF DRILLING** ---
SAMPLER TYPE/ADVANCEMENT **24 HOURS AFTER DRILLING** ---

ENV: BH-1 - GINT STD US.GDT - 4/11/14 09:16 - P:\ENV\FEDERAL\NAVY\CLEAN - I\ICTO HC26 (60134474)\50 - DATA\GINT\LIBRARY\HC26.GLB
 I\USHNL\IFP003\DATA\PROJECTS\ENV\FEDERAL\NAVY\CLEAN - I\ICTO HC26 (60134474)\50 - DATA\GINT\LIBRARY\HC26.GLB

DEPTH (ft)	SAMPLE TYPE NUMBER	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	Depth (ft bgs)	MATERIAL DESCRIPTION	Elevation (ft amsl)	REMARKS
0							0.5	ASPHALT , (AF), hydrocarbon odor, Light odor.	51.8	
	AL FX228	80	0	20	AF		1.0	WELL GRADED SAND WITH GRAVEL , (SW), yellow (10YR 8/6 (yellow / pale yellowish orange)), fine grained, moist, angular, and gravel, no odor, no staining, Sandy fill below asphalt.	51.3	Light odor; sandy fill below asphalt
		40	0	60	SW			LEAN CLAY WITH GRAVEL , (CL), dark yellowish brown (10YR 4/4 (dark yellowish brown)), fine to medium grained, moist, subangular, low plasticity, with gravel, no odor, no staining.		
		30	0	70	CL		3.0		49.3	
								LEAN CLAY WITH GRAVEL , (CL), dark yellowish brown (10YR 3/4 (dark yellowish brown)), fine to medium grained, moist, medium plasticity, little gravel, no odor, no staining.		
5		20	0	80	CL		6.0		46.3	
	AL FX229							SANDY LEAN CLAY , (CL), brown (10YR 4/3 (brown)), dry to moist, low plasticity, little sand, no odor, no staining.		
		0	10	90	CL		8.0		44.3	
								SANDY LEAN CLAY , (CL), yellowish brown (10YR 5/4 (yellowish brown / moderate yellowish brown)), moist, low plasticity, little sand, no odor, no staining, Perched irrigation water caused moist soil.		
10		0	20	80	CL		10.0		42.3	
								SANDY LEAN CLAY , (CL), (10YR 5/4), wet, trace sand, Poor recovery; sandy slough (10%).		
		0	10	90	CL		12.0		40.3	
								No Recovery		
							14.0		38.3	
15								LEAN CLAY , (CL), very dark gray (10YR 3/1 (very dark gray)), moist, low plasticity, no odor, no staining.		Perched water. Cuttings very moist.
	AL FX230/FX231	0	0	100	CL		18.0		34.3	
								FAT CLAY , (CH), very dark gray (10YR 3/1 (very dark gray)), moist, high plasticity, no odor, no staining.		
20		0	0	100	CH					


CLIENT NAVFAC Hawaii NORTHING 71046.71 ft. EASTING 1662971.64 ft. DATUM NAD 1983 Hawaii State Plane Zone 4
 PROJECT NAME HC26 - Makalapa Crater GSA PROJECT LOCATION JBPHH, Makalapa, Oahu, HI

ENV\BH-1 - GINT STD US.GDT - 4/11/14 09:16 - P:\ENV\FEDERAL\NAVY\CLEAN_I\IIC\TO HC26 - 60134474\50_DATA\GINT\LIBRARY\HC26.GLB

DEPTH (ft)	SAMPLE TYPE NUMBER	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	Depth (ft bgs)	MATERIAL DESCRIPTION	Elevation (ft amsl)	REMARKS
25		0	0	100	CH		25.0	FAT CLAY , (CH), very dark gray (10YR 3/1 (very dark gray)), moist, high plasticity, no odor, no staining. <i>(continued)</i>	27.3	Shells have "Mother of Pearl" appearance sheen
		0	20	80	CL		29.0	LEAN CLAY WITH SAND , (CL), very dark gray (10YR 3/1 (very dark gray)), moist, low plasticity, little sand, no odor, no staining.	23.3	
30	AL FX232							LEAN CLAY WITH GRAVEL , (CL), black (10YR 2/1 (black)), fine to medium grained, dry to moist, very stiff, low plasticity, no odor, no staining, basalt clasts present.		
35		40	0	60	CL					
40							40.0	TUFF : Extrusive, (IE), dark brown (7.5YR 4/3), massive completely weathered; dry, fine, soft to medium hard, no staining, Tuff saprolite; Original tuff structure only faintly visible, very weathered; IE.	12.3	Weathered tuff at 40ft
45					IE					

CLIENT NAVFAC Hawaii NORTHING 71046.71 ft. EASTING 1662971.64 ft. DATUM NAD 1983 Hawaii State Plane Zone 4
 PROJECT NAME HC26 - Makalapa Crater GSA PROJECT LOCATION JBPHH, Makalapa, Oahu, HI

ENV/BH-1 - GINT STD US.GDT - 4/11/14 09:17 - P:\ENV\FEDERAL\NAVY\CLEAN_I\IIC\TO HC26 (60134474)\50_DATA\GINT\LIBRARY\HC26.GLB

DEPTH (ft)	SAMPLE TYPE NUMBER	Percent Gravel	Percent Sand	Percent Fines	U.S.C.S.	GRAPHIC LOG	Depth (ft bgs)	MATERIAL DESCRIPTION	Elevation (ft amsl)	REMARKS
50					IE		50.0	TUFF ; Extrusive, (IE), dark brown (7.5YR 4/3), massive completely weathered; dry, fine, soft to medium hard, no staining, Tuff saprolite; Original tuff structure only faintly visible, very weathered; IE. <i>(continued)</i>	2.3	Water inside of auger at 50.5ft
55					IE		55.0	TUFF ; Extrusive, (IE), dark brown (7.5YR 4/3), massive moderately weathered; wet to saturated; fine, medium hard, no staining; IE.		
60							60.0		-7.7	

Bottom of borehole at 60.0 feet.

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