September 17, 2003
BES Project No.: 02-1068.01

Ms. Tamara Edwards
The Lihue Plantation Company, Ltd.
700 Bishop Street
Suite 501
Honolulu, HI 96813

Subject: **Semi-Annual Groundwater Monitoring Report**
January 2003 through June 2003
Former Lihue Power Plant
2940 Haleko Road
Lihue, Kauai, Hawaii 96766

Dear Ms. Edwards:

BEI Environmental Services has prepared the enclosed report on behalf of The Lihue Plantation Company, Ltd. for the subject site. If you have any questions or comments, do not hesitate to contact me at (808) 535-6040.

Sincerely,

BEI ENVIRONMENTAL SERVICES

Stephanie Mandina
Environmental Scientist

Enclosure: Semi-Annual Groundwater Monitoring (1 original)

cc (with enclosure):
Ms. Liz Galves, HDOH HEER Section (1 copy)

BEI Environmental Services
311-B Pacific Street • Honolulu, Hawaii 96817 • Phone 808.535.6055 • Fax 808.535.6053 • www.beihawaii.com

98327

SEMI-ANNUAL GROUNDWATER MONITORING REPORT
JANUARY THROUGH JUNE 2003

Lihue Power Plant
2940 Haleko Road
Lihue, Kauai, Hawaii 96766

HDOH Release I.D.s:
20010223-1409
20011101-0935

Latitude: 21° 58' 40" North
Longitude: 157° 22' 30" West

BES Project No.: 02-1068.01

Prepared For:
The Lihue Plantation Company, Limited
700 Bishop Street
Honolulu, Hawaii 96813

Prepared By:
BEI Environmental Services
311 Pacific Street
Honolulu, Hawaii 96817

September 17, 2003

Prepared for:

The Lihue Plantation Company, Limited
700 Bishop Street, Suite 501
Honolulu, Hawaii 96813

SEMI-ANNUAL GROUNDWATER MONITORING REPORT JANUARY THROUGH JUNE 2003 FORMER LIHUE POWER PLANT 2940 HALEKO ROAD LIHUE, KAUAI, HAWAII 96766

HDOH Release I.D.s:
20010223-1409
20011101-0935

BES Project No.: 02-1068.01

Prepared By:

Stephanie Mandina
Environmental Scientist

for
James T. Hayes
Operations Manager

BEI Environmental Services
311 Pacific Street
Honolulu, Hawaii 96817
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September 17, 2003

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1.0 INTRODUCTION

BEI Environmental Services (BES) has prepared this Semi-Annual Groundwater Monitoring and Skimmer Servicing Report on behalf of The Lihue Plantation Company, Limited for submittal to the State of Hawaii Department of Health (HDOH). This report details groundwater gauging and sampling activities, and passive free product recovery skimmer servicing conducted at the former Lihue Power Plant, henceforth the "Site," in Lihue, Kauai during the period January 1 through June 30, 2003 (Figure 1). All activities have been performed in accordance with the recommendations and initial release response activities described in the *Diesel Spill Response, Well Installation, Product Recovery, and Groundwater Monitoring Report*, dated August 28, 2002 and prepared by BES.

Section 2.0 of this report presents background information, Section 3.0 presents the methods used by BES to complete the project, Section 4.0 summarizes groundwater sampling results and findings, and Section 5.0 presents our conclusions and discussion.

2.0 SITE DESCRIPTION

2.1 General

The Site is approximately 700 feet south of Kaumualii Highway also known as Hwy 50 (Hwy 50) near the Rice Street intersection (Figure 1). The Site is located approximately 150 feet above mean sea level (MSL). The closest body of water is Nawiliwili Stream, which is approximately 1,000 feet to the north of the spill site, and empties into the Pacific Ocean at Nawiliwili Harbor. The spill site area consists of approximately 16,800 square feet (sf), or 0.39 acres, and prominent structures or features include the former power plant cooling towers, carpentry shops, transfer pumps and secondary spill containment, former 5,000-gallon used oil Underground Storage Tank (UST) and the access roads (Figure 2).

The Site has some hillside embankments to the west, but is otherwise generally level. Aside from the power plant and former sugar mill-oriented buildings and shops, there are no other businesses or establishments in the immediate vicinity. Features of the spill site, including the adjacent former UST location, are illustrated in Figure 2.

The soil management unit (SMU) area consists of approximately 5,500 sf (0.12 acres) and is located along the north side of the former sugar mill facility, near Hwy 50. Notable features of the surrounding area include the elevated conveyor systems and 1,000-gallon aboveground storage tank (AST) and concrete secondary containment.

2.2 Background

2.2.1 5,000 Gallon Used Oil Underground Storage Tank Closure

A 5,000-gallon used oil underground storage tank (UST), believed to have been installed at the former sugar mill in the 1950s and operated until 1999, was removed on February 15, 2001 by BES (Brewer, July 2001). The one-quarter inch thick, non-cathodically sealed, steel tank was used as a transfer tank for the Lihue Sugar Mill. At the time of the closure, there was no visual or olfactory evidence of a release; however, there were detections of total petroleum hydrocarbons as oil (TPH-O) in two of the three closure samples. Thus, HDOH release number 0100-40 was issued to the UST closure activities and release response analyses were performed on the two samples. Results of the subsequent release response analyses were either non-detect or below HDOH Tier 1 Soil Action Levels (SALs). Based on this, BES recommended that no further action was required.

2.2.2 July 26, 2001 Diesel Spill

On July 26, 2001, a diesel spill occurred at the transfer pump station and secondary containment system during offloading of fuel to the Site hillside AST used to provide fuel to the power plant. Approximately 1,900 gallons of an estimated 6,000-gallon spill pooled in the recessed, secondary containment vault/sump area and was immediately recovered. The remaining 4,100-gallons apparently leaked out through openings in the secondary containment

wall into the adjacent surrounding soil. This area had been recently backfilled with clean fill soil after removal of the former 5,000-gallon UST discussed above.

BES contacted the HDOH, the National Release Center (NRC), Kauai Civil Defense, and Kauai Fire Department on July 26, 2001 upon receiving knowledge of the spill, and the HDOH Release ID 20010223-1409 was assigned to the incident. From July 26 to August 22, 2001, BES directed emergency response activities at the diesel spill site including the excavation of the soil at the former adjacent UST location, which because of its looser compaction relative to the surrounding soil, acted as a preferential spill collection area. BES constructed a SMU at the Site to contain the excavated diesel-impacted soil. Additionally, BES excavated eight observation/recovery trenches down to groundwater in select locations surrounding the spill area to allow assessment of the extent of the release in the subsurface and the pumping and recovery of diesel from the groundwater using a vacuum truck. Figure 3 shows the locations of the observation/recovery trenches. On August 24, 2001, BES submitted a written *Follow-up Notification for the Lihue Power Plant* (formerly, Lihue Sugar Mill) diesel release to HDOH Hazardous Evaluation and Emergency Response (HEER) Office summarizing the release, contact, and response information.

BES oversaw an additional diesel-impacted groundwater skimming/recovery operation from the recovery trenches on October 3, 2001 with the use of a vacuum truck. Recovery Trenches 1, 2, 4, and 5 were each skimmed once for removal of diesel-impacted groundwater (Figure 3). A summary of the recovery quantities and overall diesel product spill and recovery estimates for the Site is included in Table 1.

2.2.3 October 31, 2001 Diesel Spill

On October 31, BES responded to a second diesel spill that took place at the exact same bulk fuel off-loading and secondary containment system. A pipe leak detected by the emergency cut-off system during fuel off-loading caused the transfer pump to shut down and approximately 1,600 gallons of diesel fuel to spill into the secondary containment system. An estimated 1,550 gallons of free product were recovered from the secondary containment and approximately 50 gallons were released into the previously excavated collection area through cracks or holes that remained in the containment system. Upon receiving knowledge of this spill, BES advised the Lihue Plantation Company (LPC) to contact the HDOH and the other relevant agencies for proper notification of the spill. HDOH issued Release ID 20011101-0935 for the October 31, 2001 incident.

BES directed emergency response activities at the Site and supervised the skimming of approximately 900 gallons of diesel-impacted groundwater from the still-open collection area on November 1, 2001 using a vacuum truck. On November 6, 2001, BES submitted a summary and a Written Follow-up Notification form to HDOH regarding the spill.

2.2.4 Long Term Response Actions

BES compiled and submitted a *Diesel Spill Response Well Installation, Product Recovery, & Monitoring Work Plan*, dated September 12, 2001, to the HDOH HEER office for

implementing long-term recovery efforts. The Work Plan called for the installation of both groundwater monitoring and recovery wells for diesel recovery using both pumping and passive skimmers. The Work Plan was prepared in response to the July 26, 2001 spill, but also accounted for the second, smaller spill on October 31, 2001. The Work Plan was approved by Ms. Liz Galvez, HDOH HEER Office On-Scene Coordinator, on October 11, 2001.

BES planned, coordinated, and directed installation of long-term groundwater monitoring and recovery wells from December 10 through 17, 2001. Activities included the installation of four, 4-inch diameter recovery wells and four, 2-inch diameter monitoring wells in the recovery trenches prior to their backfill. Passive skimmers were installed in the recovery wells and the groundwater monitoring program began. Figure 3 shows the location of the groundwater monitoring and recovery wells and the respective recovery trenches.

The passive diesel fuel recovery skimmers have been checked on an approximate monthly basis and their contents emptied into a DOT-approved 15-gallon drum since the installation of the wells in December 2001 (Table 1). Additionally, the monitoring wells were gauged on an approximate monthly basis to determine the presence or absence of free product or sheen, and to evaluate groundwater gradient and magnitude.

Groundwater recovered from the trench skimming and well purge water from groundwater monitoring events had been temporarily stored in on-Site, 55-gallon DOT-approved drums; two, 275-gallon chemical totes; one, 1,000-gallon steel AST; and one, 7,000-gallon tanker trailer. On November 13, 2001, BES supervised the skimming of separated diesel from the storage totes, the AST, and tanker trailer into three, 550-gallon DOT-approved steel totes for shipping to and disposal on Oahu.

Samples of the residual water remaining in the storage tanks were collected and chemically analyzed. Following the chemical analysis of the water samples, the results were submitted to HDOH HEER office, and following approval by HDOH, BES pumped the residual groundwater from the tanker trailer onto the diesel-impacted soil contained in the SMU. The pumping of the residual water onto the soil within the SMU took place incrementally during the week of December 11, 2001 to December 17, 2001 and during subsequent skimmer servicing events until the containers were empty. On June 6, 2002, the SMU , which had previously been covered with plastic, was uncovered and the final pumping of residual water from the AST and totes onto the SMU took place.

3.0 METHODS

For the period from January 1 through June 30, 2003, BES: 1) periodically emptied and serviced the passive product recovery skimmers in recovery wells RW-1 and RW-4; 2) periodically gauged all wells; and 3) collected groundwater samples from groundwater monitoring wells MW-1 through MW-4 and from recovery wells RW-2 and RW-3 on June 27, 2003. This section outlines the methods used by BES during these activities.

3.1 Periodic Service and Gauging

BES checked and serviced the passive product recovery skimmers during Site visits on January 22, March 6, April 9, May 21, and June 27, 2003. BES gauged all recovery and monitoring wells on January 22, March 6, April 9, May 21, and June 27, 2003 to check for the presence of diesel and to measure groundwater elevations for calculating groundwater gradient direction and magnitude. The results of these activities are presented in Section 4.0.

3.1.1 Product Passive Skimmer Servicing

Servicing of the passive skimmers included the removal of the skimmers from recovery wells RW-1 and RW-4 and emptying of any product recovered by the Hydro-skimmer® passive skimmer in RW-1, and changing of the absorbent pads on the custom-built passive skimmer in RW-4. To remove the skimmers, the two recovery wells were uncovered and the well caps to which the skimmers were secured were lifted off the well casings, and the passive product recovery skimmers were slowly pulled up out of each well. The skimmers were then inspected for the presence of diesel product. If diesel product was present in the Hydro-skimmer® passive skimmer (RW-1), the contents were emptied into a 15-gallon, DOT-approved drum. If the absorbent pads on the custom-built passive skimmer (RW-4) were at least partially saturated with diesel product, the pads were removed and disposed of in a 15-gallon, DOT-approved drum and clean absorbent pads were attached to the skimmer. Section 4.1 presents the findings during the passive product skimmer servicing events.

On June 27, 2003, BES replaced the Hydro-skimmer® passive skimmer in RW-1 with a custom-built passive skimmer made of one and one-half inch diameter PVC pipe covered in oil-spill absorbent pads. A T-shaped slip-connector was bolted to one end of an approximate two foot long PVC pipe to prevent the absorbent pads from inadvertently sliding off the end. Nylon rope was cut at the proper length, tied to the skimmer through holes that were drilled in the free end of the PVC pipe, and used to lower the skimmer into the well until it was approximately half submerged in the groundwater. Two absorbent pads were wrapped around and secured to the PVC pipe using three, 2-inch long cable ties and the skimmer was lowered into the well.

3.1.2 Groundwater Gauging

Groundwater/product levels were measured in the four groundwater and four recovery wells immediately after skimmer removal and servicing using a Solinst model 122 electronic interphase probe. The probe was decontaminated per the hand wash procedure in standard

operating procedure (SOP) #1 between each well. Standard operating procedures used for well gauging and equipment decontamination are presented in Appendix A. Following gauging the passive product recovery skimmers were re-inserted in the two recovery wells and the caps and well covers secured. Results of the groundwater gauging activities are discussed in Sections 4.2 and 4.3.

3.2 Groundwater Monitoring Activities

On June 27, 2002, groundwater samples were collected from monitoring wells MW-1 through MW-4 and recovery wells RW-2 and RW-3 (Figure 3), since no product was present in these recovery wells. Field observations and laboratory results of the groundwater monitoring event are presented in Section 4.0.

3.2.1 Field Methods

Following gauging, all four groundwater monitoring wells and recovery wells RW-2 and RW-3 were purged of free-standing water and groundwater samples were collected. The SOP used for performing groundwater sampling is included in Appendix A. Copies of the groundwater sample collection data sheets are provided in Appendix B. Recovery wells RW-1 and RW-4 were not sampled due to the presence of diesel product.

Dedicated disposable polyethylene bailers were used to purge wells MW-1, MW-3, and MW-4 and a Whale model 921 submersible pump with dedicated tubing was used to purge wells MW-2, RW-2, and RW-3. Dedicated disposable polyethylene bailers were used to sample the six wells. Purged groundwater was deposited onto the soil in the SMU. The groundwater samples were identified with a BES project number (02-1068), sample matrix identifier (GW for groundwater), and specific well identification number. The sample identifications for their respective wells were as follows:

WELL ID	SAMPLE ID
MW-1	02-1068-GW-MW-1
MW-2	02-1068-GW-MW-2
MW-3	02-1068-GW-MW-3
MW-4	02-1068-GW-MW-4
RW-2	02-1068-GW-RW-2
RW-3	02-1068-GW-RW-3

A duplicate groundwater sample was collected from monitoring well RW-3 and submitted as sample number 02-1068-GW-RW-A.

The samples were sealed, labeled, and stored in a cooler containing wet and pre-frozen gel ice in the field. Prior to departing the Site and flying to Oahu, the wet ice was removed. Upon arrival in Oahu, the samples were refrigerated at BES. On the following Monday, June 30, 2003, the seven samples were hand-delivered in a cooler chilled with gel ice to Advanced Analytical Laboratory, located in Honolulu, Oahu, Hawaii.

3.2.2 Laboratory Analysis Methods

The six groundwater samples and one duplicate sample collected from recovery well RW-3 were analyzed for the following:

- total petroleum hydrocarbons as diesel (TPH-D) using EPA Method 8015-Modified;
- benzene, toluene, ethylbenzene, and total xylenes (BTEX) using EPA Method 8021b;
- the polynuclear aromatic hydrocarbons (PAHs) acenaphthene, benzo(a)pyrene, fluoranthene, and naphthalene using EPA Method 8100; and
- total lead and cadmium using EPA Method 6010b.

A copy of the laboratory report and chain-of-custody is included in Appendix C. The laboratory results are discussed in Section 4.4.

4.0 FIELD AND LABORATORY RESULTS

This section summarizes the observations during the passive product skimmer servicing and groundwater sampling event, and the results of the groundwater samples submitted for laboratory analysis.

4.1 Passive Product Skimmer Recovery

During each of the five skimmer servicing events during this six-month period, only trace amounts (0.02 gallon) of diesel product were present in the Hydro-Skimmer® installed in RW-1. During the June 27, 2003 passive skimmer servicing, there was a thin diesel layer (sheen) in RW-1, but no accumulated product in the passive skimmer.

The skimmer in recovery well RW-3 was removed during the January 22, 2003 servicing event based on repeated absence of product in the skimmer, as discussed in the previous Semi-Annual Groundwater Monitoring Report, dated February 24, 2003 (BES, 2003). The Work Plan does not address the removal of skimmers; however, the removal of the skimmer in recovery well RW-3 was deemed appropriate due to the repeated absence of product in the skimmer. This well will continue to be gauged and monitored.

The custom-skimmer in recovery well RW-4 was one-quarter to one-half saturated with free product, or an estimated 0.025 gallon, during each skimmer servicing event. A free product layer was not detected in recovery well RW-4 during gauging.

Based on recovery from RW-1 and RW-4, approximately 0.05 gallons of product were recovered during the January, March, and April events and 0.04 gallons were recovered during the May and June events (Table 1).

4.2 Groundwater Gauging Results

A measurable diesel product layer was not detected in any of the four monitoring wells (wells MW-1 through MW-4) or recovery wells (wells RW-1 through RW-4) during any of the five gauging events in this reporting period.

A heavy to moderate sheen was evident on the decontamination water when cleaning the interface probe after gauging recovery wells RW-1 and RW-4. A light sheen was evident on the decontamination water when cleaning the interface probe after gauging recovery wells RW-2 and RW-3 during the January, March, and April gauging events; however, no sheen was evident during the May and June gauging events.

Groundwater elevations varied by approximately three feet in some locations between the five gauging events in this reporting period. During the June 27, 2003 groundwater sampling event, the depth to groundwater in the wells ranged from 14.06 to 18.57 feet below the top of well casings and the elevation of groundwater ranged from 134.31 to 139.52 feet above Site

datum. Groundwater gauging data for June 27, 2003 are presented in Table 2 and historical gauging results are presented in Table 3.

4.3 Hydraulic Gradient

BES prepared a groundwater potentiometric surface map based on the June 27, 2003 gauging results. The groundwater gradient contours are shown in Figure 4. The gradient on June 27, 2003 was towards the northeast, toward Nawiliwili Stream, with a magnitude ranging from 0.098 foot per foot near the hillside to 0.006 foot per foot in the downgradient flat area.

The groundwater gradients calculated from the January 22, March 6, April 9, and May 21, 2003 gauging events had similar groundwater gradient direction and magnitude.

4.4 Groundwater Sample Results

Laboratory analytical results for the groundwater sample analyses are summarized in Table 4. The analytes benzene, toluene, ethylbenzene, total xylenes, two of the four PAHs (acenaphthene and benzo(a)pyrene), and cadmium were not detected in any of the groundwater samples collected. Total petroleum hydrocarbons as diesel (TPH-D) were detected only in the sample collected from recovery well RW-2, the concentration was 2.5 milligrams per liter (mg/L). Naphthalene was detected in the samples collected from MW-2 and MW-3 at 0.00021 mg/L and 0.00019 mg/L, respectively, which is below the HDOH Tier 1 groundwater action level (GAL) of 0.24 mg/L. Fluoranthene was detected in the samples collected from RW-2 and RW-3 at 0.00042 mg/L and 0.00032 mg/L, respectively, which is below the HDOH Tier 1 GAL of 0.013 mg/L. Additionally, lead was detected in the sample collected from MW-4 at 0.0080 mg/L, which exceeds the Tier 1 GAL of 0.0056 mg/L.

Analytical results for all sampling events are presented in Table 5. BES has compared the analytical results of groundwater samples to "Tier 1 Action Levels for groundwater where rainfall is less than 200-centimeter per year (cm/y) and a drinking water source is threatened" from the HDOH TGM regulatory guidelines (HDOH, 2000). Additionally, detected analytes and results from the June 27, 2003 sampling event are illustrated in Figure 5.

A complete copy of the laboratory analytical report and chain-of-custody form are included in Appendix C.

5.0 DISCUSSION

The groundwater gradient magnitude and direction toward the northeast remains similar to previous observations and is consistent throughout the year based on results from the on-going periodic skimmer servicing events at the Site. The laboratory results for the monitoring and recovery wells reveal decreased contamination levels and concentrations generally below Tier 1 action levels for six of the eight wells, except for low levels of lead. From the December 18, 2002 to the June 27, 2003 sampling events, TPH-D concentrations decreased from 9.1 mg/L to 2.5 mg/L in recovery well RW-2, and from 4.7 mg/L to a non-detectable concentration in recovery well RW-3.

Passive product recovery skimmers maintained in recovery wells RW-1 and RW-4 continue to collect residual diesel product; however, free product within the wells appears only as a sheen. BES will continue periodically (approximately every 45 days) servicing the skimmers and monitoring the wells during the next semi-annual period based on the decreasing evidence of free product.

6.0 REFERENCES

BEI Environmental Services, 2002, *Semi-Annual Groundwater & Soil Management Unit Monitoring (January – July 2002)*, October 11, 2002.

BEI Environmental Services, 2002, *Diesel Spill Response, Well Installation, Product Recovery, and Groundwater Monitoring Report*, August 28, 2002.

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HDOH, 2000; State of Hawaii Department of Health, Solid and Hazardous Waste Branch, *Technical Guidance Manual for Underground Storage Tank Closure and Release Response,* rev. March 2000.

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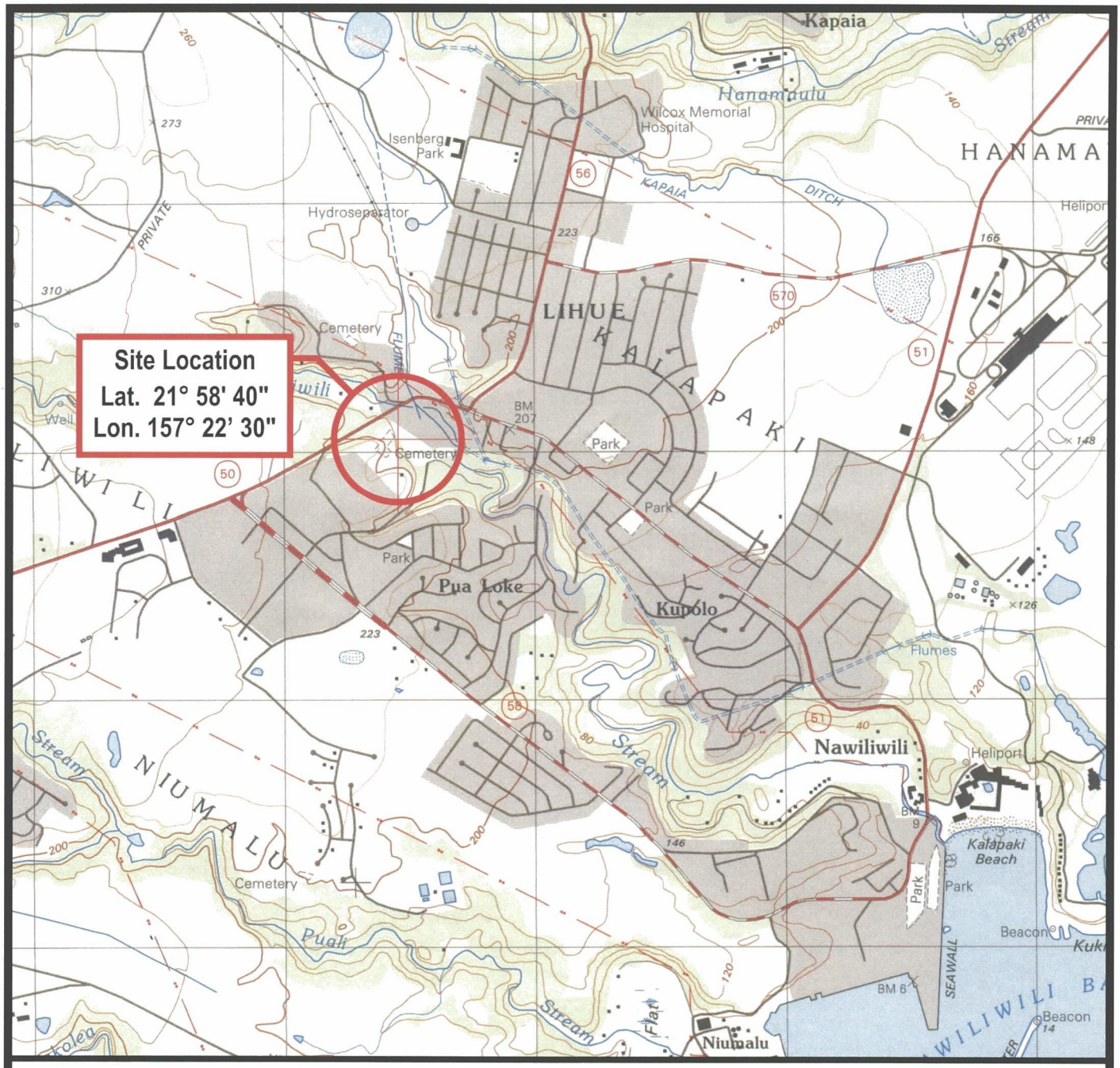
US Department of Interior Geological Survey, Lihue Quadrangle, Island of Kauai, 7.5 Minute Series (Topographic), 1996.

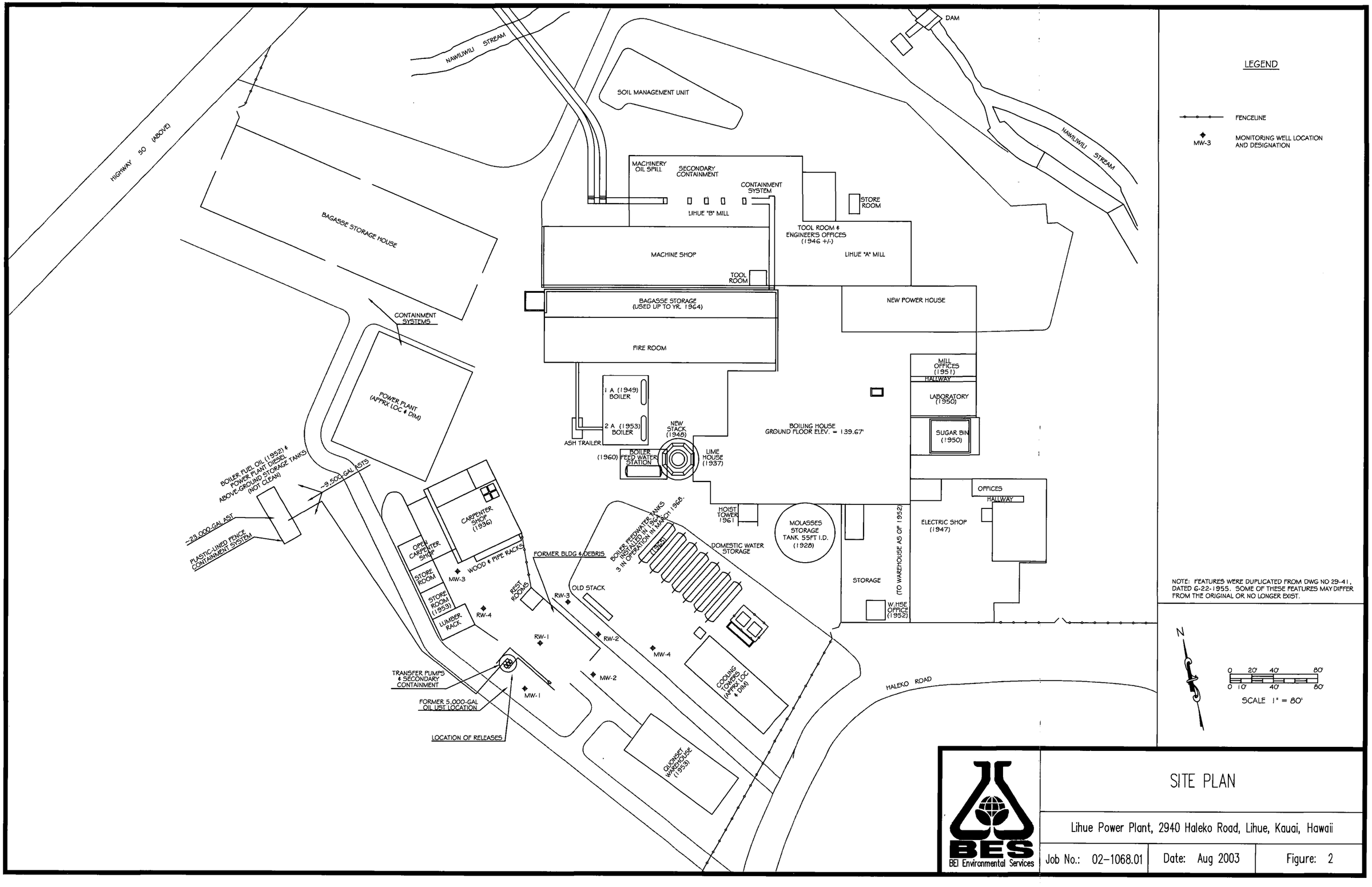
FIGURES



Source:
U.S. Department of Interior Geographical Survey
Lihue Quadrangle
Lihue, Hawaii
1996, 7.5 Minute Series
Scale = 1:24,000

BES
BEI Environmental Services

Site Location Map		
Lihue Power Plant		
2940 Haleko Road • Lihue, Kauai, Hawaii 96766		
Job No.: 02-1068.01	Date: Aug 2003	Figure: 1



LEGEND

FENCELINE

MW-3 — MONITORING WELL LOCATION AND DESIGNATION

NOTE: FEATURES WERE DUPLICATED FROM DWG NO 29-41, DATED 6-22-1955. SOME OF THESE FEATURES MAY DIFFER FROM THE ORIGINAL OR NO LONGER EXIST.

N

0 20' 40' 80'
0 10' 40' 80'
SCALE 1" = 80'

BES
BEI Environmental Services

SITE PLAN

Lihue Power Plant, 2940 Haleko Road, Lihue, Kauai, Hawaii

Job No.: 02-1068.01	Date: Aug 2003	Figure: 2

TRASH DUMPSTER

TO SOIL MANAGEMENT UNIT & HWY 50

ACCESS ROADS

FORMER LIHUE MILL FACTORY

COOLING TOWERS

METAL STACK

MW-4

FORMER RECOVERY TRENCH #8

TO HALEKO RD

TBM-1: 1-3/8" DIA. BRASS SURVEY MARKER IN CONC. FOOTING

COVERED PARKING AREA

CHAIN-LINK FENCE & SLIDING GATES

FORMER RECOVERY TRENCH #4

RW-3

FORMER RECOVERY TRENCH #2

RW-2

ACCESS ROAD

UTILITY POLE

ENCLOSED CARPENTRY SHOP

WOOD & PIPE RACKS

RESTROOMS

FORMER BUILDING & DEBRIS

MW-2

FORMER RECOVERY TRENCH #3

QUONSET HUT

RW-1

FORMER RECOVERY TRENCH #1

DEBRIS & VEGETATION

FORMER RECOVERY TRENCH #6

MW-3

OPEN CARPENTRY SHOP

RW-4

FORMER RECOVERY TRENCH #5

FORMER COLLECTION AREA

FUEL DELIVERY/ ELECTRICAL CONDUIT

TRANSFER PUMPS

BULK FUEL OFF-LOADING

CONTROL PANEL

STORAGE ROOM

WOOD & PIPE RACKS

STORAGE ROOM

FORMER 5,000-GAL UST LOCATION

FORMER EXCAVATION FOR UST REMOVAL

MW-1

TO HILLSIDE ASTs & HWY 50

WIRE MESH FENCE WITH FIBERGLASS PANELBOARD

CHAIN-LINK FENCE

SECONDARY CONTAINMENT SYSTEM

ABOVE-GROUND FUEL DELIVERY LINE

ACCESS ROAD

BELOW-GROUND FUEL DELIVERY LINE

REMOVED CLEANED/UNUSED 5,000-GALLON UST

HILLSIDE

TO HALEKO RD

ACCESS ROAD

HILLSIDE

FORMER RECOVERY TRENCH #7

N

0' 10' 20'

SCALE : 1" = 20'

LEGEND

- 2" DIAMETER MONITORING WELL LOCATION
- 4" DIAMETER RECOVERY WELL LOCATION

BES BEI Environmental Services

Detail of Collection and Recovery Trench Area

Lihue Power Plant

2940 Haleko Road, Lihue, Kauai, Hawaii 96766

Job No.: 02-1068.01	Date: Aug 2003	Figure: 3

TRASH DUMPSTER

TO SOIL MANAGEMENT UNIT & HWY 50

ACCESS ROADS

FORMER LIHUE MILL FACTORY

COOLING TOWERS

METAL STACK

MW-4
134.31

TBM-1: 1-3/8" DIA. BRASS SURVEY MARKER IN CONC. FOOTING

TO HALEKO RD

COVERED PARKING AREA

CHAIN-LINK FENCE & SLIDING GATES

ACCESS ROAD

RW-3
134.44

RW-2
134.44

UTILITY POLE

ENCLOSED CARPENTRY SHOP

WOOD & PIPE RACKS

RESTROOMS

FORMER BUILDING & DEBRIS

134.5

BOLLARD

MW-2
134.92

QUONSET HUT

DEBRIS & VEGETATION

134.73
RW-1

OPEN CARPENTRY SHOP

MW-3
134.69

134.81
RW-4

135.5

136.5

137.5

138.5

FUEL DELIVERY/ ELECTRICAL CONDUIT

TRANSFER PUMPS

BULK FUEL OFF-LOADING

CONTROL PANEL

STORAGE ROOM

WOOD & PIPE RACKS

STORAGE ROOM

TO HILLSIDE ASTs & HWY 50

BOLLARDS

MW-1
139.52

WIRE MESH FENCE WITH FIBERGLASS PANELBOARD

CHAIN-LINK FENCE

SECONDARY CONTAINMENT SYSTEM

ACCESS ROAD

TO HALEKO RD

ACCESS ROAD

HILLSIDE

N

0' 10' 20'

SCALE : 1" = 20'

ABOVE-GROUND FUEL DELIVERY LINE

ACCESS ROAD

BELOW-GROUND FUEL DELIVERY LINE

REMOVED CLEANED/UNUSED 5,000-GALLON UST

HILLSIDE

LEGEND

- 2" Diameter Monitoring Well Location
- 4" Diameter Recovery Well Location
- 134.76 Groundwater Elevation
- 137.0 Groundwater Contour
- Average Groundwater Gradient - Direction and Flow

Groundwater Elevations Measured on June 27, 2003

BES BEI Environmental Services

Site Plan Detail Showing June 27, 2003 Groundwater Contours

Lihue Power Plant

2940 Haleko Road, Lihue, Kauai, Hawaii 96766

Job No.: 02-1068.01 | Date: Aug 2003 | Figure: 4

TRASH DUMPSTER

TO SOIL MANAGEMENT UNIT & HWY 50

ACCESS ROADS

FORMER LIHUE MILL FACTORY

COOLING TOWERS

METAL PIPE

MW-4
Lead 0.0080

TBM-1: 1-3/8" DIA. BRASS SURVEY MARKER IN CONC. FOOTING

TO HALEKO RD

COVERED PARKING AREA

CHAIN-LINK FENCE & SLIDING GATES

RW-3
Fluoranthene 0.00032

RW-2
TPH-D 2.5
Fluoranthene 0.00042

ACCESS ROAD

ENCLOSED CARPENTRY SHOP

WOOD & PIPE RACKS

UTILITY POLE

RESTROOMS

FORMER BUILDING & DEBRIS

DEBRIS & VEGETATION

MW-2
Naphthalene 0.00021

QUONSET HUT

RW-1
DIESEL LAYER DETECTED - NO SAMPLE COLLECTED

TO HALEKO RD

OPEN CARPENTRY SHOP

MW-3
Naphthalene 0.00019

DIESEL LAYER DETECTED - NO SAMPLE COLLECTED

RW-4

FUEL DELIVERY/ ELECTRICAL CONDUIT

ACCESS ROAD

STORAGE ROOM

WOOD & PIPE RACKS

STORAGE ROOM

TRANSFER PUMPS

BULK FUEL OFF-LOADING

CONTROL PANEL

MW-1

TO HILLSIDE ASTs & HWY 50

WIRE MESH FENCE WITH FIBERGLASS PANELBOARD

CHAIN-LINK FENCE

SECONDARY CONTAINMENT SYSTEM

HILLSIDE

N

0' 10' 20'

SCALE : 1" = 20'

ACCESS ROAD

ABOVE-GROUND FUEL DELIVERY LINE

BELOW-GROUND FUEL DELIVERY LINE

5,000-GALLON UST

HILLSIDE

LEGEND

- 2" Diameter Monitoring Well Location
- 4" Diameter Recovery Well Location

TPH-D	2,230
Naphthalene	0.00995
Acenaphthene	0.252
Fluoranthene	0.0151
Benzo(a)pyrene	0.0052
Lead	0.0274
Cadmium	0.008

Summary of laboratory detected analytical results by EPA methods 8015M, 8100, and 3010a with concentrations in mg/L - results in red exceed HDOH Tier I Groundwater Action Levels where drinking water is not threatened and rainfall is less than 200 centimeters per year.

TPH-D = Total Petroleum Hydrocarbons as Diesel

BES
BEI Environmental Services

Site Plan Detail Showing Results of Groundwater Samples Collected on June 27, 2003

Lihue Power Plant

2940 Haleko Road, Lihue, Kauai, Hawaii 96766

Job No.: 02-1068.01 | Date: Aug 2003 | Figure: 5

TABLES

TABLE 1
Diesel Spill and Recovery Estimates

Dates From	Dates To	Activity	Est Diesel Spilled, (gallons)	Est Diesel Recovered, (gallons)	Est Diesel Remaining, (gallons)
07/26/01	07/26/01	Diesel spill occurred during fuel off-loading to the hillside AST.	6,000.0		6,000.0
07/26/01	07/26/01	Recovery of free standing diesel from transfer pump sump area.		1,900.0	4,100.0
07/26/01	07/29/01	Recovery of diesel fuel with the removal and stockpiling of diesel-contaminated soil.		1,800.0	2,300.0
07/26/01	08/22/01	Recovery of diesel fuel with the skimming of the collection area and recovery trenches.		820.0	1,480.0
08/22/01	08/22/01	Recovery of diesel fuel with the skimming of the collection area and recovery trenches.		49.0	1,431.0
10/03/01	10/03/01	Recovery of diesel fuel with the skimming of the collection area and recovery trenches.		28.0	1,403.0
10/31/01	10/31/01	Diesel spill occurred during fuel off-loading to the hillside AST.	1,600.0		3,003.0
10/31/01	10/31/01	Recovery of free standing diesel from transfer pump sump area.		1,550.0	1,453.0
10/31/01	11/01/01	Recovery of diesel fuel with the skimming of the excavated collection area adjacent to the pump.		18.0	1,435.0
12/15/01	12/15/01	Recovery of diesel fuel during recovery well development.		2.0	1,433.0
01/09/02	01/09/02	Skimmer O&M Servicing.		1.2	1,431.8
03/20/02	03/20/02	Skimmer O&M Servicing.		0.8	1,431.0
04/19/02	04/19/02	Skimmer O&M Servicing.		0.8	1,430.2
06/07/02	06/07/02	Skimmer O&M Servicing, SMU uncovering.		0.5	1,429.7
07/08/02	07/08/02	Skimmer O&M Servicing during groundwater sampling and waste disposal.		0.5	1,429.2
07/27/02	07/27/02	Skimmer O&M Servicing during SMU sampling.		0.5	1,428.7
09/13/02	09/13/02	Skimmer O&M Servicing.		0.4	1,428.3
10/04/02	10/04/02	Skimmer O&M Servicing.		0.4	1,427.9
10/25/02	10/25/02	Skimmer O&M Servicing.		0.5	1,427.4
11/08/02	11/08/02	Skimmer O&M Servicing.		0.5	1,426.9
11/13/02	11/13/02	Skimmer O&M Servicing.		0.5	1,426.4
12/04/02	12/04/02	Skimmer O&M Servicing.		0.5	1,425.9
12/12/02	12/13/02	Skimmer O&M Servicing and groundwater sampling from monitoring and recovery wells.		0.5	1,425.4
12/30/02	12/30/02	Skimmer O&M Servicing.		0.05	1,425.4
01/22/03	01/22/03	Skimmer O&M Servicing.		0.05	1,425.3
03/06/03	03/06/03	Skimmer O&M Servicing.		0.05	1,425.3
04/09/03	04/09/03	Skimmer O&M Servicing.		0.05	1,425.2
05/21/03	05/21/03	Skimmer O&M Servicing.		0.04	1,425.2
06/27/03	06/27/03	Skimmer O&M Servicing and groundwater sampling from monitoring and recovery wells.		0.04	1,425.1
TOTALS			**7,600.0**	**6,174.9**	**1,425.1**

Notes:
Est = estimated

TABLE 2
Well Gauging Data
June 27, 2003

Well ID	Well Diameter (inch)	Well Depth (feet bMP)	Well MP Elevation (feet)	Depth to Water (feet bMP)	Groundwater Elevation (feet)
MW-1	2	27.03	154.82	15.30	139.52
MW-2	2	22.75	150.99	16.07	134.92
MW-3	2	23.65	150.46	15.77	134.69
MW-4	2	19.66	148.37	14.06	134.31
RW-1	4	24.41	153.30	18.57	134.73
RW-2	4	19.65	148.96	14.52	134.44
RW-3	4	18.85	149.00	14.56	134.44
RW-4	4	21.21	151.02	16.21	134.81

Notes:
Elevations are relative to Temporary Bench Mark-1 (TBM-1) with an assumed elevation of 150.00 feet mean sea level (aMSL) based on the 1996 USGS 7.5 Minute Series Lihue Quadrangle.
bMP = below measuring point (or top, northernmost location of well casing)

TABLE 3
Current and Historic Well Gauging Data

Well ID	Date of Gauging	Well MP Elevation (feet)	Depth to Product (feet bMP)	Depth to Water (feet bMP)	Product Thickness (feet)	Groundwater Elevation (feet)
MW-1	17-Dec-01	154.82		16.84	0.00	137.98
	6-Jun-02	154.82		13.71	0.00	141.11
	8-Jul-02	154.82		15.83	0.00	138.99
	13-Sep-02	154.82		16.87	0.00	137.95
	4-Oct-02	154.82		17.11	0.00	137.71
	25-Oct-02	154.82		17.42	0.00	137.40
	8-Nov-02	154.82		17.45	0.00	137.37
	13-Nov-02	154.82		17.40	0.00	137.42
	4-Dec-02	154.82		16.36	0.00	138.46
	18-Dec-02	154.82		17.04	0.00	137.78
	30-Dec-02	154.82		16.94	0.00	137.88
	22-Jan-03	154.82		17.51	0.00	137.31
	6-Mar-03	154.82		12.14	0.00	142.68
	9-Apr-03	154.82		14.00	0.00	140.82
	21-May-03	154.82		14.59	0.00	140.23
	27-Jun-03	154.82		15.30	0.00	139.52
MW-2	17-Dec-01	150.99		15.21	0.00	135.78
	6-Jun-02	150.99		12.99	0.00	138.00
	8-Jul-02	150.99		15.53	0.00	135.46
	13-Sep-02	150.99		13.53	0.00	137.46
	4-Oct-02	150.99		15.98	0.00	135.01
	25-Oct-02	150.99		16.51	0.00	134.48
	8-Nov-02	150.99		16.52	0.00	134.47
	13-Nov-02	150.99		16.39	0.00	134.60
	4-Dec-02	150.99		15.37	0.00	135.62
	18-Dec-02	150.99		16.22	0.00	134.77
	30-Dec-02	150.99		16.15	0.00	134.84
	22-Jan-03	150.99		16.93	0.00	134.06
	6-Mar-03	150.99		14.94	0.00	136.05
	9-Apr-03	150.99		14.41	0.00	136.58
	21-May-03	150.99		15.49	0.00	135.50
	27-Jun-03	150.99		16.07	0.00	134.92
MW-3	17-Dec-01	150.46		14.55	0.00	135.91
	6-Jun-02	150.46		12.72	0.00	137.74
	8-Jul-02	150.46		15.16	0.00	135.30
	13-Sep-02	150.46		15.89	0.00	134.57
	4-Oct-02	150.46		15.64	0.00	134.82
	25-Oct-02	150.46		16.05	0.00	134.41
	8-Nov-02	150.46		15.91	0.00	134.55
	13-Nov-02	150.46		15.58	0.00	134.88

TABLE 3
Current and Historic Well Gauging Data

Well ID	Date of Gauging	Well MP Elevation (feet)	Depth to Product (feet bMP)	Depth to Water (feet bMP)	Product Thickness (feet)	Groundwater Elevation (feet)
	4-Dec-02	150.46		14.62	0.00	135.84
	18-Dec-02	150.46		15.70	0.00	134.76
	30-Dec-02	150.46		15.57	0.00	134.89
	22-Jan-03	150.46		16.48	0.00	133.98
	6-Mar-03	150.46		14.20	0.00	136.26
	9-Apr-03	150.46		13.99	0.00	136.47
	21-May-03	150.46		15.13	0.00	135.33
	27-Jun-03	150.46		15.77	0.00	134.69
MW-4	17-Dec-01	148.37		13.80	0.00	134.57
	6-Jun-02	148.37		10.70	0.00	137.67
	8-Jul-02	148.37		13.42	0.00	134.95
	13-Sep-02	148.37		15.54	0.00	132.83
	4-Oct-02	148.37		13.61	0.00	134.76
	25-Oct-02	148.37		14.16	0.00	134.21
	8-Nov-02	148.37		14.27	0.00	134.10
	13-Nov-02	148.37		14.17	0.00	134.20
	4-Dec-02	148.37		13.16	0.00	135.21
	18-Dec-02	148.37		13.97	0.00	134.40
	30-Dec-02	148.37		13.93	0.00	134.44
	22-Jan-03	148.37		14.69	0.00	133.68
	6-Mar-03	148.37		11.77	0.00	136.60
	9-Apr-03	148.37		12.37	0.00	136.00
	21-May-03	148.37		13.51	0.00	134.86
	27-Jun-03	148.37		14.06	0.00	134.31
RW-1	17-Dec-01	153.30		17.60	0.00	135.70
	6-Jun-02	153.30	15.45	15.47	0.02	137.85
	8-Jul-02	153.30	18.03	18.06	0.03	135.26
	13-Sep-02	153.30	18.32	18.37	0.05	134.97
	4-Oct-02	153.30	18.41	18.44	0.03	134.88
	25-Oct-02	153.30	18.90	18.91	0.01	134.40
	8-Nov-02	153.30	18.86	18.87	0.01	134.44
	13-Nov-02	153.30		18.65	0.00	134.65
	4-Dec-02	153.30		17.71	0.00	135.59
	18-Dec-02	153.30		18.62	0.00	134.68
	30-Dec-02	153.30		18.51	0.00	134.79
	22-Jan-03	153.30		19.35	0.00	133.95
	6-Mar-03	153.30		16.32	0.00	136.98
	9-Apr-03	153.30		16.88	0.00	136.42
	21-May-03	153.30		18.01	0.00	135.29
	27-Jun-03	153.30		18.57	0.00	134.73

TABLE 3
Current and Historic Well Gauging Data

Well ID	Date of Gauging	Well MP Elevation (feet)	Depth to Product (feet bMP)	Depth to Water (feet bMP)	Product Thickness (feet)	Groundwater Elevation (feet)
RW-2	17-Dec-01	148.96		13.46	0.00	135.50
	6-Jun-02	148.96		11.38	0.00	137.58
	8-Jul-02	148.96		13.96	0.00	135.00
	13-Sep-02	148.96		14.18	0.00	134.78
	4-Oct-02	148.96		14.22	0.00	134.74
	25-Oct-02	148.96		14.76	0.00	134.20
	8-Nov-02	148.96		14.78	0.00	134.18
	13-Nov-02	148.96		14.61	0.00	134.35
	4-Dec-02	148.96		13.65	0.00	135.31
	18-Dec-02	148.96		14.51	0.00	134.45
	30-Dec-02	148.96		14.42	0.00	134.54
	22-Jan-03	148.96		15.21	0.00	133.75
	6-Mar-03	148.96		13.15	0.00	135.81
	9-Apr-03	148.96		12.87	0.00	136.09
	21-May-03	148.96		13.99	0.00	134.97
	27-Jun-03	148.96		14.52	0.00	134.44
RW-3	17-Dec-01	149.37		13.81	0.00	135.56
	6-Jun-02	149.37		11.80	0.00	137.57
	8-Jul-02	149.37		14.35	0.00	135.02
	13-Sep-02	149.37		14.59	0.00	134.78
	4-Oct-02	149.37		14.65	0.00	134.72
	25-Oct-02	149.00		14.77	0.00	134.23
	8-Nov-02	149.00		14.75	0.00	134.25
	13-Nov-02	149.00		14.57	0.00	134.43
	4-Dec-02	149.00		13.63	0.00	135.37
	18-Dec-02	149.00		14.51	0.00	134.49
	30-Dec-02	149.00		14.42	0.00	134.58
	22-Jan-03	149.00		15.22	0.00	133.78
	6-Mar-03	149.00		13.15	0.00	135.85
	9-Apr-03	149.00		12.87	0.00	136.13
	21-May-03	149.00		14.01	0.00	134.99
	27-Jun-03	149.00		14.56	0.00	134.44
RW-4	17-Dec-01	151.02		15.13	0.00	135.89
	6-Jun-02	151.02		13.08	0.00	137.94
	8-Jul-02	151.02		15.63	0.00	135.39
	13-Sep-02	151.02	16.02	16.03	0.01	135.00
	4-Oct-02	151.02		16.09	0.00	134.93
	25-Oct-02	151.02		16.53	0.00	134.49
	8-Nov-02	151.02		16.35	0.00	134.67
	13-Nov-02	151.02		16.08	0.00	134.94
	4-Dec-02	151.02		15.19	0.00	135.83

TABLE 3
Current and Historic Well Gauging Data

Well ID	Date of Gauging	Well MP Elevation (feet)	Depth to Product (feet bMP)	Depth to Water (feet bMP)	Product Thickness (feet)	Groundwater Elevation (feet)
	18-Dec-02	151.02		16.22	0.00	134.80
	30-Dec-02	151.02		16.03	0.00	134.99
	22-Jan-03	151.02		16.97	0.00	134.05
	6-Mar-03	151.02		14.05	0.00	136.97
	9-Apr-03	151.02		14.44	0.00	136.58
	21-May-03	151.02		15.62	0.00	135.40
	27-Jun-03	151.02		16.21	0.00	134.81

Notes:
Elevations are relative to Temporary Bench Mark-1 (TBM-1) with an assumed elevation of 150.00 feet mean sea level (aMSL) based on the 1996 USGS 7.5 Minute Series Lihue Quadrangle.
bMP = below measuring point (or top, northernmost location of well casing)
Specific gravity of product assumed to be 0.75

Semi-Annual Groundwater Monitoring (1/03 - 6/03)
Former Lihue Power Plant
Lihue, Kauai

TABLE 4
Groundwater Sample Laboratory Analytical Results
June 27, 2003

Sample ID	TPH-D	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Naph-thalene	Acenaph-thene	Fluoran-thene	Benzo(a)-pyrene	Lead	Cadmium
EPA Method:	8015 M	8021B	8021B	8021B	8021B	8100	8100	8100	8100	3010A	3010A
Units:	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
02-1068-GW-MW-1	<1.5	<0.005	<0.05	<0.05	<0.15	<0.0002	<0.0002	<0.0002	<0.0002	<0.0050	<0.0030
02-1068-GW-MW-2	<1.5	<0.005	<0.05	<0.05	<0.15	0.00021	<0.0002	<0.0002	<0.0002	<0.0050	<0.0030
02-1068-GW-MW-3	<1.5	<0.005	<0.05	<0.05	<0.15	0.00019	<0.0002	<0.0002	<0.0002	<0.0050	<0.0030
02-1068-GW-MW-4	<1.5	<0.005	<0.05	<0.05	<0.15	<0.0002	<0.0002	<0.0002	<0.0002	**0.0080**	<0.0030
02-1068-GW-RW-2	2.5	<0.005	<0.05	<0.05	<0.15	<0.0002	<0.0002	0.00042	<0.0002	<0.0050	<0.0030
02-1068-GW-RW-3	<1.5	<0.005	<0.05	<0.05	<0.15	<0.0002	<0.0002	0.00030	<0.0002	<0.0050	<0.0030
02-1068-GW-RW-A[1]	<1.5	<0.005	<0.05	<0.05	<0.15	<0.0002	<0.0002	0.00032	<0.0002	<0.0050	<0.0030
HDOH Tier 1 GALs	No Standard	0.005	1.0	0.14	10	0.24	0.32	0.013	0.0002	0.0056	0.005

Notes:
1. RW-A is a duplicate sample collected from recovery well RW-3.
TPH-D = Total Petroleum Hydrocarbons as Diesel
mg/L = milligrams per liter
<0.0005 = Not detected at or above the laboratory detection limit
BOLD = concentration that exceeds Tier 1 action level
HDOH Tier 1 GALs = Hawaii Department of Health Tier 1 groundwater action levels

Semi-Annual Groundwater Monitoring (1/03 - 6/03)
Former Lihue Power Plant
Lihue, Kauai

TABLE 5
Current and Historic Groundwater Laboratory Analytical Results

Well ID	Date	TPH-D	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Naph-thalene	Acenaph-thene	Fluoran-thene	Benzo(a) pyrene	Lead	Cadmium
	EPA Method:	8015M		8020 or 8021B				8100 or 8270B			6010B, 6020, or 3010A	
	Units:	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
MW-1	17-Dec-01	<0.60	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	-	-
	8-Jul-02	6.89	<0.001	<0.001	<0.001	<0.002	<0.0004	<0.0004	<0.0002	<0.00012	<0.005	<0.005
	18-Dec-02	<0.20	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	**0.00645**	<0.0005
	27-Jun-03	<1.5	<0.005	<0.05	<0.05	<0.15	<0.0002	<0.0002	<0.0002	<0.0002	<0.0050	<0.0030
MW-2	17-Dec-01	<0.60	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	-	-
	8-Jul-02	7.22	<0.001	<0.001	<0.001	<0.002	<0.0004	<0.0004	<0.0002	<0.00012	**0.0274**	<0.005
	18-Dec-02	<0.20	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	**0.0112**	<0.0005
	27-Jun-03	<1.5	<0.005	<0.05	<0.05	<0.15	0.00021	<0.0002	<0.0002	<0.0002	<0.0050	<0.0030
MW-3	17-Dec-01	<0.60	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	-	-
	8-Jul-02	7.46	<0.001	<0.001	<0.001	<0.002	0.000918	<0.0004	<0.0002	<0.00012	<0.005	<0.005
	18-Dec-02	<0.20	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	0.00281	<0.0005
	27-Jun-03	<1.5	<0.005	<0.05	<0.05	<0.15	0.00019	<0.0002	<0.0002	<0.0002	<0.0050	<0.0030
MW-4	17-Dec-01	<0.60	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	-	-
	8-Jul-02	7.08	<0.001	<0.001	<0.001	<0.002	<0.0004	<0.0004	<0.0002	<0.00012	**0.0471**	<0.005
	18-Dec-02	<0.20	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	**0.0377**	<0.0005
	27-Jun-03	<1.5	<0.005	<0.05	<0.05	<0.15	<0.0002	<0.0002	<0.0002	<0.0002	**0.0080**	<0.0030
RW-2	17-Dec-01	No Sample. Sheen dectected upon gauging and product recovered during well development.										
	8-Jul-02	20.6	0.00176	<0.001	<0.001	0.00434	0.00406	0.00639	<0.0002	<0.00012	<0.005	<0.005
	18-Dec-02	9.1	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	0.00177	<0.0005
	27-Jun-03	2.5	<0.005	<0.05	<0.05	<0.15	<0.0002	<0.0002	0.00042	<0.0002	<0.0050	<0.0030

TABLE 5
Current and Historic Groundwater Laboratory Analytical Results

Well ID	Date	TPH-D	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Naph-thalene	Acenaph-thene	Fluoran-thene	Benzo(a) pyrene	Lead	Cadmium
	EPA Method:	8015M		8020 or 8021B				8100 or 8270B			6010B, 6020, or 3010A	
	Units:	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
RW-3	17-Dec-01	No Sample. Sheen detected upon gauging and product recovered during well development.										
	8-Jul-02	6.37	0.00209	<0.001	<0.001	0.00412	0.0604	0.00634	0.00026	<0.00012	<0.005	<0.005
	18-Dec-02	4.7	<0.001	<0.001	<0.001	<0.001	0.0130	<0.0002	<0.0002	<0.0002	0.00045	<0.0005
	27-Jun-03	<1.5	<0.005	<0.05	<0.05	<0.15	<0.0002	<0.0002	0.00030	<0.0002	<0.0050	<0.0030
RW-4	17-Dec-01	No Sample. Heavy sheen detected upon gauging and product recovered during well development.										
	8-Jul-02	1,500	0.00458	0.00177	0.0173	0.0597	0.0995	0.252	**0.0151**	<0.00303	**0.0206**	<0.005
	18-Dec-02	No Sample. Heavy sheen detected upon gauging and product recovered from skimmer.										
	27-Jun-03	No Sample. Heavy sheen detected upon gauging and product recovered from skimmer.										
HDOH Tier 1 GALs		No Standard	0.005	1.0	0.14	10	0.24	0.32	0.013	0.0002	0.0056	0.005

Notes:
TPH-D = Total Petroleum Hydrocarbons as Diesel
mg/L = milligrams per liter
<0.0005 = Not detected at or above the laboratory detection limit
BOLD = concentration that exceeds Tier 1 action level
HDOH Tier 1 GALs = Hawaii Department of Health Tier 1 groundwater action levels
- = not analyzed

APPENDIX A

Standard Operating Procedures

STANDARD OPERATING PROCEDURE #1
EQUIPMENT DECONTAMINATION

This Standard Operating Procedure (SOP) states how BEI Environmental Services (BES) personnel decontaminate equipment. All equipment that comes in contact with potentially contaminated media must be decontaminated prior to reuse of the equipment. This includes, for example, split-spoon soil samplers, bailers, and interface probes. Disposable equipment is not to be decontaminated and reused, only equipment designed for reuse will be decontaminated and reused by BES personnel.

There are two acceptable decontamination procedures. First is steam cleaning and the second is hand washing with non-phosphate detergent and rinsing.

Steam Cleaning

Steam cleaning is typically performed by drilling and other contractors prior to reusing drilling rods and other heavy or large equipment. Steam cleaning equipment will be operated by qualified subcontractor personnel. BES personnel should verify that the equipment is operating properly such that the water is actually heated and not just a pressure wash. Steam cleaning will be performed such that the excess water is collected.

Hand Wash and Rinse

Standard Decontamination

BES or subcontractor personnel can use hand washing and rinse as a decontamination method. The following steps are performed to decontaminate a piece of equipment:

1. Wash equipment in a bucket containing a non-phosphate detergent/tap or distilled water solution using a scrub brush, bottle brush, and/or scrub pad, as needed.
2. Rinse equipment once in a second bucket containing distilled water.
3. Rinse equipment a second time in a third bucket containing distilled water.
4. Allow the equipment to completely air dry.

Additional Decontamination

If a piece of equipment is particularly dirty additional solutions can be used to decontaminate it. These include:

- Isopropyl alcohol to remove petroleum staining
- Acid solutions to remove inorganic and/or organic deposits

After these solutions have been used to decontaminate a piece of equipment, the four standard decontamination steps above must be performed.

STANDARD OPERATING PROCEDURE #2
MONITORING WELL GAUGING

This Standard Operating Procedure (SOP) states how BEI Environmental Services (BES) personnel collect liquid level measurements from temporary and permanent groundwater monitoring wells. There are two general methods used to gauge a monitoring well: electronic probe and steel tape. The SOP for both is provided below.

Using an Electronic Probe

1. Unlock, if appropriate, and open wellhead cover.
2. Unlock, if appropriate, and remove cap from the top of the well casing.
3. Lower the electronic probe into the well slowly. Acceptable electronic probes include:
   - electronic interphase probes, or
   - electronic water finding probes.
4. Continue lowering the probe until the probe gives a tone.
5. Place the probe tape against the well measuring point (MP) and slightly raise and lower the probe until the depth at which the tone of the probe is first signaled is established. Typical well MPs include:
   - north side of the top of the well casing
   - notch or mark in top of well casing
   - the top of pipes and other access points if remediation equipment is in well
   - ground surface in the case of temporary wells or open borings
6. Record the depth at which the probe first gives a tone. All measurements are recorded to the nearest 0.01-foot relative to the well MP. If the tone is a beeping, the probe is encountering water and the depth should be recorded as the depth to water. If the tone is a steady tone, the probe is encountering petroleum product and the depth should be recorded as the depth to product.
7. If product is present, record the depth to product (Step 6), then continue lowering the probe until the probe tone becomes a beep. Place the probe tape against the well MP and slightly raise and lower the probe until the depth at which the tone turns from a steady tone to a beep is established.
8. Record the depth to water to nearest 0.01-foot relative to the well MP.
9. Raise the probe until the contact with the liquid surface is broken. Lower the probe again and repeat Steps 5 and 7 to verify that the depths you recorded are correct.
10. Slowly pull up the probe using the reel making sure not to kink the tape.
11. Replace the well cap and lock it, if appropriate.
12. Close the wellhead cover and lock it, if appropriate.

Using a Steel Tape

1. Unlock, if appropriate, and open wellhead cover.
2. Unlock, if appropriate, and remove cap from the top of the well casing.
3. Evaluate what the depth to water in the well will be based on available information such as depth to water during drilling or the depth to water when the well was last gauged.
4. Place chalk or water-find paste on the graduated portion of the end of the steel tape.
5. Place petroleum-find paste on the opposite side of the steel tape if a product layer is suspected to be present in the well.
6. Lower the steel tape into the well avoiding contact between the chalk/paste portion of the tape with the side of the well casing until you reach the suspected depth to water foot marker on the steel tape.
7. Line up the suspected depth to water foot marker on the steel tape with the well's MP and hold it steady for one to five seconds. Hold the tape steady for only a short period if no product is present and for a longer period if product, especially a viscous product, is present.
8. Raise the steel tape until the lower, graduated portion of the tape is free. Calculate and record the depth to water by adding the foot marker held against the well MP to the portion of graduated tape where the chalk is wet or the water find paste changed color. Calculate and record the depth to product, if present, by adding the foot marker held against the well MP to the portion of graduated tape where the product-find paste changed color. All measurements are recorded to the nearest 0.01-foot relative to the well MP.
9. Clean off the graduated portion of the steel tape and repeat Steps 4 through 8 to verify that the depths you recorded are correct.
10. Replace the well cap and lock it, if appropriate.
11. Close the wellhead cover and lock it, if appropriate.

STANDARD OPERATING PROCEDURE #3
GROUNDWATER SAMPLE COLLECTION USING A BAILER

This Standard Operating Procedure (SOP) states how BEI Environmental Services (BES) personnel collect representative aqueous samples from temporary and permanent groundwater monitoring wells using a bailer.

1. Unlock, if appropriate, and open wellhead cover.
2. Unlock, if appropriate, and remove cap from the top of the well casing.
3. Measure the static water level in the well and total depth of the well to the nearest 0.01-foot relative to the well's designated measuring point (MP) using a decontaminated probe (Refer to SOPs for Decontamination and Monitoring Well Gauging).
4. Calculate the well casing volume using the formula: $\mathbf{V = (D)^2 \times (TD - DTW) \times (0.041)}$; where V = one well casing volume in gallons, D = well diameter in inches, TD = total depth of well in feet below MP, and DTW = depth to water in well in feet below MP.
5. Calculate the depth to water that will correspond with 80 percent recovery after purging is complete using the formula: $\mathbf{WL^{80} = TD - ((TD - DTW) * 0.80)}$; where WL^{80} is the water level in feet below MP when 80 percent recovery is reached, TD = total depth of well in feet below MP, and DTW = depth to water in well in feet below MP.
6. Attach a sufficient length of new or dedicated rope to the top of the bailer to be used to purge the well. The following bailer types can be used to purge groundwater from a well:
   - dedicated, disposable polyethylene, PVC, or Teflon® bailer, or
   - decontaminated stainless-steel, acrylic, PVC, or Teflon® bailer.
7. Secure the other end of the rope to a secure object that cannot fit into the well casing.
8. Lower the bailer into the well, allow it to completely fill with groundwater, then retrieve the bailer from the well with a minimum of disturbance to the water column.
9. Pour recovered groundwater from the bailer into a bucket of known volume. Repeat steps 8 and 9 until one well casing volume of groundwater has been purged from the well.
10. Repeat step 8 then pour the bailer contents into a container suitable for measuring the water quality parameters pH, temperature, and specific conductance (conductivity).
11. Measure and record the pH, temperature, and specific conductance (conductivity) of the most recently recovered groundwater using electronic meters. These parameters should be recorded as follows:
    - pH to the nearest 0.1 unit,
    - temperature to the nearest 0.5 degree Celsius, and
    - specific conductance (conductivity) to three significant figures and corrected to 25 degrees Celsius.

12. Repeat steps 8, 9, 10, and 11 until at least four well casing volumes of groundwater have been purged from the well and the two most recent water quality parameter readings are stable to the following criteria or the well is bailed dry:
    - pH varies less than 0.5 unit,
    - temperature varies less than 1 degree Celsius, and
    - specific conductance varies less than 10 percent of first value.
13. Allow the water column to recover to 80 percent or more of its original thickness (measure depth to water to verify, see result of step 5) at the completion of purging the well, or if the well is bailed dry. Proceed if the well has not recovered within 2 hours of purging.
14. Label all required sample bottles with at least the sample number and date and approximate time of sample collection.
15. Begin the sample collection process by repeating step 5 if a different bailer is to be used to collect the sample. The following bailer types can be used to sample groundwater from a well:
    - dedicated, disposable polyethylene, PVC, or Teflon® bailer, or
    - decontaminated Teflon® bailer.
16. Repeat step 7 with the sample bailer and pour the first bailer full of groundwater into a bucket if the sample bailer is not the same bailer used to purge the well.
17. Repeat step 7 and place the recovered groundwater in the required sample bottles until all the required bottles are full. Sample bottles should be filled and closed in the following order using the indicated methods:
    a. 40-milliliter (mL) volatile organic analysis (VOA) vials using a bailer bottom-emptying device until completely full, then cap the vials with screw caps having Teflon®-lined septa so that there are no air bubbles in the vials.
    b. Other clear or amber glass bottles using the bailer bottom-emptying device or pouring from the top of the bailer until approximately 90 percent full, then cap the bottles with Teflon®-lined screw caps.
    c. Plastic bottles using the bailer bottom-emptying device or pouring from the top of the bailer until approximately 90 percent full then capped with plastic screw caps.
18. Place the sample bottles in a water-ice-chilled chest.
19. Replace the well cap and lock it, if appropriate.
20. Close the wellhead cover and lock it, if appropriate.

APPENDIX B

Groundwater Sample Collection Data Sheets

GROUNDWATER SAMPLING DATA

BEI Hawaii

Well I.D.: **MW-1**

Proj. Name: **Lihue Power Plant** | Date: **June 27, 2003**
Proj. No.: **02-1068.01** | Tidally Influenced: **Yes**
Proj. Manager: **Edmund Urban** | Well Depth, ft: **27.03**
Field Reps.: **Stephanie Mandina** | Screened Interval, ft:

1 Purging Data/Field Measurements: All Measurements Relative to Top of Casing (TOC)

Depth to Well Bottom (DTB), ft: **27.03** | Casing Dia., in: **2** | Purge Vol
Depth to Sediment (DTS), ft: | Casing Vol., gal: **~2** | 0.163 gal/ft for 2" dia
Depth to Water (DTW), ft: **15.30** | Purge Vol., gal: **8** | 0.653 gal/ft for 4" dia.
DTS or DTB - DTW, ft: **11.73** | Actual Purge Vol., gal: **8**

No. of Gal Purged	Time	Salinity, %	pH	Conduct., mS/cm	Turbidity	Diss. O_2, mg/L	Temp., deg. C	Comments: (quality, recovery, color, odor sheen, accum. silt/sand)
0	0954		5.08				26.2	clear, no odor
2	1005		5.58				25.9	cloudy
4	1021		5.65				26.0	"
6	1032		5.62				25.7	"
~~Sample~~ 8	1051		5.66				25.2	slightly cloudy

Sample 1100
Comments:

	Method	Pumping Rate, gpm	Depth of Equip., ft
Purge	Dedicated bailer		
Sample	Dedicated bailer		

Bails dry? Yes ____ No X
At no. of casing volumes:
Purge Water Disposal Method: on site

V = (D)" X (H) x (0.041)

V = 1 well volume
D = dia. of well (in)
H = height of water (ft)

2 Sampling Data

Sample Number: **02-1068-GW-MW-1** 11:00 | Field Blank I.D.:
Duplicate Sample I.D.: | Rinseate Sample I.D.:

Bottle Type	No. of Bottles	Analytical		Preservative	Filter
		EPA Method	Analyses		
40 mL VOA	1	8021	BTEX	None	None
40 mL VOA	2	8100	PAHs	None	None
1 L Amber	1	8015M	TPH-D	None	None
250 mL Clear Plastic	1	6010	Cadmium, Lead	None	None
Total:	5				

3 Field Equipment

Pump Type/Tubing Type: **None** | Temp/pH/E..C. Meter:
Bailer Type: **Plastic (Disposable)** | Water Level Probe: **Solinst 122**
Filter Type: **None** | Other: **None**

4 Well Conditions

Okay ☆ Not Okay: X Explain: bend in well that causes bailer to go down w/ difficulty

GROUNDWATER SAMPLING DATA

BEI Hawaii

Well I.D.: MW-2

Proj. Name: Lihue Power Plant
Proj. No.: 02-1068.01
Proj. Manager: Edmund Urban
Field Reps.: Stephanie Mandina

Date: June 27, 2003
Tidally Influenced: Yes
Well Depth, ft: 22.75
Screened Interval, ft:

1 Purging Data/Field Measurements: All Measurements Relative to Top of Casing (TOC)

Depth to Well Bottom (DTB), ft: 22.75
Depth to Sediment (DTS), ft:
Depth to Water (DTW), ft: 16.07
DTS or DTB - DTW, ft: 6.68

Casing Dia., in: 2
Casing Vol., gal: 1.1
Purge Vol., gal: 4.4
Actual Purge Vol., gal: 5.0

Purge Vol
0.163 gal/ft for 2" dia
0.653 gal/ft for 4" dia.

No. of Gal Purged	Time	Salinity, %	pH	Conduct., mS/cm	Turbidity	Diss. O_2, mg/L	Temp., deg. C	Comments: (quality, recovery, color, odor sheen, accum. silt/sand)
0	1147		7.20				27.3	turbid, no odor
1.25	1151		7.11				26.8	"
2.5	1152		7.00				26.2	"
3.75	1154		7.25				25.8	"
~~Sample~~	1157		7.13				26.0	"
Sample 6.25	1200		7.09				25.8	"

Comments:

	Method	Pumping Rate, gpm	Depth of Equip., ft
Purge	Dedicated bailer		
Sample	Dedicated bailer		

Bails dry? Yes ____ No X
At no. of casing volumes:
Purge Water Disposal Method:
0

V = (D)" X (H) x (0.041)

V = 1 well volume
D = dia. of well (in)
H = height of water (ft)

2 Sampling Data

Sample Number: 02-1068-GW-MW-2 1200
Duplicate Sample I.D.:
Field Blank I.D.:
Rinseate Sample I.D.:

Bottle Type	No. of Bottles	Analytical: EPA Method	Analytical: Analyses	Preservative	Filter
40 mL VOA	1	8021	BTEX	None	None
40 mL VOA	2	8100	PAHs	None	None
1 L Amber	1	8015M	TPH-D	None	None
250 mL Clear Plastic	1	6010	Cadmium, Lead	None	None
Total:	5				

3 Field Equipment

Pump Type/Tubing Type: ~~None~~ Pump
Bailer Type: Plastic (Disposable)
Filter Type: None

Temp/pH/E..C. Meter: 0
Water Level Probe: Solinst 122
Other: None

4 Well Conditions

Okay ~~X~~ Not Okay: X Explain:

bends in well that ~~require a smaller bailer~~ pump

GROUNDWATER SAMPLING DATA

BEI Hawaii

Well I.D.: **MW-3**

Proj. Name: **Lihue Power Plant** Date: **June 27, 2003**

Proj. No.: **02-1068.01** Tidally Influenced: **Yes**

Proj. Manager: **Edmund Urban** Well Depth, ft: **23.65**

Field Reps.: **Stephanie Mandina** Screened Interval, ft:

1 Purging Data/Field Measurements: All Measurements Relative to Top of Casing (TOC)

Depth to Well Bottom (DTB), ft: **23.65** Casing Dia., in: **2** Purge Vol

Depth to Sediment (DTS), ft: Casing Vol., gal: 1.3 0.163 gal/ft for 2" dia

Depth to Water (DTW), ft: 15.77 Purge Vol., gal: 5.2 0.653 gal/ft for 4" dia.

DTS or DTB - DTW, ft: 7.88 Actual Purge Vol., gal:

No. of Gal Purged	Time	~~Salinity, %~~	pH	~~Conduct., mS/cm~~	~~Turbidity~~	~~Diss. O2, mg/L~~	Temp., deg. C	Comments: (quality, recovery, color, odor sheen, accum. silt/sand)
0	1505		5.72				28.9	Slightly turbid, no odor
1.5	1509		5.86				26.6	"
3.0	1512		5.90				25.8	"
4.5	1515		5.93				25.8	"
6.0 ~~Sample~~	1519		5.95				26.4	"

Sample 1525

Comments:

	Method	Pumping Rate, gpm	Depth of Equip., ft
Purge	Dedicated bailer		
Sample	Dedicated bailer		

Bails dry? Yes ____ No X

At no. of casing volumes:

Purge Water Disposal Method:

On Sru 0

V = (D)² X (H) x (0.041)

V = 1 well volume

D = dia. of well (in)

H = height of water (ft)

2 Sampling Data

Sample Number: **02-1068-GW-MW-3** Field Blank I.D.:

Duplicate Sample I.D.: Rinseate Sample I.D.:

Bottle Type	No. of Bottles	Analytical		Preservative	Filter
		EPA Method	Analyses		
40 mL VOA	1	8021	BTEX	None	None
40 mL VOA	2	8100	PAHs	None	None
1 L Amber	1	8015M	TPH-D	None	None
250 mL Clear Plastic	1	6010	Cadmium, Lead	None	None
Total:	5				

3 Field Equipment

Pump Type/Tubing Type: ~~None~~ ~~Many~~ sr None

Temp/pH/E..C. Meter: 0

Bailer Type: **Plastic (Disposable)** Water Level Probe: **Solinst 122**

Filter Type: **None** Other: **None**

4 Well Conditions

Okay X Not Okay: ____ Explain:

GROUNDWATER SAMPLING DATA

BEI Hawaii

Well I.D.: **MW-4**

Proj. Name: **Lihue Power Plant** Date: **June 27, 2003**

Proj. No.: **02-1068.01** Tidally Influenced: **Yes**

Proj. Manager: **Edmund Urban** Well Depth, ft: **19.66**

Field Reps.: **Stephanie Mandina** Screened Interval, ft:

1 Purging Data/Field Measurements: All Measurements Relative to Top of Casing (TOC)

Depth to Well Bottom (DTB), ft: **19.66** Casing Dia., in: **2** Purge Vol

Depth to Sediment (DTS), ft: Casing Vol., gal: ~~.91~~ 0.163 gal/ft for 2" dia

Depth to Water (DTW), ft: 14.06 Purge Vol., gal: 3.64 0.653 gal/ft for 4" dia.

DTS or DTB - DTW, ft: 5.60 Actual Purge Vol., gal: 4.0

No. of Gal Purged	Time	Salinity, %	pH	Conduct., mS/cm	Turbidity	Diss. O_2, mg/L	Temp., deg. C	Comments: (quality, recovery, color, odor sheen, accum. silt/sand)
0	1234		6.38				28.7	turbid, no odor
1	1235		6.34				27.1	"
2	1236		6.34				26.0	"
3	1239		6.37				25.4	less turbid
4 ~~Sample~~	1241		6.31				25.2	
Sample	1245							

Comments:

	Method	Pumping Rate, gpm	Depth of Equip., ft
Purge	Dedicated bailer		
Sample	Dedicated bailer		

Bails dry? Yes ____ No X

At no. of casing volumes:

Purge Water Disposal Method: 0

V = (D)" X (H) x (0.041)

V = 1 well volume

D = dia. of well (in)

H = height of water (ft)

2 Sampling Data

Sample Number: **02-1068-GW-MW-4** 1245 Field Blank I.D.:

Duplicate Sample I.D.: Rinseate Sample I.D.:

Bottle Type	No. of Bottles	Analytical		Preservative	Filter
		EPA Method	Analyses		
40 mL VOA	1	8021	BTEX	None	None
40 mL VOA	2	8100	PAHs	None	None
1 L Amber	1	8015M	TPH-D	None	None
250 mL Clear Plastic	1	6010	Cadmium, Lead	None	None
Total:	5				

3 Field Equipment

Pump Type/Tubing Type: **None** Temp/pH/E..C. Meter: 0

Bailer Type: **Plastic (Disposable)** Water Level Probe: **Solinst 122**

Filter Type: **None** Other: **None**

4 Well Conditions

Okay ✓ Not Okay: ____ Explain:

GROUNDWATER SAMPLING DATA

BEI Hawaii

Well I.D.: **RW-2**

Proj. Name: **Lihue Power Plant** Date: **June 27, 2003**
Proj. No.: **02-1068.01** Tidally Influenced: **Yes**
Proj. Manager: **Edmund Urban** Well Depth, ft: **19.65**
Field Reps.: **Stephanie Mandina** Screened Interval, ft:

1 Purging Data/Field Measurements: All Measurements Relative to Top of Casing (TOC)

Depth to Well Bottom (DTB), ft: **19.65** Casing Dia., in: **4** Purge Vol
Depth to Sediment (DTS), ft: Casing Vol., gal: 3.3 0.163 gal/ft for 2" dia
Depth to Water (DTW), ft: 14.52 Purge Vol., gal: 13.2 0.653 gal/ft for 4" dia.
DTS or DTB - DTW, ft: ~~14~~ 5.13 Actual Purge Vol., gal: 14.0

No. of Gal Purged	Time	~~Salinity, %~~	pH	~~Conduct., mS/cm~~	~~Turbidity~~	~~Diss. O_2, mg/L~~	Temp., deg. C	Comments: (quality, recovery, color, odor sheen, accum. silt/sand)
0	1552		6.89				28.3	Slight odor, gray/black turbidity
3.5	1554		6.52				26.5	and Spotty sheen (grayish)
7.0	1556		6.57				26.2	less turbid
10.5	1607		6.60				26.9	
14.0 ~~Sample~~	1608		6.62				26.2	
Sample	1610							

Comments:

	Method	Pumping Rate, gpm	Depth of Equip., ft
Purge	Dedicated bailer		
Sample	Dedicated bailer		

Bails dry? Yes ____ No X
At no. of casing volumes:
Purge Water Disposal Method:
on SMU 0

V = (D)" X (H) x (0.041)

V = 1 well volume
D = dia. of well (in)
H = height of water (ft)

2 Sampling Data

Sample Number: **02-1068-GW-RW-2** 1610 Field Blank I.D.:
Duplicate Sample I.D.: Rinseate Sample I.D.:

Bottle Type	No. of Bottles	Analytical		Preservative	Filter
		EPA Method	Analyses		
40 mL VOA	1	8021	BTEX	None	None
40 mL VOA	2	8100	PAHs	None	None
1 L Amber	1	8015M	TPH-D	None	None
250 mL Clear Plastic	1	6010	Cadmium, Lead	None	None
Total:	5				

3 Field Equipment

Pump Type/Tubing Type: ~~None~~ Pump Temp/pH/E..C. Meter: 0
Bailer Type: **Plastic (Disposable)** Water Level Probe: **Solinst 122**
Filter Type: **None** Other: **None**

4 Well Conditions

Okay X Not Okay: Explain:

GROUNDWATER SAMPLING DATA

BEI Hawaii

Well I.D.: **RW-3**

Proj. Name: **Lihue Power Plant** Date: **June 27, 2003**

Proj. No.: **02-1068.01** Tidally Influenced: **Yes**

Proj. Manager: **Edmund Urban** Well Depth, ft: **18.85**

Field Reps.: **Stephanie Mandina** Screened Interval, ft:

1 Purging Data/Field Measurements: All Measurements Relative to Top of Casing (TOC)

Depth to Well Bottom (DTB), ft: **18.85** Casing Dia., in: **4** Purge Vol

Depth to Sediment (DTS), ft: Casing Vol., gal: **2.8** 0.163 gal/ft for 2" dia

Depth to Water (DTW), ft: **14.56** Purge Vol., gal: **11.2** 0.653 gal/ft for 4" dia.

DTS or DTB - DTW, ft: **4.29** Actual Purge Vol., gal: **12.0**

No. of Gal Purged	Time	Salinity, %	pH	Conduct., mS/cm	Turbidity	Diss. O_2, mg/L	Temp., deg. C	Comments: (quality, recovery, color, odor sheen, accum. silt/sand)
0	1633		7.32				27.6	stale gas odor, turbid, light sheen
3	1634		7.06				26.7	"
6	1636		6.96				26.0	"
9	1643		6.95				26.4	mostly clear, no sheen
12 ~~Sample~~	1644		6.95				25.9	

Sample 1647

Comments:

	Method	Pumping Rate, gpm	Depth of Equip., ft
Purge	Dedicated bailer		
Sample	Dedicated bailer		

Bails dry? Yes ____ No X

At no. of casing volumes:

Purge Water Disposal Method:

on SMU 0

V = (D)" X (H) x (0.041)

V = 1 well volume

D = dia. of well (in)

H = height of water (ft)

2 Sampling Data

Sample Number: **02-1068-GW-RW-3** 16:47 Field Blank I.D.:

Duplicate Sample I.D.: **02-1068-GW-RW-A** 16:50 Rinseate Sample I.D.:

Duplicate - 1 VOA was an old VOA + septum may be bad

Bottle Type	No. of Bottles	Analytical: EPA Method	Analytical: Analyses	Preservative	Filter
40 mL VOA	2	8021	BTEX	None	None
40 mL VOA	4	8100	PAHs	None	None
1 L Amber	2	8015M	TPH-D	None	None
250 mL Clear Plastic	2	6010	Cadmium, Lead	None	None
Total:	10				

3 Field Equipment

Pump Type/Tubing Type: ~~None~~ pump

Temp/pH/E..C. Meter: 0

Bailer Type: **Plastic (Disposable)**

Water Level Probe: **Solinst 122**

Filter Type: **None**

Other: **None**

4 Well Conditions

Okay X Not Okay: ____ Explain:

GROUNDWATER SAMPLING DATA

BEI Hawaii

Well I.D.: **RW-1**

Proj. Name: **Lihue Power Plant** Date: **June 27, 2003**
Proj. No.: **02-1068.01** Tidally Influenced: **Yes**
Proj. Manager: **Edmund Urban** Well Depth, ft: **24.41**
Field Reps.: **Stephanie Mandina** Screened Interval, ft:

1 Purging Data/Field Measurements: All Measurements Relative to Top of Casing (TOC)

Depth to Well Bottom (DTB), ft: **24.41** Casing Dia., in: **4** Purge Vol
Depth to Sediment (DTS), ft: Casing Vol., gal: 0.163 gal/ft for 2" dia
Depth to Water (DTW), ft: 18.57 Purge Vol., gal: 0.653 gal/ft for 4" dia.
DTS or DTB - DTW, ft: 5.84 Actual Purge Vol., gal:

No. of Gal Purged	Time	Salinity, %	pH	Conduct., mS/cm	Turbidity	Diss. O_2, mg/L	Temp., deg. C	Comments: (quality, recovery, color, odor sheen, accum. silt/sand)
NA								
Sample								

Comments: Product present in ~~water~~ E/H skimmer. Sheen evident on decon. water after cleaning IP Probe. Removed hydro-skimmer and replaced with custom-built skimmer.

	Method	Pumping Rate, gpm	Depth of Equip., ft
Purge	Dedicated bailer		
Sample	Dedicated bailer		

Bails dry? Yes NA No
At no. of casing volumes:
Purge Water Disposal Method:

V = (D)" X (H) x (0.041)

V = 1 well volume
D = dia. of well (in)
H = height of water (ft)

2 Sampling Data

Sample Number: ~~02-1068-GW-RW-1~~ NA Field Blank I.D.:
Duplicate Sample I.D.: Rinseate Sample I.D.:

Bottle Type	No. of Bottles	Analytical		Preservative	Filter
		EPA Method	Analyses		
NA					
Total:	0				

3 Field Equipment

Pump Type/Tubing Type: **None** Temp/pH/E..C. Meter: **None**
Bailer Type: **None** Water Level Probe: **Solinst 122**
Filter Type: **None** Other: **None**

4 Well Conditions

Okay X Not Okay: Explain:

GROUNDWATER SAMPLING DATA

BEI Hawaii

Well I.D.: **RW-4**

Proj. Name: **Lihue Power Plant** Date: **June 27, 2003**

Proj. No.: **02-1068.01** Tidally Influenced: **Yes**

Proj. Manager: **Edmund Urban** Well Depth, ft: **21.21**

Field Reps.: **Stephanie Mandina** Screened Interval, ft:

1 Purging Data/Field Measurements: All Measurements Relative to Top of Casing (TOC)

Depth to Well Bottom (DTB), ft: **21.21** Casing Dia., in: **4** Purge Vol

Depth to Sediment (DTS), ft: Casing Vol., gal: 0.163 gal/ft for 2" dia

Depth to Water (DTW), ft: 16.21 Purge Vol., gal: 0.653 gal/ft for 4" dia.

DTS or DTB - DTW, ft: 5.00 Actual Purge Vol., gal:

No. of Gal Purged	Time	Salinity, %	pH	Conduct., mS/cm	Turbidity	Diss. O_2, mg/L	Temp., deg. C	Comments: (quality, recovery, color, odor sheen, accum. silt/sand)
NA								
Sample								

Comments: Product present on ~~bailer~~ skimmer & absorbent. Sheen evident on decon. water after cleaning IP Probe.

	Method	Pumping Rate, gpm	Depth of Equip., ft
Purge	Dedicated bailer		
Sample	Dedicated bailer		

Bails dry? Yes NA No

At no. of casing volumes:

Purge Water Disposal Method: **0**

V = (D)" X (H) x (0.041)

V = 1 well volume

D = dia. of well (in)

H = height of water (ft)

2 Sampling Data

Sample Number: NA Field Blank I.D.:

Duplicate Sample I.D.: Rinseate Sample I.D.:

Bottle Type	No. of Bottles	Analytical		Preservative	Filter
		EPA Method	Analyses		
Total:	0				

3 Field Equipment

Pump Type/Tubing Type: **None** Temp/pH/E..C. Meter: **None**

Bailer Type: **None** Water Level Probe: **Solinst 122**

Filter Type: **None** Other: **None**

4 Well Conditions

Okay X Not Okay: Explain:

APPENDIX C

Laboratory Analytical Reports and Chain-of-Custody Forms

ADVANCED ANALYTICAL LABORATORY, LLC

July 17, 2003

BEI Environmental Services
311B Pacific Street
Honolulu, HI
96817

Dear Stephanie Mandina:

Please find enclosed the laboratory report for your project # Lihue Power Plant. If you have any questions regarding this project, please don't hesitate to contact AAL.

Thank you for your business and continuing support.

Sincerely,

Uwe Baumgartner, Ph.D
Owner

Elisa M. Young
Owner

544 OHOHIA STREET, #10 HONOLULU HAWAII 96819
TEL (808) 836-2252 FAX (808) 836-2250

ADVANCED ANALYTICAL LABORATORY-CHAIN OF CUSTODY RECORD

544 OHOHIA STREET, HONOLULU, HAWAII 96819 TEL (808) 836-2252 FAX (808) 836-2250

TURNAROUND TIME: STND AAL PROJECT#: B215

METHOD 5035 NEEDED: YES/ NO

CLIENT: BEI Environmental Services	LOCATION: Lihue Power Plant
ADDRESS: 311 B Pacific St, Honolulu	COLLECTOR: E. Urban, S. Mandina
PHONE: 535-6040 FAX: 535-6053	DATE OF COLLECTION: 6/27/03
CLIENT PROJECT#: 02-1068.01	PROJECT MANAGER: S. mandina

Sample Number	Depth	Time	Sample type	Container Type	8015B TPH Fuel Scan	8015B TPH Gasoline	8015B TPH Diesel	8015B TPH Oil	8021B BTEX	8021B MtBE	8100 PAH DOH 4	8100 PAH 16 analytes	8082 PCB	Total Lead 6010	Total Cadmium 6010	Total Chromium	Total RCRA 8 Metals	8260B Volatiles	8270 Semi Volatiles	8021B HVOC	Field Notes	Total Number of Containers	Total Number received
02-1068-GW-MW1		1100	Water	3 VOAs / glass 1 plastic			X			X		X		X	X							5	5
02-1068-GW-MW-2		1200					X			X		X		X	X							5	5
02-1068-GW-MW-3		1525					X			X		X		X	X							5	5
02-1068-GW-MW-4		1245					X			X		X		X	X							5	5
02-1068-GW-RW-2		1610					X			X		X		X	X							5	5
02-1068-GW-RW-3		1647					X			X		X		X	X							5	5
02-1068-GW-RW-A		1650	↓	↓			X			X		X		X	X							5	5
			LAST ENTRY																				

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
[signature]	6/30/03 14:16	[signature]	6/30/03 14:16
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	35
CHAIN OF CUSTODY SEALS INTACT	NA
RECEIVED IN GOOD CONDITION	Y
TEMPERATURE	1.2°C
PAGE 1 OF 1	

LABORATORY NOTES:

ADVANCED ANALYTICAL LABORATORY, LLC

AAL Project #B215

BEI Environmental Services

Client Project #: 02-1068.01 Method: 8015M

Client Project Name: Lihue Power Plant Matrix: Water

CLIENT SAMPLE ID	TPH-DIESEL [mg/L]	SURROGATE RECOVERY	FLAGS	DATE ANALYZED
Blank	nd	101%		7/2/2003
02-1068-GW-MW-1	nd	102%		7/2/2003
02-1068-GW-MW-2	nd	103%		7/2/2003
02-1068-GW-MW-3	nd	104%		7/2/2003
02-1068-GW-MW-4	nd	102%		7/2/2003
02-1068-GW-RW-2	2.5	113%		7/2/2003
02-1068-GW-RW-3	nd	103%		7/2/2003
02-1068-GW-RW-A	nd	106%		7/2/2003
PQL	1.5	Acceptable Range		
MDL	0.30	70%-130%		

QA/QC DATA

QC BATCH # 070203	TPH-DIESEL [mg/L]	Acceptable Range
Lab Control Spike (LCS)	13.4	10.6-19.7
Matrix Spike (MS)	13.7	10.6-19.7
Matrix Spike Dup (MSD)	13.3	10.6-19.7
Recovery MS	90%	70%-130%
Recovery MSD	88%	70%-130%
RPD of MS/MSD	3.0%	20%

Analyst: U. Baumgartner, Ph.D.

Data review: E. Young

544 OHOHIA STREET, #10 HONOLULU HAWAII 96819
TEL (808) 836-2252 FAX (808) 836-2250

ADVANCED ANALYTICAL LABORATORY, LLC

AAL Project #B215

BEI Environmental Services

Client Project #: 02-1068.01
Client Project Name: Lihue Power Plant

Method: 8021B
Matrix: Water

CLIENT SAMPLE ID	Benzene [mg/L]	Toluene [mg/L]	Ethylbenzene [mg/L]	Xylenes [mg/L]	SURROGATE RECOVERY	FLAGS	DATE ANALYZED
Blank	nd	nd	nd	nd	87%		7/1/2003
02-1068-GW-MW-1	nd	nd	nd	nd	87%		7/1/2003
02-1068-GW-MW-2	nd	nd	nd	nd	88%		7/1/2003
02-1068-GW-MW-3	nd	nd	nd	nd	87%		7/1/2003
02-1068-GW-MW-4	nd	nd	nd	nd	87%		7/1/2003
02-1068-GW-RW-2	nd	nd	nd	nd	87%		7/1/2003
02-1068-GW-RW-3	nd	nd	nd	nd	86%		7/1/2003
02-1068-GW-RW-A	nd	nd	nd	nd	87%		7/1/2003
PQL	0.005	0.05	0.05	0.15	Acceptable Range		
MDL	0.001	0.01	0.01	0.01	70%-130%		

QA/QC DATA

QC BATCH #070103	Benzene [mg/L]	Toluene [mg/L]	Ethylbenzene [mg/L]	Xylenes [mg/L]	Acceptable Range	Xylenes
Lab Control Spike (LCS)	0.477	0.485	0.454	1.447	0.35-0.65	1.05-1.95
Matrix Spike (MS)	0.486	0.491	0.458	1.463	0.35-0.65	1.05-1.95
Matrix Spike Dup (MSD)	0.485	0.493	0.482	1.461	0.35-0.65	1.05-1.95
Recovery MS	97%	98%	92%	98%	70%-130%	
Recovery MSD	97%	99%	96%	97%	70%-130%	
RPD of MS/MSD	0.2%	0.4%	5.1%	0.1%	20%	

Analyst: E. Young
Data review: U. Baumgartner, Ph.D.

544 OHOHIA STREET, #10 HONOLULU HAWAII 96819
TEL (808) 836-2252 FAX (808) 836-2250

ADVANCED ANALYTICAL LABORATORY, LLC

AAL Project #B215

BEI Environmental Services

Client Project #: 02-1068.01
Client Project Name: Lihue Power Plant

Method: 8100
Matrix: Water

CLIENT SAMPLE ID	Naphthalene (mg/L)	Acenaphthene (mg/L)	Fluoranthene (mg/L)	Benzo(a)pyrene (mg/L)	SURROGATE RECOVERY	FLAGS	DATE ANALYZED
Blank	nd	nd	nd	nd	123%		7/7/2003
02-1068-GW-MW-1	nd	nd	nd	nd	99%		7/7/2003
02-1068-GW-MW-2	0.00021	nd	nd	nd	95%		7/7/2003
02-1068-GW-MW-3	0.00019	nd	nd	nd	86%		7/7/2003
02-1068-GW-MW-4	nd	nd	nd	nd	97%		7/7/2003
02-1068-GW-RW-2	nd	nd	0.00042	nd	80%		7/7/2003
02-1068-GW-RW-3	nd	nd	0.00030	nd	91%		7/7/2003
02-1068-GW-RW-A	nd	nd	0.00032	nd	89%		7/7/2003
PQL	0.00020	0.00020	0.00020	0.00020	Acceptable Range		
MDL	0.00005	0.00005	0.00005	0.00005	70%-130%		

QA/QC DATA

QC BATCH # 070703	Naphthalene (mg/L)	Acenaphthene (mg/L)	Fluoranthene (mg/L)	Benzo(a)pyrene (mg/L)	Acceptable Range
Lab Control Spike (LCS)	0.00477	0.00488	0.00505	0.00455	0.00350-0.00650
Matrix Spike (MS)	0.00492	0.00506	0.00529	0.00505	0.00350-0.00650
Matrix Spike Dup (MSD)	0.00481	0.00492	0.00510	0.00469	0.00350-0.00650
Recovery MS	98%	101%	106%	101%	70%-130%
Recovery MSD	96%	98%	102%	94%	70%-130%
RPD of MS/MSD	2.2%	2.7%	3.8%	7.3%	20%

Analyst: E. Young
Data review: U. Baumgartner, Ph.D.

544 OHOHIA STREET, #10 HONOLULU HAWAII 96819
TEL (808) 836-2252 FAX (808) 836-2250

CLIENT: Advanced Analytical Laboratory, LLC **Lab Order:** 063628
Project: B215, 02-1068.01

Lab ID: 063628-001 **Collection Date:** 6/27/2003
Client Sample ID: 02-1068-GW-MW1 **Matrix:** WATER

Analyte	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	(EPA 3010A)			**EPA 6010B**		
RunID: ICP2_030708C	QC Batch: 14295			PrepDate	7/3/2003	Analyst: **RQ**
Cadmium	ND	0.0030		mg/L	1	7/8/2003
Lead	ND	0.0050		mg/L	1	7/8/2003

Lab ID: 063628-002 **Collection Date:** 6/27/2003
Client Sample ID: 02-1068-GW-MW2 **Matrix:** WATER

Analyte	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	(EPA 3010A)			**EPA 6010B**		
RunID: ICP2_030708C	QC Batch: 14295			PrepDate	7/3/2003	Analyst: **RQ**
Cadmium	ND	0.0030		mg/L	1	7/8/2003
Lead	ND	0.0050		mg/L	1	7/8/2003

Lab ID: 063628-003 **Collection Date:** 6/27/2003
Client Sample ID: 02-1068-GW-MW3 **Matrix:** WATER

Analyte	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	(EPA 3010A)			**EPA 6010B**		
RunID: ICP2_030708C	QC Batch: 14295			PrepDate	7/3/2003	Analyst: **RQ**
Cadmium	ND	0.0030		mg/L	1	7/8/2003
Lead	ND	0.0050		mg/L	1	7/8/2003

Qualifiers:

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range
- H-Sample exceding holding time

Results are wet unless othewise specified

Advanced Technology Laboratories
3275 Walnut Avenue Signal Hill, CA 90807 Tel: 562 989-4045 Fax: 562 989-4040

Advanced Technology Laboratories

Date: *08-Jul-03*

CLIENT: Advanced Analytical Laboratory, LLC **Lab Order:** 063628
Project: B215, 02-1068.01

Lab ID: 063628-004 **Collection Date:** 6/27/2003
Client Sample ID: 02-1068-GW-MW4 **Matrix:** WATER

Analyte	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	(EPA 3010A)			**EPA 6010B**		
RunID: ICP2_030708C	QC Batch: 14295			PrepDate	7/3/2003	Analyst: RQ
Cadmium	ND	0.0030		mg/L	1	7/8/2003
Lead	0.0080	0.0050		mg/L	1	7/8/2003

Lab ID: 063628-005 **Collection Date:** 6/27/2003
Client Sample ID: 02-1068-GW-RW-2 **Matrix:** WATER

Analyte	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	(EPA 3010A)			**EPA 6010B**		
RunID: ICP2_030708C	QC Batch: 14295			PrepDate	7/3/2003	Analyst: RQ
Cadmium	ND	0.0030		mg/L	1	7/8/2003
Lead	ND	0.0050		mg/L	1	7/8/2003

Lab ID: 063628-006 **Collection Date:** 6/27/2003
Client Sample ID: 02-1068-GW-RW-3 **Matrix:** WATER

Analyte	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	(EPA 3010A)			**EPA 6010B**		
RunID: ICP2_030708C	QC Batch: 14295			PrepDate	7/3/2003	Analyst: RQ
Cadmium	ND	0.0030		mg/L	1	7/8/2003
Lead	ND	0.0050		mg/L	1	7/8/2003

Qualifiers:

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range
- H-Sample exceding holding time

Results are wet unless othewise specified

Advanced Technology Laboratories
3275 Walnut Avenue Signal Hill, CA 90807 Tel: 562 989-4045 Fax: 562 989-4040

Advanced Technology Laboratories

Date: *08-Jul-03*

CLIENT: Advanced Analytical Laboratory, LLC **Lab Order:** 063628
Project: B215, 02-1068.01

Lab ID: 063628-007 **Collection Date:** 6/27/2003
Client Sample ID: 02-1068-GW-RW-A **Matrix:** WATER

Analyte	Result	PQL	Qual	Units	DF	Date Analyzed
ICP METALS						
	(EPA 3010A)			**EPA 6010B**		
RunID: ICP2_030708C	QC Batch: 14295			PrepDate	7/3/2003	Analyst: **RQ**
Cadmium	ND	0.0030		mg/L	1	7/8/2003
Lead	ND	0.0050		mg/L	1	7/8/2003

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range
H-Sample exceding holding time

Results are wet unless othewise specified

Advanced Technology Laboratories
3275 Walnut Avenue Signal Hill, CA 90807 Tel: 562 989-4045 Fax: 562 989-4040

Methods and Procedures

Gasoline/MBTEX Method 5035A/8015M/8021B

8015M and 8021B are the Gas Chromatography methods used for the determination of volatile aromatic hydrocarbons and Total Petroleum Hydrocarbons (TPH) in soils, solid wastes. EPA method 5035A is the extraction procedure used for soils and waters which involves the use of a closed-system purge and trap autosampler and concentrator.

Diesel and Oil Sample Preparation and Extraction by EPA 8015M

8015M is the GC method used for determination of Total Petroleum Hydrocarbons (TPH) in the diesel to lube oil range (C12 - C40) in soils, solid wastes, and waters using a flame ionization detector.
EPA Method 3510C is the extraction procedure used for water preparation.
EPA Method 3550B is the extraction procedure used for soils and solid wastes.
The extracted samples are analyzed by direct injection into a Shimadzu 2010 GC.

PAH Sample Preparation and Extraction by EPA 8100

8100 is the GC method used for determination of Polynuclear Aromatic Hydrocarbons (PAH) in soils, solid wastes, and waters using a flame ionization detector.
EPA Method 3510C is the extraction procedure used for water preparation.
EPA Method 3550B is the extraction procedure used for soils and solid wastes.
The extracted samples are analyzed by direct injection into a Shimadzu 2010 GC.
Positive results are confirmed by another analysis on a second column.

Data Qualifiers and Abbreviations

ND	not detected
MI	Matrix Interference
DO	diluted out
DF	Dilution Factor
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
LCS	Laboratory Control Sample
TPH	Total Petroleum Hydrocarbons
PAH	Polynuclear Aromatic Hydrocarbons