Source Water Quality Assessment
Castle Hills Access Road
Drainage Improvements Project
Kaneohe, Hawaii

Source Water Quality Assessment for the Castle Hills Access Road Drainage Improvements Project Kane'ohe, Hawai'i

October 29, 2009 *AECOS* No. 1212

Allen Cattell
AECOS, Inc.
45-939 Kamehameha Highway, No. 104
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Introduction

The proposed Castle Hills Access Road Drainage Improvements Project involves the demolition of the existing drainage outlet structure for Kapunahala Stream at Pookela Street (Figure 1). Demolition will be followed by construction of a new concrete outlet structure, gabion walls and apron; installation of fences and gates; and grading and landscaping. The total project area is 0.83 ha (2.04 ac), of which 0.64 ha (1.57 ac) will be disturbed. Construction of the new outlet will be done within the confines of a temporary cofferdam structure to isolate the work area from the stream. Due to subsurface water sources, the area within the cofferdam will likely be partially filled with water. Accumulating water will be removed from the construction area by daily pumping. A sump pit will be dug within the cofferdam to separate silt and debris from the dewatered effluent which will be passed through a filter media to further remove solids from the effluent. The effluent will be stored in a 40,000 gallon settling basin and tested to insure that water quality criteria are met before being discharged into Kapunhala Stream (ParEn, 2009).

Methods

This report summarizes analytical results of water quality samples collected by *AECOS* field personnel on July 14, 2009 from an existing well in the backyard of a house located within the proposed project area on Kupohu Street just downstream of the crossing of Kapunahala Stream by Pookela Street (Figure 2). Field/laboratory methods are provided in Table 1.

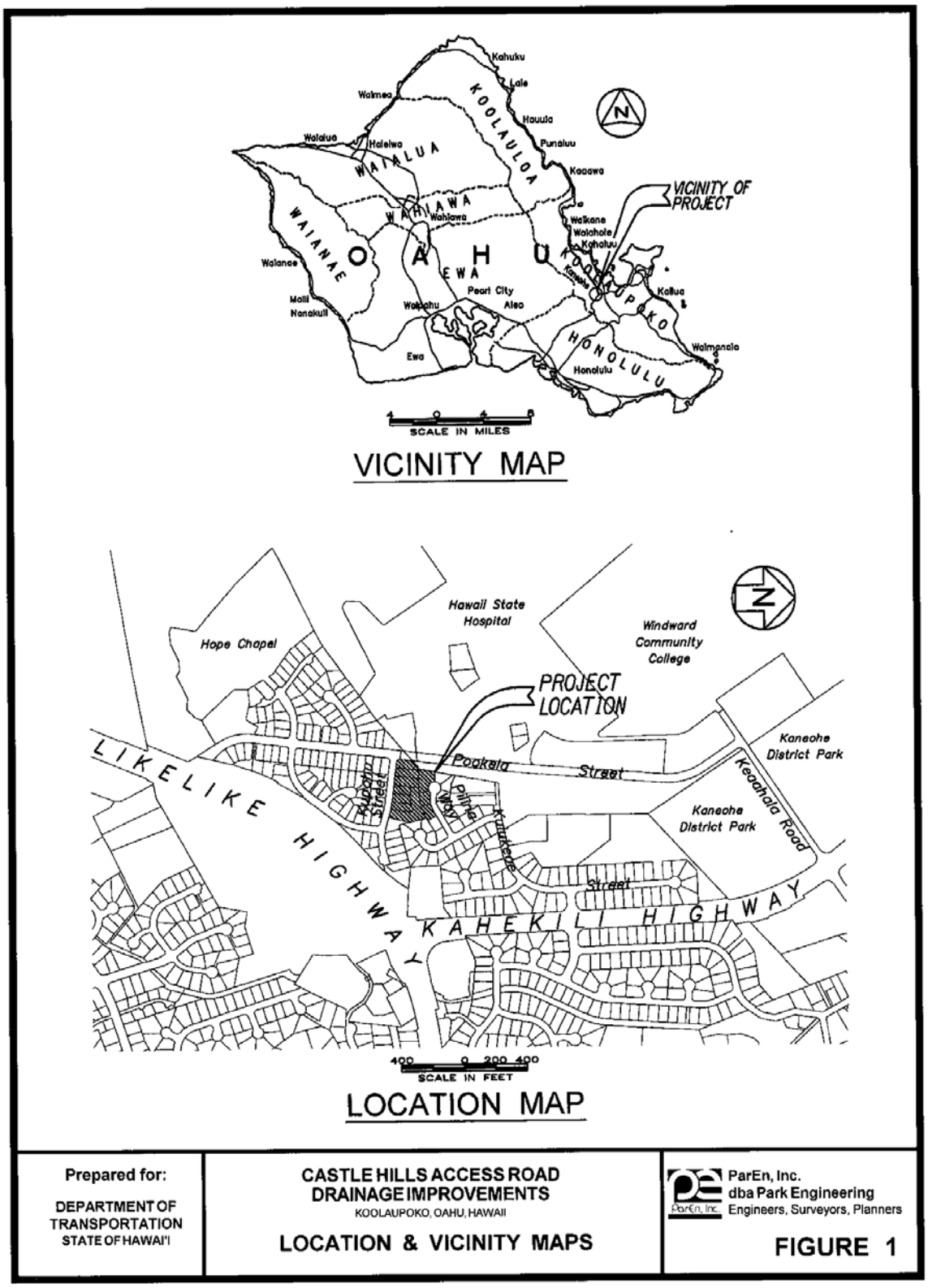

Figure 1. Location of the proposed project in Kane'ohe, Hawai'i.

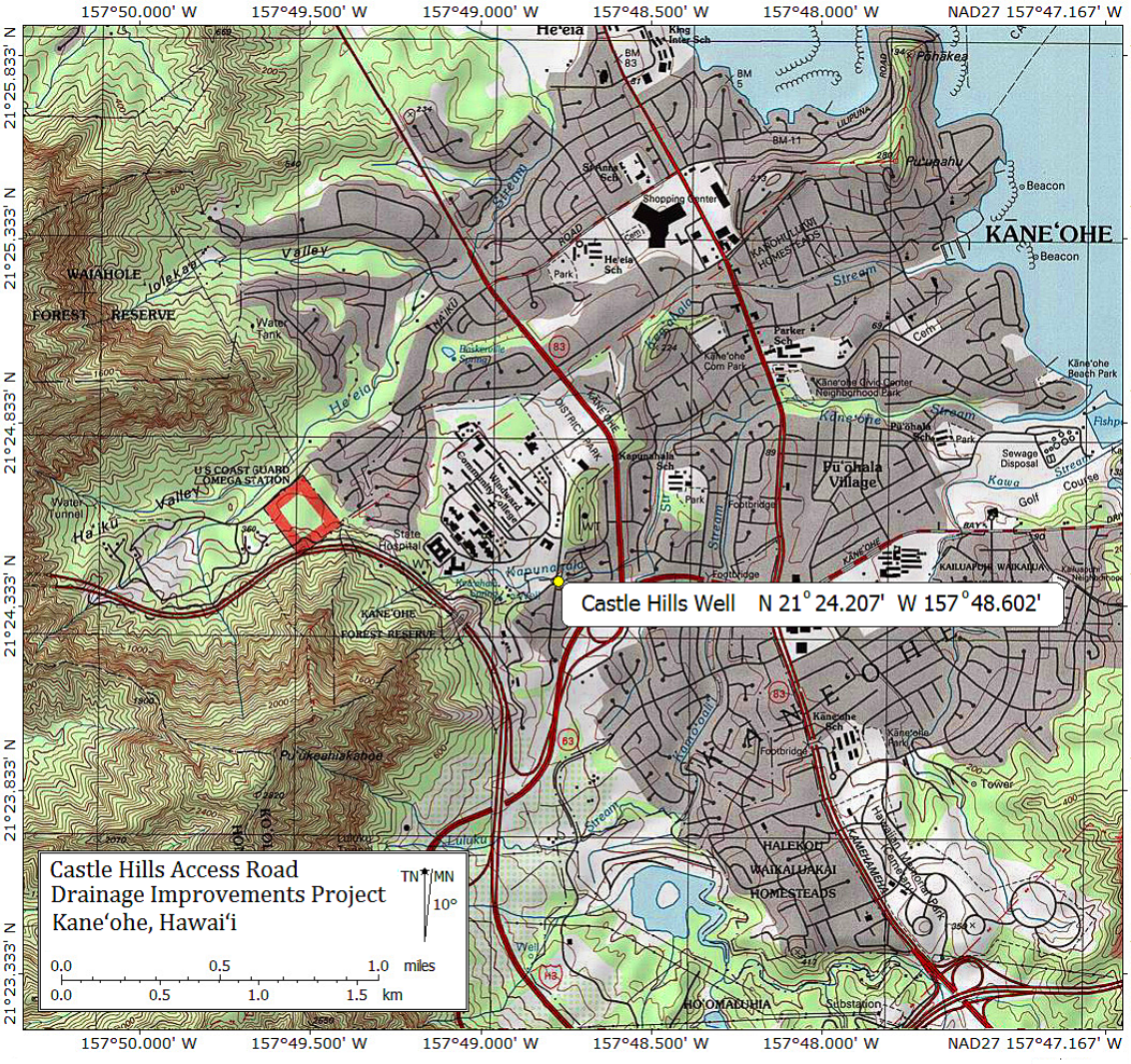

Figure 2. Location of groundwater well near Kapunahala Stream at the project site.

Temperature, pH, and dissolved oxygen (DO) were measured in the field. Samples for turbidity, total suspended solids (TSS), nutrients, oil and grease, and other organic compounds were collected using a Teflon bailer and transferred to appropriate containers, placed on ice, and taken to the *AECOS*, Inc. laboratory (*AECOS* Log. No. 25455) for analyses.

Results

The purpose of testing a groundwater sample is to characterize the water most likely to be seeping into the work area behind the cofferdam and proposed to be discharged (after filtering and settling procedures) into Kapunahala Stream. The results reported in Table 1 are compared with the state criteria for streams

(HDOH, 2004) and with water samples collected by HDOH (2008) in Kapunahala Stream. The stream sampling location was 500 m (1640 ft) below the project site, just before the confluence with Kane'ohe Stream. The state water quality criteria for particulates (turbidity and TSS) and nutrients (nitrogen and phosphorus compounds) are for comparisons with geometric mean values. A set of three separate samples, collected on different dates, is required to compute a geometric mean for comparison with a geometric mean criterion. Thus, the single set of data presented herein for the July 14, 2009 sampling for particulates and nutrients cannot be assessed against state criteria for a regulatory purpose, an important limitation.

The conductivity of the sample was below the maximum value (300 µmhos/cm) specified by the state criterion. Dissolved oxygen (DO) and the corresponding DO saturation level was low compared with the state saturation criterion (≥75%) as would be expected for groundwater that has not been in contact with air for a considerable period of time. pH was within the range specified by state criterion (5.5 - 8.0). Water temperature was consistent with expectation.

Particulate levels (turbidity and TSS) were high relative to Kapunahala Stream values and exceeded state turbidity and TSS geometric mean criteria. Similarly nutrients were high in the groundwater sample compared with Kapunahala Stream and the state water quality criteria.

Oil-and-grease was not present in detectable amounts which is consistent with the state criterion that all waters will be free of oil and grease. Toxic organics (pesticides and PCBs) were analyzed for but were not detected and are not listed in Table 1, but may be found in Appendix A.

Assessment

The low DO and DO saturation levels found in the sample from the groundwater sample are characteristic of groundwater that has not been in contact with air for a protracted period. DO levels will rise as the water contacts the atmosphere during the dewatering and treatment processes. The high particulate levels will be significantly reduced by the proposed filtering and settling procedures.

Table 1. Water quality characteristics of groundwater samples collected at the Castle Hills Access Road site July 14, 2009 compared with downstream Kapunahala Stream (HDOH, 2008) and state water quality standards (WQS) for streams.

Parameter	Analytical Method	Castle Hills Well	Kapunahala Stream	WQS dry season streams
Conductivity (µmho/cm)	SM†2510B	198	---	<300
Dissolved oxygen (mg/l)	YSI meter / SM4500	2.04	---	---
Dissolved oxygen (%)	YSI / 360 calculated	24	---	≥75%
pH	SM4500H+	7.0	---	5.5 - 8.0
Temperature (°C)	YSI meter / SM2550B	24.0	---	see footnotes
Turbidity (NTU)	EPA 180.1	8.65	---	2.0/5.0††
TSS (mg/L)	SM2540D	28.8	6.8 (4 – 17)	10/20††
Ammonia (µg N/L)	SM4500 B/C	220	3 (1 – 21)	---
Nitrate + nitrite (µg N/L)	SM4500E	470	37 (1-1120)	30/70††
Total nitrogen (µg N/L)	calculated	3200	168 (102 – 1230)	180/250††
Total phosphorus (µg P/L)	SM4500P	142	26 (14 - 154)	30/50††
Oil & grease (mg/L)	SM1664A	n.d.	---	see footnotes

† = Standard Methods, 1998.
n.d. = not detectable.
†† = geometric mean criteria not to exceed the given value; *dry/wet* season criteria

- Oil and grease: "All waters shall be free of substances attributable to domestic, industrial, or other controllable sources of pollutants, including … (2) Floating debris, oil, grease, scum, or other floating material"
- Dissolved oxygen shall not decrease below 75% of saturation.
- Temperature shall not vary more than 1 C° from ambient conditions.

In Hawai'i, groundwater typically has higher concentrations of nitrogen compounds (especially nitrates) in comparison with samples collected from streams or coastal waters. Soluble nutrient compounds—such as ammonia, nitrites, and nitrates—are presently contributed by groundwater seepage to the stream. The proposed project should only slightly "enhance" this exchange.

The well water results show that the groundwater is free of persistent toxic organic compounds and compounds classified as oil-and-grease (see Appendix A).

Proposed settling and filtering treatments will reduce particulates and some nutrient forms (particulate organics) before discharge into Kapunahala Stream. Further, treatment will allow groundwater DO levels to equilibrate to surface water conditions.

References

Parking Engineering, Inc. (ParEn). 2009. NPDES General Permit Application for the Castle Hills Access Road Drainage Improvements Project. 34 pp.

State of Hawaii Department of Health (HDOH). 2004. Hawaii Administrative Rules, Title 11, Department of Health, Chapter 55, Appendix G. 66 pp.

_____. 2008. Total Maximum Daily Loads (TMDLs) for Total Suspended Solids, Nitrogen and Phosphorus in Kaneohe Stream, Kaneohe, Hawaii (draft). 127 pp.

APPENDIX A

Analytical Reports

Calscience Environmental Laboratories, Inc.

July 23, 2009

Snookie Mello
AECOS, Inc.
45-939 Kamehameha Hwy #104
Kaneohe, HI 96744-3221

Subject: **Calscience Work Order No.: 09-07-1191**
Client Reference: 25455

Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 7/15/2009 and analyzed in accordance with the attached chain-of-custody.

Unless otherwise noted, all analytical testing was accomplished in accordance with the guidelines established in our Quality Systems Manual, applicable standard operating procedures, and other related documentation. The original report of subcontracted analysis, if any, is provided herein, and follows the standard Calscience data package. The results in this analytical report are limited to the samples tested and any reproduction thereof must be made in its entirety.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Sincerely,

Ranjit K. J. Clarke

Calscience Environmental
Laboratories, Inc.
Ranjit Clarke
Project Manager

Calscience Environmental Laboratories, Inc.

Analytical Report

AECOS, Inc.		Date Received:	07/15/09
45-939 Kamehameha Hwy #104		Work Order No:	09-07-1191
Kaneohe, HI 96744-3221		Preparation:	EPA 608
		Method:	EPA 608
		Units:	ug/L
Project: 25455			Page 1 of 1

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Castle Hills Well	**09-07-1191-1-E**	**07/14/09 08:15**	**Aqueous**	**GC 37**	**07/16/09**	**07/19/09 14:07**	**090716L04**

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Alpha Chlordane	ND	0.10	1		Endosulfan II	ND	0.10	1	
Gamma Chlordane	ND	0.10	1		4,4'-DDT	ND	0.10	1	
Alpha-BHC	ND	0.10	1		Endosulfan Sulfate	ND	0.10	1	
Gamma-BHC	ND	0.10	1		Methoxychlor	ND	0.10	1	
Beta-BHC	ND	0.10	1		Chlordane	ND	1.0	1	
Heptachlor	ND	0.10	1		Toxaphene	ND	2.0	1	
Delta-BHC	ND	0.10	1		Endrin Ketone	ND	0.10	1	
Aldrin	ND	0.10	1		Aroclor-1016	ND	1.0	1	
Heptachlor Epoxide	ND	0.10	1		Aroclor-1221	ND	1.0	1	
Endosulfan I	ND	0.10	1		Aroclor-1232	ND	1.0	1	
Dieldrin	ND	0.10	1		Aroclor-1242	ND	1.0	1	
4,4'-DDE	ND	0.10	1		Aroclor-1248	ND	1.0	1	
Endrin	ND	0.10	1		Aroclor-1254	ND	1.0	1	
Endrin Aldehyde	ND	0.10	1		Aroclor-1260	ND	1.0	1	
4,4'-DDD	ND	0.10	1		Aroclor-1262	ND	1.0	1	
Surrogates:	REC (%)	Control Limits		Qual	Surrogates:	REC (%)	Control Limits		Qual
Decachlorobiphenyl	104	50-135			2,4,5,6-Tetrachloro-m-Xylene	88	50-135		

Method Blank	099-12-731-61	N/A	Aqueous	GC 37	07/16/09	07/19/09 12:43	090716L04

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Alpha Chlordane	ND	0.10	1		Endosulfan II	ND	0.10	1	
Gamma Chlordane	ND	0.10	1		4,4'-DDT	ND	0.10	1	
Alpha-BHC	ND	0.10	1		Endosulfan Sulfate	ND	0.10	1	
Gamma-BHC	ND	0.10	1		Methoxychlor	ND	0.10	1	
Beta-BHC	ND	0.10	1		Chlordane	ND	1.0	1	
Heptachlor	ND	0.10	1		Toxaphene	ND	2.0	1	
Delta-BHC	ND	0.10	1		Endrin Ketone	ND	0.10	1	
Aldrin	ND	0.10	1		Aroclor-1016	ND	1.0	1	
Heptachlor Epoxide	ND	0.10	1		Aroclor-1221	ND	1.0	1	
Endosulfan I	ND	0.10	1		Aroclor-1232	ND	1.0	1	
Dieldrin	ND	0.10	1		Aroclor-1242	ND	1.0	1	
4,4'-DDE	ND	0.10	1		Aroclor-1248	ND	1.0	1	
Endrin	ND	0.10	1		Aroclor-1254	ND	1.0	1	
Endrin Aldehyde	ND	0.10	1		Aroclor-1260	ND	1.0	1	
4,4'-DDD	ND	0.10	1		Aroclor-1262	ND	1.0	1	
Surrogates:	REC (%)	Control Limits		Qual	Surrogates:	REC (%)	Control Limits		Qual
Decachlorobiphenyl	116	50-135			2,4,5,6-Tetrachloro-m-Xylene	88	50-135		

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

ACCREDITED IN ACCORDANCE WITH nelac

AECOS, Inc.
45-939 Kamehameha Hwy #104
Kaneohe, HI 96744-3221

Date Received: 07/15/09
Work Order No: 09-07-1191

Project: 25455

Client Sample Number	Lab Sample Number	Date Collected	Matrix
Castle Hills Well	**09-07-1191-1**	**07/14/09**	**Aqueous**

Parameter	Result	RL	DF	Qual	Units	Date Prepared	Date Analyzed	Method
HEM: Oil and Grease	ND	1.0	1		mg/L	07/20/09	07/20/09	EPA 1664A
Total Kjeldahl Nitrogen	2.7	0.50	1		mg/L	07/21/09	07/21/09	SM 4500 N Org B
Phosphorus, Total	ND	0.20	2		mg/L	07/21/09	07/21/09	SM 4500 P B/E
Ammonia (as N)	0.22	0.10	1		mg/L	07/21/09	07/21/09	SM 4500-NH3 B/C
Nitrate-Nitrite (as N)	0.47	0.10	1		mg/L	N/A	07/15/09	SM 4500-NO3 E

Method Blank	**N/A**	**Aqueous**

Parameter	Result	RL	DF	Qual	Units	Date Prepared	Date Analyzed	Method
HEM: Oil and Grease	ND	1.0	1		mg/L	07/20/09	07/20/09	EPA 1664A
Total Kjeldahl Nitrogen	ND	0.50	1		mg/L	07/21/09	07/21/09	SM 4500 N Org B
Phosphorus, Total	ND	0.10	1		mg/L	07/21/09	07/21/09	SM 4500 P B/E
Ammonia (as N)	ND	0.10	1		mg/L	07/21/09	07/21/09	SM 4500-NH3 B/C
Nitrate-Nitrite (as N)	ND	0.10	1		mg/L	N/A	07/15/09	SM 4500-NO3 E

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

AECOS, Inc.	Date Sampled:	07/14/09
45-939 Kamehameha Hwy #104	Date Received:	07/15/09
Kanehoe, HI 96744-3221	Date Analyzed:	07/15-21/09
	Work Order No.:	09-07-1191
	Method:	SM 4500-NO3 E + SM 4500 N Org B
Project: 25455		Page 1 of 1

Total Nitrogen (TN) is calculated by adding Nitrate+Nitrite (as N) + Total Kjeldahl Nitrogen. Results reported in mg/L.

Sample Number	Total Nitrogen Concentration	RL	Qual
Castle Hills Well	3.2	0.50	
Method Blank	ND	0.50	

RL - Reporting Limit , Qual - Qualifiers

*

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

AECOS, Inc.
45-939 Kamehameha Hwy #104
Kaneohe, HI 96744-3221

Date Received: N/A
Work Order No: 09-07-1191

Project: 25455

Matrix: Aqueous

Parameter	Method	Quality Control Sample ID	Date Analyzed	Date Extracted	MS% REC	MSD % REC	%REC CL	RPD	RPD CL	Qualifiers
Phosphorus, Total	SM 4500 P B/E	09-07-1272-3	07/21/09	7/21/09	90	90	70-130	0	0-25	
Nitrate-Nitrite (as N)	SM 4500-NO3 E	Castle Hills Well	07/15/09	N/A	98	99	70-130	1	0-25	
HEM: Oil and Grease	EPA 1664A	09-07-1145-1	07/20/09	7/20/09	80	82	78-114	2	0-18	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - Duplicate

AECOS, Inc.		Date Received:	N/A
45-939 Kamehameha Hwy #104		Work Order No:	09-07-1191
Kaneohe, HI 96744-3221			

Project: 25455

Matrix: Aqueous

Parameter	Method	QC Sample ID	Date Analyzed	Sample Conc	DUP Conc	RPD	RPD CL	Qualifiers
Total Kjeldahl Nitrogen	SM 4500 N Org B	Castle Hills Well	07/21/09	2.7	2.5	8	0-25	
Ammonia (as N)	SM 4500-NH3 B/C	09-07-1271-5	07/21/09	ND	ND	NA	0-25	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - Laboratory Control Sample

ACCREDITED IN ACCORDANCE WITH nelac

AECOS, Inc.
45-939 Kamehameha Hwy #104
Kaneohe, HI 96744-3221

Date Received: N/A
Work Order No: 09-07-1191

Project: 25455

Matrix : Aqueous

Parameter	Method	Quality Control Sample ID	Date Analyzed	Date Extracted	Conc Added	Conc Recovered	LCS %Rec	%Rec CL	Qualifiers
Phosphorus, Total	SM 4500 P B/E	099-05-098-2,039	07/21/09	07/21/09	0.400	0.396	99	80-120	
Nitrate-Nitrite (as N)	SM 4500-NO3 E	099-05-120-1,661	07/15/09	N/A	0.500	0.495	99	80-120	
HEM: Oil and Grease	EPA 1664A	099-05-119-1,977	07/20/09	07/20/09	40.0	38.0	95	78-114	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Glossary of Terms and Qualifiers

Work Order Number: 09-07-1191

Qualifier	Definition
*	See applicable analysis comment.
1	Surrogate compound recovery was out of control due to a required sample dilution, therefore, the sample data was reported without further clarification.
2	Surrogate compound recovery was out of control due to matrix interference. The associated method blank surrogate spike compound was in control and, therefore, the sample data was reported without further clarification.
3	Recovery of the Matrix Spike (MS) or Matrix Spike Duplicate (MSD) compound was out of control due to matrix interference. The associated LCS and/or LCSD was in control and, therefore, the sample data was reported without further clarification.
4	The MS/MSD RPD was out of control due to matrix interference. The LCS/LCSD RPD was in control and, therefore, the sample data was reported without further clarification.
5	The PDS/PDSD associated with this batch of samples was out of control due to a matrix interference effect. The associated batch LCS/LCSD was in control and, hence, the associated sample data was reported with no further corrective action required.
A	Result is the average of all dilutions, as defined by the method.
B	Analyte was present in the associated method blank.
C	Analyte presence was not confirmed on primary column.
E	Concentration exceeds the calibration range.
H	Sample received and/or analyzed past the recommended holding time.
J	Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated.
ME	LCS Recovery Percentage is within LCS ME Control Limit range.
N	Nontarget Analyte.
ND	Parameter not detected at the indicated reporting limit.
Q	Spike recovery and RPD control limits do not apply resulting from the parameter concentration in the sample exceeding the spike concentration by a factor of four or greater.
U	Undetected at the laboratory method detection limit.
X	% Recovery and/or RPD out-of-range.
Z	Analyte presence was not confirmed by second column or GC/MS analysis.
	Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture.

AECOS, Inc.

45-939 Kamehameha Highway Suite 104
Kaneohe, Oahu, HI 96744
Tel: (808) 234-7770 Fax: 234-7775

SUB-- CHAIN OF CUSTODY FORM

1191

PROJECT FILE No.
LOG NUMBER [25455]

CLIENT: AECOS INC.
ADDRESS:

CONTACT: SNOOKIE MELLO
PHONE No.: ☎ (808)234-7770
Purchase Order No.:

☐ RUSH
☐ SEE REVERSE
SPECIAL INSTRUCTIONS

	☑	SAMPLE ID	SAMPLED DATE	TIME	SAMPLE TYPE	CONTAINER(S)		REQUESTED ANALYSES	PRESERVATION
1		Castle Hills Well	7/14/09	0815	groundwater	2	1L amber glass	NH_3, NO_3 NO_2, TN, TP	H_2SO_4
2		1	1	1	1	1	1	Oil & grease 1664A D.L. ≤1 mg/L	H_2SO_4
3		1	1	1	1	2	1	EPA 608 (Pesticides + PCB's	None
4									
5									
6									
7									
8									
9									
10									

CLIENTS PROVIDING SAMPLES TO THE LABORATORY SHOULD COMPLETE AS MUCH OF THE ABOVE FORM AS POSSIBLE. NOTE: NAME AND DATED SIGNATURE OF PERSON COLLECTING THE SAMPLE MUST BE ENTERED BELOW ↓. INFORMATION REQUESTED IN SHADED BOXES ABOVE TO BE FILLED IN BY THE LABORATORY.

SAMPLED BY: Chad Linebaugh, Jessica Withrow (PRINT NAME) DATE 7/14/2009
RELINQUISHED: (SIGNATURE) DATE 7/14/2009 TIME 0845

RECEIVED BY: (SIGNATURE) DATE 7/14/2009 TIME 0845
RELINQUISHED: J. Withrow (SIGNATURE OR INITIALS) DATE 7/14/2009 TIME Noon

RECEIVED FOR LABORATORY: (SIGNATURE) DATE 7/15/2009 TIME 1000
~~RELINQUISHED:~~ FedEx 797762466780 (SIGNATURE OR INITIALS) DATE 7/15/2009 TIME 1000

COMMENTS:

PRECAUTIONS:

DISPOSAL:

USE (BLACK) INK

RETURN SAMPLE TO CLIENT ☐

1191

AECOS, Inc.
(808) 234-7770
45-939 Kamehameha Hwy, #104
Kaneohe HI 96744

Subcontractor: CEL

Requested By: SNOOKIE MELLO
Date: 7/14/09

Results Requested By: N.T.A.T

Log No.	Qty	Sample Type	Analysis Requested	Collection Information	Sample Preparation
25455	2	ground Water	$NH_3, NO_3 NO_2, TN, TP$	7/14/09 0815	H_2SO_4
"	1	"	Oil + grease DL ≤ 1mg/L	"	H_2SO_4
"	2	"	EPA 608 (Pesticides + PCB's)	"	None

Notes/Special Instructions: Please return ~~Sample~~ IW cooler with replacement bottles.

Thank you,
AECOS, Inc.

Calscience Environmental Laboratories, Inc.

WORK ORDER #: 09-07- 1 1 9 1

SAMPLE RECEIPT FORM

Cooler 1 of 1

CLIENT: AECOM, INC. DATE: 7 / 15 / 09

TEMPERATURE: (Criteria: 0.0 °C – 6.0 °C, not frozen)

Temperature 4.5 °C - 0.2 °C (CF) = 4.3 °C ☐ Blank ☑ Sample

☐ Sample(s) outside temperature criteria (PM/APM contacted by: _____).

☐ Sample(s) outside temperature criteria but received on ice/chilled on same day of sampling.

☐ **Received at ambient temperature, placed on ice for transport by Courier.**

Ambient Temperature: ☐ Air ☐ Filter ☐ Metals Only ☐ PCBs Only **Initial:** WB

CUSTODY SEALS INTACT:

☐ Cooler ☐_____ ☐ No (Not Intact) ☑ Not Present ☐ N/A **Initial:** WB

☐ Sample ☐_____ ☐ No (Not Intact) ☑ Not Present **Initial:** RS

SAMPLE CONDITION:	Yes	No	N/A
Chain-Of-Custody (COC) document(s) received with samples	☑	☐	☐
COC document(s) received complete	☑	☐	☐
☐ Collection date/time, matrix, and/or # of containers logged in based on sample labels.			
☐ COC not relinquished. ☐ No date relinquished. ☐ No time relinquished.			
Sampler's name indicated on COC	☑	☐	☐
Sample container label(s) consistent with COC	☑	☐	☐
Sample container(s) intact and good condition	☑	☐	☐
Correct containers and volume for analyses requested	☑	☐	☐
Analyses received within holding time	☑	☐	☐
Proper preservation noted on COC or sample container	☑	☐	☐
☐ Unpreserved vials received for Volatiles analysis			
Volatile analysis container(s) free of headspace	☐	☐	☑
Tedlar bag(s) free of condensation	☐	☐	☑

CONTAINER TYPE:

Solid: ☐4ozCGJ ☐8ozCGJ ☐16ozCGJ ☐Sleeve ☐EnCores® ☐TerraCores® ☐_____

Water: ☐VOA ☐VOA**h** ☐VOA**na_2** ☐125AGB ☐125AGB**h** ☐125AGB**p** ☑1AGB[2] ☐1AGB**na_2** ☑1AGB**s**[3]

☐500AGB ☐500AGJ ☐500AGJ**s** ☐250AGB ☐250CGB ☐250CGB**s** ☐1PB ☐500PB ☐500PB**na**

☐250PB ☐250PB**n** ☐125PB ☐125PB**znna** ☐100PJ ☐100PJ**na_2** ☐_____ ☐_____ ☐_____

Air: ☐Tedlar® ☐Summa® ☐_____ **Other:** ☐_____ **Checked/Labeled by:** PS

Container: **C:** Clear **A:** Amber **P:** Plastic **G:** Glass **J:** Jar (Wide-mouth) **B:** Bottle (Narrow-mouth) **Reviewed by:** WS

Preservative: **h:** HCL **n:** HNO3 **na_2:**$Na_2S_2O_3$ **Na:** NaOH **p:** H_3PO_4 **s:** H_2SO_4 **znna:** $ZnAc_2$+NaOH **f:** Field-filtered **Scanned by:** PS