Cyto Culture

ENVIRONMENTAL BIOTECHNOLOGY

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May 5, 1989

Mr. William Meckel Source Control Division EAST BAY MUNICIPAL UTILITY DISTRICT Mail Stop 59 P.O. Box 24055 Oakland, CA 94623

RE: Wastewater Discharge Permit (Groundwater Treatment)
EBMUD Account No. 001-00002
Second monthly report of treatment and discharge operations
for APRIL 1989

CytoCulture/Sybron Chemicals are herein reporting on the results for the second month of continuous biological treatment of diesel-contaminated groundwater and discharge of the treated water into an EBMUD interceptor at the former P.I.E. Nationwide truck terminal in Emeryville. Laboratory analytical results are enclosed along with our Daily Facility Log Sheets.

SUMMARY OF EVENTS AND OPERATIONS IN APRIL

Operating Conditions at Beginning of Month

At the end of March, the south bioreactor system had been in continuous operation for one month processing diesel-contaminated groundwater at a rate of 1 to 1.5 gpm (1,400 to 2,000 gpd). As a result, approximately 25,000 gallons of contaminated groundwater were processed during the start-up phase and first three weeks of pilot scale operation of our treatment system.

Influent total petroleum hydrocarbon levels had been in the range of 2.9 to 4 ppm; BTXE levels were variable, ranging from zero to 450 ppb for benzene, zero to 13 ppb for toluene, zero to 4 ppb for ethyl benzene and zero to 11 ppb for xylenes. All treated water effluent discharges registered as non-detectable for all of these constituents; a healthy bacterial floc settled out in about one hour to leave a clear, transparent and odorless supernatant. Samples at this treated water are available for inspection.

On April 1, the south extraction trench flow rate was running consistently at 1.5 gpm through the south bioreactor system until the system was shut down for a day of routine compressor maintenance servicing. Our compressor supplies pressurized air (125 psi) to power our pneumatically operated well pumps (two in the south trench and two in the north trench not in use yet).

On April 4, the south trench flow rate was increased to $2.0~{\rm gpm}$ through the south bioreactor system (no flow in the north yet).

1208 Fourth Avenue San Francisco CA 94122 USA 415 564 1516

Batch Inoculation Experiments During Start-Up of North System

As part of the start-up procedure to go full scale with the north bioreactor system, two inoculation experiments were conducted in series with the twin ("NE"/"NW") bioreactors in late March to compare the following culture conditions using a standard dose of $100~\rm ppm$ diesel substrate:

- * Aeration alone vs. aeration with nutrient (NH4/PO4) to compare air-stripping of volatile organics vs. biodegradation by indigenous organisms in the water
- * Sybron diesel-blend bacterial cultures inoculated as a 50 gallon dose of floc from the south bioreactor vs. addition of two 5 lb dry culture "Biosocks"

The experiment began on March 25 when both bioreactors in the north system were filled with contaminated water from the north trench and spiked with 440 ml of diesel fuel per 1,000 gallon bioreactor (final hydrocarbon level of 100 ppm diesel / 300 ppm COD). The contents of the two bioreactors were mixed with a 50 gallon pump to ensure uniform starting material (sample N-1 is background before diesel dose; sample N-2 15 minutes after adding diesel to $100 \, \text{ppm}$).

The NE bioreactor was set up with continuous aeration without adding any nutrients or bacteria (although the system is obviously open to inoculation from aerosols in the atmosphere and the tanks were not sterile to begin with). For the NW bioreactor, ammonium nitrogen and ortho-phosphate levels were adjusted to 50-60 ppm (well beyond the stoichiometric amount required to enhance biodegradation of 100 ppm diesel fuel). After 48 hours of continuous mixing and aeration, the experiment was concluded and the culture medium of each bioreactor was analyzed for TPH and BTXE (samples NE-3 and NW-4).

For the second phase of the experiment, the contents of the NE and NW bioreactors were mixed on March 27 with 50 gpm recirculation pumps to set up identical starting conditions for both tanks again. The ammonium nitrogen and ortho-phosphate levels were re-adjusted to 60 ppm prior to inoculation. bioreactor was inoculated with a log phase culture of Sybron bacteria obtained from the south bioreactor system. This liquid culture inoculation was achieved by exchanging 50 gallons of culture medium from the south system for 50 gallons of water from the NE bioreactor. In contrast, the NW bioreactor was inoculated with two 5 lb Biosocks (Sybron dry diesel blend culture). bioreactors were then spiked with 440 ml diesel each (100 ppm). After 48 hours, the experiment was concluded and the culture medium of each bioreactor analyzed for TPH and BTXE (samples NE-5 and NW-6). A few days later, on April 4, the culture medium of these tanks were mixed together and primed with another dose of 100 ppm diesel to start-up the system for processing groundwater. Culture temperatures range from 15 to 18 Deg. Celsius.

On April 4 the effluent discharge of the continuous flow (2.5 gpm flow from the south trench) treatment in the south system was analyzed (S17B) while the north system was primed again for start-up. 48 hours later, the northwest bioreactor (#2) was analyzed (sample NW-19) prior to starting flow of contaminated water from the north trench (influent sample N-20). Flow through to the 2,000 gallon tank was adjusted later that day to 1.5 gpm for the north system and 2.5 gpm for the south system. This combined flow of 4 gpm was then maintained as long as the north trench was pumping water. Groundwater processing was at this point now flowing at about 5,600 gallons a day with a combined retention time of approximately 24 hours.

However it soon became apparent that our pumping rate exceeded the recharge capacity of the north trench, causing the north wells to operate intermittently rather than continuously. We observed that the north trench pumps, which are designed to shut off automatically when they run out of water, would shut down for hours at a time. No obvious correlation has been established with tidal levels. Flow rates through the net system must then vary between 2,300 and 5,600 gallons per day.

On April 12, with the north system off from lack of water, the south trench provided water to both the north and south bioreactor systems (a redundancy design feature of our system). An influent sample from the south trench (S-21) and an effluent sample of the combined north/south treatment discharge (E-NS-22) were analyzed for TPH and BTXE. Approximately 500 gallons of effluent water were used for inoculating the landfarmed contaminated soil on site. This practice of discharging 500 gallons of cleaned water with nutrients and cultures was to be repeated every week provided the system was operating normally.

System Interruption: Power Failure

On the afternoon of Thursday, April 13 a major power failure resulted from an accidental short back at the main meter box during the hook-up of power for a new clothing store in the shopping center. The short caused an explosion and minor fire which destroyed the CytoCulture meter panel in the same box. It took the contractor and PGE 7 days to get new replacement parts and restore power to our job site. In spite of our request to get temporary power from another panel, the City of Emeryville building inspector and PGE would not permit a power transfer.

During the power outage, the bacterial cultures settled to the bottom of the bioreactor tanks and became anaerobic. Although some viable cultures undoubtedly remained after a week without aeration, there was considerable foul smelling dead sludge to be pumped out when the power did come back on. The sludge was mixed in with the landfarm soil on site and the aerators cleaned for renewed service. The holding tank was fully discharged in preparation for a re-start of the both bioreactor systems.

On the morning of April 20 power was restored. All four bioreactors (SE,SW,NE,NW) were spiked with 100 ppm diesel and inoculated with one 5 lb Biosock each.

On April 21, 24 hours after the diesel addition and inoculation, the #2 bioreactors of each system were analyzed for TPH and BTXE (samples NW-23 and SW-24) with a 24 hour turn-around time. Groundwater flow was restarted at 1 gpm per bioreactor system (net of 2 gpm) and the treated water collected in the aerated 2,000 gallon holding tank. A newly purchased oil skimming device (water inlet sleeve for the well pumps) was installed in the southeast well (south trench) where free-product has been seen.

Treatment water effluent began to discharge into the interceptor on April 22 (sample E-26) as the cultures reached high densities of bacteria (good floc, foam). The north trench continued to pump irregularly as the depression zone dropped the water table below the pumps in the trench. A third effluent sample (E-27) was taken on April 23, 48 hours after flow-through had started. Without the north trench in full operation, the overall flow rate for the system was only around 2 gpm (4,500 gallons per day). A 72 hour flow-through effluent discharge sample was taken on April 24 (E-28) and a 96 hour effluent sample taken on April 25 (E-29), during which time the overall flow rate maintained at 2 gpm. On April 26, a 120 hour flow-through sample was taken from the effluent discharge (E-30).

On April 27, the overall flow rate for the combined bioreactor systems was increased to 2.5 to 3.0 gpm, depending on the availability of groundwater in the north trench (the entire treatment system is clearly water-limited by the shortage of trenches). On April 28, samples were taken of the south trench influent (IS-31), the north trench influent (IN-32) and the overall system effluent discharge at the interceptor (E-33). Flow rates were maintained in the range of 2.5 to 3.0 gpm, processing about 3,000 to 4,000 gallons of groundwater per day.

The East Bay Municipal Utility District field technician, Roy Luna, took samples of the effluent discharge on April 28.

Net groundwater treatment in April is estimated as follows:

Dates		Average	Flow		Volum	ne
April 1 - 6: April 6 - 13: April 21 - 30:		2 gpr 3 gpr 2 gpr	Ŋ		17,000 30,000 28,000	ga1
	Est.	treated	grdwtr	April:	75,000	gal
Plus	est.	treated	grdwtr	March:	25,000	gal

Total groundwater treated to date: 100,000 gal

LABORATORY ANALYSIS OF GROUNDWATER TREATMENT SAMPLES

Tests run by Curtis & Tompkins, Ltd. on fresh or ice-preserved samples collected by CytoCulture field technicians:

- 1) EPA 602 Volatile Aromatic Hydrocarbons in Water
- 2) EPA 8015 (modified) Total Extractable Petroleum Hydrocarbons in Aqueous Solutions (TPH/TEH)

ND = Not Detectable; Detection limits for BTXE, ND = 1 ug/L; for TPH, ND = 0.5 mg/L

		1	ıg/L (pp	b)	mg/L	(ppm)
No.	Date	Description / Comment	Benz.	<u>Tol.</u>	<u>Xy1.</u>	TPH/TEH
NORTH	SYSTEM	BATCH START-UP EXPERIMENT	rs:			
N1	3/25	North trench INFLUENT starting material	ND	ND	ND	ND
N 2	3/25	Same, spiked with diesel after 15 min mixing time	ND	ND	2	240
NE-3	3/27	No nutrient, no bacteria control bioreactor, 48 h	ND	ND	ND	860
NW-4	3/27	+ nutrients, no bacteria control bioreactor, 48 hr	ND	ND	ND	53
NE-5	3/27	Starting material T=0 Liquid inoculum experimen	ND nt	ND	ND	110
NW-6	3/27	Starting material T=0 Biosock inoculum expermt.	ND	2	3	129
NE-7	3/29	Liquid inoculum experimentation 48 hours	nt ND	ND	ND	7.4
NW-8	3/29	Biosock inoculum expermt. after 48 hours	, ND	ND	ND	trace
NE-9	3/30	Liquid inoculum, 72 hr	ND	ND	ND	-
NW-10	3/30	Biosock inoculum, 72 hr	ND	ND	ND	_

NORMAL GROUNDWATER TREATMENT PROGRAM

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No.	<u>Date</u>	Description / Comment	Benz.	Tol.	<u>Xy1.</u>	TPH/TEH
S-17A	3/29	South System Effluent	ND	ND	ND	ND
S-17B	4/4	South System Effluent	ND	ND	ND	ND
S-18	3/31	South System Effluent	ND	ND	ND	ND
NW-19	4/6	NW Bioreactor, 48 hr after start, No Flow	ND	ND	ND	24
N-20	4/6	North trench Influent	630	4	ND	ND
S-21	4/12	South trench Influent	310	16	12	2.2
E-22	4/12	Combined N/S Effluent	ND	ND	ND	ND
NW-23	4/21	NW Bioreactor, 24 hr after 100 ppm diesel (Power loss re-start)	ND	ND	ND	42
SW-24	4/21	SW Bioreactor, 24 hr after 100 ppm diesel (Power loss re-start)	ND	ND	ND	1.0
E-26	4/22	Combined Effluent at 24 hours after Flow	ND	ND	ND	ND
E-27	4/23	Combined Effluent at 48 hours after Flow	ND	ND	ND	ND .
E-28	4/24	Combined Effluent at 72 hours after Flow	ND	ND	ND	ND
E-29	4/25	Combined Effluent at 96 hours after Flow	ND	ND	ND	ND
E-30	4/26	Combined Effluent at at 120 hrs after Flow	ND	ND	ND	ND
I-S31	4/28	South trench Influent	ND	ND	ND	1.2
I-N32	4/28	North trench Influent	ND	ND	ND	trace
E-33	4/28	Combined Effluent	ND	ND	ND	ND

Conclusions: Influent levels of BTXE are highly variable, but the bioreactors consistently discharge treated waters with nondetectable or trace levels of aromatics and heavier hydrocarbons. Effluent treated water now being discharged into the EBMUD interceptor is at or near non-detectable levels of BTXE and total extractable petroleum hydrocarbons. Upon standing 20 minutes to allow the bacterial floc to settle, this treated water appears clear and odorless except when free product appears in the bioreactor (some sheen seen, darker foam often has product

Except for the power interruption, aeration and mixing was found to be consistent, providing saturated oxygen levels in the water and little accumulation of sediment on the bottom of the tanks. The aeration blower and air compressor for powering the pneumatic well pumps in the extraction trenches performed very well in the field. After proper adjustment, the well pumps themselves now easily deliver 2 gpm apiece (there are two wells per trench), although the tidally influenced north well works intermittently.

Near daily observations of the turbidity, color and foam accumulation confirmed that the bioreactors were maintaining healthy bacterial cultures. Continual diammonium phosphate addition kept ammonium nitrogen levels at 60 ppm or greater, and ortho phosphate levels at 30 ppm or greater, to ensure adequate nutrients for full degradation of the diesel COD. Laboratory studies suggest a ratio of 100:10:1 for ppm levels of diesel COD:NH4:PO4 is required for optimal biological activity (100 ppm diesel is roughly 300 ppm COD).

On the occasions when there is adequate water available in the north trench, overall flow rates can achieve greater than 4 gpm. This flow rate maintains a long retention rate in the bioreactors of at least 16 hours. As summer temperatures increase, the flow rates may be pushed higher. At 23 Deg. C., the hydraulic retention rate need not exceed 8 hours for full biodegradation of the diesel influent (assuming no free product in the bioreactor).

All discharges of treated water leaving either bioreactor system are directed first to the 2,000 gallon aerated holding tank. This tank is effectively serving as a final "polishing" step in the biological treatment process by extending the actual retention rate of contaminated water within the system.

Soil infiltration with treated water and bacterial cultures will utilize the effluent from the 2,000 gallon aerated holding tank which is now being discharged into the EBMUD interceptor.

Progress in Obtaining Permission to Reinfiltrate Treated Water

A meeting was held with Dr. Ken Snarkel and John Wesnouski in the Office of Alternative Technology, DHS, Sacramento on Tuesday, April 18 to review our results and plans for reinfiltration. The phased approach to reinfiltration is a means by which CytoCulture can begin diverting increasing amounts of treated water from the sanitary sewer discharge to the infiltration galleries in soil.

Presently there is only one prototype infiltration trench on the site, around 65 feet long, parallel to and about 25 feet upfield from the current south extraction trench. The trench is gravel lined and lies about five feet under the pavement of the parking lot in engineered fill just above a heavily contaminated area of old fill left over from the truck terminal facility (see soil sample data from the Alton Geoscience hydrogeological study of this site, especially data for Monitoring Well # 3 which is just 23 feet to the east of this infiltration trench).

CytoCulture is hopeful of obtaining permission to proceed with pilot studies using treated water effluent from the holding tank directed to the model infiltration trench by the end of June. Thereafter, the company plans to construct a series of infiltration galleries under the parking lot pavement along both sides of building D (upfield of both the north and south extraction trenches in an attempt to achieve some "hydraulic control" of infiltrated water). Please refer to CytoCulture's Phase II Report and Operational Plan for details on the proposed infiltration program for seeding contaminated soil with bacteria.

The Regional Water Quality Control Board (SF Bay Region) is giving consideration to CytoCulture's request to reinfiltrate the treated water with bacteria and nutrients. Meetings with this group are anticipated for early July.

Meanwhile, CytoCulture is getting bids on the excavation work required to install infiltration galleries parallel to Building D (Such a Business).

Randall J. von Wedel, Ph.D

Project Director

CytoCulture Bioremediation Project for P.I.E. Nationwide former Truck Terminal Site Emeryville, CA

Laboratory Analytical Results for April 1989 including BTXE, TPH/TEH and Lead Data provided by Curtis & Tompkins, Ltd.

Each sample data set is preceded by the corresponding Chain of Custody sheet

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Dispatched by: (signature) Date/Hr

143

Received by (signature)

Received by Lab by (signature)



2323 Fifth Street, Berkeley, CA 9471O, Phone (415) 486-0900

LABORATORY NUMBER: 17082

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

DATE RECEIVED: 03-27-89

DATE ANALYZED: 03-29-89 DATE REPORTED: 04-03-89

PAGE 1 OF 5

Extractable Petroleum Hydrocarbons in Aqueous Solutions EPA 8015 (Modified) Extraction Method: EPA 3510

LAB ID	CLIENT ID	KEROSINE (mg/L)	DIESEL (mg/L)	OTHER (mg/L)	
17082-1	37 1				
1/002-1	N 1	ND(0.5)	ND(0.5)	ND(0.5)	
17082-2	N 2	ND(0.5)	240	ND(0.5)	
17082-3	NE 3	ND(0.5)	860	ND(0.5)	
17082-4	NW 4	ND(0.5)	53	ND(0.5)	

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

Duplicate: Relative % Difference 11
Spike: % Recovery 97

LABORATORY DIRECTOR

Berkeley

Wilmington

Los Angeles



2323 Fifth Street, Berkeley, CA 9471O, Phone (415) 486-0900

LABORATORY NUMBER: 17082-1

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

SAMPLE #: N 1

DATE RECEIVED: 03-27-89
DATE ANALYZED: 03-30-89

DATE REPORTED: 04-03-89

PAGE 2 OF 5

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichloropenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1

ND = None Detected

QA/QC SUMMARY



2323 Fifth Street, Berkeley, CA 9471O, Phone (415) 486-0900

LABORATORY NUMBER: 17082-2

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

SAMPLE #: N 2

DATE RECEIVED: 03-27-89
DATE ANALYZED: 03-30-89

DATE REPORTED: 04-03-89

PAGE 3 OF 5

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	2	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	ı
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1

ND = None Detected

QA/QC SUMMARY



2323 Fifth Street, Berkeley, CA 9471O, Phone (415) 486-0900

LABORATORY NUMBER: 17082-3

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

SAMPLE #: NE 3

DATE RECEIVED: 03-27-89

DATE ANALYZED: 03-30-89

DATE REPORTED: 04-03-89

PAGE 4 OF 5

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	N D	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	ı
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1

ND = None Detected

QA/QC SUMMARY



2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 17082-4

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

SAMPLE #: NW 4

DATE RECEIVED: 03-27-89

DATE ANALYZED: 03-30-89

DATE REPORTED: 04-03-89

PAGE 5 OF 5

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene,	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1

ND = None Detected

QA/QC SUMMARY



2323 Fifth Street, Berkeley, CA 9471O, Phone (415) 486-0900

LABORATORY NUMBER: 17085

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

DATE RECEIVED: 03-27-89

DATE ANALYZED: 03-29-89

DATE REPORTED: 04-03-89

PAGE 1 OF 3

Extractable Petroleum Hydrocarbons in Aqueous Solutions
EPA 8015 (Modified)

Extraction Method: EPA 3510

LAB ID	CLIENT ID	KEROSINE (mg/L)	DIESEL (mg/L)	OTHER (mg/L)	
17085-1	NE 5	ND(0.5)	110	ND(0.5)	
17085-2	NW 6	ND(0.5)	129	ND(0.5)	

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

Duplicate: Relative % Difference 11
Spike: % Recovery 97

LABORATORY DIRECTOR

Berkeley

Wilmington

Los Angeles

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Curtis & Tomble 2323 Fifth Street Berkeley, CA 94710 Phone 415-486-0900 FAX 415-486-0532 Job Description PLE Job Number Client Contact Rugou						wnWe	Hel					(#	e-Xylene(s)		Pest's&PCB's			
Matrix Subject of Preserved	Sample Number	Samplir	ng [Date	·		LE NOTES	PA 601/8010	PA 602/8020	PA 624/8240	AM 17 Metals	EPA PP Metals (#)	enzene-Toluen	I and Grease	PA 608/8080			
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2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 17085-1

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

SAMPLE #: NE 5

DATE RECEIVED: 03-27-89

DATE ANALYZED: 03-30-89 DATE REPORTED: 04-03-89

PAGE 2 OF 3

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1

ND = None Detected

QA/QC SUMMARY



2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 17085-2

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

SAMPLE #: NW 6

DATE RECEIVED: 03-27-89

DATE ANALYZED: 03-30-89

DATE REPORTED: 04-03-89

PAGE 3 OF 3

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	2	1
Ethyl Benzene	ND	1
Total Xylenes	3	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1

ND = None Detected

QA/QC SUMMARY

Curtio & Tompki	70 144	Chai	n	of	C	us	sto	od	Form					٨	NVĽ.	YSIS	REC	XUE:	STED		
Curtis & Tompki 2323 Fifth Street Berkeley, CA 94710 Phone 415-486-0900 FAX 415-486-0532	ns, Lia		;	Sai	mpl	ers	_	R	<u>, w</u>						1		(s)		STS&PCBS	į	
Job Description PIE	Emeryville																-Xylene(s)	(N N		
Job Number Client Contact Ruow	World		ı	Re	cor	dei		R	vou woodel	···········	10	202	40	70	als	164	Jene-Xy				
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2323 Fifth Street, Berkeley, CA 9471O, Phone (415) 486-0900

LABORATORY NUMBER: 17103

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

DATE RECEIVED: 03-29-89

DATE ANALYZED: 03-31-89

DATE REPORTED: 04-05-89

PAGE 1 OF 4

Extractable Petroleum Hydrocarbons in Aqueous Solutions
EPA 8015 (Modified)
Extraction Method: EPA 3510

LAB ID	CLIENT ID	KEROSINE (mg/L)	DIESEL (mg/L)	OTHER (mg/L)
17103-1B	s 17 A	ND(0.5)	ND(0.5)	TRACE *
17103-2B	NE 7	ND(0.5)	ND(0.5)	7.4 *
17103-3B	NW 8	ND(0.5)	ND(0.5)	TRACE *

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

Duplicate: Relative % Difference Spike: % Recovery

7 100

LABORATORY DIRECTOR

Berkeley

Wilmington

Los Angeles

^{*} Fingerprint pattern does not match Hydrocarbon standard. Quantitation based on largest peaks withing C12-C24 boiling range.



2323 Fifth Street, Berkeley, CA 9471O, Phone (415) 486-0900

LABORATORY NUMBER: 17103-1B

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

SAMPLE #: S 17

DATE RECEIVED: 03-29-89

DATE ANALYZED: 03-31-89

DATE REPORTED: 04-05-89

PAGE 2 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1

ND = None Detected

QA/QC SUMMARY



2323 Fifth Street, Berkeley, CA 9471O, Phone (415) 486-0900

LABORATORY NUMBER: 17103-2B

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

SAMPLE #: NE 7

DATE RECEIVED: 03-29-89

DATE ANALYZED: 03-31-89 DATE REPORTED: 04-05-89

PAGE 3 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1

ND = None Detected

QA/QC SUMMARY



2323 Fifth Street, Berkeley, CA 9471O, Phone (415) 486-0900

LABORATORY NUMBER: 17103-3B

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

SAMPLE #: NW 8

DATE RECEIVED: 03-29-89

DATE ANALYZED: 03-31-89 DATE REPORTED: 04-05-89

PAGE 4 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4~Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1

ND = None Detected

QA/QC SUMMARY

Curtis & Tompkins, Ltd	ANALYSIS REQUESTED						
2323 Fifth Street Berkeley, CA 94710 Phone 415-486-0900 FAX 415-486-0532	Samplers R, voncosaled	\$ (8) (8)					
Job Description LIE Emergative		R PC					
Job Number Cyto Client Contact Room worder	Recorder 2. val Wadol	10 10 10 15 (#) TEH ene-Xylene(s) e					
Matrix Superved Preserved Sample Number	er Sampling Date SAMPLE NOTES	EPA 601/8010 EPA 602/8020 EPA 624/8240 EPA 625/8270 CAM 17 Metals EPA PP Metals (# TPH Method- TE Benzene-Toluene Oil and Grease EPA 608/8080 P					
Water Soil Waste Oil HNS Other	Yr Mo Dy Time	E D S S S S S S S S S S S S S S S S S S					
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	Dispatched by: (signature) Date	/Hr Received for Lab by (signature) Nomay Wilan					



2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 17136

CLIENT: CYTO CULTURE
JOB ID: PIE EMERYVILLE

DATE RECEIVED: 04/04/89
DATE ANALYZED: 04/05/89
DATE REPORTED: 04/12/89

PAGE 1 OF 2

Extractable Petroleum Hydrocarbons in Aqueous Solutions EPA 8015 (Modified) Extraction Method: EPA 3510

LAB ID	CLIENT ID	GASOLINE (mg/L)	KEROSINE (mg/L)	DIESEL (mg/L)	OTHER (mg/L)
17136-1	S-175	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

RPD, %
Spike: % Recovery

3 98

LABORATORY DIRECTOR



LABORATORY NUMBER: 17136 CLIENT: CYTO CULTURE JOB ID: PIE EMERYVILLE

SAMPLE ID: S-17 3

DATE RECEIVED: 04/04/89 DATE ANALYZED: 04/04/89 DATE REPORTED: 04/13/89

PAGE 2 OF 2

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1
ND = None Detected		
QA/QC SUMMARY		
RPD % SPIKE RECOVERY %	5 95	

	7 Chain of Cust	odv	/ Form	-										
Curtis & Tompkins, Ltd		رد	7 1 01111	-	7		NALY	SIS	HEC	JUE	SIE	十	ТТ	\top
2323 Fifth Street Berkeley, CA 94710 Phone 415-486-0900 FAX 415-486-0532	Samplers_	R.	von wedel						(\$)	į	Pest's&PCB's			
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2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 17118-2

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

SAMPLE #: NE 9

DATE RECEIVED: 03-31-89

DATE ANALYZED: 04-03-89 DATE REPORTED: 04-06-89

PAGE 3 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1

ND = None Detected

QA/QC SUMMARY

RPD %
SPIKE RECOVERY %
95

Berkeley

Wilmington

Los Angeles



2323 Fifth Street, Berkeley, CA 9471O, Phone (415) 486-0900

LABORATORY NUMBER: 17118-3

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

SAMPLE #: NW 10

DATE RECEIVED: 03-31-89 DATE ANALYZED: 04-03-89

DATE REPORTED: 04-06-89

PAGE 4 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	N D	1
Total Xylenes	N D	1
Chlorobenzene	N D	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1

ND = None Detected

QA/QC SUMMARY



2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 17118

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

SAMPLE #: S - 18

DATE RECEIVED: 03-31-89

DATE ANALYZED: 04-04-89

DATE REPORTED: 04-06-89

PAGE 1 OF 4

Extractable Petroleum Hydrocarbons in Aqueous Solutions EPA 8015 (Modified)

Extraction Method: EPA 3510

LAB ID	CLIENT ID	KEROSINE (mg/L)	DIESEL (mg/L)	OTHER (mg/L)
17118-1	S - 18	ND(0.5)	ND(0.5)	ND(0.5)

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

Duplicate: Relative % Difference

Spike: % Recovery

100

109

LABORATORY DIRECTOR

Berkeley

Wilmington

Los Angeles



2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 17118-1

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

SAMPLE #: S - 18

DATE RECEIVED: 03-31-89

DATE ANALYZED: 04-03-89

DATE REPORTED: 04-06-89

PAGE 2 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1

ND = None Detected

QA/QC SUMMARY

Curtis & Tompkins, Ltd	Chain of Custo	ly Form	ANALYSIS REQUESTED
2323 Fifth Street ; Berkeley, CA 94710 Phone: 415-486-0900 FAX 415-486-0532	Samplers	R. var cool	#) EH e-Xylene(s) Pest's&PCB's
Job Description PIE Enquite			
Job Number Cyto			
Client Contact R. von Woodel	Recorder_	(UW)	20 20 20 20 20 20 20 20 20 20 20 20 20 2
Matrix υ Method Preserved Sample Numb	er Sampling Date		A 601/8010 A 602/8020 A 624/8240 A 625/8270 A 17 Metals A PP Metals (#) H Method- TEH A mithod- TEH A 608/8080 Pest's&PCB's
		SAMPLE NOTES	A 60 A 17 A 17 A 17 A 17 A 17 A 17 A 17 A 17
Water Waste Soll Waste HR204 HR08 HR09 Oil Contact Con	Yr Mo Dy Time		EPA EPA EPA CAM CAM EPA Dil an EPA
WW-II AIT	1890406131	5 NW Bioreactor # 2	
		48 hr after stock up	
		Prior to beginning	
<u> </u>	- - - - - - - - - -	flow-flood.	
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Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878

2323 Fifth Street, Berkeley, CA 9471O, Phone (415) 486-0900

LABORATORY NUMBER: 17156

CLIENT: CYTO CULTURE JOB ID: PIE EMERYVILLE DATE RECEIVED: 04/06/89

DATE ANALYZED: 04/11/89 DATE REPORTED: 04/13/89

PAGE 1 OF 2

Extractable Petroleum Hydrocarbons in Aqueous Solutions
EPA 8015 (Modified)

Extraction Method: EPA 3510

LAB ID	CLIENT ID	GASOLINE (mg/L)	KEROSINE (mg/L)	DIESEL (mg/L)	OTHER (mg/L)
17156-1	NW-19	ND(0.5)	ND(0.5)	24	ND(0.5)

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

RPD, %
Spike: % Recovery

15
99

LABORATORY DIRECTOR

Berkeley

Wilmington

Los Angeles



LABORATORY NUMBER: 17156 CLIENT: CYTO CULTURE

JOB ID: PIE EMERYVILLE

SAMPLE ID: NW-19

DATE RECEIVED: 04/06/89 DATE ANALYZED: 04/06/89 DATE REPORTED: 04/13/89

PAGE 2 OF 2

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ИД	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1

ND = None Detected

TIME RECOVERS 6	103
SPIKE RECOVERY %	1 0 2
RPD ⅔	3

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Curtis & Tompkins, Ltd 2323 Fifth Street Berkeley, CA 94710 Phone 415-486-0900 FAX 415-486-0532 Job Description JE Emerguitle		-	Samı	oler	S	R.	Les anoi			:			10001	(c)allal	Pest's&PCB's			
Job Number and Client Contact Roun wedel	· 		Reco	rde	r	S	ر <i>-س</i>					#	声	۲۷- <u>-</u>	Pest			
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Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878

2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 17157

CLIENT: CYTO CULTURE
JOB ID: PIE EMERYVILLE

DATE RECEIVED: 04/06/89 DATE ANALYZED: 04/11/89 DATE REPORTED: 04/13/89

PAGE 1 OF 2

Extractable Petroleum Hydrocarbons in Aqueous Solutions EPA 8015 (Modified) Extraction Method: EPA 3510

LAB ID	CLIENT ID	GASOLINE (mg/L)	KEROSINE (mg/L)	DIESEL (mg/L)	OTHER (mg/L)
17157-1	N-20	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

RPD, %
Spike: % Recovery

15

LABORATORY DIRECTOR



LABORATORY NUMBER: 17157 CLIENT: CYTO CULTURE JOB ID: PIE EMERYVILLE

SAMPLE ID: N-20

DATE RECEIVED: 04/06/89 DATE ANALYZED: 04/06/89 DATE REPORTED: 04/13/89

PAGE 2 OF 2

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	630	1
Toluene	4	1
Ethyl Benzene	3	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND .	1
1,2-Dichlorobenzene	ND	1
ND = None Detected		

RPD %	3
05777	3
SPIKE RECOVERY %	103

Courtie O Terroll 111									7	Chain of Custody Form												ANALYSIS REQUESTED																							
2323 Fifth Street Berkeley, CA 94710 Phone 415-486-0900 FAX 415-486-0532 Job Description PLE									Samplers Ruw													donole	(clailai)	0,000	SATUDS																				
	Client Contact R. von Wedel								-		R	9C	ore	de.	r_	q	<u>ر</u>	<u>w</u>		0 9	2 5	⊋ c	ي د	2	# # S	(E 1	V-2112	9 C																	
Water	Matrix Method Preserved Sample Number						r Sampling Date									·		SAMPLE NOTES		A 601/80	A 604/80	A 524/52	M 17 Meta	אובום	EPA PP Metals (#)	T Metriou-	מיסובשרון	Col and Grease	A buoloud																
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Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878

2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 17186

CLIENT: CYTO CULTURE INTERNATION

JOB ID: PIE EMERYVILLE

DATE RECEIVED: 04/12/89

DATE ANALYZED: 04/14/89 DATE REPORTED: 04/21/89

PAGE 1 OF 3

Extractable Petroleum Hydrocarbons in Aqueous Solutions EPA 8015 (Modified) Extraction Method: EPA 3510

LAB ID	CLIENT ID	GASOLINE (mg/L)	KEROSINE (mg/L)	DIESEL (mg/L)	OTHER (mg/L)
17186-1	S-21	2.2	ND(0.5)	ND(0.5)	ND(0.5)
17186-2	NS-22	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

RPD, %

Spike: % Recovery

5 101

LABORATORY DIRECTOR



LABORATORY NUMBER: 17186-1

CLIENT: CYTO CULTURE JOB ID: PIE EMERYVILLE

SAMPLE ID: S-21

RPD %

SPIKE RECOVERY %

DATE RECEIVED: 04/12/89
DATE ANALYZED: 04/13/89
DATE REPORTED: 04/21/89

PAGE 2 OF 3

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT
		ug/L
Benzene	310	1
Toluene	16	1
Ethyl Benzene	ND	1
Total Xylenes	12	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1
ND = None Detected		
QA/QC SUMMARY		



LABORATORY NUMBER: 17186-2

CLIENT: CYTO CULTURE
JOB ID: PIE EMERYVILLE

SAMPLE ID: NS-22

DATE RECEIVED: 04/12/89
DATE ANALYZED: 04/13/89
DATE REPORTED: 04/21/89

PAGE 3 OF 3

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1
ND = None Detected		

ND = None Detected

QA/QC SU	MMARY
RPD %	8
SPIKE RECOVERY %	98

Curtic & Tompking 1td	Chai	n o	f C	usi	ody	Form		<u>. </u>		NVĽ	YSIS	REQL	JESTE	D		
Curtis & Tompkins, Ltd 2323 Fifth Street Berkeley, CA 94710 Phone, 415-486-0900 FAX, 415-486-0532 Job Description		Sa	ampl	ers_ _		Rvw						lene(s)	Pest's&PCB's			
Job Number Client Contact Ron Wede(R	ecor	der_			5	20	70	als	# ST	Jene-Xy	30 Pest			
Matrix # Method Preserved Sample Num # Contain of the North of the Nor			ling	 		SAMPLE NOTES		A 602/80	A 625/82	NM 17 Meta	H Method-	nzene-Tolu	EPA 608/8080 Pest's&PCB's			
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LABORATORY NUMBER: 17241 CLIENT: CYTO CULTURE
JOB ID: PIE EMERYVILLE

DATE RECEIVED: 04/21/89 DATE ANALYZED: 04/21/89 DATE REPORTED: 05/08/89

PAGE 2 OF 4

Total Petroleum Hydrocarbons in Aqueous Solutions EPA 8015 (Modified) Extraction Method: EPA 3510

LAB ID	CLIENT ID	GASOLINE (mg/L)	KEROSINE (mg/L)	DIESEL (mg/L)	OTHER (mg/L)				
17241-1A	NW-23	ND(0.5)	ND(0.5)	42*	ND(0.5)				
17241-2A	SW-24	ND(0.5)	ND(0.5)	1.0*	ND(0.5)				
				4/24 00	erbal				

 \star Fingerprint pattern does not match Hydrocarbon Standards. Quantitation based on largest peaks within C11 to C22 diesel range.

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

Duplicate: Relative % Difference <1
Spike: % Recovery 99



LABORATORY NUMBER: 17241 CLIENT: CYTO CULTURE JOB ID: PIE EMERYVILLE

SAMPLE ID: NW-23

DATE RECEIVED: 04/21/89 DATE ANALYZED: 04/21/89 DATE REPORTED: 05/08/89

PAGE 3 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1

ND = None Detected

OX/OC	SUMMARY
UA/UU	SUMMARY

77.70 A	
RPD %	Λ
SPIKE RECOVERY %	100



LABORATORY NUMBER: 17241 CLIENT: CYTO CULTURE JOB ID: PIE EMERYVILLE

SAMPLE ID: SW-24

DATE RECEIVED: 04/21/89 DATE ANALYZED: 04/21/89 DATE REPORTED: 05/08/89

PAGE 4 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1
ND = None Detected		

OA/OC	SUMMARY
O_{Δ}/O_{C}	

RPD %	4
SPIKE RECOVERY %	100

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Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878

2323 Fifth Street, Berkeley, CA 9471O, Phone (415) 486-0900

LABORATORY NUMBER: 17251

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

DATE RECEIVED: 04/24/89 DATE ANALYZED: 04/24/89

DATE REPORTED: 04/25/89

PAGE 1 OF 4

Extractable Petroleum Hydrocarbons in Aqueous Solutions EPA 8015 (Modified) Extraction Method: EPA 3510

LAB ID	CLIENT ID	KEROSINE (mg/L)	DIESEL (mg/L)	OTHER (mg/L)
17251-1	E-26	ND(0.5)	ND(0.5)	ND(0.5)
17251-2	E-27	ND(0.5)	ND(0.5)	ND(0.5)
17251-3	E-28	ND(0.5)	ND(0.5)	ND(0.5)

ND = Not Detected; Limit of detection in parentheses.

LABORATORY DIRECTOR

Berkeley

Wilmington

los Angeles



LABORATORY NUMBER: 17251-1

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

SAMPLE #: E-26

DATE RECEIVED: 04/24/89 DATE ANALYZED: 04/24/89 DATE REPORTED: 04/25/89

PAGE 2 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ИD	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1

ND = None Detected

SPIKE RECOVERY %	95							
RPD %	4							



LABORATORY NUMBER: 17251-2

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

SAMPLE #: E-27

DATE RECEIVED: 04/24/89 DATE ANALYZED: 04/24/89 DATE REPORTED: 04/25/89

PAGE 3 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1
ND = None Detected		

ND = None Detected

SPIKE RECOVERY	*	95
RPD €		4



LABORATORY NUMBER: 17251-3

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

SAMPLE #: E-28

DATE RECEIVED: 04/24/89 DATE ANALYZED: 04/24/89 DATE REPORTED: 04/25/89

PAGE 4 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	И D	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlcrobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlocobenzene	ND	1

ND = None Detected

· 1. \$	
SPIKE RECOVERY %	
RPD %	

Chain of Custody Form **ANALYSIS REQUESTED** Curtis & Tompkins, Ltd 2323 Fifth Street Berkeley, California 94710 Samplers_____ (415) 486-0900 Job Description PIE and Grease 608/8080 Pesticides Job Number_____ Recorder____ Client Contact_____ Method Matrix Sample Number Sampling Date Preserved **SAMPLE NOTES** Yr Mo Dy Time 890425 effe 97 hrs -29 890426 eff @120 hre. Laboratory Notes: Chain of Custody Record 1-wk results 69 572

Relinquished by signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Acceived the Lab by (signature)
	1315



LABORATORY NUMBER: 17272 A, 2A CLIENT: CYTO CULTURE INTERNATIONAL

PROJECT : PIE EMERYVILLE

DATE RECEIVED: 04/26/89 DATE ANALYZED: 04/27/89 DATE REPORTED: 05/01/89

PAGE 2 OF 4

LAB ID	CLIENT ID	GASOLINE (mg/L)	KEROSINE (mg/L)	DIESEL (mg/L)	OTHER (mg/L)	
17272-1A	E-29	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	
17272-2A	E-30	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

RPD, %
Spike: % Recovery

97



LABORATORY NUMBER: 17272-1B

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

SAMPLE #: E-29

DATE RECEIVED: 04/26/89 DATE ANALYZED: 04/27/89 DATE REPORTED: 05/01/89

PAGE 3 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1

ND = None Detected

SPIKE RECOVERY % 102	
RPD %	



LABORATORY NUMBER: 17272-2B

CLIENT: CYTO-CULTURE INTERNATIONAL

PROJECT: PIE EMERYVILLE

SAMPLE #: E-30

DATE RECEIVED: 04/26/89
DATE ANALYZED: 04/27/89
DATE REPORTED: 05/01/89

PAGE 4 OF 4

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1

ND = None Detected

	^=====================================
RPD %	10
SPIKE RECOVERY %	102

Chain of Custody Form **ANALYSIS REQUESTED** Curtis & Tompkins, Ltd 2323 Fifth Street Samplers Ruw Berkeley, California 94710 (415) 486-0900 PIE TPH Method- $\mathcal{L}\mathcal{EH}$ Benzene-Toluene-Xylene(s) Job Description Job Number Cyto Cuthyre Recorder Row A won wedd Client Contact-602/8020 624/8240 625/8270 le 22 Metals EPA PP Metals Method Matrix Preserved Sample Number Sampling Date EPA 624/8. EPA 625/8: Title 22 **SAMPLE NOTES** Water Soil Waste H2SO4 HNO3 ICe None EPA EPA 011 Time Dy - S31 281130 Indoen - sortetranch N32 4281 30 · north trench 4281200 - Fallowith 3 Laboratory Notes: Chain of Custody Record I week by Friday May 5 NOON Relinguished by: (signature) Date/Hr Received by (signature) (Downald Relinquished by: (signature) Date/Hr Received by (signature) Relinquished by: (signature) Date/Hr Received by (signature) Relinquished by: (signature) Date/Hr Received by (signature)

Dispatched by: (signature) Date/Hr

Received for Lab by (signature)



LABORATORY NUMBER: 17290 CLIENT: CYTO CULTURE

JOB ID: PIE EMERYVILLE

DATE RECEIVED: 04/28/89 DATE ANALYZED: 04/29/89 DATE REPORTED: 05/08/89

PAGE 2 OF 5

Extractable Petroleum Hydrocarbons in Aqueous Solutions EPA 8015 (Modified) Extraction Method: EPA 3510

LAB ID	CLIENT ID	GASOLINE (mg/L)	KEROSINE (mg/L)	DIESEL (mg/L)	OTHER (mg/L)
17290-1	I-S31	ND(0.5)	1.2*	ND(0.5)	ND(0.5)
17290-2	I-N32	ND(0.5)	TRACE	ND(0.5)	ND(0.5)
17290-3	E-33	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)

* Fingerprint pattern does not match Hydrocarbon Standards. Quantitation based on largest peaks within C9 to C12 boiling range.

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

RPD, %
Spike: % Recovery
102



LABORATORY NUMBER: 17290

CLIENT: CYTO CULTURE JOB ID: PIE EMERYVILLE

SAMPLE ID: I-S31

DATE RECEIVED: 04/28/89
DATE ANALYZED: 05/01/89
DATE REPORTED: 05/08/89

PAGE 3 OF 5

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	N D	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	N D	1
1,2-Dichlorobenzene	ND	1
ND - Nors Datastal		

ND = None Detected

RPD %	
	4
SPIKE RECOVERY %	100
	100



LABORATORY NUMBER: 17290
CLIENT: CYTO CULTURE
JOB ID: PIE EMERYVILLE
SAMPLE ID: I-N32

DATE ANALYZED: 05/01/89 DATE REPORTED: 05/08/89

DATE RECEIVED: 04/28/89

PAGE 4 OF 5

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1
ND = None Detected QA/QC SUMMARY		
RPD %		4 100



LABORATORY NUMBER: 17290 CLIENT: CYTO CULTURE

JOB ID: PIE EMERYVILLE

SAMPLE ID: E-33

DATE RECEIVED: 04/28/89 DATE ANALYZED: 05/01/89 DATE REPORTED: 05/08/89

PAGE 5 OF 5

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene	ND	1
Toluene	ND	1
Ethyl Benzene	ND	1
Total Xylenes	ND	1
Chlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,2-Dichlorobenzene	ND	1
ND = None Detected		

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4

<u>Daily Facility Log Sheets for April 1989</u> CytoCulture - PIE Bioremediation Project, Emeryville

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA
OPERATOR: Ruw Duna
DATE: 41 TIME: HIGH TIDE:
WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:
SOUTH TRENCH: Refill \not Discharge \not Pressure
East well flow setting: West well flow setting:
NORTH TRENCH: Refill Discharge Pressure
South well flow setting: North well flow setting: OFF Overwalk Stumedon 130n COMPRESSOR CHECKS: Hours (622) Temperature Oil
Air Filter drain checks: 1) 2) 3)
BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:
North system: $\frac{82}{10}$ in. South system: $\frac{84}{100}$ in. Blower: $\frac{82}{100}$ in.
GROUNDWATER EXTRACTION TRENCH FLOW RATES: Tennogon
North Trench: GPM South Trench: GPM GPM
TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 6 Temp GPM > 1.59pm - 2.6 DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING: end of day
DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING: end of day
North: % South: 30/30 20 %
DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)
North Units: $3/31$ South Units: $3/31$ 2,000 Gal. Unit $3/20$
CULTURE OBSERVATIONS:
DOURs: [NH4]: [PO4]:
SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS:
Sample No. TPF/TLH: BTNE: Commert:
Sample No TOW IND: PINI: Comment:
Portne service of compressor 3/31-4/1
to change oil, filters + clean unit
Fluce interrupted Noon 3B1 - 3 pm 4/1-han states up 1.5 ypn

P.I.E. NATIONWIDE BICREMEDIATION SITE, EMERYVILLE, CA
OPERATOR: RVW D.V.
DATE: 44 TIME: 9 Am HIGH TIDE:
WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:
SOUTH TRENCH: Refill A Discharge A. V. Pressure 605
East well flow setting: Foll West well flow setting: Foll
NORTH TRENCH: Refill Discharge Pressure
South well flow setting: North well flow setting:
COMPRESSOR CHECKS: Hours 686 Temperature 100° 0i1
Air Filter drain checks: 1) 2) 3)
BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:
North system: 1 in. South system: 1 in. Blower: 1 in.
GROUNDWATER EXTRACTION TRENCH FLOW RATES:
North Trench: GPM South Trench: GPM (Loth Exw)
TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 2-6 GPM
DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:
North:/ % South: 30/30 25 %
DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)
North Units: 44 South Units: 41 2,000 Gal. Unit 320
CULTURE OBSERVATIONS:
DOURs: [NH4]: [P04]:
SAMPLIS TAKEN AND TESTS (LO ESTED FOR ANALYSIS:
Sample No. 5176 I'm 101: V BIVI: _ Content: 20090 holding tech effluent
OPTRATIONAL CHANGES 10000: BITT: Common: before starting up. Autitude Starting System
OPTRATIONAL CHARGES TODAY:
obrosas Add ICC ppm diesel to histor contaminated
obrosas Add (CCppm diese) to better contaminated [NW Sun, HT HATTER STORY TO LOCAL TO CONTACT STORY STORY TO
440 ms due es = 1,000gsl

	P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA
	OPERATOR: RNOWWedd
	DATE: 46 TIME: Noon-2 PM HIGH TIDE:
	WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:
	SOUTH TRENCH: Refill A Discharge A-Y2 Pressure 60/5
	East well flow setting: Foll West well flow setting: foll
TART	NORTH TRENCH: Refill A Discharge A'/2 Pressure(00/4.5
	South well flow setting: $\frac{1}{2}$ North well flow setting: $\frac{f_{ij}}{2}$
	COMPRESSOR CHECKS: Hours 718 Temperature 10° 0i1 -
	Air Filter drain checks: 1) 2) 3)
	BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:
	North system: 2 in. South system: 1 in. Blower: 2 in.
	GROUNDWATER EXTRACTION TRENCH FLOW RATES:
	North Trench: 1.5 GPM South Trench: 2.5 GPM
	TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 4.0 GPM we reached
	DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING: this level
	North: 10/10 100 % South: 30/30 20 %
	DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)
	North Units: 4 2,000 Gal. Unit 320
	CULTURE OBSERVATIONS:
	DOURs: [NH4]: [PO4]:
	SAMPLES TAKEN AND DESTS REQUESTED FOR ANALYSIS:
	Samula No. NW19 THE HE BINDS CONTENT : North wat Drug to Strage to Floris
	OPERATIONAL CHANGES 10. 11:
	OPERATIONAL CHANGES TO. 11:
	Started Flow of North Brosentos system.
	OPERATIONAL CHANGES 10.11: Started Flow of North Bronentor system. 48 hr after Startep @ 1.5gpm (plus Secte system.) Flew roge 2.5gpm)
	fleurige 2.5 gfm)

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA
OPERATOR: D. Vi, 10
DATE: 4/2/23 TIME: 1500 HIGH TIDE:
WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:
SOUTH TRENCH: Refill $A+2$ Discharge $O+2$ Pressure 78
East well flow setting: West well flow setting:
✓NORTH TRENCH: Refill 🔏 Discharge <u>O+z</u> Pressure <u>O</u>
South well flow setting: North well flow setting:
COMPRESSOR CHECKS: Hours 833 Temperature 140 Oil N/Cleck
Air Filter drain checks: 1) 2) 3)
BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:
North system: 79 in. South system: 79 in. Blower: 20 in.
GROUNDWATER EXTRACTION TRENCH FLOW RATES:
North Trench: O GFM South Trench: 2.5 GPM
TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 2 GPM
DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:
North: 20/20 100 % South: 20/20 100 %
DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)
North Units: 2,000 Gal. Unit
CULTURE OBSERVATIONS:
DOURs: [NH4]: [PO4]:
SAMPLES TAKEN AND TESTS "EQUESTED FOR ANALYSIS:
Sample No. 521 TPH/TEH: V BILL: V Corrent: 1/ FLUENT-Sutt french
Sample No. 521 TPH/TEH: V BILL: V Corrent: MFLUERIT-Suth freed Sample No. (No.) 62 TPH TLH: V BTYT: Corrent: Effluent- combani
OPERATIONAL CHANGES TODAY:

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA
OPERATOR: RUW DU
DATE: 413 TIME: Noon-4PM HIGH TIDE:
WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:
SOUTH TRENCH: Refill WA Oischarge All Pressure
East well flow setting: Full West well flow setting: Full
NORTH TRENCH: Refill Discharge Pressure
South well flow setting: $\frac{1}{2}$ North well flow setting: $\frac{2}{2}$
COMPRESSOR CHECKS: Hours 853 Temperature 140° 0il
Air Filter drain checks: 1) ν 2) ν 3)
BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:
North system: 12 in. South system: 77 in. Blower: 70 in.
GROUNDWATER EXTRACTION TRENCH FLOW RATES:
North Trench: interndent GPM South Trench: 3.5 GPM
TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 2.5.3.5 GPM
DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:
North: 20/30 100 % South: 20/80 100 %
DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)
North Units: 4 d South Units: 44 2,000 Gal. Unit 44
CULTURE OBSERVATIONS:
DOURs: [NH4]: [PO4]:
SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS:
Sample No. TPF/Fit: BTXE: Commence With 1916.
Sample No. THOUSE PINE: Comment: 1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-
OPERATIONAL CHANGES MANY: POWER FAILURE - COMMISSION A WOLLDER
System Interription - NC Flow @ 21th CFF
System Interuption — AC FOUL @ 21M CFF Elegtrical *Norsherology stocations accedentally shortered at meter box —
Explosion + brief fire destroyed eather loss - expet secucidades a feit Person

P.I.E. NATIONWIDE BYOREMEDIATION SITE, EMERYVILLE, CA
OPERATOR: RUW-DU BACKON
DATE: 420 TIME: 1145 HIGH TIDE: 745AM
WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:
SOUTH TRENCH: Refill OFF Discharge OFF Pressure USed
East well flow setting: West well flow setting: Dunus to
NORTH TRENCH: Refill OFF Discharge OFF Pressure 5 Studges
South well flow setting: North well flow setting:
COMPRESSOR CHECKS: Hours 853 at status 120° Oil - Cultures
Air Filter drain checks: 1) 2) 3) Very low
BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS: Let still
North system: 32 in. South system: 31 in. Blower: 72 in. Vane some
GROUNDWATER EXTRACTION TRENCH FLOW RATES:
North Trench: GPM South Trench: GPM Hurough aerotors
TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: GPM to Uncluy,
DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:
North: 106 % South: 10/10 (00%
DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)
North Units: 2,000 Gal. Unit
CULTURE OBSERVATIONS: All biogractors were cleaned out, studge DOURS: CULTURE OBSERVATIONS: All biogractors were cleaned out, studge landfarmed on site; and new biosocks added [NH4]: [P04]: when peur
DOURs: (andtarmed on site; and New Otosocks added) [PO4]:
SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS: COMMECA
Sample NoTPH'II':BTλΤ:Com ett:
Sample No HTTHE: BINL: Comme +: Mr.
1861 + Sylve (440,05 feet to each 1000 c)
CPERATIONAL CHANGES TODAY: Restart Scatterestem - Load Bresh wast such categories to the account of the confidence of th

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA
OPERATOR: Row DV
OPERATOR: Row DV DATE: 4/2(TIME: 1/3 Am HIGH TIDE:
WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:
SOUTH TRENCH: Refill $\underline{\beta t2}$ Discharge $\underline{Ot2}$ Pressure $\underline{\mathcal{SO}}$
East well flow setting: West well flow setting:
NORTH TRENCH: Refill Discharge O+2 Pressure 80
South well flow setting: North well flow setting:
COMPRESSOR CHECKS: Hours 909.3 Temperature 100 011 N/Cleen
Air Filter drain checks: 1) 2) 3)
BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:
North system: 29 in. South system: 78 in. Blower: 80 in.
GROUNDWATER EXTRACTION TRENCH FLOW RATES:
North Trench: 161n GPM South Trench: 1 GPM
TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: GPM 1500 G=1
DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:
North: 20 / 10
DATE OF LAST BIOSOCK INOCULATIONS: (# pei unit)
North Units: 4-20 South Units: 4-20 2,000 Gal. Unit
CULTURE OBSERVATIONS: Water Temperature: Deg.C.
DOURS: half fed pro-flow outil [NE4]: 760 [PO4]: 760 SAMPLES TAKEN AND TESTS RECUESTED FOR NO NOTE:
Sample No. NW23 III TEL: V IVII: V Coment: Brast 2, 24hrafta 160pm desd
OT PATIONAL CHANGES TODAY: Start-flow at Noon at Igen easysten - North
OF PATIONAL CHANGES TOTAY: Start-flow at Noon at 19pm Gasysten - North * Oil Frae product skimmer installed in 5F well today - no obvious + sooth South Influent has 1.5 PPM Phosphoto oil seenin well.

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA
OPERATOR: Rue
DATE: 422 TIME: 539m HIGH TIDE: NOON-1
WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:
SOUTH TRENCH: Refill Discharge Pressure
East well flow setting: West well flow setting:
NORTH TRPNCH: Refill Discharge Pressure
South well flow setting: North well flow setting:
COMPRESSOR CHECKS: Hours 935 Temperature 85° 0il ok
Air Filter drain checks: 1) 2) 3)
BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:
North system: 7 in. South system: in. Blower: 81 in.
GROUNDWATER EXTRACTION TRENCH FLOW RATES:
North Trench: 6 to GPM South Trench: 1.5 GPM
TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 1-2 GPM
DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:
North: (0/20 30 % South: / %
DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)
North Units: 4/20 South Units: 4/20 2,000 Gal. Unit
DOUP : North to 1 - (of 5 = 1) [NI4]: See over [P04]:
DOUP : North #1 - (offsof 1) [NT4]: See over [P04]:
SAMPLES TAVEN AND TESTS REGULECTED 10: ANTLYST:
Sarpie Vo. 26 184/178: V FIXE: Con ort: Set suple 2000gal effunt
Sample No. 198 (IEH: 1995: Com ont: 48hr affa state
OPERATIONAL CHANGES TODAY: Add Cotosack long flow flow
North trench to 2000 gal suptom a lot
OPERATIONAL CHANGE FORMY: Addal (brotack 24 or after begin flow through to 2000gal suptom begin flow through to 2000gal suptom a both to confort > sometimes (unin workers)
* I(AA) 1(AZ 110°0)

GROUNDWATER TREATMENT DAILY FACILITY INSPECTION LOG

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA OPERATOR: Kuw TIME: 1239m WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS: SOUTH TRENCH: Refill ____ Discharge ____ Pressure ____ East well flow setting: full West well flow setting: NORTH TRENCH: Refill ____ Discharge ____ Pressure ____ South well flow setting: 34 North well flow setting: Full COMPRESSOR CHECKS: Hours 954 Temperature 82 Air Filter drain checks: 1) BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS: North system: 10 in. South system: in. Blower: 1 in. moderate TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: ~ 1.5-1.9GPM Some DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING: turnel down South: /0 //0 DATE OF LAST BIOSOCK INOCULATIONS: (# per unit) North Units: 420 South Units: 420 2,000 Gal. Unit 4/22 CULTURE OBSERVATIONS: Water Temperature: Deg.C.

grey withour Northsystem South Radors

[NH4]: Modest foam [P04]: SAMELLS TARTY AND LEST. REQUESTED FOR ASSETS: Sample YoF27 FOUTTH: V BIXE: Compost: Your offer from through Simple No. IPP IER: __ : TVE: _ Comment: opaid up North wells to 1 Place, but little making m but 20.59pm on N/N well, even at hightale.

Directed ~ 1/3 water from south french (1.1gpm) to North bruraited

	P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA
	OPERATOR: Ruw
	DATE: 424 TIME: 11AM HIGH TIDE: 4PM
0.0.0	WELL FUMP CONTROLLER SETTINGS AND OBSERVATIONS:
100000	SOUTH TRENCH: Refill C Discharge THA Pressure 80/4.5
1	East well flow setting: West well flow setting:
Tuterno 4	NORTH TRENCH: Refill C Discharge 314A Pressure 72/85
action	South well flow setting: <u>Full</u> North well flow setting: <u>Full</u>
rey 10sc	COMPRESSOR CHECKS: Hours 976 Temperature 75° 0il CK-formy
	Air Filter drain checks: 1) 2) 3) all beginn
	BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:
	North system: 80 in. South system: 81 in. Blower: 87 in.
tropa)	GROUNDWATER EXTRACTION TRENCH FLOW RATES: - intermediation of 8.4
a section	North Trench: < 5 GPM South Trench: 4.2 GPM North
way.	TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 42 GPM
~	DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING: JOSEPH TO NEW TOOK TO THE TO
	North: 10/10 20% South: 10/10 50% Worth
	DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)
	North Units: 420 South Units: 420 2,000 Gal. Unit 422
	CULTURE OBSERVATIONS: Water Temperature: Deg.C. North # Grey-green twood & from DOURs: # 2 H. Januar, New York [NH4]: [P04]:
	DOURS: #2 H. Jacour, Jeotra [NH4]: [PO4]:
	SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS: Effluent (2000ga)
	Sample No. E 28 TPH/TEH: U BIXE: U Comment: 72hy after-Row throughland
	Sample No. TPH/TFH: BTXE: Compent:
	OPERATIONAL CHANGES TODAY: TOrned up NH4/Por flow month.
	North 1) chave, Refill from "C" to "B" (action goes 10 xc > 3 sec)
	OPERATIONAL CHANGES TODAY: Towned up NH4/POI flow north. North: 1) chave. Refill from "C" to "B" (action goes 10 xc > 3 sec) 2) block all flow from New flow rate about 0, agam North alon sufficient overth. 1,0 gpm 50 th alex Northinflied frams like seawater (clear w/odor 1,9 gpm total)
	North influent frams like seawater (clear will odor 1,9 ypm total

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA
OPERATOR: Rvw
DATE: 4 25 TIME: 13 m HIGH TIDE: 5
WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:
SOUTH TRENCH: Refill Discharge Pressure
East well flow setting: West well flow setting:
NORTH TRENCH: Refill C Discharge 3/4 A Pressure 80/4.5
South well flow setting: North well flow setting: FUL
COMPRESSOR CHECKS: Hours 1003 Temperature 80° 0il Replaced foda
Air Filter drain checks: 1) 2) 3)
BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:
North system: 🔊 in. South system: 🏋 in. Blower: 📆 in.
GROUNDWATER EXTRACTION TRENCH FLOW RATES:
North Trench: vo.9 GPM South Trench: CPM
TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 2.6 GPM
DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:
North: % South: %
DATE OF LAST BIOSOCK INOCULATIONS: (# per unit) VEW TODA(- >4/25 Bor#1 North Units: 4/30 South Units: 4/35 2,000 Gal. Unit 4/22 ok
CULTURE OBSERVATIONS: Water Temperature: Dec.C.
DOUR <: Still group [NH4]: [PO4]:
SAMPLES TAKEN AND TESTS REQUESTED FOR ANALYSIS: Effluent/bulkande 2000 gal
Sample No E 29 IPH/JEH: BIYE: Concert: 96hr after flow
Sample No. TPH 'TTH: BOXE: Correct:
OPIRATIONAL CHANGES TODAY: COMPRESSOR OFF 130 330 for oil change, filter stroken replacement of maintenance.
artibing - Kew GED How resomed at N = 1 aren
the lang being shipped today. S=/gpm

P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA
OPERATOR: OCO
DATE: 4/26 TIME: 6:20 HIGH TIDE:
WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:
SOUTH TRENCH: Refill $0+1$ Discharge 80
East well flow setting: Fell West well flow setting: Ell
NORTH TRENCH: Refill $O+1$ Discharge $B+1$ Pressure BO
South well flow setting: Off North well flow setting: $1/3$
COMPRESSOR CHECKS: Hours 1030 Temperature 95 0il N/C(BA)
Air Filter drain checks: 1) 2 2) 3)
BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:
North system: 20 in. South system: 1 in. Blower: 1 in.
GROUNDWATER EXTRACTION TRENCH FLOW RATES:
North Trench: GPM South Trench: GPM
TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: GPM
DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:
North: % South: %
DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)
North Units: 2,000 Gal. Unit
CULTURE OBSERVATIONS: Water Temperature: Deg.C.
DOURs: [NH4]: [PO4]:
SAMPLES TAKEN AND TESTS REQUESTED FOR AVALYSIS:
Sample No. E-30 TPH TIH: V BIYF: 100 rent: 120 hr stler tlaw
Sample No TDU'TI": BTNF: Corrent:
OPERATIONAL CHANGES TOBAL: To Freed 3 SS and Downe to North Box.

	P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA
	OPERATOR: Ryw
	DATE: 422 TIME: 323 HIGH TIDE: 6ft.
	WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:
NEW	SOUTH TRENCH: Refill 3/A Discharge 3/A Pressure 5/5.
	East well flow setting: West well flow setting:
16m	NORTH TRENCH: Refill 3/A Discharge 3/1 A Pressure 79/4
ton.	South well flow setting: North well flow setting:
	COMPRESSOR CHECKS: Hours 1572 Temperature 1300 Oil clear (1300) Air Filter drain checks: 1) (2) (3)
	Air Filter drain checks: 1) which 2) 3)
	BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:
	North system: $\frac{30}{100}$ in. South system: $\frac{30}{100}$ in. Blower: $\frac{50}{100}$ in.
	GROUNDWATER EXTRACTION TRENCH FLOW RATES:
	North Trench: North Trench: 10 GPM CPM
	TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 1.8 GPM
	DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:
	North: 10/10 5 % South: 10/10 20 %
	DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)
	North Units: Today South Units: Today 2,000 Gal. Unit 4/22
	CULTURE OBSERVATIONS: Water Temperature: Deg.C.
	DOURS: Very little fran avivatrese [N44]: [P04]:
	SAMPLES TAKEN AND TESTS REQUESTED FOR ANTIYETS
	Sample No. TRU/IFF: BUSE: On ent: Co. C. C. C.
	Sample Vo IPH THT: 1417: Colvert:
	OPERATIONAL CHINCLE TODAY:
	OPERATIONAL CHINCID TODAY: 4" 1. 100 10 10 10 10 10 10 10 10 10 10 10 10
	35-30 vanning

	P.I.E. NATIONWIDE BIOREMEDIATION SITE, EMERYVILLE, CA
	OPERATOR: DE RUCO
	DATE: 4/78 TIME: 10:15 Apr-Wood HIGH TIDE:
	WELL PUMP CONTROLLER SETTINGS AND OBSERVATIONS:
	SOUTH TRENCH: Refill A+ 1/2 Discharge 012 Pressure 30
	East well flow setting: Full West well flow setting: Securo
	NORTH TRENCH: Refill A+2/4 Discharge O+2 Pressure SO
	South well flow setting: $\sqrt{2}$ North well flow setting: $\sqrt{2}$
	COMPRESSOR CHECKS: Hours 1000 Temperature 150 011/1/1000
	Air Filter drain checks: 1) $\underline{\hspace{1cm}}$ 2) $\underline{\hspace{1cm}}$ 3) $\underline{\hspace{1cm}}$
	BLOWER AIR PRESSURE READINGS and TEMPERATURE CHECKS:
	North system: 80 in. South system: 80 in. Blower: 30 in.
	GROUNDWATER EXTRACTION TRENCH FLOW RATES:
	North Trench: 2-5 GPM South Trench: 2-2.5 GPM
	TOTAL GROUNDWATER TREATMENT DISCHARGE RATE: 2.2-3 GPM
	DIAMMONIUM PHOSPHATE FLOW AND PERCENT REMAINING:
	North:
	DATE OF LAST BIOSOCK INOCULATIONS: (# per unit)
	North Units: 2,000 Gal. Unit
	CULTURE OBSERVATIONS: Water Temp@rature: Deg.C.
	PO"R: [YH4]: [P04]:
(STOPLES TAKEN AND TESTS RIQUESTED FOR ANDLYSIS.
1	S-tyle Vo. 1581 IIF IEH: W BIVE: W Corrent: South trench MFLUENT 1130
a \	Sample Vo. 132 IPH III - 4 VII - Content Work trend MFLUENT 4 2000
	Samle Vo. 132 IPH III : 1 4 V.: 1 cent: North troug INFLUENT of 300 gallellingtonk EFF 1000 por 1000 p
	EBMUD (Royline) took effect sample today 1/03 Am Pick of Blymyo 150 Agreer
	7