

**Arthur D Little**

**DRAFT**

**Environmental  
Monitoring and Analysis Unit**  
Arthur D. Little, Inc.  
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Cambridge, Massachusetts  
02140-2390 USA

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<b>To:</b>	Mr. Rich Rosen	<b>Company:</b>	Tesoro Hawaii
<b>Date:</b>	September 21, 1998	<b>Fax Number:</b>	808-847-7183 <del>347-3795</del> 3041
<b>From:</b>	John S. Brown	<b>Location:</b>	15W/311
<b>Total number of pages (including cover):</b> <del>12</del> 14			

Dear Rich:

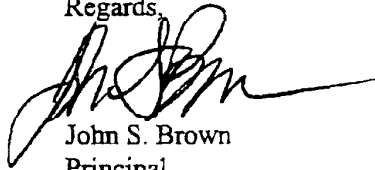
Attached are Draft PAH, SHC, and biomarker data for the two tarball samples (SPM OA01 and SPM KA-Kamala) analyzed by Arthur D. Little, Inc. A preliminary evaluation of the relationship between the samples based on the analytical data is summarized as follows:

SPM OA01: Beach tarball - Highly weathered mid/heavy petroleum of a source unrelated to the Bunker C spill source sample SPMHose001.

SPM KA-Kamala: Beach tarball - Highly weathered heavy petroleum product of a source unrelated to tarball sample SPM OA01, or the Bunker C spill source sample SPMHose001

Please contact me if you have any questions concerning these draft data.

Regards,



John S. Brown  
Principal  
Environmental Science and Technology

**Confidentiality Notice**

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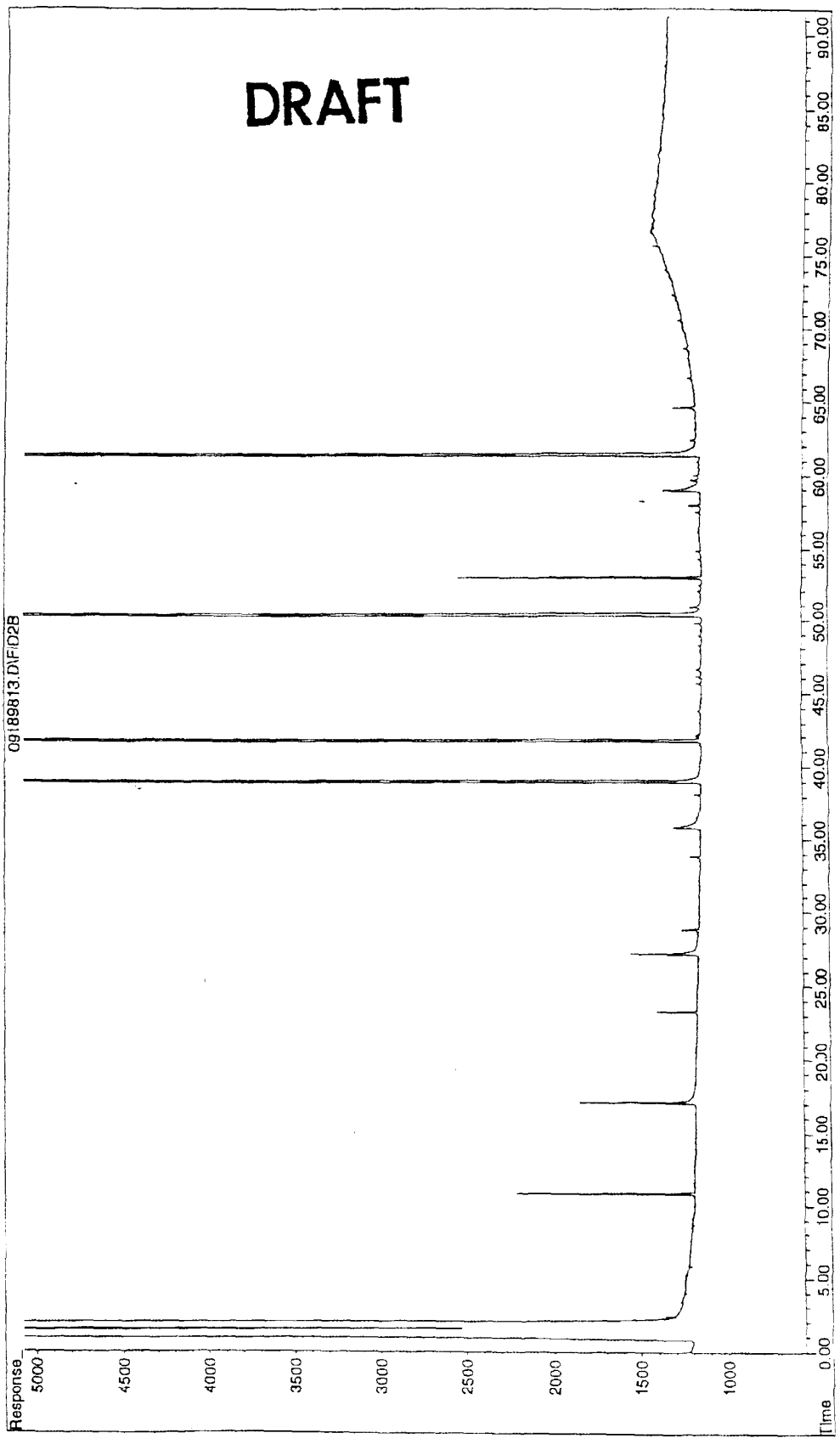
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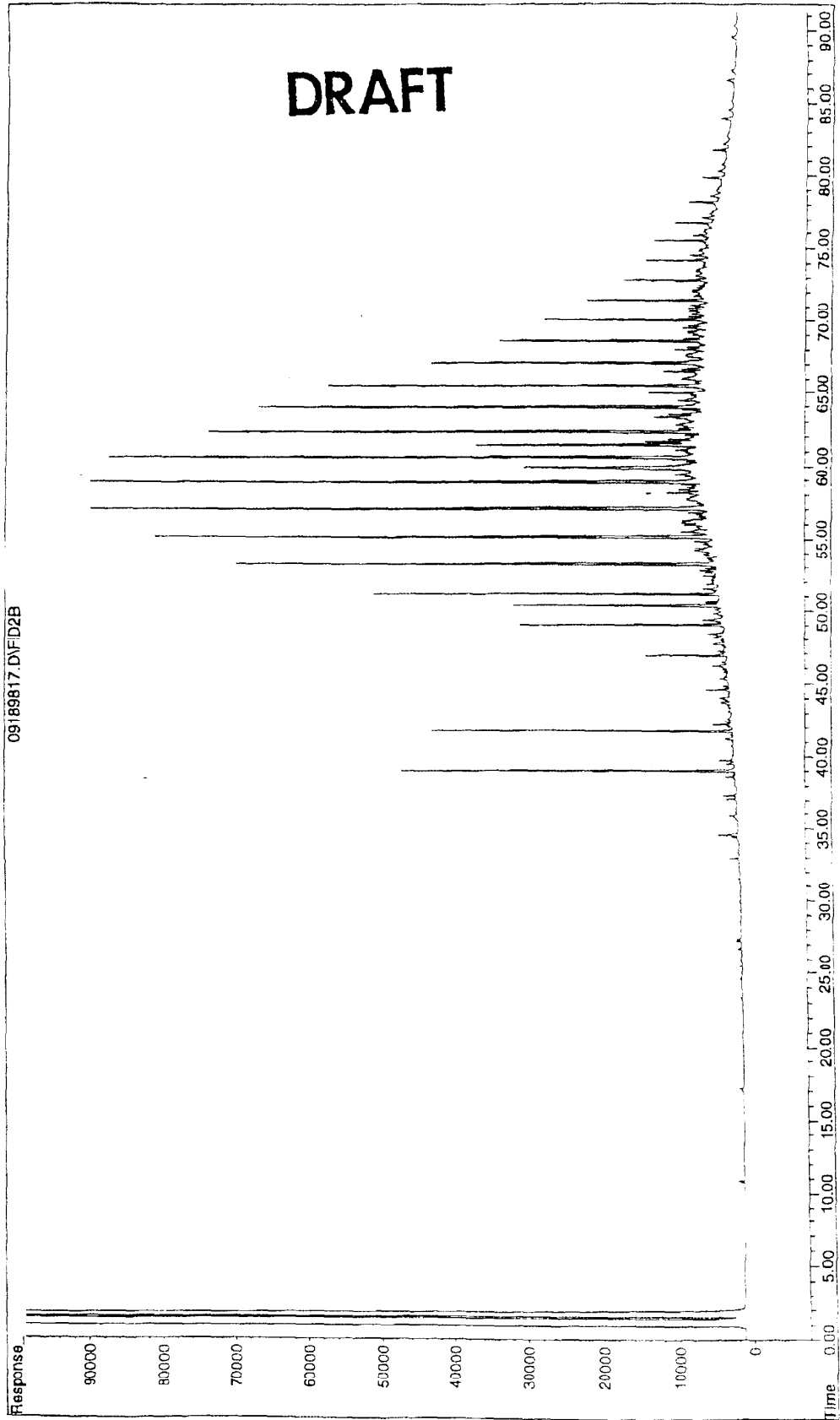
Call if there is a problem: (1) 617.498.5387

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Arthur D. Little - Environmental Monitoring and Analysis  
File : C:\HPCHEM\1\DATA\0318981B\09189813.D  
Operator : FQ  
Acquired : 19 Sep 98 12:04 am using AcqMethod SHCDUAL.M  
Instrument : GC FID #1  
Sample Name: BW-S-08PB  
Misc Info : Procedural Blank  
Vial Number: 55



Arthur D. Little - Environmental Monitoring and Analysis  
File : C:\HPCHEM\1\DATA\0918981E\09189817.D  
Operator : FQ  
Acquired : 19 Sep 98 3:28 am using AcqMethod SHCDUAL.M  
Instrument : GC FID #1  
Sample Name : 98D2928  
Misc Info : SPM OA01  
Vial Number : 57



Arthur D. Little - Environmental Monitoring and Analysis

File : C:\HPCHEM\1\DATA\0918981B\09189819.D

Operator : FQ

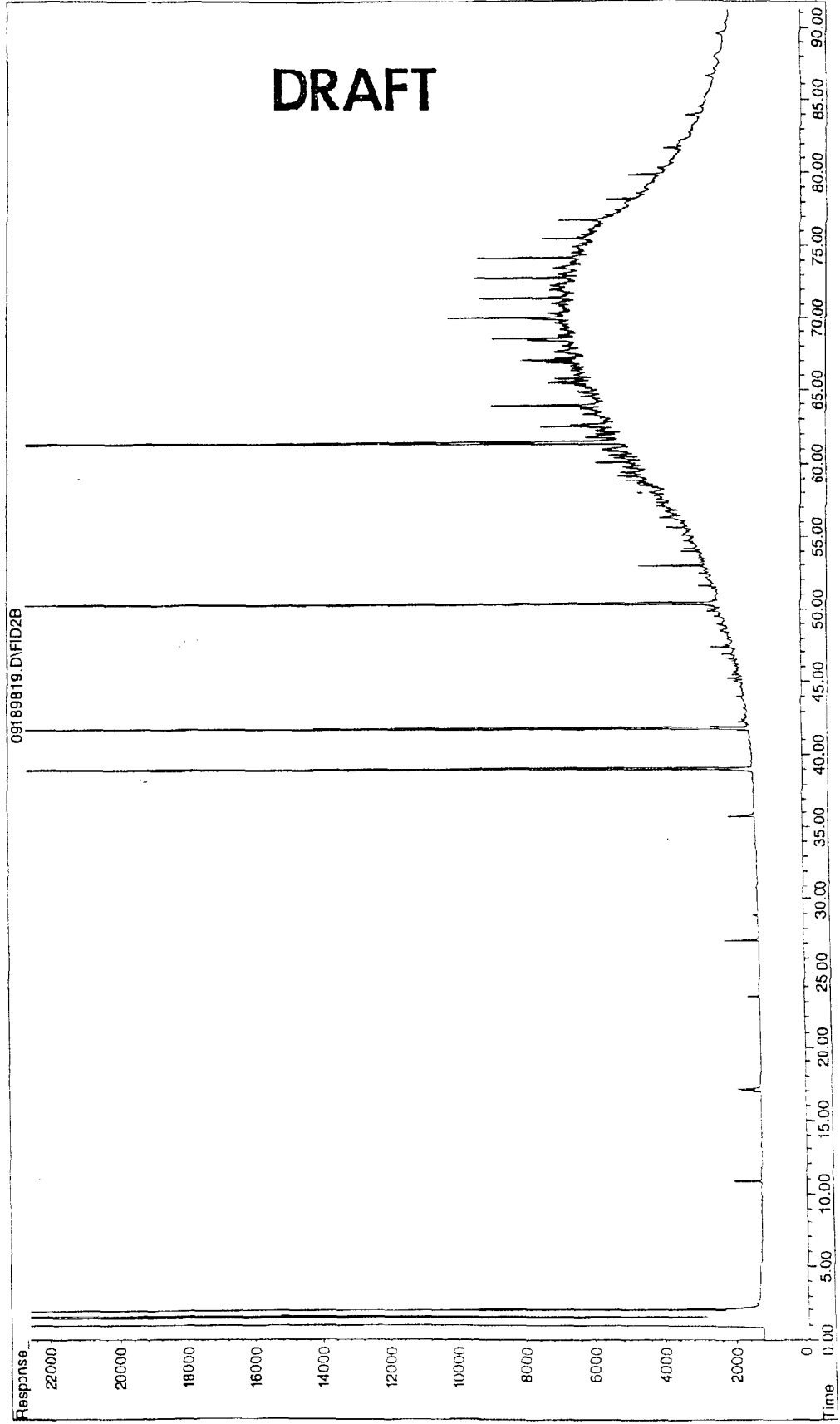
Acquired : 19 Sep 98 5:09 am using AcqMethod SHCDUAL.M

Instrument : GC FID #1

Sample Name: 98D2929

Misc Info : SPM KA-KAMALA

Vial Number: 58



Arthur D. Little  
Environmental Monitoring and Analysis Unit

# DRAFT

Project Title : Tesoro Hawaii Corp - Tesoro Hawaii  
Data Package: 1330  
Data Table: PAH - Main - Surrogate Corrected

Field ID	IRM 1491	North Slope Crude	Procedural Blank	Blank Spike
Lab ID	BM62	BM91	BW-S-08PB	BW-S-09BS
Lab Batch	B0152	B0152	B0152	B0152
File	DX8343.D	DX8344.D	DX8363.D	DX8364.D
Sample Type	QC	QC	QC	QC
Weight Basis	WET	WET	WET	WET
Matrix	IRM	OIL	OIL	OIL
Sample Size	0.1 mL	5 mg	10 mg	10 mg
Associated Blank	NA	NA	NA	BW-S-08PB
Field Date	NA	NA	NA	NA
Extract Date	NA	NA	09/17/98	09/17/98
Analysis Date	09/18/98	09/18/98	09/19/98	09/19/98
Min Reporting Limit	250	5	2.5	2.5
Units	ug/L	mg/Kg	mg/Kg	ng/Kg
Naphthalene	6100	750	ND	77
C1-Naphthalenes	ND	1600	ND	ND
C2-Naphthalenes	ND	2200	ND	ND
C3-Naphthalenes	ND	1800	ND	ND
C4-Naphthalenes	ND	1100	ND	ND
Acenaphthylene	6200	ND	ND	80
Acenaphthene	6300	ND	ND	80
Biphenyl	6100	210	ND	ND
Fluorene	6200	98	ND	77
C1-Fluorenes	ND	170	ND	ND
C2-Fluorenes	ND	340	ND	ND
C3-Fluorenes	ND	400	ND	ND
Anthracene	7900	18	ND	78
Phenanthrene	6100	250	ND	73
C1-Phenanthrenes/anthracenes	ND	620	ND	ND
C2-Phenanthrenes/anthracenes	ND	830	ND	ND
C3-Phenanthrenes/anthracenes	ND	600	ND	ND
C4-Phenanthrenes/anthracenes	ND	330	ND	ND
Dibenzothiophene	ND	210	ND	0.55 J
C1-Dibenzothiophenes	ND	500	ND	ND
C2-Dibenzothiophenes	ND	670	ND	ND
C3-Dibenzothiophenes	ND	630	ND	ND
Fluoranthene	5200	ND	ND	75
Pyrene	5300	14	ND	72
C1-Fluoranthenes/pyrenes	ND	90	ND	ND
C2-Fluoranthenes/pyrenes	ND	150	ND	ND
C3-Fluoranthenes/pyrenes	ND	180	ND	ND
Benzo[a]anthracene	3200	ND	ND	88
Chrysene	6400	48	ND	82
C1-Chrysenes	ND	92	ND	ND
C2-Chrysenes	ND	120	ND	ND
C3-Chrysenes	ND	100	ND	ND
C4-Chrysenes	ND	79	ND	ND
Benzo[b]fluoranthene	4500	7.9	ND	70
Benzo[k]fluoranthene	5100	ND	ND	78
Benzo[e]pyrene	5100	10	ND	ND
Benzo[a]pyrene	6900	ND	ND	88
Perylene	6800	ND	ND	ND
Indeno[1,2,3-c,d]pyrene	5400	ND	ND	61
Dibenzo[a,h]anthracene	4700	ND	ND	64
Benzo[g,h,i]perylene	4500	3.5 J	ND	60
%d8-Naphthalene	99	99	122	122
%d10-Acenaphthene	101	97	114	112
%d10-Phenanthrene	104	94	118	118
%d12-Benzo[a]pyrene	103	102	115	118

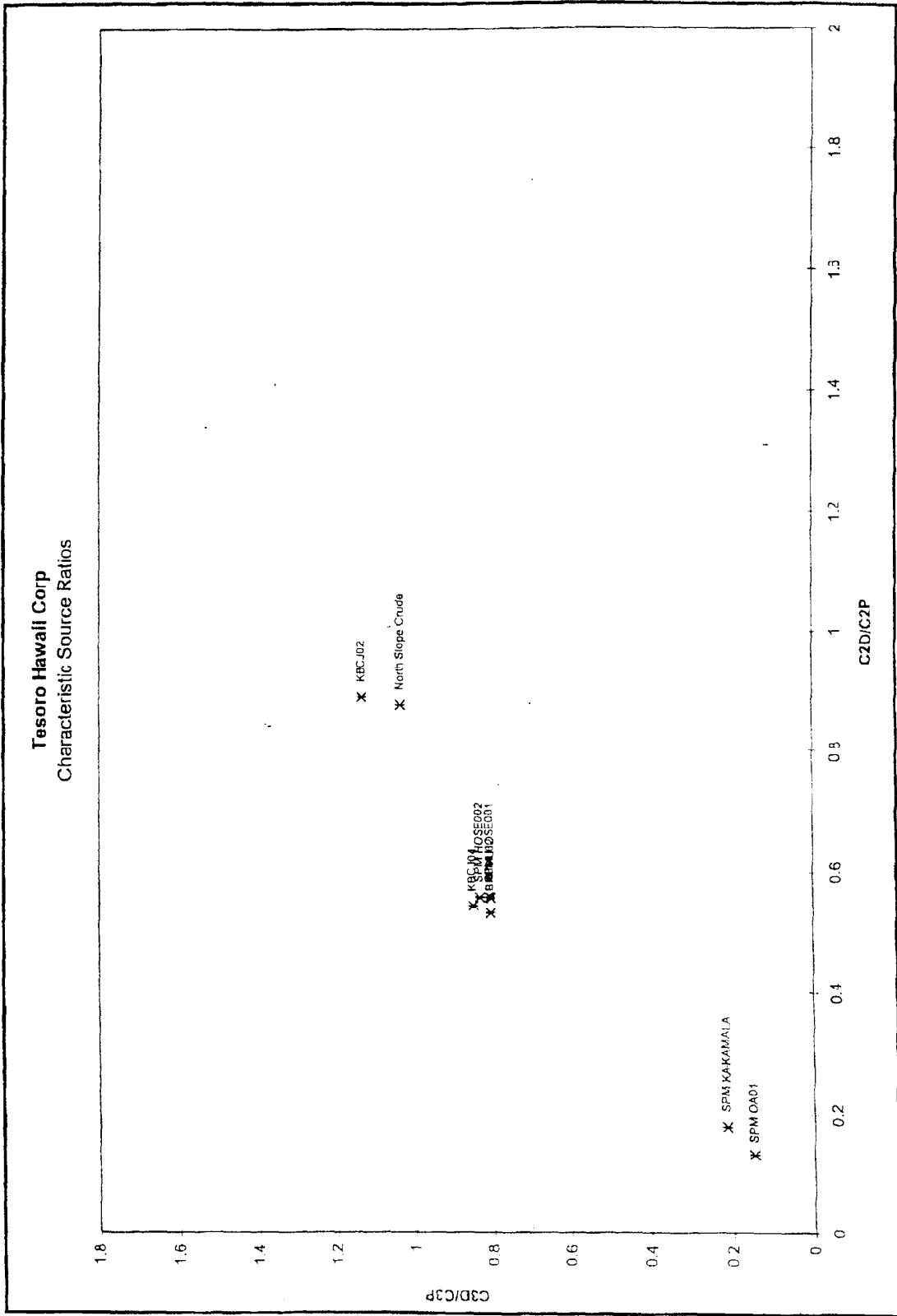
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Environmental Monitoring and Analysis Unit

# DRAFT

Project Title : Tesoro Hawaii Corp - Tesoro Hawaii  
Data Package: 1330  
Data Table: PAH - Main - Surrogate Corrected

Field ID	SPM 0A01	SPM KA-KAMALA
Lab ID	98D2928	98D2929
Lab Batch	B0152	B0152
File	DX8365.D	DX8366.D
Sample Type	SAMP	SAMP
Weight Basis	WET	WET
Matrix	OIL	OIL
Sample Size	10.1 mg	10.3 mg
Associated Blank	BW-S-08PB	BW-S-08PB
Field Date	09/14/98	09/14/98
Extract Date	09/17/98	09/17/98
Analysis Date	09/19/98	09/19/98
Min Reporting Limit	2.5	2.4
Units	mg/Kg	mg/Kg
Naphthalene	ND	ND
C1-Naphthalenes	ND	ND
C2-Naphthalenes	ND	ND
C3-Naphthalenes	ND	ND
C4-Naphthalenes	ND	ND
Acenaphthylene	ND	0.64 J
Acenaphthene	ND	ND
Biphenyl	ND	ND
Fluorene	ND	ND
C1-Fluorenes	ND	ND
C2-Fluorenes	ND	ND
C3-Fluorenes	ND	14
Anthracene	ND	ND
Phenanthrene	0.48 J	0.31 J
C1-Phenanthrenes/anthracenes	31	10
C2-Phenanthrenes/anthracenes	160	72
C3-Phenanthrenes/anthracenes	170	150
C4-Phenanthrenes/anthracenes	89	150
Dibenzothiophene	ND	ND
C1-Dibenzothiophenes	2.5	1.6 J
C2-Dibenzothiophenes	21	13
C3-Dibenzothiophenes	25	32
Fluoranthene	0.84 J	1.4 J
Pyrene	3.7	16
C1-Fluoranthenes/pyrenes	21	72
C2-Fluoranthenes/pyrenes	34	120
C3-Fluoranthenes/pyrenes	49	140
Benzo[a]anthracene	ND	6.2
Chrysene	42	46
C1-Chrysenes	100	120
C2-Chrysenes	130	170
C3-Chrysenes	81	160
C4-Chrysenes	40	77
Benzo[b]fluoranthene	ND	9.9
Benzo[k]fluoranthene	38	ND
Benzo[e]pyrene	18	33
Benzo[a]pyrene	ND	14
Perylene	ND	5.9
Indeno[1,2,3-c,d]pyrene	ND	ND
Dibenzo[a,h]anthracene	1.1 J	4.1
Benzo[g,h,i]perylene	1.4 J	11
%d8-Naphthalene	124	125
%d10-Acenaphthene	113	110
%d10-Phenanthrene	111	110
%d12-Benzo[a]pyrene	116	101

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Environmental Monitoring and Analysis Unit

# DRAFT

Project Title : Tesoro Hawaii Corp - Tesoro Hawaii  
Data Package: 1330  
Data Table: ST - Main - Surrogate Corrected

Field ID	North Slope Crude	Procedural Blank	Blank Spike	SPM 0A01
Lab ID	BK81	BW-S-08PB	BW-S-09BS	98D2928
Lab Batch	B0152	B0152	B0152	B0152
File	DX8349.D	DX8363.D	DX8364.D	DX8365.D
Sample Type	QC	QC	QC	SAMP
Weight Basis	WET	WET	WET	WET
Matrix	OIL	OIL	OIL	OIL
Sample Size	5.04 mg	10 mg	10 mg	10.1 mg
Associated Blank	NA	NA	BW-S-08PB	BW-S-08PB
Field Date	NA	NA	NA	09/14/98
Extract Date	NA	09/17/98	09/17/98	09/17/98
Analysis Date	09/19/98	09/19/98	09/19/98	09/19/98
Min Reporting Limit	5	2.5	2.5	2.5
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg
T4-C23Diterpane	53	ND	ND	24
S4-Diacholestane	53	ND	ND	22
S5-Diacholestane	24	ND	ND	8.1
T9-C29Tricyclitriterpane	17	ND	ND	14
T10-C29Tricyclitriterpane	18	ND	ND	9.7
S17-Cholestane(20R)	ND	ND	ND	ND
T11-Trisanthropane(TS)	26	ND	ND	130
T12-Trisnorhopane(TM)	30	ND	ND	38
S24-Methylcholestane	26	ND	ND	3.9
S25-Ethylcholestane	37	ND	ND	8
S28-Ethylcholestane	29	ND	ND	5.9
T15-Norhopane	100	ND	ND	240
T18-Oleanane	ND	ND	ND	34
T19-Hopane	140	ND	ND	280
T21-Homohopane	54	ND	ND	58
T22-Homohopane	36	ND	ND	47
T23-Hopane	ND	ND	ND	ND
%5B(H)-Cholane	110	95	93	91



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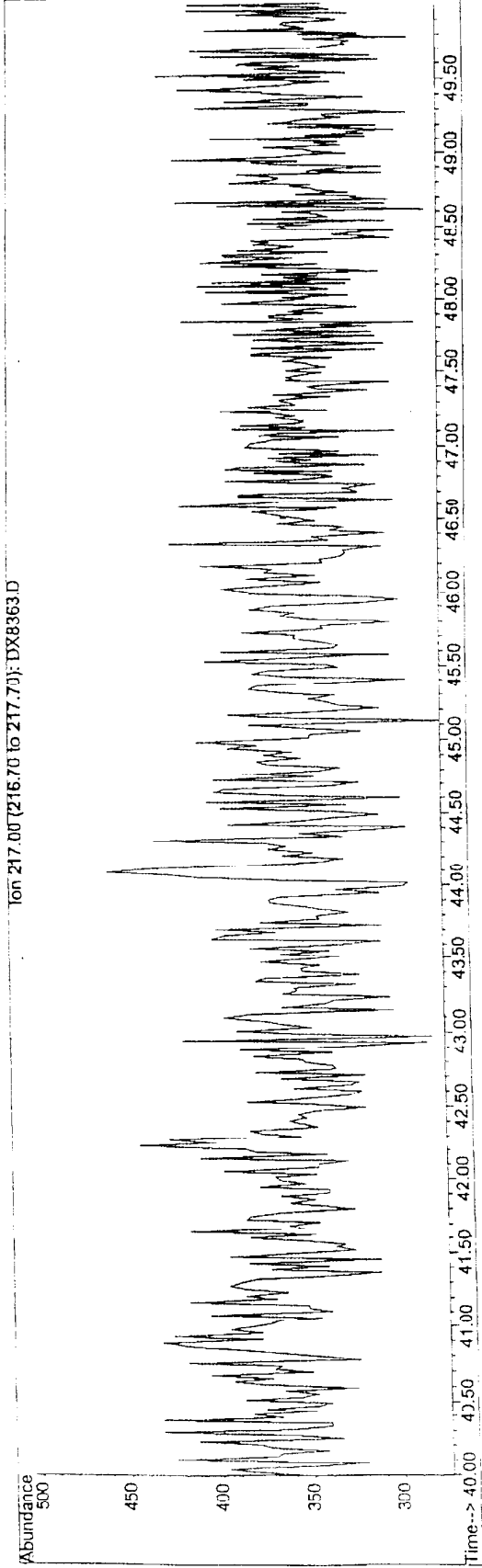
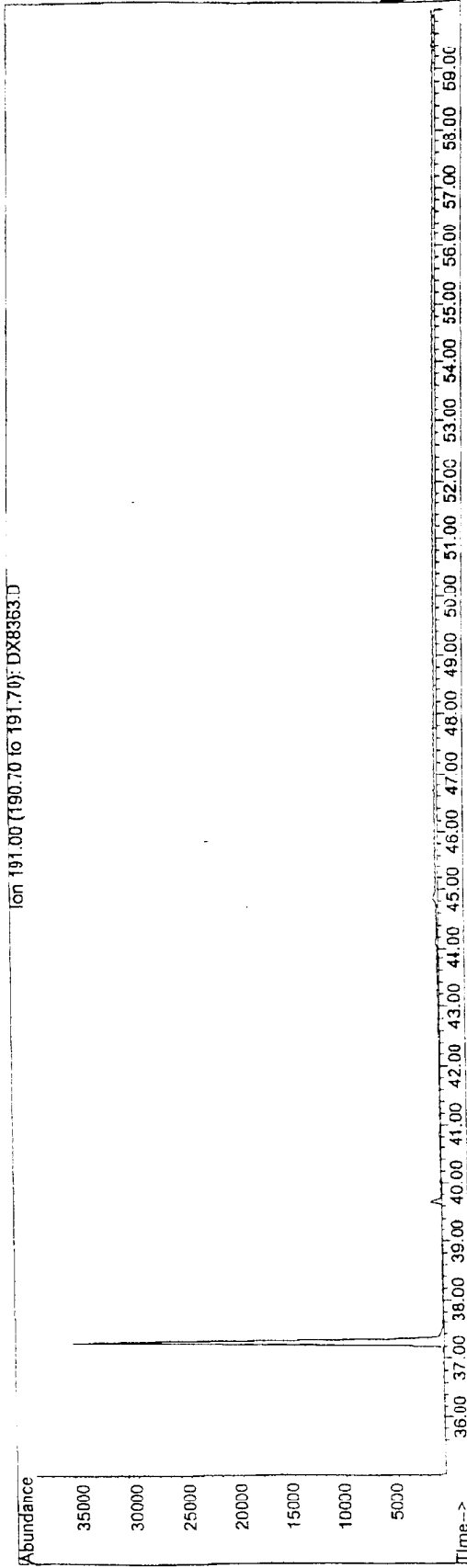
Project Title : Tesoro Hawaii Corp - Tesoro Hawaii  
Data Package: 1330  
Data Table: ST - Main - Surrogate Corrected

Field ID	SPM KA-KAMALA
Lab ID	98D2929
Lab Batch	B0152
File	DX8366.D
Sample Type	SAMP
Weight Basis	WET
Matrix	OIL
Sample Size	10.3 mg
Associated Blank	BW-S-08PB
Field Date	09/14/98
Extract Date	09/17/98
Analysis Date	09/19/98
Min Reporting Limit	2.4
Units	mg/Kg

T4-C23Diterpane	19
S4-Diacholestane	30
S6-Diacholestane	16
T9-C29Tricyclitriterpane	19
T10-C29Tricyclitriterpane	16
S17-Cholestane(20R)	ND
T11-Trisnorhopane(TS)	25
T12-Trisnorhopane(TM)	67
S24-Methylcholestane	99
S25-Ethylcholestane	30
S28-Ethylcholestane	76
T15-Norhopane	150
T18-Oleanane	41
T19-Hopane	200
T21-Homohopane	56
T22-Homohopane	39
T23-Hopane	ND
%5B(H)-Cholane	95

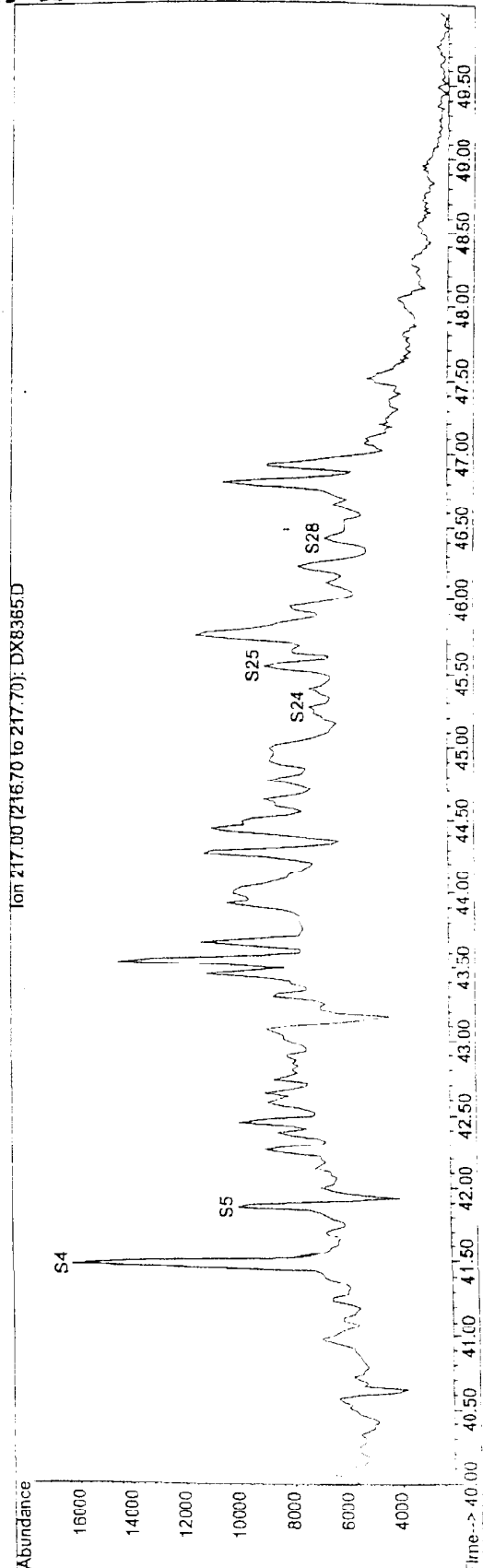
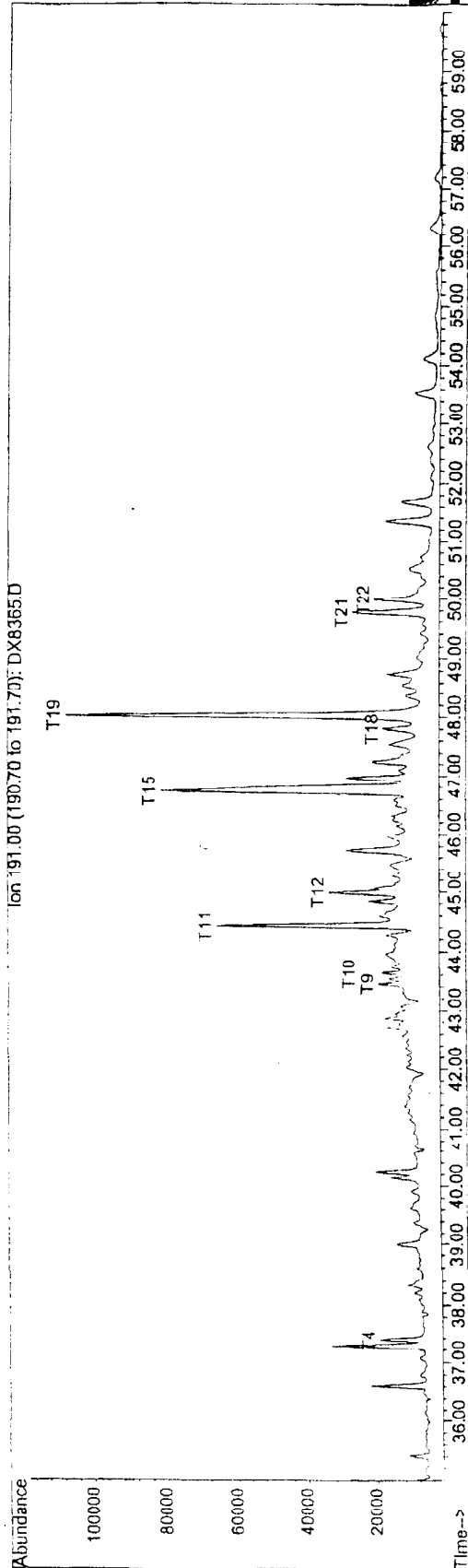
DRAFT

File : C:\HPCHEM\1\SQX661\DX8363.D  
 Operator : SLR  
 Acquired : 19 Sep 98 6:46 pm using AcqMethod PA4SIM  
 Instrument : GC/MS#4  
 Sample Name: BW-S-08PB  
 Misc Info : Procedural Blank  
 Vial Number: 1



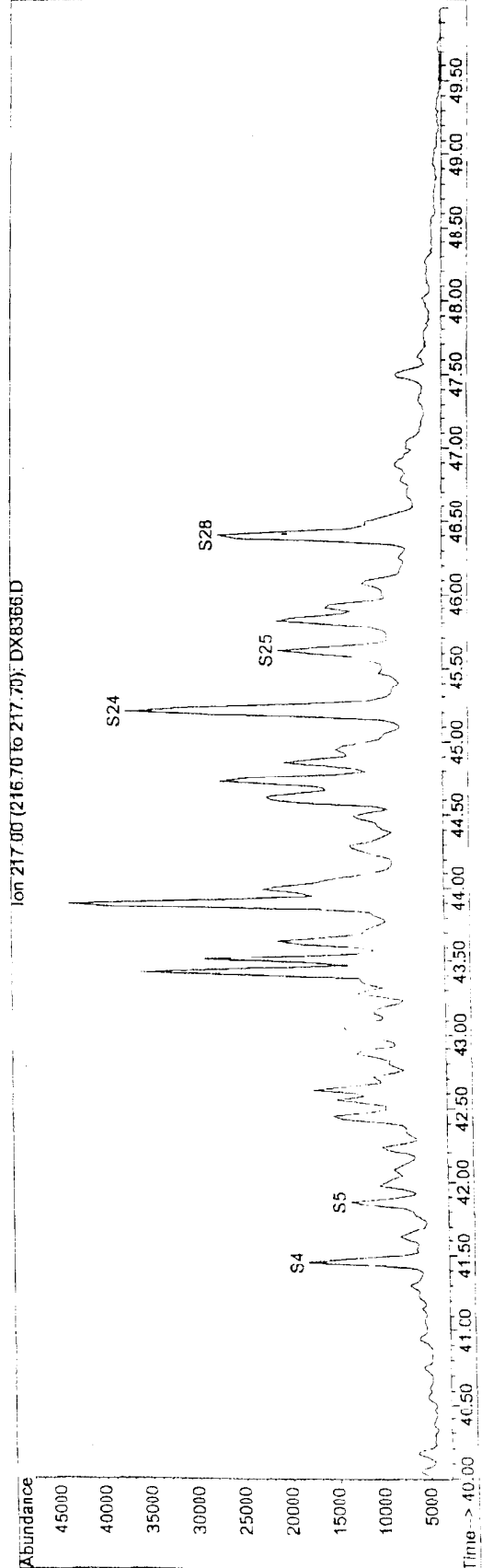
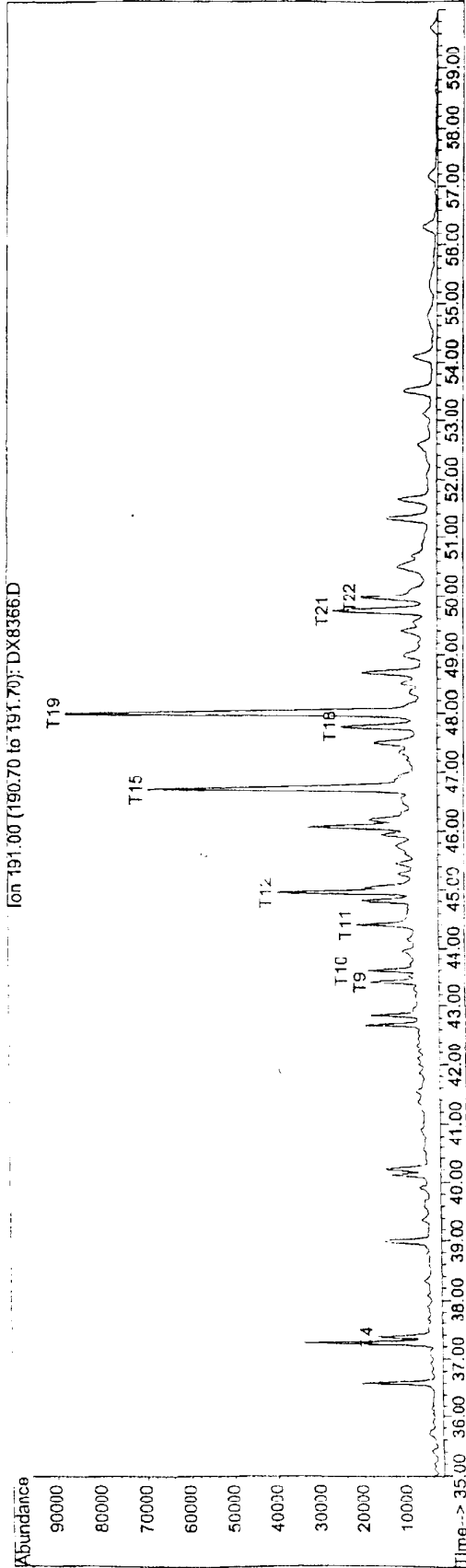
DRAFT

File : C:\HPCHEM\1\SQX661\DX8365.D  
 Operator : SLR  
 Acquired : 19 Sep 98 9:03 pm using AcqMethod PA4SIM  
 Instrument : GC/MS#4  
 Sample Name: 98D2928  
 Misc Info : SPM 0A01  
 Vial Number: 1



# DRAFT

File : C:\HPCHEM\1\SQX661\DX8366.D  
 Operator : SLR  
 Acquired : 19 Sep 98 10:12 pm using AcqMethod PA4SIM  
 Instrument : GC/MS#4  
 Sample Name : 98D2929  
 Misc Info : SPM KA-KAMALA  
 Vial Number : 1



CHAIN OF CUSTODY RECORD

Client Name		Project or PC#		Phone #		Report #		Number of containers		Remarks	
TESORO HAWAII		547 3142		547 3142		RICH ROSKIN		1		3 Day Turnaround	
Address		P.O. Box 3379		Hono Kula, HI 96842		Sample description					
City, State, Zip		Hono Kula, HI 96842		Sampled by		WALSH JANSSEN					
Date sampled	Time sampled	Type of Sample	Sample description	Signature	Print Name	Company	Date	Time			
9/14/98	1700	Solid	Solid black with	Wallis T. Janssen	Wallis T. Janssen	Pacific Environmental Corp	15 Sept 98	0630			
		SPUR w/ CG	some spno coating	Chris Janssen	CHRIS JANSSEN	TESORO HAWAII	15 Sept 98	0630			
			* MALAKAHANA BEACH	CHRIS JANSSEN	CHRIS JANSSEN	TESORO	9-15-98	07:15			
			WINDWARD (Radium sample location)	CHRIS JANSSEN	CHRIS JANSSEN	U.S. CG	15 SEP 98	1905			
				CHRIS JANSSEN	CHRIS JANSSEN	TESORO HAWAII	15-SEP-98	0705			
				LINA TONG LE	LINA TONG LE	ARTHUR D. LITTLE	9/17/98	13:00			

Dries CFC match samples: Y or N  
 Broken containers: Y or N  
 Received within holding time: Y or N  
 CFC still intact: Y or N / None  
 Any other problems: Y or N  
 If problems, client contacted: Y or N  
 Date contacted: / /  
 Temperature (C): 1000 HELP

Note: Samples are discarded 30 days after results are reported unless other arrangements are made.  
 Hazardous samples will be returned to client or disposed of at client's expense.  
 Disposal arrangements:

**C ANALYTICAL**  
 1005 Shary Circle, Concord, CA 94518 (510) 825-3894  
 961 Western Avenue, Glendora, CA 91701 (818) 247-5737  
 1200 Gene Ave., Westborough, MA 01581 (508) 352-1417 x280113

