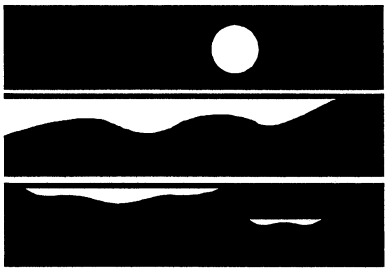

Sound Refining Company
Class II Inspection
July/August 1994

July 1995

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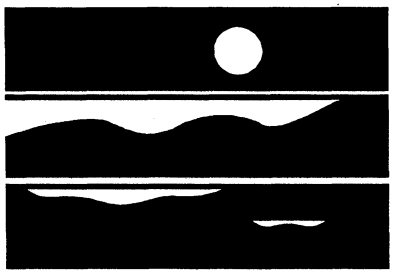

Sound Refining Company
Class II Inspection
July/August 1994

by
Steven Golding

Environmental Investigations and Laboratory Services Program
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July 1995

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Abstract

A Class II Inspection was conducted at the Sound Refining Company refinery in Tacoma, Washington on July 20-21, 1994. Related sediment sampling was conducted August 22, 1994. The effluent met all daily average and daily maximum NPDES permit requirements. The effluent BOD_5 concentration met the daily maximum permit limit but was greater than the daily average permit limit. Effluent BOD_5 was based on a 24-hour sample while BOD_5 permit limits are based on monthly averages. Plant treatment effectiveness generally fell within a range typical of similar facilities. Considerable nitrification was taking place. Split sample comparisons of Ecology and Sound sampling and analyses showed close agreement.

All VOA compounds found in effluent were in concentrations below State water quality criteria. No BNA compounds were detected in effluent. Of eight priority pollutant metals detected in effluent, copper, mercury, and zinc exceeded State marine water quality criteria. Mercury exceeded the chronic criterion by a factor of 76. Of four species tested in effluent bioassay tests, the fathead minnow and bivalve larvae showed significant mortality and developmental effects.

Seven VOA compounds were found in sediment samples near the outfall. Of the BNAs detected in sediment samples, bis(2-ethylhexyl)phthalate and hexachlorbenzene exceeded Marine Sediment Quality Standards criteria. No metals exceeded Marine Sediment Quality Standards criteria. The echinoderm embryo sediment bioassay test showed no statistically significant difference relative to the control. For the marine amphipod test, all three sediment samples showed a statistical difference for mortality from the control.

Summary

Wastewater

Plant flow is measured with an in-line flow meter just upstream of the effluent box and was not accessible for Ecology verification of flow measurements.

The effluent met all permit requirements for COD, TSS, oil and grease, phenolic compounds, NH_3-N, sulfide, total chromium, hexavalent chromium, and pH. The effluent BOD_5 concentration met the daily maximum permit limit but was greater than the daily average permit limit. Effluent BOD_5 was based on a 24-hour sample while BOD_5 permit limits are based on monthly averages. Because the BOD_5 test showed a toxic response to the effluent, actual effluent BOD_5 was likely higher.

The wastewater treatment facility was achieving substantial nitrification at the time of the inspection. A comparison with other facilities indicates that the nitrification may have been occurring in the rotating biological contactor unit.

Treatment effectiveness generally fell within a range typical of similar facilities.

Results of sample splits were in close agreement for Ecology and Sound samples and analyses of COD, TSS, oil and grease, NH_3-N, phenolics, and pH.

Twenty-three volatile organic acid (VOA) compounds, fifteen base-neutral acid (BNA) compounds, and seven priority pollutant metals were detected in the influent.

Eight priority pollutant and other target VOA compounds were detected in the effluent. Of these, naphthalene (12.8 µg/L - est.; 3.2 µg/L - est.) was found in the highest concentrations. All VOA compounds found in the effluent were in concentrations below State water quality criteria. No BNA compounds were detected in the effluent.

Of the eight priority pollutant metals detected in effluent samples, copper, mercury, and zinc exceeded State marine water quality criteria. Mercury exceeded the chronic criterion by a factor of 76. Although a dilution study has not been conducted, there are plans to eliminate the outfall by diverting the treated wastewater to the City of Tacoma sewer system.

Effluent bioassays showed toxicity for most species tested. Rainbow trout and *Daphnia magna* showed no statistically significant mortality. The fathead minnow and bivalve larvae tests showed statistically significant mortality and developmental effects.

Sediment

Seven VOA compounds were found in the two sediment samples near the outfall (Sed-1 and Sed-2). MEK (p-isopropyltoluene) was found in concentrations of 27.2 µg/Kg-dry (est.) in Sed-1 and 22.7 µg/Kg-dry in Sed-2 (est.). MEK was also found in the Sound influent and effluent. Seven VOA compounds were found in the background sediment sample, all at concentrations below 1.0 µg/Kg-dry.

Although no BNAs were detected in the Sound effluent, sediment results indicate BNA contamination near the outfall. BNA concentrations in the two sediment samples near the outfall were generally higher than the BNA concentrations in the background sample by a factor of two. Of the BNAs detected in the sediment samples, bis(2-ethylhexyl)phthalate exceeded the Marine Sediment Quality Standards chemical criterion in Sed-1 and was 99% of the maximum chemical criterion. Hexachlorobenzene in Sed-2 exceeded the maximum chemical criterion by 58%.

While metals were found in elevated concentrations in the effluent, metals in sediments near the outfall were found in similar concentrations to those at the background site, reflecting the contaminated nature of the background comparison site. Ten metals were detected in each of the three sediment samples, all in concentrations lower than applicable Marine Quality Standards.

For the echinoderm embryo sediment bioassay test, none of the combined endpoint data showed a statistically significant difference relative to the control.

For the marine amphipod sediment test, mortality in all three sediment samples was statistically different than the control. The mean mortality for the two sediment samples near the outfall did not exceed the 25% mortality biological effects criterion for amphipod tests.

Recommendations

- The effluent meter should be checked regularly per manufacturer's recommendations, and meter accuracy should be assured. Provision for a means of independent evaluation of the flow determined by the in-line flow meter should be considered.

- Further sediment sampling and analyses should be considered to verify concentrations of bis(2-ethylhexyl)phthalate and other BNA compounds.

Introduction

A Class II Inspection was conducted at the Sound Refining Company (Sound) refinery in Tacoma, Washington on July 20-21, 1994 (Figure 1). Conducting the inspection of the facility were environmental engineers Guy Hoyle-Dodson and Steven Golding from the Department of Ecology Toxics Investigations Section. Raymond Burke, lab and environmental supervisor for Sound, assisted during the inspection. The inspection was requested by the Department of Ecology Industrial Section. Nancy Kmet of the Industrial Section is permit manager.

Facility Description

Crude oil is refined at the facility by both atmospheric and vacuum distillation. The principle petroleum products are heavy fuel oil, asphalt, naphthas, and lube stocks.

Primary treatment of wastewater is with API and corrugated plate separators (CPS), a surge pond, and an induced air flotation unit (IAF) to separate oil from the wastewater (Figure 2). The wastewater is then treated in an activated sludge aeration basin, followed by a rotating biological contactor unit (RBC), and a clarifier. The effluent is discharged via Outfall 001 to the Hylebos Waterway (Figure 1). The 12-inch outfall line discharges 22 feet from shore at a depth of 10 feet below MLLW (mean low low water).

Stormwater not from plant process areas is treated with oil skimmers and wood excelsior filters. Sanitary sewage from the facility is pumped to the City of Tacoma sewer system.

Discharge from Outfall 001 and stormwater outfalls 002, 003, and 004, is regulated by National Pollutant Discharge Elimination System (NPDES) Permit No. WA 000320-4. The permit includes two production tiers representing partial and full production rates. The permit was issued May 15, 1990 and expires May 15, 1995.

Sound is tentatively planning to discontinue discharge of effluent, and instead divert its pretreated wastewater to the City of Tacoma sewer system, by January 1, 1996 (Kmet, 1995).

Objectives

Objectives of the inspection included:

- Assess effluent compliance with NPDES permit limits
- Verify NPDES permit self-monitoring, and split samples with the permittee to determine the comparability of sampling methods and laboratory results
- Evaluate treatment effectiveness
- Assess effluent toxicity with bioassays and pollutant scans
- Assess toxicity of sediments near the outfall

Procedures

Ecology collected a composite sample of influent process water (Inf-E) from the influent box upstream of the API separator. Grab samples of influent process water were collected downstream of the API separator (Inf-1,2), and grab and composite samples of IAF effluent and of final effluent (Eff) were collected. Sound also collected final effluent grab and composite samples (Table 1, Figure 2).

Sediment samples were collected by Ecology near the Sound outfall (Table 1, Figure 1).

Ecology and Sound sampler configurations and locations are summarized in Figure 2 and Table 1. A more detailed description of sampling procedures appears in Appendix A. Sampling times and parameters analyzed appear in Appendix B. Ecology analytical methods and laboratories performing the analyses are summarized in Appendix C. Ecology field and laboratory QA/QC are summarized in Appendix D. Quality assurance cleaning procedures are included in Appendix E. A glossary of terms appears in Appendix H.

Results and Discussion

Wastewater

Flow Measurements

Plant flow is measured with an in-line flow meter just upstream of the effluent box and was not accessible for Ecology verification of flow measurements. The effluent meter should be checked regularly per manufacturer's recommendations, and meter accuracy should be assured.

Sound reported flow during the 24-hour period 7 AM - 7 AM July 20-21, 1994 of 48,710 gallons. Ecology recorded flow from the Sound totalizer of 48,562 gallons. This Ecology flow, a prorated estimate from 0945 7/20 to 1030 7/21, verified Sound's reporting of flow. Sound's flow will be used for calculations within this report.

NPDES Permit Compliance/General Chemistry

General chemistry results appear in Table 2. The effluent met the limits in Sound's NPDES permit for COD, TSS, oil and grease, phenolic compounds, NH_3-N, sulfide, total chromium, hexavalent chromium, and pH (Table 3).

Effluent BOD_5 met the daily maximum permit limit but was greater than the daily average permit limit. The BOD_5 test showed a toxic response to the effluent. Actual BOD_5 in the effluent may have been higher. It should be noted that the daily average permit limit is based on a monthly average, not a single day's sample as collected during the inspection.

The permit specifies two tiers of effluent limitations based upon production. When production for the previous two consecutive months averages less than 5,000 barrels (bbls) per day, tier one effluent limits apply. Average production was 3,429 bbls per day for May 1994 and 837 bbls per day for June (Burke, 1994). Tier one limits applied at the time of the inspection. Production for 7 AM July 20 to 7 AM 21 1994 was 3,067 bbls.

The tier one effluent limitations for Outfall 001 that appear in Table 3 include stormwater allocations, as specified in the permit, for any effluent flow in excess of 45,000 gallons per day. With a plant flow of 48,710 gpd the 3,710 gpd excess flow is attributed to stormwater flow. The extent of actual stormwater flow at the time of the inspection is unknown.

A comparison of influent ammonia and nitrate-nitrite concentrations indicate that the wastewater treatment facility was achieving substantial nitrification at the time of the

inspection. Ammonia concentrations of approximately 2.8 mg/L in the influent were reduced to approximately 0.04 mg/L in the effluent (Table 2). The reduction of 50 mg/L of alkalinity from the influent to the effluent is consistent with the nitrification of approximately 7 mg/L of NH_3-N. NO_2+NO_3 concentrations increased from approximately 1.3 mg/L in the influent to 16 mg/L in the effluent. The reduction in NH_3-N concentrations is not sufficient to account for the large decrease in alkalinity or the large increase in NO_2 + NO_3-N concentration. The unaccounted for increase in effluent NO_2 + NO_3-N may indicate the likelihood of organic nitrogen in the influent being converted to ammonia in the wastewater treatment processes and then nitrified, or the oxidation of other nitrogenous compounds.

Two composite samplers were used simultaneously to collect a large volume of influent sample (Inf-E). Because the level of influent in the influent box was low during the inspection, one of the influent samplers appeared to contain a large portion of oil, apparently sampling from a layer of oil floating on the surface. The oily sample was discarded. The other composite sample was used for all influent composite analyses. This sample did not appear oily, but it may not have been representative of the combined oil and water components of the influent either. The composite influent sample intake, located in the influent below the floating oil, may have collected a disproportionately low proportion of oil.

In comparisons of parameter concentrations through a wastewater treatment facility, it is usually assumed that the facility is in a steady state. To be in a steady state, a wastewater treatment facility must be in operation for a period of time longer than its detention time. Dry weather detention time through the wastewater treatment facility is 2 to 4.5 days (Burke, 1994). Because the plant started up at 1830 on July 19, just 13 hours before the inspection, the wastewater treatment facility was not in a steady state. To the extent that conditions in the treatment facility did not approximate a steady state, a degree of uncertainty is introduced to determinations of treatment effectiveness and analyses of nitrification.

Treatment Effectiveness

From comparisons of influent samples and effluent samples, treatment efficiencies have been calculated and appear in the following table. TSS and oil and grease percent removals are based on comparisons of grab samples. All other comparisons are based on composite samples. Because percent removals are based on comparisons with the influent and the representativeness of the influent composite sample was uncertain, and also because the wastewater treatment facility was not in a steady state, calculated percent removals should be viewed with caution.

The lower than expected calculated percent removals through the IAF appear to indicate not the actual removal efficiency through the IAF, but the unrepresentative weak Inf-E composite sample. The low IAF TSS concentrations can be attributed to settling in the surge pond and equalization tank upstream of the IAF.

Comparison of Concentrations and Removal Efficiencies with Typical Values*

Parameter	IAF Effluent (mg/L)	Typical IAF Effluent (mg/L)	Removal Through IAF	Typical Removal Through IAF	Final Effluent (mg/L)	Typical Final Effluent (mg/L)	Final Effluent Removal	Typical Final Effluent Removal
TSS	8;5	25-60	82%	50-85%	42	20-100	41%	20-70%
BOD_5	126	45-200	10%	20-70%	74**	10-60	47%**	40-95%
COD	290	130-450	15%	10-60%	72	50-300	79%	30-65%
NH_3-N	2.82		-1%		0.044	3-50	98%	0-15%
Oil&Grease	15;11	5-20	70%	70-85%	3	1.6-50	93%	50-90%

* From EPA (1978)

** The effluent BOD test showed a toxic response. As a result, the actual effluent BOD_5 concentration was likely higher and the percent removal likely lower.

BOD_5, COD, and oil and grease concentrations and removal efficiencies through the IAF were within the typical range (EPA, 1978). Final effluent concentrations of TSS and COD were within the typical range. Effluent BOD_5 was somewhat higher than typical, despite sample toxicity in the BOD_5 test, and percent BOD_5 removal through the plant was within the normal range. The effluent oil and grease concentration was low with higher than typical percent removal.

Effluent NH_3-N was considerably lower than the typical range. This indicates the achievement of nitrification in the facility. The RBC unit following the other treatment units, which was not present in the systems included in the EPA comparison facilities, may be responsible for the nitrification. Nitrification occurs in RBC units or in other biological treatment units when detention times are long and temperature and other conditions are favorable (Metcalf and Eddy, 1991).

Split Sample Comparison

Samples were split to determine the comparability of Ecology and permittee laboratory results and sampling methods (Table 4). Results were in close agreement for Ecology and Sound samples and analyses of COD, TSS, oil and grease, NH_3-N, phenolics, and pH.

Priority Pollutant Scans

Influent

Influent BNAs and metals were included in the Inf-E sample. Because of sampling problems in the poorly mixed influent box, influent BNAs and metals results may be nonrepresentative. Since the Inf-E sample may have included only a portion of the total wastestream, Inf-E BNA and metals results may be only a partial representation of BNAs and metals in the influent. VOAs were sampled downstream of the API, providing for a more representative sample.

Twenty-three priority pollutant and other target volatile organic acid (VOA) compounds were detected in the influent (Table 5). Toluene was found in the highest concentrations (2760 µg/L - est. and 3170 µg/L - est.). Fifteen priority pollutant and other target base-neutral acid compounds were detected in the influent, with 4-methylphenol (2800 µg/L) at the highest concentration.

Of the seven priority pollutant metals detected in the influent samples, zinc was found in the highest concentration (47.1 µg/L). Total chromium was found in a concentration of 11 µg/L (est.).

Effluent

Eight priority pollutant and other target VOA compounds were detected in the effluent (Table 5). Of these, naphthalene (12.8 µg/L - est.; 3.2 µg/L - est.) was found in the highest concentrations. All VOA compounds found in the effluent were in concentrations lower than State water quality criteria (Ecology, 1992). No BNA compounds were detected in the effluent.

A complete list of parameters analyzed and analytical results is included in Appendix F. A number of tentatively identified compounds (TICs) were found in the influent samples in concentrations up to 991 µg/L (est.). In the effluent samples the highest concentrations of tentatively identified compounds were the VOAs 1-methyl-naphthalene (60.7 µg/L - est.) and 2-methylnaphthalene (134 µg/L - est.). TICs are summarized in Appendix G.

Eight priority pollutant metals were detected in the effluent samples. Copper in the effluent exceeded the acute marine State water quality criterion by a factor of six. Total mercury concentrations were lower than the State acute criterion but higher than the chronic marine criterion by a factor of 76. Zinc was found in slightly higher concentrations than State acute and chronic criteria. Hexavalent chromium was found in concentrations well below State water quality criteria.

A dilution ratio at the mixing zone boundary of approximately 6:1 for copper and approximately 76:1 for mercury would be required to meet water quality standards. [Note: A higher dilution factor may be required if background concentrations in the receiving water of one or more of these pollutants of concern is elevated or if other effluent conditions are more critical than those which were assumed]. A dilution zone study has not been conducted for the Sound outfall (Kmet, 1995). Plans to divert the treated wastewater to the City of Tacoma sewer system are expected to eliminate the outfall, however.

The concentrations for some metals were higher in the Inf-E composite sample than the Eff-E sample. This may reflect an unrepresentative Inf-E sample or the wastewater treatment facility having not arrived at a steady state at the time of the sampling.

Bioassays

The *Daphnia magna* test resulted in an NOEC of 100% and an LC50 of greater than 100% (Table 6). The *Daphnia magna* test was not acceptable in accordance with the WET rule power standard (Ecology, 1993). The power standard requires the test to be able to find a significant difference in results which disagree by 30%. In this case no significant difference in survival was found in a test with a 40% disagreement in survival between control and 100% effluent.

For the bivalve larvae test, the NOEC for survival was 70% effluent. It was not possible to determine an LC50. Abnormality was significant at 35% effluent, with an NOEC of 17.5% effluent. The EC50 was 66.6% effluent.

The fathead minnow test resulted in significant mortality at 100% effluent. The LC50 was estimated at greater than 100%. The NOEC for mortality was 50%. The NOEC for growth was 25%.

The bioassay test for rainbow trout showed no toxic effects.

Sediment

General Chemistry/Physical Characteristics

The sediment sample collected closest to the outfall diffuser (Sed-1) and the background sample (Sed-3) shared a common grain size distribution, with the samples consisting of one half silt and one quarter each of sand and clay (Table 2). The sample collected downcurrent of the diffuser (Sed-2) contained less silt and more sand than the other two samples. TOC, percent solids and percent volatile solids were similar for all three samples.

Priority Pollutant Scans

Seven VOA compounds were found in the two sediment samples near the outfall (Sed-1 and Sed-2 - Table 7). Of these, all were at concentrations of 1.2 µg/L or less except 2-butanone (MEK) and p-isopropyltoluene. MEK was found at concentrations of 27.2 µg/Kg-dry (est.) in Sed-1 and 22.7 µg/Kg-dry in Sed-2 (est.). MEK was found in the Sound influent and effluent. The Sed-2 sample contained 13.0 µg/Kg-dry p-isopropyltouluene, a compound found in the Sound influent. Seven VOA compounds were found in the background sediment sample (Sed-3), all at concentrations less than 1.0 µg/Kg-dry.

Although no BNAs were detected in the Sound effluent, sediment results indicate BNA contamination near the outfall. Twenty-five BNA compounds were found in the Sed-1 and Sed-2 samples. Twenty BNA compounds were found in Sed-3, the background sediment sample. BNA concentrations in Sed-1 and Sed-2 were generally higher than the BNA concentrations in Sed-3 by a factor of two.

Of the BNAs detected in the sediment samples, bis(2-ethylhexyl)phthalate exceeded the Marine Sediment Quality Standards chemical criterion in Sed-1 and was 99% of the maximum chemical criterion. Hexachlorobenzene in Sed-2 exceeded the maximum chemical criterion by 58%.

While metals were found in elevated concentrations in the effluent, metals in sediments near the outfall were found in similar concentrations to those at the background site. This reflects the contaminated nature of the background comparison site. Ten metals were detected in each of the three sediment samples. Metals concentrations were similar in all three sediment samples (Table 7). All metals found were in concentrations lower than applicable Marine Sediment Quality Standards.

A complete list of parameters analyzed and analytical results is included in Appendix F.

A number of tentatively identified compounds were found in the sediment samples in concentrations up to 22,700 µg/Kg-dry. VOA TICs were found in the Sed-1 sample in concentrations generally three orders of magnitude higher than those in the Sed-2 sample. Only one VOA TIC was found in the Sed-3 background sample. BNA TICs were in closer agreement between all three sediment samples than were the VOA TICs. Sediment TICs are summarized in Appendix G.

Bioassays

For the echinoderm embryo sediment bioassay test, none of the combined endpoint data showed a statistically significant difference relative to the West Beach control (Table 8).

Marine amphipod sediment test survival was 98% in the control and ranged from 69% in Sed-3 to 81% in Sed-1. Mortality in all three sediment samples was statistically different than the control. The mean mortality for Sed-1 and Sed-2, the two sediment samples near the outfall, did not exceed the 25% mortality biological effects criterion for amphipod tests (Ecology, 1991).

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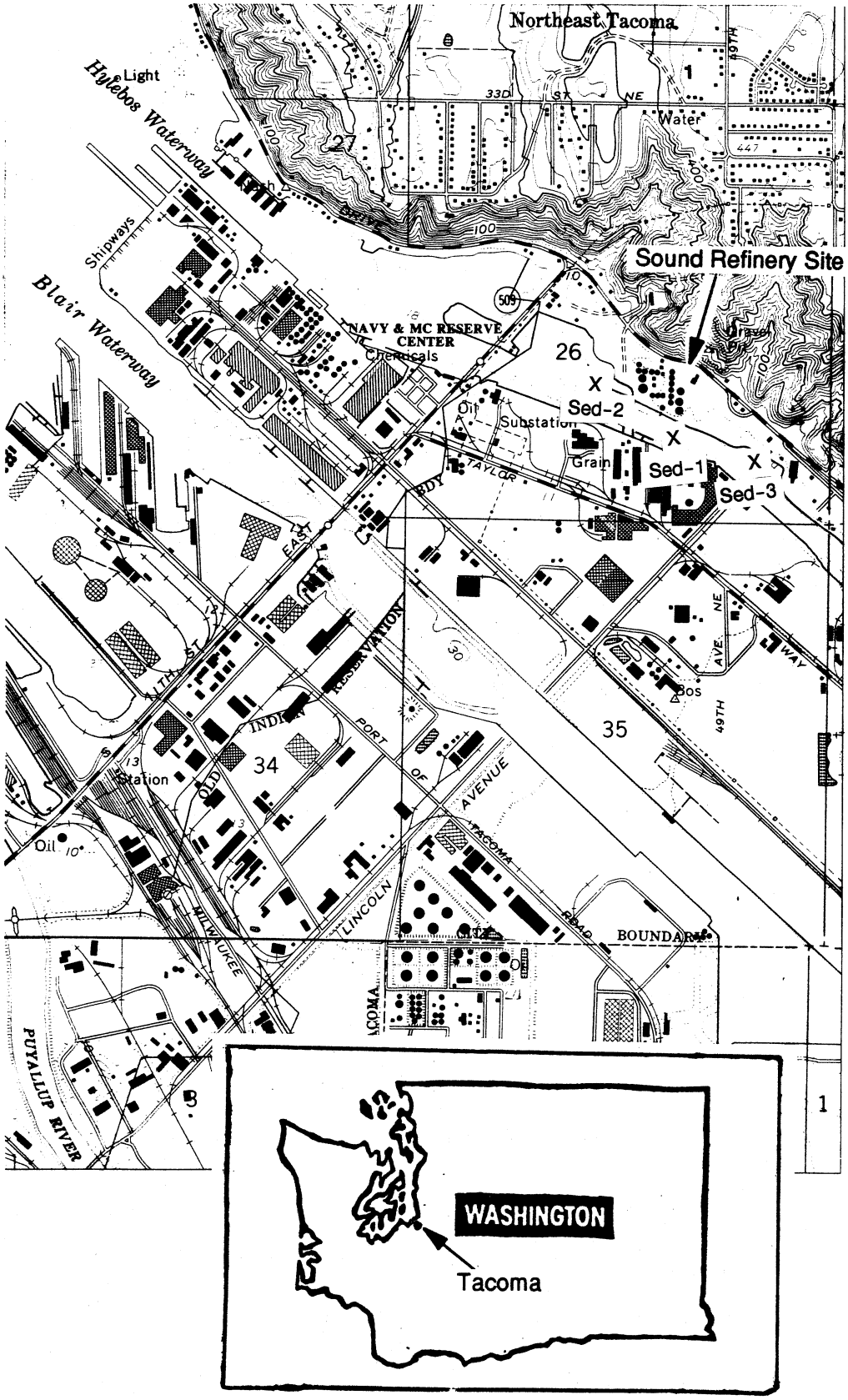

Figure 1 – Location Map – Sound Refining, July 1994

Sound Refining Co., Tacoma

Wastewater Treatment Plant

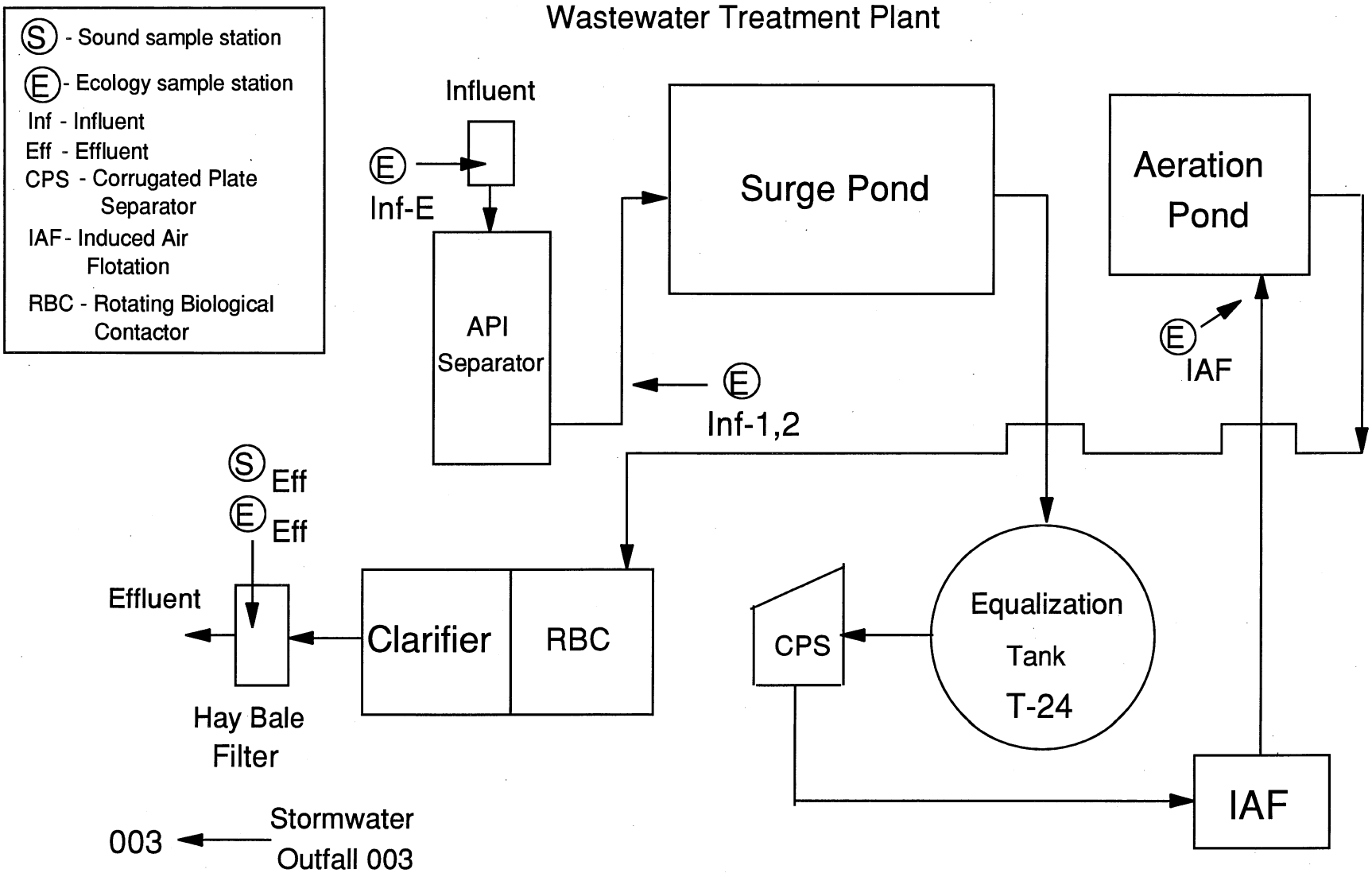

Figure 2 – Flow Schematic – Sound Refining, July 1994.

Figure based on schematic supplied by Sound Refining Company.

Table 1 - Sampling Station Descriptions - Sound Refining, 1994.

Influent (Inf-E)

Process water influent. Influent was sampled from the influent box just upstream of the API separator. Because the wastewater flow in the box was only approximately three inches in depth, the compositer strainer was placed on the bottom of the influent box on its side. Hanger wire was inserted through the stainless steel strainer to keep the strainer stationary.

Influent (Inf-1, Inf-2)

Grab influent samples were taken at the downstream end of the API in a well mixed area.

IAF

Effluent from the IAF. The IAF effluent was sampled from a pipe as the effluent entered the aeration pond. A stainless steel strainer was placed into the open end of the IAF effluent pipe.

Effluent (Eff-E, Eff-S)

Effluent from Outfall 001. Sound and Ecology's compositer intakes were located in the effluent box, in a well mixed location just upstream of the weir, downstream of the hay bale filter in the box. Effluent depth in the box was approximately 18 inches. The compositer strainers were within three inches of the wastewater surface.

Stormwater Outfall 003

Stormwater outfall 003 was the only stormwater outfall discharging at the time of the inspection. Sound reports that outfall 003 discharges continually as a result of groundwater flow. Grab-composite samples were collected by intercepting the discharge in air. The samples were collected with a beaker cleaned for priority pollutant sampling. The beaker was attached to a pole.

Sed-1 (47°16'33"N 122°23'05"W)

Sediment sample collected 25 feet downcurrent (northwest) from the end of the outfall pipe at a depth of 27 feet.

Sed-2 (47°16'35"N 122°23'10"W)

Sediment sample collected 100 yards downcurrent (northwest) at the end of the Sound pier at a depth of 23 feet.

Sed-3 (47°16'28"N 122°22'45W)

Background station. Sediment sample collected 1/4 mile upcurrent (southeast) of the Sound outfall pipe at a depth of 26 feet.

Table 2 – General Chemistry Results – Sound Refining, 1994.

Parameter	Location:	Inf-1	Inf-2	Inf-E	IAF-1	IAF-2	IAF-E	Eff-1	Eff-2	Eff-E	Eff-S	Eff-G	003-1	Eff-Dupe
	Type:	grab	grab	comp	grab	grab	comp	grab	grab	comp	comp	grab	grab-comp	comp
	Date:	7/20	7/20	7/20-21	7/20	7/20	7/20-21	7/20	7/20	7/20-21	7/20-21	7/20	7/20	7/20-21
	Time:	1015	1355**	30-0730	0955	1330	0730-0730	0900	1300**	0730-0730	0730-0730	0845	1050	0730-0730
	Lab Log #:	298105	298106	298107	298109	298110	298111	298112	298113	298114	298115	298116	298118	298120
GENERAL CHEMISTRY														
Conductivity (umhos/cm)		395	421	391	429	430	413	483	518	532	535	478	193	533
Alkalinity (mg/L CaCO3)				106			95.1			56.4	67.0	53.7		
Hardness (mg/L CaCO3)				31.8E			24.7			31.9	30.7E	29.3E		30.3E
Sulfide (mg/L)		33	26					2U	2U					
Grain Size (%)														
Gravel (>2.0 mm)														
Sand (2.0 – 0.063 mm)														
Silt (0.063-0.004 mm)														
Clay (<0.004 mm)														
TS (mg/L)				364			321			425	512			473
TNVS (mg/L)				275			241			303	195			246
TSS (mg/L)		51	23	71	8	5	13	22	38	42	36	20	1U	42
TNVSS (mg/L)				60			4			14	12			14
% Solids														
% Volatile Solids														
BOD5 (mg/L)				140			126			74*	59*			76*
COD (mg/L)				340			290	86	81	72	76		5U	91
TOC (water mg/L)		80.4	84.1	69.6	70.5	68.7	66.7	17.7	18.2	20.2	18.7			21.0
TOC (soil/sed mg/Kg)														
NH3-N (mg/L)				2.79			2.82			0.044	0.016			0.044
NO2+NO3-N (mg/L)				1.33			0.491			15.7	16.0			15.0
Total-P (mg/L)				0.333			0.336			0.864	0.932			0.779
Oil and Grease (mg/L)		62	24		15	11		3	3				1U	
F-Coliform MF (#/100mL)								10U	10U					
F-Coliform MPN (#/100mL)								2U	2U					
Cyanide total (ug/L)		0.005	0.007J					0.003	0.006					
Cyanide (wk & dis ug/L)		0.004	0.008J					0.002U	0.002U					
ORGANICS														
Phenolics Total(water-ug/L)				7330						10.0U	10.0U			10.0U
FIELD OBSERVATIONS														
Temperature (C)		36.8	37.4		35.4	36.3		22.4	24.2			22.1	18.2	
Temp-cooled (C)				8.8			7.9			7.4	14.0			
pH		7.3	7.0	7.6	8.2	7.8	8.4	7.3	7.6	8.7	7.6	7.7	6.8	
Conductivity (umhos/cm)		429	464	427	444	451	430	493	535	560	552	493	193	
Chlorine (mg/L)														
Sulfide (mg/L)		3	4					<0.1	<0.1					

Inf – influent
IAF – induced air flotation effluent
Eff – 001 effluent
Dupe – duplicate sample
003 – stormwater outfall 003
Sed – sediment sample
E – Ecology sample
S – Sound Refining sample

U – The analyte was not detected at or above the reported result.
J – estimated result
E – estimated result because of difficulty in reaching a titratable endpoint.
* – BOD tests showed a toxic response to the effluent

grab – grab sample
comp – composite sample
G – grab sample for bioassay testing

** – hexavalent chromium samples taken at 1614 on 7/12

Table 2 – (cont'd) – Sound Refining, 1994.

Parameter	Location:	Sed–1	Sed–2	Sed–3
	Type:	grab	grab	grab
	Date:	8/22	8/22	8/22
	Time:	1200	1225	1255
	Lab Log #:	348000	348001	348002
GENERAL CHEMISTRY				
Conductivity (umhos/cm)				
Alkalinity (mg/L CaCO3)				
Hardness (mg/L CaCO3)				
Sulfide (mg/L)				
Grain Size (%)				
Gravel (>2.0 mm)		0	4	1
Sand (2.0 – 0.063 mm)		25	36	25
Silt (0.063–0.004 mm)		50	39	50
Clay (<0.004 mm)		25	21	24
TS (mg/L)				
TNVS (mg/L)				
TSS (mg/L)				
TNVSS (mg/L)				
% Solids		44.3	42.8	38.5
% Volatile Solids		8.3	8.2	7.8
BOD5 (mg/L)				
COD (mg/L)				
TOC (water mg/L)				
TOC (soil/sed mg/Kg)		35,000	32,000	29,000
NH3–N (mg/L)				
NO2+NO3–N (mg/L)				
Total–P (mg/L)				
Oil and Grease (mg/L)				
F–Coliform MF (#/100mL)				
F–Coliform MPN (#/100mL)				
Cyanide total (ug/L)				
Cyanide (wk & dis ug/L)				
ORGANICS				
Phenolics Total(water–ug/L)				
FIELD OBSERVATIONS				
Temperature (C)				
Temp–cooled (C)				
pH				
Conductivity (umhos/cm)				
Chlorine (mg/L)				
Sulfide (mg/L)				

grab – grab sample

Sed–1 – Sediment sample collected 25 feet downcurrent (northwest) from the end of the outfall pipe at a depth of 27 feet.

Sed–2 – Sediment sample collected 100 yards downcurrent (northwest) at the end of the Sound pier at a depth of 23 feet.

Sed–3 – Background station. Sediment sample collected 1/4 mile upcurrent (southeast) of the Sound outfall pipe at a depth of 26 feet.

Table 3 – NPDES Permit Limits and Inspection Results – Sound Refining, 1994.

Outfall 001 Parameter	NPDES Limits (lbs/day)* Daily Avg.**	Daily Max.**	Ecology Inspection Results (lbs/day)
BOD5	26.8	50.5	30.1***
COD	136	265	29.2
TSS	22.7	35.0	17.1
Oil and Grease	8.2 10 mg/L ****	15.5	1.2 3 mg/L
Phenolic Compounds	0.065	0.261	<0.004
NH3-N	2.8	6.1	0.018
Sulfide	0.15	0.3	<0.8; <0.04@
Total Chromium	0.077	0.219	0.0028 (est.)
Hexavalent Chromium	0.006	0.01	0.0013 (est.)
pH (std. units)	6.0 to 9.0 @@		7.3-7.6

* for Tier One production of less than 5,000 bbls per day average for two consecutive months. Stormwater allocation for 3,710 gpd above 45,000 gpd dry weather flow has been added in. Total flow measured by Sound 48,710 gpd for the period 7/20-21 7:30 AM - 7:30 AM.

** Daily average is the average over a calendar month. Daily maximum is the highest recorded daily value for the same monthly period.

*** The BOD5 test showed a toxic response to the effluent.

**** at no time exceeding 15 mg/L

@ laboratory test result; field test result

@@ Excursions between 4.0 and 10.0 shall not be considered violations provided no single exursion exceeds 60 minutes in length and total excursions not exceed 7 hours and 26 minutes per month.

Table 4 – Split Sample Results Comparison – Sound Refining, 1994.

	Location:	Eff-1	Eff-2	Eff-E	Eff-S1	Eff-S
	Type:	grab	grab	comp	grab	comp
	Date:	7/20	7/20	7/20-21	7/20	7/20-21
	Time:	0900	1300	0730-0730	0730	0730-0730
	Lab Log #:	298112	298113	298114		298115
	Sampled by:	Ecology	Ecology	Ecology	Sound	Sound
Parameter:	Analysis by:					
COD (mg/L)						
	Ecology			72		76
	Sound			87.8		70.9
TSS (mg/L)						
	Ecology			42		36
	Sound			48.0		26.0
Oil and Grease (mg/L)						
	Ecology	3	3			
	Sound				1.1	
NH3-N (mg/L)						
	Ecology			0.044		0.016
	Sound			<0.1		<0.1
Phenolics Total (ug/L)						
	Ecology			<10.0		<10.0
	Sound			5.7		
pH						
	Ecology	7.3	7.6			
	Sound				7.55	

E - Ecology sample
S - Sound sample
Eff - effluent sample
grab - grab sample
comp - composite sample

Table 5 – VOA, BNA, Metals Detected in Influent and Effluent – Sound Refining, 1994.

	Location:	Inf-1	Inf-2	Eff-1	Eff-2	State Water Quality Criteria Summary	
	Type:	grab	grab	grab	grab		
	Date:	7/20	7/20	7/20	7/20		
	Time:	1015	1355@	0900	1300@	Acute Marine	Chronic Marine
	Lab Log#:	298105	298106	298112	298113		
(Group)[1]	VOA Compounds	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
	Acetone	1870 EJ	2400 EJ				
a	Chloroform	10.5 J	11.0 J			12,000 *(a)	6,400 *(a)
	Benzene	833	1510			5,100 *	700 *
c	1,1,1-Trichloroethane	163	225			31,200 *	
a	Chloromethane		8.4 J			12,000 *(a)	6,400 *(a)
	1,1-Dichloroethane	25.8	76.4				
	2-Butanone (MEK)	1680 E	2300 E	0.86 J	0.69 J		
	Trichloroethene					2,000 *	
n	Naphthalene	487	481	12.8 J	3.2 J	2,350 *	
	o-Xylene	661	720				
	1,2,4-Trimethylbenzene	634	688		0.97 J		
	Isopropylbenzene		60.5				
	p-Isopropyltoluene	18.6 J	18.7 J				
	Ethylbenzene	407	475	0.83 J	0.60 J	430 *	
	Propylbenzene	74.5	79.5				
	Butylbenzene	14.8 J	16.8 J				
	1,2-Dichloroethane		42.8			113,000 *	
	4-Methyl-2-Pentanone (MIBK)	87.6	83.0				
	1,3,5-Trimethylbenzene	162	178	0.40 J	0.28 J		
	Toluene	2760 E	3170 E	0.49 J	0.18 J	6,300 *	5,000 *
	Tetrachloroethene					10,200 *	450 *
	sec-Butylbenzene	19.0 J	21.0 J				
b	cis-1,2-Dichloroethene					224,000 *(b)	
b	trans-1,2-Dichloroethene					224,000 *(b)	
	2-Hexanone	156	172				
	Total Xylenes	2000	2210	1.8 J	1.4 J		
	m&p-Xylene	1340	1490	1.8 J	1.4 J		

Inf – influent
Eff – effluent

E – The concentration of the associated value exceeds the known calibration range.
J – The analyte was positively identified. The associated numerical value is an estimate.

Sed-1 – Sediment sample collected 25 feet downcurrent (northwest) from the end of the outfall pipe at a depth of 27 feet.
Sed-2 – Sediment sample collected 100 yards downcurrent (northwest) at the end of the Sound pier at a depth of 23 feet.
Sed-3 – Background station. Sediment sample collected 1/4 mile upcurrent (southeast) of the Sound outfall pipe at a depth of 26 feet.

Table 5 – (cont'd) – Sound Refining, 1994.

	Location:	Inf–E	Eff–E	Eff–Dupe	State Water Quality Criteria Summary	
	Type:	comp	comp	comp		
	Date:	7/20–21	7/20–21	7/20–21		
	Time:	0730–0730	0730–0730	0730–0730	Acute	Chronic
	Lab Log#:	298107	298114	298120	Marine	Marine
(Group)[1]	BNA Compounds	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
n	Benzo(a)Pyrene		(none detected)	(none detected)	300 *(n)	
n	Dibenzo(a,h)Anthracene				300 *(n)	
n	Benzo(a)Anthracene				300 *(n)	
	Isophorone	20.5			12,900 *	
n	Acenaphthene	6.2 J			970 *	710 *
n	Phenanthrene	21.4			300 *(n)	
i	Butylbenzyl Phthalate				2.944 *(i)	3.4 *(i)
n	Fluorene	10.2 J			300 *(n)	
	Carbazole	8.9 J				
n	Naphthalene	388			2,350 *	
	2–Methylnaphthalene	234				
	2–Methylphenol	1120				
	2,4–Dimethylphenol	684				
	4–Methylphenol	2800				
	Phenol	1180			5,800 *	
i	Bis(2–Ethylhexyl)Phthalate				2.944 *(i)	3.4 *(i)
i	Di–n–Octyl Phthalate				2.944 *(i)	3.4 *(i)
g	Hexachlorobenzene				160 *(g)	129 *(g)
n	Anthracene	1.6 J			300 *(n)	
n	Pyrene	5.1 J			300 *(n)	
	Dibenzofuran	4.9 J				
n	Benzo(g,h,i)Perylene				300 *(n)	
n	Indeno(1,2,3–cd)Pyrene				300 *(n)	
n	Benzo(b)Fluoranthene				300 *(n)	
n	Fluoranthene				40 *	16 *
n	Benzo(k)Fluoranthene				300 *(n)	
n	Acenaphthylene				300 *(n)	
n	Chrysene	3.5 J			300 *(n)	
	3B–Coprostanol					
	Retene					

Inf – influent
Eff – effluent
Dupe – duplicate

J – The analyte was positively identified. The associated numerical value is an estimate.

Sed–1 – Sediment sample collected 25 feet downcurrent (northwest) from the end of the outfall pipe at a depth of 27 feet.

Sed–2 – Sediment sample collected 100 yards downcurrent (northwest) at the end of the Sound pier at a depth of 23 feet.

Sed–3 – Background station. Sediment sample collected 1/4 mile upcurrent (southeast) of the Sound outfall pipe at a depth of 26 feet.

Table 5 – (cont'd) – Sound Refining, 1994.

Location:	Inf–2	Inf–E	Eff–2	Eff–E	Eff–Dupe	Eff–S	003–1	State Water Quality Criteria Summary	
Type:	grab	comp	grab	comp	comp	comp	grab		
Date:	7/20	7/20–21	7/20	7/20–21	7/20–21	7/20–21	7/20		
Time:	1355@	0730–0730	1300@	0730–0730	0730–0730	0730–0730	1050	Acute	Chronic
Lab Log#:	298106	298107	298113	298114	298120	298115	298118	Marine	Marine
Metals **	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
Arsenic		11.0		6.9	6.6	6.7			
Pentavalent								2,319 *	13 *
Trivalent								69	36
Beryllium									
Cadmium		0.12 P		0.70 P	0.46 P	0.52 P		37.2	8.0
Chromium									
Total recoverable				6.3 P	7.2 P	5.3 P			
Total	11 P		7 P						
Hexavalent (total)	REJ	REJ	4.2 P	3.3 P	6.4 P	5.4 P		1,100	50
Trivalent								10,300 *	
Copper		11 P		17 P	18 P	13 P	4.8 P	2.5	
Lead		3.2 P		1.9 P	2.4 P	2.0 P		151	5.8
Mercury (total)		3.42 N		1.89 N	1.91 N	1.26 N		2.1	0.025
Nickel								71	7.9
Selenium								300	71
Silver				1.0 P	0.90 P	0.62 P		1.2	
Zinc		47.1		79.9	89.8	61.5	4 P	85	77

[1]NOTE: SOME INDIVIDUAL COMPOUND CRITERIA OR LOELS MAY NOT AGREE WITH GROUP CRITERIA OR LOELS. REFER TO APPROPRIATE EPA DOCUMENT ON AMBIENT WATER QUALITY CRITERIA FOR FULL DISCUSSION.

U The analyte was not detected at or above the reported result.
UJ The analyte was not detected at or above the reported estimated result.
P The analyte was detected above the instrument detection limit but below the established minimum quantitation limit.
N The spike sample recovery is not within control limits.
REJ The data are unusable for all purposes.
@ hexavalent chromium sampled at 1415 on 7/20

* Insufficient data to develop criteria. Value presented is the LOEL – Lowest Observed Effect Level.

** Metals are total recoverable unless otherwise noted. Sediment metals are total.

[ ] – effluent exceeds acute or chronic water quality criteria

a Total Halomethanes
b Total Dichloroethenes
g Total Chlorinated Benzenes (excluding Dichlorobenzenes)
i Total Phthalate Esters
n Total Polynuclear Aromatic Hydrocarbons

Inf – influent sample
Eff – effluent sample
Dupe – duplicate sample
003 – stormwater outfall 003

Sed–1 – Sediment sample collected 25 feet downcurrent (northwest) from the end of the outfall pipe at a depth of 27 feet.
Sed–2 – Sediment sample collected 100 yards downcurrent (northwest) at the end of the Sound pier at a depth of 23 feet.
Sed–3 – Background station. Sediment sample collected 1/4 mile upcurrent (southeast) of the Sound outfall pipe at a depth of 26 feet.

Table 6 – Effluent Bioassay Results – Sound, 1994.

Daphnia magna - 48-hour survival test
(Daphnia magna)
Sample No. 298116

Sample Concentration	# Tested*	Percent Survival
0 % Effluent	20	100
6.25 % Effluent	20	100
12.5 % Effluent	20	95
25 % Effluent	20	90
50 % Effluent	20	80
100 % Effluent	20	60

NOEC = 100% effluent
LC50 > 100% effluent

* four replicates per concentration, five organisms per replicate

Bivalve Larvae - 48 hour survival and development test
Pacific oyster *(Crassostrea gigas)*
Sample No. 298116

Sample Conc.*	% Survival	% Abnormal
Brine Control	76.3	4.2
Seawater Control	80	-1.7
4.38 % Effluent	72	0.1
8.75 % Effluent	72	2.8
17.5 % Effluent	60	4.7
35 % Effluent	44.0	10.9
70 % Effluent	76	52.5

Chronic	Acute
NOEC = 17.5 % effluent	LC50 = a
EC50 = 66.6 % effluent	NOEC = 70 % effluent

* 3 replicates per test concentration, average initial count of 113 embryos per replicate.
a Not possible to estimate

Table 6 – (cont'd) – Sound Refining, 1994.

Fathead Minnow larval - 7 day survival and reproduction test
(Pimephales promelas)
Sample No. 298116

Sample Conc.	# Tested*	Survival	Weight (mg)
Control	40	92.5	0.511
6.25 % Effluent	40	82.5	0.478
12.5 % Effluent	40	92.5	0.463
25 % Effluent	40	87.5	0.475
50 % Effluent	40	87.5	0.389
100 % Effluent	40	70.0	0.416

NOEC for Weight = 25 % effluent
NOEC for Survival = 50 % effluent
LC50 > 100 % effluent

* four replicates per concentration, ten organisms per replicate

Rainbow Trout - 96 hour survival test
(Oncorhynchus mykiss)
Sample No. 298116

Sample Conc.	Number Tested*	Percent Survival
Control	30	100
100 % Effluent	30	100

NOEC for Survival = 100 % effluent
LC50 > 100 % effluent

* three replicates per concentration, ten organisms per replicate

NOEC - no observable effects concentration
LOEC - lowest observable effects concentration
LC50 - lethal concentration for 50% of the organisms
EC50 - effect concentration for 50% of the organisms

Table 7 – Sediment VOA, BNA, and Metals Detected – Sound Refining, 1994.

	Dry Weight Basis			Organics Data Normalized to TOC			Marine Sediment Quality Standards	
Location:	Sed-1	Sed-2	Sed-3	Sed-1	Sed-2	Sed-3	Chemical Criteria	Max. Chemical Criteria
Type:	grab	grab	grab	grab	grab	grab	TOC	TOC
Date:	8/22	8/22	8/22	8/22	8/22	8/22	Basis	Basis
Time:	1200	1225	1255	1200	1225	1255		
Lab Log#:	348000	348001	308132	348000	348001	308132		
	ug/Kg-dry	ug/Kg-dry	ug/Kg-dry	mg/Kg-dry	mg/Kg-dry	mg/Kg-dry	mg/Kg	mg/Kg
VOA Compounds								
Benzene			0.76 J					
2-Butanone (MEK)	27.2 J	22.7 J						
Trichloroethene			0.47 J					
p-Isopropyltoluene		13.0						
Isopropylbenzene			0.29 J					
Ethylbenzene			0.36 J					
4-Methyl-2-Pentanone (MIBK)		1.2 J						
Toluene			0.76 J					
Tetrachloroethene	0.41 J	0.50 J	0.37 J					
sec-Butylbenzene			0.28 J					
cis-1,2-Dichloroethene	1.5 J	1.2 J	0.54 J					
trans-1,2-Dichloroethene	0.20 J							
2-Hexanone	0.88 J	7.3	0.78 J					
BNA Compounds								
Benzo(a)Pyrene	708	565		20.2	17.7		99	210
Dibenzo(a,h)Anthracene	150 J	102 J	80.6 J	4.29 J	3.19 J	2.78 J	12	33
Benzo(a)Anthracene	737	675	370	21.1	21.1	12.8	110	270
Acenaphthene	109 J	148	50.1 J	3.11 J	4.62	1.73 J	16	57
Phenanthrene	736	965	302	21.0	30.2	10.4	100	480
Butylbenzyl Phthalate	166			4.74			4.9	64
Fluorene	130 J	176	60.1 J	3.71 J	5.50	2.07 J	23	79
Naphthalene	218	206	111 J	6.23	6.44	3.83 J	99	170
2-Methylnaphthalene	110 J	98.8 J	60.5 J	3.14 J	3.09 J	2.09 J	38	64
4-Methylphenol	90.1 J	58.0 J	85.2 J	2.57 J	1.81 J	2.94 J	670	670
Bis(2-Ethylhexyl)Phthalate	2710			77.4			47	78
Di-n-Octyl Phthalate	144 J			4.11 J			58	4500
Hexachlorobenzene		116 J			3.63 J *		0.38	2.3
Anthracene	435	377	182	12.4	11.8	6.28	220	1200
Pyrene	1940	2150	916	55.4	67.2	31.6	1000	1400
Dibenzofuran	118 J	138	68.9 J	3.37 J	4.31	2.38 J	15	58
Benzo(g,h,i)Perylene	459 J	364	356	13.1 J	11.4	12.3	31	78
Indeno(1,2,3-cd)Pyrene	476	386	340	13.6	12.1	11.7	34	88
Benzo(b)Fluoranthene	1570	1290	979	44.9	40.3	33.8		
Fluoranthene	1700	2230	800	48.6	69.7	27.6	160	1200
Benzo(k)Fluoranthene	484	440	345	13.8	13.8	11.9		
Acenaphthylene	132 J	108 J	54.3 J	3.77 J	3.38 J	1.87 J	66	66
Chrysene	1580	1410	815	45.1	44.1	28.1	110	460
3B-Coprostanol	2340 J	2280 J	2450 J	66.9 J	71.3 J	84.5 J		
Retene	406	300	220	11.6	9.38	7.59		

[ ] – criterion exceeded [ ] * – maximum criterion exceeded

Table 7 – (cont'd) – Sound Refining, 1994.

Location:	Sed–1		Sed–2		Sed–3		Marine Sediment Quality Standards Chemical Criteria Dry wt. Basis	Max. Chemical Criteria Dry wt. Basis
Type:	grab		grab		grab			
Date:	8/22		8/22		8/22			
Time:	1200		1225		1255			
Lab Log#:	348000		348001		308132			
	mg/Kg–dry		mg/Kg–dry		mg/Kg–dry		mg/Kg	mg/Kg
Metals **								
Arsenic	30.4		29.9		20.5		57	93
Beryllium	0.25	P	0.24	P	0.21	P		
Cadmium	0.4	P	0.472	N	0.541	N	5.1	6.7
Chromium	26.2		21.1		25.6		260	270
Copper	127		113		119		390	390
Lead	62.5	N	58.4	N	67.3	N	450	530
Mercury	0.144		0.102		0.144		0.41	0.59
Nickel	19.2		15.2		20.8			
Selenium	0.47	P	0.42P		0.57	P		
Zinc	121	N	116	N	138	N	410	960

** Sediment metals are total metals.

J The analyte was positively identified. The associated numerical result is an estimate.
P The analyte was detected above the instrument detection limit but below the established minimum quantitation limit.
N The spike sample recovery is not within control limits.

☐ – criterion exceeded

Sed–1 – Sediment sample collected 25 feet downcurrent (northwest) from the end of the outfall pipe at a depth of 27 feet.

Sed–2 – Sediment sample collected 100 yards downcurrent (northwest) at the end of the Sound pier at a depth of 23 feet.

Sed–3 – Background station. Sediment sample collected 1/4 mile upcurrent (southeast) of the Sound outfall pipe at a depth of 26 feet.

Table 8 – Sediment Bioassay Results – Sound Refining, 1994.

Echinoderm Embryo Test
(Dendraster excentricus)

Sample	Sample No.	% abnormal	% abnormal/ dead*	Percent mortality
Seawater Control		12.9	24.1	0.0
West Beach Control		22.6	46.1	21.8
Sed-1	348000	28.7	58.6	33.8
Sed-2	348001	17.0	61.2	46.2
Sed-3	348002	20.2	63.2	47.0

* based on an average initial count of 213 embryos per 10 ml subsample.

Marine Amphipod Sediment Test
(Rhepoxinius abronius)

Sample	Sample No.	Sediment emergence events (No./test chamber)	10-Day mortality (No./test chamber)	Mortality	Failure to rebury (No./test chamb
West Beach Control		1.2	0.4	98%	0.0
Sed-1	348000	1.4	3.8	81%	0.2
Sed-2	348001	2.2	4.4	78%	0.6
Sed-3	348002	3.0	6.2	69%	0.2

5 replicates (test chambers) of 20 organisms each per replicate.

Sed-1 - Sediment sample collected approximately 25' downcurrent (northwest) of the outfall.
Sed-2 - Sediment sample collected approximately 100 yards downcurrent (northwest) of the outfall.
Sed-3 - Sediment sample collected approximately 1/4 mile upcurrent (southeast) of the outfall.

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Appendices

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Appendix A - Sampling Procedures - Sound Refining, 1994.

All Ecology Isco samplers were set up to collect equal volumes of sample every 30 minutes for 24 hours. All samplers were set to collect sample from 7:30 AM to 7:30 AM to coincide with the refinery sampler collection time. All composite samplers were iced to keep samples cool. Sampler configurations and locations are summarized in Figure 2 and Table 1.

The Sound final effluent sampler was set up to collect equal volumes of sample with one sample per 10 gallons of flow. The sampler operated from 7:30 AM to 7:30 AM.

Ecology employed a 0.1 m^2 van Veen grab sampler to collect sediments at three stations: one at a background site approximately 1/4 mile upcurrent (southeast) of the Sound outfall pipe at a depth of 26 feet; one 100 yards downcurrent (northwest) at the end of the Sound pier at a depth of 23 feet; and one 25 feet downcurrent (northwest) from the end of the outfall pipe at a depth of 27 feet.

At each sediment station, the top two centimeters of sample from successive grab samples were collected. A VOA bottle was filled from one grab, while the remainder of the sample was placed in a three gallon stainless steel bucket, homogenized and put in appropriate containers for analysis.

Appendix B – Sampling Schedule – Sound Refining, 1994.

Parameter	Location:	Inf–1	Inf–2	Inf–E	IAF–1	IAF–2	IAF–E	Eff–1	Eff–2	Eff–E	Eff–S	Eff–G	003–1	Eff–Dupe
	Type:	grab	grab	comp	grab	grab	comp	grab	grab	comp	comp	grab	grab–comp	comp
	Date:	7/20	7/20	7/20–21	7/20	7/20	7/20–21	7/20	7/20	7/20–21	7/20–21	7/20	7/20	7/20–21
	Time:	1015	1355**	30–0730	0955	1330	0730–0730	0900	1300**	0730–0730	0730–0730	0845	1050	0730–0730
	Lab Log #:	298105	298106	298107	298109	298110	298111	298112	298113	298114	298115	298116	298118	298120
GENERAL CHEMISTRY														
Conductivity (umhos/cm)		E	E	E	E	E	E	E	E	E	E	E	E	E
Alkalinity (mg/L CaCO3)				E			E			E	E	E		
Hardness (mg/L CaCO3)				E			E			E	E	E		E
Sulfide (mg/L)		E	E					E	E					
Grain Size (%)														
Gravel (>2.0 mm)														
Sand (2.0 – 0.063 mm)														
Silt (0.063–0.004 mm)														
Clay (<0.004 mm)														
TS (mg/L)				E			E			E	E			E
TNVS (mg/L)				E			E			E	E			E
TSS (mg/L)		E	E	E	E	E	E	E	E	ES	ES	E	E	E
TNVSS (mg/L)				E			E			E	E			E
% Solids														
% Volatile Solids														
BOD5 (mg/L)				E			E			E	E			E
COD (mg/L)				E			E	E	E	ES	ES		E	E
TOC (water mg/L)		E	E	E	E	E	E	E	E	E	E			E
TOC (soil/sed mg/Kg)														
NH3–N (mg/L)				E			E			ES	ES			E
NO2+NO3–N (mg/L)				E			E			E	E			E
Total–P (mg/L)				E			E			E	E			E
Oil and Grease (mg/L)		E	E		E	E		ES*	E				E	
F–Coliform MF (#/100mL)								E	E					
F–Coliform MPN (#/100mL)								E	E					
Cyanide total (ug/L)		E	E					E	E					
Cyanide (wk & dis ug/L)		E	E					E	E					
ORGANICS														
Phenolics Total(water–ug/L)				E						ES	E			E
FIELD OBSERVATIONS														
Temperature (C)		E	E		E	E		E	E			E	E	
Temp–cooled (C)*+				E			E			E	E			
pH		E	E	E	E	E	E	E	E	E	E	E	E	
Conductivity (umhos/cm)		E	E	E	E	E	E	E	E	E	E	E	E	
Chlorine (mg/L)														
Sulfide (mg/L)		E	E					E	E					

Inf – influent
IAF – induced air flotation effluent
Eff – 001 effluent
Dupe – duplicate sample
003 – stormwater outfall 003

E – Ecology analysis
S – Sound analysis
* – Sound grab sample taken 0730 on 7/20
** – hexavalent chromium samples taken at 1615 on 7/12

grab – grab sample
comp – composite sample
G – grab sample for bioassay testing

Appendix B – (cont'd) – Sound Refining, 1994.

Parameter	Location:	Sed–1	Sed–2	Sed–3
	Type:	grab	grab	grab
	Date:	8/22	8/22	8/22
	Time:	1200	1225	1255
	Lab Log #:	348000	348001	348002
GENERAL CHEMISTRY				
Conductivity (umhos/cm)				
Alkalinity (mg/L CaCO3)				
Hardness (mg/L CaCO3)				
Sulfide (mg/L)				
Grain Size (%)				
Gravel (>2.0 mm)		E	E	E
Sand (2.0 – 0.063 mm)		E	E	E
Silt (0.063–0.004 mm)		E	E	E
Clay (<0.004 mm)		E	E	E
TS (mg/L)				
TNVS (mg/L)				
TSS (mg/L)				
TNVSS (mg/L)				
% Solids		E	E	E
% Volatile Solids		E	E	E
BOD5 (mg/L)				
COD (mg/L)				
TOC (water mg/L)				
TOC (soil/sed mg/Kg)		E	E	E
NH3–N (mg/L)				
NO2+NO3–N (mg/L)				
Total–P (mg/L)				
Oil and Grease (mg/L)				
F–Coliform MF (#/100mL)				
F–Coliform MPN (#/100mL)				
Cyanide total (ug/L)				
Cyanide (wk & dis ug/L)				
ORGANICS				
Phenolics Total(water–ug/L)				
FIELD OBSERVATIONS				
Temperature (C)				
Temp–cooled (C)*+				
pH				
Conductivity (umhos/cm)				
Chlorine (mg/L)				
Sulfide (mg/L)				

Sed–1 – Sediment sample collected 25 feet downcurrent (northwest) from the end of the outfall pipe at a depth of 27 feet.

Sed–2 – Sediment sample collected 100 yards downcurrent (northwest) at the end of the Sound pier at a depth of 23 feet.

Sed–3 – Background station. Sediment sample collected 1/4 mile upcurrent (southeast) of the Sound outfall pipe at a depth of 26 feet.

grab – grab sample

Appendix C – Ecology Analytical Methods – Sound Refining, 1994.

Laboratory Analysis	Method Used for Ecology Analysis	Laboratory Performing Analysis
Conductivity	EPA, Revised 1983: 120.1	Ecology Manchester Laboratory
Alkalinity	EPA, Revised 1983: 310.1	Ecology Manchester Laboratory
Hardness	EPA, Revised 1983: 130.2	Ecology Manchester Laboratory
Sulfide	EPA, Revised 1983: 410.1; 376.1	Sound Analytical Services
Grain Size	Tetra Tech, 1986:TC-3991-04	Soil Technology
TS	EPA, Revised 1983: 160.3	Ecology Manchester Laboratory
TNVS	EPA, Revised 1983: 106.3	Ecology Manchester Laboratory
TSS	EPA, Revised 1983: 160.2	Ecology Manchester Laboratory
TNVSS	EPA, Revised 1983: 106.2	Ecology Manchester Laboratory
% Solids	APHA, 1989: 2540G.	Ecology Manchester Laboratory
% Volatile Solids	EPA, Revised 1983: 160.4	Ecology Manchester Laboratory
BOD5	EPA, Revised 1983: 405.1	Ecology Manchester Laboratory
COD	EPA, Revised 1983: 410.1	Sound Analytical Services
TOC (water)	EPA, Revised 1983: 415.1	Ecology Manchester Laboratory
TOC (soil/sed)	EPA, Revised 1983: 415.1	Sound Analytical Services
NH3-N	EPA, Revised 1983: 350.1	Ecology Manchester Laboratory
NO2+NO3-N	EPA, Revised 1983: 353.2	Ecology Manchester Laboratory
Total-P	EPA, Revised 1983: 365.3	Ecology Manchester Laboratory
Oil and Grease (water)	EPA, Revised 1983: 413.1	Ecology Manchester Laboratory
F-Coliform MF	APHA, 1989: 9222D.	Ecology Manchester Laboratory
F-Coliform MPN	APHA, 1989: 9221C.	Ecology Manchester Laboratory
Cyanide (total)	EPA, Revised 1983: 335.2	Ecology Manchester Laboratory
Cyanide (wk & dis)	APHA, 1989: 4500-CNI.	Ecology Manchester Laboratory
VOC (water) - Extensive TICs	EPA, 1986: 8260	Ecology Manchester Laboratory
VOC (soil/sed) - Extensive TICs	EPA, 1986: 8240	Ecology Manchester Laboratory
BNAs (water) - Extensive TICs	EPA, 1986: 8270	Ecology Manchester Laboratory
BNAs (soil/sed) - Extensive TICs	EPA, 1986: 8270	Ecology Manchester Laboratory
Phenolics Total(water)	EPA, Revised 1983: 420.2	Ecology Manchester Laboratory
PP Metals (water)	EPA, Revised 1983: 200-299	Ecology Manchester Laboratory
PP Metals (soil/sed)	EPA, Revised 1983: 200-299	Ecology Manchester Laboratory
Total chromium	EPA, Revised 1983: 218.3	Ecology Manchester Laboratory
Hexavalent chromium	EPA, Revised 1983: 218.5	Ecology Manchester Laboratory
Salmonid DOE 80-12 (One Conc.)	Ecology, 1981.	Parametrix
Bivalve Larvae (chronic)	ASTM E724-1989	Parametrix
Fathead Minnow (chronic)	EPA, 1989:1000.0	Parametrix
Echinoderm Embryo	EPA, 1991.	Northwestern Aquatic Sciences
Rhepoxinius (solid acute)	ASTM, 1990: E1367	Northwestern Aquatic Sciences

METHOD BIBLIOGRAPHY

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Appendix D - Quality Assurance/Quality Control (QA/QC) - Sound Refining, 1994.

SAMPLING QA/QC

Ecology quality assurance procedures for sampling included priority pollutant cleaning of the sampling equipment prior to the inspection to prevent sample contamination (Appendix E). Chain-of-custody procedures were followed to assure the security of the samples (Ecology, 1994).

LABORATORY QA/QC

General Chemistry Analysis

COD and Sulfide analyses were performed within holding times. While the TOC sample was not frozen, the holding time for frozen samples is 6 months. The procedural blanks showed that the processes were free from contamination. All check standards are reasonable, acceptable, and within QC limits. Duplicate analyses were within QC limits. All matrix spike recoveries and precision data were reasonable, acceptable, and within QC limits.

VOA, BNA, and Pesticide/PCB Priority Pollutant Organics Analysis

Wastewater and sediment samples were analyzed within the recommended holding times. Low levels of the common laboratory solvents acetone and methylene chloride were detected in the wastewater and sediment laboratory blanks. The EPA five times rule was applied to all target compounds which were found in the blanks. Surrogate recoveries were within acceptable limits for all samples. All water matrix spikes were within acceptable QC limits for both percent recovery and RPD for all compounds except acetone, carbon disulfide and naphthalene. Results for these compounds in sample 298112 were given the "J" qualifier. Soil matrix spikes were within acceptable QC limits for both percent recovery and Relative Percent Differences (RPD).

Metals Analysis

Wastewater and sediment samples were analyzed within the recommended holding times with the exception of hexavalent chromium which exceeded the 24 hour holding time by 3 hours. Calibrations were acceptable. Procedural blanks showed no significant levels of analytes. All spike recoveries for wastewater were within acceptance limits except mercury and hexavalent chromium for sample 298107. All spike recoveries for sediment were within acceptance limits except antimony, cadmium, lead, thallium, and zinc. Cd, Pb, Tl and Zn results are qualified with "N" for unacceptable spike recoveries. The antimony results are qualified with "J" as estimates due to other QA deficiencies. Laboratory control sample analyses were within the windows established for each parameter with the exception of the sediment antimony results.

Two of the samples for hexavalent chromium, 298106 (Inf-2) and 298107 (Inf-E), were nearly opaque. This presented severe interferences and hex chrome was not determined for

these samples.

LABORATORY AUDIT

The Sound Refining laboratory was accredited on July 1, 1992. An onsite audit will be conducted during the summer of 1995. The accreditation expires on March 31, 1996.

Appendix E - Priority Pollutant Cleaning Procedures - Sound Refining, 1994.

PRIORITY POLLUTANT SAMPLING EQUIPMENT CLEANING PROCEDURES

1. Wash with laboratory detergent
2. Rinse several times with tap water
3. Rinse with 10% HNO3 solution
4. Rinse three (3) times with distilled/deionized water
5. Rinse with high purity methylene chloride
6. Rinse with high purity acetone
7. Allow to dry and seal with aluminum foil

Appendix F – VOA, BNA, and Metals Scan Results – Sound Refining, 1994.

Location:	Inf–1	Inf–2	Inf–E	Eff–1	Eff–2	Eff–E	Eff–Dupe	Eff–S	003–1
Type:	grab	grab	comp	grab	grab	comp	comp	comp	grab
Date:	7/20	7/20	7/20–21	7/20	7/20	7/20–21	7/20–21	7/20–21	7/20
Time:	1015	1355@	0730–0730	0900	1300@	0730–0730	0730–0730	0730–0730	1050
Lab Log#:	298105	298106	298107	298112	298113	298114	298120	298115	298118
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
VOA Compounds									
Carbon Tetrachloride	25.0 U	25.0 U		1.0 U	1.0 U				
Acetone	1870 EJ	2400 EJ		2.2 UJ	2.1 UJ				
Chloroform	10.5 J	11.0 J		1.0 U	1.0 U				
Benzene	833	1510		1.0 UJ	1.0 UJ				
1,1,1–Trichloroethane	163	225		1.0 U	1.0 U				
Bromomethane	25.0 UJ	25.0 UJ		2.0 U	2.0 U				
Chloromethane	25.0 UJ	8.4 J		1.0 U	1.0 U				
Dibromomethane	25.0 U	25.0 U		1.0 U	1.0 U				
Bromochloromethane	25.0 U	25.0 U		1.0 U	1.0 U				
Chloroethane	25.0 U	25.0 U		2.0 U	2.0 U				
Vinyl Chloride	25.0 UJ	25.0 UJ		1.0 U	1.0 U				
Methylene Chloride	25.0 UJ	125 U		2.0 U	2.0 U				
Carbon Disulfide	25.0 U	25.0 U		4.0 UJ	3.6 UJ				
Bromoform	25.0 U	25.0 U		1.0 U	1.0 U				
Bromodichloromethane	25.0 U	25.0 U		1.0 U	1.0 U				
1,1–Dichloroethane	25.8	76.4		1.0 U	1.0 U				
1,1–Dichloroethene	25.0 U	25.0 U		1.0 U	1.0 U				
Trichlorofluoromethane	25.0 U	25.0 U		1.0 U	1.0 U				
Dichlorodifluoromethane	25.0 U	25.0 U		1.0 U	1.0 U				
1,2–Dichloropropane	25.0 U	25.0 U		1.0 U	1.0 U				
2–Butanone (MEK)	1680 E	2300 E		0.86 J	0.69 J				
1,1,2–Trichloroethane	25.0 U	25.0 U		1.0 U	1.0 U				
Trichloroethene	25.0 U	25.0 U		1.0 U	1.0 U				
1,1,2,2–Tetrachloroethane	25.0 U	25.0 U		1.0 U	1.0 U				
1,2,3–Trichlorobenzene	25.0 U	25.0 U		1.0 U	1.0 U				
Hexachlorobutadiene	25.0 U	25.0 U		1.0 U	1.0 U				
Naphthalene	487	481		12.8 J	3.2 J				
o–Xylene	661	720		1.0 U	1.0 U				
2–Chlorotoluene	25.0 U	25.0 U		1.0 U	1.0 U				
1,2–Dichlorobenzene	25.0 U	25.0 U		1.0 U	1.0 U				
1,2,4–Trimethylbenzene	634	688		1.0 U	0.97 J				
1,2–Dibromo–3–Chloropropane (DBCP)	25.0 U	25.0 U		1.0 U	1.0 U				
1,2,3–Trichloropropane	25.0 U	25.0 U		1.0 U	1.0 U				

Inf – influent sample
Eff – effluent sample
003 – outfall 003 sample
Dupe – duplicate sample
E – Ecology sample
S – Sound Refining sample

– detected analyte

Appendix F – (cont'd) – Sound Refining, 1994.

Location:	Inf-1	Inf-2	Inf-E	Eff-1	Eff-2	Eff-E	Eff-Dupe	Eff-S	003-1
Type:	grab	grab	comp	grab	grab	comp	comp	comp	grab
Date:	7/20	7/20	7/20-21	7/20	7/20	7/20-21	7/20-21	7/20-21	7/20
Time:	1015	1355@	0730-0730	0900	1300@	0730-0730	0730-0730	0730-0730	1050
Lab Log#:	298105	298106	298107	298112	298113	298114	298120	298115	298118
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
VOA Compounds (cont'd)									
tert-Butylbenzene	25.0 U	25.0 U		1.0 U	1.0 U				
Isopropylbenzene	52.2 U	60.5		1.0 U	1.0 U				
p-Isopropyltoluene	18.6 J	18.7 J		1.0 U	1.0 U				
Ethylbenzene	407	475		0.83 J	0.60 J				
Styrene (Ethenylbenzene)	25.0 U	25.0 U		1.0 U	1.0 U				
Propylbenzene	74.5	79.5		1.0 U	1.0 U				
Butylbenzene	14.8 J	16.8 J		1.0 U	1.0 U				
4-Chlorotoluene	25.0 U	25.0 U		1.0 U	1.0 U				
1,4-Dichlorobenzene	25.0 U	25.0 U		1.0 U	1.0 U				
1,2-Dibromoethane (EDB)	25.0 U	25.0 U		1.0 U	1.0 U				
1,2-Dichloroethane	25.0 U	42.8		1.0 U	1.0 U				
4-Methyl-2-Pentanone (MIBK)	87.6	83.0		1.0 U	1.0 U				
1,3,5-Trimethylbenzene	162	176		0.40 J	0.28 J				
Bromobenzene	25.0 U	25.0 U		1.0 U	1.0 U				
Toluene	2760 E	3170 E		0.49 J	0.18 J				
Chlorobenzene	25.0 U	25.0 U		1.0 U	1.0 U				
1,2,4-Trichlorobenzene	25.0 U	25.0 U		1.0 U	1.0 U				
Dibromochloromethane	25.0 U	25.0 U		1.0 U	1.0 U				
Tetrachloroethene	25.0 U	25.0 U		1.0 U	1.0 U				
sec-Butylbenzene	19.0 J	21.0 J		1.0 U	1.0 U				
1,3-Dichloropropane	25.0 U	25.0 U		1.0 U	1.0 U				
cis-1,2-Dichloroethene	25.0 U	25.0 U		1.0 U	1.0 U				
trans-1,2-Dichloroethene	25.0 U	25.0 U		1.0 U	1.0 U				
1,3-Dichlorobenzene	25.0 U	25.0 U		1.0 U	1.0 U				
1,1-Dichloropropene	25.0 U	25.0 U		1.0 U	1.0 U				
2-Hexanone	156	172		1.0 UJ	1.0 UJ				
2,2-Dichloropropane	25.0 U	25.0 U		1.0 U	1.0 U				
1,1,1,2-Tetrachloroethane	25.0 U	25.0 U		1.0 U	1.0 U				
Total Xylenes	2000	2210		1.8 J	1.4 J				
m&p-Xylene	1340	1490		1.8 J	1.4 J				
cis-1,3-Dichloropropene	13.2 U	13.2 U		0.53 U	0.53 U				
trans-1,3-Dichloropropene	11.8 U	11.8 U		0.47 U	0.47 U				

Inf – influent sample
Eff – effluent sample
003 – outfall 003 sample
Dupe – duplicate sample
E – Ecology sample
S – Sound Refining sample

□ – detected analyte

Appendix F – (cont'd) – Sound Refining, 1994.

Location:	Inf–1	Inf–2	Inf–E	Eff–1	Eff–2	Eff–E	Eff–Dupe	Eff–S	003–1
Type:	grab	grab	comp	grab	grab	comp	comp	comp	grab
Date:	7/20	7/20	7/20–21	7/20	7/20	7/20–21	7/20–21	7/20–21	7/20
Time:	1015	1355@	0730–0730	0900	1300@	0730–0730	0730–0730	0730–0730	1050
Lab Log#:	298105	298106	298107	298112	298113	298114	298120	298115	298118
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
BNA Compounds									
Benzo(a)Pyrene			13.1 U			0.82 U	1.4 U		
2,4–Dinitrophenol			524 UJ			32.6 UJ	54.2 UJ		
Dibenzo(a,h)Anthracene			13.1 U			0.82 U	1.4 U		
Benzo(a)Anthracene			13.1 U			0.82 U	1.4 U		
4–Chloro–3–Methylphenol			13.1 U			0.82 U	1.4 U		
Aniline			13.1 U			0.82 U	1.4 U		
Dimethylnitrosamine			65.6 U			4.1 U	6.8 U		
Benzoic Acid			524 U			32.6 UJ	54.2 U		
Hexachloroethane			13.1 U			0.82 UJ	1.4 U		
Hexachlorocyclopentadiene			131 UJ			8.2 UJ	13.6 UJ		
Isophorone			20.5			0.82 U	1.4 U		
Acenaphthene			6.2 J			0.82 U	1.4 U		
Diethyl Phthalate			13.1 U			0.82 U	1.4 U		
Di–n–Butyl Phthalate			13.1 U			0.82 U	1.4 UJ		
Phenanthrene			21.4			0.82 U	1.4 U		
Butylbenzyl Phthalate			13.1 U			0.82 U	1.4 U		
N–Nitrosodiphenylamine			13.1 U			0.82 U	1.4 U		
Fluorene			10.2 J			0.82 U	1.4 U		
Carbazole			8.9 J			0.82 U	1.4 U		
Hexachlorobutadiene			13.1 U			0.82 UJ	1.4 U		
Pentachlorophenol			131 U			8.2 U	13.6 U		
2,4,6–Trichlorophenol			13.1 U			0.82 U	1.4 U		
2–Nitroaniline			65.6 U			4.1 UJ	6.8 U		
2–Nitrophenol			13.1 UJ			0.82 U	1.4 UJ		
Naphthalene			388			0.82 U	1.4 U		
2–Methylnaphthalene			234			0.82 U	1.4 U		
2–Chloronaphthalene			13.1 U			0.82 U	1.4 U		
3,3'–Dichlorobenzidine			26.2 U			1.6 U	2.7 U		
Benzidine			131 U			8.2 U	13.6 U		
2–Methylphenol			1120			0.82 U	1.4 U		
1,2–Dichlorobenzene			13.1 U			0.82 UJ	1.4 U		
o–Chlorophenol			13.1 U			0.82 U	1.4 U		
2,4,5–Trichlorophenol			13.1 U			0.82 U	1.4 U		
Nitrobenzene			13.1 U			0.82 U	1.4 U		
3–Nitroaniline			26.2 U			1.6 U	2.7 U		
4–Nitroaniline			65.6 U			4.1 UJ	6.8 U		
4–Nitrophenol			65.6 U			4.1 U	6.8 U		
Benzyl Alcohol			13.1 U			0.82 U	1.4 U		
4–Bromophenyl Phenylether			13.1 U			0.82 U	1.4 U		
2,4–Dimethylphenol			684			0.82 U	1.4 U		
4–Methylphenol			2800			0.82 U	1.4 U		

Inf – influent sample
Eff – effluent sample
003 – outfall 003 sample
Dupe – duplicate sample

E – Ecology sample
S – Sound Refining sample

– detected analyte

Appendix F – (cont'd) – Sound Refining, 1994.

Location:	Inf–1	Inf–2	Inf–E	Eff–1	Eff–2	Eff–E	Eff–Dupe	Eff–S	003–1
Type:	grab	grab	comp	grab	grab	comp	comp	comp	grab
Date:	7/20	7/20	7/20–21	7/20	7/20	7/20–21	7/20–21	7/20–21	7/20
Time:	1015	1355@	0730–0730	0900	1300@	0730–0730	0730–0730	0730–0730	1050
Lab Log#:	298105	298106	298107	298112	298113	298114	298120	298115	298118
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
BNA Compounds (cont'd)									
1,4–Dichlorobenzene			13.1 U			0.82 UJ	1.4 U		
4–Chloroaniline			13.1 U			0.82 UJ	1.4 U		
Phenol			1180			0.82 U	1.4 U		
Pyridine			65.6 U			4.1 U	6.8 U		
Bis(2–Chloroethyl)Ether			13.1 U			0.82 U	1.4 U		
Bis(2–Chloroethoxy)Methane			13.1 U			0.82 U	1.4 U		
Bis(2–Ethylhexyl)Phthalate			13.1 UJ			0.82 UJ	1.4 UJ		
Di–n–Octyl Phthalate			13.1 UJ			0.82 UJ	1.4 UJ		
Hexachlorobenzene			13.1 U			0.82 U	1.4 U		
Anthracene			1.6 J			0.82 U	1.4 U		
1,2,4–Trichlorobenzene			13.1 U			0.82 UJ	1.4 U		
2,4–Dichlorophenol			13.1 U			0.82 U	1.4 U		
2,4–Dinitrotoluene			131 U			8.2 U	13.6 U		
1,2–Diphenylhydrazine			13.1 U			0.82 U	1.4 U		
Pyrene			5.1 J			0.82 U	1.4 U		
Dimethyl Phthalate			13.1 U			0.82 U	1.4 U		
Dibenzofuran			4.9 J			0.82 U	1.4 U		
Benzo(g,h,i)Perylene			13.1 U			0.82 U	1.4 U		
Indeno(1,2,3–cd)Pyrene			13.1 U			0.82 U	1.4 U		
Benzo(b)Fluoranthene			13.1 U			0.82 U	1.4 U		
Fluoranthene			13.1 U			0.82 U	1.4 U		
Benzo(k)Fluoranthene			13.1 U			0.82 U	1.4 U		
Acenaphthylene			13.1 U			0.82 U	1.4 U		
Chrysene			3.5 J			0.82 U	1.4 U		
Retene			13.1 U			0.82 U	1.4 U		
4,6–Dinitro–2–Methylphenol			524 U			32.6 UJ	54.2 U		
1,3–Dichlorobenzene			13.1 U			0.82 UJ	1.4 U		
2,6–Dinitrotoluene			65.6 U			4.1 U	6.8 U		
N–Nitroso–di–n–Propylamine			13.1 U			0.82 U	1.4 U		
4–Chlorophenyl Phenylether			13.1 U			0.82 U	1.4 U		
Bis(2–chloroisopropyl)–			13.1 U			0.82 U	1.4 U		

Inf – influent sample
Eff – effluent sample
003 – outfall 003 sample
Dupe – duplicate sample
E – Ecology sample
S – Sound Refining sample

[ ] – detected analyte

Appendix F – (cont'd) – Sound Refining, 1994.

Location:	Inf–1	Inf–2	Inf–E	Eff–1	Eff–2	Eff–E	Eff–Dupe	Eff–S	003–1
Type:	grab	grab	comp	grab	grab	comp	comp	comp	grab
Date:	7/20	7/20	7/20–21	7/20	7/20	7/20–21	7/20–21	7/20–21	7/20
Time:	1015	1355@	0730–0730	0900	1300@	0730–0730	0730–0730	0730–0730	1050
Lab Log#:	298105	298106	298107	298112	298113	298114	298120	298115	298118
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Metals *									
Antimony			30 U			30 U	30 U	30 U	30 U
Arsenic			11.0			6.9	6.6	6.7	1.5 U
Beryllium			1 U			1 U	1 U	1 U	1 U
Cadmium			0.12 P			0.70 P	0.46 P	0.52 P	0.10 U
Chromium		11* P	5 U		7* P	6.3 P	7.2 P	5.3 P	5 U
Hexavalent		REJ	REJ		4.2* P	3.3* P	6.4* P	5.4* P	
Trivalent									
Copper			11 P			17 P	18 P	13 P	4.8 P
Lead			3.2 P			1.9 P	2.4 P	2.0 P	1.0 U
Mercury (Total)			3.42 N			1.89 N	1.91 N	1.26 N	0.05 U
Nickel			10 U			10 U	10 U	10 U	10 U
Selenium			2.0 U			2.0 U	2.0 U	2.0 U	2.0 U
Silver			0.50 U			1.0 P	0.90 P	0.62 P	0.50 U
Thallium			2.5 U			2.5 U	2.5 U	2.5 U	2.5 U
Zinc			47.1			79.9	89.8	61.5	4 P

* All metals are total recoverable except mercury and those results marked with a *. Marked results are total metals.

U The analyte was not detected at or above the reported result.
UJ The analyte was not detected at or above the reported estimated result.
J The analyte was positively identified. The associated numerical result is an estimate.
E The concentration of the associated value exceeds the known calibration range.
P The analyte was detected above the instrument detection limit but below the established minimum quantitation limit.
N The spike sample recovery is not within control limits.
REJ The data are unusable for all purposes.
@ hexavalent chromium grabs sampled at 1415 on 7/20

Inf – influent sample
Eff – effluent sample
003 – outfall 003 sample
Dupe – duplicate sample
E – Ecology sample
S – Sound Refining sample

[ ] – detected analyte

Appendix F – (cont'd) – Sound Refining, 1994.

Location:	Sed–1	Sed–2	Sed–3
Type:	grab	grab	grab
Date:	8/22	8/22	8/22
Time:	1200	1225	1255
Lab Log#:	348000	348001	308132
	ug/Kg–dry	ug/Kg–dry	ug/Kg–dry
VOA Compounds			
Carbon Tetrachloride	3.6 U	3.5 U	3.6 U
Acetone	86.7 UJ	64.9 UJ	36.3 UJ
Chloroform	3.6 U	3.5 U	3.6 U
Benzene	3.6 U	3.5 U	0.76 J
1,1,1–Trichloroethane	3.6 U	3.5 U	3.6 U
Bromomethane	3.6 U	3.5 U	3.6 U
Chloromethane	3.6 U	3.5 U	3.6 U
Dibromomethane	3.6 U	3.5 U	3.6 U
Bromochloromethane	3.6 U	3.5 U	3.6 U
Chloroethane	3.6 U	3.5 U	3.6 U
Vinyl Chloride	3.6 U	3.5 U	3.6 U
Methylene Chloride	3.6 U	3.5 U	1.4 UJ
Carbon Disulfide	6.1 UJ	6.4 UJ	5.3 UJ
Bromoform	3.6 U	3.5 U	5.6 UJ
Bromodichloromethane	3.6 U	3.5 U	3.6 UJ
1,1–Dichloroethane	3.6 U	3.5 U	3.6 U
1,1–Dichloroethene	3.6 U	3.5 U	3.6 U
Trichlorofluoromethane	3.6 U	3.5 U	3.6 U
Dichlorodifluoromethane	3.6 U	3.5 U	3.6 U
1,2–Dichloropropane	3.6 U	3.5 U	3.6 U
2–Butanone (MEK)	27.2 J	22.7 J	14.1 UJ
1,1,2–Trichloroethane	3.6 U	3.5 U	3.6 U
Trichloroethene	3.6 U	3.5 U	0.47 J
1,1,2,2–Tetrachloroethane	3.6 U	3.5 U	3.6 U
1,2,3–Trichlorobenzene	3.6 U	3.5 U	3.6 U
Hexachlorobutadiene	3.6 U	3.5 U	3.6 UJ
Naphthalene	17.9 U	3.5 U	3.6 U
o–Xylene	3.6 U	3.5 U	3.6 U
2–Chlorotoluene	3.6 U	3.5 U	3.6 U
1,2–Dichlorobenzene	3.6 U	3.5 U	3.6 U
1,2,4–Trimethylbenzene	3.6 U	3.5 U	3.6 U
1,2–Dibromo–3–Chloropropane (DBCP)	3.6 U	3.5 U	3.6 U
1,2,3–Trichloropropane	3.6 U	3.5 U	3.6 U

Sed–1 – Sediment sample collected 25 feet downcurrent (northwest) from the end of the outfall pipe at a depth of 27 feet.

Sed–2 – Sediment sample collected 100 yards downcurrent (northwest) at the end of the Sound pier at a depth of 23 feet.

Sed–3 – Background station. Sediment sample collected 1/4 mile upcurrent (southeast) of the Sound outfall pipe at a depth of 26 feet.

Appendix F – (cont'd) – Sound Refining, 1994.

Location:	Sed–1	Sed–2	Sed–3
Type:	grab	grab	grab
Date:	8/22	8/22	8/22
Time:	1200	1225	1255
Lab Log#:	348000	348001	308132
	ug/Kg–dry	ug/Kg–dry	ug/Kg–dry
VOA Compounds (cont'd)			
tert–Butylbenzene	3.6 U	3.5 U	3.6 U
Isopropylbenzene	77.6 U	3.5 U	0.29 J
p–Isopropyltoluene	3.6 U	13.0	3.6 U
Ethylbenzene	3.6 U	3.5 U	0.36 J
Styrene (Ethenylbenzene)	3.6 U	3.5 U	3.6 U
Propylbenzene	3.6 U	3.5 U	3.6 U
Butylbenzene	289 UJ	3.5 U	3.6 U
4–Chlorotoluene	3.6 U	3.5 U	3.6 U
1,4–Dichlorobenzene	3.6 U	3.5 U	3.6 U
1,2–Dibromoethane (EDB)	3.6 U	3.5 U	3.6 U
1,2–Dichloroethane	3.6 U	3.5 U	3.6 U
4–Methyl–2–Pentanone (MIBK)	3.6 U	1.2 J	3.6 U
1,3,5–Trimethylbenzene	53.8 U	3.5 U	3.6 U
Bromobenzene	3.6 U	3.5 U	3.6 U
Toluene	3.6 U	3.5 U	0.76 J
Chlorobenzene	3.6 U	3.5 U	3.6 U
1,2,4–Trichlorobenzene	3.6 U	3.5 U	3.6 U
Dibromochloromethane	3.6 U	3.5 U	3.6 UJ
Tetrachloroethene	0.41 J	0.50 J	0.37 J
sec–Butylbenzene	3.6 U	3.5 U	0.28 J
1,3–Dichloropropane	3.6 U	3.5 U	3.6 U
cis–1,2–Dichloroethene	1.5 J	1.2 J	0.54 J
trans–1,2–Dichloroethene	0.20 J	3.5 U	3.6 U
1,3–Dichlorobenzene	3.6 U	3.5 U	3.6 U
1,1–Dichloropropene	3.6 U	3.5 U	3.6 U
2–Hexanone	0.88 J	7.3	0.78 J
2,2–Dichloropropane	3.6 U	3.5 U	3.6 U
1,1,1,2–Tetrachloroethane	3.6 U	3.5 U	3.6 U
Total Xylenes	10.7 U	10.5 U	10.8 U
m&p–Xylene	7.1 U	7.0 U	7.2 U
cis–1,3–Dichloropropene	3.8 U	3.7 U	3.8 UJ
trans–1,3–Dichloropropene	3.4 U	3.3 U	3.4 UJ

Sed–1 – Sediment sample collected 25 feet downcurrent (northwest) from the end of the outfall pipe at a depth of 27 feet.

Sed–2 – Sediment sample collected 100 yards downcurrent (northwest) at the end of the Sound pier at a depth of 23 feet.

Sed–3 – Background station. Sediment sample collected 1/4 mile upcurrent (southeast) of the Sound outfall pipe at a depth of 26 feet.

Appendix F – (cont'd) – Sound Refining, 1994.

Location:	Sed–1	Sed–2	Sed–3
Type:	grab	grab	grab
Date:	8/22	8/22	8/22
Time:	1200	1225	1255
Lab Log#:	348000	348001	308132
	ug/Kg–dry	ug/Kg–dry	ug/Kg–dry
BNA Compounds			
Benzo(a)Pyrene	708	565	413 U
2,4–Dinitrophenol	1570 UJ	1250 UJ	1470 UJ
Dibenzo(a,h)Anthracene	150 J	102 J	80.6 J
Benzo(a)Anthracene	737	675	370
Caffeine	157 U	125 U	147 U
4–Chloro–3–Methylphenol	157 U	125 U	147 U
Aniline	157 U	125 U	147 U
Dimethylnitrosamine	157 U	125 U	147 U
Benzoic Acid	1570 UJ	1250 U	1470 UJ
Hexachloroethane	157 UJ	125 U	147 U
Hexachlorocyclopentadiene	REJ	251 UJ	295 UJ
Isophorone	157 U	125 U	147 U
Acenaphthene	109 J	148	50.1 J
Diethyl Phthalate	157 U	125 U	147 U
Di–n–Butyl Phthalate	157 U	426 UJ	236 UJ
Phenanthrene	736	965	302
Butylbenzyl Phthalate	166	125 U	147 U
N–Nitrosodiphenylamine	157 U	125 U	147 U
Fluorene	130 J	176	60.1 J
Carbazole	157 U	125 U	147 U
Hexachlorobutadiene	157 U	125 U	147 U
Pentachlorophenol	157 U	125 U	147 U
2,4,6–Trichlorophenol	157 U	125 U	147 U
2–Nitroaniline	157 U	125 U	147 U
2–Nitrophenol	157 U	125 U	147 U
Naphthalene	218	206	111 J
2–Methylnaphthalene	110 J	98.8 J	60.5 J
2–Chloronaphthalene	157 U	125 U	147 U
3,3'–Dichlorobenzidine	315 U	251 U	295 U
Benzidine	315 UJ	251 UJ	295 UJ
2–Methylphenol	157 U	125 U	147 U
1,2–Dichlorobenzene	157 U	125 U	147 U
o–Chlorophenol	157 U	125 U	147 U
2,4,5–Trichlorophenol	157 U	125 U	147 U
Nitrobenzene	157 U	125 U	147 U
3–Nitroaniline	157 UJ	125 U	147 U
4–Nitroaniline	157 UJ	125 U	147 U
4–Nitrophenol	787 U	627 U	737 U
Benzyl Alcohol	157 U	125 U	147 U

Sed–1 – Sediment sample collected 25 feet downcurrent (northwest) from the end of the outfall pipe at a depth of 27 feet.

Sed–2 – Sediment sample collected 100 yards downcurrent (northwest) at the end of the Sound pier at a depth of 23 feet.

Sed–3 – Background station. Sediment sample collected 1/4 mile upcurrent (southeast) of the Sound outfall pipe at a depth of 26 feet.

Appendix F – (cont'd) – Sound Refining, 1994.

Location:	Sed–1	Sed–2	Sed–3
Type:	grab	grab	grab
Date:	8/22	8/22	8/22
Time:	1200	1225	1255
Lab Log#:	348000	348001	308132
	ug/Kg–dry	ug/Kg–dry	ug/Kg–dry
BNA Compounds (cont'd)			
4–Bromophenyl Phenylether	157 U	125 U	147 U
2,4–Dimethylphenol	157 U	125 U	147 U
4–Methylphenol	90.1 J	58.0 J	85.2 J
1,4–Dichlorobenzene	157 U	125 U	147 U
4–Chloroaniline	157 UJ	125 U	147 U
Phenol	157 UJ	125 U	147 U
Pyridine	787 U	627 U	737 U
Bis(2–Chloroethyl)Ether	157 U	125 U	147 U
Bis(2–Chloroethoxy)Methane	157 U	125 U	147 U
Bis(2–Ethylhexyl)Phthalate	2710	561 UJ	755 UJ
Di–n–Octyl Phthalate	144 J	125 U	147 U
Hexachlorobenzene	157 U	116 J	147 U
Anthracene	435	477	182
1,2,4–Trichlorobenzene	157 U	125 U	147 U
2,4–Dichlorophenol	157 U	125 U	147 U
2,4–Dinitrotoluene	157 U	125 U	147 U
1,2–Diphenylhydrazine	157 U	125 U	147 U
Pyrene	1940	2150	916
Dimethyl Phthalate	157 U	125 U	147 U
Dibenzofuran	118 J	138	88.9 J
Benzo(g,h,i)Perylene	459 J	364	356
Indeno(1,2,3–cd)Pyrene	476	386	340
Benzo(b)Fluoranthene	1570	1290	979
Fluoranthene	1700	2230	800
Benzo(k)Fluoranthene	484	440	345
Acenaphthylene	132 J	108 J	54.3 J
Chrysene	1580	1410	815
3B–Coprostanol	2340 J	2280 J	2450 J
Retene	406	300	220
4,6–Dinitro–2–Methylphenol	1570 U	125 U	1470 U
1,3–Dichlorobenzene	157 U	125 U	147 U
2,6–Dinitrotoluene	157 U	125 U	147 U
N–Nitroso–di–n–Propylamine	157 U	125 U	147 U
4–Chlorophenyl Phenylether	157 U	125 U	147 U
Bis(2–chloroisopropyl)–	157 U	125 U	147 U

Sed–1 – Sediment sample collected 25 feet downcurrent (northwest) from the end of the outfall pipe at a depth of 27 feet.

Sed–2 – Sediment sample collected 100 yards downcurrent (northwest) at the end of the Sound pier at a depth of 23 feet.

Sed–3 – Background station. Sediment sample collected 1/4 mile upcurrent (southeast) of the Sound outfall pipe at a depth of 26 feet.

Appendix F – (cont'd) – Sound Refining, 1994.

Location:	Sed–1	Sed–2	Sed–3
Type:	grab	grab	grab
Date:	8/22	8/22	8/22
Time:	1200	1225	1255
Lab Log#:	348000	348001	308132
	mg/Kg–dry	mg/Kg–dry	mg/Kg–dry
Metals *			
Antimony	3 UJ	3 UJ	3 UJ
Arsenic	30.4	29.9	20.5
Beryllium	0.25 P	0.24 P	0.21 P
Cadmium	0.4 P	0.472 N	0.541 N
Chromium	26.2	21.1	25.6
Copper	127	113	119
Lead	62.5 N	58.4 N	67.3 N
Mercury	0.144	0.102	0.144
Nickel	19.2	15.2	20.8
Selenium	0.47 P	0.42P	0.57 P
Silver	0.3 UJ	0.3 UJ	0.3 UJ
Thallium	0.50 UN	0.50 UN	0.50 UN
Zinc	121 N	116 N	138 N

* Sediment metals are total metals.

[ ] – detected analyte

U The analyte was not detected at or above the reported result.
UJ The analyte was not detected at or above the reported estimated result.
J The analyte was positively identified. The associated numerical result is an estimate.
E The concentration of the associated value exceeds the known calibration range.
P The analyte was detected above the instrument detection limit but below the established minimum quantitation limit.
N The spike sample recovery is not within control limits.
@ hexavalent chromium sampled at 1415 on 7/20

Sed–1 – Sediment sample collected 25 feet downcurrent (northwest) from the end of the outfall pipe at a depth of 27 feet.
Sed–2 – Sediment sample collected 100 yards downcurrent (northwest) at the end of the Sound pier at a depth of 23 feet.
Sed–3 – Background station. Sediment sample collected 1/4 mile upcurrent (southeast) of the Sound outfall pipe at a depth of 26 feet.

Appendix G – VOA and BNA Scan Tentatively Identified Compounds (TICs) – Sound Refining, 1994.

TIC data are presented on the laboratory report sheets that follow. VOA (volatile organic) fractions are identified as VOA. BNA (semivolatile organic) fractions are identified as B/N/Acid. Locations corresponding to the Lab Log# (called Sample No. on the laboratory report sheet) and data qualifiers are summarized on this page. If sheets are not included for a station, no TICs were detected.

Location:	Inf-E	Inf-1	Inf-2	Eff-E	Eff-Dupe	Eff-1	Eff-2
Type:	comp	grab	grab	comp	comp	grab	grab
Date:	7/20-21	7/20	7/20	7/20-21	7/20-21	7/20	7/20
Time:	0730-0730	1015	1355	0730-0730	0730-0730	0900	1300*
Lab Log#:	298107	298105	298106	298114	298120	298112	298113

Location:	Sed-1	Sed-2	Sed-3
Type:	grab	grab	grab
Date:	8/22	8/22	8/22
Time:	1200	1225	1255
Lab Log#:	348000	348001	348002

Inf – influent
Eff – effluent
Sed – sediment
comp – composite sample
grab – grab sample
E – Ecology sample

Laboratory: Ecology, Manchester

Sample No: 94 298105 Description: INF-1

Tent Ident - VOA Sca	Water-Total Result	Units
NAPHTHALENE, 1-METHYL-	131NJ*	ug/l
2-Methylnaphthalene	170NJ*	ug/l
1H-INDENE	87.8NJ*	ug/l
CYCLOHEXANE, METHYL-	271NJ*	ug/l
THIOPHENE, TETRAHYDRO-	115NJ*	ug/l
Cyclohexane	203NJ*	ug/l
CYCLOPENTENE	255NJ*	ug/l
Indan	286NJ*	ug/l
Thiophene, 2-methyl	238NJ*	ug/l
2-Butene, (Z)	56.8NJ*	ug/l
BENZENE, 1-ETHYL-2-MET+	240NJ*	ug/l
THIOPHENE, 3-METHYL-	120NJ*	ug/l
BENZENE, 1-ETHYL-3-MET+	392NJ*	ug/l
BENZENE, 1-ETHYL-4-MET+	417NJ*	ug/l
1H-INDENE, 2,3-DIHYDRO+	179NJ*	ug/l
THIOPHENE, TETRAHYDRO-+	222NJ*	ug/l
THIOPHENE, TETRAHYDRO-+	52.2NJ*	ug/l

Laboratory: Ecology, Manchester

Sample No: 94 298106 Description: INF-2

Begin Date: 94/07/20

Tent Ident - VOA Sca	Water-Total Result	Units
METHANE, THIOBIS	74.6NJ*	ug/l
Butane, 2-Methyl	47.8NJ*	ug/l
NAPHTHALENE, 1-METHYL-	159NJ*	ug/l
2-Methylnaphthalene	183NJ*	ug/l
PENTANE, 3-METHYL-	83.4NJ*	ug/l
Cyclopentane-methyl	467NJ*	ug/l
2-PENTANONE	68.6NJ*	ug/l
CYCLOHEXANE, METHYL-	344NJ*	ug/l
THIOPHENE	347NJ*	ug/l
Cyclohexane	372NJ*	ug/l
CYCLOPENTENE	284NJ*	ug/l
Cyclobutane	61.5NJ*	ug/l
CYCLOPENTANE(DOT)	170NJ*	ug/l
Benzene, 1,2,3,4-Tetra+	89.0NJ*	ug/l
2-BUTENE, 2-METHYL	116NJ*	ug/l
BENZENE, 1,2,3-TRIMETH+	454NJ*	ug/l
Thiophene, 2-methyl	138NJ*	ug/l
BENZENE, 1-ETHYL-2-MET+	450NJ*	ug/l
THIOPHENE, 3-METHYL-	238NJ*	ug/l
BENZENE, 1-ETHYL-3-MET+	991NJ*	ug/l

*** Lab Analysis Report ***

Transaction #: 08169412 Seq #: 01 (6A) Tent Ident - B/N/Acid Scan
Proj Code : DOE-164X SOUND REFINING PE # : D38F1

Sample No.: 94 298107 Alternate Keys:

Samp Matrix: (10) Water-Total Units: (11) ug/l %Slds: NAR
QA Code: ( ) Unspecifed Peaks Total:
Date Extracted: Date Analyzed: 940808 # Days to Ext/Anal: 0/ 18

Line	Par #	Parameter Description	Units	Value
1	108883	Toluene	ug/l	1630NJ
2	120923	CYCLOPENTANONE	ug/l	517NJ
3	108941	Cyclohexanone	ug/l	257NJ
4	1757422	CYCLOPENTANONE, 3-METHYL-	ug/l	322NJ
5	100414	Ethylbenzene	ug/l	377NJ
6	108383	m-Xylene	ug/l	1230NJ
7	106423	p-Xylene	ug/l	614NJ
8	-3008001	UNKNOWN COMPOUND 1	ug/l	276J
9	611143	BENZENE, 1-ETHYL-2-METHYL-	ug/l	378NJ
10	620144	BENZENE, 1-ETHYL-3-METHYL-	ug/l	227NJ
11	526738	BENZENE, 1,2,3-TRIMETHYL-	ug/l	660NJ
12	95636	1,2,4-Trimethylbenzene	ug/l	458NJ
13	-3005001	UNKNOWN HYDROCARBON 1	ug/l	146J
14	90006	PHENOL, 2-ETHYL-	ug/l	126NJ
15	95874	Phenol, 2,5-dimethyl	ug/l	209NJ
16	934805	BENZENE, 4-ETHYL-1,2-DIMETHY	ug/l	157NJ
17	95658	Phenol, 3,4-dimethyl	ug/l	926NJ
18	526750	PHENOL, 2,3-DIMETHYL-	ug/l	196NJ
19	-3005002	UNKNOWN HYDROCARBON 2	ug/l	146J
20	618451	Phenol, 3-(1-methylethyl)	ug/l	85.2NJ
21	1687645	PHENOL, 2-ETHYL-6-METHYL-	ug/l	52.2NJ
22	621272	PHENOL, 3-PROPYL-	ug/l	142NJ
23	90120	NAPHTHALENE, 1-METHYL-	ug/l	88.5NJ
24	1470946	1H-Inden-5-ol, 2,3-dihydro	ug/l	87.4NJ
25	2423714	Phenol, 2,6-dimethyl-4-nitro	ug/l	85.0NJ
26	582161	NAPHTHALENE, 2,7-DIMETHYL-	ug/l	50.1NJ
27	569415	NAPHTHALENE, 1,8-DIMETHYL-	ug/l	77.5NJ

Laboratory: Ecology, Manchester

Sample No: 94 298112 Description: EFF-1

Tent Ident - VOA Sca	Water-Total Result	Unit
NAPHTHALENE, 1-METHYL-	60.7NJ*	ug/l
2-Methylnaphthalene	134NJ*	ug/l
UNKNOWN COMPOUND 1	3.6J*	ug/l

Laboratory: Ecology, Manchester

Sample No: 94 298113 Description: EFF-2

Tent Ident - VOA Sca	Water-Total Result	Units
NAPHTHALENE, 1-METHYL-	3.3NJ*	ug/l
BENZENE, 1,2,3,5-TETRA+	0.61NJ*	ug/l
BENZENE, 1-ETHYL-2-MET+	1.4NJ*	ug/l
BENZENE, 1-ETHYL-3-MET+	0.52NJ*	ug/l
ETHANE, 1,2-DIETHOXY-	1.3NJ*	ug/l
1,3-Dioxolane	2.6NJ*	ug/l
UNKNOWN HYDROCARBON 1	0.39J*	ug/l
UNKNOWN HYDROCARBON 2	0.46J*	ug/l
UNKNOWN COMPOUND 1	0.62J*	ug/l
BENZENE, (1-METHYL-2-C+	0.57NJ*	ug/l

*** Lab Analysis Report ***

Transaction #: 08169412 Seq #: 02 (6A) Tent Ident - B/N/Acid Scan
Proj Code : DOE-164X SOUND REFINING PE # : D38F1

Sample No.: 94 298114 Alternate Keys:

Samp Matrix: (10) Water-Total Units: (11) ug/l %Slds: NAR
QA Code: ( ) Unspecifed Peaks Total:
Date Extracted: Date Analyzed: 940808 # Days to Ext/Anal: 0/ 18

Line	Par #	Parameter Description	Units	Value
1	629141	ETHANE, 1,2-DIETHOXY-	ug/l	8.3NJ
2	-3008001	UNKNOWN COMPOUND 1	ug/l	2.6J
3	5910894	Pyrazine, 2,3-dimethyl	ug/l	3.4NJ
4	13360640	Pyrazine, 2-ethyl-5-methyl	ug/l	2.5NJ
5	-3008002	UNKNOWN COMPOUND 2	ug/l	8.5J
6	-3008003	UNKNOWN COMPOUND 3	ug/l	14.1J
7	-3008004	UNKNOWN COMPOUND 4	ug/l	8.3J
8	-3008005	UNKNOWN COMPOUND 5	ug/l	2.2J
9	-3008006	UNKNOWN COMPOUND 6	ug/l	3.8J
10	-3008007	UNKNOWN COMPOUND 7	ug/l	3.7J
11	-3008008	UNKNOWN COMPOUND 8	ug/l	2.0J
12	-3008009	UNKNOWN COMPOUND 9	ug/l	1.9J
13	-3008010	UNKNOWN COMPOUND 10	ug/l	2.0J
14	-3008011	UNKNOWN COMPOUND 11	ug/l	2.2J
15	-3008012	UNKNOWN COMPOUND 12	ug/l	4.6J
16	-3008013	UNKNOWN COMPOUND 13	ug/l	3.0J
17	-3008014	UNKNOWN COMPOUND 14	ug/l	2.5J
18	-3008015	UNKNOWN COMPOUND-15	ug/l	3.7J
19	-3008016	UNKNOWN COMPOUND-16	ug/l	3.7J
20	-3008017	UNKNOWN COMPOUND-17	ug/l	3.0J

*** Lab Analysis Report ***

Transaction #: 08169412 Seq #: 03 (6A) Tent Ident - B/N/Acid Scan
Proj Code : DOE-164X SOUND REFINING PE # : D38F1

Sample No.: 94 298120 Alternate Keys:

Samp Matrix: (10) Water-Total Units: (11) ug/l %Slds: NAR
QA Code: ( ) Unspecifed Peaks Total:
Date Extracted: Date Analyzed: 940808 # Days to Ext/Anal: 0/ 18

Line	Par #	Parameter Description	Units	Value
1	629141	ETHANE, 1,2-DIETHOXY-	ug/l	8.0NJ
2	5910894	Pyrazine, 2,3-dimethyl	ug/l	3.6NJ
3	13925036	Pyrazine, 2-ethyl-6-methyl	ug/l	3.1NJ
4	2896608	1,3-BENZENEDIOL, 4-ETHYL-	ug/l	1.9NJ
5	112367	ETHANE, 1,1'-OXYBIS[2-ETHOXY	ug/l	14.3NJ
6	-3008001	UNKNOWN COMPOUND 1	ug/l	7.7J
7	-3008002	UNKNOWN COMPOUND 2	ug/l	8.2J
8	-3008003	UNKNOWN COMPOUND 3	ug/l	3.5J
9	-3008004	UNKNOWN COMPOUND 4	ug/l	3.0J
10	-3008005	UNKNOWN COMPOUND 5	ug/l	6.2J
11	-3008006	UNKNOWN COMPOUND 6	ug/l	2.9J
12	-3008007	UNKNOWN COMPOUND 7	ug/l	3.0J
13	-3008008	UNKNOWN COMPOUND 8	ug/l	4.9J
14	-3008009	UNKNOWN COMPOUND 9	ug/l	3.3J
15	-3008010	UNKNOWN COMPOUND 10	ug/l	3.9J
16	-3008011	UNKNOWN COMPOUND 11	ug/l	3.1J
17	-3008012	UNKNOWN COMPOUND 12	ug/l	2.3J
18	-3008013	UNKNOWN COMPOUND 13	ug/l	4.0J
19	-3008014	UNKNOWN COMPOUND 14	ug/l	5.0J
20	-3008015	UNKNOWN COMPOUND-15	ug/l	2.9J
21	-3008016	UNKNOWN COMPOUND-16	ug/l	4.7J
22	-3008017	UNKNOWN COMPOUND-17	ug/l	3.1J

Laboratory: Ecology, Manchester

Sample No: 94 348000 Description: SED-1

Tent Ident - VOA Sca	Sediment Result	Units
METHANE, THIOBIS	50NJ*	ug/kg
CAMPHENE (DOT)	410NJ*	ug/kg
.ALPHA.-PINENE	1700NJ*	ug/kg
1,4-CYCLOHEXADIENE, 1-+	2200NJ*	ug/kg
1,3-CYCLOHEXADIENE, 1-+	1400NJ*	ug/kg
.BETA.-PINENE	5300NJ*	ug/kg
LIMONENE	900NJ*	ug/kg
CYCLOHEXENE, 1-METHYL-+	4200NJ*	ug/kg
BICYCLO[3.1.0]HEX-2-EN+	360NJ*	ug/kg
3-CARENE	380NJ*	ug/kg
BICYCLO[3.1.0]HEX-2-EN+	6600NJ*	ug/kg
Bicyclo[3.1.0]hexane, +	930NJ*	ug/kg

Tent Ident - B/N/Aci	Sediment Result	Units
OCTADECANOIC ACID	677NJ*	ug/kg
CHOLESTEROL	7250NJ*	ug/kg
.GAMMA.-SITOSTEROL	8200NJ*	ug/kg
Oleic acid	7460NJ*	ug/kg
Decanoic Acid, Tetra-	1720NJ*	ug/kg
87	2340NJ*	ug/kg
Decanoic Acid, Penta-	2640NJ*	ug/kg
9-HEXADECENOIC ACID	1550NJ*	ug/kg
86	2580NJ*	ug/kg
UNKNOWN HYDROCARBON 1	2410J*	ug/kg
UNKNOWN COMPOUND 3	2800J*	ug/kg
UNKNOWN COMPOUND 4	1010J*	ug/kg
UNKNOWN COMPOUND 5	4400J*	ug/kg
SULFUR, MOL. (S8)	10900NJ*	ug/kg

Laboratory: Ecology, Manchester

Sample No: 94 348001 Description: SED-2

Tent Ident - VOA Sca	Sediment Result	Units
METHANE, THIOBIS	218NJ*	ug/kg
.ALPHA.-PINENE	5.1NJ*	ug/kg
1,4-CYCLOHEXADIENE, 1-+	2.7NJ*	ug/kg
.BETA.-PINENE	3.3NJ*	ug/kg
LIMONENE	3.9NJ*	ug/kg
BICYCLO[4.1.0]HEPT-2-E+	8.2NJ*	ug/kg
BICYCLO[4.1.0]HEPT-2-E+	2.6NJ*	ug/kg
UNKNOWN HYDROCARBON 3	5.0NJ*	ug/kg
DECANE, 2,2,6-TRIMETHY+	0.98NJ*	ug/kg

Tent Ident - B/N/Aci	Sediment Result	Units
Decanoic Acid, Hexa-	7700NJ*	ug/kg
CHOLESTEROL	8090NJ*	ug/kg
.GAMMA.-SITOSTEROL	7700NJ*	ug/kg
Oleic acid	659NJ*	ug/kg
Decanoic Acid, Tetra-	1850NJ*	ug/kg
S7	2200NJ*	ug/kg
9-HEXADECENOIC ACID	8100NJ*	ug/kg
UNKNOWN COMPOUND 1	4130J*	ug/kg
UNKNOWN COMPOUND 2	1950J*	ug/kg
UNKNOWN COMPOUND 3	1190J*	ug/kg
UNKNOWN COMPOUND 4	2260J*	ug/kg
UNKNOWN COMPOUND 5	6940J*	ug/kg
UNKNOWN COMPOUND 6	1970J*	ug/kg
UNKNOWN COMPOUND 7	3540J*	ug/kg
SULFUR, MOL. (S8)	22700NJ*	ug/kg
BENZENE, METHYL(1-METH+	2960NJ*	ug/kg

Laboratory: Ecology, Manchester

Sample No: 94 348002 Description: SED-3

Tent Ident - VOA Sca	Sediment Result	Units
METHANE, THIOBIS	136NJ*	ug/kg

Tent Ident - B/N/Aci	Sediment Result	Units
CHOLESTEROL	5790NJ*	ug/kg
.GAMMA.-SITOSTEROL	5320NJ*	ug/kg
PHYTOL	3000NJ*	ug/kg
Decanoic Acid, Tetra-	1610NJ*	ug/kg
9-HEXADECENOIC ACID	4710NJ*	ug/kg
UNKNOWN COMPOUND 1	1300J*	ug/kg
UNKNOWN COMPOUND 2	2160J*	ug/kg
UNKNOWN COMPOUND 3	1520J*	ug/kg
UNKNOWN COMPOUND 4	1920J*	ug/kg
Sulfur, (S7)	2050NJ*	ug/kg
SULFUR, MOL. (S8)	8190NJ*	ug/kg

Blank ID: vbw4202

Tent Ident - VOA Sca Blank #1	Water-Total Result	Units
UNKNOWN COMPOUND 1	15.8J*	ug/l

Blank ID: BW4203

Tent Ident - B/N/Aci Blank #1	Water-Total Result	Units
Tetrachloroethene	0.24NJ*	ug/l
UNKNOWN HYDROCARBON 1	0.25J*	ug/l
UNKNOWN HYDROCARBON 2	0.21J*	ug/l
UNKNOWN COMPOUND 1	0.47J*	ug/l
UNKNOWN COMPOUND 2	0.30J*	ug/l
UNKNOWN COMPOUND 3	0.42J*	ug/l
UNKNOWN COMPOUND 4	0.27J*	ug/l
UNKNOWN COMPOUND 5	0.84J*	ug/l
UNKNOWN COMPOUND 6	0.25J*	ug/l
difluorbiphenyl (surro+	0.40NJ*	ug/l
difluorobiphenyl (surr+	0.54NJ*	ug/l

Blank ID: BW4203D

Tent Ident - B/N/Aci Blank #2	Water-Total Result	Units
Tetrachloroethene	0.28NJ*	ug/l
UNKNOWN HYDROCARBON 1	0.21NJ*	ug/l
UNKNOWN HYDROCARBON 2	0.26NJ*	ug/l
UNKNOWN HYDROCARBON 3	0.37NJ*	ug/l
UNKNOWN HYDROCARBON 4	0.43NJ*	ug/l
UNKNOWN HYDROCARBON 5	0.44NJ*	ug/l
UNKNOWN HYDROCARBON 6	0.46NJ*	ug/l
UNKNOWN HYDROCARBON 7	0.43NJ*	ug/l
UNKNOWN HYDROCARBON 8	0.26NJ*	ug/l
UNKNOWN COMPOUND 1	0.49J*	ug/l
UNKNOWN COMPOUND 2	0.36J*	ug/l
UNKNOWN COMPOUND 3	0.38J*	ug/l
UNKNOWN COMPOUND 4	0.33J*	ug/l
UNKNOWN COMPOUND 5	0.40J*	ug/l
UNKNOWN COMPOUND 6	0.92J*	ug/l
difluorbiphenyl (surro+	0.42NJ*	ug/l
difluorobiphenyl (surr+	0.57NJ*	ug/l

Blank ID: BS4244

Tent Ident - B/N/Aci Blank #1	Sediment Result	Units
OCTADECANOIC ACID	34.0NJ*	ug/kg
4-HYDROXY-4-METHYLPENT+	106000NJ*	ug/kg
OCTADECANAL	26.1NJ*	ug/kg
4-PENTEN-2-ONE, 4-METH+	3560NJ*	ug/kg
UNKNOWN COMPOUND 1	289J*	ug/kg
UNKNOWN COMPOUND 2	53.0J*	ug/kg
UNKNOWN COMPOUND 3	115J*	ug/kg
UNKNOWN COMPOUND 4	186J*	ug/kg
UNKNOWN COMPOUND 5	709J*	ug/kg
UNKNOWN COMPOUND 6	736J*	ug/kg
UNKNOWN COMPOUND 7	145J*	ug/kg
UNKNOWN COMPOUND 8	277J*	ug/kg
UNKNOWN COMPOUND 9	198J*	ug/kg
UNKNOWN COMPOUND 10	27.1J*	ug/kg
UNKNOWN COMPOUND 11	27.2J*	ug/kg
UNKNOWN COMPOUND 12	78.5J*	ug/kg
UNKNOWN COMPOUND 13	349J*	ug/kg
UNKNOWN COMPOUND 14	2050J*	ug/kg
UNKNOWN COMPOUND-15	197J*	ug/kg
UNKNOWN COMPOUND-16	652J*	ug/kg

Blank ID: BS4244D

Tent Ident - B/N/Aci Blank #2	Sediment Result	Units
OCTADECANOIC ACID	33.8NJ*	ug/kg
4-HYDROXY-4-METHYLPENT+	115000NJ*	ug/kg
4-PENTEN-2-ONE, 4-METH+	2800NJ*	ug/kg
2-Pentene, 3,4-dimethy+	838NJ*	ug/kg
UNKNOWN COMPOUND 1	260J*	ug/kg
UNKNOWN COMPOUND 2	207J*	ug/kg
UNKNOWN COMPOUND 3	37.6J*	ug/kg
UNKNOWN COMPOUND 4	301J*	ug/kg
UNKNOWN COMPOUND 5	624J*	ug/kg
UNKNOWN COMPOUND 6	515J*	ug/kg
UNKNOWN COMPOUND 7	178J*	ug/kg
UNKNOWN COMPOUND 8	122J*	ug/kg
UNKNOWN COMPOUND 9	302J*	ug/kg
UNKNOWN COMPOUND 10	31.0J*	ug/kg
UNKNOWN COMPOUND 11	25.2J*	ug/kg
UNKNOWN COMPOUND 12	84.2J*	ug/kg
UNKNOWN COMPOUND 13	297J*	ug/kg
UNKNOWN COMPOUND 14	1690J*	ug/kg
UNKNOWN COMPOUND-15	508J*	ug/kg
16-Octadecenal	25.0NJ*	ug/kg

Appendix H - Glossary of Terms - Sound Refining, 1994.

BOD - biochemical oxygen demand
BNA - base-neutral acids (semivolatile organics)
COD - chemical oxygen demand
comp - composite sample
CPS - corrugated plate separator
dry wt - dry weight
est. - estimated concentration
E - Department of Ecology
EC50 - concentration with an effect to 50% of the test organisms
Eff - effluent
EPA - United States Environmental Protection Agency
F-coli - fecal coliform bacteria
g - gram
grab - grab sample
grab-comp - grab-composite sample
IAF - induced air flotation unit
Inf - influent
LC50 - concentration which is lethal to 50% of the test organisms
MF - membrane filter
mg - milligram
mg/L - milligram per liter
NOEC - no observable effect concentration
NPDES - National Pollutant Discharge Elimination System
P - phosphorus
pH - hydrogen ion concentration
QA - quality assurance
QC - quality control
RBS - rotating biological surface
Sed - sediment sample
Sound - Sound Refining Company
TIC - tentatively identified compound
TNVS - total nonvolatile solids
TNVSS - total nonvolatile suspended solids
TOC - total organic carbon
TS - total solids
TSS - total suspended solids
μg - microgram
VOA - volatile organic acid