

**Occidental Chemical Corporation
Class II Inspection
September and December 1992**

by
Paul Stasch

Washington State Department of Ecology
Environmental Investigations and Laboratory Services Program
Toxics, Compliance and Ground Water Investigations Section
Olympia WA 98504-7710

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ABSTRACT

A Class II Inspection was conducted in September and December to assess seasonal variation in the Occidental Chemical Corporation's discharge in Tacoma, Washington. The majority of the discharge is once-through cooling water withdrawn from the Hylebos Waterway. Inspection data found the Occidental discharge was of similar quality to that which was withdrawn from the waterway. The Occidental discharge was within the limits specified in the NPDES permit. Effluent priority pollutant organic and metal concentrations were less than the EPA acute and chronic water quality toxicity criteria for saltwater. Bioassays indicated limited toxicity of the discharge, however, the cause of the toxicity could not be isolated.

INTRODUCTION

A Class II Inspection was conducted at the Occidental Chemical Corporation (Occidental) in Tacoma, Washington. The Class II was a phased inspection conducted in September and December 1992 to investigate seasonal variation in the NPDES discharge quality. The dry weather portion was conducted on September 1-2, 1992, and the wet weather portion was conducted on December 7-8, 1992. Paul Stasch and Marc Heffner of the Washington State Department of Ecology (Ecology) Toxics, Compliance and Ground Water Investigations Section of the Environmental Investigations and Laboratory Services Program (EILS), performed the dry weather inspection in September. Rebecca Inman replaced Marc Heffner for the wet weather inspection in December. Mr. Karl Iams represented Occidental during the September inspection and Mr. Bob Johnson represented Occidental during the December inspection. Anise Ahmed of the Ecology Southwest Regional Office requested the inspection.

Occidental owns and operates a chlor-alkali plant. The facility occupies approximately 33 acres in the industrial port area (Figure 1). The facility discharges wastewater into the mouth of the Hylebos Waterway in Commencement Bay. The discharge is regulated by NPDES Permit No. WA-003726-5, which became effective on December 15, 1991. The permit was appealed and a modified permit was issued on June 9, 1993. The permit expires on November 15, 1996. The facility began operation in 1929. Since that time, it has initiated and closed several different manufacturing processes and has undergone several expansion phases, the last of which was completed in 1988.

Occidental produces chlorine and caustic soda by the electrolysis of a sodium chloride solution in diaphragm-type and membrane-type cells. The facility also includes a muriatic acid plant, and a calcium chloride plant. The commercial products are chlorine (Cl_2), sodium hydroxide (NaOH), sodium hypochlorite (NaOCl), calcium chloride (CaCl), muriatic acid (HCl), ammonia (NH_3), and ammonium hydroxide (NH_4OH). The ammonia plant was recently decommissioned (prior to this Class II Inspection). The facility layout is shown in Figure 2.

Raw materials come from a number of sources. About 18% of source water is supplied by the city of Tacoma water utility, and the other 82% is pumped directly out of the Hylebos Waterway. The majority of the discharge is once through cooling water. Salt is shipped from Baja, Mexico. Nitrogen was formerly extracted from the atmosphere at the ammonia plant. Limestone is used at the calcium chloride plant.

Salt is stored in a "brine pile" on which water is sprayed to produce brine. The brine is collected by underdrains, filtered and concentrated to saturation before being routed to the cells. Brine filter cake is sent to the city landfill.

The cells use electricity to disassociate the brine into chlorine, hydrogen, and caustic soda. Hydrogen is used in the muriatic acid plant as a raw material, and it can also be burned as fuel. Muriatic acid is reacted with limestone to produce calcium chloride.

Chlorine is "dried" with sulfuric acid, which produces a low-pH wastewater stream. Wastewater containing chlorine is steam-stripped to recover product. Sulfur dioxide is used to neutralize most or all of the remaining chlorine in the wastewater, which results in an additional source of acidity. Water with dissolved chlorine from wastewater stripping and vent-gas recovery is processed and sold as sodium hypochlorite bleach.

Caustic is concentrated to a 50% solution using heat and a barometric condenser. A large amount of seawater is used as contact cooling water in this process. The resulting wastewater has a high pH. Waste brine is recycled, and concentrated recycled brine is discharged through the outfall.

Wastewater is dechlorinated and treated by pH neutralization. Adjustment of pH occurs in two locations. Wastewater, after dechlorination, is only partially neutralized. After the low pH and high pH wastestreams combine, final neutralization occurs prior to discharge to the Hylebos.

All wastewater streams combine at the "mixing box" where compliance sampling is conducted. A pipe from the mixing box leads to a diffuser, located 80 feet out from the mixing box at a depth of 32 feet below mean low low water (MLLW). The diffuser consists of a "T" with two 24-inch nozzles spaced 20 feet apart in the Hylebos Waterway.

The objectives of the inspection included:

1. Verify compliance with NPDES permit limits and check calibration of OCC's compliance monitoring equipment;
2. Characterize wastewater toxicity with acute and chronic bioassays;
3. Investigate seasonal variation in the quality of the wastewater discharge; and
4. Assess the facility's operation and ability to treat wastewater flows.

PROCEDURES

Ecology collected composite samples from two locations within the facility. Ecology used Isco composite samplers to collect equal volumes of sample every 30 minutes for a 24-hour period. A composite sample of the Hylebos intake water was collected at the same location where Occidental collects their sample. Sample water was tapped out of the main line and discharged into a plastic bucket. The Isco sampler intake line collected sample directly from the bucket. The effluent composite sampler was positioned atop of the mixing box, adjacent to the Occidental sampler. The sampler intake line was suspended deeply enough so that the tidal fluctuation would not adversely affect sample collection.

Grab samples were collected at the composite sample locations and from several other locations within the facility. Samples were collected from discrete manholes within facility subareas to

assess variations in discharge quality prior to merging with other wastestreams. Manholes AE 109, AE 110, and AE 111 were analyzed for the field parameters temperature and pH. City water was collected from the faucet in the laboratory to assess its contribution of chlorine and copper to the overall discharge. Prior to collection of this sample the tap was allowed to run a number of minutes to purge the line. A grab-composite sample of the effluent was collected for extensive bioassay testing.

Occidental also collected a composite of equal volumes of influent and effluent sample over the same 24-hour period. Ecology and Occidental samples were split for analysis by both the Ecology and Occidental laboratories. The Occidental laboratory has been accredited by the Quality Assurance Section of EILS.

Sample station descriptions are presented in Table 1. Sample locations are depicted on Figure 3. Sampling quality assurance/quality control (QA/QC) measures included priority pollutant cleaning of sampling equipment (Appendix A), icing the compositors, and maintaining chain-of-custody on all samples. Samples collected for Ecology analyses were placed on ice and delivered to the Ecology Manchester Laboratory. A blind duplicate was also submitted to the Manchester Laboratory for analyses. Samples collected, sampling times and parameters analyzed are summarized in Appendices B and C. Ecology's analytical methods and laboratories used are identified in Appendices D and E.

RESULTS AND DISCUSSION

Quality Assurance/Quality Control (QA/QC)

All samples were received in good condition with chain-of-custody intact. All analyses were performed within the USEPA Contract Laboratory Program specified holding times. All results can be used noting the data qualifiers provided on the tables.

Flow Measurements

No flow measurements were taken. This was because all facility wastestreams combine in the mixing box and the flows through the mixing box are tidally influenced. At high tide flows in the mixing box are backed up, rendering traditional flow meters inaccurate. Occidental is currently in the process of installing a new flow measuring device.

Field Measurements

Temperature and pH field measurements at manholes AE 109, AE 110, and AE 111 documented nothing that would adversely affect the quality of the discharge (Table 2). It was noted that the September manhole temperatures were higher overall relative to the December manhole temperatures. It is not known whether this can be attributed to seasonal or other temporal variations. The Occidental pH monitor at manhole AE 110 consistently measured a lower pH than the Ecology field pH meter.

General Chemistry

Little variation was noted in the general chemistry parameters analyzed (see Tables 2 and 3). Changes in concentration between influent and effluent were negligible. Seasonal variation in concentration was also minimal.

Conductivity was the exception. Both the September and December conductivities demonstrated a reduction between the influent and effluent. There was a seasonal variation in conductivities. The December conductivities were substantially higher than those measured in September. It should be noted that the September conductivities were measured with field instrumentation while those in December were determined in the laboratory.

Total suspended solids were low. There was a slight reduction in concentration from influent to effluent in both the September and December inspection results. This reduction could be a result of deposition in the piping and ancillary equipment, from dissolution as the cooling water warms and/or dilution with purer city water.

Ammonia concentrations were also low and remained relatively constant or were slightly reduced from influent to effluent. Ammonia concentrations in December were approximately half the concentrations seen in September.

Oil and grease was detected in only one sample at a concentration of 1.2 mg/L.

Priority Pollutant Organics - VOA, BNA and Pesticide/PCB Scans

Few volatile organic priority pollutants were detected in the course of these inspections (Tables 4 and 5). Only acetone, chloroform and 1,1,1-trichloroethane were detected in the effluent. Acetone was detected at the highest concentration (22 ug/L), while 1,1,1-trichloroethane was detected once at the lowest concentration (1.7 ug/L).

Acetone is a common laboratory contaminant and was used to clean the composite samplers; as such the significance of its presence is masked. Chloroform concentrations (3.6 ug/L; 3.5 ug/L) were approximately one-fifth of the median concentrations found in municipal water supplies (Stasch, 1992). Since municipal supply water makes up approximately one-fifth of the discharge, these levels are not unexpected. Chloroform is the most frequently detected chlorinated organic compound in Ecology Class II Inspections (Stasch, 1992).

Few BNA compounds were detected. Only phenol was detected in the effluent at a higher concentration than the influent. It was present at a concentration below one part per billion.

Effluent organic priority pollutant concentrations were less than the EPA acute and chronic water quality toxicity criteria for saltwater (USEPA, 1986).

Dichlorodifluoromethane was the only Tentatively Identified Compound found exclusively in the effluent. It was detected only in the grab samples collected during the September inspection at estimated concentrations of 4 and 25 ug/L.

A complete list of target compounds and detection limits is provided in Appendix F.

Priority Pollutant Inorganics - Metals Scans

A few priority pollutant metals were detected in the samples (Table 4 and 5). Copper, lead, and nickel were detected in the effluent near the quantification limit. Only nickel was detected in both the effluent and the corresponding blind duplicate sample. It was also detected in the transport blank.

Effluent metal priority pollutant concentrations were less than the EPA acute and chronic water quality toxicity criteria for saltwater (USEPA,1986).

A complete list of target compounds and detection limits is provided in Appendix G.

Bioassays

For the September bioassay results, the sea urchin gametes (*Arbacia punctulata*) 80-Minute Acute Exposure Test and the sand dab (*Citharichthys* sp.) 48-Hour Static Renewal Acute Toxicity Test both demonstrated significant adverse effects to the Occidental effluent (Table 10). The December sea urchin test demonstrate a less severe adverse effect to the effluent (Table 11). The December sand dab test showed no toxic effects. No other test organisms were adversely effected.

The September effluent appears to have been more toxic than the December effluent and *Arbacia punctulata* gametes appear to be the most sensitive test organism. Any future whole effluent toxicity testing should be accompanied by bioassay testing of Hylebos influent for at least the two most sensitive test organisms to assess any pre-existing toxicity.

NPDES Permit Compliance

Occidental's compliance with their permit at the time of the inspections was good (Table 6 and 7). Temperature was below the permitted limit. TSS was below both the monthly average and the daily maximum. Copper was below the allowable concentration. Lead and nickel loadings were below both the monthly average and the daily maximum. The pH of the discharge was within the permitted range.

The ammonia loading calculated from the September composite sample results indicate the loading is slightly above the monthly average specified in the permit. However, it should be noted that the Hylebos influent ammonia concentrations were greater than the effluent concentrations and that the ammonia limitation is specified in the permit to be applied at manhole

AE 109 and not the mixing box where the Ecology samples were collected. Since the flow in manhole AE 109 is minimal relative to the permitted discharge and does not consist of Hylebos cooling water, the ammonia loadings calculated at this compliance point would be far less than those calculated from the inspection data at the mixing box.

The detection limit of the field chlorine test kit for total residual chlorine was greater than the limit specified in the permit. Therefore, compliance with this parameter could not be assessed.

Split Sample Analyses

In general, the Ecology analytical results for the Occidental samples compared adequately with the results of the Ecology samples (Tables 8 and 9). However, Occidental TSS results were consistently higher relative to the Ecology results. The Occidental results for effluent nickel and copper concentrations were also elevated relative to the Ecology results (Tables 8 and 9).

CONCLUSIONS AND RECOMMENDATIONS

It appears that change in water quality between influent and effluent for the general chemistry parameters analyzed is minimal. The trend established was a decrease in conductivity and the concentration for TSS and ammonia. This could be attributed to the dilution of the Hylebos cooling water with city water. City water comprises less than 20% of the permitted discharge.

Few priority pollutants were detected in the effluent. If acetone and chloroform are disregarded as contaminants, then the other organic compounds present (1,1,1-trichloroethane, phenol and phenanthrene) were detected at concentrations below one part per billion. Copper, nickel and lead were detected in the effluent near the quantification limit. Only nickel was detected in all effluent samples for which metals were analyzed, including the blind duplicate sample. However, nickel was detected in the transport blank as well. A contribution of copper to the effluent by the city water could not be documented. Effluent priority pollutant concentrations were less than the EPA acute and chronic water quality toxicity criteria for saltwater.

NPDES permit compliance was verified to be good although the detection limit of the chlorine field test kit was too high to confirm compliance with this permit parameter.

Split sample analyses showed a good correlation between samples. However, Occidental's analytical results for TSS, nickel and copper were slightly elevated relative to Ecology's results.

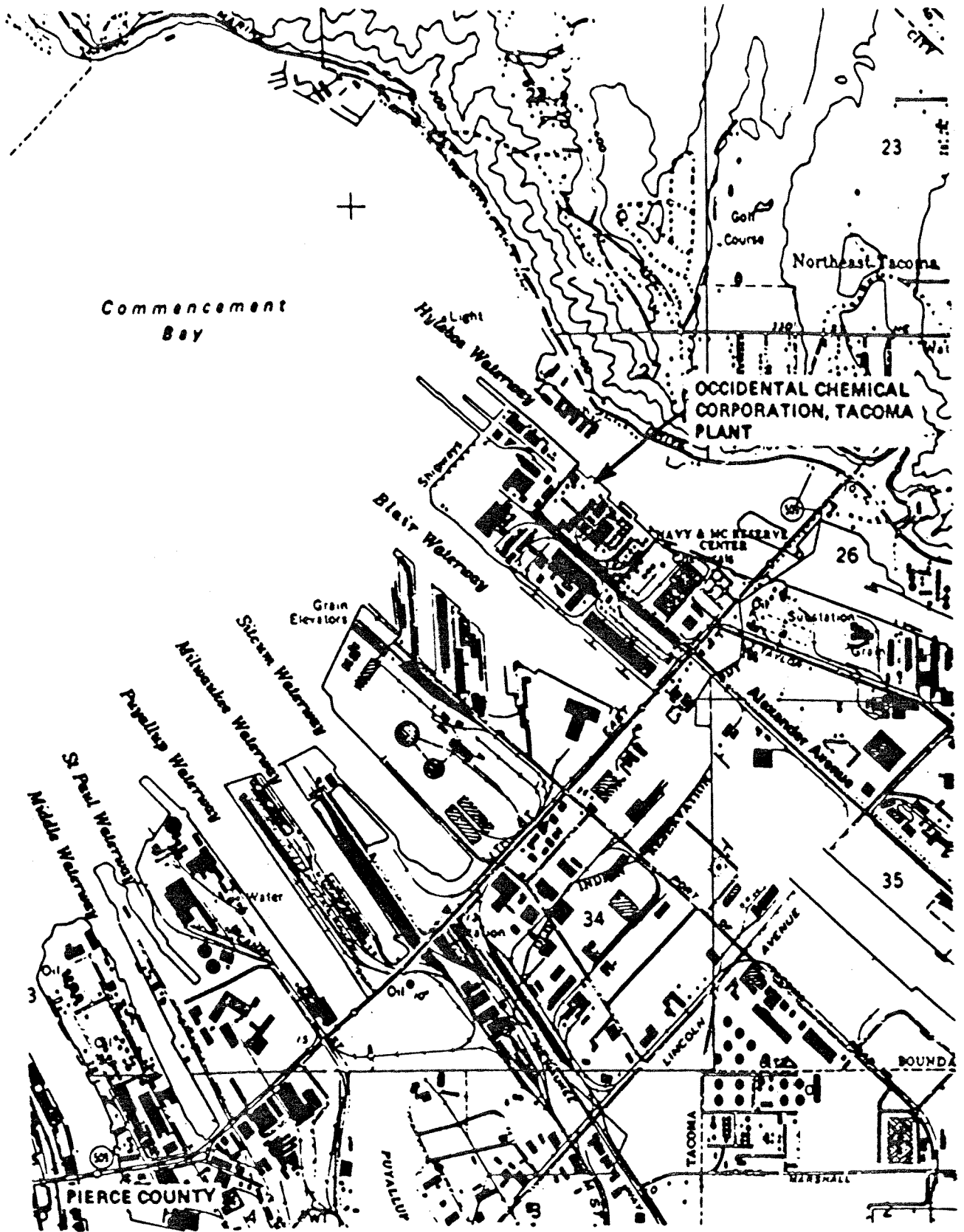
Whole effluent toxicity testing documented limited toxicity. The September effluent was more toxic than the December effluent with two of the seven bioassay tests demonstrating adverse effects. *Arbacia punctulata* was the most sensitive test organism. Any future whole effluent toxicity testing should be accompanied by bioassay testing of Hylebos influent, including at least the two most sensitive test organisms, to assess any pre-existing toxicity.

Field monitoring of selected manholes found no problem wastestreams entering the permitted discharge. However, a discrepancy between Ecology's field pH meter and Occidental's pH monitor at manhole AE 110 was noted. Occidental's pH monitor should be recalibrated as a precaution.

REFERENCES

- Stasch, 1992. Technical Memorandum, December 14, 1992. Washington State Department of Ecology.
- USEPA, 1986. Quality Criteria for Water, 1986. EPA 440/5-86-001, Office of Water Regulations and Standards, Washington, D.C.

FIGURES



Source: USGS
 Tacoma Quadrangle
 Washington
 1:100 000-Scale Series
 (Topographic) 1975



FIGURE 1
 Location Map - Occidental Chemical Corporation

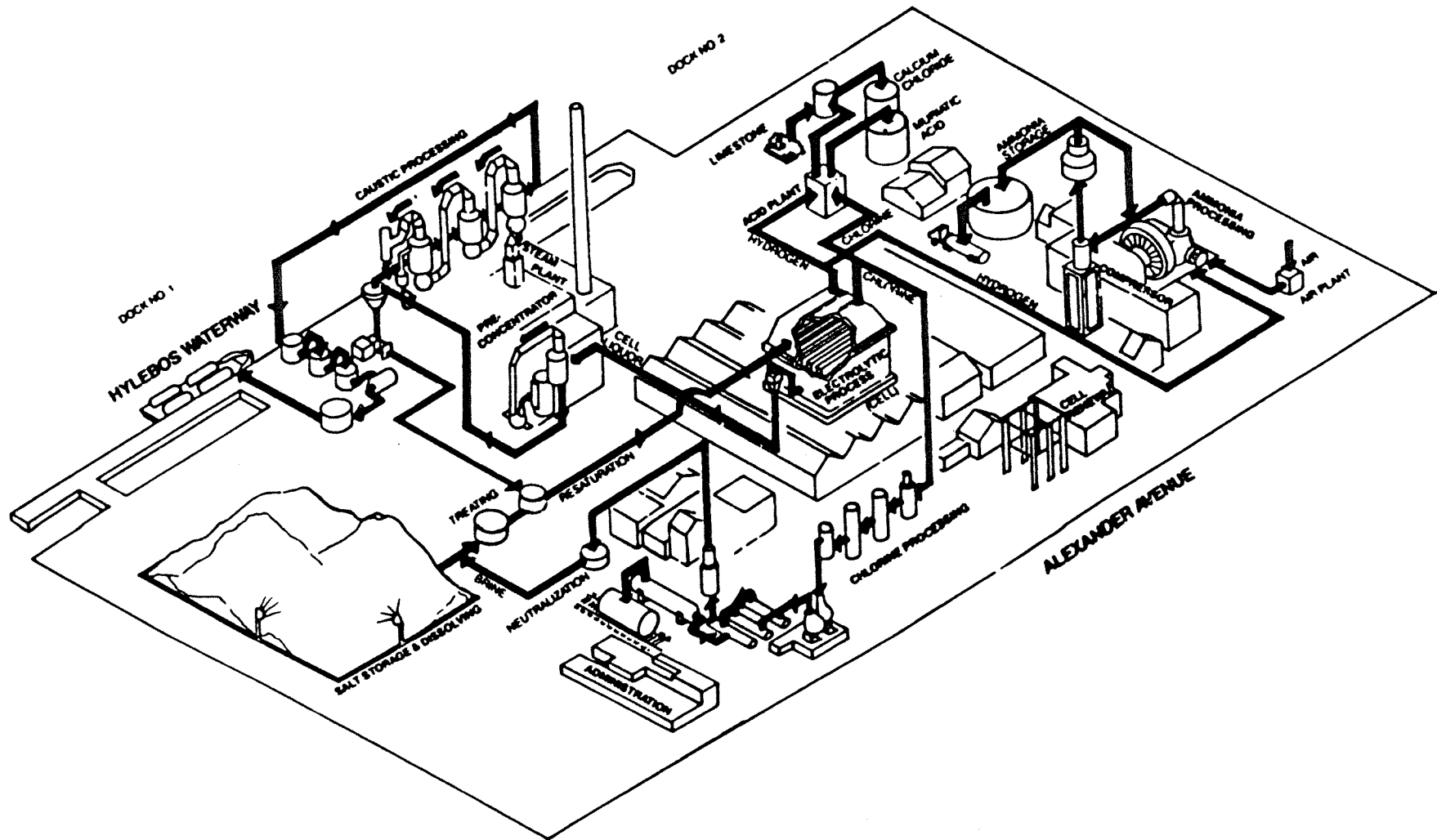


FIGURE 2
 Process Schematic - Occidental Chemical Corporation

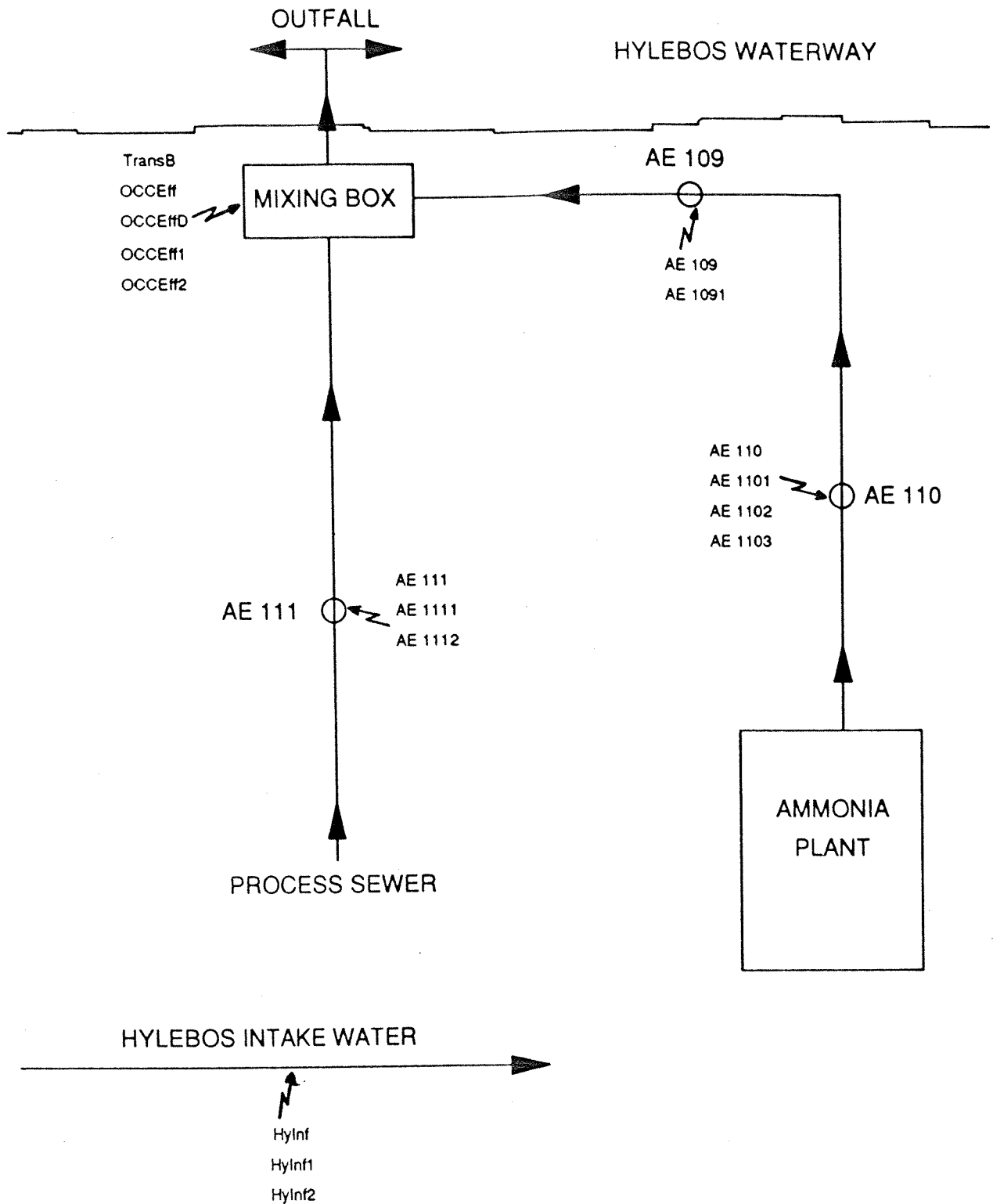


FIGURE 3
Occidental Sample Locations

TABLES

Table 1 - Sample Station Descriptions.

TransB	Sample of deionized water run through the Ecology Isco composite sampler prior to the 24-hour composite sample collection.
CityTap	Grab sample collected from the sink faucet within the Occidental Laboratory.
HyInfO	Occidental composite sample of Hylebos intake water.
HyInf	Ecology composite sample of Hylebos intake water.
HyInf1, 2	Grab samples of the Hylebos intake water.
OCCEffO	Occidental composite sample collected from the outfall mixing box.
OCCEff	Ecology composite sample collected from the outfall mixing box.
OCCEffD	Duplicate of OCCEff composite sample.
OCCEff1, 2	Grab samples collected from the outfall mixing box.
AE109, 1	Grab sample collected from the AE 109 manhole.
AE110, 1,2,3	Grab sample collected from the AE 110 manhole.
AE111, 1,2	Grab sample collected from the AE 111 manhole.

Table 2 - Ecology Laboratory General Chemistry Results - Occidental, September 1992.

Parameter	Location:	CityTap	HyInfO	HyInf	HyInf1	HyInf2	OCCEffO	OCCEff	OCCEffD	OCCEff1	OCCEff2
	Type:	grab	O-comp	E-comp	grab	grab	O-comp	E-comp	E-comp	grab	grab
	Date:	9/1/92	9/1-2/92	9/1-2/92	9/1/92	9/1/92	9/1-2/92	9/1-2/92	9/1-2/92	9/1/92	9/1/92
	Time:	1100	@	@	1000	1435	#	#	#	1045	1305
	Lab Log #:	368281	368284	368285	368282	368283	368290	368291	368292	368286	368287
GENERAL CHEMISTRY											
TSS (mg/L)			4	3	2	2	<1	1	2	2	
NH3-N (mg/L)			.065	.068	.057	.059	.052	.064	.057	.045	
Oil and Grease (mg/L)					<1	<1				1.2	
FIELD OBSERVATIONS											
Temperature (C)			11.3		14.2	15.8				19.5	29
Temp-cooled* (C)				3.9			10.2	7.2	7.2		
pH (SU)			8.09	8.07	7.72	7.73	8	7.79	7.79	7.39	7.59
Specific Conductivity (umhos/cm)			24,000	20,300			20,000	16,600	16,600		20,800
Chlorine (Total)(mg/L)			<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

* Temperature of composite sample
 @ Composite sampling period 0930-0930 Hours
 # Composite sampling period 0900-0900 Hours
 E-comp Ecology composite sample
 O-comp Occidental composite sample

Table 2 (cont.) – Ecology Laboratory General Chemistry Results – Occidental, September 1992.

Parameter	Location:	OCCEff3	OCCEff4	AE109	AE1091	AE110	AE1101	AE1102	AE1103	AE111	AE1111
	Type:	grab	grab	grab	grab	grab	grab	grab	grab	grab	grab
	Date:	9/1/92	9/2/92	9/1/92	9/1/92	9/1/92	9/1/92	9/1/92	9/2/92	9/1/92	9/1/92
	Time:	1500	1020	1120	1330	1140	1400	1515	1040	1200	1420
	Lab Log #:	368288	368289								
GENERAL CHEMISTRY											
TSS (mg/L)		2									
NH3-N (mg/L)		.047									
Oil and Grease (mg/L)		<1									
FIELD OBSERVATIONS											
Temperature (C)		29.3	25.1	37.1	37.4	43	44.5	38.5	26.3	20.9	21.6
pH (SU)		7.41	7.52	7.69	7.63	7.21	7.19	7.52	7.36	7.72	7.69
Specific Conductivity (umhos/cm)											
Chlorine (Total)(mg/L)		<0.1									
AE109	Manhole AE 109										
AE110	Manhole AE 110										
AE111	Manhole AE 111										

Table 3 - Ecology Laboratory General Chemistry Results - Occidental, December 1992.

Parameter	Location:	CityTap	HyInfO	HyInf	HyInf1	HyInf2	OCCEffO	OCCEff	OCCEffD	OCCEff1
	Type:	grab	O-comp	E-comp	grab	grab	O-comp	E-comp	E-comp	grab
	Date:	12/7/92	12/7-8/92	12/7-8/92	12/7/92	12/7/92	12/7-8/92	12/7-8/92	12/7-8/92	12/7/92
	Time:	1040	#	#	1020	1420	@	@	@	1100
	Lab Log #:	508281	508282	508283	508284	508285	508286	508287	508288	508289
GENERAL CHEMISTRY										
Specific Conductivity (umhos/cm)			45700	45700			37300	38100	38100	
TSS (mg/L)			4	1	1	<1	<1	<1	<1	2
NH3-N (mg/L)			0.026	0.039	0.031	0.025	0.031	0.032	0.033	0.028
Oil and Grease (mg/L)					<1	<1				<1
FIELD OBSERVATIONS										
Temperature (C)					10.1	10.7				21.3
Temp-cooled* (C)			11.3	3.2			3.8	0.1	0.1	
pH (SU)			7.91	7.87	8.03	8.25	7.7	7.48	7.48	7.89
Chlorine (mg/L)										
Free			0.6				<0.1	<0.1	<0.1	<0.1
Total			0.6				<0.1	<0.1	<0.1	<0.1
* Temperature of composite sample										
@ Composite sampling period 0950-0950 Hours										
# Composite sampling period 1010-1010 Hours										
E-comp Ecology composite sample										
O-comp Occidental composite sample										

Table 3 (cont.) – Ecology Laboratory General Chemistry Results – Occidental, December 1992.

Parameter	Location:	OCCEff2	AE109	AE1091	AE110	AE1101	AE111	AE1111	AE1112
	Type:	grab	grab	grab	grab	grab	grab	grab	grab
	Date:	12/7/92	2/7/92	12/8/92	2/7/92	12/8/92	12/7/92	12/7/92	12/8/92
	Time:	1350	1110	1130	1120	1115	1130	1330	1100
	Lab Log #:	508291							
GENERAL CHEMISTRY									
Specific Conductivity (umhos/cm)									
TSS (mg/L)		<1							
NH3-N (mg/L)		0.024							
Oil and Grease (mg/L)		<1							
FIELD OBSERVATIONS									
Temperature (C)		20.3	6.6	25	17	18.4	15.4	16.6	15.8
pH (SU)		6.64	7.11	7.35	7.45	7.54	8.21	8.17	7.7
Chlorine (mg/L)									
Free		<0.1							
Total		<0.1							
AE109	Manhole AE 109								
AE110	Manhole AE 110								
AE111	Manhole AE 111								

Table 4 – VOA, BNA, and Metals Detected – Occidental, September 1992.

VOA Compounds	Location:	HyInf1	HyInf2	OCCEff1	OCCEff3					EPA Water Quality Criteria Summary		
	Type:	grab	grab	grab	grab					Acute Marine	Chronic Marine	
	Date:	9/1/92	9/1/92	9/1/92	9/1/92							
	Time:	1000	1435	1045	1500							
Lab Log#:	368282	368283	368286	368288								
	ug/L	ug/L	ug/L	ug/L					(ug/L)	(ug/L)		
Chloroform	U	U	3.6	3.5					12,000	*(a)	6,400	*(a)
1,1,1-Trichloroethane	U	U	U	1.7					31,200	*		
Trichloroethene	U	0.8 J	U	U					2,000	*		
cis-1,2-Dichloroethene	U	1.4	U	U					224,000	*(b)		

BNA Compounds	Location:	TransB	CityTap	HyInfO	HyInf	OCCEffO	OCCEff	OCCEffD		
	Type:	grab	grab	O-comp	E-comp	O-comp	E-comp	E-comp	Acute Marine	Chronic Marine
	Date:	9/1/92	9/1/92	9/2/92	9/2/92	9/2/92	9/2/92	9/2/92		
	Time:	1030	1100	@	@	#	#	#		
Lab Log#:	368280	368281	368284	368285	368290	368291	368292			
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	(ug/L)	(ug/L)
Phenol	U	U	U	U	U	0.2 J	0.2 J	U	5,800	*
Phenanthrene	U	U	U	0.2 J	U	0.1 J	0.08 J	U	300	*(n)
Anthracene	U	U	U	0.04 J	U	U	U	U	300	*(n)

Metals	Location:	TransB	CityTap	HyInfO	HyInf	OCCEffO	OCCEff	OCCEffD		
	Type:	grab	grab	O-comp	E-comp	O-comp	E-comp	E-comp	Acute Marine	Chronic Marine
	Date:	9/1/92	9/1/92	9/2/92	9/2/92	9/2/92	9/2/92	9/2/92		
	Time:	1030	1100	@	@	#	#	#		
Lab Log#:	368280	368281	368284	368285	368290	368291	368292			
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	(ug/L)	(ug/L)
Copper	U	U	U	U	U	2.2 P	U	U	2.9	
Lead	U	5 P	U	U	U	U	U	U	140	5.6
Nickel	U	U	U	U	2.3 P	3.1 P	3 P	U	75	8.3
Zinc	4.3 P	846	U	U	U	U	U	U	95	86

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.

@ Composite sampling period 0930-0930 Hours

Composite sampling period 0900-0900 Hours

U The analyte was not detected at the detection limit provided in Appendix F.

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 quantification limit.

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

a Total Halomethanes

b Total Dichloroethenes

n Total Polynuclear Aromatic Hydrocarbons

Table 5 – VOA, and Metals Detected – Occidental, December 1992.

VOA Compounds	Location:	Hylnf1	Hylnf2	OCCEff1	OCCEff2					EPA Water Quality Criteria Summary	
	Type:	grab	grab	grab	grab					Acute Marine	Chronic Marine
	Date:	12/7/92	12/7/92	12/7/92	12/7/92					(ug/L)	(ug/L)
	Time:	1020	1420	1100	1350						
	Lab Log#:	508284	508285	508289	508291						
		ug/L	ug/L	ug/L	ug/L						
Acetone		U	U	U	22						
Chloroform		U	U	4	U					12,000 *(a)	6,400 *(a)

Metals	Location:	TransB	CityTap	HylnfO	Hylnf	OCCEffO	OCCEff	OCCEffD	EPA Water Quality Criteria Summary	
	Type:	grab	grab	O-comp	E-comp	O-comp	E-comp	E-comp	Acute Marine	Chronic Marine
	Date:	12/7/92	12/7/92	12/8/92	12/8/92	12/8/92	12/8/92	12/8/92		
	Time:	1030	1040	@	@	#	#	#		
	Lab Log#:	508280	508281	508282	508283	508286	508287	508288	(ug/L)	(ug/L)
		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L		
Copper		U	U	U	U	U	U	2.6 J	2.9	
Lead		U	U	2.6 J	3.5 J	U	2.6 J	U	140	5.6
Mercury		U	U	U	0.11 P	U	U	U	2.1	0.025
Nickel		2.2 P	U	U	U	2.4 P	3 P	2.8 P	75	8.3
Zinc		6.2 J	156	U	U	U	U	U	95	86

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.

@ Composite sampling period 0950–0950 Hours

Composite sampling period 1010–1010 Hours

U The analyte was not detected at the detection limit provided in Appendix G.

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 quantification limit.

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

a Total Halomethanes

Table 6 – NPDES Permit Limitation/Ecology Inspection Data Comparison – Occidental, September 1992.

	NPDES Permit Limitations		Location:	OCCEff1	OCCEff3	OCCEff	OCCEffD
	Monthly Average	Daily Maximum	Type:	Grab	Grab	Comp	Comp
			Date:	9/1/92	9/1/92	9/1-2/92	9/1-2/92
			Lab Log #:	368286	368288	368291	368292
Flow (gallons/day)	N/A	24,500,000					
Temperature (C)	N/A	32		19.5	29.3		
TSS (lbs/day)*	348	697		290	290	144	290
Copper (ug/l)	9.3	13.2				2.2	<2.0
Lead (lbs/day)*	1.2	2.5				<0.29	<.29
Nickel (lbs/day)*	1.4	2.5				0.45	0.43
Total Residual Chlorine (ug/l)	12	35		<100	<100	<100	<100
pH		6.0 to 9.0		7.39	7.41		
Ammonia (lbs/day)*+	7.3	12.5		6.51	6.8	9.26	8.25

* Gross loadings based on a flow of 17.4 MGD.

+ Ammonia loading was calculated at the mixing box and not at Manhole AE109 as specified in the permit.

Table 7 – NPDES Permit Limitation/Ecology Inspection Data Comparison – Occidental, December 1992.

	NPDES Permit Limitations		Location:	OCCEff1	OCCEff2	OCCEff	OCCEffD
	Monthly Average	Daily Maximum	Type:	Grab	Grab	Comp	Comp
			Date:	12/7/92	12/7/92	12/7-8/92	12/7-8/92
			Lab Log #:	508289	508291	508287	508288
Flow (gallons/day)	N/A	24,500,000					
Temperature (C)	N/A	32		21.3	20.3		
TSS (lbs/day)*	348	697		233	<116	<116	<116
Copper (ug/l)	9.3	13.2				<2.0	<2.0
Lead (lbs/day)*	1.2	2.5				<0.23	0.3
Nickel (lbs/day)*	1.4	2.5				0.28	0.35
Total Residual Chlorine (ug/l)	12	35		<100	<100	<100	<100
pH		6.0 to 9.0		7.89	6.64		
Ammonia (lbs/day)*+	7.3	12.5		3.27	2.8	3.74	3.85

* Gross loadings based on a flow of 14.0 MGD.

+ Ammonia loading calculated at the mixing box and not at Manhole AE109 as specified in the permit.

Table 8 - Split Sample Results Comparison - Occidental, September 1992.

		Location:	HylnfO	Hylnf	OCCEffO	OCCEff	OCCEffD
		Type:	comp	comp	comp	comp	comp
		Date:	9/1-2/92	9/1-2/92	9/1-2/92	9/1-2/92	9/1-2/92
		Lab Log #:	368284	368285	368290	368291	368292
		Sampler:	Occidental	Ecology	Occidental	Ecology	Ecology
PARAMETER	Analyzed by:						
TSS (mg/L)	Ecology	4	3	<1	1	2	
	Occidental	15.4	15.5	10.3	9.4		
Copper (ug/L)	Ecology	20 U	20 U	20 U	2.2 P	2 U	
	Occidental	37	2	3	3		
Nickel (ug/L)	Ecology	2 U	2 U	2.3 P	3.1 P	3 P	
	Occidental	6	1	7	7		
Lead (ug/L)	Ecology	2 U	2 U	2 U	2 U	2 U	
	Occidental	2	2	3	3		

Table 9 - Split Sample Results Comparison - Occidental, December 1992.

		Location:	HyInfO	HyInf	OCCE#O	OCCE#	OCCE#D
		Type:	comp	comp	comp	comp	comp
		Date:	12/7-8/92	12/7-8/92	12/7-8/92	12/7-8/92	12/7-8/92
		Lab Log #:	508282	508283	508286	508287	508288
		Sampler:	Occidental	Ecology	Occidental	Ecology	Ecology
PARAMETER	Analyzed by:						
TSS (mg/L)	Ecology	4	1	<1	<1	<1	
	Occidental	13.8	14	7.9	7.8		
Copper (ug/L)	Ecology	2 UJ	2 UJ	2 UJ	2 UJ	2.6 J	
	Occidental	3	3	6	8		
Nickel (ug/L)	Ecology	2 U	2 U	2.4 J	3 P	2.8 P	
	Occidental	3	3	7	9		
Lead (ug/L)	Ecology	2.6 J	3.5 J	2 UJ	2.6 J	2 UJ	
	Occidental	2	2	3	3		

Table 10 - Effluent Bioassay Results - Occidental, September 1992.

NOTE: all tests were run on the effluent (OEFFBA sample) - lab log # 368293

Sea Urchin gametes (*Arbacia punctulata*) 80 - Minute Acute Exposure Test

<u>Sample</u>	<u># Tested*</u>	<u>Mean Percent Fertilization</u>
Control	8000	77
1.56	8000	78
3.12	8000	70.6
6.25	8000	60.8
12.5	8000	50.2
25	8000	30.7
50	8000	11.8
100	8000	0

* 4 replicates of 2000 eggs

EC50 = 17.87% Effluent
 NOEC for Fertilization = 6.25% Effluent

Silverside Minnow (*Menidia beryllina*) - 7-Day Static Renewal Short Term Chronic Toxicity Test

<u>Sample</u>	<u># Tested*</u>	<u>Mean Percent Survival</u>	<u>Mean Dry Weight per Organism</u>
Control	40	93	1.02
6.25 % Effluent	40	80	1.35
12.5 % Effluent	40	78	1.40
25 % Effluent	40	48	1.89
50 % Effluent	40	95	1.08
100 % Effluent	40	93	1.26

* 4 replicates of 10 organisms

LC50 = >100%
 NOEC for Growth = 100%

Table 10 (cont.) - Effluent Bioassay Results - Occidental, September 1992.

Mysidopsis bahia - 7-Day Static Renewal Short Term Chronic Toxicity Test

<u>Sample</u>	<u># Tested*</u>	<u>Mean Percent Survival</u>	<u>Mean Dry Weight per Organism</u>	<u>Mean % Fecundity</u>
Control	40	95	.38	100
6.25 % Effluent	40	95	.35	100
12.5 % Effluent	40	98	.37	93
25 % Effluent	40	98	.35	100
50 % Effluent	40	100	.39	94
100 % Effluent	40	98	.38	93

* 8 replicates of 5 organisms

LC50 = >100%

NOEC for Survival = 100%

NOEC for Growth = 100%

NOEC for Fecundity = 100%

Mysidopsis bahia - 48-Hour Static Renewal Acute Toxicity Test

24

<u>Sample</u>	<u># Tested*</u>	<u>Mean Percent Survival</u>
Control	40	100
6.25 % Effluent	40	100
12.5 % Effluent	40	100
25 % Effluent	40	93
50 % Effluent	40	90
100 % Effluent	40	70

* 4 replicates of 10 organisms

LC50 = >100%

NOEC for Survival = 100%

Table 10 (cont.) - Effluent Bioassay Results - Occidental, September 1992.

Sheepshead Minnow (Cyprinodon variegatus) - 48-Hour Static Renewal Acute Toxicity Test

<u>Sample</u>	<u># Tested*</u>	<u>Mean Percent Survival</u>
Control	40	100
6.25 % Effluent	40	100
12.5 % Effluent	40	100
25 % Effluent	40	100
50 % Effluent	40	100
100 % Effluent	40	100

* 4 replicates of 10 organisms

LC50 = >100%

NOEC for Survival = 100%

Sand Dab (Citharichthys sp) - 48-Hour Static Renewal Acute Toxicity Test

25

<u>Sample</u>	<u># Tested*</u>	<u>Mean Percent Survival</u>
Control	40	95
6.25 % Effluent	40	45
12.5 % Effluent	40	60
25 % Effluent	40	35
50 % Effluent	40	35
100 % Effluent	40	0

**# 4 replicates of 10 organisms

LC50 = 12.1%

NOEC for Survival = 50%

Table 10 (cont.) - Effluent Bioassay Results - Occidental, September 1992.

Inland Silverside (Menidia beryllina) - 48-Hour Static Renewal Acute Toxicity Test

<u>Sample</u>	<u># Tested*</u>	<u>Mean Percent Survival</u>
Control	40	100
6.25 % Effluent	40	100
12.5 % Effluent	40	100
25 % Effluent	40	100
50 % Effluent	40	100
100 % Effluent	40	100

* 4 replicates of 10 organisms

LC50 = >100%

NOEC for Survival = 100%

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 11 - Effluent Bioassay Results - Occidental, December 1992.

NOTE: all tests were run on the effluent (OEFFBA sample) - lab log # 508293

Sea Urchin gametes (*Arbacia punctulata*) 80 - Minute Acute Exposure Test

<u>Sample</u>	<u># Tested*</u>	<u>Mean Percent Fertilization</u>
Control	8000	83
1.56	8000	79
3.12	8000	75
6.25	8000	72
12.5	8000	68
25	8000	72
50	8000	71
100	8000	69

* 4 replicates of 2000 eggs

EC50 = >100% Effluent
 NOEC for Fertilization = 50% Effluent

Silverside Minnow (*Menidia beryllina*) - 7-Day Static Renewal Short Term Chronic Toxicity Test

<u>Sample</u>	<u># Tested*</u>	<u>Mean Percent Survival</u>	<u>Mean Dry Weight per Organism</u>
Control	10	95	1.4
6.25 % Effluent	10	100	1.49
12.5 % Effluent	10	95	1.54
25 % Effluent	10	100	1.40
50 % Effluent	10	98	1.56
100 % Effluent	10	95	1.63

* 4 replicates of 10 organisms

LC50 = >100%
 NOEC for Growth = 100%

Table 11 (cont.) - Effluent Bioassay Results - Occidental, December 1992.

Mysidopsis bahia - 7-Day Static Renewal Short Term Chronic Toxicity Test

<u>Sample</u>	<u># Tested*</u>	<u>Mean Percent Survival</u>	<u>Mean Dry Weight per Organism</u>	<u>Mean % Fecundity</u>
Control	40	100	.30	100
6.25 % Effluent	40	98	.34	100
12.5 % Effluent	40	93	.35	100
25 % Effluent	40	98	.31	100
50 % Effluent	40	95	.35	86
100 % Effluent	40	98	.34	91

* 8 replicates of 5 organisms

LC50 = >100%

NOEC for Survival = 100%

NOEC for Growth = 100%

NOEC for Fecundity = 100%

Mysidopsis bahia - 48-Hour Static Renewal Acute Toxicity Test

<u>Sample</u>	<u># Tested*</u>	<u>Mean Percent Survival</u>
Control	40	93
6.25 % Effluent	40	93
12.5 % Effluent	40	100
25 % Effluent	40	100
50 % Effluent	40	90
100 % Effluent	40	93

* 4 replicates of 10 organisms

LC50 = >100%

NOEC for Survival = 100%

Table 11 (cont.) - Effluent Bioassay Results - Occidental, December 1992.

Sheepshead Minnow (*Cyprinodon variegatus*) - 48-Hour Static Renewal Acute Toxicity Test

<u>Sample</u>	<u># Tested*</u>	<u>Mean Percent Survival</u>
Control	40	100
6.25 % Effluent	40	100
12.5 % Effluent	40	100
25 % Effluent	40	100
50 % Effluent	40	100
100 % Effluent	40	100

* 4 replicates of 10 organisms

LC50 = >100%

NOEC for Survival = 100%

Sand Dab (*Citharichthys* sp) - 48-Hour Static Renewal Acute Toxicity Test

29

<u>Sample</u>	<u># Tested*</u>	<u>Mean Percent Survival</u>
Control	40	100
6.25 % Effluent	40	100
12.5 % Effluent	40	100
25 % Effluent	40	100
50 % Effluent	40	95
100 % Effluent	40	100

* 4 replicates of 10 organisms

LC50 = >100%

NOEC for Survival = 100%

Table 11 (cont.) - Effluent Bioassay Results - Occidental, December 1992.

Inland Silverside (Menidia beryllina) - 48-Hour Static Renewal Acute Toxicity Test

<u>Sample</u>	<u># Tested*</u>	<u>Mean Percent Survival</u>
Control	40	98
6.25 % Effluent	40	100
12.5 % Effluent	40	100
25 % Effluent	40	100
50 % Effluent	40	100
100 % Effluent	40	100

* 4 replicates of 10 organisms

LC50 = >100%

NOEC for Survival = 100%

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

APPENDICES

**Appendix A - Priority Pollutant Cleaning Methodology - Occidental
September and December 1992.**

Priority Pollutant Cleaning Methodology

1. Wash with laboratory grade detergent (Liqui-Nox).
2. Rinse several times with tap water.
3. Rinse with 10% nitric acid solution.
4. Rinse three (3) times with distilled/deionized water.
5. Rinse with reagent-grade methylene chloride.
6. Rinse with reagent-grade acetone.
7. Allow to air dry and seal with aluminum foil.

Appendix B - Ecology Sampling Schedule and Parameters Analyzed - Occidental, September 1992.

Parameter	Location:	TransB	CityTap	HylnfO	Hylnf	Hylnf1	Hylnf2	OCCEffO	OCCEff	OCCEffD	OCCEff1	OCCEff2	OCCEff3
	Type:	grab	grab	O-comp	E-comp	grab	grab	O-comp	E-comp	E-comp	grab	grab	grab
	Date:	9/1/92	9/1/92	9/1-2/92	9/1-2/92	9/1/92	9/1/92	9/1-2/92	9/1-2/92	9/1-2/92	9/1/92	9/1/92	9/1/92
	Time:	1030	1100	@	@	10000	1435	#	#	#	1045	1305	1500
	Lab Log #:	368280	368281	368284	368285	368282	368283	368290	368291	368292	368286	368287	368288
GENERAL CHEMISTRY													
TSS				1	1	1	1	1	1	1	1	1	1
NH3-N				1	1	1	1	1	1	1	1	1	1
Oil and Grease (water)						1	1				1		1
ORGANICS													
VOC (water)						1	1				1		1
BNAs (water)					1				1	1			
Pest/PCB (water)					1				1	1			
METALS													
PP Metals (water)		1	1	1	1			1	1	1			
BIOASSAYS													
Sheepshead Minnow (acute)													
Inland Silverside (acute)													
Inland Silverside (chronic)													
Mysid (acute)													
Mysid (chronic)													
Sanddab (acute)													
Echinoderm sperm cell													
FIELD OBSERVATIONS													
Temperature						1	1				1	1	1
Temp-cooled*						1	1	1	1				
pH				1	1	1	1	1	1		1	1	1
Conductivity				1	1	1	1	1	1			1	
Chlorine			1	1	1	1	1				1	1	1

- * Temperature of composite sample
- @ Composite sampling period 0930-0930 Hours
- # Composite sampling period 0900-0900 Hours
- E-comp Ecology composite sample
- O-comp Occidental composite sample

Appendix B (cont.) - Ecology Sampling Schedule and Parameters Analyzed - Occidental, September 1992.

Parameter	Location:	OCCEff4	OEffBA	AE109	AE1091	AE110	AE1101	AE1102	AE1103	AE111	AE1111
	Type:	grab	gr-comp	grab	grab	grab	grab	grab	grab	grab	grab
	Date:	9/2/92	9/1/92								
	Time:	1020									
	Lab Log #:	368289	368293								

GENERAL CHEMISTRY

TSS

NH3-N

Oil and Grease (water)

ORGANICS

VOC (water)

BNAs (water)

Pest/PCB (water)

METALS

PP Metals (water)

BIOASSAYS

Sheepshead Minnow (acute) 1

Inland Silverside (acute) 1

Inland Silverside (chronic) 1

Mysid (acute) 1

Mysid (chronic) 1

Sanddab (acute) 1

Echinoderm sperm cell 1

FIELD OBSERVATIONS

Temperature 1 1 1 1 1 1 1 1 1 1

Temp-cooled* 1 1 1 1 1 1 1 1 1 1

pH 1 1 1 1 1 1 1 1 1 1

Conductivity 1 1 1 1 1 1 1 1 1 1

Chlorine 1 1 1 1 1 1 1 1 1 1

OEffBA Occidental Effluent Bioassay

AE109 Manhole AE109

AE110 Manhole AE110

AE111 Manhole AE111

Appendix C - Ecology Sampling Schedule and Parameters Analyzed - Occidental, December 1992.

Parameter	Location:	TransB	CityTap	HyInfO	HyInf	HyInf1	HyInf2	OCCEffO	OCCEff	OCCEffD	OCCEff1	OCCEff2	OEffBA
	Type:	grab	grab	O-comp	E-comp	grab	grab	O-comp	E-comp	E-comp	grab	grab	gr-comp
	Date:	12/7/92	12/7/92	12/7-8/92	12/7-8/92	12/7/92	12/7/92	12/7-8/92	12/7-8/92	12/7-8/92	12/7/92	12/7/92	12/7/92
	Time:	1000	1040	@	@	1020	1420	#	#	#	1100	1350	
	Lab Log #:	508280	508281	508282	508283	508284	508285	508286	508287	508288	508289	508291	508293
GENERAL CHEMISTRY													
TSS				1	1	1	1	1	1	1	1	1	1
NH3-N				1	1	1	1	1	1	1	1	1	1
Oil and Grease (water)						1	1				1	1	
ORGANICS													
VOC (water)						1	1				1	1	
BNAs (water)					1				1	1			
Pest/PCB (water)					1				1	1			
METALS													
PP Metals (water)		1	1	1	1			1	1	1			
BIOASSAYS													
Sheepshead Minnow (acute)													1
Inland Silverside (acute)													1
Inland Silverside (chronic)													1
Mysid (acute)													1
Mysid (chronic)													1
Sanddab (acute)													1
Echinoderm sperm cell													1
FIELD OBSERVATIONS													
Temperature						1	1				1	1	
Temp-cooled*				1	1			1	1				
pH				1	1	1	1	1	1		1	1	
Conductivity													
Chlorine													
Free		1						1	1	1	1	1	1
Total		1						1	1	1	1	1	1

* Temperature of composite sample
 @ Composite sampling period 0950-0950 Hours
 # Composite sampling period 1010-1010 Hours
 E-comp Ecology composite sample
 O-comp Occidental composite sample
 OEffBA Occidental Effluent Bioassay

Appendix C (cont.) - Ecology Sampling Schedule and Parameters Analyzed - Occidental, December 1992.

Parameter	Location:	AE109	AE1091	AE110	AE1101	AE111	AE1111	AE1112
	Type:	grab	grab	grab	grab	grab	grab	grab
	Date:	12/7/92	12/8/92	12/7/92	12/8/92	12/7/92	12/7/92	12/8/92
	Time:	1110	1130	1120	1115	1130	1330	1100
	Lab Log #:							

GENERAL CHEMISTRY

TSS

NH3-N

Oil and Grease (water)

ORGANICS

VOC (water)

BNAs (water)

Pest/PCB (water)

METALS

PP Metals (water)

BIOASSAYS

Sheepshead Minnow (acute)

Inland Silverside (acute)

Inland Silverside (chronic)

Mysid (acute)

Mysid (chronic)

Sanddab (acute)

Echinoderm sperm cell

FIELD OBSERVATIONS

Temperature

Temp-cooled*+

pH

Conductivity

Chlorine

Free

Total

AE109 Manhole AE 109
 AE110 Manhole AE 110
 AE111 Manhole AE 111

Appendix D – Ecology Analytical Methods and Laboratories Used – Occidental, September 1992.

<u>Parameter</u>	<u>Method</u>	<u>Laboratory</u>
Conductivity	EPA Method 120.1	Manchester Laboratory
TSS	EPA Method 160.2	Manchester Laboratory
NH ₃ -N	EPA Method 350.1	Manchester Laboratory
Oil and Grease	EPA Method 405.1	Water Management Laboratories, Inc.
VOA	EPA Method 624	Analytical Resources, Inc.
BNA	EPA Method 625	Manchester Laboratory
Pest/PCB	EPA Method 8080	Manchester Laboratory
PP Metals	EPA Method 220.2	Manchester Laboratory
Sea Urchin	EPA/600/4-87/028	AnalytiKEM Incorporated
Inland Silverside (acute)	EPA/600/4-90/027	AnalytiKEM Incorporated
Inland Silverside (chronic)	EPA/600/4-87/028	AnalytiKEM Incorporated
Sheepshead Minnow (acute)	EPA/600/4-90/027	AnalytiKEM Incorporated
Sandab (acute)	EPA/600/4-90/027	AnalytiKEM Incorporated
Mysid (acute)	EPA/600/4-90/027	AnalytiKEM Incorporated
Mysid (chronic)	EPA/600/4-87/028	AnalytiKEM Incorporated

Method Bibliography

EPA, Revised 1983. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020 (Reev. March, 1983).

EPA, 1986: SW846. Test Methods for Evaluating Solid Waste Physical/Chemical Methods, SW-846, 3rd. ed. November, 1986.

EPA, 1987. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms. Second Edition. EPA/600/4-87/028.

EPA, Revised 1990. Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms. EPA/600/4-90/027.

Appendix E – Ecology Analytical Methods and Laboratories Used – Occidental, December 1992.

<u>Parameter</u>	<u>Method</u>	<u>Laboratory</u>
Conductivity	EPA Method 120.1	Manchester Laboratory
TSS	EPA Method 160.2	Manchester Laboratory
NH3-N	EPA Method 350.1	Manchester Laboratory
Oil and Grease	EPA Method 413.1	Manchester Laboratory
VOA	EPA Method 624	Laucks Testing Laboratory
BNA	EPA Method 625	Laucks Testing Laboratory
Pest/PCB	EPA Method 608	Laucks Testing Laboratory
PP Metals	EPA Method 220.2	Manchester Laboratory
Sea Urchin	EPA/600/4-87/028	AnalytiKEM Incorporated
Inland Silverside (acute)	EPA/600/4-90/027	AnalytiKEM Incorporated
Inland Silverside (chronic)	EPA/600/4-87/028	AnalytiKEM Incorporated
Sheepshead Minnow (acute)	EPA/600/4-90/027	AnalytiKEM Incorporated
Sandab (acute)	EPA/600/4-90/027	AnalytiKEM Incorporated
Mysid (acute)	EPA/600/4-90/027	AnalytiKEM Incorporated
Mysid (chronic)	EPA/600/4-87/028	AnalytiKEM Incorporated

Method Bibliography

EPA, Revised 1983. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020 (Reev. March, 1983).

EPA, 1986: SW846. Test Methods for Evaluating Solid Waste Physical/Chemical Methods, SW-846, 3rd. ed. November, 1986.

EPA, 1987. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms. Second Edition. EPA/600/4-87/028.

EPA, Revised 1990. Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms. EPA/600/4-90/027.

Appendix F – VOA, BNA, Pesticide/PCB and Metals Results – Occidental, September 1992.

VOA Compounds	Location: Type: Date: Time: Lab Log#:	Hylnf1 grab 9/1/92 1000 368282 ug/L	Hylnf2 grab 9/1/92 1435 368283 ug/L	OCCEff1 grab 9/1/92 1045 368286 ug/L	OCCEff3 grab 9/1/92 1500 368288 ug/L
Chloromethane		2 U	2 U	2 U	2 U
Bromomethane		2 U	2 U	2 U	2 U
Vinyl Chloride		2 U	2 U	2 U	2 U
Chloroethane		2 U	2 U	2 U	2 U
Methylene Chloride		2 U	2 U	2 U	2 U
Acetone		6 U	5 U	5 U	5 U
Carbon Disulfide		1 U	1 U	1 U	1 U
1,1-Dichloroethene		1 U	1 U	1 U	1 U
1,1-Dichloroethane		1 U	1 U	1 U	1 U
1,2-Dichloroethene (total)		1 U	1 U	1 U	1 U
Chloroform		1 U	1 U	3.6	3.5
1,2-Dichloroethane		1 U	1 U	1 U	1 U
2-Butanone (MEK)		5 U	5 U	1 U	1 U
1,1,1-Trichloroethane		1 U	1 U	1 U	1.7
Carbon Tetrachloride		1 U	1 U	1 U	1 U
Vinyl Acetate		1 U	1 U	1 U	1 U
Bromodichloromethane		1 U	1 U	1 U	1 U
1,2-Dichloropropane		1 U	1 U	1 U	1 U
cis-1,3-Dichloropropene		1 U	1 U	1 U	1 U
Trichloroethene		1 U	0.8 J	1 U	1 U
Dibromochloromethane		1 U	1 U	1 U	1 U
1,1,2-Trichloroethane		1 U	1 U	1 U	1 U
Benzene		1 U	1 U	1 U	1 U
trans-1,3-Dichloropropene		1 U	1 U	1 U	1 U
Bromoform		1 U	1 U	1 U	1 U
4-Methyl-2-Pentanone (MIBK)		5 U	5 U	5 U	5 U
2-Hexanone		5 U	5 U	5 U	5 U
Tetrachloroethene		1 U	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane		1 U	1 U	1 U	1 U
Toluene		1 U	1 U	1 U	1 U
Chlorobenzene		1 U	1 U	1 U	1 U
Ethylbenzene		1 U	1 U	1 U	1 U
Styrene		1 U	1 U	1 U	1 U
Total Xylenes		2 U	2 U	2 U	2 U
1,3-Dichloropropane		2 U	2 U	2 U	2 U
tert-Butylbenzene		2 U	2 U	2 U	2 U
cis-1,2-Dichloroethene		1 U	1.4	1 U	1 U
Trichlorofluoromethane		2 U	2 U	2 U	2 U
1,1,2-Trichloro-1,2,2-Trifluoroethane		2 U	2 U	2 U	2 U

Appendix F (cont.) – VOA, BNA, Pesticide/PCB and Metals Results – Occidental, September 1992.

	Location:	TransB	CityTap	HylInfo	HylInfo	OCCEffO	OCCEff	OCCEffD
	Type:	grab	grab	O-comp	E-comp	O-comp	E-comp	E-comp
	Date:	9/1/92	9/1/92	9/2/92	9/2/92	9/2/92	9/2/92	9/2/92
	Time:	1030	1100	@	@	#	#	#
BNA Compounds	Lab Log#:	368280	368281	368284	368285	368290	368291	368292
		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
1-Methylnaphthalene					1 U		2 U	2 U
Retene					1 U		2 U	2 U
Dibutyl Phthalate					1 UJ		2 U	2 U
o-Chlorophenol					1 U		2 U	2 U
Carbazole					7 UJ		9 UJ	210 UJ
Phenol					1 U		0.2 J	0.2 J
Bis(2-Chloroethyl)Ether					1 U		2 U	2 U
2-Chlorophenol					1 U		2 U	2 U
1,3-Dichlorobenzene					1 U		2 U	2 U
1,4-Dichlorobenzene					1 U		2 U	2 U
Benzyl Alcohol					29 UJ		35 UJ	41 UJ
1,2-Dichlorobenzene					1 U		2 U	2 U
2-Methylphenol					1 U		2 U	2 U
Bis(2-Chloroisopropyl)Ether					1 U		2 U	2 U
4-Methylphenol					1 U		2 U	2 U
N-Nitroso-di-n-Propylamine					1 U		2 U	2 U
Hexachloroethane					1 U		2 U	2 U
Nitrobenzene					1 U		2 U	2 U
Isophorone					1 U		2 U	2 U
2-Nitrophenol					4 U		4 U	5 U
2,4-Dimethylphenol					1 U		2 U	2 U
Benzoic Acid					18 UJ		22 UJ	26 UJ
Bis(2-Chloroethoxy)Methane					1 U		2 U	2 U
2,4-Dichlorophenol					1 U		2 U	2 U
1,2,4-Trichlorobenzene					1 U		2 U	2 U
Naphthalene					1 U		2 U	2 U
4-Chloroaniline					18 U		22 U	26 U
Hexachlorobutadiene					4 U		4 U	5 UJ
4-Chloro-3-Methylphenol					7 UJ		9 UJ	10 UJ
2-Methylnaphthalene					1 U		2 U	2 U
Hexachlorocyclopentadiene					7 U		9 U	10 UJ
2,4,6-Trichlorophenol					4 U		4 U	5 U
2,4,5-Trichlorophenol					7 U		9 U	10 U
2-Chloronaphthalene					1 U		2 U	2 U
2-Nitroaniline					4 U		4 U	5 U
Dimethyl Phthalate					1 U		2 U	2 U
Acenaphthylene					1 U		2 U	2 U
2,6-Dinitrotoluene					4 U		4 U	5 U
Acenaphthene					1 U		2 U	2 U
2,4-Dinitrophenol					18 UJ		22 UJ	26 UJ
4-Nitrophenol					9 UJ		11 UJ	13 UJ
Dibenzofuran					1 U		2 U	2 U
2,4-Dinitrotoluene					4 UJ		4 UJ	5 U
Diethyl Phthalate					1 UJ		2 UJ	2 UJ
4-Chlorophenyl Phenylether					1 U		2 U	2 U
Fluorene					1 U		2 U	2 U
4-Nitroaniline					18 UJ		22 UJ	26 UJ
4,6-Dinitro-2-Methylphenol					18 UJ		22 UJ	26 UJ
N-Nitrosodiphenylamine					1 UJ		2 UJ	2 U
4-Bromophenyl Phenylether					1 U		2 U	2 U
Hexachlorobenzene					1 U		2 U	2 U
Pentachlorophenol					7 UJ		9 UJ	10 UJ
Phenanthrene					0.2 J		0.1 J	0.08 J
Anthracene					0.04 J		2 U	2 U
Di-n-Butyl Phthalate					1 UJ		2 UJ	2 UJ
Fluoranthene					1 U		2 U	2 U
Pyrene					1 U		2 U	2 U
Butylbenzyl Phthalate					1 UJ		2 UJ	2 UJ
3,3'-Dichlorobenzidine					36 U		43 U	52 U
Benzo(a)Anthracene					1 U		2 U	2 U
Chrysene					1 U		2 U	2 U
Bis(2-Ethylhexyl)Phthalate					1 UJ		15 UJ	2 UJ
Di-n-Octyl Phthalate					1 UJ		2 UJ	2 UJ
Benzo(b)Fluoranthene					1 U		2 U	2 U
Benzo(k)Fluoranthene					1 U		2 U	2 U
Benzo(a)Pyrene					1 U		2 U	2 U
Indeno(1,2,3-cd)Pyrene					1 U		2 U	2 U
Dibenzo(a,h)Anthracene					4 U		4 U	5 U
Benzo(g,h,i)Perylene					1 U		2 U	2 U

Appendix F (cont.) – VOA, BNA, Pesticide/PCB and Metals Results – Occidental, September 1992.

Location:	TransB	CityTap	HyInfO	HyInf	OCCEffO	OCCEff	OCCEffD
Type:	grab	grab	O-comp	E-comp	O-comp	E-comp	E-comp
Date:	9/1/92	9/1/92	9/2/92	9/2/92	9/2/92	9/2/92	9/2/92
Time:	1030	1100	@	@	#	#	#
Lab Log#:	368280	368281	368284	368285	368290	368291	368292
Pesticide/PCB Compounds							
alpha-BHC				0.015 U		0.017 U	0.021 U
beta-BHC				0.015 U		0.017 U	0.021 U
delta-BHC				0.015 U		0.017 U	0.021 U
gamma-BHC (Lindane)				0.015 U		0.017 U	0.021 U
Heptachlor				0.015 U		0.017 U	0.021 U
Aldrin				0.015 U		0.017 U	0.021 U
Heptachlor Epoxide				0.015 U		0.017 U	0.021 U
Endosulfan I				0.015 U		0.017 U	0.021 U
Dieldrin				0.015 U		0.017 U	0.021 U
4,4'-DDE				0.015 U		0.017 U	0.021 U
Endrin				0.015 U		0.017 U	0.021 U
Endosulfan II				0.015 U		0.017 U	0.021 U
4,4'-DDD				0.015 U		0.017 U	0.021 U
Endosulfan Sulfate				0.015 U		0.017 U	0.021 U
4,4'-DDT				0.015 U		0.017 U	0.021 U
Methoxychlor				0.015 U		0.52 U	0.021 U
Endrin Ketone				0.015 U		0.017 U	0.021 U
Toxaphene				0.44 U		1 U	0.62 U
Aroclor-1016				0.15 U		0.35 U	0.2 U
Aroclor-1221				0.15 U		0.35 U	0.2 U
Aroclor-1232				0.38 U		0.87 U	0.51 U
Aroclor-1242				0.15 U		0.35 U	0.2 U
Aroclor-1248				0.15 U		0.35 U	0.2 U
Aroclor-1254				0.15 U		0.35 U	0.2 U
Aroclor-1260				0.15 U		0.35 U	0.2 U
Endrin Aldehyde				0.015 U		0.017 U	0.021 U
Chlordane				0.075 U		0.087 U	0.1 U

Metals

Antimony	30 U	30 U	150 U	150 U	150 U	150 U	150 U
Arsenic	3 UN	3 UN	3 UN	3 UN	3 UN	3 UN	3 UN
Beryllium	1 U	1 U	5 U	5 U	5 U	5 U	5 U
Cadmium	2 U	2 U	10 U	10 U	10 U	10 U	10 U
Chromium	5 UN	5 UN	60 UN	60 UN	60 UN	60 UN	60 UN
Copper	3 U	3 U	20 U	20 U	20 U	2.2 P	2 U
Lead	2 U	5 P	2 U	2 U	2 U	2 U	2 U
Mercury	0.1 U	0.05 U	0.1 U	0.05 U	0.05 U	0.05 U	0.05 U
Nickel	2 U	10 U	2 U	2 U	2.3 P	3.1 P	3 P
Selenium	4 UN	4 UN	4 UN	4 UN	4 UN	4 UN	4 UN
Silver	3 UN	3 UN	15 UN	15 UN	15 UN	15 UN	15 UN
Thallium	5 UN	5 UN	5 UN	5 UN	5 UN	5 UN	5 UN
Zinc	4.3 P	846	20 U	20 U	20 U	20 U	20 U

@ Composite sampling period 0930–0930 Hours

Composite sampling period 0900–0900 Hours

U The analyte was not detected at or above the reported result.

UU 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.

N For organic analytes there is evidence the analyte is present in the sample.

P The analyte was detected above the instrument detection limit but below the established minimum quantification limit.

Appendix G – VOA, BNA, Pesticide/PCB and Metals Results – Occidental, December 1992.

VOA Compounds	Location: Type: Date: Time: Lab Log#:	Hylnf1 grab 12/7/92 1020 508284 ug/L	Hylnf2 grab 12/7/92 1420 508285 ug/L	OCCEff1 grab 12/7/92 1100 508289 ug/L	OCCEff2 grab 12/7/92 1350 508291 ug/L
Chloromethane		1 U	1 U	1 U	1 U
Bromomethane		1 U	1 U	1 U	1 U
Vinyl Chloride		1 U	1 U	1 U	1 U
Chloroethane		2 U	2 U	2 U	2 U
Methylene Chloride		10 U	10 U	10 U	10 U
Acetone		U	U	U	22
1,1-Dichloroethene		1 U	1 U	1 U	1 U
1,1-Dichloroethane		1 U	1 U	1 U	1 U
1,2-Dichloroethene (total)		1 U	1 U	1 U	1 U
Chloroform		1 U	1 U	4	5
1,2-Dichloroethane		1 U	1 U	1 U	1 U
1,1,1-Trichloroethane		1 U	1 U	1 U	1 U
Carbon Tetrachloride		1 U	1 U	1 U	1 U
Bromodichloromethane		1 U	1 U	1 U	1 U
1,2-Dichloropropane		1 U	1 U	1 U	1 U
cis-1,3-Dichloropropene		1 U	1 U	1 U	1 U
Trichloroethene		1 U	1 U	1 U	1 U
Dibromochloromethane		1 U	1 U	1 U	1 U
1,1,2-Trichloroethane		1 U	1 U	1 U	1 U
Benzene		1 U	1 U	1 U	1 U
trans-1,3-Dichloropropene		1 U	1 U	1 U	1 U
Bromoform		1 U	1 U	1 U	1 U
Tetrachloroethene		1 U	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane		1 U	1 U	1 U	1 U
Toluene		1 U	1 U	1 U	1 U
Chlorobenzene		1 U	1 U	1 U	1 U
Ethylbenzene		1 U	1 U	1 U	1 U
1,3-Dichloropropane		1 U	1 U	1 U	1 U
1,2-Dichlorobenzene		1 U	1 U	1 U	1 U
Trichlorofluoromethane		1 U	1 U	1 U	1 U
1,3-Dichlorobenzene		1 U	1 U	1 U	1 U
1,4-Dichlorobenzene		1 U	1 U	1 U	1 U

Appendix G (cont.) – VOA, BNA, Pesticide/PCB and Metals Results – Occidental, December 1992.

	Location:	TransB	CityTap	HylInfo	HylInfo	OCCEffO	OCCEff	OCCEffD
	Type:	grab	grab	O-comp	E-comp	O-comp	E-comp	E-comp
	Date:	12/7/92	12/7/92	12/8/92	12/8/92	12/8/92	12/8/92	12/8/92
	Time:	1030	1040	@	@	#	#	#
	Lab Log#:	508280	508281	508282	508283	508286	508287	508288
BNA Compounds		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Dibutyl Phthalate					1 U		1 U	1 U
o-Chlorophenol					1 U		1 U	1 U
1,2-Diphenylhydrazine					2 U		2 U	2 U
Phenol					1 U		1 U	1 U
Bis(2-Chloroethyl)Ether					1 U		1 U	1 U
2-Chlorophenol					1 U		1 U	1 U
1,3-Dichlorobenzene					1 U		1 U	1 U
1,4-Dichlorobenzene					1 U		1 U	1 U
1,2-Dichlorobenzene					1 U		1 U	1 U
Bis(2-Chloroisopropyl)Ether					1 U		1 U	1 U
N-Nitroso-di-n-Propylamine					1 U		1 U	1 U
Hexachloroethane					2 U		2 U	2 U
Nitrobenzene					1 U		1 U	1 U
Isophorone					1 U		1 U	1 U
2-Nitrophenol					2 U		2 U	2 U
2,4-Dimethylphenol					1 U		1 U	1 U
Bis(2-Chloroethoxy)Methane					1 U		1 U	1 U
2,4-Dichlorophenol					2 U		2 U	2 U
1,2,4-Trichlorobenzene					1 U		1 U	1 U
Naphthalene					1 U		1 U	1 U
Hexachlorobutadiene					1 U		1 U	1 U
4-Chloro-3-Methylphenol					2 U		2 U	2 U
Hexachlorocyclopentadiene					2 U		2 U	2 U
2,4,6-Trichlorophenol					2 U		2 U	2 U
2-Chloronaphthalene					1 U		1 U	1 U
Dimethyl Phthalate					1 U		1 U	1 U
Acenaphthylene					1 U		1 U	1 U
2,6-Dinitrotoluene					2 U		2 U	2 U
Acenaphthene					1 U		1 U	1 U
2,4-Dinitrophenol					10 U		10 U	10 U
4-Nitrophenol					10 U		10 U	10 U
2,4-Dinitrotoluene					2 U		2 U	2 U
Diethyl Phthalate					1 U		1 U	1 U
4-Chlorophenyl Phenylether					1 U		1 U	1 U
Fluorene					1 U		1 U	1 U
4,6-Dinitro-2-Methylphenol					10 U		10 U	10 U
N-Nitrosodiphenylamine					1 U		1 U	1 U
4-Bromophenyl Phenylether					2 U		2 U	2 U
Hexachlorobenzene					2 U		2 U	2 U
Pentachlorophenol					10 U		10 U	10 U
Phenanthrene					1 U		1 U	1 U
Anthracene					1 U		1 U	1 U
Di-n-Butyl Phthalate					1 U		1 U	1 U
Fluoranthene					1 U		1 U	1 U
Pyrene					1 U		1 U	1 U
Butylbenzyl Phthalate					1 U		1 U	1 U
3,3'-Dichlorobenzidine					10 UJ		10 UJ	10 UJ
Benzo(a)Anthracene					1 U		1 U	1 U
Chrysene					1 U		1 U	1 U
Bis(2-Ethylhexyl)Phthalate					1 U		1 U	1 U
Di-n-Octyl Phthalate					1 U		1 U	1 U
Benzo(b)Fluoranthene					1 U		1 U	1 U
Benzo(k)Fluoranthene					1 U		1 U	1 U
Benzo(a)Pyrene					1 U		1 U	1 U
Indeno(1,2,3-cd)Pyrene					1 U		1 U	1 U
Dibenzo(a,h)Anthracene					1 U		1 U	1 U
Benzo(g,h,i)Perylene					1 U		1 U	1 U

Appendix G (cont.) – VOA, BNA, Pesticide/PCB and Metals Results – Occidental, December 1992.

Location:	TransB	CityTap	HyInFO	HyInf	OCCEffO	OCCEff	OCCEffD
Type:	grab	grab	O-comp	E-comp	O-comp	E-comp	E-comp
Date:	12/7/92	12/7/92	12/8/92	12/8/92	12/8/92	12/8/92	12/8/92
Time:	1030	1040	@	@	#	#	#
Lab Log#:	508280	508281	508282	508283	508286	508287	508288

Pesticide/PCB Compounds

alpha-BHC				0.003 U		0.003 U	0.003 U
beta-BHC				0.006 U		0.006 U	0.006 U
delta-BHC				0.009 U		0.009 U	0.009 U
gamma-BHC (Lindane)				0.004 U		0.004 U	0.004 U
Heptachlor				0.003 U		0.003 U	0.003 U
Aldrin				0.004 U		0.004 U	0.004 U
Heptachlor Epoxide				0.083 U		0.083 U	0.083 U
Endosulfan I				0.014 U		0.014 U	0.014 U
Dieldrin				0.002 U		0.002 U	0.002 U
4,4'-DDE				0.004 U		0.004 U	0.004 U
Endrin				0.006 U		0.006 U	0.006 U
Endosulfan II				0.004 U		0.004 U	0.004 U
4,4'-DDD				0.011 U		0.011 U	0.011 U
Endosulfan Sulfate				0.066 U		0.066 U	0.066 U
4,4'-DDT				0.012 U		0.012 U	0.012 U
Toxaphene				0.24 U		0.24 U	0.24 U
Aroclor-1016				0.065 U		0.065 U	0.065 U
Aroclor-1221				0.13 U		0.13 U	0.13 U
Aroclor-1232				0.065 U		0.065 U	0.065 U
Aroclor-1242				0.065 U		0.065 U	0.065 U
Aroclor-1248				0.065 U		0.065 U	0.065 U
Aroclor-1254				0.065 U		0.065 U	0.065 U
Aroclor-1260				0.065 U		0.065 U	0.065 U
Endrin Aldehyde				0.023 U		0.023 U	0.023 U
Chlordane				0.014 U		0.014 U	0.014 U

Metals

Antimony	30 UJ	30 UJ	300 UJ	300 UJ	300 UJ	300 UJ	300 UJ
Arsenic	3 U	3 U	3 U	3 U	3 U	3 U	3 U
Beryllium	1 U	1 U	10 U	10 U	10 U	10 U	10 U
Cadmium	2 UJ	2 UJ	20 UJ	20 UJ	20 UJ	20 UJ	20 UJ
Chromium	5 UN	5 UN	60 UN	60 UN	60 UN	60 UN	60 UN
Copper	3 U	3 U	2 UJ	2 UJ	2 UJ	2 UJ	2.6 J
Lead	2 UJ	2 UJ	2.6 J	3.5 J	2 UJ	2.6 J	2 UJ
Mercury	0.05 U	0.05 U	0.05 U	0.11 P	0.05 U	0.05 U	0.05 U
Nickel	2.2 P	2 U	2 U	2 U	2.4 P	3 P	2.8 P
Selenium	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Silver	3 U	3 U	30 U	30 U	30 U	30 U	30 U
Thallium	5 UN	5 UN	5 UN	5 UN	5 UN	5 U	5 U
Zinc	6.2 J	156	40 U	40 U	40 U	40 U	40 U

@ Composite sampling period 0950-0950 Hours

Composite sampling period 1010-1010 Hours

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.

N For organic analytes there is evidence the analyte is present in the sample.

P The analyte was detected above the instrument detection limit but below the established minimum quantification limit.