SOURCES OF TOXIC ORGANIC COMPOUNDS TO THE DISTRICTS' WATER RECLAMATION AND WATER TREATMENT PLANTS.

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ABSTRACT

The California Department of Health Services shall soon place limits on the concentrations of toxic organics in the Districts' ground-water recharge. Past data indicate that the Districts will violate the limits for benzene, p-dichlorobenzene, and tetrachloroethylene (PCE). Personal communications and a literature review has uncovered clues to the major sources of these compounds and enough data has been gathered to develop a rudimentary mass balance for PCE. Calculations indicate that unknown sources discharge 86% of the PCE released to the waste-water system. Not enough data is available to determine the relative contribution of the residential/commercial sector. This study recommends that the Districts focus on controlling PCE discharges from these sources, in this order: companies under enforcement, companies reporting PCE on their Critical Parameter Reports, companies reporting PCE on their Baseline Monitoring reports, dry cleaners.

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The Problem

In 1986, the California Department of Health Services placed limits on toxic organic discharges to drinking water sources. The Regional Water Quality Board will soon incorporate these limits, called action levels, into the water reuse permits at the Whittier Narrows, San Jose Creek, and Pomona Water Reclamation Plants. When the Board takes this action, the plants cannot legally recharge the groundwater basins with any effluent containing toxic organics in excess of the action levels. The Board will require analyses every 14 days to verify compliance with the action levels. (Appendix I shows the list of action levels.)

In recent years, the U.S. Environmental Protection Agency has assigned increasing importance to the control of organic priority pollutants. In fact, the EPA is considering emissions limits for treatment plants (Noriega 1986) as well as effluent limits on the Districts' ocean discharge.

Unfortunately, the Districts do not know what the major sources of toxic organics are. Moreover, the Districts do not regulate two potentially major dischargers: dry cleaners and the residential/commercial sector. This study is one of the first attempts to rigorously identify the major sources of toxic organics and to determine the relative contributions of the industrial and residential/commercial sectors.

Toxic Organic Data

This is a list of practically all the data which the Districts have collected on toxic organics:

1. Four semi-annual priority pollutant monitoring samples from the Districts' plants.
2. Whittier Narrows and San Jose toxic organic monitoring 1979-1980.
3. Two Chino Basin samples from 1987.
4. Air and influent concentrations at JWPCP in a 1986-7 study.
5. Sporadic, self-reported analyses of industrial discharges (review of 216 Critical Parameter Report files).
6. More extensive sampling at companies under enforcement in the period January 1985 - July 1987.

The first set of data, influent and effluent concentrations at the Districts' treatment plants, reveals that the Districts have 'violated' the proposed action levels for three compounds:

1. benzene
2. p-dichlorobenzene
3. tetrachloroethylene (PCE).

Tables 1, 2, and 3 summarize the influent and effluent data for benzene and PCE. Table 4 summarizes the number of one-time violations of the action levels for benzene, p-dichlorobenzene, and PCE. At times, the detection limit at the San Jose Creek lab is too high to detect benzene violations with certainty.

The physical and chemical characteristics of the three compounds vary widely, as Table 5 shows, although all the compounds are relatively volatile. Table 6 lists the major industrial, residential, and commercial uses of the three compounds.

Literature Review

This study started with personal communications and a review of literature. These efforts attempted to find any positive identification of toxic organic sources and estimates of the relative contributions of the industrial and residential/commercial sectors.

Patterson (1985) provides a list of average effluent concentrations of various compounds, information gleaned from the EPA's development documents. His results, shown in Table 7, indicate that steel plants, leather tanners, and laundries discharge the highest concentrations of benzene, p-dichlorobenzene, and PCE, respectively. Comba and Kaiser (1984) pinpointed the major sources of volatile organics in the Detroit River. However, PCE's ubiquitous presence in the storm and sanitary sewers prevented determination of its major sources.

A project sponsored by the Metropolitan Water District and the Environmental Defense Fund (Wolf 1987) presents perhaps the most thorough attempt at source identification thus far. Dr. Wolf has gleaned information on the uses of chlorinated solvents from the Halogenated Solvents Industry Alliance and from industrial contacts and has determined the amounts of different compounds used by different Standard Industrial Codes (SICs). The next section of this paper incorporates her data and methods into a mass balance for PCE.

Brown (1987) reports two estimates of the toxic organic contribution of residences. In Seattle, Wash., 65% of the toxics in the wastewater comes from the residential sector. In Albuquerque, N.M., each residence discards 0.5 kg of hazardous substances each year into the sewer system. DeWalle et al. (1982) found no benzene or p-dichlorobenzene in the effluent from a residential subdivision and found PCE in concentrations greater than 0.7 ug/L in only 25% of the influent samples.

Both Hunter et al. (1986) and Dunovant et al. (1986) analyzed wastewater treatment plants which treated wastestreams containing various percentages of industrial flow. In general, they discovered that wastewater containing relatively high percentages of industrial flow also contained higher concentrations of PCE. Dunovant et al. (1986) also report an increase in toxic organic discharges in the evening and later in the week (Fridays and Saturdays).

According to Mary Belefsky at EPA headquarters in Washington, D.C., the EPA has conducted toxic organic sampling at various industrial dischargers throughout the country. Results and regulatory guidance should come forth in late 1987 (Belefsky 1987). Another environmental agency, the Orange County Sanitation Districts, will soon implement its own rigorous toxic organic monitoring program for six EPA pretreatment categories (Wybenga 1987). Both EPA's and Orange County's efforts may fill voids in the Districts' data base.

Estimated Mass Balance for PCE

Using the data listed earlier, this study has developed a rudimentary mass balance for tetrachloroethylene. Table 8 lists mass inputs to the Districts' plants, using average influent PCE concentrations and average flows. Due to sludge transfers in the Joint Outfall system and in the Santa Clarita Valley, some 'double-counting' of PCE occurs in this portion of the mass balance.

Table 9 shows the amounts of PCE used by different SICs in 1984. This portion of the mass balance is based entirely upon the data of Wolf (1987). Although the amount of PCE disposed is not necessarily directly proportional to use, the table does narrow the search for major dischargers to certain segments of industry. Moreover, the amount of PCE used places an upper value on the amount which dischargers could possibly release to the sewer system.

Review of 2.5 years of enforcement summaries and 216 Critical Parameter Report (CPR) files generated the list of documented PCE dischargers in Table 10. Appendix II shows the self-reported and Districts-monitored PCE concentrations and 1984-5 flows of these documented dischargers.

Table 11 and Figure 1 present the completed mass balance. The trunk sewer volitalization estimate comes from Griffith (1987). To account for city sewer volatilzation, this study arbitrarily adds to the mass balance an amount of PCE equal to 50% of trunk sewer volatilization. Table 11 reveals that documented dischargers account for only 14% of the inputs to the sewer system.

The hatched areas in Figure 1 indicate those portions of the mass flow for which this study has either found data or has produced reasonable estimates. The poor quality of the data at hand has forced this study to estimate or ignore important features of the mass balance.

Continuing Efforts

1. Sampling at La Canada, a water reclamation plant serving a predominantly residential area.

2. Sampling in six different residential/commercial areas of the Districts' service area.

Conclusions for Tetrachloroethylene

1. Various sources discharged approximately 41 000 kg of PCE into the wastewater system in 1984. Approximately 33 000 kg of PCE entered the Districts' plants, the balance volatilizing in the sewers.

2. Companies under enforcement and companies reporting PCE on their Critical Parameter Reports discharged approximatley 5 500 kg of PCE in 1984. Undocumented sources contributed the remaining 86%.

3. The following information supports the hypothesis that the residential/commercial sector contributes a relatively low proportion of the toxic organics in the Districts' wastewater:

   a. Industry in the Districts' service area used over 150 kg of PCE for each kg discharged to the wstewater system in 1984. This huge amount increases the probabilty that the industrial sector discharges a large amount of PCE to the wastewater.

   b. Research in Cincinnati, Ohio (Dunovant et al. 1986) and in New Jersey (Hunter et al. 1986) found increasing PCE concentrations with increasing industrial wastewater contributions.

   c. Research in Tacoma, Wash. (DeWalle et al. 1982) found very little PCE in a residential subdivision's septic tank.

4. The following information supports the hypothesis that the residential/commercial sector contributes a relatively high amount of PCE to the Districts' wastewater:

   a. Influent to the Pomona Water Reclamation Plant, whose service area is residential in character, contained higher concentrations of PCE than JWPCP, whose service area is highly industrial.

   b. This study found no documented PCE dischargers in the Whittier Narrows and San Jose Creek service areas. Yet, the influent to these treatment plants contains significant concentrations of PCE.

   c. Research in Detroit (Comba & Kaiser 1984) could not pinpoint PCE dischargers because sampling found PCE distributed ubiquitously throughout the wastewater system.

   d. Research in Seattle (Brown 1987) found that households contribute 65% of the toxics in the sewer system.

5. Chino Basin contains 8 dischargers with SIC 34xx but its effluent contained no PCE. Yet, 4 of the documented dischargers in Table 12 have SIC 34xx. This implies that the Districts cannot implicate an entire segment of industry, e.g. SIC 34xx, as a PCE discharger.

Recommendations for Tetrachloroethylene

1. Reduce discharges from companies already under enforcement.

2. Then, reduce discharges from companies reporting PCE on their CPRs.

3. Review Baseline Monitoring Reports for EPA categorical industries and verify that each company has accurately reported its halogented solvent use. Then, require wastewater analyses for the solvents which they use.

4. Conduct more analyses for PCE in the discharges of the types of listed in Table 9.

5. Determine the flow and concentration of PCE from dry cleaners.

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FIGURE 1. SCHEMATIC DIAGRAM OF ESTIMATED MASS BALANCE FOR TETRACHLOROETHYLENE IN 1984.

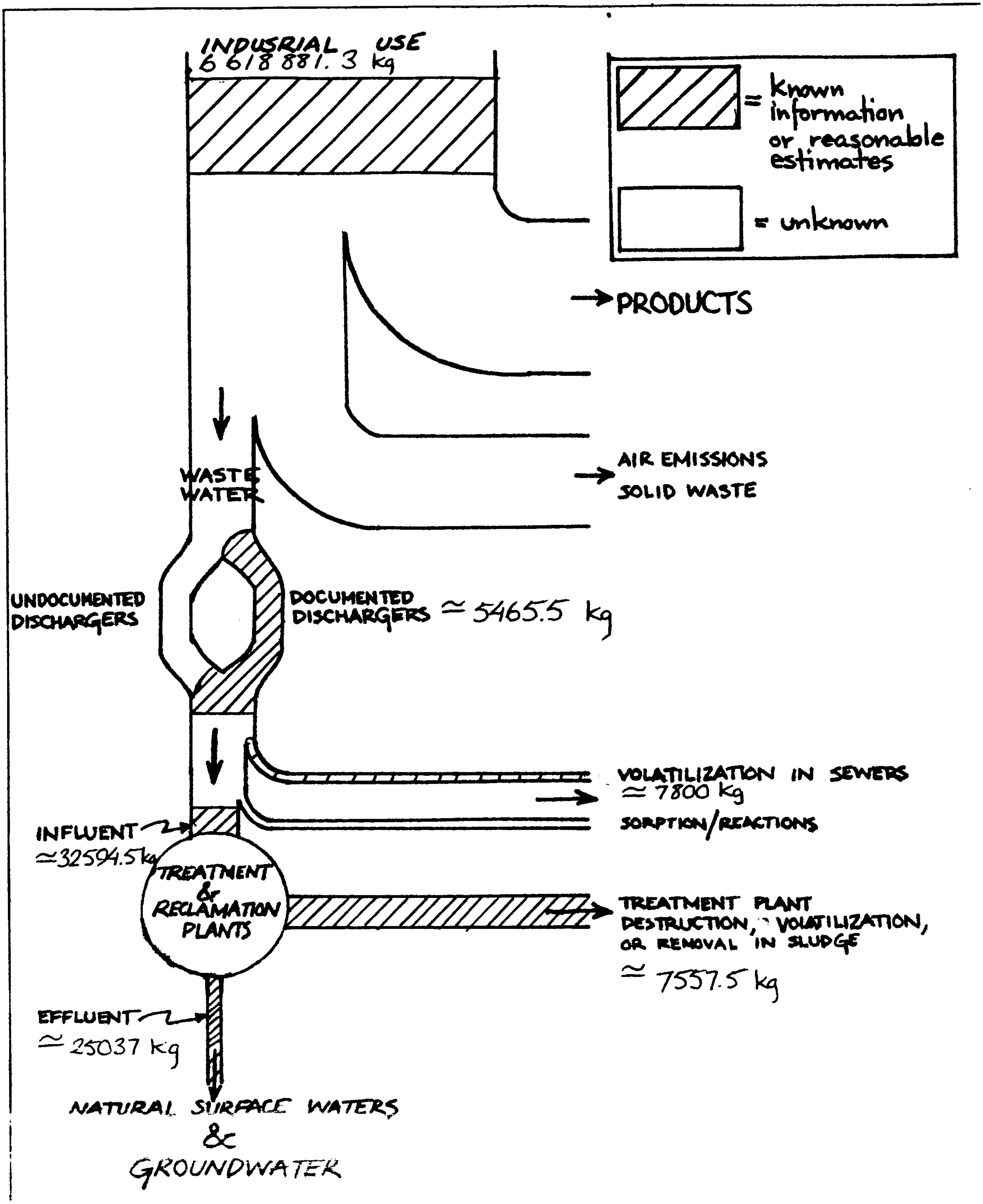


Table 1.

Average treatment plant influent concentrations (ug/L) of two toxic organic compounds. 1985 - 1987.
Violations of California Dept. of Health Services action levels = ◯

plant	samples	benzene	tetrachloroethylene(PCE)
JWPCP	4	(130.0) ±26.5	(52.3) ±26.0
Lancaster	4	<0.5	(5.2)
Long Beach	3	(1.2) ± 0.8	(12.3) ±11.8
Los Coyotes	4	(31.2) ±11.3	(56.2) ±63.0
Palmdale	1	<0.5	(49.0)
Pomona	3	0.7 ± 0.3	(118.0) ±201.0
Saugus	4	(<1.0)	(8.2) ± 7.4
San Jose Ck.	4	(<1.0)	(26.7) ±16.6
Valencia	4	(<1.0)	3.4 ± 2.5
Whittier Nar.	4	<0.5	(23.0) ±26.4
California Dept.'o Health Serv. action levels		0.7	4

Table 2.

Average treatment plant <u>effluent</u> concentrations (ug/L) of two toxic organic compounds. 1985 - 1987.
Violations of California Dept. of Health Services action levels = ○

plant	samples	benzene	tetrachloro-ethylene(PCE)
JWPCP	4	59.0 ±42.6	45.5 ±26.0
Lancaster	1	<0.5	<0.2
Long Beach	3	<1.0	1.5 ± 0.4
Los Coyotes	4	<0.5	3.1 ± 3.3
Palmdale	1	<0.5	0.3
Pomona	4	<1.0	2.3 ± 3.9
Saugus	4	<1.0	0.9 ± 0.9
San Jose Ck.	4	<0.5	3.4 ± 3.3
Valencia	4	<1.0	<1.0
Whittier Nar.	4	<1.0	4.7 ± 7.5
California Dept.'o Health Serv. action levels		0.7	4

Table 3.

Maximum treatment plant effluent concentrations (ug/L) of two toxic organic compounds. 1985 - 1987.
Violations of California Dept. of Health Services action levels = ◯ (circled values shown in bold below)

plant	samples	benzene	tetrachloro-ethylene(PCE)
JWPCP	4	**110.0**	**78.0**
Lancaster	1	<0.5	<0.2
Long Beach	3	**<1.0**	2.0
Los Coyotes	4	<0.5	**8.0**
Palmdale	1	<0.5	0.3
Pomona	4	**<1.0**	**8.2**
Saugus	4	**<1.0**	2.0
San Jose Ck.	4	<0.5	**8.2**
Valencia	4	**<1.0**	<1.0
Whittier Nar.	4	**<1.0**	**16.0**
California Dept.'o Health Serv. action levels		0.7	4

Table 4.

Violations of California Department of Health Services action levels in effluent from the Districts' water reclamation plants from October 1985 to June 1987. No violations occurred at Lancaster or Palmdale. The Districts' labs did not analyze effluent from the San Jose plant for p-dichlorobenzene.

plant	benzene		p-dichlorobenzene		tetrachloroethylene	
	viol.	total samp.	viol.	total samp.	viol.	total samp.
JWPCP	4	4	2	2	4	4
Long Beach	1	3	1	1	0	3
Los Coyotes	0	4	0	1	1	4
Pomona	1	4	0	1	1	4
Saugus	1	4	0	1	0	4
San Jose Creek	1	4			1	4
Valencia	2	4	1	1	0	4
Whittier Nar.	1	4	1	1	1	4
TOTALS	11	31	5	8	8	31

CHEMICAL CHARACTERISTICS

OF COMPOUNDS OF CONCERN IN THE DISTRICTS' EFFLUENTS

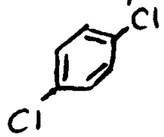
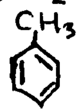
compound	formula	m.w. ($g \cdot mol^{-1}$)	SDLAC TEST no.	DOHS ACTION LEVEL ($\mu g \cdot L^{-1}$)	s.g.	sol. @20°C ($mg \cdot L^{-1}$)	v.p. @20°C (mmHg)	Lowest flow-thr. fish LC_{50} ($mg \cdot L^{-1}$)	log H_c	log K_{ow}	biodeg. log $t_{1/2}$
benzene		78	620	0.7	0.88	1780	76	5.8	-0.65	2.04	0.32
carbon tetrachloride	CCl_4	154	604	5	1.59	800	90	125	-0.01	2.64	5.08
p-dichlorobenzene		147	615	0.5	1.46	49	0.6	33.7	-0.93	3.39	0.48
methylene chloride	CH_2Cl_2	85	601	40	1.3	20,000	349	193			
tetrachloroethylene (PCE)	$Cl_2C{=}CCl_2$	166	607	4	1.63	150 (25°C)	14	14.8	-0.08	2.88	1
toluene		92	621	100	0.87	470	22	7.3	-0.58	2.69	-0.21
trichloroethylene (TCE)	$Cl_2C{=}CHCl$	132	606	5	1.46	1100 (25°C)	20	40.7			

TABLE 5.

abbrev.

- biodeg. log $t_{1/2}$ - logarithm of biodegradation half-life
- fish LC_{50} - the lowest value (for the lethal concentration to 50% of a population) ever observed in a fish flow-through test
- H_c - Henry's Constant
- K_{ow} - octanol-water partition coefficient
- m.w. - molecular weight
- SDLAC - Sanitation Districts of L.A. County
- s.g. - specific gravity
- sol. - solubility

sources: Verschueren, K. 1983. Handbook of Env. Data on Org. Chem.
Gillette, J. 1986. Cornell Univ. Pers. comm.

Table 6. Major uses of benzene, p-dichlorobenzene, and tetrachloroethylene (Hathaway 1980).

Compound	Industrial Uses	Residential uses
benzene	petroleum products paints pharmaceuticals	solvents & thinners tar remover oven cleaner detergents hair shampoos & remedies antiperspirants
p-dichlorobenzene	manufacture of polyphenylene sulfide resins	toilet bowl deodorants bathroom cleaners household cleaners diaper cleaners fabric dyes mothballs
tetrachloroethylene	metal cleaner metal degreaser dry cleaning solvent textile processing solder flux remover intermediate in chlorofluorocarbon synthesis	contact cement wax remover shoe dye upholstery/rug cleaner vegetable pesticide

Table 7. Average concentrations of benzene, p-dichlorobenzene, in the effluent of variuos industries. Data taken from US EPA development documents by Patterson (1985).

Compound	Industrial Source	Concentration (μg/l) Avg	Range
Benzene	Coal mining	2.6	0–15
	Textile mills	<5	0–200
	Timber products processing	350	0–2,800
	Petroleum refining	>100	—
	Paint and ink formulation	1,200	0–9,900
	Gum and wood chemicals	180	0–710
	Rubber processing	610	0–3,400
	Auto and other laundries	840	0–23,000
	Pharmaceuticals	220	0–2,100
	Ore mining and dressing	2.1	0–4.2
	Steam electric power	45	—
	Foundries	200	—
	Leather tanning and finishing	19	0–150
	Nonferrous metals	11	0–160
	Iron and steel	2,000	0–43,000
Dichlorobenzenes	Coal mining	<1.2	0–10
	Textile mills	2	0–280
	Auto and other laundries	30	0–1,100
	Steam electric power	20	10–26
	Leather tanning and finishing	69	0–200
Tetrachloroethylene	Textile mills	<5	0–2,100
	Petroleum refining	<50	—
	Paint and ink formulation	920	0–4,900
	Auto and other laundries	9,600	0–93,000
	Pharmaceuticals	3.5	0–36
	Steam electric power	78	—
	Inorganic chemicals manufacture	—	0–196
	Foundries	70	0–370
	Leather tanning and finishing	12	—
	Nonferrous metals	14	0–310
	Iron and steel	42	0–1,100

Table 8. PCE inputs to the treatment plants.

Plant	1985-87 ave. infl. conc. (ug/L)	ave. flow (m3/s)	1984 PCE input (kg)
JWPCP	52.3	15.0	24740.0
Lancaster	5.2	0.2	3.3
Long Beach	12.3	0.8	310.3
Los Coyotes	56.2	1.6	2835.7
Palmdale	49.0	0.15	231.8
Pomona	118.0	0.4	1488.5
Saugus	8.2	0.2	51.7
San Jose Creek	26.7	2.6	2189.2
Valencia	3.4	0.15	16.1
Whittier Narrows	23.0	0.6	435.2
TOTAL			32594.5

Table 9. Amounts of PCE used by various SICs in 1984. Data from Wolf (1987) and U.S. Department of Commerce (1984).

SIC	LA County establishments	solvent use (tonnes)	PCE use (fraction)	PCE use (tonnes)	fraction of total PCE used
22xx	231	115.5	1.00	115.5	0.010
23xx	2953	295.3	1.00	295.3	0.025
2869	22	2156	1.00	2156	0.182
34xx	2033	8538.6	0.16	1392.8	0.118
36xx	1267	5954.9	0.09	565	0.048
37xx	667	7136.9	0.17	1225.5	0.104
39xx	899	3056.6	0.14	419.5	0.036
7215	188	714.4	1.00	714.4	0.061
7216	698	3210	0.98	3134.5	0.266
7218	66	369.6	1.00	369.6	0.031
other				1378.8	0.117
			TOTAL	11766.9 metric tonnes	
	Fraction of L.A. County industry in the Districts			0.56	
			Districts TOTAL	6618.9 metric tonnes	

SIC code	Industry
22xx	Textile mill products
23xx	Apparel and other products from fabrics
2869	Industrial inorganic chemicals, not elsewhere classified
34xx	Fabricated metal products
36xx	Electrical & electronic machinery
37xx	Transportation equipment
39xx	Misc. maufacturing equipment
7215	Coin-op laundries and dry cleaners
7216	Dry cleaning plants
7218	Industrial laundries

Table 10. Documented dischargers of PCE (Data from Appendix II).

Discharger	IW	kg discharged in 1984	information source
Ardrox	10887	0.14	enforcement
Brite-Sol	6486	1.10	enforcement
CSD-Palos Verdes	8297	0.003	CPR
CSD-Palos Verdes	8914	0.013	CPR
CSD-Puente Hills	10524	0.002	CPR
Chem-Trans	1832	12.00	enforcement
DeMenno/Kerdoon	2703	27.00	enforcement
Forbes	11264	0.10	CPR
NuWay Linen	981	5400.00	enforcement
Olympic Fastening	1474	5.50	CPR
Omega Recovery	8513	0.14	enforcement
Sierracin/Thermal	10948	9.10	CPR
Sigma Plating	11021	4.60	CPR
Syst. Trans.	8595	0.29	enforcement
Talley Bros.	1177	3.70	enforcement
Van Waters	4067	0.26	CPR
Van Waters	4068	1.50	enforcement
TOTAL		5465.45	

Table 11. PCE Mass Balance Summary for 1984.

amount used by industry	6 618 881.3 kg
inputs to treatment plants	32 594.5
trunk sewer volatilization	5 200.0
city sewer volatilization	2 600.0
TOTAL discharged into wastewater	40 394.5
documented dischargers	5 465.5
unknown dischargers	34 929.0

APPENDIX I

State of California
Department of Health Services

Drinking Water Action Levels Recommended by the Department of Health Services

January 1987

Chemical	Action Level parts per billion (ppb)
Pesticides	
Chlorinated Hydrocarbon	
Aldrin	Limit of Quantification (0.05)
a-Benzene Hexachloride (a-BHC)	0.70
b-Benzene Hexachloride (b-BHC)	0.30
Chlordane	0.055
Dieldrin	Limit of Quantification (0.05)
Heptachlor	0.02
Heptachlor Epoxide	0.10
Pentachlorophenol	30.00
Organophosphate	
Dimethoate	140.00
Diazinon	14.00
Ethion	35.00
Malathion	160.00
Methyl Parathion	30.00
Parathion	30.00
Trithion	7.00
Carbamate	
Aldicarb	10.00
Baygon	90.00
Carbaryl	60.00
Phthalamide	
Captan	350.00
Amides	
Diphenamide	40.00
Fumigants	
Dibromochloropropane	1.00
1,2-Dichloropropane	10.00
Ethylene Dibromide	Limit of Quantification (0.02)
Chloropicrin	50.00 (37.0)*
Miscellaneous	
Terrachlor (Pentachloronitrobenzene)	0.90
Herbicides	
CIPC (isopropyl N (3-chlorophenyl) carbamate)	350.0
Bolero (thiobencarb)	10.0 (Tentative) (1.0)*
Ordram (Molinate)	20.0
Glyphosate	500.0
Atrazine	15.0
Simazine	150.0
Bentazon (Basagran)	8.0
Purgeable Halocarbons	
Carbon Tetrachloride	5.00
1,2-Dichloroethane	1.00
1,1-Dichloroethylene	6.00
Methylene Chloride	40.00
Tetrachloroethylene	4.00
1,1,1-Trichloroethane	200.00
Trichloroethylene	5.00
Vinyl Chloride	2.00
1,1-Dichloroethane	20.00
Trichlorofluoromethane (Freon 11)	3,400.00
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	18,000.00
1,1,2-Trichloroethane	100.00
Cis-1,2-Dichloroethylene	16.00
Trans-1,2-Dichloroethylene	16.00

(Action Level for Cis and Trans 1,2-Dichloroethylene is either for a single isomer or for the sum of the 2 isomers)

Chemical	Action Level parts per billion (ppb)
Purgeable Aromatics	
Benzene	0.70
Monochlorobenzene	30.00 (3)*
1,2-Dichlorobenzene	130.00 (10)*
1,3-Dichlorobenzene	130.00 (20)*
1,4-Dichlorobenzene	Limit of Quantification (0.5) (0.3)*
Ethylbenzene	680.00 (29)*

(Action Level for 1,2-Dichlorobenzene and 1,3-Dichlorobenzene is either for a single isomer or for the sum of the 2 isomers)

Chemical	Action Level parts per billion (ppb)
Toluene	100.00
Ortho-Xylene	620.00
Para-Xylene	620.00
Meta-Xylene	620.00

(Action Level for Xylene is either for a single isomer or the sum of the 3 isomers)

Chemical	Action Level parts per billion (ppb)
Phenols	
2,4-dimethylphenol	(400.00)*
Phenol	(1.00)* (For Chlorinated Systems)
Aldehydes	
Formaldehyde	30.00
Radioactivity	
Uranium	20 pico Curies/liter

*Taste & Odor Threshold

APPENDIX II. DATA ON DOCUMENTED DISCHARGERS

Company	Dist.	IW	SIC	Q 1984 10^6 gal.	Benzene low	Benzene high ($\mu g \cdot L^{-1}$)	Benzene mean	p-Dichlorobenzene low	p-Dichlorobenzene high ($\mu g \cdot L^{-1}$)	p-Dichlorobenzene mean	Tetrachloroethylene low	Tetrachloroethylene high ($\mu g \cdot L^{-1}$)	Tetrachloroethylene mean	information source
Airdrex, Inc.	18	10887	2819 2842	0.69		ND			ND		<0.5	260	<54	enforcement
Brite-Sol	8	6486	5161	1.87	<0.2	530	<97		ND		<0.2	820	<158	enforcement
CSD-Palos Verdes	5	8297	4953	1.42	10	53	21	14	18	16	0.6	0.7	0.6	CPRs
CSD-Palos Verdes	5	8914	4953	0.52		32			80			26		CPRs
CSD-Puente Hills	18	10524	4953	2.70		ND			9.7			0.8		CPRs
Chem-Trans	8	1832	4212	10.8		ND		<0.5	6100	<2066	<0.1	700	<290	enforcement
DiMenno/Kerdoon	1	2703	2911 2992	27.2	5.0	6300	<771		ND		<5.0	3500	<266	enforcement
Edgington Oil	3	5074	2911	96.4		280			ND			ND		CPRs
Forbes, Ind.	15	11264	3471	0.57		NT			NT			170		CPRs
Fuller Co.	8	6498	3563	1.61	10	100	56		NT			NT		CPRs
Nu-Way Linen	3	981	7211 7218	55.95		NT			NT		<200	68000	25480	enforcement

CSD- County Sanitation Districts of L.A. County
CPR= critical parameter report
ND = not detected
NT = not tested (no analyses run)

APPENDIX II. DATA ON DOCUMENTED DISCHARGERS.

Company	Dist.	IW	SIC	Q 1984 10^6 gal.	Benzene low	Benzene high	Benzene mean	p-Dichlorobenzene low	p-Dichlorobenzene high	p-Dichlorobenzene mean	Tetrachloroethylene low	Tetrachloroethylene high	Tetrachloroethylene mean	information source
Olympic Fast.	2	1474	3471 3542	10.96		NT			NT		43	220	132	CPRs
Omega Rec.	18	8513	2869	0.016		ND			ND		420	5800	2410	enforceme
Sierracin/Th	2	10948	3479	9.84		NT			NT		38	3200	920	CPRs
Signal Plate.	21	11021	3471	12.22		NT			NT			100		CPRs
Syst. Trans.	29	8595	4214	0.52		ND			ND		<50	510	<146	enforceme
Talley Bros.	1	1177	2969 2992	0.52	<50	700	<169		ND		<50	7400	<1879	enforceme
Van Waters	2	4067	5085 5161	0.96	<0.5	5.1	<2.8		NT		3.7	160	<71	CPRs
Van Waters	2	4068	5085 5161	0.026		ND			NT		<0.1	53000	<15000	enforcem
Witco Chem.	8	1679	2841 2869	22.15	<500	420000	<56000		NT			NT		

CPR: critical parameter report
CSD: County Sanitation Districts of L.A. County
ND: not detected
NT: not tested (no analyses run)