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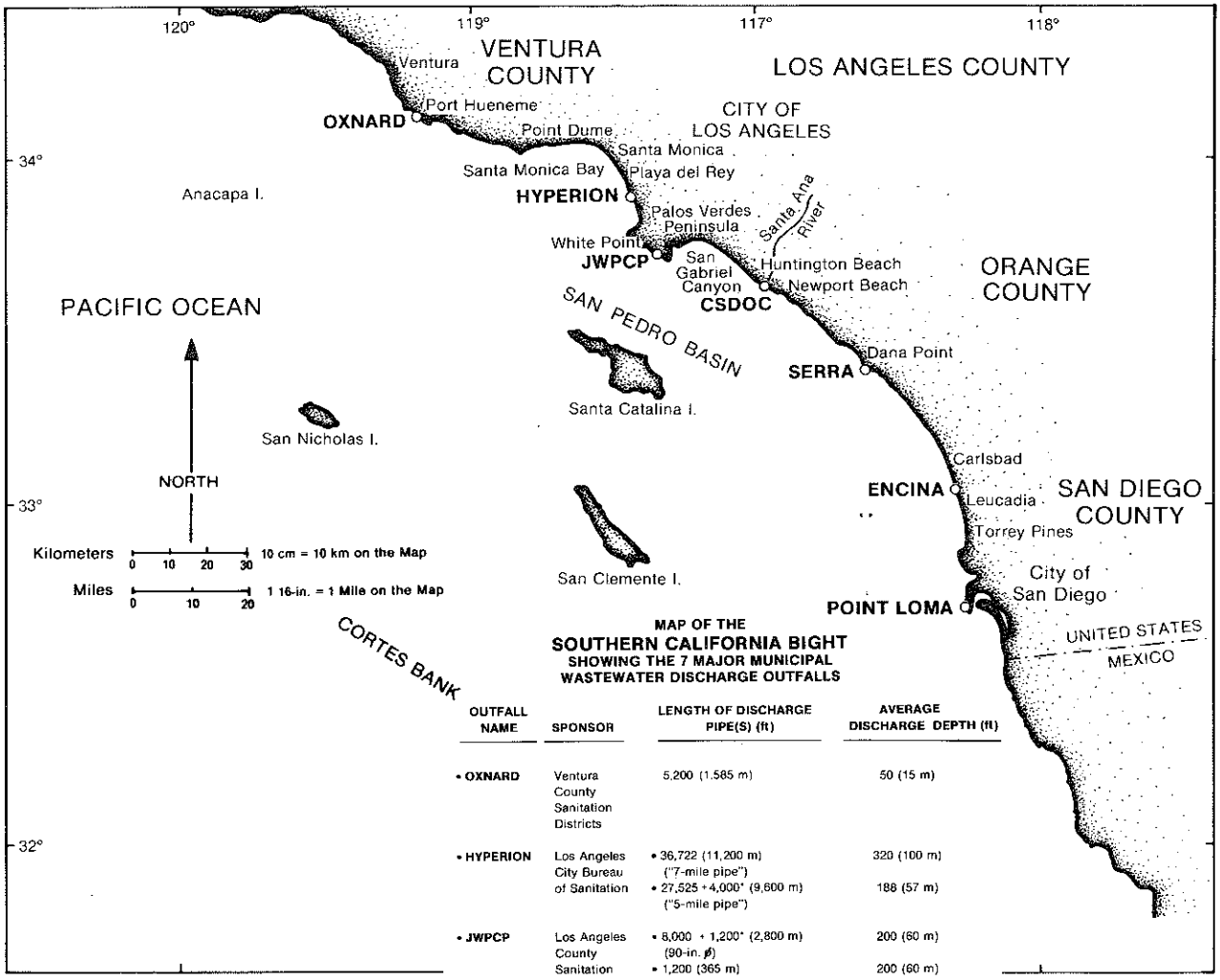
CHARACTERISTICS OF MUNICIPAL WASTEWATER

Each year SCCWRP summarizes the information about municipal wastewater discharge reported to the State of California's Regional Water Quality Control Boards by seven of the largest dischargers*. During 1982 and 1983 these seven released an average of 1150 mgd (4.35 billion L or 4.35 million cu m/day) of water containing 640 mt of suspended solids into the open coastal waters of southern California. The release points are in depths of 15 to 100 m along some 250 km of coast as shown in Figure 1; flows and treatments are given in Table 1.

The concentrations and calculated mass emissions for 1982 are listed in Tables 2 and 3; the corresponding data for 1983 are in Tables 4 and 5. A summary of the combined emissions for the last 13 years is shown in Table 6. The SERRA and Encina dischargers, which recently associated themselves with SCCWRP, have contributed to the last 2 years of data.

*The concentrations reported in this summary were analyzed by the treatment plant laboratories shown below based on the requirements of the following National Pollution Discharge Elimination System (NPDES) permits, and reported to the appropriate California Regional Water Quality Control Boards.

San Diego Regional Water Quality Control Board: City of San Diego (Point Loma), NPDES Permit No. CAO 107409; Encina Water Pollution Control Facility, NPDES Permit No. CAO 107395; South East Regional Reclamation Authority (SERRA), NPDES Permit No. CAO 107417. Santa Ana Regional Water Quality Control Board: County Sanitation Districts of Orange County (CSDOC), NPDES Permit No. CAO 110604. Los Angeles Regional Water Quality Control Board: County Sanitation Districts of Los Angeles County (JWPCP), NPDES Permit No. CAO 053813; City of Los Angeles (Hyperion), NPDES Permit No. CAO 109991; Ventura Regional County Sanitation Districts (Oxnard), NPDES Permit No. CAO 054097.



OUTFALL NAME	SPONSOR	LENGTH OF DISCHARGE PIPE(S) (ft)	AVERAGE DISCHARGE DEPTH (ft)
• OXNARD	Ventura County Sanitation Districts	5,200 (1,585 m)	50 (15 m)
• HYPERION	Los Angeles City Bureau of Sanitation	• 36,722 (11,200 m) ("7-mile pipe")	320 (100 m)
		• 27,525 +4,000* (9,600 m) ("5-mile pipe")	188 (57 m)
• JWPCP	Los Angeles County Sanitation Districts	• 8,000 + 1,200* (2,800 m) (90-in. ø)	200 (60 m)
		• 1,200 (365 m) (120-in. ø)	200 (60 m)
• CSDOC	Orange County Sanitation Districts	27,400 (8,350 m)	185 (55 m)
• SERRA	South East Regional Reclamation Authority	8,700 (2,650 m)	170 (50 m)
• ENCINA	Encina Water Pollution Control Facility	5,300 (1,600 m)	100 (30 m)
• POINT LOMA	City of San Diego	11,500 +1,360* (4,000 m)	200 (60 m)

*Pipe length + length of each arm of a "Y" shaped diffuser.

Figure 1. Locations of the 7 discharges summarized in this report.

The following important trends, illustrated in Figures 2 and 3, show that the amount of suspended solids and related contaminants decreased over a period of years while the adjusted flow increased. DDT and PCB emissions are now only a small fraction of what they were a decade ago.

1) The flow reported for 1983 was approximately 50 mgd higher than reported for 1980-81; this increase is due partly to the addition of data from the Encina and SERRA outflows and partly to increased flows from the Hyperion 5-mile outfall.

Table 1. Treatment plant flows and treatments.

Treatment Plant	Treatment	Flow (mgd)
JWPCP	Advanced Primary[a]	356[b]
Hyperion	Primary	310
	Secondary	100
	Diluted sludge[c]	4.5
Orange County	Primary	98
	Secondary	125
Point Loma	Primary	131
Oxnard	Secondary	18
Encina	Secondary	14
SERRA	Secondary	10
	Total	1166.5

[a] A 200-mgd secondary treatment capability is now under construction and testing.
[b] Includes 60 mgd secondary treatment as of November 1983.
[c] 1 part digested sludge to 3 parts secondary.

2) In 1982 the suspended solids emissions were at their lowest reported level, while BOD was at its highest level. In 1983 there was a 6% increase in solids and a 10% decrease in BOD, leaving both measurements about equal in tons of emissions.

3) Although oil and grease emissions rose slightly in 1983, the combined 1982 and 1983 average is the lowest value ever reported and is approximately 40% below values of the early 1970's.

4) Nine of the ten measured metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Se, and Zn) were at the lowest levels reported since measurements began. The exception was silver, for which the reported emissions were very low in the early 1970's. Between 1976 and 1979 silver emissions doubled; however, there has been a steady decrease during the last 4 years to 25.6 mt/year.

5) DDT continues to decrease; total emission is now down to about 200 kg/year. Discharges of PCBs, which have exceeded those of DDT for the last 12 years, decreased in 1982 and increased in 1983, but the average of the two is about the same as before.

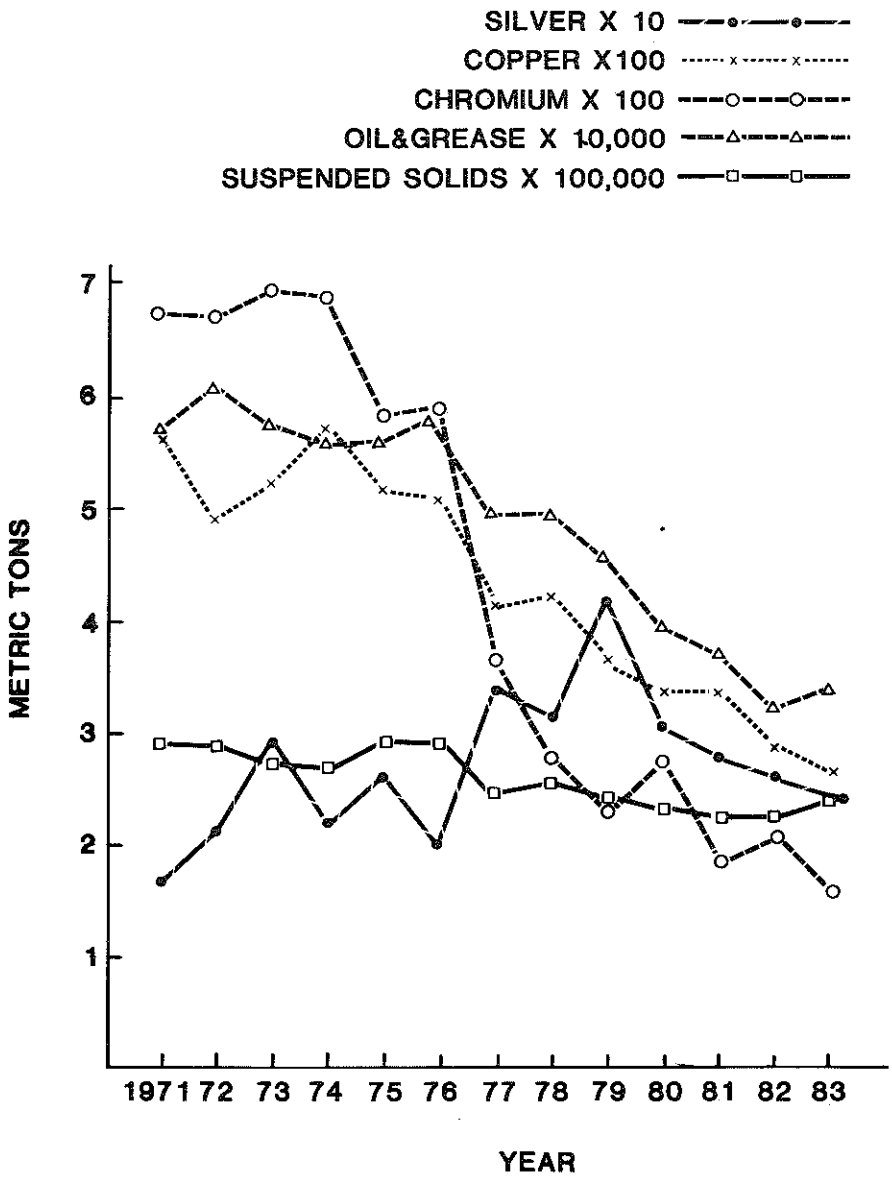


Figure 2. Combined mass emissions per year (1971-1983); trends in five constitutents.

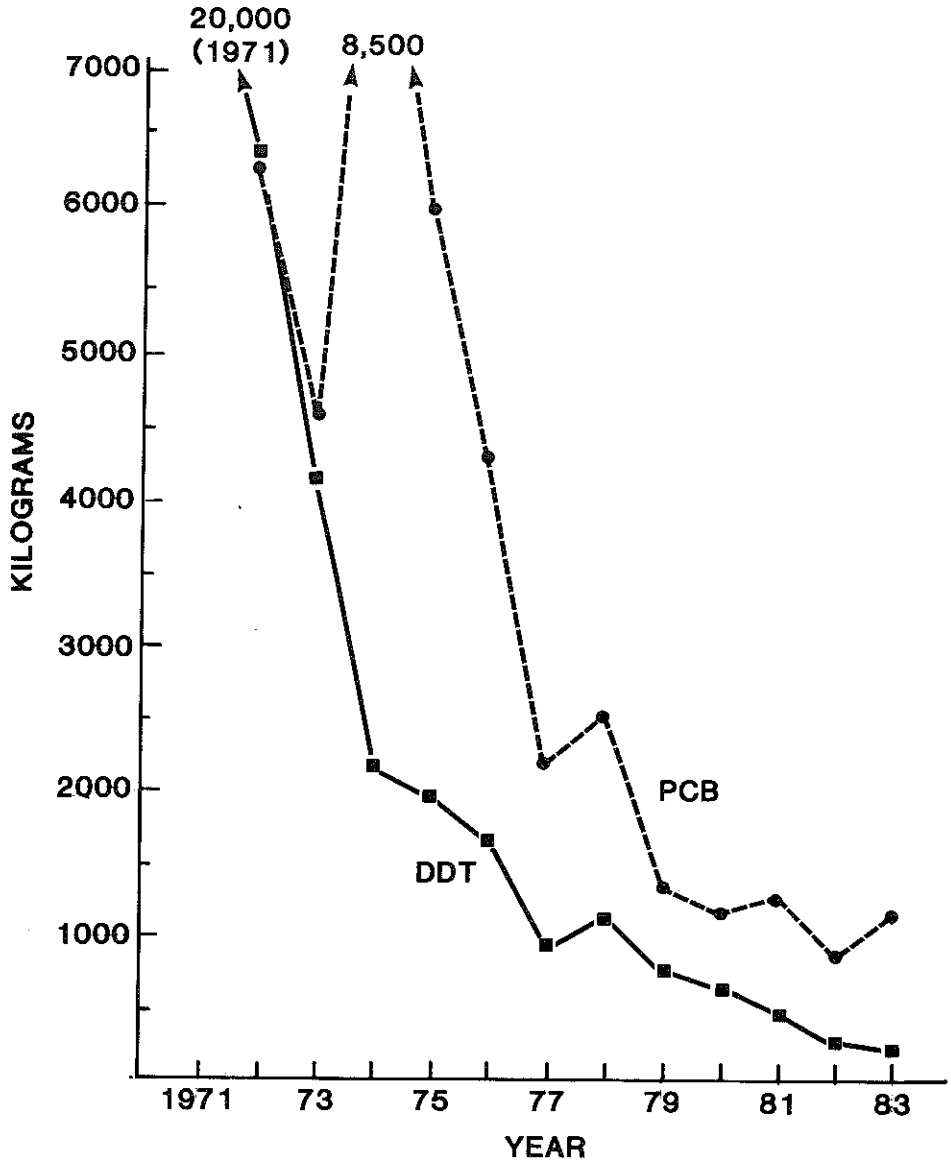


Figure 3. DDT and PCB emissions, 1971-1983 (PCBs were not measured in 1971).

Table 2. 1982 effluent characterstics (concentrations in mg/L, except as noted).

	JWPCP	Hyperion 5	Hyperion 7	CSDOC	Pt Loma	Oxnard	Encina	SERRA
Flow (mgd)	359	375	4.7	223	132	16.6	13.8	10.2
General Constituents								
Suspended solids	164	77	7,001 [a]	112	126	40.9	91	16.0
Settlable solids	0.4	0.9		1.8	1.7	<0.1	0.42	1.4
BOD	199	176		158	151	24.8	125	28.6
Oil and grease	24.5	20	373	18.6	36.4	9.3	17.9	3.5
NH3-N	41	14.8	259	24	24.2	13.9	22.1	
Organic-N	12.5	8.2	291			4.13		
Total-P	9.09	6	218					
MBAS [b]	5.61	4.1			4.10			
CN-	0.06	0.06	0.39	0.04	0.007	<0.05	0.01	
Phenols	2.53	0.062	0.31	0.07	0.033	0.012	0.032	
Turbidity (JTU)	99	61		66	50	20.4	51	7.5
Toxicity (TU)	4.48	1.36		0.88	1.04	1.3	1.22	
Metals								
Silver	0.0112	0.02	0.65	0.016	<0.002	0.019	0.0025	
Arsenic	0.0070	<0.005	0.15	0.002	0.004	0.011	0.003	
Cadmium	0.0111	0.01	0.59	0.016	0.008	0.010	0.0016	
Chromium	0.19	0.09	5.6	0.070	0.022	0.008	0.0132	
Copper	0.128	0.14	8.7	0.218	0.133	0.028	0.114	
Mercury	0.0008	0.0007	0.04	0.0002	0.0004		<0.0001	
Nickle	0.15	0.09	2.0	0.07	0.069	0.035	0.024	
Lead	0.081	0.05	2.5	0.08	0.082	0.026	0.0148	
Selenium	0.0123	<0.005	0.05					
Zinc	0.51	0.18	13	0.20	0.292		0.174	
Chlorinated hydrocarbons (µg/L)								
DDT Total	0.45	0.06	<0.2	0.064	0.081	ND [c]	ND	
PCB Total	0.47	<0.1	1.1	1.77	<0.001	1		
TiCH [d]	1.34	0.1	1.5	2.06	0.165	1	<1	

[a] Total solids
[b] Methylene blue active substances (detergents)
[c] Not detected
[d] Total identified chlorinated hydrocarbons

Table 3. 1982 mass emissions (in mt/year, except as noted).

	JWPCP	Hyperion 5	Hyperion 7	CSDOC	Pt Loma	Oxnard	Encina	SERRA
Flow (L/year x 10^9)	496.	518.	6.49	308.1	182.4	22.93	19.0	14.1
General Constituents								
Suspended solids	81,344.	39,890.	45,440.	34,500.	23,000.	938.	1,730.	225.
Settlable solids								
BOD	98,700.	91,200.		48,700.	27,500.	569.	2,375.	403.
Oil and grease	12,150.	10,400.	2,420.	5,730.	6,640.	213.	340.	49.3
NH3-N	20,340.	7,670.	1,680.	7,400.	6,310.	319.	420.	
Organic-N	6,200.	4,250.	1,890.			94.7		
Total-P	4,510.	3,110.	1,410.					
MBAS[a]	2,780.	2,120.			748.			
CN-	29.86	31.1	2.01	12.3	1.28	< 1.15	< 0.19	
Phenols	1,254.	32.1	1.45	21.6	6.02	0.275	0.61	
Metals								
Silver	5.56	10.4	4.22	4.93	<0.365	0.436	0.048	
Arsenic	3.47	2.59	0.974	0.616	0.730	0.252	0.057	
Cadmium	5.51	5.18	3.63	4.93	1.46	0.229	0.030	
Chromium	94.2	46.6	36.3	21.6	4.01	0.183	0.251	
Copper	63.5	72.5	56.5	67.2	23.7	0.642	2.17	
Mercury	0.397	0.363	0.260	0.062	0.073		<0.602	
Nickle	74.4	46.6	13.	21.6	12.6	0.802	0.456	
Lead	40.2	25.9	16.2	24.6	15.0	0.596	0.281	
Selenium	6.10	<2.59	0.324					
Zinc	253.	93.2	84.4	61.6	53.3		3.31	
Chlorinated hydrocarbons (kg/year)								
Total DDT	223.	31.1	1.30	19.7	14.8		ND[b]	
Total PCB	233.	<51.8	7.14	545.	<0.18	20.	ND	
TICH[c]	664.	51.8	9.74	635.	30.165	20.	<19.	

[a] Methylene blue active substances (detergents).
[b] Not detected.
[c] Total identified chlorinated hydrocarbons.

Table 4. 1983 effluent characteristics (concentrations in mg/L, except as noted).

	JWPCP	Hyperion 5	Hyperion 7	CSDOC	PL Loma	Oxnard	Encina	SERRA
Flow (mgd)	353.3	411	4.23	223.7	129.6	19.5	14.2	10.5
General Constituents								
Suspended solids	186.6	102	8,100.[a]	95.8	98.4	34.3	75.8	10
Settlable solids	0.908	1.3		2.1	0.9	< 0.1	1.01	0.7
BOD 5	175.5	183		129	124	26.8	105	22.2
Oil and grease	27.94	19.0		15.8	23.8	9.5	18.0	1.7
NH3-N	40.71	14.5		22.8	26.2	11.6	22	
Organic-N	12.02	8.37	314			5.2		
Total-P	8.78	6.46	181					
MBAS[b]	5.60	3.22			3.61			
CN-	0.038	0.044	0.289	< 0.02	0.007	0.038	0.014	0.01
Phenols	2.573	0.064	0.177	0.039	0.033	0.010	0.031	< 0.01
Turbidity (JTU)	131.3	69		61	71.3	18.2	40.7	3.8
Toxicity (TU)	5.06	0.83		0.38	1.19	0.79	1.14	0.847
Metals								
Silver	0.0104	0.015	0.756	0.015	0.016	0.009	0.0029	0.03
Arsenic	0.0063	0.007	0.183	0.0036	0.003	0.006	< 0.002	< 0.01
Cadmium	0.0152	0.013	0.480	0.0108	0.012	0.011	< 0.0009	< 0.01
Chromium	0.144	0.08	4.21	0.0632	0.02	0.013	0.009	< 0.01
Copper	0.127	0.15	9.28	0.172	0.10	0.013	0.063	< 0.01
Mercury	0.00088	0.0006	0.029	0.00038	0.0004		< 0.0001	0.0007
Nickle	0.153	0.09	1.76	0.06	0.048	0.044	0.014	< 0.01
Lead	0.083	0.03	1.9	0.06	0.06	0.020	0.060	< 0.01
Selenium	0.0134	< 0.005	< 0.05					
Zinc	0.521	0.17	10.9	0.153	0.20	0.017	0.178	0.016
Chlorinated hydrocarbons (µ/L)								
Total ODT	0.375	0.03	0.55	0.02	0.046			
Total PCB	0.508	< 0.2	< 2.0	1.23	< 0.002	< 10		ND[c]
TICH[d]	1.323	4.9	5.07	1.41	0.107	< 1	< 1	ND

[a] Total solids.
[b] Methylene blue active substances.
[c] Not detected.
[d] Total identified chlorinated hydrocarbons.

Table 5. 1983 mass emissions (in mt/year, except as noted).

	JWPC	Hyperion 5	Hyperion 7	CSDOC	Pt Loma	Oxnard	Encina	SERRA
Flow (L/year X 10^9)	488.1	567.6	5.84	309	179.1	26.94	19.62	14.51
General Constituents								
Suspended solids	92,056	57,920	47300	29,600	17,600	924	1,487	145
BOD	85,644	104,000		39,860	22,200	722	2,060	322
Oil and grease	13,640	10,800	2,160	4,882	4,260	256	353	24.7
NH3-N	19,870	8,236		7,045	4,690	313	432	
Organic-N	5,870	4,750	1,830			140		
Total-P	4,290	3,670	1,060					
MBAS[a]	2,730	1,830			646			
CN	18.54	24.9	1.69	<6.18	1.25	1.02	0.275	0.145
Phenols	1,260	36.3	1.03	12.05	5.91	0.269	0.608	<0.145
Metals								
Silver	5.075	8.52	4.42	4.02	2.86	0.242	0.057	0.435
Arsenic	3.07	3.97	1.07	1.11	0.537	0.162	<0.039	<0.145
Cadmium	7.42	7.38	2.80	3.34	2.15	0.296	<0.018	<0.145
Chromium	70.27	45.4	24.6	19.53	3.58	<0.350	0.177	<0.145
Copper	61.98	85.2	54.2	53.06	17.9	0.835	1.24	<0.145
Mercury	0.429	0.340	0.169	0.117	0.072		<0.002	0.010
Nickle	74.66	51.1	10.3	18.54	8.59	1.19	0.275	<0.145
Lead	40.50	17.0	11.1	18.54	10.7	0.539	1.18	<0.145
Selenium	6.52	< 2.83	< 0.29					
Zinc	254	96.5	63.7	47.28	35.8	1.92	3.49	2.32
Chlorinated hydrocarbons (kg/year)								
Total DDT	183	17	3.21	6.18	8.23			
Total PCB	248	< 114	<11.7	380	< 0.358	< 269		ND[b]
TICH[c]					19.2	<27	<19.6	ND

[a] Methylene blue active substances (detergents).
[b] Not detected.
[c] Total identified chlorinated hydrocarbons.

Table 6. Combined annual mass emission rates for seven southern California municipal wastewater dischargers, 1971-1983.[a]

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Flow													
MDG	931	922	955	967	985	1,027	966	1,015	1,054	1,097	1,097	1,134	1,166
L/day x 10	3,524	3,490	3,615	3,360	3,728	3,889	3,656	3,840	4,000	4,160	4,160	4,292	4,414
General constituents (mt/year)													
Total sus. sol.	288,000	279,000	270,000	264,000	287,000	288,000	244,000	256,000	243,000	233,000	226,000	227,000	247,000
5-Day BOD	283,000	250,000	217,000	222,000	237,000[b]	259,000[b]	244,000	237,000[b]	246,000[b]	260,000[b]	264,000[b]	269,000[b]	255,000[b]
Oil and grease	63,500	60,600	57,400	54,700	57,420	59,100	49,000	49,000	45,000	39,000	37,000	31,900	36,300
NH3-N	56,600	39,900	45,900	37,000	36,620	37,350[b]	41,200	39,500	41,200	42,000[b]	41,000[b]	44,000	40,600[b]
Trace metals (mt/year)													
Silver	17.7	21.1	29.0	21.7	25.7	20.2	34.3	32.3	42.2	30.8	27.9	25.9	25.6
Arsenic	ND	ND	ND	20.9[c]	11.9[c]	10.5[c]	14.0	14.5	15.4	10.6	12.2	8.7	10.1
Cadmium	57.3	33.8	49.3	55.4	50.0	45.0	42.4	44.6	42.3	39.5	31.7	21.2	23.6
Chromium	676	673	695	690	580	593.0	366	280	237	275	187	203	164
Copper	559	485	509	575	511	507	412	417	359	336	339	286	247
Mercury	ND	ND	ND	3.1[c]	2.2[c]	2.6[c]	2.6	1.9	2.5	1.9	1.8	1.2	1.2
Nickel	338	273	318	314	234	307	264	320	256	224	167	169	185
Lead	243	226	180	199	198	191	152	219	223	175	130	123	99.7
Selenium	ND	ND	ND	17.75[b]	16.9[d]	22.0[d]	23.0[d]	23.0[d]	7.7[d]	10.5[d]	15.3[d]	9[d]	10[d]
Zinc	1,880	1,210	1,360	1,320	1,142	1,064	837	905	724	730	540	549	505
Chlorinated hydrocarbons (kg/year)													
Total DDT	21,700	6,600	4,120	2,120	1,989	1,673	920	1,110	760	644	474	289	218
Total PCB	8,730	9,830	4,620	9,390	6,011	4,310	2,183	2,510	1,190	1,129	1,250	857	1,440

[a] Oxnard included only since 1975, Serra and Encina included since 1982.
[b] Hyperion 7-mile effluent excluded.
[c] CSDOC data not included.
[d] Total for Hyperion and JWPCP only.