COASTAL WATER RESEARCH PROJECT

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CHARACTERISTICS OF MUNICIPAL WASTEWATER DISCHARGES, 1975

Municipal wastewater discharges are the principal sources of most pollutants entering southern California waters as a result of human activity. The 1975 flow from marine outfalls was over 1 billion gallons per day. The Project receives effluent monitoring data from the five largest municipal dischargers; as shown in Table 1, the combined flow of these five is 94 percent of the total municipal wastewater input. We review the data received each year for major changes in wastewater constituent concentrations or mass emission rates.

The 1975 annual average concentration of certain waste constituents is listed in Table 2; calculated 1975 mass emission rates for the same constituents are given in Table 3.

The Los Angeles County Sanitation Districts Joint Water Pollution Control Plant (JWPCP) effluent is not a typical primary effluent. This discharge alone accounts for one-third the flow of wastewater to coastal waters and--because of high numbers of industrial influents it receives--more than half the total mass emissions of chromium, lead, zinc, and DDT.

Table 4 presents the 1971-75 total annual mass emissions for the dischargers. Between 1971 and 1974, all of the general constituents showed a slight decrease. Trace metals and PCB remained relatively constant, and DDT decreased by a factor of 10. However, between 1974 and 1975, there were several significant changes:

- The combined annual mass emission rate of total suspended solids increased by about 10 percent between 1974 and 1975, although the total flow of wastewater increased less than 1 percent. Several factors contributed to this situation. Projects to reclaim water from the increasing influents to the JWPCP resulted in a slight reduction in the flow from this plant but an increase in particulate load. Digester cleaning and renovation at the Los Angeles City Hyperion treatment plant in 1975 temporarily increased the suspended solids concentration of the 7-mile effluent and brought the

Table 1. Municipal wastewater discharged to southern California coastal waters, 1975

Discharger	Agency	Flow, (mgd)	Nature of Effluent	% of Total Flow
Joint Water Pollution Control Plant (JWPCP)	Los Angeles County Sanitation Districts	339	Primary	32.4
		1.7	Digested Sludge Centrate	0.16
Hyperion Plant	City of Los Angeles Bureau of Sanitation	249	Primary	23.8
		100	Secondary	9.56
		2.3	Plant Sludge	0.22
Orange County Plants	Orange County Sanitation Districts	165.2	Primary	15.8
		10	Secondary	0.96
Pt. Loma Plant	City of San Diego	109	Primary	10.4
Oxnard Plant	City of Oxnard	9.51	Primary	0.91
Other (about 20)	Various	40	Primary	3.8
		20	Secondary	1.9
Total		1,045.7		100

Table 2. Average concentrations of general constituents, trace metals, and chlorinated hydrocarbons in the final effluent of municipal waste dischargers, 1975

		Hyperion				
	JWPCP	5 mile	7 mile	Orange County	Point Loma	Oxnard
Flow (mgd)	341	345	4.3	175.2	109	9.51
General Constituents (mg/liter)						
Total Suspended Solids	278	85	10,300	138	125	166
5-day B.O.D.	209	125	–*	193	191	305
Oil and Grease	61.4	20	970	34	26.7	37
Ammonia Nitrogen	37.6	13.9		33.3	25.7	28.9
Total Phosphate	13.2	9	80	–	–	–
Detergent (MBAS)	7.1	3.9	–	–	6.16	1.84
Cyanide (CN)	0.33	0.14	0.67	0.10	0.001	<0.001
Phenols	4.13	0.04	0.29	0.43	0.272	0.469
Trace metals (mg/liter)						
Silver	0.013	0.02	0.8	0.012	0.0143	0.013
Arsenic	<0.011	0.01	0.29	–	<0.001	0.0068
Cadmium	0.036	0.02	1.17	0.04	0.0515	0.017
Chromium	0.8	0.13	11.7	0.19	0.167	0.044
Copper	0.42	0.19	16.8	0.41	0.149	0.073
Mercury	0.0011	0.002	0.108	–	0.00076	0.0015
Nickel	0.28	0.15	3.1	0.15	0.16	0.226
Lead	0.25	0.03	2.05	0.16	0.1	0.07
Selenium	<0.013	0.02	0.27	–	–	–
Zinc	1.45	0.23	23.1	0.65	0.315	0.209
Chlorinated Hydrocarbons (μg/liter)						
Discharger Values						
Total DDT	2.33	1.63	6.49	0.31	–	–
Total PCB	3.03	3.92	17.3	10.8	–	–
Project Values**						
Total DDT	2.3	0.07	3	0.04	0.89	0.1
Total PCB	1.38	0.34	22	7.31	1.63	0.29

*Not reported.

**Analyses of two 1-week composite samples of each effluent.

Table 3. Mass emission rates of general constituents, trace metals and chlorinated hydrocarbons in final effluent of municipal waste dischargers, 1975.

	JWPCP	Hyperion 5 mile	Hyperion 7 mile	Orange County	Point Loma	Oxnard
General Constituents (metric tons/year)						
Flow mgd	341	345	4.3	175.2	109	9.5
Total Suspended Solids	130,966	40,460	69,720	33,396	18,725	2,181
5-day BOD	98,460	59,575	–*	46,706	28,612	4,002
Oil and Grease	28,926	9,532	6,566	8,228	4,000	485
Ammonia Nitrogen	17,713	6,625	–	8,059	3,850	379
Total Phosphate	6,912	4,289	541	–	–	–
Detergent (MBAS)	3,345	1,859	–	24.2	923	24.1
Cyanide (CN)	155	66.7	4.5	–	0.15	0.013
Phenols	1,945	19.1	2	104.1	40.7	6.15
Trace Metals (metric tons/year)						
Silver	6.12	9.5	5.4	2.90	2.14	0.17
Arsenic	5.18	4.8	2	–	0.15	0.09
Cadmium	17	9.5	7.9	9.68	7.71	0.22
Chromium	377	62	79.2	46	25	0.58
Copper	198	91	113.7	99.2	22.3	0.96
Nickel	132	71	21	36.3	24	2.97
Lead	118	14.2	13.9	38.7	15	0.92
Selenium	6.1	9.53	1.83	–	–	–
Zinc	683	110	156	157.3	47.2	2.74
Mercury	0.52	0.95	0.73	–	0.114	0.02
Chlorinated Hydrocarbons (kg/year)						
Dishcarger Values						
Total DDT	<1,098	777	43.9	75		
Total PCB	<1,427	1,868	117.1	2,613	–	–
Project Values**						
Total DDT	1,080	32.4	18	8.7	134	1.2
Total PCB	649	162	239	1,777	247	3.5

*Not reported.

**Based on analyses of two 1-week composite samples of each effluent.

Table 4. Combined annual mass emission rates of southern California's five largest municipal waste dischargers,[a] 1971-1975.

Year	1971	1972	1973	1974	1975
Flow (mgd)	931	922	955	967	985
General Constituents (metric tons/year)					
Total Suspended Solids	288,000	279,000	270,000	264,000	295,448
5-day BOD	283,000	250,000	217,000	222,000	–
Oil and Grease	62,500	60,600	57,400	54,700	58,222
Ammonia Nitrogen	56,600	39,900	45,900	37,000	36,621
Trace Metals (metric tons/year)					
Silver	17.7	21.2	29.0	21.7	26.3
Arsenic	–	–	–	20.9[b]	12.2[b]
Cadmium	57.3	33.8	49.3	55.4	52
Chromium	676	673	696	690	589.6
Copper	559	485	509	575	525
Mercury	–	–	–	3.09[b]	2.33[b]
Nickel	339	273	318	314	287
Lead	243	226	180	199	–
Selenium	–	–	–	17.75[c]	17.1[c]
Zinc	1,880	1,210	1,360	1,320	1,156
Chlorinated Hydrocarbons (kg/year)					
Total DDT	21,700	6,600	4,120	2,120	1,994
Total PCB	8,730	9,830	4,620	9,390	6,025

a. Oxnard included only in 1975 data.
b. Orange County data not included.
c. Total for Hyperion and JWPCP only.

annual mass emission rate of this discharger to a level about 25 percent higher than the 1974 rate.

- The combined mass emission rates for all measured metals except silver were lower than the 1974 rates; these reductions, which ranged from 6 percent for cadmium to 25 percent for mercury, appear to be the result of improved source control of metals. In contrast, the reported mass emission rates for silver for all five dischargers increased by an average of 17 percent. We believe that these higher silver numbers reflect improvements in the ability to measure this metal rather than actual increases in effluent concentrations.
- Total DDT values continued to decline, and the combined mass emission rate for 1975 was 6 percent lower than the 1974 value. The combined mass emission rates between 1971 and 1975 seem mainly to represent flushing of the substance from the JWPCP system following control of a single, dominant industrial source in 1970.
- The average reported amount of total PCB declined 35 percent between 1974 and 1975. We are not sure whether this decrease reflects actual reductions in effluent concentrations or refinements in analytical procedures.

During 1975, the Project collected two effluent samples--each a 1-week composite and each taken in a different season of the year--from each of the five major discharges. The samples were analyzed for total DDT and total PCB. The concentrations and mass emission rates for each discharger are given at the bottom of Tables 2 and 3, and the combined chlorinated hydrocarbon mass emission rates are given below, along with the 1975 value based on those reported by the dischargers:

	Total DDT (kg/yr)	Total PCB (kg/yr)
Total of discharger's reported 1975 mass emission rates	1,994	6,025
Total 1975 mass emission rate based on Project analyses of two samples of each effluent	1,270	3,078

We plan to continue our intercalibration efforts with the laboratories of the major dischargers.