MERCURY IN BOTTOM SEDIMENTS OFF PALOS VERDES

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Between 1970 and 1972, we conducted a program to examine the distributions of a number of potentially toxic metals in the bottom sediments around major municipal wastewater outfalls in southern California. To see if changes have occurred since that time, we have again looked at the concentrations of one of these metals, mercury, around the largest of the outfall systems, the Whites Point discharge on the Palos Verdes shelf.

In September 1973, the Los Angeles County Sanitation Districts collected Shipek grab samples from the 40 stations in their standard benthic sampling grid on the Palos Verdes shelf. The Project performed biological and geological analysis of these sediment samples (discussed elsewhere in this report). In addition, we determined their total mercury content; the concentrations are illustrated in Figure 1.

In Table 1, the 1973 results are listed along with those obtained from gravity cores collected at some of the same stations during June of the previous year. (To give a reasonable approximation of Shipek sampling results, we averaged the values for the top 4 to 5 cm of the gravity cores.) A statistical analysis* of these data revealed no significant difference between the results for the two years, suggesting little change in the mercury load of these bottom sediments. However, the degree to which the core and grab samplers "blast away" the surface layers before beginning to sample is still an important uncertainty.

The 1973 results revealed the continued existence of a tongue of relatively high mercury concentrations generally centered along the 60 m contour: A high enrichment factor, relative to the estimated natural concentration of about 0.05 mg/dry kg, is found at this depth as far away as Palos Verdes Point, 12 km to the northwest of the outfall system. As the values are still high at the boundary of the sampling region, we plan to extend the survey area into Santa Monica Bay in the coming year.

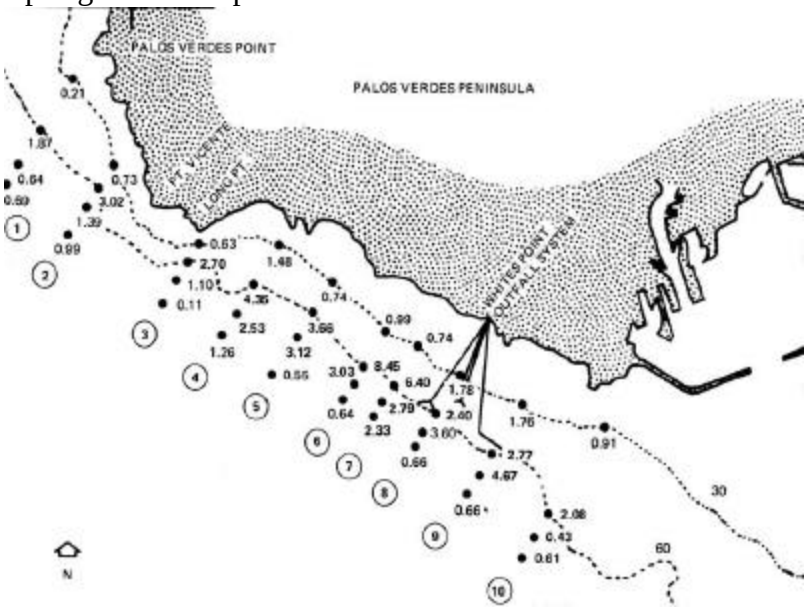
Another program recently initiated by the Project has produced preliminary information on the mercury concentrations discussed above. During May 1974, a few special sampling devices designed to collect settling particulates were maintained about 3 m above the ocean bottom near the JWPCP* Whites Point outfalls for approximately 2 week intervals. During this period, 24 hour, flow proportioned composites of JWPCP final effluents were frozen daily and combined to provide week long composites. Both the sediment trap and effluent samples were then filtered through 0.45 micron Millipore filters, and the residues were analyzed for total mercury. The results are presented in Table 2.

These data indicate that, on a dry weight basis, the JWPCP effluent particulates contain approximately twice as much mercury as the particulate material that is settling to the

bottom within a few kilometers of the outfall diffusers. The effluent particulates also contain more than twice as much volatile material (presumed to be largely organic) as the settling particulates. One hypothesis that could explain these observations is that organic material in the effluent particles is decaying as the particles settle to the bottom, and that mercury either is released from the organic fraction during this process or is desorbed from the inorganic fraction, or both. An alternate hypothesis is that the particulates that settle on the traps contain a considerable amount of non-effluent material with low concentrations of volatiles and mercury. In contrast, some of the ocean bottom sediments contain higher mercury levels than do the effluent particulates we have analyzed. We are continuing our studies in this area in hopes of better understanding the processes that control the eventual fate of effluent contaminants in the coastal waters.

FIGURES

Figure 1.
Concentrations of total mercury {mg/dry kg) in the upper 5 cm of bottom sediment collected by Shipek grab on 5 September 1973.



TABLES

Table 1.
Comparison of 1972 and 1973 concentrations of total mercury (mg/dry kg) in the upper 4 to 5 cm of bottom sediments collected off Palos Verdes*

Station**	1972	1973
1 B	0.64	0.64
1 C	2.08	1.87
1 D	0.22	0.21
3 C	3.42	2.7
3 D	0.71	C.63
5 B	3.24	3.12
5 D	0,95	0.74
6 B	2.92	3.03
6 D	0.35	0.99
9 B	4,78	4.67
9 C	2.54	2.77

9 D	0.88	1.76
10 B	0.71	0.43
10 C	0.84	2.08
10 D	0.96	0.91

*The 1972 values came from Phleger cores collected on 22 June;
the 1973 values are from Shipek grabs collected on 5 September

**In the two-part station number, the numeral refers to the transect
on the station grid shown on Figure 1 and the letter indicates the depth of the station (B = 150 m, C = 60 m,
and D = 30 m).

Table 2.
Concentrations of total mercury in particulate material from JWPCP final effluent and in samples from sediment traps placed near the Whites Point outfalls, spring 1974.

				Total Suspended Solids	
	Mercury (mg/dry kg)	**Effluent (mg/L)**			**% Volatile at 500 C**
Sample	**Date**				
Effluent	3 9 May	4.3	301		53.8
	10 16 May	3.3	250		55.4
	17 23 May	3.6	243		55.5
	24 30 May	3.3	249		57.7
	Average	3.6	261		55.6
Sediment Traps*					
1C	25 Apr 8 May	1.7	--		21
4C	25 Apr 8 May	1.9	--		23.9
6C	25 Apr 8 May	1.7	--		26.2
6C	25 Apr 8 May	1.4	--		32.3
6D	25 Apr 8 May	1.4	--		22
5C	8 23 May	1.8	--		19.8
6C	8 23 May	2.0	--		23.1
	Average**	1.8			22.7

*In the two part station number, the numeral refers to the transect in the station grid shown on Figure 1, and the letter indicates the depth of the station (C = 60 m and D = 30 m). At Station 6C, the sampler was maintained in midwater (30 m above bottom); at other stations, the trap was placed 3 m above bottom.

**Excluding the midwater sample (6C).