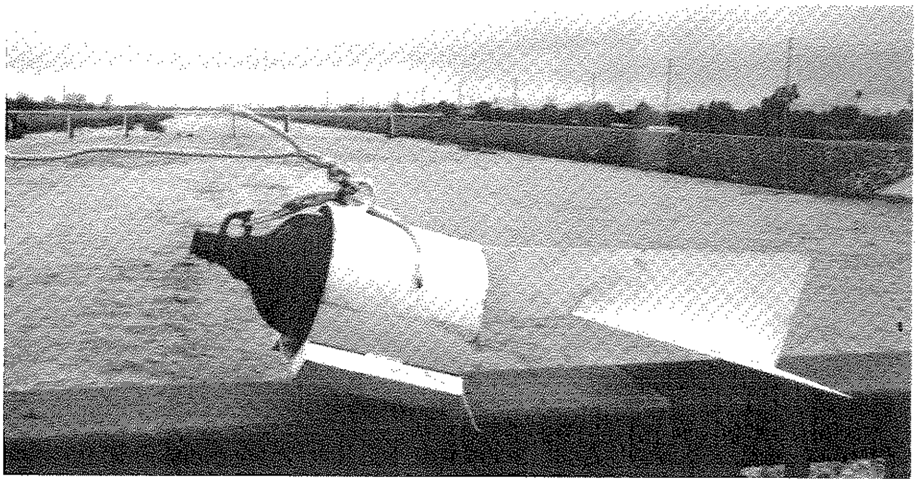


CONTAMINANTS IN LOS ANGELES RIVER STORM WATER RUNOFF

Since its inception SCCWRP has investigated relationships between contaminants in sewage outfalls and effects on marine water quality, sediments and marine life. However, other inputs to marine waters, including storm water runoff and aerial fallout, may introduce contaminants as well. How large these inputs are, compared to those from treated effluent, has not been satisfactorily determined. Also, levels of contaminants in treated wastewater have been reduced significantly over recent years; hence, wastewater's importance as a source of contaminants to marine waters may be changing relative to other sources.

This report describes research, begun in 1985 and currently in progress, that addresses the question of contaminant input from storm water runoff. Reliable estimates of annual inputs of contaminants due to stormwater runoff are difficult to obtain for a number of reasons:

1. Storm channels and rivers are monitored infrequently (usually quarterly) and at low flow periods.
2. The flow is highly variable, with runoff increasing by three orders of magnitude in periods of hours; also, annual flow may vary by an order of magnitude.
3. Runoff contamination levels are highly seasonal, with higher levels seen in the first storms of the season and lower levels evident in the more frequent fall and winter storms.
4. Stormwater runoff is introduced to the Southern California Bight by way of approximately 150 coastal streams plus hundreds of storm drains. These undoubtedly vary tremendously and it is prohibitively expensive to sample them all.

	1971/72	1979/80	1985/86
FLOW ($M^3 \times 10^6$)	68	673	290
Sus. Solids (tons/year)	14,000	1,350,000	116,000
Oil & Grease (tons/year)	1,290		2,900
METALS			
Ag	0.15	0.54	0.08
Cd	0.9	2.7	0.3
Cr	6	67	11
Cu	9	58	15
Ni	5.3	41	5.5
Pb	64	108	32
Zn	68	646	81
CHLORINATED HYDROCARBONS			
DDT	0.63	0.22	0.020
PCB	0.18	0.21	0.009

Table 1. Estimated L.A. River Mass Emissions (Metric Tons/Year)

In two previous water years, 1971-72 and 1979-80 (October 1 through September 30 of the following year), SCCWRP researchers measured contaminants in Los Angeles River water during winter storms. These earlier studies indicated that runoff was far less important than outfalls as a source of contaminants, with the exception of lead. However, outfall contamination levels have been reduced since those studies, and in addition, both of the study years could be considered atypical storm years. 1971-72 was a drought year and 1979-80 was abnormally wet (for flows, see Table 1). Also, few storms were sampled: three in 1971-72 and two in 1979-80, so that trends in contaminants with flow through the season were not well documented.

In the 1985-86 study, SCCWRP researchers Henry Schafer and Richard Gossett returned to the Los Angeles River to sample runoff water during storms. The Los Angeles River (Figure 1) receives stormwater from the largest drainage basin in southern California. Also, its runoff is 30 percent of the total gauged runoff to the Southern California Bight.

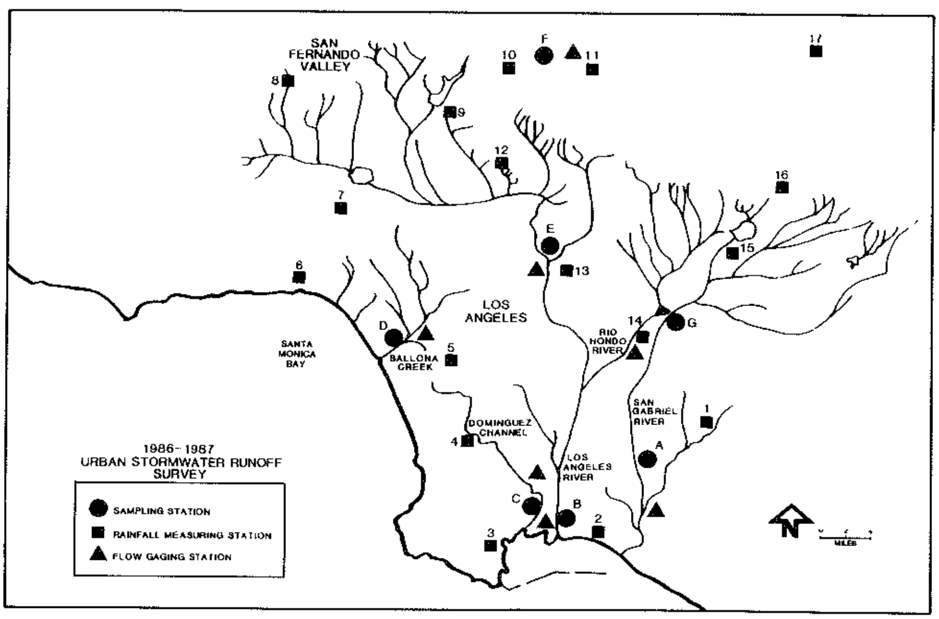


Figure 1. Los Angeles River Basin.

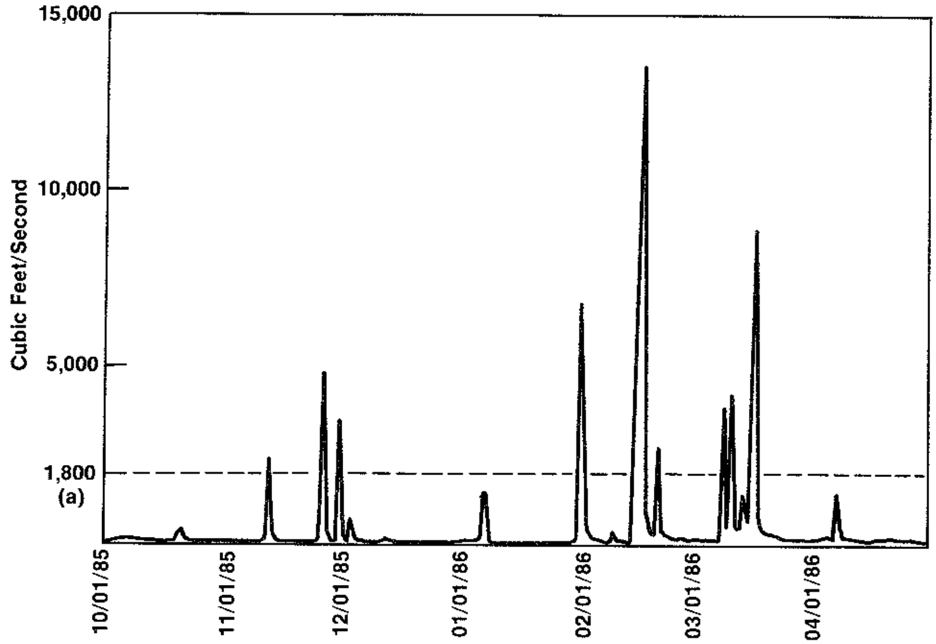
Because runoff is influenced by the frequency, duration, intensity and location of rainfall, Schafer, Gossett and their staff sampled a series of storms, beginning with the first storm of the 1985-86 season and including five of 17 subsequent storms. The total annual flow was 290 million cubic meters, which is very close to the average flow for the past 54 years. The daily average flow for the sampling site at Willow Street for the period October 1985 to May 1986 is shown in Figure 2.

The researchers attempted to take samples just before river flow increased, as well as during increasing, peak and declining flow periods. This requires educated guesswork relying on a crude visual estimate of flow, because it is not possible to obtain data on flow until several weeks after a storm. Samples were taken from the center of the Willow Street bridge using the one-gallon sampler designed by SCCWRP. The sampler is lowered through the water column and fills in roughly one minute. The sample taken is representative of mid-water column but is not designed to sample the surface layer or the heavy bedload material.

The constituents analyzed include: suspended solids, percent volatile solids, total solids, oil and grease, silver, cadmium, chromium, copper, nickel, lead, zinc, DDT, PCBs, and oil and grease.

Schafer and Gossett used the results of the contaminant analyses to make two comparisons: first, with the results of the previous storm runoff studies (Table 1), and second, with outfall contamination levels (Table 2). They note that there is a consistent trend over the three studies in decreasing DDT and PCB levels.

There are orders of magnitude variations in mass emissions of some constituents between the study years, corresponding to variations in flow. The contaminant numbers are not normalized to flow volume; Schafer notes that the researchers do not yet know whether twice the flow means twice the contaminant contribution or twice the dilution. While there is some thought that high flows dilute contaminants, Schafer and Gossett have seen only higher levels of contaminants with higher flows.



(a) = Average daily total flow of all municipal wastewater in the Southern California Bight.

Figure 2. Average daily flow (cu ft/sec) LA River at Willow St.

Orange County Sanitation District figures, which represent an annual discharge of 220 million gallons per day (mgd) — 140 mgd of secondary treated effluent and 80 mgd of primary treated effluent, were used to compare to L.A. River mass emissions (Table 2).

Seven of the 11 measured constituents are comparable within a factor of three. However, the river supplies about 10 times as much suspended solids as the outfall, while the outfall contributes about 10 times as much silver and cadmium and 70 times as much PCBs as the river. The difference in PCB contributions may not be as large as this comparison suggests, because Orange County Sanitation District used a method of PCB measurement that consistently yields concentrations higher than the procedures used by SCCWRP and other dischargers.

	L.A. River	OCSD
FLOW (M^3x 10^6)	290	220
Suspended Solids	116,000	14,500
Oil and Grease	2,900	4,400
Silver	0.8	3.9
Cadmuim	0.32	2.8
Chromium	11.	11.
Copper	15.	32.
Nickel	5.5	15.
Lead	32.	12.
Zinc	82.	52.
DDT	.020	0.11
PCB	.009	.660

TABLE 2. L.A. River and Orange County Sanitation Districts Estimated Mass Emissions 1985 (Metric Tons Per Year)

The great variation in flows and in constituents between years makes further measurement essential, so that reliable estimates of variability can be made. Schafer and Gossett will continue stormwater runoff sampling in 1986-87. In addition to sampling the Los Angeles River, they and other SCCWRP staff will measure inputs at five other river and storm channels in Ventura and Los Angeles Counties to better estimate the inputs from runoff. They will sample runoff from three storms — the first storm of the year, a very large storm during the year, and a storm late in the season.