

APPENDIX

ESTIMATING MUNICIPAL DISCHARGES OF BOD, TOTAL NITROGEN, PHOSPHORUS, AND REFRACTORY ORGANICS INTO U.S. STREAMS

Nine assumptions were used in estimating the municipal discharges of various materials into streams in the United States (TABLE 3). The formulas used to estimate each of the four components considered are described after the pertinent assumptions.

1. It is assumed that all sewer municipal effluents are discharged into U.S. streams.

2. It is assumed that by 1980 the discharge of raw municipal wastes will have ceased, and that by 1990 the entire sewer population will be serviced by primary-secondary treatment. For the period 1900-1962, the sewer populations receiving "no treatment," $(SP)_{on}$, "primary treatment," $(SP)_{pn}$, and "secondary treatment," $(SP)_{sn}$, were derived from References 4-8.

3. It is assumed that the waste treatment efficiencies for various materials are those shown in TABLE 2. The fraction (f) of each material remaining in

TABLE 2

MUNICIPAL PRIMARY AND SECONDARY TREATMENT REMOVAL EFFICIENCIES AND FRACTIONS REMAINING IN EFFLUENT (f) FOR BOD, TOTAL NITROGEN, PHOSPHORUS AND REFRACTORY ORGANICS

Removal of:	No Treatment		Primary Treatment		Secondary Treatment	
	Percent Removal	f_o	Percent Removal	f_p	Percent Removal	f_s
BOD	0	1.0	35	.65	90	.10
Total Nitrogen	0	1.0	20	.80	50	.50
Phosphorus	0	1.0	10	.90	30	.70
Refractory Organics	0	1.0	20	.80	60	.40

the effluent discharge, that is, $f = 1 - \frac{\text{treatment efficiency}}{100}$, is also given.

Biochemical Oxygen Demand (BOD)

4. Daily domestic BOD contribution, p_{BOD} , is 0.167 lbs./capita/day (a constant).

5. To account for the increase in industrial wastes handled in municipal sewerage systems between 1900 and 2000, a varying ratio of "industrial plus domestic BOD" to "domestic BOD" was used. This was sometimes expressed as "PE/capita." Based on PE/capita figures for 1900, 1970, and 1980, as given in Reference 11, and an assumption of PE/capita = 1.1 in 1930, a curve was prepared as shown in FIGURE 11. This curve was extrapolated to the year 2000 at a constant PE/capita of 1.75.