4. SUMMARY AND CONCLUSIONS

This study investigated the dynamics and transport of pollutants in three tidal tributaries of the Hackensack Estuary: namely, Sawmill Creek, Mill Creek and Berry's Creek. The study also investigated microscale transport dynamics at a marsh impoundment site and a mudflat impoundment site in the Sawmill Creek sub-basin. Tidal elevation, flow and water quality data were collected at these sites during the periods November 1988, July 1989 and August 1989. Mass flux was calculated for nutrients, $CBOD_5$, DO, chlorophyll-a, TSS and salinity at each station for the ebb and flood portion of each tidal cycle. The mass of these constituents transported during the ebb portion of the tidal cycle was subtracted from the mass transported during the flood portion of the tidal cycle to determine the net import (flood mass > ebb mass) or export (ebb mass > flood mass) of each constituent over a tidal cycle.

In addition, a net analysis was conducted for each sampling period which compared the pollutant load transported over the flood portions of the tidal cycles in a sampling period to that transported during the ebb portions of the same cycles. This provided an estimate of the total net transport for each sampling period. In many instances, the net analysis seemed to provide the best estimate of mass transport at each site due to better hydraulic flow balancing over the total duration of the tidal cycles in each sampling period than for each individual cycle. It is essential to achieve good hydraulic flow balance in order to differentiate the mass transport due to flow imbalance from that due to exchange between the wetlands and the estuary.

A major goal of this study was to investigate the impact of transport dynamics of $CBOD_5$, nutrients and dissolved oxygen on the water quality in the lower Hackensack River. Table 4.1 summarizes the results regarding transport of selected parameters between each tributary and the lower Hackensack River for the different sampling periods.

TABLE 4.1: Summary of Net Transport for Selected Parameters

EXPERIMENT	$CBOD_5$ N	J	A	NH_3-N N	J	A	NO_3-N N	J	A	Total N N	J	A	DO N	J	A
Sawmill Cr.- S3	E	E	I	E	E	I	E	E	I	E	E	I	E	E	I*
Mill Cr.- S9	E	I*	I	E*	O	I*	O	I	E	O	I*	I	-	I*	I
Berrys Cr.- S14	-	I*	I	-	E*	I	-	I	E	-	E*	I	-	E	E*

N = November 1988 I = Import A = August 1989
J = July 1989 E = Export
* = Less than 5% of Flood Mass transported

Review of Table 4.1 reveals that transport direction was not consistent for any parameter at any tidal tributary during the three sampling periods. Additional long-term data would be required to determine whether the variations are due to natural conditions within each tributary.

In Sawmill Creek, which has the largest tidal exchange with the lower Hackensack River, all parameters listed in Table 4.1 were exported during the November, 1988 and July, 1989 sampling periods, but were imported during the August, 1989 sampling period. The July and August 1989 sampling events were conducted within a period of two weeks apart and so were expected to serve as replicate sampling events. Clearly, the inconsistent results obtained during these two periods indicate the need for additional data to determine the reasons that the tidal tributaries behave as both sources and sinks of pollutants.

$CBOD_5$ and the nitrogen-series parameters were exported at Station S3 in Sawmill Creek during the November and July sampling events. Station S3 drains a large expanse of mudflat and a smaller area of tidal marsh. In addition, two active HMDC sanitary landfills are located at the head of the Creek. The flux of water quality

parameters at Station S3 would be influenced by a combination of processes in the tidal marshes, mudflats, and ,possibly, by leachate from the landfills.

Two microscale experiments were conducted in the Sawmill Creek system: (a) at a mudflat embayment (Station M1), and (b) at a marsh impoundment (Station M2). Station M1 was sampled during the November, 1988 and July, 1989 sampling periods. Consistent results were obtained when all data for each sampling period was combined into a net analysis, although results for individual tidal cycles varied to some extent. Based on these results, the mudflat appeared to import NH_3-N, TKN, Total N, and $CBOD_5$ and to export NO_3-N, NO_2-N, and DO.

The microscale marsh station, M2, was sampled in November, 1988 and July and August, 1989, respectively. At Station S3, the transport results for the nitrogen-series parameters obtained from the July sampling period were similar to those from the November sampling period, and less so to the August results. The marsh consistently imported TKN and Total N during the three periods. NH_3-N was imported during November and July and exported in August, while NO_3-N showed the opposite pattern. DO, on the other hand, was imported in November, and exported during July and August.

Thus, the export of $CBOD_5$, NH_3-N, and Total N at Station S3 during the November and July sampling periods can not be explained by the results of the microscale studies. A source of NH_3-N to the lower Hackensack River in the vicinity of Sawmill Creek was also noted in the data taken for the modeling study of the main stem of the River, described in Appendix A, Part I of this report. The results of this study do not indicate that the mudflats or marshes within Sawmill Creek are the source of the NH_3-N. A possible source could be the two HMDC sanitary landfills located at the head of Sawmill Creek. Analysis of leachate data taken from wells at the perimeter of these landfills revealed very high concentrations of NH_3-N and other nitrogen-series parameters. However, data was not available to calculate actual loading rates

from the landfills to the Creek. Therefore, the conclusion that the landfills are the source of excess NH_3-N must be regarded as speculative at this time.

In Berry's Creek and Mill Creek, two stations were sampled in each Creek to separate the impact of the wetlands on mass transport from the effect of other sources or sinks in the system. These systems were sampled completely in July and August, 1989, while an additional sampling was conducted in Mill Creek in November, 1988. Mill Creek is also affected by discharge from the Secaucus STP about 1,5 miles upstream from its mouth. As shown in Table 4.1, the results from Stations at the mouths of both Creeks revealed very inconsistent results.

The results for Mill Creek do not show the consistent export of $CBOD_5$ and nutrients that might be expected given the discharge of secondary-treated effluent from the Secaucus STP. These data suggest that the marsh acts as a sink for these parameters. During the July 1989 sampling period, all parameters listed in Table 4.1 were imported into Mill Creek from the Hackensack River, except NH_3-N which had no net transport. During the August sampling period, only NO_3-N and DO were exported, while the other parameters listed in Table 4.1 were imported. During the growing season, the marshes within the Mill Creek basin appear to have consumed the excess nutrients and $CBOD_5$ input to the system from the STP. In November, however, during the end of the growing season, when marsh plants stop growing and begin to senesce and die, $CBOD_5$ and NH_3-N were exported from Mill Creek. Thus, the plants are no longer capable of removing the excess $CBOD_5$ and NH_3-N from the system. Clearly, additional long-term data would be needed to confirm these conclusions.

There is no consensus in the scientific literature regarding the direction or magnitude of mass flux between tidal wetlands and estuaries. The complex chemistry and hydrodynamics of these systems create a high degree of natural variability as well as making it difficult to accurately measure flows and representative concentrations.

Methods used by researchers to sample the systems and to calculate net flux also vary widely. In addition, site specific conditions may make generalizations regarding estuarine-wetlands nutrient exchange unreliable. In particular, the Hackensack River estuary is a highly enriched system in which nutrient dynamics may be very different than those in less enriched systems. Another possible confounding factor was that each tributary studied contained other possible sources and sinks of nutrients, including an STP and two landfills. Most research in the literature have analyzed systems with less human influences. For these reasons it is difficult to compare the results of this study to the results of other such analyses reported in the literature.

The wetlands of the Hackensack Estuary play an important role in the nutrient dynamics of its ecosystem. The system is complex and appears to be inherently variable in the nature and direction of nutrient exchange. This variability was also reflected in the sediment studies (see Appendix A-3-3) in which consistent results were not obtained. This study has been a critical first step in exploring the nature of nutrient and dissolved oxygen exchange between the tidal wetlands and the lower Hackensack River. Due to the variability in mass transport results, the conclusions reached herein must be considered somewhat speculative until additional data becomes available to further explore this system.

However, the results of this study have provided valuable insights into the nutrient and dissolved oxygen dynamics in the complex tidal wetland ecosystem of the lower Hackensack River. **The study also revealed that nutrient loads for the wetlands <u>assumed</u> in most previous studies of the lower Hackensack River were not appropriate.** The results of the comprehensive Marsh study were used to generate pollutant contributions from the extensive tidal marshes, mudflats and landfills of the lower Hackensack River Basin for use in the River Modeling phase of the study.

These results are summarized as follows:

1. The overall Nutrient Transport results do not indicate a clear and consistent pollutant loading pattern to the tidal Hackensack River. Thus, the extrapolation of these results to the remaining tidal marshes and mudflats within the lower Hackensack River Basin could not be justified.

2. The review of the net DO transport results revealed export from the tidal tributaries in almost all instances. These results were incorporated into the River Model by increasing the Dissolved Oxygen Reaeration coefficients in the relevant reaches of the River.

3. The review of the Net Pollutant transport results in the vicinity of the extensive HMDC Landfills indicate a source of both BOD and NH_3-N to the river. Although the data were not consistent during the three monitoring periods, high pollutant concentrations present in the wells adjoining the landfills and the current literature, justify the extrapolation of these data to the remaining landfills within the watershed.

The results of this Tidal Marsh Study were incorporated into the River Modeling Phase of the lower Hackensack River Study (Appendix A, Part 1) to determine viable alternatives for water quality enhancement within the lower Hackensack River Basin.

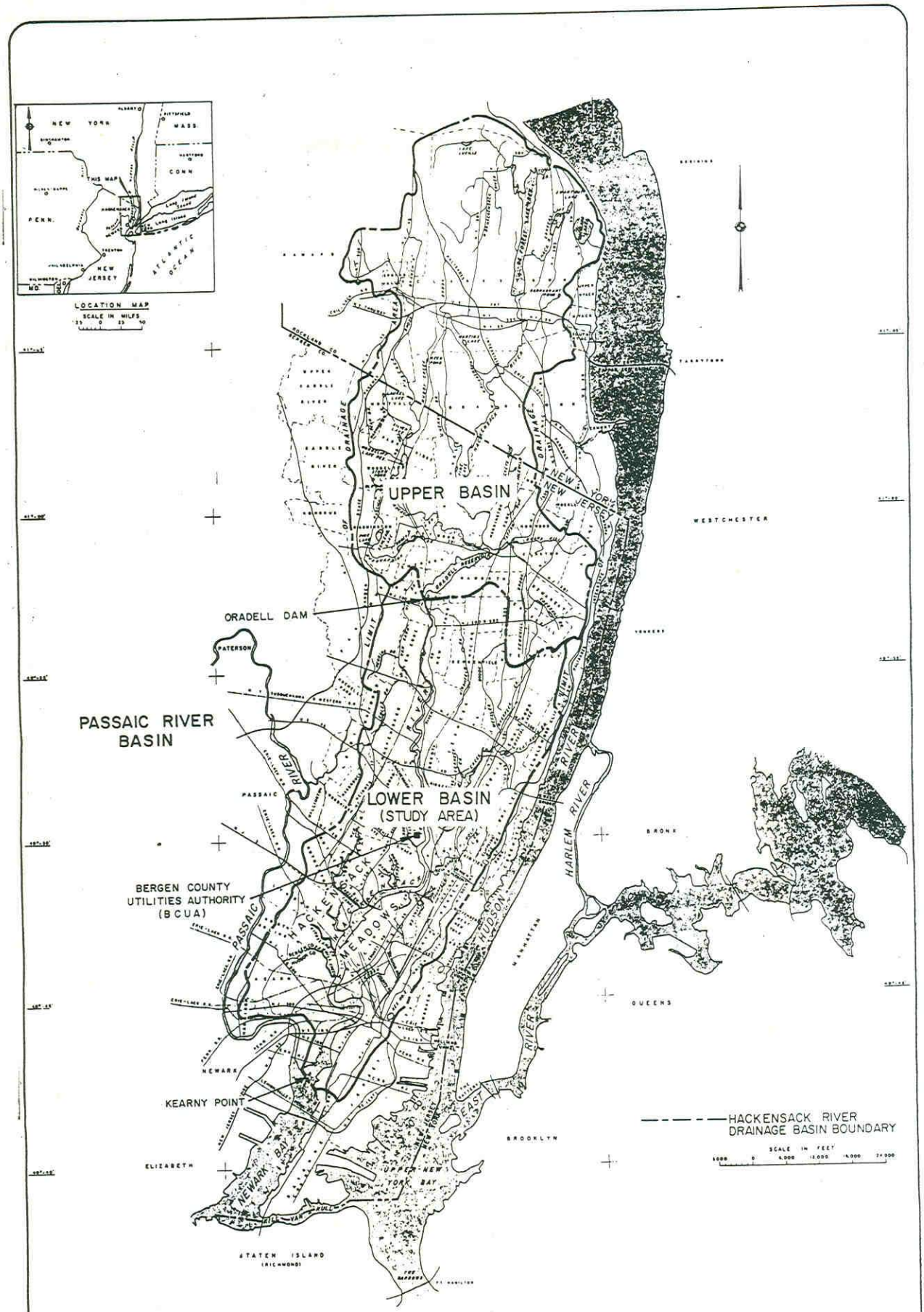
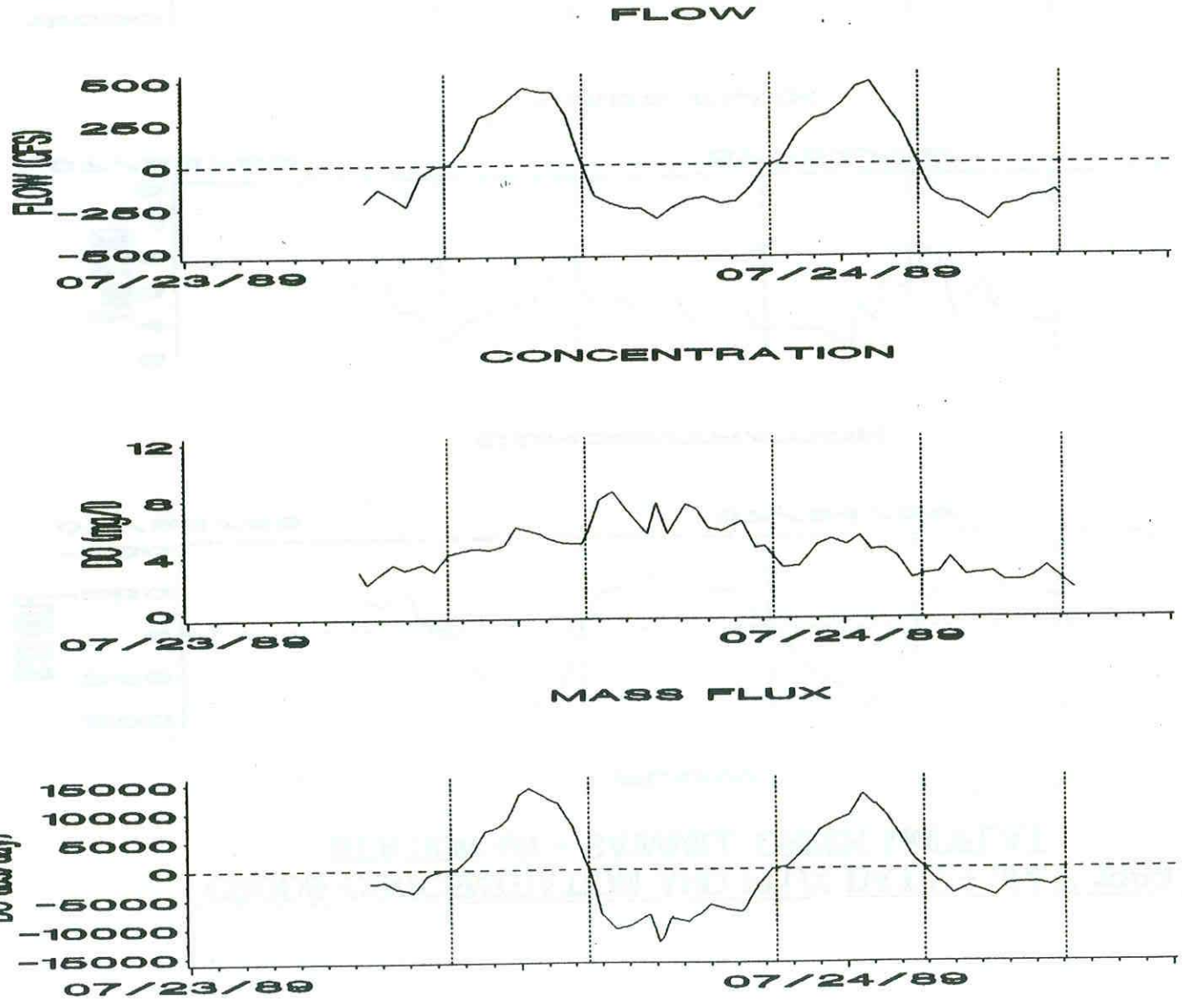
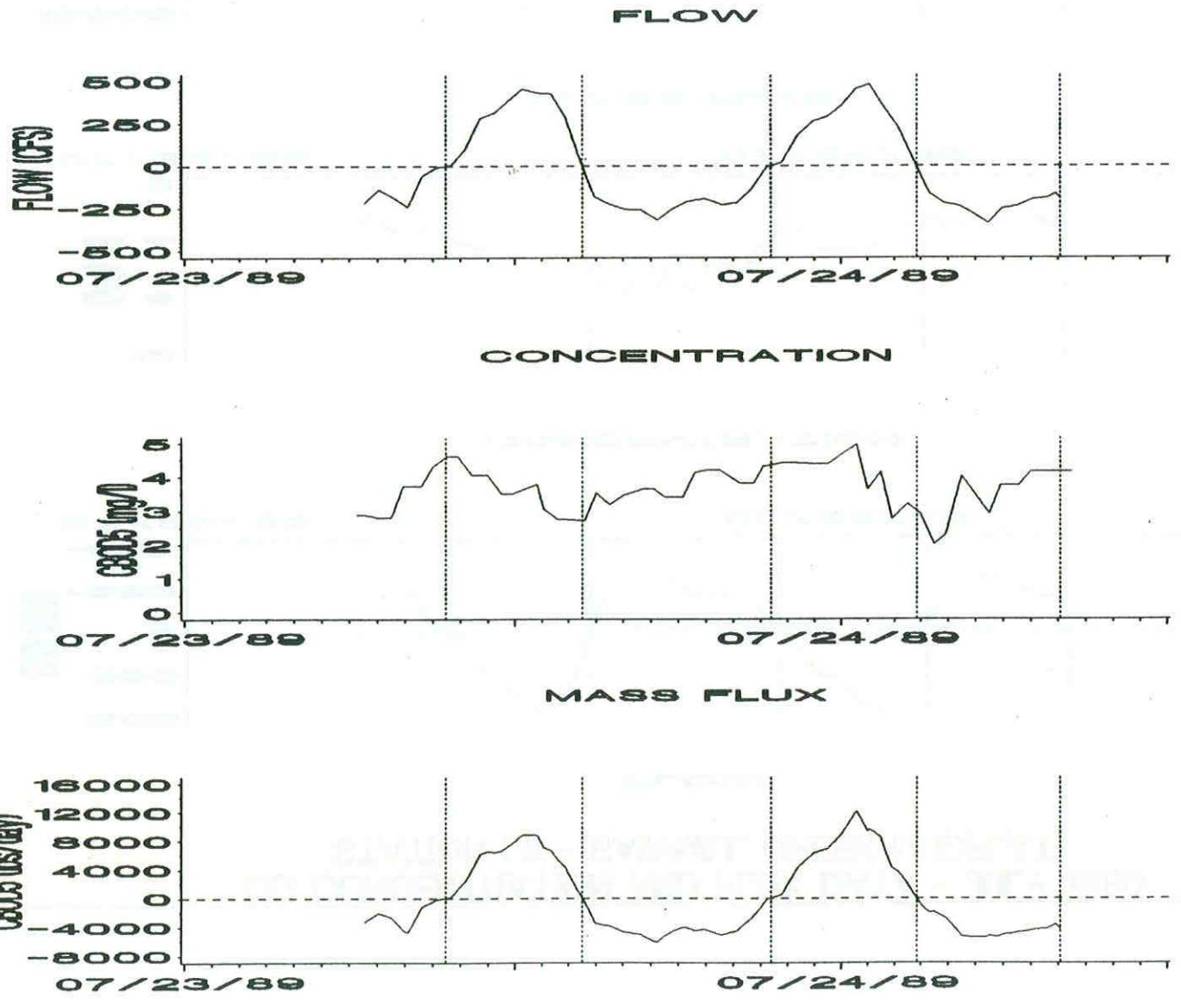


Figure 1.1 Hackensack River Drainage Basin and Location Map

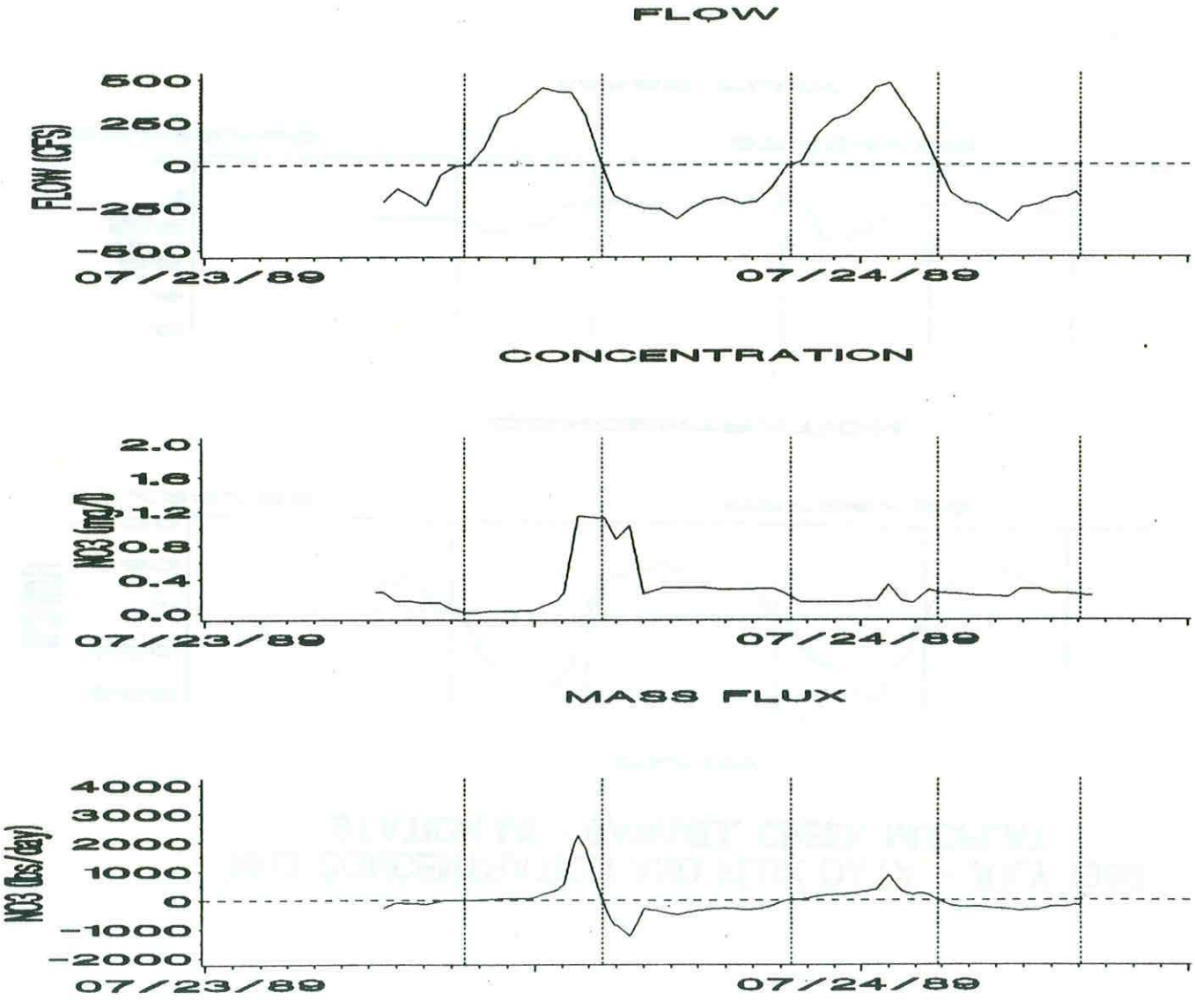
DO CONCENTRATION AND FLUX DATA - JULY 1989
STATION M1 - SAWMILL CREEK MUDFLAT



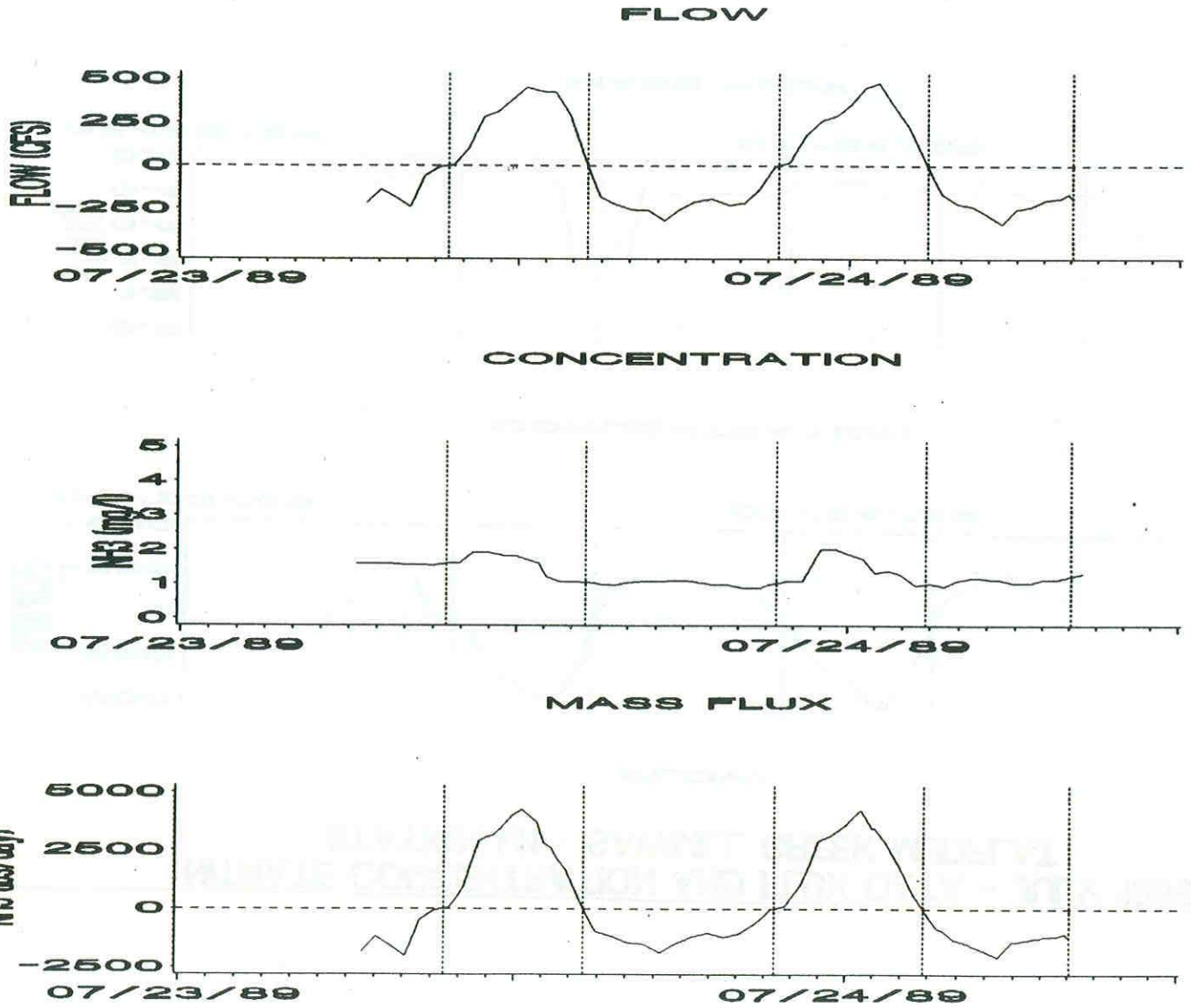
CBOD5 CONCENTRATION AND FLUX DATA - JULY 1989
STATION M1 - SAWMILL CREEK MUDFLAT



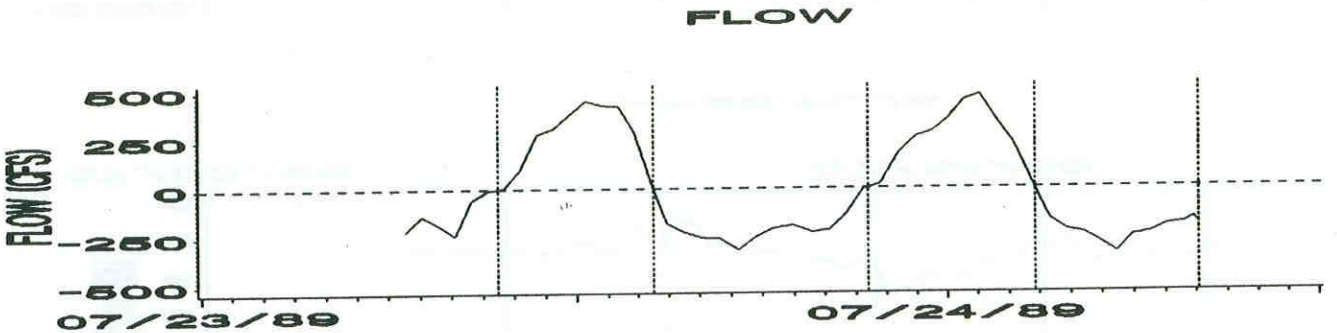
NITRATE CONCENTRATION AND FLUX DATA - JULY 1989
STATION M1 - SAWMILL CREEK MUDFLAT

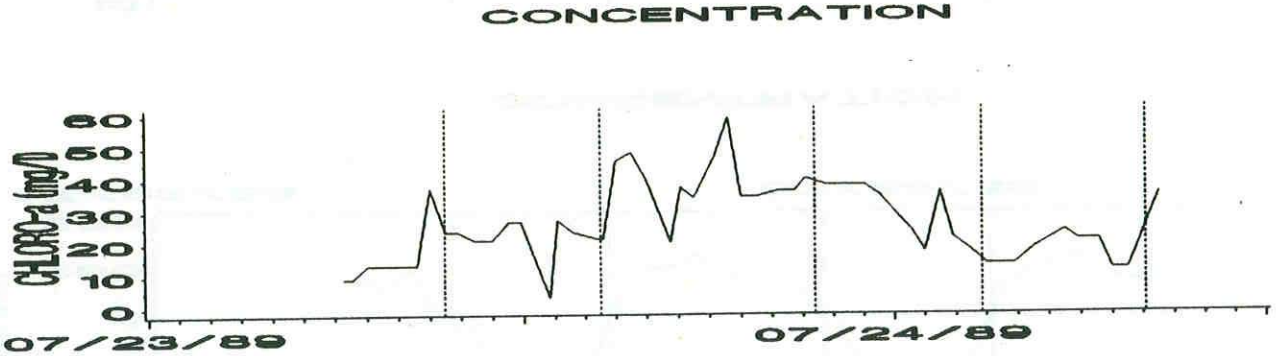


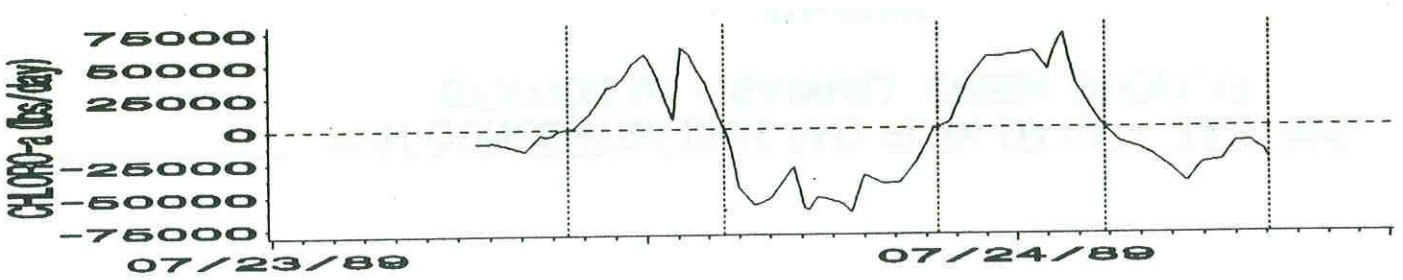
NH3 CONCENTRATION AND FLUX DATA - JULY 1989
STATION M1 - SAWMILL CREEK MUDFLAT



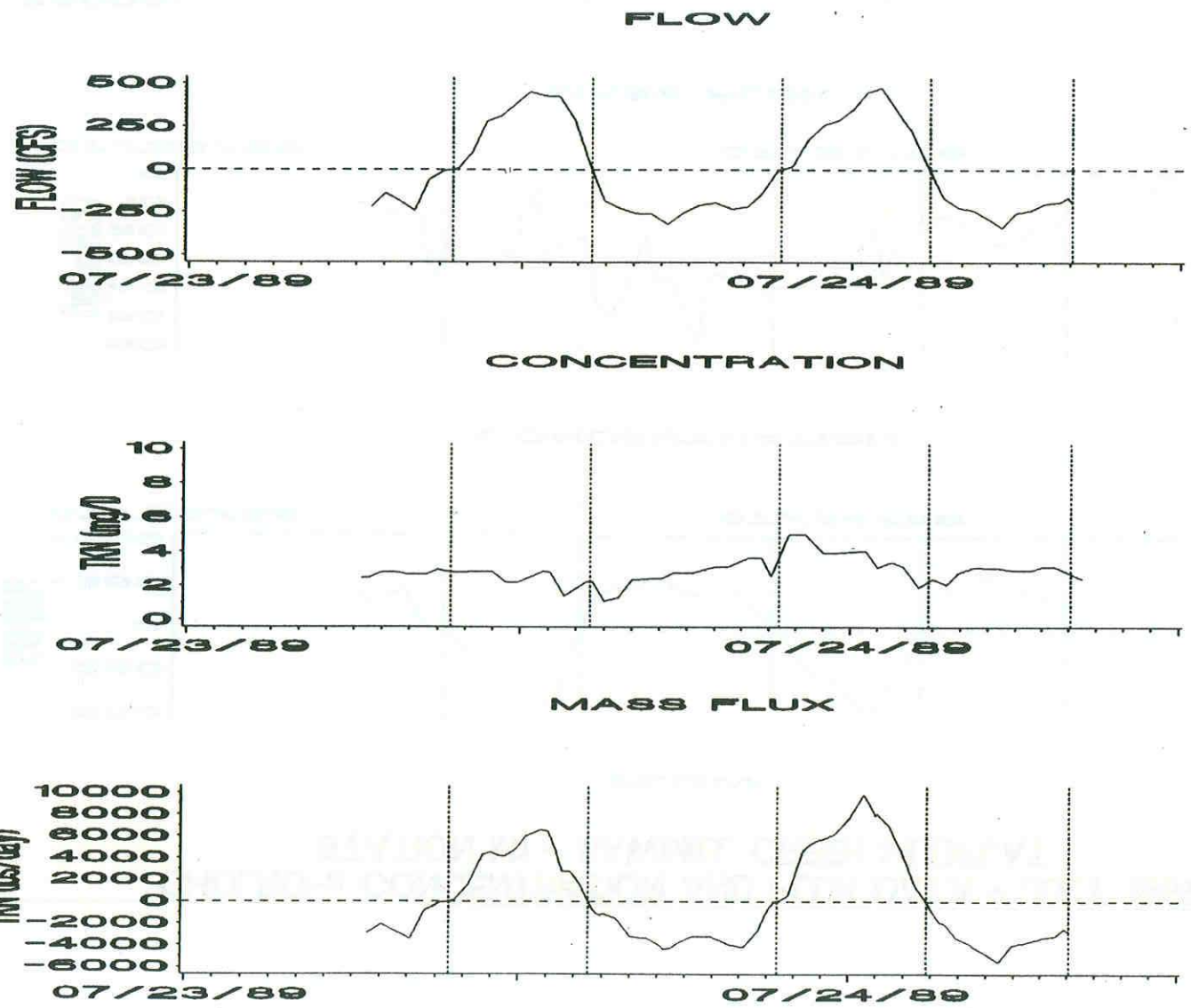
CHOLRO-a CONCENTRATION AND FLUX DATA - JULY 1989
STATION M1 - SAWMILL CREEK MUDFLAT



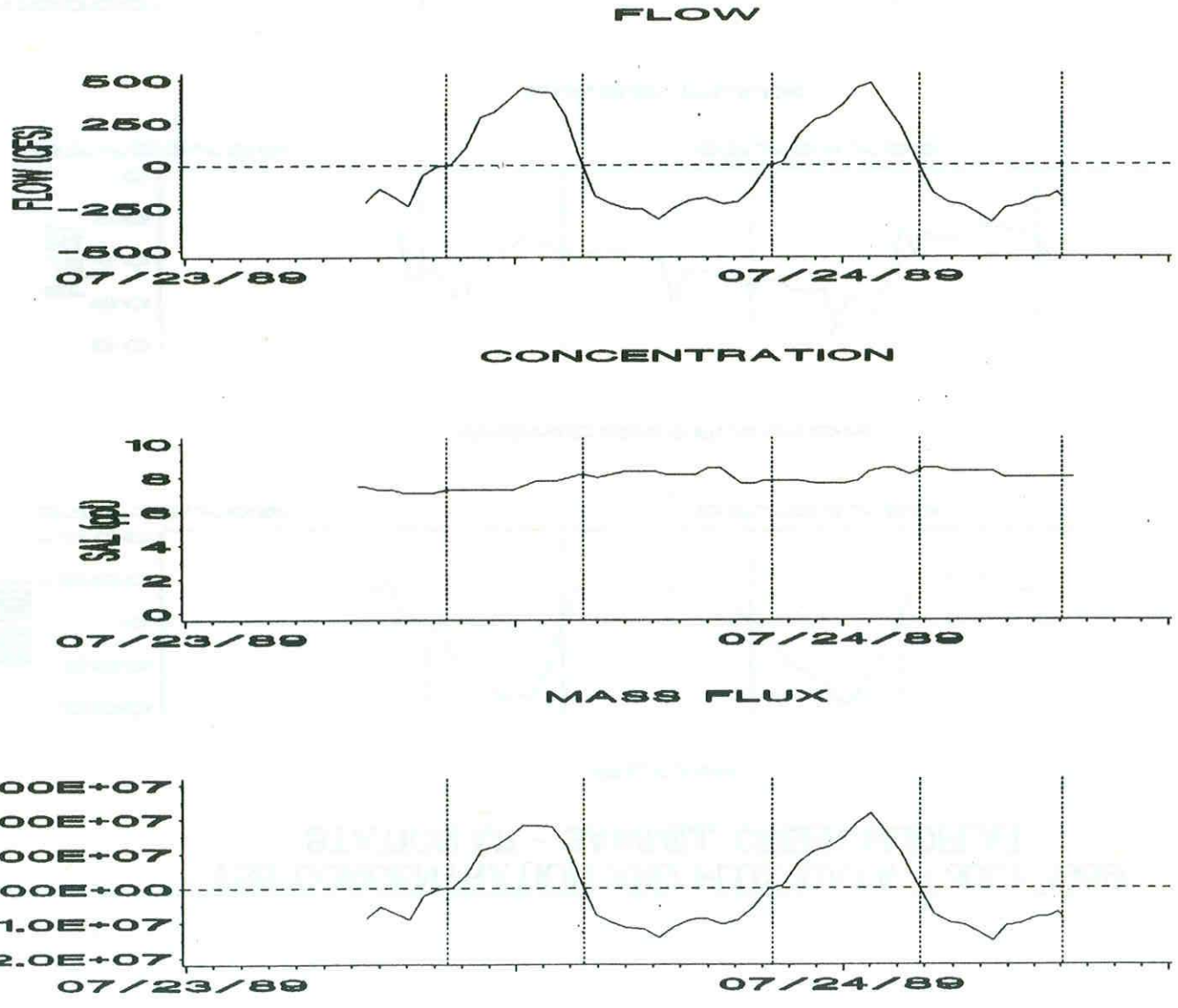




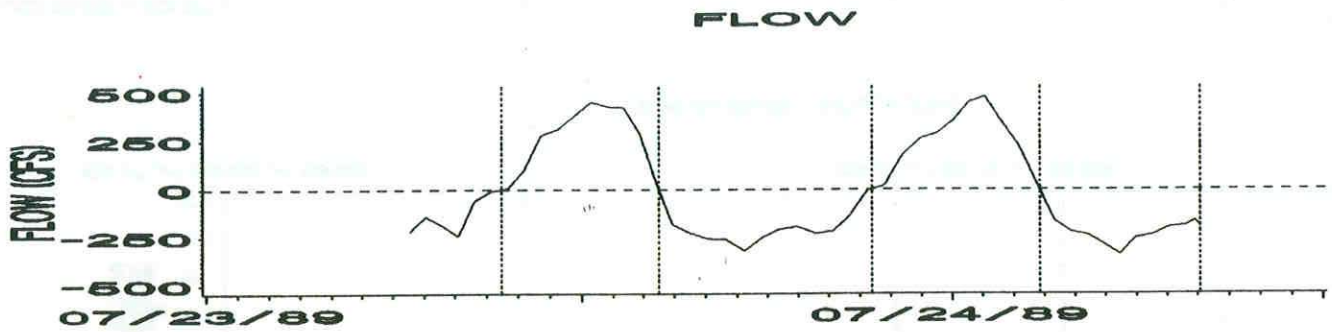
TKN CONCENTRATION AND FLUX DATA - JULY 1989
STATION M1 - SAWMILL CREEK MUDFLAT

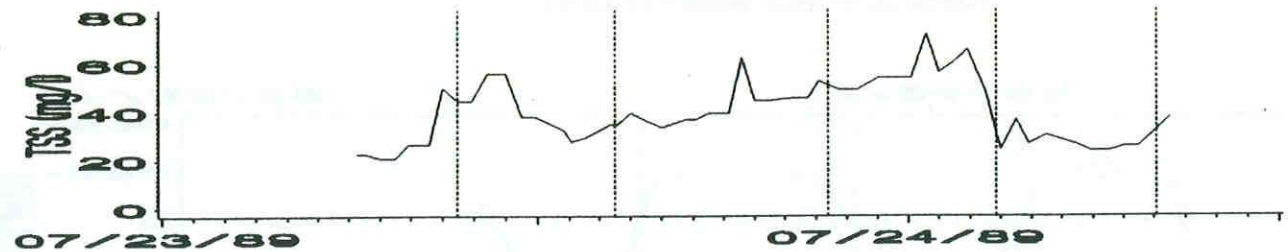


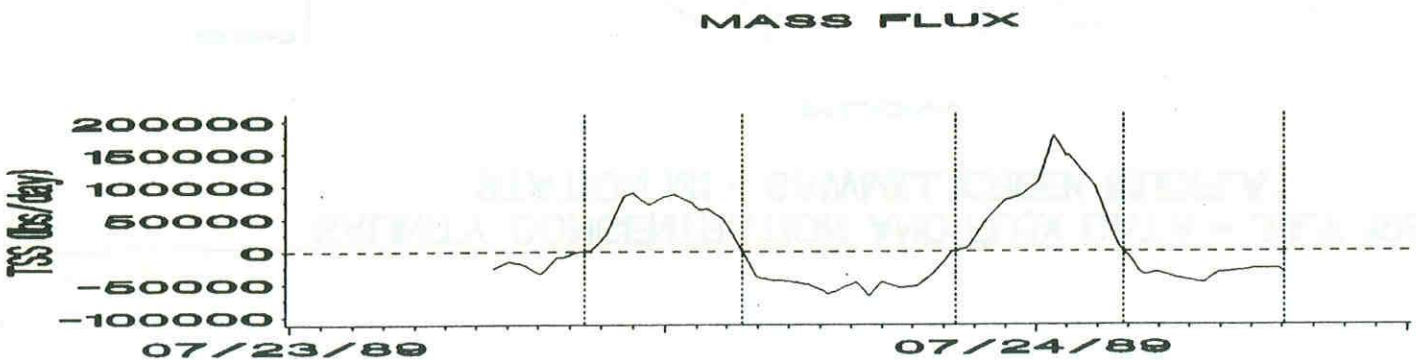
SALINITY CONCENTRATION AND FLUX DATA - JULY 1989
STATION M1 - SAWMILL CREEK MUDFLAT



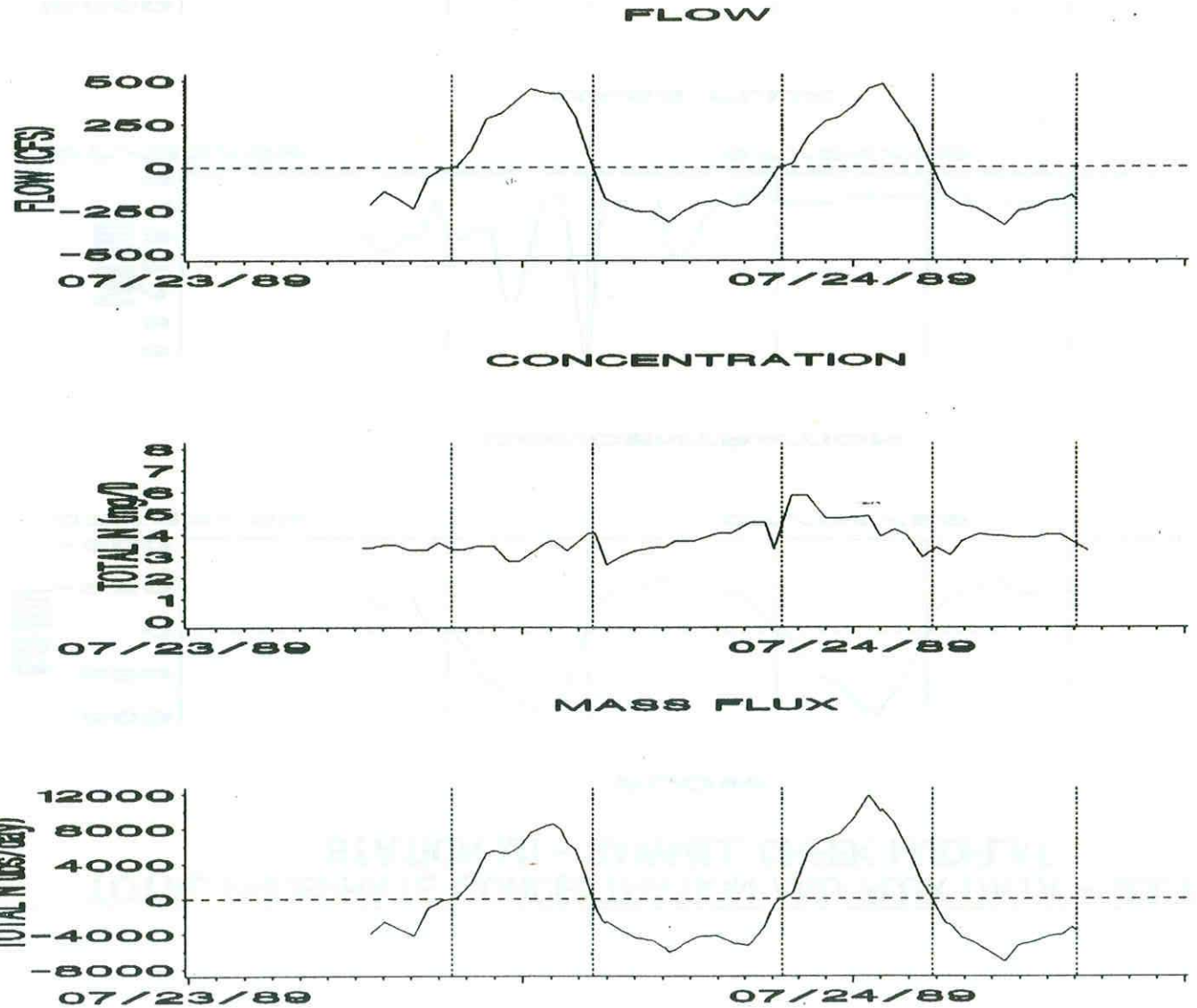
TSS CONCENTRATION AND FLUX DATA - JULY 1989
STATION M1 - SAWMILL CREEK MUDFLAT



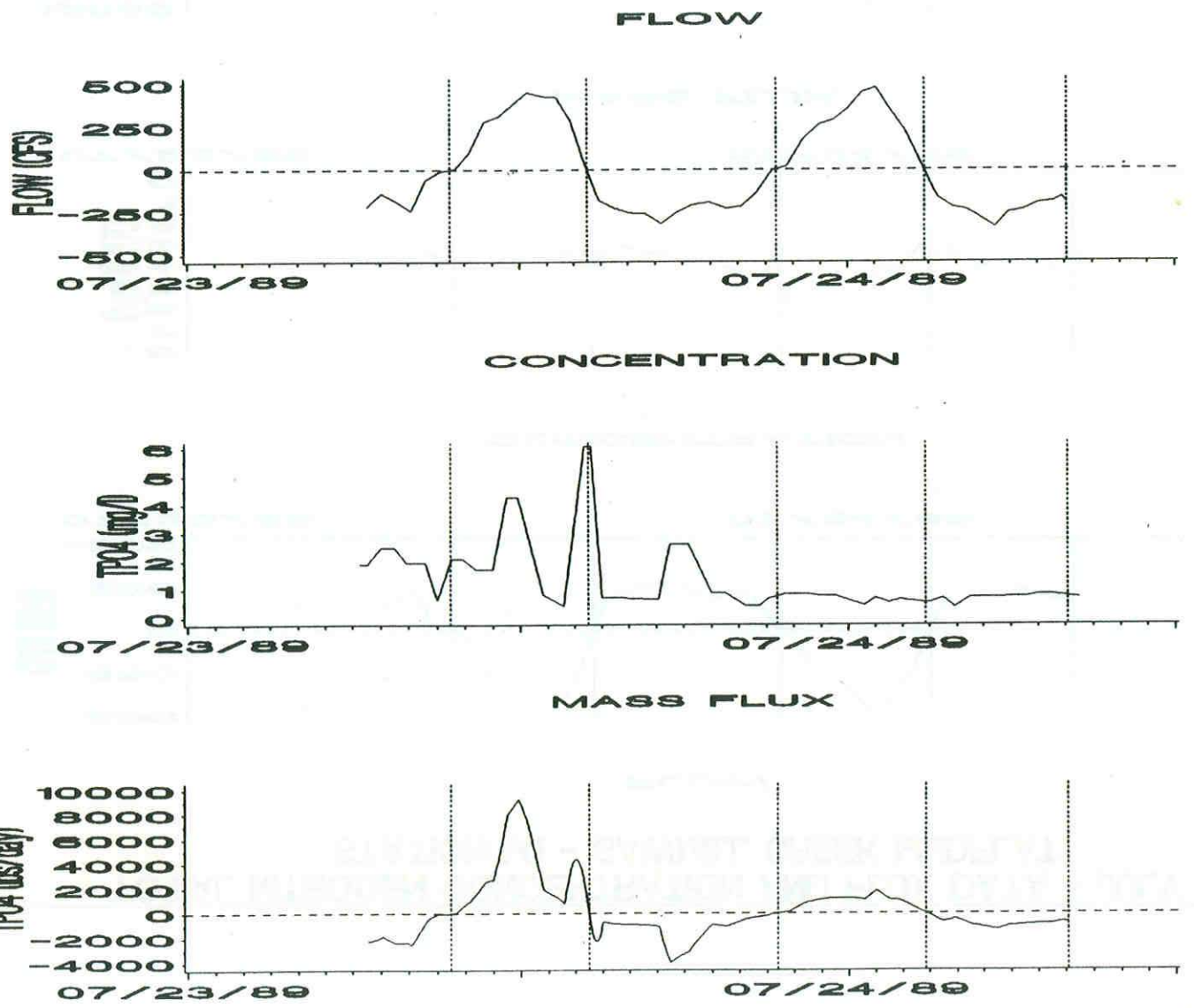




TOTAL NITROGEN CONCENTRATION AND FLUX DATA - JULY 1989
STATION M1 - SAWMILL CREEK MUDFLAT



TOTAL PHOSPHATE CONCENTRATION AND FLUX DATA - JULY 1989
STATION M1 - SAWMILL CREEK MUDFLAT



CYCLES 3+4 (D+N)	20789467	4055.3	6137.2	875.57	400.05	10656.9	11932.52	4072.21	1.01E+07	596.3	29937	36513
FLOOD CYCLES 3+4	-2.06E+07	-4083	-6121.9	-881.12	-412.35	-8667.3	-10126.7	-4936.5	-1.0E+07	-485.42	-22537	-30804
EBB CYCLES 3+4												
NET MASS CYCLE 3+4	153168	-27.7	15.3	-5.55	-12.3	1989.6	1805.79	-864.3	-94132	110.88	7400	5709
% Transport	0.7%	-0.7%	0.2%	-0.6%	-3.1%	18.7%	15.1%	-21.2%	-0.9%	18.6%	24.7%	15.6%
NET SECAUCUS STP	163551.6	169.805	246.813	6.31382	1.30261	320.425	328.0414	57.6675	8285.47	21.2406	21.3236	413.258
NET MASS W/STP	316719.6	142.105	262.113	0.76382	-10.997	2310.03	2133.831	-806.63	-85847	132.121	7421.32	6122.26
% Transport	1.5%	3.5%	4.3%	0.1%	-2.7%	21.7%	17.9%	-19.8%	-0.8%	22.2%	24.8%	16.8%

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JULY 1989 DATA

Summary of Mass Loading Information At S9
Conversion of lbs/ft3 to mg/l 16020

CYCLE 1	FLOW (cfs)	BOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE												
07/26/89 09:32-15:48												
Total Mass (lbs)	11387715	3567.9	1183.4	511.31	790.46	2614	3915.77	3160.6	3140431	480.34	17208	31339
Flow Av. Conc. mg/l		5.019	1.665	0.719	1.112	3.677	5.509	4.446	4.418	0.676	24.208	44.087
EBBING TIDE												
07/26/89 15:49-22:25												
Total Mass (lbs)	-1.15E+07	-3463.8	-1231.7	-358.69	-826.24	-2250.1	-3435.03	-3269.7	-3.6E+06	-430.48	-38443	-26887
Flow Av. Conc. mg/l		4.813	1.711	0.498	1.148	3.126	4.773	4.543	5.054	0.598	53.412	37.356
INFLOW FROM SECAUCUS												
07/26/89 15:30-22:30												
Total Mass (lbs)	201160	102.133	55.8331	137.438	25.7494	114.627	277.8144	77.2395	12662.2	33.864	26.464	403.442
Flow Av. Conc. mg/l		8.134	4.446	10.945	2.051	9.129	22.125	6.151	1.008	2.697	2.108	32.129
NET FLUX - CYCLE 1												
07/26/89 09:31-22:25												
Net Mass (lbs/cycle)	-142671	104.1	-48.3	152.62	-35.78	363.9	480.74	-109.11	-496836	49.86	-21235	4452
% Change in Mass	-1.3%	2.9%	-4.1%	29.8%	-4.5%	13.9%	12.3%	-3.5%	-15.8%	10.4%	-123.4%	14.2%
not including STP												
Net Mass (lbs/cycle)	58489	206.233	7.5331	290.058	-10.031	478.527	758.5544	-31.87	-484174	83.724	-21209	4855.44
% Change in Mass	0.5%	5.8%	0.6%	56.7%	-1.3%	18.3%	19.4%	-1.0%	-15.4%	17.4%	-123.2%	15.5%
including STP												
Net Ch. In Conc mg/l		0.207	-0.047	0.221	-0.036	0.551	0.736	-0.097	-0.636	0.078	-29.204	6.731
% Change in Conc		4.1%	-2.8%	30.7%	-3.2%	15.0%	13.4%	-2.2%	-14.4%	11.5%	-120.6%	15.3%

CYCLE 2	FLOW (cfs)	BOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE 07/26/89 22:26- 07/27/89 04:17												
Total Mass (lbs)	6339346	1814.4	819.2	171.390	492.290	1202.50	1866.18	816.400	1702295	256.66	19440	16063
Flow Av. Conc. mg/l		4.585	2.070	0.433	1.244	3.039	4.716	2.063	4.302	0.649	49.126	40.592
EBBING TIDE 07/27/89 04:18-10:19												
Total Mass (lbs)	-6289470	-1831	-787.6	-172.51	-463.38	-1559.3	-2195.19	-643.1	-1681403	-282.11	-14091	-11038
Flow Av. Conc. mg/l		4.663	2.006	0.439	1.180	3.972	5.591	1.638	4.283	0.719	35.891	28.115
INFLOW FROM SECAUCUS 07/27/89 04:01-10:00												
Total Mass (lbs)	185566	153.885	48.501	121.841	21.3292	88.034	231.2042	68.2398	11180.5	34.1117	23.3805	351.671
Flow Av. Conc. mg/l		13.285	4.187	10.519	1.841	7.600	19.960	5.891	0.965	2.945	2.018	30.360
NET FLUX - CYCLE 2 07/26/89 22:26 - 07/27/89 10:1900												
Net Mass (lbs/cycle)	49876	-16.2	31.6	-1.12	28.91	-356.8	-329.01	173.3	20892	-25.45	5349	5025
% Change in Mass not including STP	0.8%	-0.9%	3.9%	-0.7%	5.9%	-29.7%	-17.6%	21.2%	1.2%	-9.9%	27.5%	31.3%
Net Mass (lbs/cycle)	235442	137.685	80.101	120.721	50.2392	-268.77	-97.8058	241.54	32072.5	8.6617	5372.38	5376.67
% Change in Mass including STP	3.7%	7.6%	9.8%	70.4%	10.2%	-22.4%	-5.2%	29.6%	1.9%	3.4%	27.6%	33.5%
Net Ch. In Conc mg/l		-0.078	0.064	-0.006	0.064	-0.933	-0.875	0.425	0.019	-0.070	13.235	12.477
% Change in Conc		-1.7%	3.1%	-1.5%	5.1%	-30.7%	-18.6%	20.6%	0.4%	-10.8%	26.9%	30.7%

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NET FOR JULY 1989 AT STATION S-9

	FLOW (cfs)	BOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE	17727061	5382.3	2002.6	682.7	1282.75	3816.5	5781.95	3977	4842726	737	36648	47402
EBBING TIDE	-1.78E+07	-5294.4	-2019.3	-531.2	-1289.6	-3809.4	-5630.22	-3912.8	-5.3E+06	-712.59	-52534	-37925
NET MASS	-92795	87.9	-16.7	151.5	-6.87	7.1	151.73	64.19	-475944	24.41	-15886	9477
%Transport	-0.5%	1.6%	-0.8%	22.2%	-0.5%	0.2%	2.6%	1.6%	-9.8%	3.3%	-43.3%	20.0%
NET SECAUCUS STP	386726	256.018	104.334	259.279	47.0786	202.661	509.0186	145.479	23842.7	67.9757	49.8445	755.113
NET MASS W/STP	293931	343.918	87.6341	410.779	40.2086	209.761	660.7486	209.669	-452101	92.3857	-15836	10232.1
% Transport	1.7%	6.4%	4.4%	60.2%	3.1%	5.5%	11.4%	5.3%	-9.3%	12.5%	-43.2%	21.6%
FLOOD FLOW AVE CONC		9.6044	3.7350	1.1524	2.3561	6.7161	10.2246	6.5094	8.7197	1.3243	73.3342	84.6795
EBB FLOW AVE CONC		9.4753	3.7174	0.9378	2.3282	7.0979	10.3639	6.1809	9.3362	1.3167	89.3030	65.4711
NET CHANGE CONC		0.1291	0.0176	0.2147	0.0278	-0.3818	-0.1393	0.3285	-0.6165	0.0077	-15.9688	19.2083
%		1.3%	0.5%	18.6%	1.2%	-5.7%	-1.4%	5.0%	-7.1%	0.6%	-21.8%	22.7%

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Summary of Mass Loading Information At S9
Conversion lbs/ft3 to mg/l: 16020

CYCLE 2	FLOW (cfs)	BOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE												
11/07/88 13:42-19:39												
Total Mass (lbs)	7861354	1392.5	2240.8	343.85	160.49	2891.3	3395.64	1653.7	3885471	192.43	12537	15426
Flow Av. Conc. mg/l		2.838	4.566	0.701	0.327	5.892	6.920	3.370	7.918	0.392	25.548	31.435
EBBING TIDE												
11/07/88 19:40-01:46												
Total Mass (lbs)	-7758399	-1637.3	-2422.7	-345.52	-139.82	-4870	-5355.34	-2032.9	-3.7E+06	-249.45	-12245	-12048
Flow Av. Conc. mg/l		3.381	5.003	0.713	0.289	10.056	11.058	4.198	7.586	0.515	25.284	24.877
INFLOW FROM SECAUCUS												
11/07/88 19:40-01:46												
Total Mass (lbs)	89181	86.894	140.283	3.17081	0.47639	193.922	197.5692	23.3658	4001.87	14.4279	11.6273	167.343
Flow Av. Conc. mg/l		15.609	25.200	0.570	0.086	34.835	35.490	4.197	0.719	2.592	2.089	30.061
NET FLUX - CYCLE 2												
11/07/88 13:42-01:46												
Net Mass (lbs/cycle)	102955	-244.8	-181.9	-1.67	20.67	-1978.7	-1959.7	-379.2	211847	-57.02	292	3378
% Change in Mass	1.3%	-17.6%	-8.1%	-0.5%	12.9%	-68.4%	-57.7%	-22.9%	5.5%	-29.6%	2.3%	21.9%
not including STP												
Net Mass (lbs/cycle)	192136	-157.91	-41.617	1.50081	21.1464	-1784.8	-1762.13	-355.83	215849	-42.592	303.627	3545.34
% Change in Mass	2.4%	-11.3%	-1.9%	0.4%	13.2%	-61.7%	-51.9%	-21.5%	5.6%	-22.1%	2.4%	23.0%
including STP												
Net Ch. In Conc mg/l		-0.543	-0.436	-0.013	0.038	-4.164	-4.138	-0.828	0.332	-0.123	0.264	6.558
% Change in Conc		-19.1%	-9.6%	-1.8%	11.7%	-70.7%	-59.8%	-24.6%	4.2%	-31.4%	1.0%	20.9%

CYCLE 3	FLOW (cfs)	BOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE												
11/08/88 01:47-08:00												
Total Mass (lbs)	12568308	2725.2	3746.4	529.29	235.31	7332.8	8097.4	2189.6	6152994	448.03	19771	21622
Flow Av. Conc. mg/l		3.474	4.775	0.675	0.300	9.347	10.321	2.791	7.843	0.571	25.201	27.560
EBBING TIDE												
11/08/88 08:01-14:26												
Total Mass (lbs)	-1.28E+07	-2615.3	-3843.8	-557.79	-254.98	-5395.9	-6208.67	-2670.6	-6.3E+06	-355.61	-14300	-17516
Flow Av. Conc. mg/l		3.272	4.808	0.698	0.319	6.750	7.767	3.341	7.941	0.445	17.888	21.911
INFLOW FROM SECAUCUS												
11/08/88 08:01-14:26												
Total Mass (lbs)	83839.2	52.039	124.349	4.06582	0.55224	179.915	184.5331	21.9865	3750.94	11.7807	10.9308	159.257
Flow Av. Conc. mg/l		9.944	23.761	0.777	0.106	34.378	35.261	4.201	0.717	2.251	2.089	30.431

NET FLUX - CYCLE 3												
11/08/88 01:47-14:26												
Net Mass (lbs/cycle)	-238270	109.9	-97.4	-28.5	-19.67	1936.9	1888.73	-481	-195425	92.42	5471	4106
% Change in Mass	-1.9%	4.0%	-2.6%	-5.4%	-8.4%	26.4%	23.3%	-22.0%	-3.2%	20.6%	27.7%	19.0%
not including STP												
Net Mass (lbs/cycle)	-154431	161.939	26.949	-24.434	-19.118	2116.81	2073.263	-459.01	-191674	104.201	5481.93	4265.26
% Change in Mass	-1.2%	5.9%	0.7%	-4.6%	-8.1%	28.9%	25.6%	-21.0%	-3.1%	23.3%	27.7%	19.7%
including STP												
Net Ch. In Conc mg/l		0.202	-0.033	-0.023	-0.019	2.597	2.555	-0.550	-0.099	0.126	7.313	5.649
% Change in Conc		5.8%	-0.7%	-3.4%	-6.3%	27.8%	24.8%	-19.7%	-1.3%	22.1%	29.0%	20.5%

CYCLE 4	FLOW (cfs)	BOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE												
11/08/88 14:27-20:22												
Total Mass (lbs)	8221159	1330.1	2390.8	346.28	164.74	3324.1	3835.12	1882.6	3973935	148.27	10166	14891
Flow Av. Conc. mg/l		2.592	4.659	0.675	0.321	6.477	7.473	3.668	7.744	0.289	19.810	29.017
EBBING TIDE												
11/08/88 14:27-02:29												
Total Mass (lbs)	-7829721	-1467.7	-2278.1	-323.33	-157.37	-3271.4	-3918.06	-2265.9	-3.9E+06	-129.81	-8237	-13288
Flow Av. Conc. mg/l		3.003	4.661	0.662	0.322	6.693	8.017	4.636	7.924	0.266	16.853	27.188
INFLOW FROM SECAUCUS												
11/08/88 14:27-02:29												
Total Mass (lbs)	79712.4	117.766	122.464	2.248	0.75037	140.51	143.5084	35.681	4534.53	9.4599	10.3928	254.001
Flow Av. Conc. mg/l		23.668	24.612	0.452	0.151	28.239	28.841	7.171	0.911	1.901	2.089	51.047
NET FLUX - CYCLE 4												
11/08/88 20:23-02:29												
Net Mass (lbs/cycle)	391438	-137.6	112.7	22.95	7.37	52.7	-82.94	-383.3	101293	18.46	1929	1603
% Change in Mass	4.8%	-10.3%	4.7%	6.6%	4.5%	1.6%	-2.2%	-20.4%	2.5%	12.5%	19.0%	10.8%
not including STP												
Net Mass (lbs/cycle)	471150.4	-19.834	235.164	25.198	8.12037	193.21	60.56837	-347.62	105828	27.9199	1939.39	1857
% Change in Mass	5.7%	-1.5%	9.8%	7.3%	4.9%	5.8%	1.6%	-18.5%	2.7%	18.8%	19.1%	12.5%
including STP												
Net Ch. In Conc mg/l		-0.411	-0.002	0.013	-0.001	-0.216	-0.543	-0.968	-0.180	0.023	2.956	1.829
% Change in Conc		-15.9%	-0.0%	2.0%	-0.3%	-3.3%	-7.3%	-26.4%	-2.3%	8.1%	14.9%	6.3%

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NET FOR NOVEMBER 1988 AT STATTION S-9

	FLOW (cfs)	BOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
CYCLES 2+3+4 (N+D+N)												
FLOODING TIDE	28650821	5447.8	8378	1219.42	560.54	13548.2	15328.16	5725.9	1.40E+07	788.73	42474	51939
EBBING TIDE	-2.84E+07	-5720.3	-8544.6	-1226.6	-552.17	-13537	-15482.1	-6969.4	-1.4E+07	-734.87	-34782	-42852
NET MASS	256123	-272.5	-166.6	-7.22	8.37	10.9	-153.91	-1243.5	117715	53.86	7692	9087
%Transport	0.9%	-5.0%	-2.0%	-0.6%	1.5%	0.1%	-1.0%	-21.7%	0.8%	6.8%	18.1%	17.5%
NET SECAUCUS STP	252732.6	256.699	387.096	9.48463	1.779	514.347	525.6106	81.0333	12287.3	35.6685	32.9509	580.601
NET MASS W/STP	508855.6	-15.801	220.496	2.26463	10.149	525.247	371.7006	-1162.5	130002	89.5285	7724.95	9667.6
% Transport	1.8%	-0.3%	2.6%	0.2%	1.8%	3.9%	2.4%	-20.3%	0.9%	11.4%	18.2%	18.6%

Appendix A-2-1
Table 4: Summary of Mass Transport at Station S9

CYCLE 2	FLOW (cfs)	CBOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE 08/06/89 19:48-01:40												
Total Mass (lbs)	6.17E+07	11343	2992.9	3174.1	1402.1	8699.9	13276.1	17140	46851797	2795.9	54993	279512
Flow Av. Conc. mg/l		2.947	0.778	0.825	0.364	2.261	3.450	4.454	12.174	0.727	14.290	72.630
EBBING TIDE 08/07/89 01:40-07:47												
Total Mass (lbs)	-6.4E+07	-7740	-3208.2	-2569.7	-1406.8	-5744.8	-6912.4	-6516	-45248985	-2353.1	-32641	-260962
Flow Av. Conc. mg/l		1.934	0.802	0.642	0.352	1.436	1.727	1.628	11.308	0.588	8.157	65.218
Inundated Area (ft3)-												
NET FLUX — CYCLE 2 08/06/89 19:48-07:47												
Net Mass (lbs/cycle)	-2.5E+06	3603	-215.3	604.4	-4.7	2955.1	6363.7	10624	1602812	442.8	22352	18550
% Change in Mass	-4.0%	31.8%	-7.2%	19.0%	-0.3%	34.0%	47.9%	62.0%	3.4%	15.8%	40.6%	6.6%
Net Mass/unit area (lbs/ft3/cycle)	-	-	-	-	-	-	-	-	-	-	-	
Net Ch. In Conc mg/l		1.013	-0.024	0.183	0.013	0.825	1.722	2.825	0.866	0.138	6.132	7.412
% Change in Conc		34.4%	-3.1%	22.1%	3.5%	36.5%	49.9%	63.4%	7.1%	19.1%	42.9%	10.2%

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NET FOR AUGUST 1989 AT STATION S-3

	FLOW (cfs)	CBOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE	1.27E+08	23761	9232.4	6818.5	2955.8	15154.4	24928.7	31132	90836637	4852	103033	581890
EBBING TIDE	-1.3E+08	-19626	-6554.2	-6247.6	-2831.5	-14055	-17346.6	-29954	-93905451	-5227.6	-107958	-537200
NET MASS	-1.9E+06	4135	2678.2	570.9	124.3	1099.6	7582.1	1178	-3068814	-375.6	-4925	44690
% Transport	-1.5%	17.4%	29.0%	8.4%	4.2%	7.3%	30.4%	3.8%	-3.4%	-7.7%	-4.8%	7.7%

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Summary Of Mass Loading Information At S3 JULY 1989
Conversion of lbs/ft3 to mg/ 16020

Station S3 - Sawmill Creek at NJ Turnpike
Import (+)/ Export (-)

CYCLE 1	FLOW (cfs)	CBOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE												
07/23/89 07:48-14:17												
Total Mass (lbs)	6.87E+07	5439	4356	1464.3	3083.9	7021.4	11569.6	7666	37586683	2772.1	7185	131035
Flow Av. Conc. mg/l		1.268	1.015	0.341	0.719	1.636	2.696	1.787	8.760	0.646	1.674	30.538
EBBING TIDE												
07/23/89 14:17-20:17												
Total Mass (lbs)	-6.9E+07	-8693	-3973.6	-1468	-2734.3	-7436.8	-11639.1	-14026	-38793105	-2447.7	-35980	-215890
Flow Av. Conc. mg/l		2.030	0.928	0.343	0.638	1.736	2.718	3.275	9.058	0.572	8.401	50.410
Inundated Area (ft3)-												
NET FLUX — CYCLE 1												
07/23/89 07:48-20:17												
Net Mass (lbs/cycle)	130497	-3254	382.4	-3.7	349.6	-415.4	-69.5	-6360	-1206422	324.4	-28795	-84855
% Change in Mass	0.2%	-59.8%	8.8%	-0.3%	11.3%	-5.9%	-0.6%	-83.0%	-3.2%	11.7%	-400.8%	-64.8%
Net Mass/unit area (lbs/ft3/cycle)	-	-	-	-	-	-	-	-	-	-	-	
Net Ch. In Conc mg/l		-0.762	0.087	-0.002	0.080	-0.100	-0.021	-1.488	-0.298	0.075	-6.727	-19.872
% Change in Conc		-60.1%	8.6%	-0.4%	11.2%	-6.1%	-0.8%	-83.3%	-3.4%	11.5%	-401.7%	-65.1%

CYCLE 2	FLOW (cfs)	CBOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE												
07/23/89 20:17-02:32												
Total Mass (lbs)	6.79E+07	7314	3047.6	979.3	3038.8	7084	11102.1	10166	38477523	3023.2	13581	294996
Flow Av. Conc. mg/l		1.725	0.719	0.231	0.717	1.671	2.618	2.398	9.075	0.713	3.203	69.573
EBBING TIDE												
07/24/89 02:32-08:32												
Total Mass (lbs)	-6.9E+07	-6405	-3966.5	-1699.8	-2802.8	-7971	-12473.6	-8803	-41340994	-2749.5	-13583	-138287
Flow Av. Conc. mg/l		1.491	0.923	0.396	0.652	1.856	2.904	2.049	9.624	0.640	3.162	32.191
Inundated Area (ft3)-												
NET FLUX — CYCLE 2												
07/23/89 20:17-08:32												
Net Mass (lbs/cycle)	-892565	909	-918.9	-720.5	236	-887	-1371.5	1363	-2863471	273.7	-2	156709
% Change in Mass	-1.3%	12.4%	-30.2%	-73.6%	7.8%	-12.5%	-12.4%	13.4%	-7.4%	9.1%	-0.0%	53.1%
Net Mass/unit area (lbs/ft3/cycle)	-	-	-	-	-	-	-	-	-	-	-	
Net Ch. In Conc mg/l		0.234	-0.205	-0.165	0.064	-0.185	-0.285	0.348	-0.549	0.073	0.041	37.382
% Change in Conc		13.6%	-28.5%	-71.3%	9.0%	-11.1%	-10.9%	14.5%	-6.0%	10.2%	1.3%	53.7%

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NET FOR JULY 1989 AT STATION S-3

	FLOW (cfs)	CBOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE	1.37E+08	12753	7403.6	2443.6	6122.7	14105.4	22671.7	17832	76064206	5795.3	20766	426031
EBBING TIDE	-1.4E+08	-15098	-7940.1	-3167.8	-5537.1	-15408	-24112.7	-22829	-80134099	-5197.2	-49563	-354177
NET MASS	-762068	-2345	-536.5	-724.2	585.6	-1302.4	-1441	-4997	-4069893	598.1	-28797	71854
% Transport	-0.6%	-18.4%	-7.2%	-29.6%	9.6%	-9.2%	-6.4%	-28.0%	-5.4%	10.3%	-138.7%	16.9%

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Station S3 - Sawmill Creek at NJ Turnpike AUGUST 1989
Import (+)/ Export (-)

CYCLE 1	FLOW (cfs)	CBOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE												
08/06/89 07:03-13:48												
Total Mass (lbs)	6.56E+07	12418	6239.5	3644.4	1553.7	6454.5	11652.6	13992	43984840	2056.1	48040	302378
Flow Av. Conc. mg/l		3.033	1.524	0.890	0.379	1.576	2.846	3.417	10.743	0.502	11.733	73.853
EBBING TIDE												
08/06/89 13:48-19:48												
Total Mass (lbs)	-6.5E+07	-11886	-3346	-3677.9	-1424.7	-8310	-10434.2	-23438	-48656466	-2874.5	-75317	-276238
Flow Av. Conc. mg/l		2.929	0.825	0.906	0.351	2.048	2.571	5.776	11.990	0.708	18.559	68.070
Inundated Area (ft3)-												
NET FLUX — CYCLE 1												
08/06/89 07:03-19:48												
Net Mass (lbs/cycle)	579079	532	2893.5	-33.5	129	-1855.5	1218.4	-9446	-4671626	-818.4	-27277	26140
% Change in Mass	0.9%	4.3%	46.4%	-0.9%	8.3%	-28.7%	10.5%	-67.5%	-10.6%	-39.8%	-56.8%	8.6%
Net Mass/unit area (lbs/ft3/cycle)	-	-	-	-	-	-	-	-	-	-	-	-
Net Ch. In Conc mg/l		0.104	0.699	-0.016	0.028	-0.471	0.275	-2.358	-1.247	-0.206	-6.826	5.784
% Change in Conc		3.4%	45.9%	-1.8%	7.5%	-29.9%	9.7%	-69.0%	-11.6%	-41.0%	-58.2%	7.8%

Summary Of Mass Loading Information At S3
Conversion of lbs/ft3 to mg/ 16020

Station S3 - Sawmill Creek at NJ Turnpike
Import (+)/ Export (-)

CYCLE 1	FLOW (cfs)	BOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE												
11/10/88 03:17-10:18												
Total Mass (lbs)	8.11E+07	7787	8146	5532.2	1456.3	13173	20161.5	21356	74562470	922	30447	172481
Flow Av. Conc. mg/l		1.539	1.610	1.093	0.288	2.603	3.984	4.220	14.733	0.182	6.016	34.082
EBBING TIDE												
11/10/88 10:18-16:17												
Total Mass (lbs)	-8.1E+07	-8918	-10918	-5627	-1838.9	-15143	-22608.9	-33048	-69250803	-1080.4	-62568	-192985
Flow Av. Conc. mg/l		1.760	2.155	1.111	0.363	2.989	4.463	6.524	13.670	0.213	12.351	38.096
Inundated Area (ft3)	-											
NET FLUX — CYCLE 1												
11/10/88 03:17-16:17												
Net Mass (lbs/cycle)	-79177	-1131	-2772	-94.8	-382.6	-1970	-2447.4	-11692	5311667	-158.4	-32121	-20504
% Change in Mass	-0.1%	-14.5%	-34.0%	-1.7%	-26.3%	-15.0%	-12.1%	-54.7%	7.1%	-17.2%	-105.5%	-11.9%
Net Mass/unit area (lbs/ft3/cycle)		-	-	-	-	-	-	-	-	-	-	-
Net Ch. In Conc mg/l		-0.222	-0.546	-0.018	-0.075	-0.386	-0.479	-2.304	1.063	-0.031	-6.335	-4.014
% Change in Conc		-14.4%	-33.9%	-1.6%	-26.1%	-14.8%	-12.0%	-54.6%	7.2%	-17.1%	-105.3%	-11.8%

CYCLE 2	FLOW (cfs)	CBOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE												
11/10/88 16:17-22:46												
Total Mass (lbs)	5.07E+07	6076	8636	3456.9	1366.8	11703	16526.7	17934	39899741	846.3	29536	120100
Flow Av. Conc. mg/l		1.920	2.729	1.092	0.432	3.698	5.222	5.666	12.607	0.267	9.332	37.947
EBBING TIDE												
11/10/88 22:46-04:17												
Total Mass (lbs)	-5.1E+07	-6768	-9257	-7876.5	-1377.6	-12413	-21667.1	-18190	-38655366	-937.4	-39764	-141726
Flow Av. Conc. mg/l		2.142	2.930	2.493	0.436	3.929	6.858	5.758	12.235	0.297	12.586	44.860
Inundated Area (ft3)	-											
NET FLUX — CYCLE 2												
11/10/88 16:17-04:17												
Net Mass (lbs/cycle)	90783	-692	-621	-4419.6	-10.8	-710	-5140.4	-256	1244375	-91.1	-10228	-21626
% Change in Mass	0.2%	-11.4%	-7.2%	-127.8%	-0.8%	-6.1%	-31.1%	-1.4%	3.1%	-10.8%	-34.6%	-18.0%
Net Mass/unit area (lbs/ft3/cycle)		-	-	-	-	-	-	-	-	-	-	-
Net Ch. In Conc mg/l		-0.222	-0.201	-1.401	-0.004	-0.231	-1.636	-0.091	0.371	-0.029	-3.254	-6.913
% Change in Conc		-11.6%	-7.4%	-128.3%	-1.0%	-6.3%	-31.3%	-1.6%	2.9%	-11.0%	-34.9%	-18.2%

CYCLE 3	FLOW (cfs)	CBOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE												
11/11/88 04:17-11:16												
Total Mass (lbs)	7.51E+07	8610	11470	5032.1	2011.9	17426	24470	21200	59955112	1526.5	26104	206433
Flow Av. Conc. mg/l		1.835	2.445	1.073	0.429	3.715	5.217	4.519	12.781	0.325	5.565	44.008
EBBING TIDE												
11/11/88 11:16-16:50												
Total Mass (lbs)	-7.5E+07	-10840	-13802	-5008.9	-1952.5	-17680	-24641.4	-29870	-60474177	-1351.1	-59733	-182376
Flow Av. Conc. mg/l		2.307	2.938	1.066	0.416	3.763	5.245	6.358	12.872	0.288	12.715	38.820
Inundated Area (ft3)	-											
NET FLUX — CYCLE 3												
11/11/88 04:17-16:50												
Net Mass (lbs/cycle)	-113902	-2230	-2332	23.2	59.4	-254	-171.4	-8670	-519065	175.4	-33629	24057
% Change in Mass	-0.2%	-25.9%	-20.3%	0.5%	3.0%	-1.5%	-0.7%	-40.9%	-0.9%	11.5%	-128.8%	11.7%
Net Mass/unit area (lbs/ft3/cycle)		-	-	-	-	-	-	-	-	-	-	-
Net Ch. In Conc mg/l		-0.472	-0.493	0.007	0.013	-0.048	-0.029	-1.839	-0.091	0.038	-7.150	5.187
% Change in Conc		-25.7%	-20.1%	0.6%	3.1%	-1.3%	-0.5%	-40.7%	-0.7%	11.6%	-128.5%	11.8%

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NET FOR NOVEMBER 1988 AT STATION S-3

	Flow (cfs)	Bod5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	Ch-a	TSS
CYCLES 1+2+3 (D+N+D)												
FLOODING TIDE	2.07E+08	22473	28252	14021	4835	42302	61158	60490	174417323	3295	86087	499014
EBBING TIDE	-2.1E+08	-26526	-33977	-18512	-5169	-45236	-68917.4	-81108	-1.684E+08	-3369	-162065	-517087
NET MASS	-102296	-4053	-5725	-4491	-334	-2934	-7759	-20618	6036977	-74	-75978	-18073
% Transport	-0.0%	-18.0%	-20.3%	-32.0%	-6.9%	-6.9%	-12.7%	-34.1%	3.5%	-2.2%	-88.3%	-3.6%
CYCLES 1+2 (D+N)												
FLOODING TIDE	1.32E+08	13863	16782	8989.1	2823.1	24876	36688.2	39290	114462211	1768.3	59983	292581
EBBING TIDE	-1.3E+08	-15686	-20175	-13504	-3216.5	-27556	-44276	-51238	-1.079E+08	-2017.8	-102332	-334711
NET MASS	11606	-1823	-3393	-4514.4	-393.4	-2680	-7587.8	-11948	6556042	-249.5	-42349	-42130
% Transport	0.0%	-13.2%	-20.2%	-50.2%	-13.9%	-10.8%	-20.7%	-30.4%	5.7%	-14.1%	-70.6%	-14.4%

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Appendix A-2-1
Table 3: Summary of Mass Transport at Station S3

AUGUST DATA
AUGUST 6-7 1989

Station M2 - Sawmill Creek Marsh Impoundment
Import (+)/ Export (-)

CYCLE 1	FLOW (cfs)	BOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE												
08/06/89 07:49-13:19												
Tot. Mass (lbs or ft3)	225662	41.926	12.425	5.4107	11.676	25.566	42.6527	45.138	157773	8.5305	208.1	638.63
Flow Av. Conc. mg/l		2.976	0.882	0.384	0.829	1.815	3.028	3.204	11200.483	0.606	14.773	45.337
EBBING TIDE												
08/06/89 13:20 - 18:54												
Tot. Mass (lbs or ft3)	-225593	-48.816	-9.443	-4.0588	-11.019	-26.594	-41.6718	-72.29	-166394	-7.5507	-288.55	-539.04
Flow Av. Conc. mg/l		3.467	0.671	0.288	0.782	1.889	2.959	5.134	11816.111	0.536	20.491	38.279
Inundated Area (ft3)	137130											
NET FLUX — CYCLE 1												
08/06/89 07:49 - 18:54												
Net Mass (lbs or ft3/cycle)	69	-6.89	2.982	1.3519	0.657	-1.028	0.9809	-27.152	-8621	0.9798	-80.45	99.59
% Change in Mass	0	-16.4%	24.0%	25.0%	5.6%	-4.0%	2.3%	-60.2%	-5.5%	11.5%	-38.7%	15.6%
Net Mass/unit area (lbs/ft3/cycle)		-5.0E-05	0.00002	9.86E-06	4.79E-06	-7.5E-06	0.000007	-0.0002	-0.06286	77.15E-06	-0.000587	0.00073
Net Ch. In Conc mg/l		-0.490	0.211	0.096	0.046	-0.074	0.069	-1.929	-615.627	0.069	-5.718	7.058
% Change in Conc		-16.5%	24.0%	25.0%	5.6%	-4.1%	2.3%	-60.2%	-5.5%	11.5%	-38.7%	15.6%

CYCLE 2	FLOW (cfs)	BOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE												
08/06/89 18:55 - 08/07/89 01:04												
Tot. Mass (lbs or ft3)	197416	34.186	7.984	10.8096	4.548	30.894	46.2516	41.279	158547	9.2935	175.24	848.01
Flow Av. Conc. mg/l		2.774	0.648	0.877	0.369	2.507	3.753	3.350	12865.841	0.754	14.220	68.815
EBBING TIDE												
08/06/89 13:20 - 18:54												
Tot. Mass (lbs or ft3)	-197398	-30.063	-11.205	-9.9263	-3.669	-19.981	-33.5763	-25.067	-163430	-9.6815	-124.32	-801.59
Flow Av. Conc. mg/l		2.440	0.909	0.806	0.298	1.622	2.725	2.034	13263.299	0.786	10.089	65.054
Inundated Area (ft3)	129606											
NET FLUX — CYCLE 2												
08/06/89 07:49 - 18:54												
Net Mass (lbs or ft3/cycle)	18	4.123	-3.221	0.8833	0.879	10.913	12.6753	16.212	-4883	-0.388	50.92	46.42
% Change in Mass	0	12.1%	-40.3%	8.2%	19.3%	35.3%	27.4%	39.3%	-3.1%	-4.2%	29.1%	5.5%
Net Mass/unit area (lbs/ft3/cycle)		0.00003	-2.5E-05	6.82E-06	6.78E-06	0.00008	0.000098	0.00013	-0.03767	-3.0E-06	0.0003929	0.00036
Net Ch. In Conc mg/l		0.334	-0.261	0.072	0.071	0.885	1.028	1.315	-397.457	-0.032	4.131	3.761
% Change in Conc		12.1%	-40.4%	8.2%	19.3%	35.3%	27.4%	39.3%	-3.1%	-4.2%	29.1%	5.5%

NET FOR AUGUST 1989 AT STATION M-2

	FLOW (cfs)	BOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE	423078	76.112	20.409	16.220	16.224	56.46	88.904	86.417	316320	17.824	383.34	1486.64
EBBING TIDE	-422991	-78.879	-20.648	-13.985	-14.688	-46.575	-75.248	-97.357	-329824	-17.232	-412.87	-1340.6
NET MASS	87	-2.767	-0.239	2.235	1.536	9.885	13.656	-10.940	-13504	0.592	-29.53	146.01
% Transport	0	-3.6%	-1.2%	13.8%	9.5%	17.5%	15.4%	-12.7%	-4.3%	3.3%	-7.7%	9.8%

NET FOR NOVEMBER 1988 AT STATION M-2

	FLOW (cfs)	BOD5	NH3	NO3	NO2	TKN	TOTAL N NO2+3+TKN	DO	SAL (ppt)	TPO4	CHL-A	TSS
FLOODING TIDE	657869	98.264	104.568	45.825	16.593	154.395	216.8125	270.56	514728	9.7452	577.35	1985.47
EBBING TIDE	-657869	-73.607	-88.521	-51.347	-16.840	-126.736	-194.923	-256.02	-528656	-11.0395	-624.62	-1817.74
NET MASS	0	24.657	16.047	-5.522	-0.247	27.659	21.890	14.54	-13928	-1.2943	-47.27	167.73
% Transport	0	25.1%	15.3%	-12.1%	-1.5%	17.9%	10.1%	5.4%	-2.7%	-13.3%	-8.2%	8.4%

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JULY 1989 DATA FOR STATION M-2
JULY 23-24 1989

Station M2 - Sawmill Creek Marsh Impoundment
Import (+)/ Export (-)

CYCLE 1	FLOW (cfs)	BOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE												
07/23/89 07:52-14:09												
Tot. Mass (lbs or ft3)	237497	35.466	13.693	3.4752	11.229	37.673	52.3772	26.743	116066	7.0906	232.17	806.36
Flow Av. Conc. mg/l		2.392	0.924	0.234	0.757	2.541	3.533	1.804	7829.056	0.478	15.661	54.392
EBBING TIDE												
07/23/89 14:10-19:54												
Tot. Mass (lbs or ft3)	-238852	-37.726	-9.941	-6.9871	-8.5901	-29.215	-44.7922	-46.042	-119655	-8.9964	-89.05	-834.75
Flow Av. Conc. mg/l		2.53031	0.66675	0.46863	0.57615	1.95947	3.00425	3.08807	8025.3592	0.6034	5.9726567	55.9874
Inundated Area (ft3)	141028											
NET FLUX — CYCLE 1												
07/23/89 07:52-19:54												
Net Mass (lbs or ft3/cycle)	-1355	-2.26	3.752	-3.5119	2.6389	8.458	7.585	-19.299	-3589	-1.9058	143.12	-28.39
% Change in Mass	-0	-6.4%	27.4%	-101.1%	23.5%	22.5%	14.5%	-72.2%	-3.1%	-26.9%	61.6%	-3.5%
Net Mass/unit area (lbs/ft3/cycle)		-1.6E-05	0.00003	-2.5E-05	0.00002	0.00006	0.000054	-0.0001	-0.025449	-1.4E-05	0.0010148	-0.0002
Net Ch. In Conc mg/l		-0.138	0.257	-0.234	0.181	0.582	0.529	-1.284	-196.303	-0.125	9.688	-1.596
% Change in Conc		-5.8%	27.8%	-99.9%	23.9%	22.9%	15.0%	-71.2%	-2.5%	-26.2%	61.9%	-2.9%

CYCLE 2	FLOW (cfs)	BOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE 07/23/89 19:55– 07/24/89 02:21												
Tot. Mass (lbs or ft3)	241872	26.805	12.511	5.2407	11.448	38.903	55.5917	34.348	131703	8.3881	232.17	854.38
Flow Av. Conc. mg/l		1.775	0.829	0.347	0.758	2.577	3.682	2.275	8723.135	0.556	15.377	56.588
EBBING TIDE 07/24/89 02:22–08:19												
Tot. Mass (lbs or ft3)	-244412	-25.197	-10.911	-4.4215	-9.031	-33.342	-46.7945	-34.975	-155248	-9.4332	-233.49	-623.68
Flow Av. Conc. mg/l		1.652	0.715	0.290	0.592	2.185	3.067	2.292	10175.740	0.618	15.304	40.879
Inundated Area (ft3)	142386											
NET FLUX — CYCLE 2 07/23/89 19:55– 07/24/89 02:22												
Net Mass (lbs or ft3/cycle)	-2540	1.608	1.6	0.8192	2.417	5.561	8.7972	-0.627	-23545	-1.0451	-1.32	230.7
% Change in Mass	-0	6.0%	12.8%	15.6%	21.1%	14.3%	15.8%	-1.8%	-17.9%	-12.5%	-0.6%	27.0%
Net Mass/unit area (lbs/ft3/cycle)		0.00001	0.00001	5.75E-06	0.00002	0.00004	0.00006	2-4.4E-06	-0.16536	-7.3E-06	-0.00009	0.00162
Net Ch. In Conc mg/l		0.124	0.113	0.057	0.166	0.391	0.615	-0.017	-1452.605	-0.063	0.073	15.709
% Change in Conc		7.0%	13.7%	16.5%	21.9%	15.2%	16.7%	-0.8%	-16.7%	-11.3%	0.5%	27.8%

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NET FOR JULY 1989 AT STATION M-2

	FLOW (cfs)	BOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE	479369	62.271	26.204	8.716	22.677	76.576	107.969	61.091	247769	15.479	464.34	1660.74
EBBING TIDE	-483264	-62.923	-20.852	-11.409	-17.621	-62.557	-91.5867	-81.017	-274903	-18.43	-322.54	-1458.43
NET MASS	-3895	-0.652	5.352	-2.693	5.056	14.019	16.382	-19.926	-27134	-2.951	141.80	202.31
% Transport	-0	-1.0%	20.4%	-30.9%	22.3%	18.3%	15.2%	-32.6%	-11.0%	-19.1%	30.5%	12.2%

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Summary of Mass Loading Information At M2
Conversion of lbs/ft3 to mg/l: 16020

Station M2 - Sawmill Creek Marsh Impoundment
Import (+)/ Export (-)

CYCLE 1	FLOW (cfs)	BOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE												
11/10/88 05:58-09:47												
Total Mass (lbs)	268076	37.747	37.211	18.697	6.461	60.237	85.395	107.57	216813	2.5615	269.16	596.55
Flow Av. Conc. mg/l		2.256	2.224	1.117	0.386	3.600	5.103	6.428	12.957	0.153	16.085	35.649
EBBING TIDE												
11/10/88 09:48-13:06												
Total Mass (lbs)	-268076	-32.049	-34.075	-21.432	-6.3349	-53.815	-81.5819	-109.66	-221585	-3.4994	-269.11	-655.76
Flow Av. Conc. mg/l		1.915	2.036	1.281	0.379	3.216	4.875	6.553	13.242	0.209	16.082	39.188
Inundated Area (ft3)	151513											
NET FLUX — CYCLE 1												
11/10/88 05:58-13:06												
Net Mass (lbs/cycle)	0	5.698	3.136	-2.735	0.1261	6.422	3.8131	-2.09	-4772	-0.9379	0.05	-59.21
% Change in Mass	0	15.1%	8.4%	-14.6%	2.0%	10.7%	4.5%	-1.9%	-2.2%	-36.6%	0.0%	-9.9%
Net Mass/unit area (lbs/ft3/cycle)		0.00004	0.00002	-1.8E-05	8.32E-07	0.00004	0.000025	-1.4E-05	-0.031496	-6.2E-06	0.0000003	-0.0004
Net Ch. In Conc mg/l		0.341	0.187	-0.163	0.008	0.384	0.228	-0.125	-0.285	-0.056	0.003	-3.538
% Change in Conc		15.1%	8.4%	-14.6%	2.0%	10.7%	4.5%	-1.9%	-2.2%	-36.6%	0.0%	-9.9%

CYCLE 2	FLOW (cfs)	BOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE												
11/10/88 18:25-21:08												
Total Mass (lbs)	137409	19.166	25.01	9.599	3.494	37.731	50.824	66.79	103358	1.5209	89.57	438.31
Flow Av. Conc. mg/l		2.234	2.916	1.119	0.407	4.399	5.925	7.787	12.050	0.177	10.443	51.101
EBBING TIDE												
11/10/88 21:09-23:57												
Total Mass (lbs)	-137409	-12.519	-19.652	-10.585	-3.7599	-25.587	-39.9319	-43.6	-107504	-2.3335	-152	-448.25
Flow Av. Conc. mg/l		1.460	2.291	1.234	0.438	2.983	4.656	5.083	12.533	0.272	17.721	52.260
Inundated Area (ft3)	116699											
NET FLUX — CYCLE 2												
11/10/88 18:25-23:57												
Net Mass (lbs/cycle)	0	6.647	5.358	-0.986	-0.2659	12.144	10.8921	23.19	-4146	-0.8126	-62.43	-9.94
% Change in Mass	0	34.7%	21.4%	-10.3%	-7.6%	32.2%	21.4%	34.7%	-4.0%	-53.4%	-69.7%	-2.3%
Net Mass/unit area (lbs/ft3/cycle)		0.00006	0.00005	-8.4E-06	-2.3E-06	0.0001	0.000093	0.0002	-0.035527	-7.0E-06	-0.000535	-8.5E-05
Net Ch. In Conc mg/l		0.775	0.625	-0.115	-0.031	1.416	1.270	2.704	-0.483	-0.095	-7.278	-1.159
% Change in Conc		34.7%	21.4%	-10.3%	-7.6%	32.2%	21.4%	34.7%	-4.0%	-53.4%	-69.7%	-2.3%

CYCLE 3	FLOW (cfs)	BOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE 11/11/88 06:29-10:08												
Total Mass (lbs)	205855	35.28	33.445	14.073	5.4222	45.146	64.6412	84.18	160168	4.9086	148.14	852.84
Flow Av. Conc. mg/l		2.746	2.603	1.095	0.422	3.513	5.030	6.551	12.465	0.382	11.529	66.370
EBBING TIDE 11/11/88 10:09-13:01												
Total Mass (lbs)	-205855	-24.228	-27.111	-16.025	-5.5242	-37.458	-59.0072	-88.12	-164295	-4.2113	-171.41	-590.54
Flow Av. Conc. mg/l		1.885	2.110	1.247	0.430	2.915	4.592	6.858	12.786	0.328	13.339	45.957
Inundated Area (ft3)	135499											
NET FLUX — CYCLE 3 11/11/88 06:29-13:01												
Net Mass (lbs/cycle)	0	11.052	6.334	-1.952	-0.102	7.688	5.634	-3.94	-4127	0.6973	-23.27	262.3
% Change in Mass	0	31.3%	18.9%	-13.9%	-1.9%	17.0%	8.7%	-4.7%	-2.6%	14.2%	-15.7%	30.8%
Net Mass/unit area (lbs/ft3/cycle)		0.00008	0.00005	-1.4E-05	-7.5E-07	0.00006	0.000042	-2.9E-05	-0.030458	5.15E-06	-0.000172	0.00194
Net Ch. In Conc mg/l		0.860	0.493	-0.152	-0.008	0.598	0.438	-0.307	-0.321	0.054	-1.811	20.413
% Change in Conc		31.3%	18.9%	-13.9%	-1.9%	17.0%	8.7%	-4.7%	-2.6%	14.2%	-15.7%	30.8%

CYCLE 4	FLOW (cfs)	BOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE 11/11/88 19:58-22:17												
Total Mass (lbs)	46529	6.071	8.902	3.456	1.2153	11.281	15.9523	12.02	34389	0.7542	70.48	97.77
Flow Av. Conc. mg/l		2.090	3.065	1.190	0.418	3.884	5.492	4.139	11.840	0.260	24.266	33.662
EBBING TIDE 11/11/88 22:18-00:31												
Total Mass (lbs)	-46529	-4.811	-7.683	-3.305	-1.221	-9.876	-14.402	-14.64	-35272	-0.9953	-32.1	-123.19
Flow Av. Conc. mg/l		1.656	2.645	1.138	0.420	3.400	4.959	5.041	12.144	0.343	11.052	42.414
Inundated Area (ft3)	62685											
NET FLUX — CYCLE 4 11/11/88 19:58-00:31												
Net Mass (lbs/cycle)	0	1.26	1.219	0.151	-0.0057	1.405	1.5503	-2.62	-883	-0.2411	38.38	-25.42
% Change in Mass	0	20.8%	13.7%	4.4%	-0.5%	12.5%	9.7%	-21.8%	-2.6%	-32.0%	54.5%	-26.0%
Net Mass/unit area (lbs/ft3/cycle)		0.00002	0.00002	2.41E-06	-9.1E-08	0.00002	0.000025	-4.2E-05	-0.014086	-3.8E-06	0.0006123	-0.0004
Net Ch. In Conc mg/l		0.434	0.420	0.052	-0.002	0.484	0.534	-0.902	-0.304	-0.083	13.214	-8.752
% Change in Conc		20.8%	13.7%	4.4%	-0.5%	12.5%	9.7%	-21.8%	-2.6%	-32.0%	54.5%	-26.0%

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Appendix A-2-1
Table 2: Summary of Mass Transport at Station M2

JULY 1989 DATA FOR STATION M-1
07/23/89-07/24/89

Station M1 - Sawmill Creek Mudflat Embayment
Import (+)/ Export (-)

CYCLE 1	FLOW (cfs)	CBOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE 07/23/89 09:28-14:29												
Total Mass (lbs)	5108499	1106.7	503.27	93	195.59	762.51	1051.1	1635.9	2400321	720.74	6532	12066
Flow Av. Conc. mg/l		3.471	1.578	0.292	0.613	2.391	3.296	5.130	7.527	2.260	20.484	37.838
EBBING TIDE 07/23/89 14:30-21:23												
Total Mass (lbs)	-5.1E+06	-1164	-326.07	-122.66	-417.33	-829.49	-1160.8	-2099.2	-2598222	-380.15	-12040	-13107
Flow Av. Conc. mg/l		3.662	1.026	0.386	1.313	2.609	3.652	6.604	8.173	1.196	37.8746	41.231
Inundated Area (ft3)	1494279											
NET FLUX - CYCLE 1 11/11/88 05:11-18:30												
Net Mass (lbs/cycle)	15879	-57.3	177.2	-29.66	-221.74	-66.98	-109.7	-463.3	-197901	340.59	-5508	-1041
% Change in Mass	0.3%	-5.2%	35.2%	-31.9%	-113.4%	-8.8%	-10.4%	-28.3%	-8.2%	47.3%	-84.3%	-8.6%
Net Mass/unit area (lbs/ft3/cycle)		-3.8E-05	0.00012	-2.0E-05	-0.000148	-4.5E-05	-0.00007	-0.0003	-0.132439	0.00023	-0.0037	-0.0007
Net Ch. In Conc mg/l		-0.191	0.553	-0.094	-0.699	-0.218	-0.355	-1.473	-0.646	1.064	-17.391	-3.393
% Change in Conc		-5.5%	35.0%	-32.3%	-114.0%	-9.1%	-10.8%	-28.7%	-8.6%	47.1%	-84.9%	-9.0%

CYCLE 2	FLOW (cfs)	CBOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE 07/23/89 21:24 - 07/24/89 02:50												
Net Mass (lbs/cycle)	5101607	1321.7	501.48	53.99	203.69	1173.55	1431.2	1404.3	2539851	205.07	8964	18518
Flow Av. Conc. mg/l		4.150	1.575	0.170	0.640	3.685	4.494	4.410	7.976	0.644	28.149	58.150
EBBING TIDE 07/23/89 14:30-21:23												
Total Mass (lbs)	-5.1E+06	-1164	-326.07	-122.66	-417.33	-829.49	-1160.8	-2099.2	-2598222	-380.15	-12040	-13107
Flow Av. Conc. mg/l		3.662	1.026	0.386	1.313	2.609	3.652	6.604	8.173	1.196	37.8746	41.231
Inundated Area (ft3)	1493729											
NET FLUX - CYCLE 2 07/23/89 14:30 - 07/24/89 02:50												
Net Mass (lbs/cycle)	8987	157.7	175.41	-68.67	-213.64	344.06	270.4	-694.9	-58371	-175.08	-3076	5411
% Change in Mass	0.2%	11.9%	35.0%	-127.2%	-104.9%	29.3%	18.9%	-49.5%	-2.3%	-85.4%	-34.3%	29.2%
Net Mass/unit area (lbs/ft3/cycle)		0.00011	0.00012	-4.6E-05	-0.000143	0.00023	0.000181	-0.0005	-0.039077	-0.0001	-0.0021	0.00362
Net Ch. In Conc mg/l		0.489	0.549	-0.216	-0.673	1.076	0.843	-2.194	-0.198	-0.552	-9.726	16.919
% Change in Conc		11.8%	34.9%	-127.6%	-105.2%	29.2%	18.8%	-49.7%	-2.5%	-85.7%	-34.6%	29.1%

NET FOR JULY 1989 AT STATION M-1

	FLOW (cfs)	CBOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE	1.02E+07	2428.4	1004.75	146.99	399.28	1936.06	2482.3	3040.2	4940172	925.81	15496	30584
EBBING TIDE	-1.0E+07	-2328	-652.14	-245.32	-834.66	-1659	-2321.6	-4198.4	-5196444	-760.3	-24080	-26214
NET MASS	24866	100.4	352.61	-98.33	-435.38	277.08	160.7	-1158.2	-256272	165.51	-8584	4370
% Transport	0.2%	4.1%	35.1%	-66.9%	-109.0%	14.3%	6.5%	-38.1%	-5.2%	17.9%	-55.4%	14.3%

Table A-1: Summary of Mass Loading Information At M1
Conversion of lbs/ft3 to mg/ 16020

Station M1 - Sawmill Creek Mudflat Embayment
Import (+)/ Export (-)

CYCLE 1	FLOW (cfs)	CBOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE												
11/10/88 04:30-10:00												
Total Mass (lbs)	6370390	1201.8	1585.7	489.18	135.37	1994.3	2618.85	2689.8	4751815	88.29	10126	12743
Flow Av. Conc. mg/l		3.022	3.988	1.230	0.340	5.015	6.586	6.764	11.950	0.222	25.464	32.046
EBBING TIDE												
11/10/88 10:01-18:02												
Total Mass (lbs)	-5222484	-861.5	-1073.9	-356.3	-239.51	-1560.2	-2156.01	-2044.1	-3907427	-70.54	-10576	-10457
Flow Av. Conc. mg/l		2.643	3.294	1.093	0.735	4.786	6.614	6.270	11.986	0.216	32.442	32.077
NET FLUX - CYCLE 1												
11/10/88 04:30-18:02												
Net Mass (lbs/cycle)	1147906	340.3	511.8	132.88	-104.14	434.1	462.84	645.7	844388	17.75	-450	2286
% Change in Mass	18.0%	28.3%	32.3%	27.2%	-76.9%	21.8%	17.7%	24.0%	17.8%	20.1%	-4.4%	17.9%
Net Ch. In Conc mg/l		0.380	0.693	0.137	-0.394	0.229	-0.028	0.494	-0.036	0.006	-6.977	-0.031
% Change in Conc		12.6%	17.4%	11.2%	-115.8%	4.6%	-0.4%	7.3%	-0.3%	2.5%	-27.4%	-0.1%

CYCLE 2	FLOW (cfs)	CBOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE												
11/10/88 18:03-22:00												
Total Mass (lbs)	3466935	602	767.7	148.46	85.64	1097	1331.1	1946.5	2602065	62.91	5829	7054
Flow Av. Conc. mg/l		2.782	3.547	0.686	0.396	5.069	6.151	8.994	12.024	0.291	26.935	32.595
EBBING TIDE												
11/10/88 22:01-05:10												
Total Mass (lbs)	-4818421	-635.7	-974.9	-333.28	-114.67	-1177.8	-1625.75	-2247.9	-3654914	-85.55	-5067	-9255
Flow Av. Conc. mg/l		2.114	3.241	1.108	0.381	3.916	5.405	7.474	12.152	0.284	16.846	30.770
NET FLUX - CYCLE 2												
11/10/88 18:03-05:10												
Net Mass (lbs/cycle)	-1351486	-33.7	-207.2	-184.82	-29.03	-80.8	-294.65	-301.4	-1052849	-22.64	762	-2201
% Change in Mass	-39.0%	-5.6%	-27.0%	-124.5%	-33.9%	-7.4%	-22.1%	-15.5%	-40.5%	-36.0%	13.1%	-31.2%
Net Ch. In Conc mg/l		0.668	0.306	-0.422	0.014	1.153	0.746	1.521	-0.128	0.006	10.088	1.825
% Change in Conc		24.0%	8.6%	-61.5%	3.7%	22.7%	12.1%	16.9%	-1.1%	2.2%	37.5%	5.6%

CYCLE 3	FLOW (cfs)	CBOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
FLOODING TIDE												
11/11/88 05:11-10:53												
Total Mass (lbs)	5691557	928.8	1457.5	353.23	134.17	1977.2	2464.6	2193.7	4164982	109.12	10213	14023
Flow Av. Conc. mg/l		2.614	4.102	0.994	0.378	5.565	6.937	6.175	11.723	0.307	28.746	39.470
EBBING TIDE												
11/11/88 10:54-18:30												
Total Mass (lbs)	-5552162	-1095.8	-1197.2	-408.99	-130.72	-1498	-2037.71	-2665.1	-4134808	-117.27	-10063	-12136
Flow Av. Conc. mg/l		3.162	3.454	1.180	0.377	4.322	5.880	7.690	11.930	0.338	29.035	35.017
NET FLUX - CYCLE 3												
11/11/88 05:11-18:30												
Net Mass (lbs/cycle)	139395	-167	260.3	-55.76	3.45	479.2	426.89	-471.4	30174	-8.15	150	1887
% Change in Mass	2.4%	-18.0%	17.9%	-15.8%	2.6%	24.2%	17.3%	-21.5%	0.7%	-7.5%	1.5%	13.5%
Net Ch. In Conc mg/l		-0.547	0.648	-0.186	0.000	1.243	1.058	-1.515	-0.207	-0.031	-0.289	4.454
% Change in Conc		-20.9%	15.8%	-18.7%	0.1%	22.3%	15.2%	-24.5%	-1.8%	-10.2%	-1.0%	11.3%

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NET MASSS TRANSPORT 8 AT STATION M-1

	FLOW (cfs)	CBOD5	NH3	NO3	NO2	TKN	Total N NO2+3+TKN	DO	Sal (ppt)	TPO4	CHL-a	TSS
CYCLES 1+2+3 (D+N+D)												
FLOODING TIDE	15528882	2732.6	3810.9	990.87	355.18	5068.5	6414.55	6830	11518862	260.32	26168	33820
EBBING TIDE	-2.E+07	-2593	-3246	-1098.6	-484.9	-4236	-5819.47	-6957.1	-11697149	-273.36	-25706	-31848
NET MASS	-64185	139.6	564.9	-107.7	-129.72	832.5	595.08	-127.1	-178287	-13.04	462	1972
% Transport	-0.4%	5.1%	14.8%	-10.9%	-36.5%	16.4%	9.3%	-1.9%	-1.5%	-5.0%	1.8%	5.8%
CYCLES 1+2 (D+N)												
FLOODING CYCLES 1+2	9837325	1803.8	2353.4	637.64	221.01	3091.3	3949.95	4636.3	7353880	151.2	15955	19797
EBBING CYCLES 1+2	-1.0E+07	-1497.2	-2048.8	-689.58	-354.18	-2738	-3781.76	-4292	-7562341	-156.09	-15643	-19712
NET MASS	-203580	306.6	304.6	-51.94	-133.17	353.3	168.19	344.3	-208461	-4.89	312	85
% Transport	-2.1%	17.0%	12.9%	-8.1%	-60.3%	11.4%	4.3%	7.4%	-2.8%	-3.2%	2.0%	0.4%

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Appendix A-2-1
Table 1: Summary of Mass Transport at Station M1