The following is an excerpt from a permit application submitted to the United States Environmental Protection Agency by 6 applicants: Sarasota County, City of Sarasota, Town of Longboat Key, City of North Port, City of Venice, and Florida Department of Transportation. The application is for a National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit that requires communities who own or operate drainage systems to reduce the amount of pollution flowing to the waters of the United States by performing certain pollution prevention activities.

This excerpt is Part II of the application submitted in 1993 and includes studies of stormwater pollution from different land use types and also includes estimated (by use of a spreadsheet model called Watershed Management Model) wet season and dry season pollutant load as well as the Event Mean Concentration of stormwater.

NPDES MUNICIPAL SEPARATE STORM SEWER SYSTEM PART 2 PERMIT APPLICATION

SUBMITTED BY:

SARASOTA COUNTY

AND CO-APPLICANTS:

CITY OF SARASOTA

LONGBOAT KEY INCORPORATED

CITY ON THE GULF
THE CITY OF VENICE

CITY OF NORTH PORT FLORIDA

NORTH PORT
WATER CONTROL
DISTRICT

JULY 1993

CAMP DRESSER & McKEE INC.
SARASOTA, FLORIDA

SARASOTA COUNTY NPDES MS4
PART 2 PERMIT APPLICATION

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EXHIBITS

APPENDIX

Requirement:

40 CFR 122.26 (d) (2) (iii)

Characterization data. *When "quantitative data" for a pollutant are required under paragraph (d)(2)(iii)(A)(3) of this paragraph, the applicant must collect a sample of effluent in accordance with 40 CFR 122.21(g)(7) and analyze it for the pollutant in accordance with analytical methods approved under 40 CFR part 136. When no analytical method is approved the applicant may use any suitable method but must provide a description of the method. The applicant must provide information characterizing the quality and quantity of discharges covered in the permit application, including:*

(A) Quantitative data from representative outfalls designated by the Director (based on information received in part 1 of the application, the Director shall designate between five and ten outfalls or field screening points as representative of the commercial, residential and industrial land use activities of the drainage area contributing to the system or, where there are less than five outfalls covered in the application, the Director shall designate all outfalls) developed as follows:

(1) *For each outfall or field screening point designated under this subparagraph, samples shall be collected of storm water discharges from three storm events occurring at least one month apart in accordance with the requirements at §122.21(g)(7) (the Director may allow exemptions to sampling three storm events when climatic conditions create good cause for such exemptions);*

(2) *A narrative description shall be provided of the date and duration of the storm event(s) sampled, rainfall estimates of the storm event which generated the sampled discharge and the duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event;*

(3) *For samples collected and described under paragraphs (d)(2)(iii)(A)(1) and (A)(2) of this section, quantitative data shall be provided for: the organic pollutants listed in Table II; the pollutants listed in Table III (toxic metals, cyanide, and total phenols) of appendix D of 40 CFR part 122, and for the following pollutants:*

Total suspended solids (TSS)	*pH*
Total dissolved solids (TDS)	*Total Kjeldahl nitrogen*
COD	*Nitrate plus nitrite*
BOD_5	*Dissolved phosphorus*
Oil and grease	*Total ammonia plus organic*
Fecal coliform	*nitrogen*
Fecal streptococcus	*Total phosphorus*

40 CFR 122.26 (d) (2) (iii)

WET WEATHER CHARACTERIZATION

Sarasota County and Co-applicants selected seven sites (Figure 1) within Sarasota County to establish monitoring stations and collect stormwater event samples during the wet weather characterization phase. Sites were selected based on the homogeneity of land use, size, suitable outfall structure, and safety of sampling personnel. Land uses were selected to generally reflect the percentage of that land use within the County as a whole. Sites (with the exception of the open land use) were inspected and approved by EPA prior to sampling.

A total of three events were to be collected from each site, with analytical data from storms at least one month apart. Initially, a 72-hour antecedent dry period (with no events greater than 0.10 inches) was required for each collected event. This was later modified (by January 26, 1993 Memorandum No. 6) to a 36-hour antecedent dry period, but only for the months of June through September; so this modification did not alter the Sarasota County collection program to date. Samples were to be collected either for the entire event or for three hours. Sampling was typically initiated by rainfall amounts of greater than 0.1 inches within a one-hour period, together with water levels sufficient to allow collection (generally 0.063 feet or 0.75 inches in depth).

Rainfall amounts to be sampled were detailed in the Part I MS4 permit application (May 22, 1992) and are reproduced below in Table 1, together with additional months calculated according to the same formulae. Total rainfall criteria were established as the monthly average of daily totals plus or minus 50 percent at the beginning of the wet season (June). As the wet season progressed, the allowable range was expanded to plus or minus 75 percent for July and to plus or minus 100 percent for August in an attempt to ensure completion of all sampling prior to May, 1993. For months subsequent to August, after the wet season ended, criteria included 95

TABLE 1

MONTHLY CRITERIA FOR ACCEPTABLE RAINFALL AMOUNTS

Modified from Table 4-16

Part I Permit Application, May 22, 1992

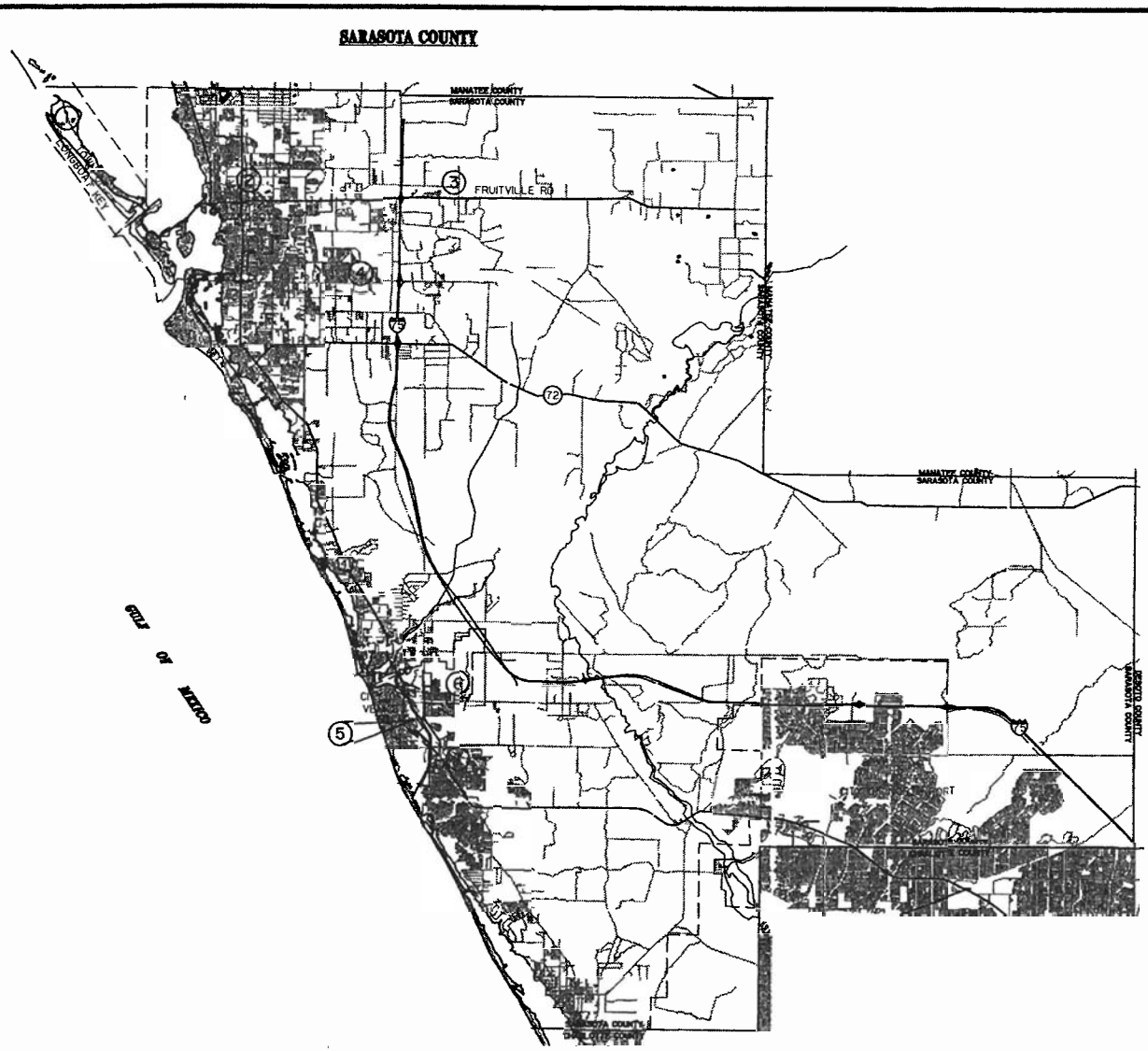
Month	Acceptable Amounts
June	0.38 in to 1.14 in
July	0.19 in to 1.33 in
August	0.10 in to 1.52 in
September	0.10 in to 2.45 in
October	0.10 in to 1.99 in
November	0.10 in to 2.20 in
December	0.10 in to 1.52 in
January	0.10 in to 1.95 in
February	0.10 in to 1.98 in
March	0.10 in to 2.35 in
April	0.10 in to 1.89 in
May	0.10 in to 2.25 in

percent of all rainfall events historically received in the respective months. Sampled events were within these criteria except as noted in the storm descriptions.

Both grab and flow-weighted composite samples were to be collected and analyzed according to the protocols detailed in the Characterization Plan (Section 4.4 Part I Permit Application, May 22, 1992) and reproduced in Table 2. Holding times for the specific analyses are also listed. Due to the extremely short holding times for bacteriological parameters (6 hours), EPA relaxed the storm requirements to allow applicants to collect grab samples for these parameters (i.e., fecal coliform and fecal streptococci) from separate storms than the remaining parameters.

The pervious area and high groundwater tables common to the area provide for an extended recession limb of most storm event hydrographs, particularly in basins with a low percentage of impervious area. This was noted especially in the open and low density land uses. In many cases it was difficult to identify the "end" of the event for purposes of determining whether sampling was complete. Accordingly, for the purpose of calculating runoff totals, events were considered to be complete once either successive flow measurements differed by less than 2 percent or when three successive level measurements each differed by less than 0.008 feet (0.1 inch).

A summary description of storms collected, those accepted by EPA and other pertinent information appears in Table 3. Analytical data appear in Tables 4 through 9. It should be noted that the organic compounds listed in Tables 7 through 9 are only those compounds which were detected. The overwhelming majority of samples were below detection limits for almost all of the organic compounds.



N

1" = 20000'

10000 0 20000

① LONGBOAT KEY - HIGH DENSITY RESIDENTIAL

② EAST AVE. - INDUSTRIAL

③ RICHARDSON ROAD - LOW DENSITY RESIDENTIAL

④ BELL MEADE DRIVE - MEDIUM DENSITY RESIDENTIAL

⑤ INDIAN AVE. - COMMERCIAL

⑥ VENICE WELLFIELD - OPEN

⑦ BRIARWOOD ROAD - MEDIUM DENSITY RESIDENTIAL

CDM
environmental engineers, scientists, planners, & management consultants

NPDES MS4 PART II

SARASOTA COUNTY
WET WEATHER SAMPLING LOCATIONS

Figure No. 1

TABLE 2
ANALYTICAL METHODOLOGIES, PRESERVATIVES AND HOLDING TIMES

ANALYSIS	SAMPLE TYPE	CONTAINER	PRESERVATIVE	HOLDING TIME	METHODOLOGY
Volatiles	Grab	G, teflon	4 °C* (HCl to pH < 2)	3 days (7 days)	EPA 624
Acid and Base/Neutrals	FWC	G, teflon	4 °C*	7 days until extract	EPA 625
Pesticides and PCBs	FWC	G, teflon	4 °C*	7 days until extract	EPA 608
Toxic Metals	FWC	P	HNO_3 to pH<2	6 months	**
Mercury	FWC	P	HNO_3 to pH<2	28 days	EPA 245.1
Total Cyanide	Grab	P	4°C-NaOH to pH>12	14 days	EPA 335.2, 335.3, SM 4500-CN
Total Phenols	Grab	G	4°C-H_2SO_4 to pH<2	28 days	EPA 420.1, 420.2
Total Suspended Solids	FWC	P	4°C	7 days	EPA 160.2
Total Dissolved Solids	FWC	P	4°C	7 days	EPA 160.1
Chemical Oxygen Demand	FWC	P	4°C-H_2SO_4 to pH<2	28 days	EPA 410.4
Biochemical Oxygen Demand	FWC	P	4°C	48 hours	EPA 405.1
Oil and Grease	Grab	G	4°C-H_2SO_4 to pH<2	28 days	EPA 413.1
Fecal Coliform	Grab	P	4°C*	6 hours	SM 909C
Fecal Streptococcus	Grab	P	4°C*	6 hours	SM 910B
pH	Grab	P	None-analyze on site	not applicable	EPA 150.1
Total Kjeldahl Nitrogen	FWC	P	4°C-H_2SO_4 to pH<2	28 days	EPA 351.2
Nitrate-Nitrite-Nitrogen	FWC	P	4°C-H_2SO_4 to pH<2	28 days	EPA 353.2
Ammonia Nitrogen	FWC	P	4°C-H_2SO_4 to pH<2	28 days	SM 4500-NH_3 H
Dissolved Total Phosphorus	FWC	P	4°C-H_2SO_4 to pH<2	Filter immediately 28 days	EPA 365.4
Total Phosphorus	FWC	P	4 °C- H_2SO_4 to pH<2	28 days	EPA 365.4

* Residual chlorine not expected to be present.

** Graphite furnace, except for zinc.
EPA 204.2, 206.2, 206.3, 210.2, 213.2, 218.2, 220.2, 239.2, 249.2, 270.2, 272.2, 289.1.

FWC = Flow Weighted Composite
G = Glass
P = Polyethylene
Teflon = Teflon lined Septa or Cap.

TABLE 3
DESCRIPTION OF STORMS COLLECTED DURING WET WEATHER CHARACTERIZATION SARASOTA COUNTY PART II NPDES PERMIT APPLICATION

Site 001

- 8/21/92 Acceptable
- 9/24/92 Insufficient sample, but selected parameters analyzed due to fresh asphalt
- 10/ 2/92 Acceptable, but no pesticide data
- 11/27/92 Acceptable
- 4/ 1/93 FWC only for first flush, rainfall above upper criteria for April
- 4/ 5/93 Acceptable, initial runoff masked by tidal backwater

Site 002

- 8/29/92 Bacteria only
- 9/ 3/92 Bacteria only
- 9/25/92 FWC collected under backwatered conditions, but flow still downstream
- 11/27/92 Acceptable
- 1/ 8/93 Acceptable, FWC for first portion of storm before backwater
- 1/25/93 FWC with gap in collection times
- 2/22/93 Acceptable
- 4/ 9/93 Additional storm

Site 003

- 10/ 2/92 Acceptable, but no pesticide data
- 1/26/93 Acceptable
- 2/26/93 Acceptable
- 4/ 1/93 FWC with gap in collection times, water depths greater than primary device Acceptable so long as pesticide data all less than limit of detection

Site 004

- 8/22/92 Acceptable
- 9/25/92 Acceptable
- 11/27/92 Acceptable

Site 005

- 8/22/92 Bacteria only
- 10/ 2/92 Acceptable, but no pesticides
- 1/14/93 Acceptable, FWC from first portion of storm
- 1/25/93 Additional storm, FWC with gap in collection times
- 3/ 3/93 Acceptable
- 4/ 5/93 Acceptable, initial and latter portion of storm processed as two FWC samples
- 4/ 9/93 Additional storm

Site 006

- 9/13/92 Acceptable, water depths greater than primary device, but consistent
- 10/02/92 Additional storm, no pesticide data
- 3/13/93 Acceptable, water depths greater than primary device, but consistent
- 3/17/93 Additonal storm, gap in FWC collection times
- 4/15/93 Acceptable

Site 007

- 9/13/92 Acceptable
- 1/ 8/93 Initial portion of storm collected
- 1/14/93 Acceptable
- 2/22/93 Bacteria only
- 2/26/93 Additional storm, initial and latter portion of storm processed as two FWC samples
- 3/ 3/93 Acceptable

TABLE 4
BACTERIOLOGICAL, DEMANDS, AND SOLIDS CONCENTRATIONS IN STORMWATER
WET WEATHER CHARACTERIZATIONS
SARASOTA COUNTY PART II NPDES PERMIT APPLICATION

Site	Date	Grab Time (hhmm)	FWC End Time(a) (hhmm)	pH Field (SU)	Fecal Coliform (#/100ml)	Fecal Strepto-coccus (#/100ml)	Oil and Grease (mg/l)	Biochem. Oxygen Demand (mg/l)	Chemical Oxygen Demand (mg/l)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)
001	8/21/92	1545	1612	6.45	1300	960	3.0	6.7	78	52	62
001	9/24/92	1619	-	-	-	-	2.9	-	-	-	-
001	10/ 2/92	1049	1423	6.70	7900	6400	<0.1	4.6	20	46	88
001	11/27/92	0713	1006	6.13	11000	15600	6.1	11.6	100	56	60
001	4/ 1/93	0150	0204	6.55	-	-	2.0	30.4	138	93	59
001	4/ 5/93	0128	0204	6.86	-	-	1.8	32.0	1190	22	87
002	8/29/92	1154	-	5.30	70800	57600	-	-	-	-	-
002	9/ 3/92	1329	1355	6.59	17800	13000	-	-	-	-	-
002	9/25/92	1858	2021	6.99	104000	89000	3.9	7.5	72	68	60
002	11/27/92	0934	1303	6.77	11600	7600	7.4	9.0	72	109	168
002	1/ 8/93	1643	1718	7.75	28200	16400	11.6	11.7	226	435	135
002	1/25/93	2023	2102	6.94	11900	13800	3.3	7.9	48	73	256
002	2/22/93	1611	2015	7.06	700	10600	10.4	13.3	157	210	219
002	4/ 9/93	1149	1306	7.01	-	-	8.3	10.8	131	155	312
003	10/ 2/92	1402	1840	6.25	3400	10600	1.0	6.4	77	4	214
003	1/26/93	0237	0433	6.46	11700	8900	<0.1	26.2	157	3	298
003	2/26/93	1309	1548	6.89	6000	9100	1.7	9.6	78	4	507
003	2/26/93	1051	-	-	1700	9600	-	-	-	-	-
003	4/ 1/93	0319	0622	6.51	-	-	0.1	21.6	68	19	86
004	8/22/92	1634	1736	7.13	>250	48000	7.4	7.0	61	139	50
004	8/22/92	1634	1736	-	-	-	3.8	7.3	61	143	46
004	9/25/92	2039	2207	6.14	89000	33000	3.2	9.4	86	94	84
004	11/27/92	1059	1232	6.77	47200	6100	1.8	6.5	48	21	70
005	8/22/92	1642	-	-	2800	33000	-	-	-	-	-
005	10/ 2/92	1305	1756	7.89	3100	9800	6.6	5.8	43	74	34
005	1/14/93	1430	1510	7.12	700	3800	10.5	14.6	141	160	131
005	1/25/93	1330	1944	7.22	600	8100	7.3	14.5	100	73	58
005	3/ 3/93	2214	2345	6.74	200	1000	9.2	1.2	53	46	54
005	4/ 5/93	-	0446	-	-	-	-	29.2	19	11	25
005	4/ 5/93	0101	0127	6.72	-	-	6.1	33.6	461	101	67
005	4/ 9/93	1111	1525	7.36	-	-	7.7	7.0	54	30	97
006	9/13/92	1640	2028	7.24	14100	10400	0.7	6.6	51	25	122
006	10/ 2/92	1301	1538	7.73	2500	2300	1.5	10.3	75	16	268
006	3/13/93	0210	0427	6.89	8300	6750	0.2	13.2	380	21	78
006	3/17/93	1252	1614	7.10	3950	5700	0.3	58.0	285	2	278
006	4/15/93	2228	0046	7.14	-	-	0.9	56.6	161	2	213
007	9/13/92	1655	1841	7.16	23400	18100	0.8	9.5	33	11	30
007	1/ 8/93	1805	1913	7.33	2000	5600	2.6	9.0	70	19	41
007	1/14/93	1527	1741	7.01	1900	9100	1.8	8.8	195	15	23
007	2/22/93	1708	-	7.49	775	6100	-	-	-	-	-
007	2/26/93	1045	1113	7.21	1450	2600	3.9	18.0	63	50	31
007	2/26/93	-	1431	-	-	-	-	10.0	38	12	31
007	3/ 4/93	2219	2256	7.79	100	1350	3.7	5.2	44	40	34

(a) Flow-weighted composite ending time.

TABLE 5
NUTRIENT CONCENTRATIONS IN STORMWATER
WET WEATHER CHARACTERIZATIONS
SARASOTA COUNTY PART II NPDES PERMIT APPLICATION

Site	Date	Grab Time (hhmm)	FWC End Time(a) (hhmm)	Total Kjeldahl Nitrogen (mg/l)	Total Phosphorus (mg/l)	Nitrate-Nitrite-Nitrogen (mg/l)	Ammonium Nitrogen (mg/l)	Dissolved Total Phosphorus (mg/l)
001	8/21/92	1545	1612	1.00	0.35	0.427	0.108	0.19
001	9/24/92	1619	-	-	-	-	-	-
001	10/ 2/92	1049	1423	0.09	0.12	0.169	0.031	0.10
001	11/27/92	0713	1006	0.44	0.22	0.108	0.078	0.07
001	4/ 1/93	0150	0204	0.74	0.21	0.200	0.145	0.06
001	4/ 5/93	0128	0204	0.33	0.08	0.758	0.096	0.03
002	8/29/92	1154	-	-	-	-	-	-
002	9/ 3/92	1329	1355	-	-	-	-	-
002	9/25/92	1858	2021	0.49	0.36	0.158	0.005	<0.05
002	11/27/92	0934	1303	0.85	1.24	0.155	0.066	0.15
002	1/ 8/93	1643	1718	2.32	1.25	0.393	0.136	0.38
002	1/25/93	2023	2102	0.34	0.26	0.172	0.073	0.08
002	2/22/93	1611	2015	1.90	1.10	0.280	0.079	0.13
002	4/ 9/93	1149	1306	1.18	0.46	0.206	0.103	0.09
003	10/ 2/92	1402	1840	1.41	0.12	<0.005	0.006	0.08
003	1/26/93	0237	0433	0.76	0.11	0.017	0.027	0.11
003	2/26/93	1309	1548	0.81	0.20	0.051	0.051	0.14
003	2/26/93	1051	-	-	-	-	-	-
003	4/ 1/93	0319	0622	0.48	0.35	0.077	0.015	0.21
004	8/22/92	1634	1736	1.45	0.46	0.174	0.031	0.24
004	8/22/92	1634	1736	1.82	0.45	0.170	0.033	0.23
004	9/25/92	2039	2207	1.22	0.46	0.266	0.023	0.10
004	11/27/92	1059	1232	0.60	0.35	0.092	0.035	0.18
005	8/22/92	1642	-	-	-	-	-	-
005	10/ 2/92	1305	1756	0.20	0.08	0.047	0.006	<0.05
005	1/14/93	1430	1510	0.72	0.29	0.238	0.062	<0.05
005	1/25/93	1330	1944	0.17	0.12	0.098	0.044	0.05
005	3/ 3/93	2214	2345	0.54	0.13	0.124	0.127	0.05
005	4/ 5/93	-	0446	0.13	0.06	0.074	<0.005	0.02
005	4/ 5/93	0101	0127	2.18	0.30	0.411	0.225	0.11
005	4/ 9/93	1111	1525	0.57	0.11	0.251	0.085	0.05
006	9/13/92	1640	2028	0.83	0.28	0.063	0.025	0.16
006	10/ 2/92	1301	1538	1.06	0.22	0.012	<0.005	0.17
006	3/13/93	0210	0427	0.52	0.20	0.053	<0.005	0.10
006	3/17/93	1252	1614	0.41	0.14	<0.005	<0.005	0.15
006	4/15/93	2228	0046	0.68	0.13	0.017	0.032	0.09
007	9/13/92	1655	1841	0.55	0.65	0.320	0.005	0.59
007	1/ 8/93	1805	1913	0.35	0.53	0.267	0.069	0.51
007	1/14/93	1527	1741	<0.05	0.16	0.084	<0.005	0.09
007	2/22/93	1708	-	-	-	-	-	-
007	2/26/93	1045	1113	0.98	0.24	0.205	0.205	0.13
007	2/26/93	-	1431	0.16	0.11	0.124	0.124	0.07
007	3/ 4/93	2219	2256	0.90	0.28	0.154	0.234	0.16

(a) Flow weighted composite ending time.

[NPDES2] d2-3-3-8,tbl

TABLE 6
CYANIDE, PHENOLS, AND TOTAL RECOVERABLE METAL CONCENTRATIONS IN STORMWATER
WET WEATHER CHARACTERIZATIONS
SARASOTA COUNTY PART II NPDES PERMIT APPLICATION

Site	Date	Grab Time (hhmm)	FWC End Time(a) (hhmm)	Cyanide, Total (mg/l)	Phenols, Total (mg/l)	Antimony (ug/l)	Arsenic (ug/l)	Beryllium (ug/l)	Cadmium (ug/l)	Chromium (ug/l)	Copper (ug/l)	Lead (ug/l)	Mercury (ug/l)	Nickel (ug/l)	Selenium (ug/l)	Silver (ug/l)	Thallium (ug/l)	Zinc (ug/l)
001	8/21/92	1545	1612	<0.020	<0.050	4	<2	<0.1	1.6	6.1	30	18	<0.2	2	<4	<0.5	<1	86
001	9/24/92	1619	-	-	-	18	<2	<0.1	0.6	1.5	8	2	<0.4	<1	<4	<0.5	<2	45
001	10/ 2/92	1049	1423	<0.010	<0.005	<6	<2	<0.1	0.3	1.7	27	3	<0.4	<1	<4	<0.5	<2	43
001	11/27/92	0713	1006	<0.005	<0.050	18	<2	<0.1	1.0	5.1	21	18	<0.1	3	<4	<0.5	<1	71
001	4/ 1/93	0150	0204	<0.005	<0.050	9	<2	<0.1	0.7	8.7	30	24	<0.2	3	<2	<0.5	<0.3	118
001	4/ 5/93	0128	0204	<0.005	<0.050	9	<2	<0.1	0.3	2.6	7	8	<0.2	<2	<2	<0.5	<0.3	65
002	8/29/92	1154	-	-	-	-	-	-	-	-	-	-	<0.2	-	-	-	-	-
002	9/ 3/92	1329	1355	-	-	-	<2	<0.1	0.9	5.8	18	24	<0.3	2	<4	<0.5	-	111
002	9/25/92	1858	2021	<0.010	<0.005	<6	<2	<0.1	1.1	3.5	17	17	<0.4	<1	<4	<0.5	<2	79
002	11/27/92	0934	1303	<0.005	<0.050	<2	5	<0.1	1.5	7.0	17	27	<0.1	2	<4	<0.5	<1	127
002	1/ 8/93	1643	1718	<0.005	<0.050	<1	3	0.2	3.6	28.2	52	103	<0.4	7	<4	<0.5	<1	449
002	1/25/93	2023	2102	<0.005	<0.050	<1	<2	<0.1	1.2	4.0	9	14	<0.4	2	5	<0.5	<1	105
002	2/22/93	1611	2015	<0.005	<0.050	2	3	0.1	1.3	9.0	29	46	<0.2	4	<4	<0.5	<1	255
002	4/ 9/93	1149	1306	<0.005	<0.050	<2	<2	<0.1	0.9	9.6	18	36	<0.2	4	3	<0.5	<1	181
003	10/ 2/92	1402	1840	<0.010	<0.005	<6	5	<0.1	0.6	1.5	2	<1	<0.4	<1	<4	<0.5	<2	11
003	1/26/93	0237	0433	<0.005	<0.050	6	7	<0.1	1.9	1.5	2	1	<0.4	<1	<4	<0.5	<1	29
003	2/26/93	1309	1548	<0.005	<0.050	6	3	<0.1	0.5	1.4	2	3	<0.2	<1	<4	<0.5	1	43
003	2/26/93	1051	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
003	4/ 1/93	0319	0622	<0.005	<0.050	<1	<2	<0.1	1.0	2.0	4	2	<0.2	<2	<2	<0.5	<0.3	23
004	8/22/92	1634	1736	0.010	<0.005	<1	2	<0.1	0.5	4.3	6	19	<0.2	3	<4	<0.5	<1	58
004	8/22/92	1634	1736	-	-	<1	<2	<0.1	0.5	2.7	6	15	<0.2	2	<4	<0.5	<1	47
004	9/25/92	2039	2207	<0.010	<0.005	<6	3	<0.1	0.7	3.6	8	29	<0.4	5	<4	<0.5	<2	152
004	11/27/92	1059	1232	<0.005	<0.050	<2	<2	<0.1	1.2	1.8	6	8	<0.1	<1	<4	<0.5	<1	75
005	8/22/92	1642	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
005	10/ 2/92	1305	1756	<0.010	<0.005	<6	<2	<0.1	0.7	8.0	5	28	<0.4	2	<4	<0.5	<2	45
005	1/14/93	1430	1510	0.011	<0.050	<1	<2	<0.1	1.3	16.4	16	60	<0.4	4	<4	<0.5	<1	189
005	1/25/93	1330	1944	<0.005	<0.050	1	<2	<0.1	0.6	8.1	6	26	<0.4	<1	<4	<0.5	<1	82
005	3/ 3/93	2214	2345	<0.005	<0.050	<1	<2	<0.1	0.6	4.9	5	19	<0.4	<1	<4	<0.5	1	61
005	4/ 5/93	-	0446	-	-	<1	<2	<0.1	0.5	2.8	3	6	<0.2	<2	<2	<0.5	<0.3	18
005	4/ 5/93	0101	0127	<0.005	<0.050	<1	2	<0.1	0.5	8.4	11	31	<0.2	3	<2	<0.5	<0.3	92
005	4/ 9/93	1111	1525	<0.005	<0.050	<2	5	<0.1	0.4	6.2	8	17	<0.2	4	<2	<0.5	<1	69

(a) Flow-weighted composite ending time.

TABLE 6 (continued)
CYANIDE, PHENOLS, AND TOTAL RECOVERABLE METAL CONCENTRATIONS IN STORMWATER
WET WEATHER CHARACTERIZATIONS
SARASOTA COUNTY PART II NPDES PERMIT APPLICATION

Site	Date	Grab Time (hhmm)	FWC End Time(a) (hhmm)	Cyanide, Total (mg/l)	Phenols, Total (mg/l)	Antimony (ug/l)	Arsenic (ug/l)	Beryllium (ug/l)	Cadmium (ug/l)	Chromium (ug/l)	Copper (ug/l)	Lead (ug/l)	Mercury (ug/l)	Nickel (ug/l)	Selenium (ug/l)	Silver (ug/l)	Thallium (ug/l)	Zinc (ug/l)
006	9/13/92	1640	2028	<0.010	<0.005	<1	<2	<0.1	0.5	1.4	<1	<1	<0.3	<1	<4	<0.5	<1	<10
006	10/ 2/92	1301	1538	<0.010	<0.005	<6	2	<0.1	0.7	1.4	<1	<1	<0.4	<1	<4	<0.5	<2	<10
006	3/13/93	0210	0427	<0.005	<0.050	<1	<2	<0.1	<0.2	1.7	2	2	<0.4	<2	<2	<0.5	<0.3	7
006	3/17/93	1252	1614	<0.005	<0.050	<1	<2	<0.1	0.2	1.8	1	<1	<0.4	<2	4	<0.5	1	7
006	4/15/93	2228	0046	<0.005	<0.050	<2	<2	<0.1	<0.2	1.5	<1	<1	<0.2	<2	<2	<0.5	<1	<10
007	9/13/92	1655	1841	<0.010	<0.005	<1	<2	<0.1	0.9	0.9	3	4	<0.2	2	<4	<0.5	<1	27
007	1/ 8/93	1805	1913	<0.005	<0.050	<1	<2	<0.1	0.8	1.5	3	9	<0.4	<1	<4	<0.5	<1	42
007	1/14/93	1527	1741	<0.005	<0.050	<1	<2	<0.1	0.4	2.4	6	12	<0.4	4	<4	<0.5	<1	30
007	2/22/93	1708	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
007	2/26/93	1045	1113	<0.005	<0.050	<1	<2	<0.1	0.4	2.2	5	21	<0.2	<1	<4	<0.5	<1	62
007	2/26/93	-	1431	-	-	<1	<2	<0.1	<0.2	2.1	2	7	<0.2	<1	<4	<0.5	1	21
007	3/ 4/93	2219	2256	<0.005	<0.050	6	<2	<0.1	0.5	1.6	4	13	<0.4	2	<4	<0.5	<1	45

(a) Flow-weighted composite ending time.

TABLE 7
LISTING OF THE ONLY ACID AND BASE/NEUTRAL EXTRACTABLE COMPOUNDS DETECTED IN STORMWATER SAMPLES
WET WEATHER CHARACTERIZATIONS
SARASOTA COUNTY PART II NPDES PERMIT APPLICATION

Site	Date	Phen-anthrene (ug/l)	Benzo(a)-anthracene (ug/l)	3,4-Benzo-fluoranthene (ug/l)	Benzo(ghi)-perylene (ug/l)	Benzo(k)-fluoranthene (ug/l)	Bis(2-ethyl-hexyl) phthalate (ug/l)	Chrysene (ug/l)	Fluoranthene (ug/l)	Pyrene (ug/l)
001	8/21/92	<5	<5	<5	<5	<5	<5	<5	<5	<5
001	9/24/92	<5	<5	<5	<5	<5	<5	<5	<5	<5
001	10/ 2/92	<5	<5	<5	<5	<5	<5	<5	<5	<5
001	11/27/92	<5	<5	<5	<5	<5	<5	<5	<5	<5
001	4/ 1/93	<5	<5	<5	<5	<5	7	<5	<5	<5
001	4/ 5/93	<5	<5	<5	<5	<5	<5	<5	<5	<5
002	8/29/92	-	-	-	-	-	-	-	-	-
002	9/ 3/92	-	-	-	-	-	-	-	-	-
002	9/25/92	<5	<5	<5	<5	<5	<5	<5	<5	<5
002	11/27/92	<5	<5	<5	<5	<5	<5	<5	<5	<5
002	1/ 8/93	<5	<5	<5	<5	<5	<5	<5	<5	<5
002	1/25/93	<5	<5	<5	<5	<5	<5	<5	<5	<5
002	2/22/93	<5	<5	<5	<5	<5	<5	<5	<5	<5
002	4/ 9/93	<5	<5	6	<5	<5	6	5	9	6
003	10/ 2/92	<5	<5	<5	<5	<5	8	<5	<5	<5
003	1/26/93	<5	<5	<5	<5	<5	<5	<5	<5	<5
003	2/26/93	<5	<5	<5	<5	<5	<5	<5	<5	<5
003	2/26/93	-	-	-	-	-	-	-	-	-
003	4/ 1/93	<5	<5	<5	<5	<5	<5	<5	<5	<5
004	8/22/92	<5	<5	<5	<5	<5	<5	<5	<5	<5
004	8/22/92	<5	<5	<5	<5	<5	<5	<5	<5	<5
004	9/25/92	<5	<5	<5	<5	<5	<5	<5	<5	<5
004	11/27/92	<5	<5	<5	<5	<5	<5	<5	<5	<5
005	8/22/92	-	-	-	-	-	-	-	-	-
005	10/ 2/92	<5	<5	<5	<5	<5	<5	<5	<5	<5
005	1/14/93	11	7	12	16	11	10	16	21	15
005	1/25/93	<5	<5	<5	<5	<5	<5	<5	7	5
005	3/ 3/93	<5	<5	<5	<5	<5	<5	<5	6	<5
005	4/ 5/93	<5	<5	<5	<5	<5	<5	<5	<5	<5
005	4/ 5/93	8	<5	6	<5	<5	<5	6	16	11
005	4/ 9/93	<5	<5	<5	<5	<5	<5	<5	5	<5

TABLE 7 (continued)
LISTING OF THE ONLY ACID AND BASE/NEUTRAL EXTRACTABLE COMPOUNDS DETECTED IN STORMWATER SAMPLES
WET WEATHER CHARACTERIZATIONS
SARASOTA COUNTY PART II NPDES PERMIT APPLICATION

Site	Date	Phen-anthrene (ug/l)	Benzo(a)-anthracene (ug/l)	3,4-Benzo-fluoranthene (ug/l)	Benzo(ghi)-perylene (ug/l)	Benzo(k)-fluoranthene (ug/l)	Bis(2-ethyl-hexyl) phthalate (ug/l)	Chrysene (ug/l)	Fluoranthene (ug/l)	Pyrene (ug/l)
006	9/13/92	<5	<5	<5	<5	<5	<5	<5	<5	<5
006	10/ 2/92	<5	<5	<5	<5	<5	<5	<5	<5	<5
006	3/13/93	<5	<5	<5	<5	<5	<5	<5	<5	<5
006	3/17/93	<5	<5	<5	<5	<5	<5	<5	<5	<5
006	4/15/93	<5	<5	<5	<5	<5	<5	<5	<5	<5
007	9/13/92	<5	<5	<5	<5	<5	<5	<5	<5	<5
007	1/ 8/93	<5	<5	<5	<5	<5	<5	<5	<5	<5
007	1/14/93	<5	<5	<5	<5	<5	<5	<5	<5	<5
007	2/22/93	-	-	-	-	-	-	-	-	-
007	2/26/93	<5	<5	<5	<5	<5	<5	<5	<5	<5
007	2/26/93	<5	<5	<5	<5	<5	<5	<5	<5	<5
007	3/ 4/93	<5	<5	<5	<5	<5	<5	<5	<5	<5

TABLE 8
LISTING OF ALL SAMPLES WITH DETECTABLE CONCENTRATIONS OF PESTICIDES
WET WEATHER CHARACTERIZATIONS
SARASOTA COUNTY PART II NPDES PERMIT APPLICATION

Site	Date	Heptachlor Epoxide (ug/l)	4,4'-DDE (ug/l)
001	8/21/92	0.1	<0.1
001	9/24/92	-	-
001	10/ 2/92	-	-
001	11/27/92	<0.05	<0.05
001	4/ 1/93	<0.1	<0.1
001	4/ 5/93	<0.1	<0.1
002	8/29/92	-	-
002	9/ 3/92	-	-
002	9/25/92	<0.05	<0.05
002	11/27/92	<0.05	<0.05
002	1/ 8/93	<0.05	<0.05
002	1/25/93	<0.2	<0.2
002	2/22/93	<0.1	0.15
002	4/ 9/93	<0.1	<0.1
003	10/ 2/92	-	-
003	1/26/93	<0.2	<0.2
003	2/26/93	<0.1	<0.1
003	2/26/93	-	-
003	4/ 1/93	<0.05	<0.05
004	8/22/92	<0.1	<0.1
004	8/22/92	<0.1	<0.1
004	9/25/92	<0.05	<0.05
004	11/27/92	<0.05	<0.05
005	8/22/92	-	-
005	10/ 2/92	-	-
005	1/14/93	<0.2	<0.2
005	1/25/93	<0.2	<0.2
005	3/ 3/93	<0.1	1.7
005	4/ 5/93	<0.1	0.11
005	4/ 5/93	<0.1	<0.1
005	4/ 9/93	<0.1	<0.1
006	9/13/92	<0.05	<0.05
006	10/ 2/92	-	-
006	3/13/93	<0.05	<0.05
006	3/17/93	<0.05	<0.05
006	4/15/93	<0.05	<0.05
007	9/13/92	<0.05	<0.05
007	1/ 8/93	<0.05	<0.05
007	1/14/93	<0.2	<0.2
007	2/22/93	-	-
007	2/26/93	<0.1	<0.1
007	2/26/93	<0.1	<0.1
007	3/ 4/93	<0.1	<0.1

TABLE 9
LISTING OF THE ONLY VOLATILE ORGANIC COMPOUNDS
DETECTED IN STORMWATER SAMPLES
WET WEATHER CHARACTERIZATIONS
SARASOTA COUNTY PART II NPDES PERMIT APPLICATION

Site	Date	Benzene (ug/l)	Ethyl-benzene (ug/l)	Toluene (ug/l)	Methylene Chloride (ug/l)	Trichloro-ethane (ug/l)
001	8/21/92	<1	<1	<1	6	1
001	9/24/92	<1	<1	<1	3	<1
001	10/ 2/92	<1	<1	<1	1	<1
001	11/27/92	<1	<1	1	<1	<1
001	4/ 1/93	<1	<1	<1	<1	<1
001	4/ 5/93	<1	<1	<1	<1	<1
002	8/29/92	-	-	-	-	-
002	9/ 3/92	-	-	-	-	-
002	9/25/92	<1	<1	<1	2	<1
002	11/27/92	<1	<1	<1	<1	<1
002	1/ 8/93	<1	<1	<1	<1	<1
002	1/25/93	<1	<1	<1	<1	<1
002	2/22/93	<1	<1	<1	<1	<1
002	4/ 9/93	<1	<1	<1	<1	<1
003	10/ 2/92	<1	<1	<1	1	<1
003	1/26/93	<1	<1	<1	<1	<1
003	2/26/93	<1	<1	<1	<1	<1
003	2/26/93	<1	<1	<1	<1	<1
003	4/ 1/93	<1	<1	<1	<1	<1
004	8/22/92	1	1	<1	<1	<1
004	8/22/92	-	-	-	-	-
004	9/25/92	<1	<1	<1	1	<1
004	11/27/92	<1	<1	<1	<1	<1
005	8/22/92	-	-	-	-	-
005	10/ 2/92	<1	<1	<1	<1	<1
005	1/14/93	<1	<1	<1	<1	<1
005	1/25/93	<1	<1	<1	<1	<1
005	3/ 3/93	<1	<1	<1	<1	<1
005	4/ 5/93	-	-	-	-	-
005	4/ 5/93	<1	<1	<1	<1	<1
005	4/ 9/93	<1	<1	<1	<1	<1
006	9/13/92	<1	<1	<1	<1	<1
006	10/ 2/92	<1	<1	<1	<1	<1
006	3/13/93	<1	<1	<1	<1	<1
006	3/17/93	<1	<1	<1	<1	<1
006	4/15/93	<1	<1	<1	<1	<1
007	9/13/92	<1	<1	<1	<1	<1
007	1/ 8/93	<1	<1	<1	<1	<1
007	1/14/93	<1	<1	<1	<1	<1
007	2/22/93	-	-	-	-	-
007	2/26/93	<1	<1	<1	<1	<1
007	2/26/93	-	-	-	-	-
007	3/ 4/93	<1	<1	<1	<1	<1

Descriptions of the individual storms sampled follow Table 9, according to land use, and include all events collected and processed. Each event is illustrated as a flow hydrograph (indicated by the square symbol) superimposed on a bar graph of 5 minute rainfall totals. Even when storms do not rigidly meet criteria (entire event, or three hours of collection) these data are presented as well since, in most cases, the samples collected emphasized the initial portions of the storm. Analytical results from samples taken during the first flush or when runoff rates were higher, may well reflect water quality which is worse than when collected under the specified criteria.

HIGH DENSITY RESIDENTIAL - LONGBOAT KEY

The high density residential land use site consists of a basin 2.9 acres in area, with approximately 78 percent Directly Connected Impervious Area (DCIA). The residential units were constructed in 1970 and consist of multistory apartment buildings, pool area, covered parking for residents, and a landscaped open area bordering Sarasota Bay. The site is located at 3800 Gulf of Mexico Dr., on the barrier island of, and in the Town of, Longboat Key. The sampling site captures the runoff from approximately 1/2 of the parking, roadways, and roof surfaces of the entire development, but from little of the landscaped area. At the site, the drainage consists of a 12 inch Reinforced Concrete Pipe (RCP) with a slope of 0.33 percent. The above dimensions, together with a roughness coefficient of 0.012, were used in Manning's equation for the computation of flow from level measurements.

Runoff from the sampling site flows to the east and discharges into Sarasota Bay through a bell-shaped RCP. The outlet is partially submerged under normal high tides and extreme high tides also produce backwater conditions at the sampling site on occasion. Storms which occurred during tidal backwater conditions were not sampled.

LONGBOAT KEY - August 21, 1992

A rainfall event of 0.62 inches was sampled on August 21, 1992. The total rainfall event duration was 55 minutes, from 15:20 until 16:20. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 2.16, 1.36, and 1.02 inches per hour, respectively. The maximum flow rate was 2.05 cfs (0.76 feet in depth) during the event.

Antecedent rainfall for the 72-hour period prior to 15:20 was 0.00 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.50 inches, received between 10:50 and 14:15 on August 15, 6 days prior. No previous analytical data had been reported for this site.

Sampling routines initiated at 15:32, grab samples were collected at 15:47, and flow-weighted composites were secured between 15:34 and 16:14, or for a total period of 42 minutes. The sampled event produced a total of 2,210 cf of runoff. Composite samples were collected between 67 and 2,180 cf, or until 99 percent of the cumulative runoff had occurred. Grab samples were collected after 1,600 cf of runoff.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: LONGBOAT KEY | SITE ID: 001 | STORM DATE: 08-21-92

Site Characteristics

Drainage Area:	2.9	(acres)
% Impervious:	78	%
Land Use:	High Density Residential	

Storm Precipitation Data Summary

Site Precipitation:	0.62	(inches)
Maximum Intensity:		
5 min:	2.16	(inches/hr)
15 min:	1.36	(inches/hr)
30 min:	1.02	(inches/hr)

Storm Flow Data Summary

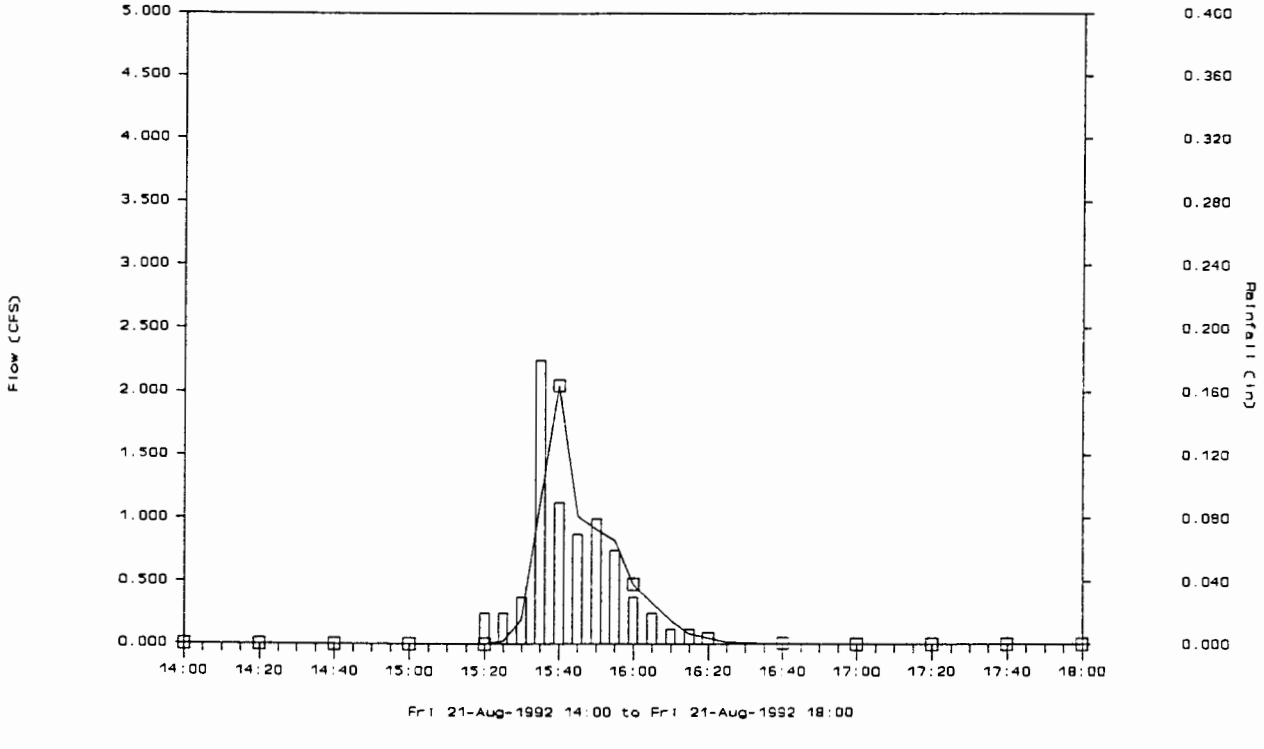
Peak Flow Rate:	2.05	(cfs)
Max Flow Depth:	0.76	(feet)
Total Sampled Vol:	67-2,180	(cf)
Total Runoff Vol:	2,210	(cf)
Baseflow Runoff Vol:	0	(cf)

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	6	(days)

Grab Sample Time:	15:47	(hhmm EST)
Flow Weighted Sample Times:	15:32-16:14	(hhmm EST)
Composite Flow Interval:	90	(cf)
No. of Samples:	23	

HIGH DENSITY RESIDENTIAL - LONGBOAT KEY



LONGBOAT KEY - September 24, 1992

A rainfall event of 0.20 inches was sampled on September 24, 1992. The total rainfall event duration was 15 minutes, from 16:05 until 16:20. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 1.08, 0.76, and 0.40 inches per hour, respectively. The maximum flow rate was 1.09 cfs (0.49 feet in depth) during the event.

Antecedent rainfall for the 72-hour period prior to 16:05 was 0.00 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.28 inches, received between 20:05 and 20:50 on September 18, 6 days prior. The previous analytical data reported for this site were from an event on August 21.

Sampling routines initiated at 16:06, and grab samples were collected at 16:21. An insufficient sample was collected to process the flow-weighted composite for all parameters. All parking and roadway surfaces within the basin, however, had recently been resurfaced with asphalt (completed on September 17, 1992), and the grab sample was analyzed for metals, oil and grease, and acid/base/neutral extractable compounds for information on the contributions from fresh road surfaces. The event produced a total of 530 cf of runoff. Grab samples were collected after 510 cf of runoff.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: LONGBOAT KEY | SITE ID: 001 | STORM DATE: 09-24-92

Site Characteristics

Drainage Area:	2.9	(acres)
% Impervious:	78	%
Land Use:	High Density Residential	

Storm Precipitation Data Summary

Site Precipitation:	0.20	(inches)
Maximum Intensity:		
5 min:	1.08	(inches/hr)
15 min:	0.76	(inches/hr)
30 min:	0.40	(inches/hr)

Storm Flow Data Summary

Peak Flow Rate:	1.09	(cfs)
Max Flow Depth:	0.49	(feet)
Total Sampled Vol:	N/A	(cf)
Total Runoff Vol:	534	(cf)
Baseflow Runoff Vol:	0	(cf)

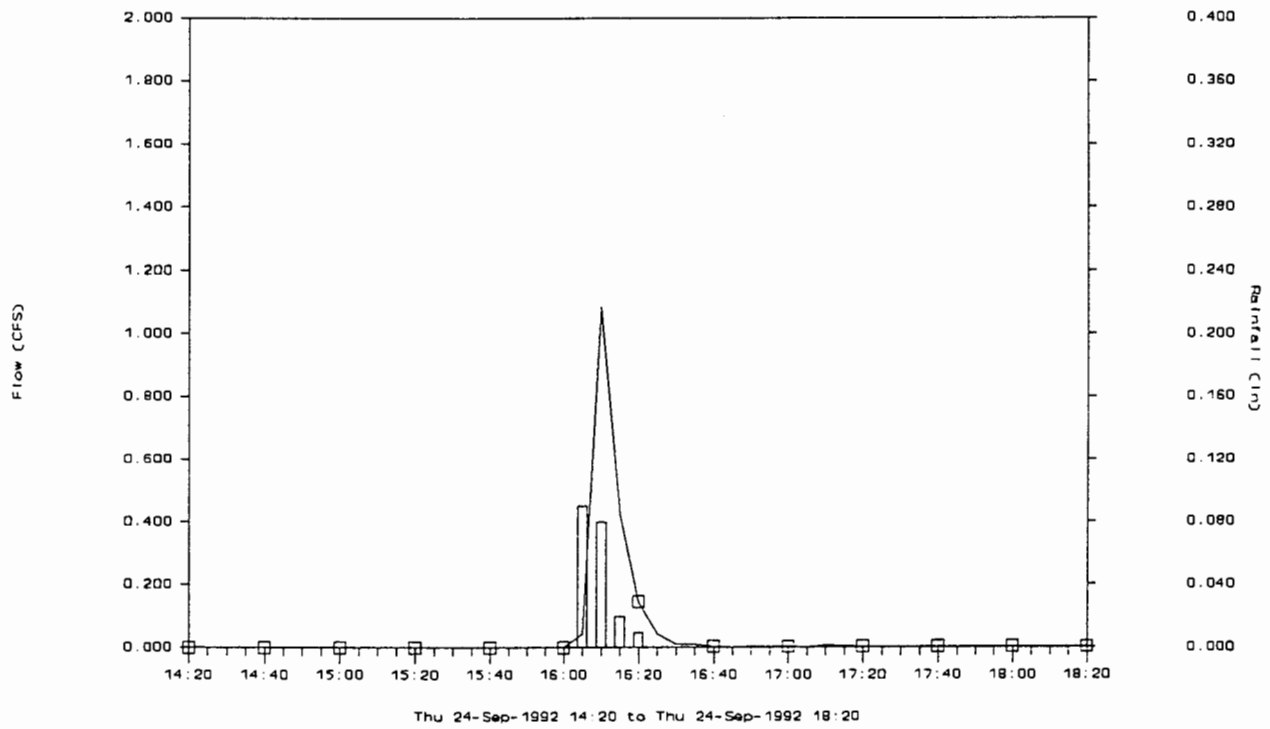
Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	6	(days)

Grab Sample Time:	16:21	(hhmm EST)
Flow Weighted Sample Times:	N/A	(hhmm EST)
Composite Flow Interval:	N/A	(cf)
No. of Samples:	N/A	

N/A = Not applicable

HIGH DENSITY RESIDENTIAL - LONGBOAT KEY



LONGBOAT KEY - October 2, 1992

A rainfall event of 2.49 inches, resulting from a frontal weather system, was sampled on October 2, 1992. The total rainfall event duration was 19 hours 50 minutes, from 10:25 until 06:15 on October 3. By 18:25 on October 2, however, high tide produced backwater conditions after 1.59 inches of rain had fallen over a period of 8 hours 40 minutes (illustrated in the following figure). Maximum rainfall intensities during the period without backwater for 5-, 15-, and 30-minute periods were 1.80, 0.68, and 0.60 inches per hour, respectively. The maximum flow rate was 0.79 cfs (0.41 feet in depth) during the event.

Antecedent rainfall for the entire 24-hour period prior to 10:15 totalled 0.12 inches, but was received in numerous small events and with only 0.08 inches generating runoff as follows:

0.01 in	14:50	October 1	no runoff
0.01 in	16:40	October 1	no runoff
0.01 in	21:40	October 1	no runoff
0.06 in	03:05 - 05:20	October 2	runoff probable, but site backwatered during the period
0.01 in	06:15	October 2	no runoff
0.02 in	08:10 - 08:30	October 2	runoff of 65 cf

In the 48-hour period prior to sampling an additional 0.05 inches of rainfall was received, and another 0.02 inches received in the 72-hour period prior. The most recent rainfall event (>0.1 inches) prior to the sampling was 1.73 inches received between 17:00 and 21:20 on September 25, 7 days prior. The previous analytical data reported for this site were from an event on September 24.

Sampling routines initiated at 10:36, grab samples were collected at 10:51, and flow-weighted composites were secured between 10:40 and 14:25, or over a total period of 3 hours 49 minutes.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: LONGBOAT KEY | SITE ID: 001 | STORM DATE: 10-02-92

Site Characteristics

Drainage Area:	2.9 (acres)
% Impervious:	78 %
Land Use:	High Density Residential

Storm Precipitation Data Summary

Site Precipitation:	2.49/1.59* (inches)
Maximum Intensity:	
5 min:	1.80 (inches/hr)
15 min:	0.68 (inches/hr)
30 min:	0.60 (inches/hr)

Storm Flow Data Summary

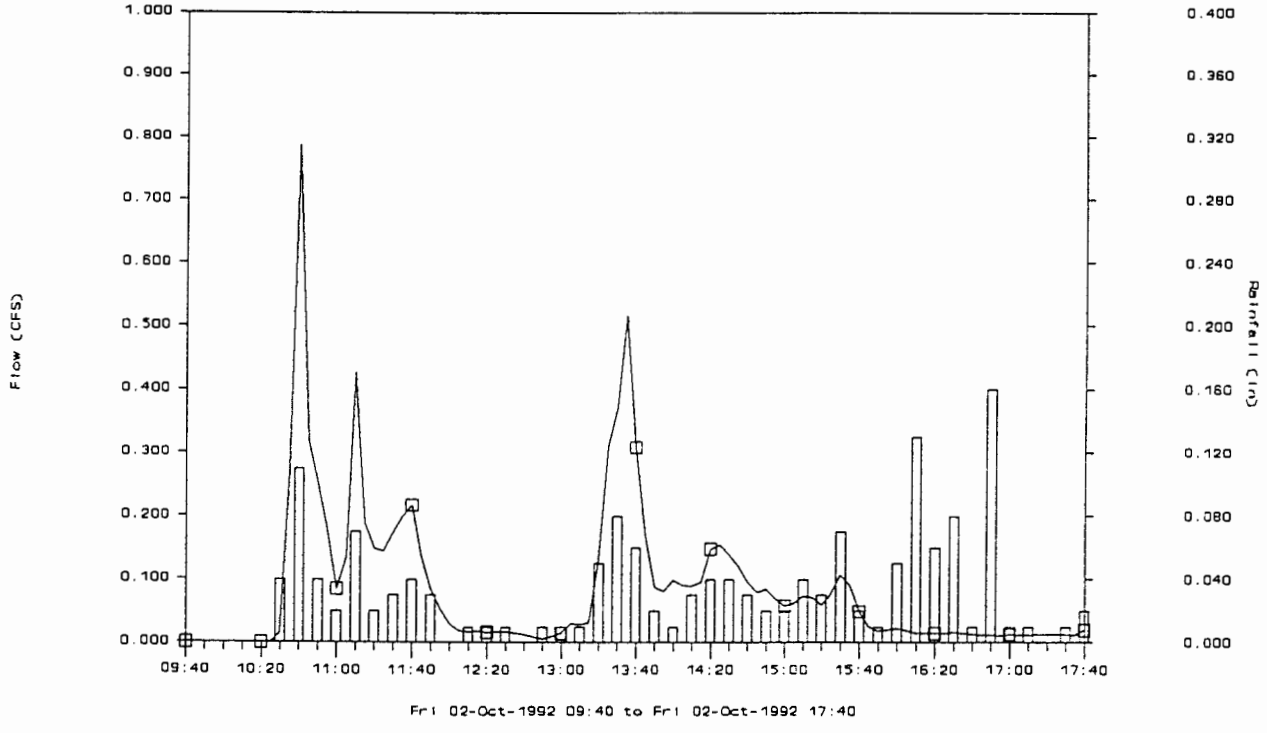
Peak Flow Rate:	0.79 (cfs)
Max Flow Depth:	0.41 (feet)
Total Sampled Vol:	86-2,030 (cf)
Total Runoff Vol:	2,530* (cf)
Baseflow Runoff Vol:	0 (cf)

*See Text

Antecedent Precipitation

24 Hour:	0.12* (inches)
48 Hour:	0.17 (inches)
72 Hour:	0.19 (inches)
Last rain >0.1":	7 (days)
Grab Sample Time:	10:51 (hhmm EST)
Flow Weighted Sample Times:	10:36-14:25 (hhmm EST)
Composite Flow Interval:	175 (cf)
No. of Samples:	11

HIGH DENSITY RESIDENTIAL - LONGBOAT KEY



The sampled event produced a total of 2,530 cf of runoff until high tide produced a backwater at the sampling site. Composite samples were collected between 86 and 2,030 cf of the cumulative runoff, or until 80 percent of the total runoff before backwatering had occurred. Grab samples were collected at 500 cf of runoff.

Due to laboratory error, the flow-weighted sample from this event was not analyzed for pesticides. The remainder of the analyses were processed normally.

LONGBOAT KEY - November 27, 1992

A rainfall event of 0.68 inches, resulting from a frontal weather system, was sampled on November 27, 1992. The total rainfall event duration was 7 hours 25 minutes, from 07:00 until 14:25, with sporadic rainfall continuing (although with no runoff) from 16:20 until 20:55. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 0.84, 0.56, and 0.36 inches per hour, respectively. The maximum flow rate was 0.60 cfs (0.36 feet in depth) during the event.

Antecedent rainfall for the 72-hour period prior to 07:00 was 0.00 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.23 inches, received between 05:30 and 09:50 on November 18, 9 days prior. The previous analytical data reported for this site were from an event on October 2.

Sampling routines initiated at 07:10, grab samples were collected at 07:15, and flow-weighted composites were secured between 07:14 and 10:08, or over a total period of 2 hours 58 minutes. Flow had declined to less than 0.01 cfs as the last composite sample was collected.

The sampled event produced a total of 1,060 cf of runoff by 13:05. Composite samples were collected between 190 and 980 cf of the cumulative runoff or until 93 percent of the total runoff had occurred. Grab samples were collected at 370 cf of runoff.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: LONGBOAT KEY | SITE ID: 001 | STORM DATE: 11-27-92

Site Characteristics

Drainage Area:	2.9	(acres)
% Impervious:	78	%
Land Use:	High Density Residential	

Storm Precipitation Data Summary

Site Precipitation:	0.68	(inches)
Maximum Intensity:		
5 min:	0.84	(inches/hr)
15 min:	0.56	(inches/hr)
30 min:	0.36	(inches/hr)

Storm Flow Data Summary

Peak Flow Rate:	0.60	(cfs)
Max Flow Depth:	0.36	(feet)
Total Sampled Vol:	190-980	(cf)
Total Runoff Vol:	1,060	(cf)
Baseflow Runoff Vol:	0	(cf)

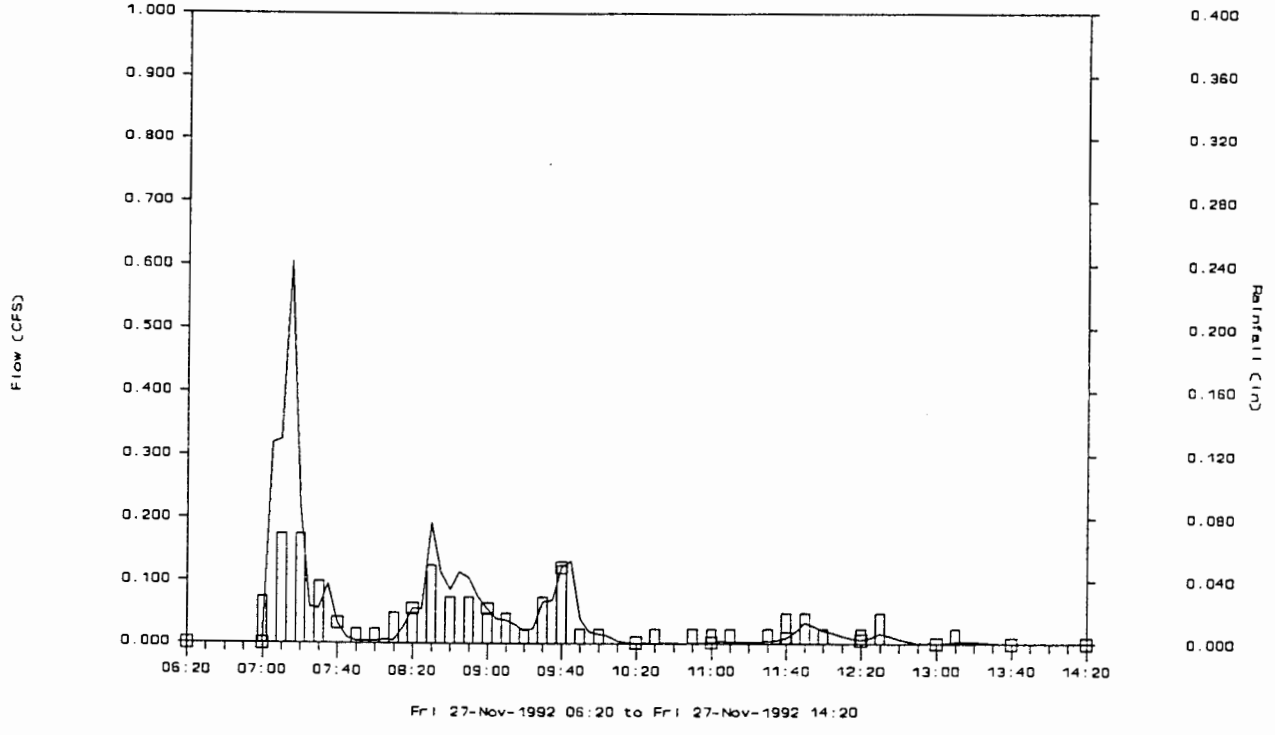
Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	9	(days)

Grab Sample Time:	07:15	(hhmm EST)
Flow Weighted Sample Times:	7:10-10:08	(hhmm EST)

Composite Flow Interval:	160	(cf)
No. of Samples:	5	

HIGH DENSITY RESIDENTIAL - LONGBOAT KEY



LONGBOAT KEY - April 1, 1993

A rainfall event of 2.62 inches, resulting from a frontal weather system, was sampled on April 1, 1993. The total event duration was 6 hours 5 minutes, from 01:35 until 07:40. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 2.88, 2.16, and 1.78 inches per hour, respectively. Maximum flow rates were 2.22 cfs (1.11 feet in depth) during the event. Surcharged conditions (depths >1.00 feet) existed only for a single 5 minute observation, and were not expected to substantially affect accuracy of flow measurements.

Antecedent rainfall for the 72-hour period prior was 0.00 inches. The most recent rainfall event prior to the sampling was 0.93 inches, received between 09:40 and 22:20 on March 19, 13 days prior. The previous analytical data reported for this site was from an event November 27, 1992.

Sampling routines initiated at 01:44, grab samples were collected at 01:53, and flow-weighted composites were secured between 01:46 and 02:07, or over a total period of 23 minutes. Although sampling did not continue for either three hours or for the entire event, and although rainfall amounts were above the upper criteria for April, samples were processed since the composite sample was collected during the first flush of the storm.

The sampled event produced a total of 8,900 cf of runoff. Composite samples were collected between 420 and 2,580 cf of the cumulative runoff, or until 30% of the runoff had occurred. Grab samples were collected at 1,490 cf of total runoff.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: LONGBOAT KEY | SITE ID: 001 | STORM DATE: 04-01-93

Site Characteristics

Drainage Area:	2.9 (acres)
% Impervious:	78 %
Land Use:	High Density Residential

Storm Precipitation Data Summary

Site Precipitation:	2.62 (inches)
Maximum Intensity:	
5 min:	2.88 (inches/hr)
15 min:	2.16 (inches/hr)
30 min:	1.78 (inches/hr)

Storm Flow Data Summary

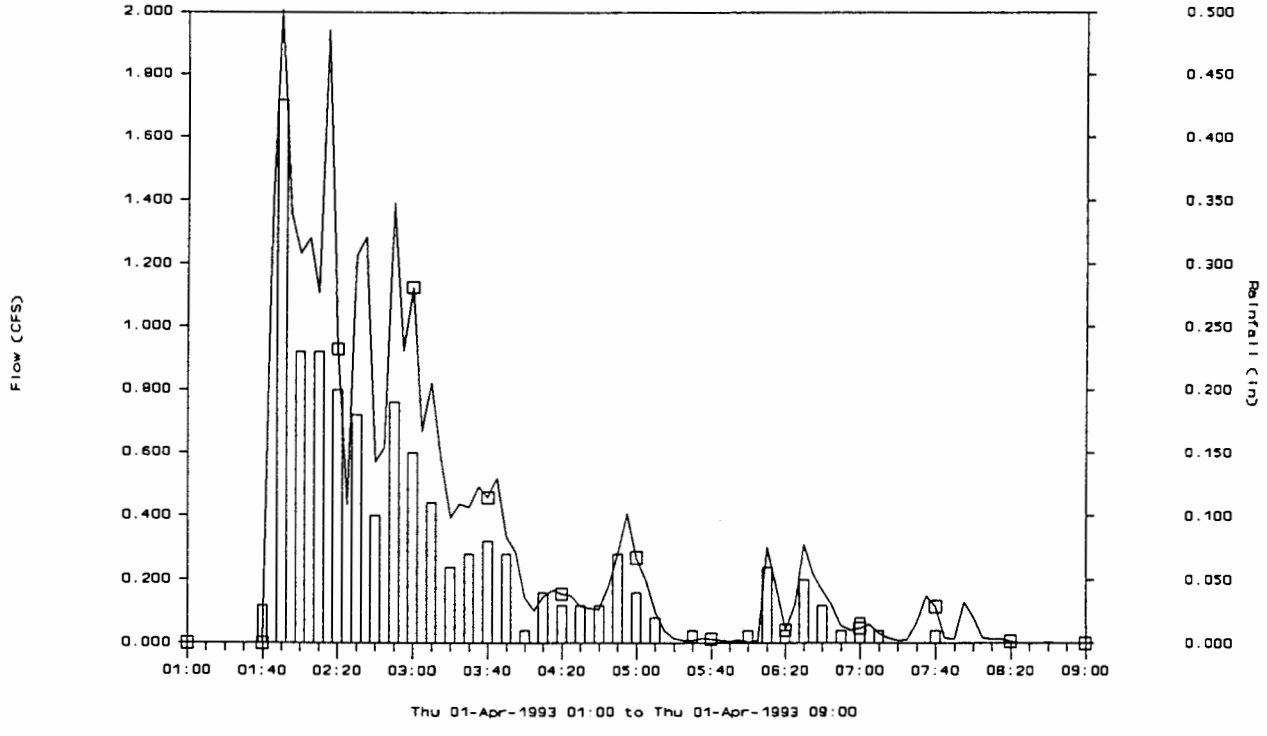
Peak Flow Rate:	2.22 (cfs)
Max Flow Depth:	1.11 (feet)
Total Sampled Vol:	420-2,580 (cf)
Total Runoff Vol:	8,900 (cf)
Baseflow Runoff Vol:	0 (cf)

Antecedent Precipitation

24 Hour:	0.00 (inches)
48 Hour:	0.00 (inches)
72 Hour:	0.00 (inches)
Last rain >0.1":	13 (days)

Grab Sample Time:	01:53 (hhmm EST))
Flow Weighted Sample Times:	01:44-02:07 (hhmm EST))
Composite Flow Interval:	180 (cf)
No. of Samples:	12

HIGH DENSITY RESIDENTIAL - LONGBOAT KEY



LONGBOAT KEY - April 5, 1993

A rainfall event of 0.73 inches, resulting from a frontal weather system, was sampled on April 5, 1993. The total event duration was 3 hours 20 minutes, from 23:15 on April 4 until 02:35, April 5. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 1.08, 0.92, and 0.78 inches per hour, respectively. High tide produced backwater at the sampling site at the initial portion of the event, between 22:40, April 4, and 00:55, April 5. During this period of backwater, rainfall amounts totalled 0.13 inches of the 0.73 event total and intensities were light. The bulk of the rainfall with the highest intensity was received after the tide had fallen and the sampler program initiated. Maximum flow rates were 0.86 cfs (0.43 feet in depth) during the event.

Antecedent rainfall for the 72-hour period prior was 0.00 inches. The most recent rainfall event prior to the sampling was 2.62 inches, received between 01:35 and 07:40 on April 1, 4 days prior. The previous analytical data reported for this site was from an event on April 1.

Sampling routines initiated at 01:21, grab samples were collected at 01:31, and flow-weighted composites were secured between 01:22 and 02:08, or over a total period of 47 minutes.

The sampled event produced a total of 1,590 cf of runoff after tidal backwater had receded. Composite samples were collected between 170 and 1,490 cf of the cumulative runoff, or until 94% of the runoff had occurred. Grab samples were collected at 860 cf of total runoff.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: LONGBOAT KEY | SITE ID: 001 | STORM DATE: 04-05-93

Site Characteristics

Drainage Area:	2.9	(acres)
% Impervious:	78	%
Land Use:	High Density Residential	

Storm Precipitation Data Summary

Site Precipitation:	0.73/0.60*	(inches)
Maximum Intensity:		
5 min:	1.08	(inches/hr)
15 min:	0.92	(inches/hr)
30 min:	0.78	(inches/hr)

Storm Flow Data Summary

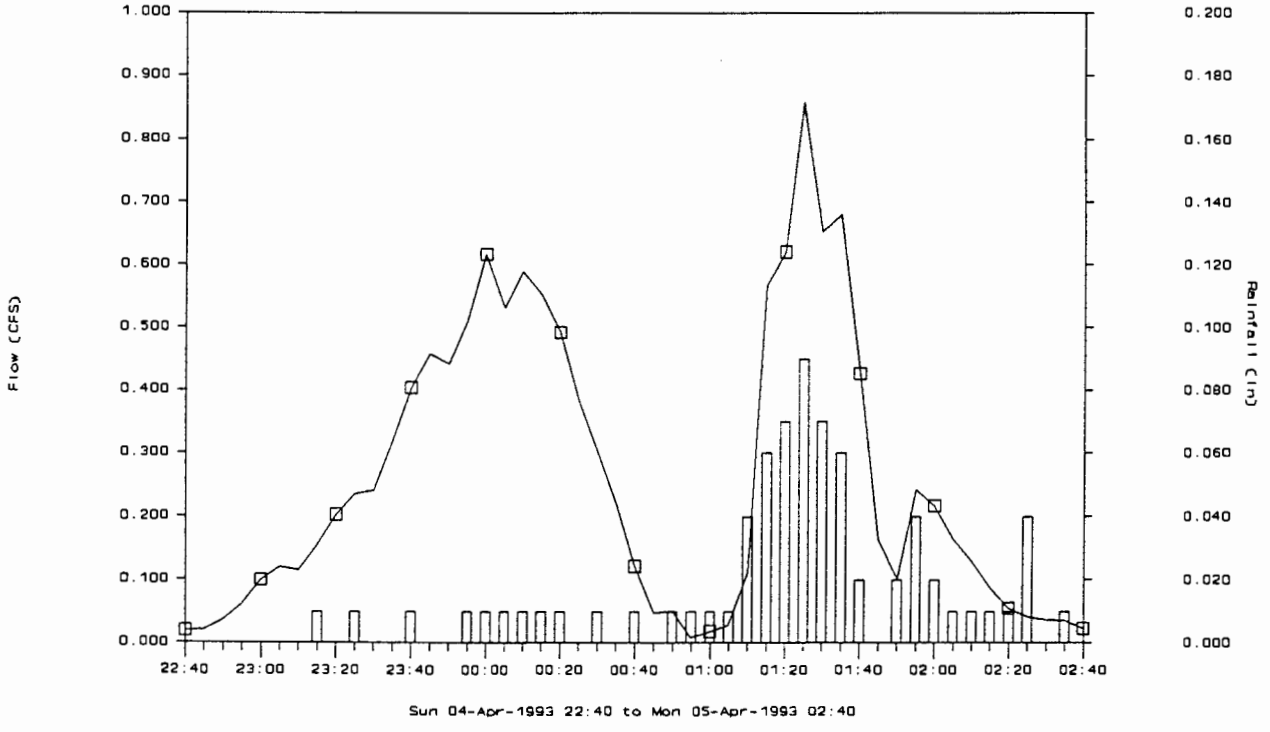
Peak Flow Rate:	0.86	(cfs)
Max Flow Depth:	0.43	(feet)
Total Sampled Vol:	170-1,490	(cf)
Total Runoff Vol:	1,590*	(cf)
Baseflow Runoff Vol:	0	(cf)

*See Text

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	4	(days)
Grab Sample Time:	01:31	(hhmm EST)
Flow Weighted Sample Times:	01:21-02:08	(hhmm EST)
Composite Flow Interval:	180	(cf)
No. of Samples:	7	

HIGH DENSITY RESIDENTIAL - LONGBOAT KEY



INDUSTRIAL - EAST AVE.

The industrial land use site captures the runoff from a basin 9.5 acres in area, with approximately 70 percent DCIA. The industries represented are small, and include automobile repair and fuel oil storage. Most of the buildings were constructed between 1970 and 1985. The sampling site is at approximately 1800 East Ave., in the City of Sarasota and consists of a 30 inch RCP with a slope of 0.43 percent. These dimensions were used in Manning's equation, together with a roughness coefficient of 0.012, for the computation of flow from level measurements.

Discharge from the RCP flows to the south and falls into a small (10 ft diameter) pool. The pool is connected by a small ditch of some 20 ft in length with a large drainageway flowing from east to west. Depending on water levels in the larger drainageway and rainfall received during the event, the site is frequently subjected to backwatering from the larger ditch. In order to characterize the runoff from the industrial basin alone, some sampled events were restricted to only the runoff from the initial stages of the event, before the larger ditch submerged the sampled outfall. When the backwater conditions occurred, this was typically prior to either the completion of the entire runoff event or before the required 3-hour sampling period had elapsed.

EAST AVE. - August 29, 1992 - Bacteria Only

A rainfall event of 0.49 inches was sampled on August 29, 1992, consisting of three small but closely spaced storms of 0.10, 0.18, and 0.21 inches, respectively. The rainfall event duration of the entire 0.49 inches was 4 hours 45 minutes, from 10:50 until 15:35. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 1.56, 0.80, and 0.40 inches per hour, respectively. The maximum flow rate was 1.37 cfs (0.37 feet in depth) during the event. A baseflow of 0.03 cfs was present as the event began.

Antecedent rainfall for the 24-hour period prior to 10:50 was 0.01 inches. The 48-hour and 72-hour antecedent rainfall totals were 0.01 inches, as well. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.97 inches, received between 13:05 and 14:50 on August 14, 15 days prior. No previous analytical data were reported for this site.

Sampling routines were initiated at 11:40, with the grab samples collected at 11:55, after 1,230 cf of runoff. The event produced a total of 4,960 cf of runoff, of which 3,890 cf could be attributed to the event, and 1,070 cf to baseflow. An insufficient sample was collected for the analysis of all parameters from the flow-weighted composite, and so the sample was processed for bacteriological parameters alone.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: EAST AVENUE | SITE ID: 002 | STORM DATE: 08-29-92

Site Characteristics

Drainage Area:	9.5	(acres)
% Impervious:	70	%
Land Use:	Industrial	

Storm Precipitation Data Summary

Site Precipitation:	0.49	(inches)
Maximum Intensity:		
5 min:	1.56	(inches/hr)
15 min:	0.80	(inches/hr)
30 min:	0.40	(inches/hr)

Storm Flow Data Summary

Peak Flow Rate:	1.37	(cfs)
Max Flow Depth:	0.37	(feet)
Total Sampled Vol:	N/A	(cf)
Total Runoff Vol:	4,960	(cf)
Baseflow Runoff Vol:	1,070	(cf)

Antecedent Precipitation

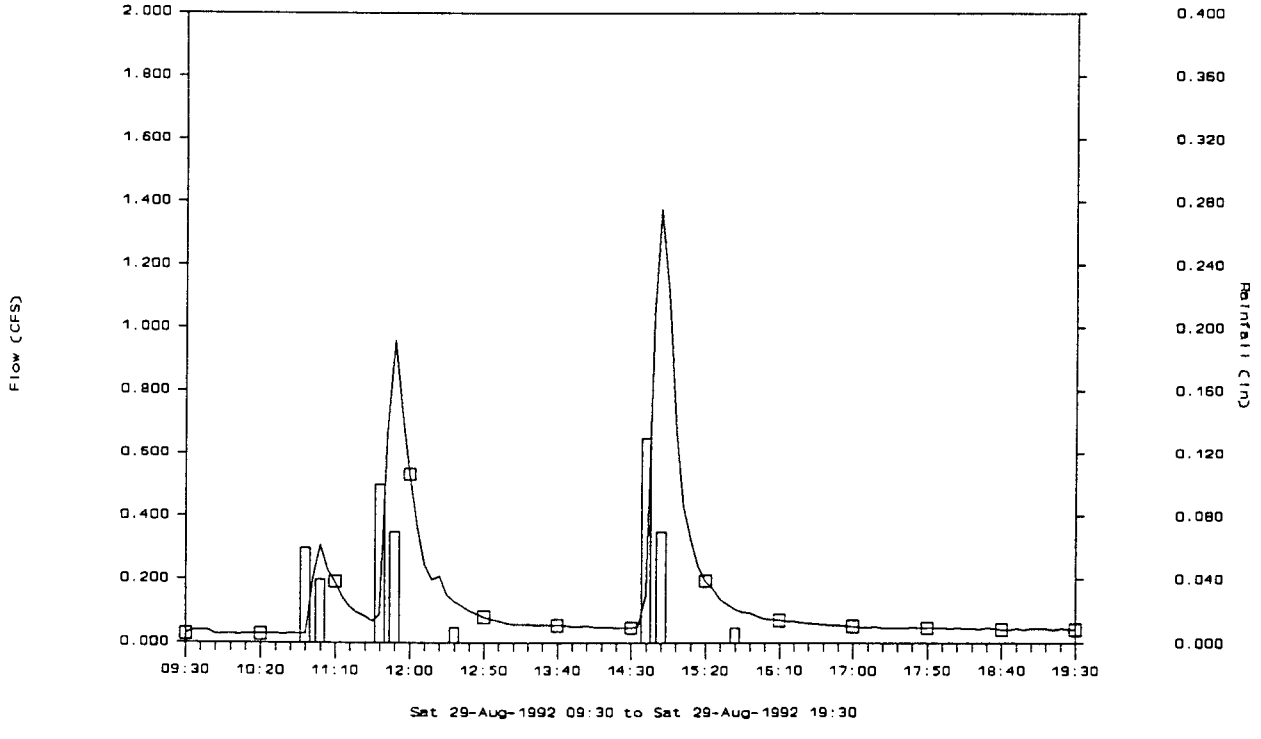
24 Hour:	0.01	(inches)
48 Hour:	0.01	(inches)
72 Hour:	0.01	(inches)
Last rain >0.1":	15	(days)

Grab Sample Time:	11:55	(hhmm EST)
Flow Weighted Sample Times:	N/A*	(hhmm EST)

N/A=Not applicable
*Grab sample processed for bacteria only

Composite Flow Interval:	N/A	(cf)
No. of Samples:	N/A	

INDUSTRIAL - EAST AVE.



EAST AVE. - September 3, 1992 - Bacteria Only

A rainfall event of 0.24 inches was sampled on September 3, 1992. The total rainfall event duration was 50 minutes, from 13:10 to 14:00. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 0.72, 0.56, and 0.40 inches per hour, respectively. Flow data from the event are unreliable due to flowmeter malfunction, and so flow-weighted composite samples were not analyzed. The grab sample for bacteriological analyses, however, was collected at 13:30, processed, and results presented below.

Antecedent rainfall for the 24-hour period prior to 13:10 was 0.02 inches. Antecedent rainfall of the prior 48 hours totalled 0.04 inches and for 72 hours totalled 0.04 inches as well. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.21 inches, received between 14:40 and 15:35 on August 29, 1992, 5 days prior. A baseflow of near 0.32 cfs (0.19 feet in depth) was present as the event began. The previous analytical data reported for this site were bacteriological results from an event on August 29, 1992.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: EAST AVENUE | SITE ID: 002 | STORM DATE: 09-03-92

Site Characteristics

Drainage Area:	9.5	(acres)
% Impervious:	70	%
Land Use:	Industrial	

Storm Precipitation Data Summary

Site Precipitation:	0.24	(inches)
Maximum Intensity:		
5 min:	0.72	(inches/hr)
15 min:	0.56	(inches/hr)
30 min:	0.40	(inches/hr)

Storm Flow Data Summary

Peak Flow Rate:	UA	(cfs)
Max Flow Depth:	UA	(feet)
Total Sampled Vol:	UA	(cf)
Total Runoff Vol:	UA	(cf)
Baseflow Runoff Vol:	N/A	(cf)

Antecedent Precipitation

24 Hour:	0.02	(inches)
48 Hour:	0.04	(inches)
72 Hour:	0.04	(inches)
Last rain >0.1":	5	(days)

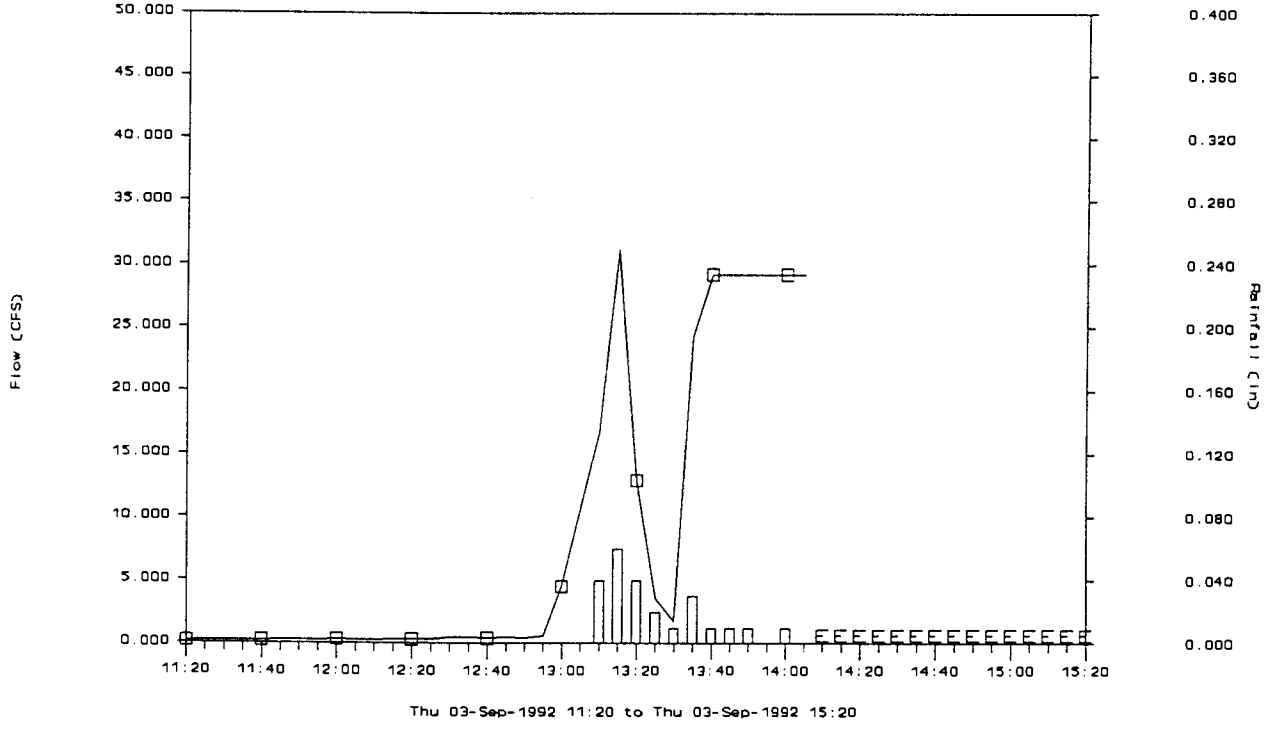
Grab Sample Time:	13:30	(hhmm EST)
Flow Weighted Sample Times:	N/A*	(hhmm EST)

UA=Unavailable
N/A = Not applicable
N/A (cf)
*Grab sample processed for bacteria only

Composite Flow Interval:

No. of Samples: N/A

INDUSTRIAL - EAST AVE.



EAST AVE. - September 25, 1992

A rainfall event of 1.65 inches was sampled on September 25, 1992. The total rainfall event duration was 3 hours 30 minutes, from 18:00 to 21:30. After a period of one and a half hours, 0.73 inches of rain (of the eventual 1.65 inches) had fallen and the sampling site was subject to backwater from the main drainage ditch. Maximum rainfall intensities (during the entire event) for 5-, 15-, and 30-minute periods were 1.68, 1.40, and 1.06 inches per hour, respectively. The maximum flow rates prior to backwatered conditions were 2.56 cfs (0.50 feet in depth) during the event.

Antecedent rainfall for the 24-hour period prior to 18:00 was 0.00 inches. The 48-hour antecedent rainfall was 0.08 inches, as was the 72-hour antecedent rainfall. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.13 inches, received between 17:15 and 17:45 on September 16, 9 days prior. The previous analytical data reported for this site were from an event on September 3, 1992. A baseflow of 0.04 cfs was present as the event began.

Sampling routines initiated at 18:44, grab samples were collected at 18:59, and flow-weighted composites were secured between 18:53 and 20:23, or over a total period of 1 hour 39 minutes. However, due to the amount of rainfall and water levels downstream, the sampled outfall was observed to be submerged by 21:17 and may have been subject to backwatering as early as 19:30. Accordingly, a large proportion of the flow-weighted composite sample was collected when flow calculations were erroneously high due to backwatering, thus providing an undue emphasis on the portion of the storm following the first flush.

Net flows, however, were observed to be downstream at the sampling site, even under the backwater conditions of 1.5 feet at 21:17. Accordingly, the water samples collected can be attributed to runoff from the industrial site alone, although the flow-compositing is recognizably flawed. Therefore, the data for the parameters from the composites are presented as

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: EAST AVENUE | SITE ID: 002 | STORM DATE: 09-25-92

Site Characteristics

Drainage Area:	9.5	(acres)
% Impervious:	70	%
Land Use:	Industrial	

Storm Precipitation Data Summary

Site Precipitation:	1.65/0.73*	(inches)
Maximum Intensity:		
5 min:	1.68	(inches/hr)
15 min:	1.40	(inches/hr)
30 min:	1.06	(inches/hr)

Storm Flow Data Summary

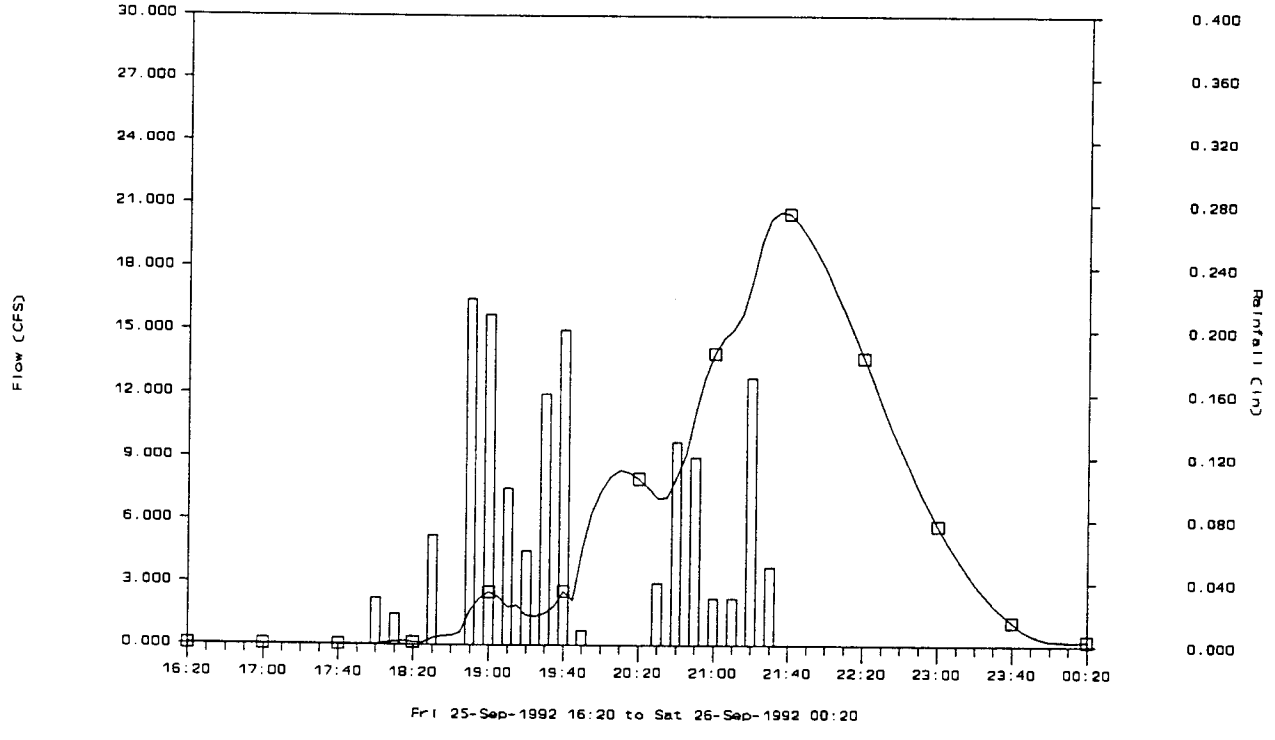
Peak Flow Rate:	2.56*	(cfs)
Max Flow Depth:	0.50	(feet)
Total Sampled Vol:	UA*	(cf)
Total Runoff Vol:	>5,960*	(cf)
Baseflow Runoff Vol:	>260	(cf)

*See Text

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.08	(inches)
72 Hour:	0.08	(inches)
Last rain >0.1":	9	(days)
Grab Sample Time:	18:59	(hhmm EST)
Flow Weighted Sample Times:	18:44-20:23	(hhmm EST)
Composite Flow Interval:	900	(cf)
No. of Samples:	27	

INDUSTRIAL - EAST AVE.



supplemental information, while parameters analyzed from grab samples (bacteria, cyanide, phenols, oil and grease, pH) are considered to be representative of the site.

The sampled event produced a total of 5,960 cf of runoff until 19:30 when backwatering was assumed to occur. The outfall remained at least partially submerged until 00:00, September 26.

EAST AVE. - November 27, 1992

A rainfall event of 0.50 inches, resulting from a frontal weather system, was sampled on November 27, 1992. The total rainfall event duration was 5 hours 10 minutes, from 07:35 to 12:45. An additional 0.05 inches of rainfall was recorded until 21:10 that night, but resulted in no substantive additional runoff. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 0.60, 0.28, and 0.18 inches per hour, respectively. The maximum flow rate was 0.25 cfs (0.17 feet in depth) during the event.

Antecedent rainfall for the 72-hour period prior was 0.00 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.34 inches, received between 21:10 and 23:40 on November 12, 15 days prior. The previous analytical data reported for this site were from an event on September 25.

Sampling routines initiated at 09:28, grab samples were collected at 09:35, and flow-weighted composites were secured between 09:59 and 13:05, or over a total period of 3 hours 37 minutes. The sampled event produced a total of 2,690 cf of runoff from the event. Composite samples were collected between 870 and 2,520 cf of the cumulative runoff, or until 94 percent of the total runoff had occurred. Grab samples were collected at 580 cf of total runoff.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: EAST AVENUE | SITE ID: 002 | STORM DATE: 11-27-92

Site Characteristics

Drainage Area:	9.5	(acres)
% Impervious:	70	%
Land Use:	Industrial	

Storm Precipitation Data Summary

Site Precipitation:	0.50	(inches)
Maximum Intensity:		
5 min:	0.60	(inches/hr)
15 min:	0.28	(inches/hr)
30 min:	0.18	(inches/hr)

Storm Flow Data Summary

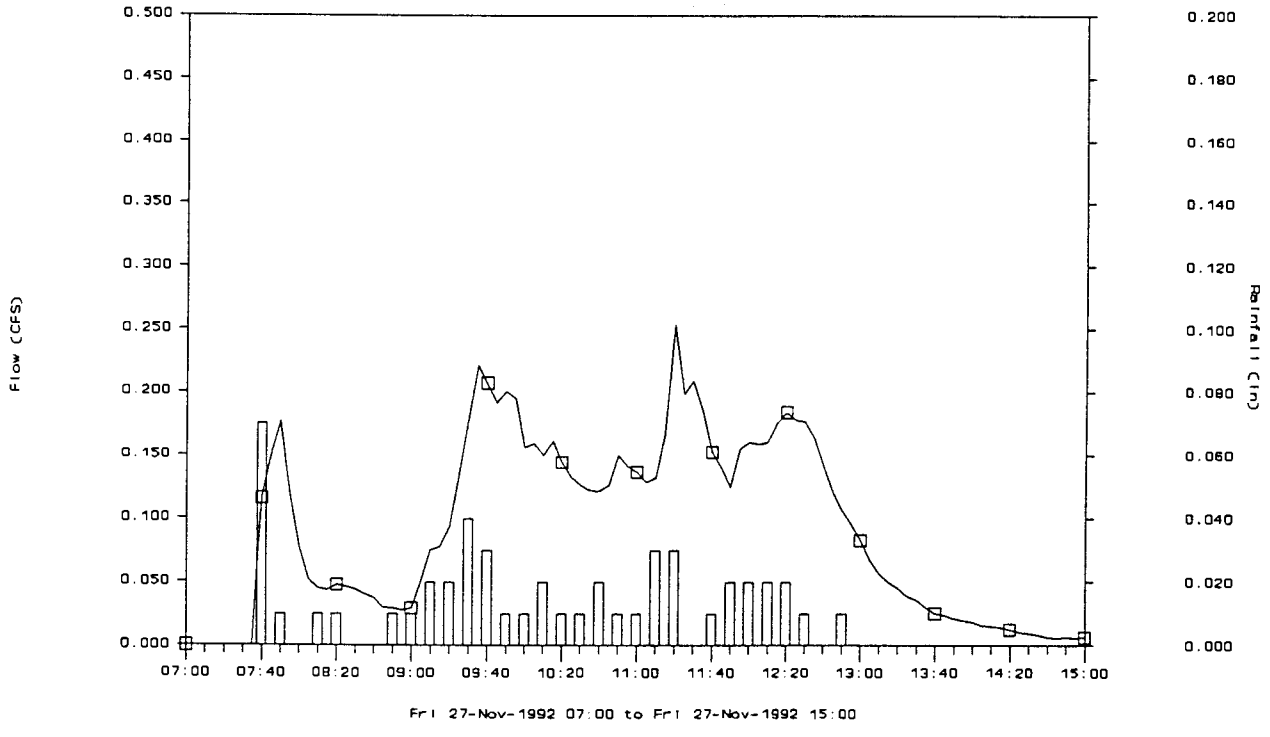
Peak Flow Rate:	0.25	(cfs)
Max Flow Depth:	0.17	(feet)
Total Sampled Vol:	870-2,520	(cf)
Total Runoff Vol:	2,690	(cf)
Baseflow Runoff Vol:	0	(cf)

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	15	(days)

Grab Sample Time:	09:35	(hhmm EST)
Flow Weighted Sample Times:	09:28-13:05	(hhmm EST)
Composite Flow Interval:	800	(cf)
No. of Samples:	3	

INDUSTRIAL - EAST AVE.



EAST AVE. - January 8, 1993

A rainfall event of 1.75 inches, resulting from a frontal weather system, was sampled on January 8, 1993. The total rainfall event duration was 13 hours 10 minutes, from 16:30, January 8, until 05:40, January 9. The bulk of the rainfall (1.63 inches) fell in 5 hours 35 minutes between 16:30 and 22:05, January 8, with intermittent rain continuing throughout the night until early in the morning of January 9. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 1.32, 0.84, and 0.64 inches per hour, respectively. The maximum flow rate was 1.07 cfs (0.33 feet in depth) during the event.

Antecedent rainfall for the 72-hour period prior to 16:30, January 8, was 0.00 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.38 inches, received between 07:30 and 08:20 on December 10, 1992, 29 days prior. The previous analytical data reported for this site were from an event on November 27, 1992.

Due to the amount of rainfall and water levels downstream, the sampled outfall was subject to backwater by approximately 17:40, after only 0.43 inches of the eventual 1.75 inches of rainfall had fallen. Sampling routines, however, initiated at 16:34, were completed by 17:22, before backwater conditions existed. Grab samples were collected at 16:47, and flow-weighted composites were secured between 16:49 and 17:22, or over a total period of 48 minutes. Undoubtedly, had backwater conditions not existed, flow from the industrial basin would have continued. The flow sampled, however, does represent the first flush and the bulk of the runoff from an event produced by 0.43 inches of rainfall. Water quality determined from the analytical samples is representative of runoff from the industrial basin and may even provide an over-estimate of pollutant loads by preferentially sampling the first flush and higher runoff rates.

The sampled event produced a total of 2,830 cf of runoff until 17:40 when backwater conditions were estimated to impact the site. The 2,840 cf for the 0.43 inches of rainfall received for the

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: EAST AVENUE | SITE ID: 002 | STORM DATE: 01-08-93

Site Characteristics

Drainage Area:	9.5	(acres)
% Impervious:	70	%
Land Use:	Industrial	

Storm Precipitation Data Summary

Site Precipitation:	1.75/0.43*	(inches)
Maximum Intensity:		
5 min:	1.32	(inches/hr)
15 min:	0.84	(inches/hr)
30 min:	0.64	(inches/hr)

Storm Flow Data Summary

Peak Flow Rate:	1.07*	(cfs)
Max Flow Depth:	0.33	(feet)
Total Sampled Vol:	140-2,140	(cf)
Total Runoff Vol:	2,830*	(cf)
Baseflow Runoff Vol:	0	(cf)

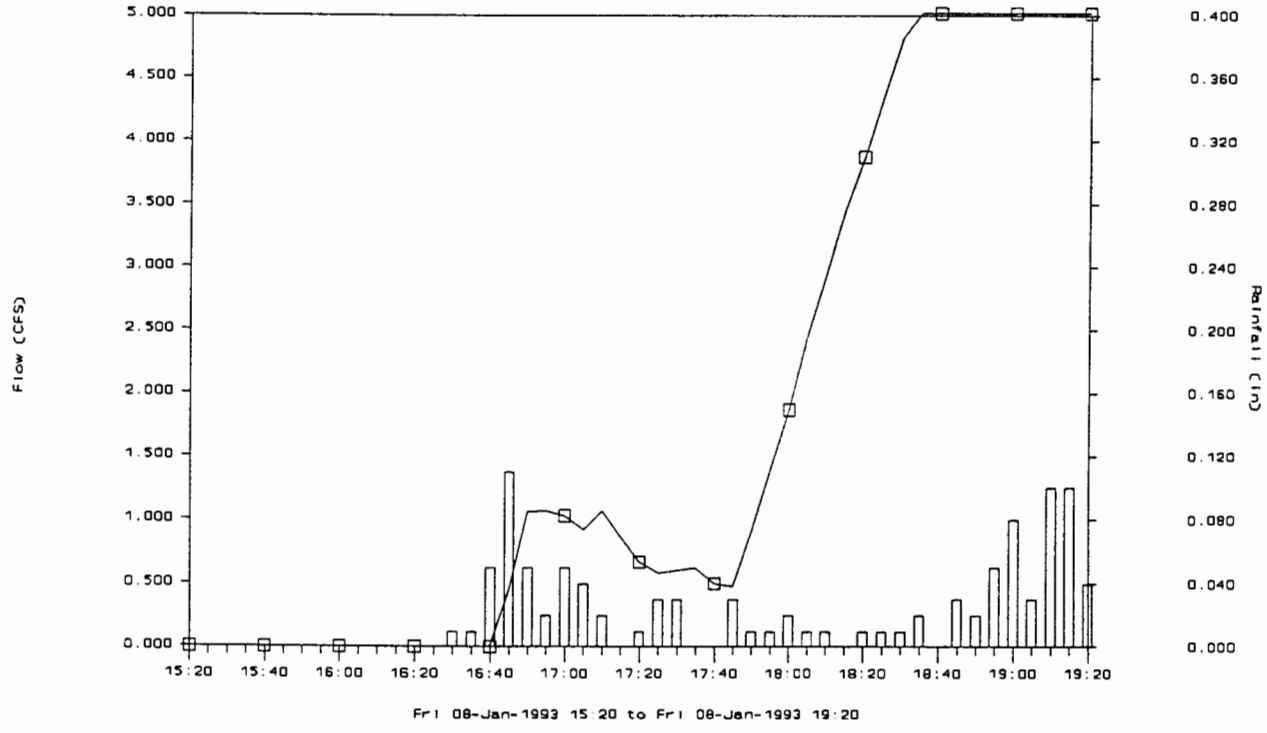
*See Text

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	29	(days)

Grab Sample Time:	16:47	(hhmm EST)
Flow Weighted Sample Times:	16:34-17:22	(hhmm EST)
Composite Flow Interval:	180	(cf)
No. of Samples:	12	

INDUSTRIAL - EAST AVE.



January 8 storm is quite comparable to the 2,640 cf of runoff received for a 0.35-inch rainfall on February 22 (see below), when no backwater occurred.

Composite samples were collected between 140 and 2,140 cf of the cumulative runoff, or for 76 percent of the flow before backwatering occurred. The entire diameter of the 2.5-foot RCP at the sampling site was submerged by backwater until January 10, and the outlet was at least partially submerged until January 14.

EAST AVE. - January 25, 1993

A rainfall event of 1.54 inches, resulting from a frontal weather system, was sampled on January 25, 1993. The total rainfall event duration was 19 hours 25 minutes, from 12:40, January 25, until 08:05, January 26. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 0.72, 0.48, and 0.36 inches per hour, respectively. The maximum flow rate was 1.20 cfs (0.35 feet in depth) during the event.

Antecedent rainfall for the 72-hour period prior to 12:40, January 25, was 0.00 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.22 inches, received between 05:20 and 09:25 on January 16, 9 days prior. The most recent analytical data reported from this site was from an event on January 8, 1993. A baseflow of 0.08 cfs was present as the event began.

Sampling routines initiated at 20:18, grab samples were collected at 20:28, and flow-weighted composites were secured between 20:27 and 21:07 and between 23:00 and 00:24 on January 26, or over a total period of 4 hours 6 minutes. Due to the high baseflow conditions, the sampling routine was rapidly completed and was restarted with additional sample bottles in order to sample at least 3 hours of the event. A delay in restarting the sampler produced a gap of 1 hour 50 minutes during which no flowweighted composites were collected. This gap represented approximately 30 percent of the flow which occurred during the entire compositing period. The two groups of composited samples were combined and analyzed as a single sample.

The sampled event produced a total of 33,300 cf of runoff until the next rain event at 22:05, January 26. Of the 33,300 cf, 23,600 cf could be attributed to the event, and the remainder (9,700 cf) to baseflow. Composite samples were collected between 4,800 and 11,100 cf, or until 33 percent of the cumulative runoff had occurred. Grab samples were collected at 5,240 cf of total runoff. Runoff rates were still at 0.15 cfs when the next event began.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: EAST AVENUE | SITE ID: 002 | STORM DATE: 01-25-93

Site Characteristics

Drainage Area:	9.5	(acres)
% Impervious:	70	%
Land Use:	Industrial	

Storm Precipitation Data Summary

Site Precipitation:	1.54	(inches)
Maximum Intensity:		
5 min:	0.72	(inches/hr)
15 min:	0.48	(inches/hr)
30 min:	0.36	(inches/hr)

Storm Flow Data Summary

Peak Flow Rate:	1.20	(cfs)
Max Flow Depth:	0.35	(feet)
Total Sampled Vol:	4,800-11,100*	(cf)
Total Runoff Vol:	33,300	(cf)
Baseflow Runoff Vol:	9,700	(cf)

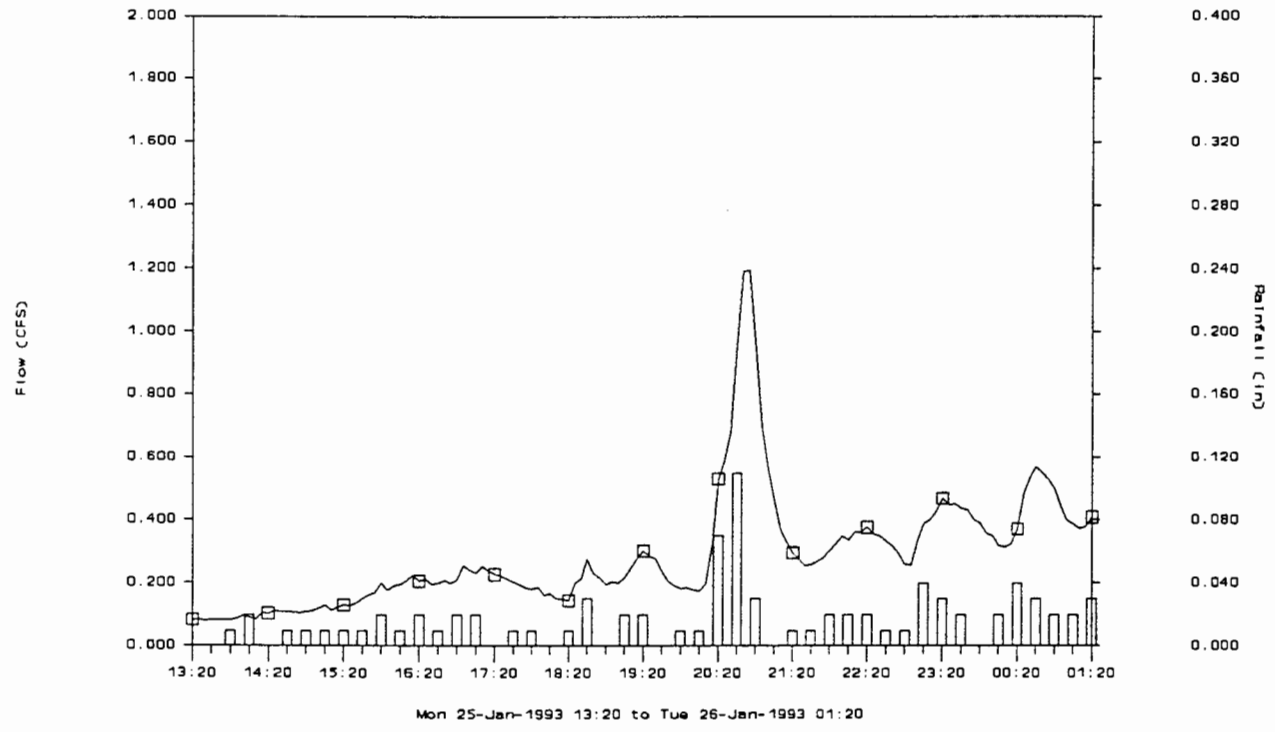
*See Text

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	9	(days)

Grab Sample Time:	20:28	(hhmm EST)
Flow Weighted Sample Times:	20:18-00:24*	(hhmm EST)
Composite Flow Interval:	180	(cf)
No. of Samples:	24	

INDUSTRIAL - EAST AVE.



EAST AVE. - February 22, 1993

A rainfall event of 0.35 inches, resulting from a frontal weather system, was sampled on February 22, 1993. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 1.44, 1.12, and 0.68 inches per hour, respectively. The maximum flow rate was 1.28 cfs (0.36 feet) during the event.

Antecedent rainfall for the 72-hour period prior to 15:40, February 22, was 0.00 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.29 inches, received between 19:05 and 20:10 on February 11, 11 days prior. The previous analytical data reported from this site were from an event on January 25. The baseflow was minimal as the event began, at less than 0.01 cfs.

Sampling routines initiated at 15:43, grab samples were collected at 15:48, and flow-weighted composites were secured between 15:52 and 19:52 on February 22, or over period of 4 hours 9 minutes.

The sampled event produced a total of 2,640 cf of runoff until the next rain event. Of the 2,640 cf, 2,530 cf could be attributed to the event, and the remainder (110 cf) to baseflow. Composite samples were collected between 76 and 2,590 cf of the cumulative runoff, or until 98 percent of the total runoff had occurred. Grab samples were collected at 220 cf of runoff. Runoff rates were still at 0.03 cfs when the next event began at 20:35, February 22.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: EAST AVENUE | SITE ID: 002 | STORM DATE: 02-22-93

Site Characteristics

Drainage Area:	9.5	(acres)
% Impervious:	70	%
Land Use:	Industrial	

Storm Precipitation Data Summary

Site Precipitation:	0.35	(inches)
Maximum Intensity:		
5 min:	1.44	(inches/hr)
15 min:	1.12	(inches/hr)
30 min:	0.68	(inches/hr)

Storm Flow Data Summary

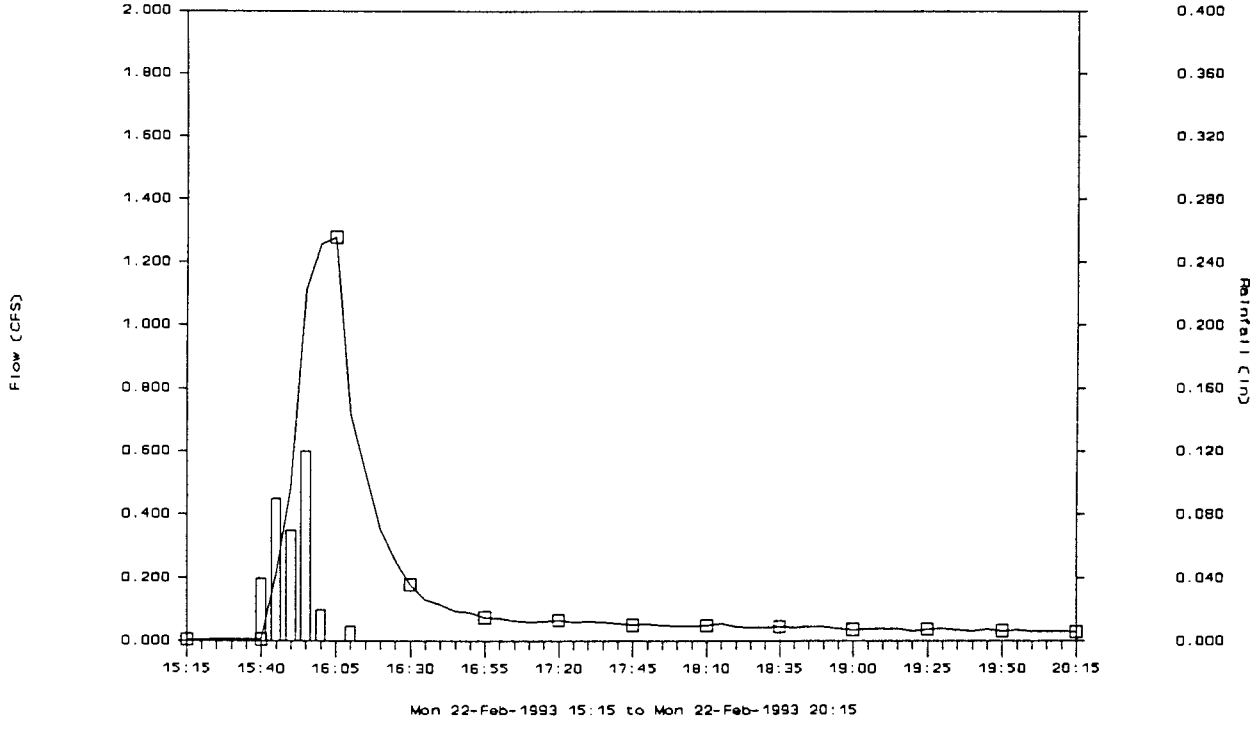
Peak Flow Rate:	1.28	(cfs)
Max Flow Depth:	0.36	(feet)
Total Sampled Vol:	76-2,590	(cf)
Total Runoff Vol:	2,640	(cf)
Baseflow Runoff Vol:	110	(cf)

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	11	(days)

Grab Sample Time:	15:48	(hhmm EST)
Flow Weighted Sample Times:	15:43-19:52	(hhmm EST)
Composite Flow Interval:	180	(cf)
No. of Samples:	15	

INDUSTRIAL - EAST AVE.



EAST AVE. - April 9, 1993

A rainfall event of 0.28 inches, resulting from a frontal weather system, was sampled on April 9, 1993. The total event duration was 1 hours 10 minutes, from 11:15 until 12:25, April 9. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 0.84, 0.52, and 0.36-inches per hour, respectively. The maximum flow rate was 0.87 cfs (0.30 feet in depth) during the event. Baseflow of 0.15 cfs (0.13 feet) was present as the event began.

Antecedent rainfall for the 72-hour period prior to sampling was 0.00 inches. The most recent rainfall event prior to the sampling was 1.11 inches, received between 23:25, April 4, and 02:45, April 5, 4 days prior. The previous analytical data reported for this site was from an event on February 22, 1993.

Sampling routines initiated at 11:50, grab samples were collected at 11:55, and flow-weighted composites were secured between 12:03 and 13:12, or over a total period of 1 hours 9 minutes.

The sampled event produced a total of 2,690 cf of runoff by the time flow had returned to pre-event levels. Of the total 2,690 cf, 1,500 cf could be attributed to the event and 1,190 cf to baseflow. Composite samples were collected between 610 and 2,690 cf of the cumulative runoff, or until flow had returned to pre-event levels. Grab samples were collected at 720 cf of total runoff.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: EAST AVENUE | SITE ID: 002 | STORM DATE: 04-09-93

Site Characteristics

Drainage Area:	9.5	(acres)
% Impervious:	70	%
Land Use:	Industrial	

Storm Precipitation Data Summary

Site Precipitation:	0.28	(inches)
Maximum Intensity:		
5 min:	0.84	(inches/hr)
15 min:	0.52	(inches/hr)
30 min:	0.36	(inches/hr)

Storm Flow Data Summary

Peak Flow Rate:	0.87	(cfs)
Max Flow Depth:	0.30	(feet)
Total Sampled Vol:	2,690	(cf)
Total Runoff Vol:	2,690	(cf)
Baseflow Runoff Vol:	1,190	(cf)

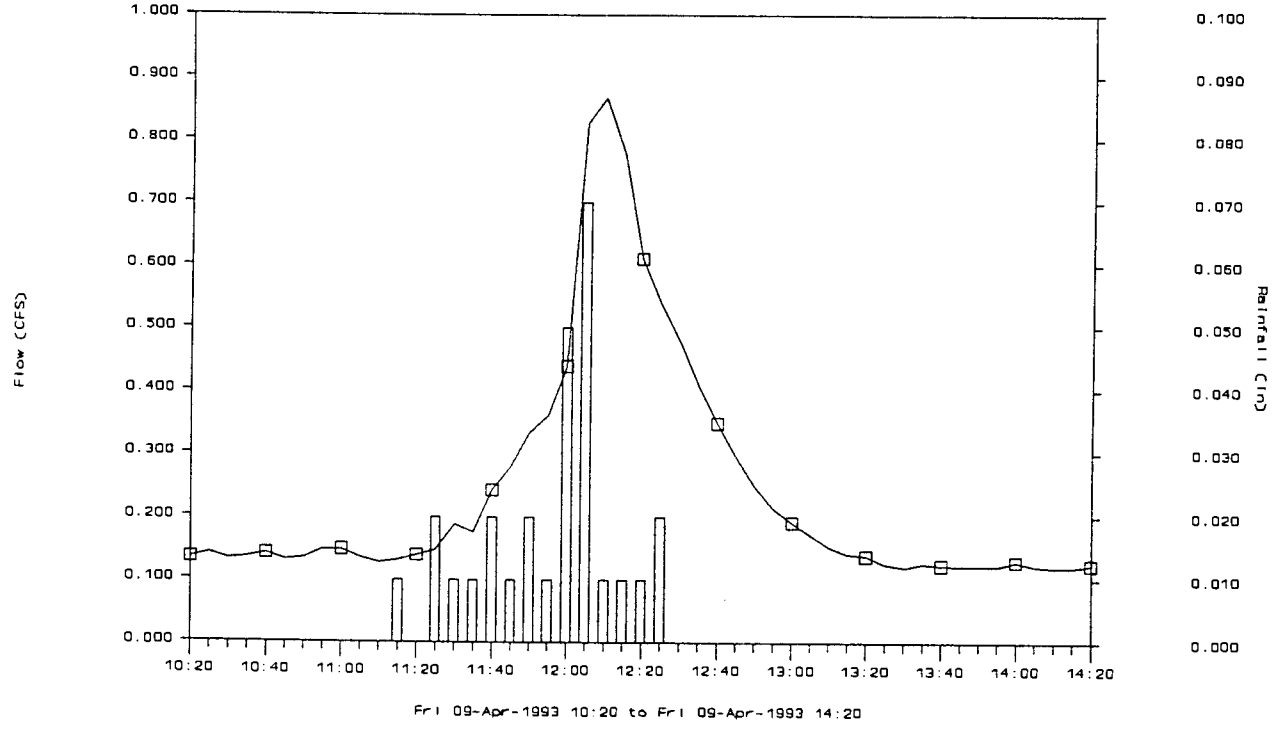
Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	4	(days)

Grab Sample Time:	11:55	(hhmm EST)
Flow Weighted Sample Times:	11:50-13:12	(hhmm EST)

Composite Flow Interval:	500	(cf)
No. of Samples:	4	

INDUSTRIAL - EAST AVE.



LOW DENSITY RESIDENTIAL - RICHARDSON RD.

The low density residential land use site consists of a basin 11.5 acres in area, with approximately 20 percent DCIA. The sampling installation is located at 7401 Richardson Rd., in Sarasota County. The residential units consist of single family homes on 1- to 5- acre lots, frequently with stables or barns on the property, and were constructed during the early 1980's. Horses, cows, and goats are kept on some properties. Drainage of the area is accomplished primarily through ditching and roadside swales. The low impervious area and depression storage available within the basin produce very long, attenuated hydrographs. Frequently, if antecedent conditions have been dry, rainfall amounts greater than 0.1 inches produce no runoff.

At the sampling site, a primary device (2-inch 30° WSC trapezoidal flume) was installed to obtain accurate flow measurements in a roadside swale. Discharges were computed from level measurements at the throat of the flume from data supplied by Grant (1989).

RICHARDSON RD. - October 2, 1992

A rainfall event of 1.57 inches, resulting from a frontal weather system, was sampled on October 2, 1992. The total rainfall event duration was 25 hours 50 minutes, from 04:00 until 05:50, October 3. The initial 0.10 inches of rainfall was light and intermittent, while the bulk of the event began at 10:25. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 0.96, 0.52, and 0.34 inches per hour, respectively. The maximum flow rate was 0.30 cfs (0.29 feet in depth) during the event.

Antecedent rainfall for the 24-hour period prior to 04:00 was 0.03 inches. Rainfall totals for the 48- and 72-hour prior periods were also 0.03 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.36 inches, received between 17:10 and 18:35 on September 26, 6 days prior. No previous analytical data had been reported for this site. Baseflow was less than 0.01 cfs before the event.

Sampling routines initiated at 13:47, grab samples were collected at 14:02, and flow-weighted composites were secured between 13:55 and 18:41, or over a total period of 4 hours 54 minutes.

The sampled event produced a total of 19,000 cf of runoff until the next rain event at 00:45 on October 4. Of the 19,000 cf, 18,300 cf could be attributed to the event, and the remainder (670 cf) to baseflow. Composite samples were collected between 370 and 4,080 cf, or until 21 percent of the cumulative runoff had occurred. Grab samples were collected at 390 cf of runoff. Runoff rates were still at 0.07 cfs when the next event began.

Due to laboratory error, the flow-weighted sample from this event was not analyzed for pesticides. The remainder of the analyses were processed normally.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: RICHARDSON RD. SITE ID: 003 STORM DATE: 10-02-92

Site Characteristics

Drainage Area:	11.5	(acres)
% Impervious:	20	%
Land Use:	Low Density Residential	

Storm Precipitation Data Summary

Site Precipitation:	1.57	(inches)
Maximum Intensity:		
5 min:	0.96	(inches/hr)
15 min:	0.52	(inches/hr)
30 min:	0.34	(inches/hr)

Storm Flow Data Summary

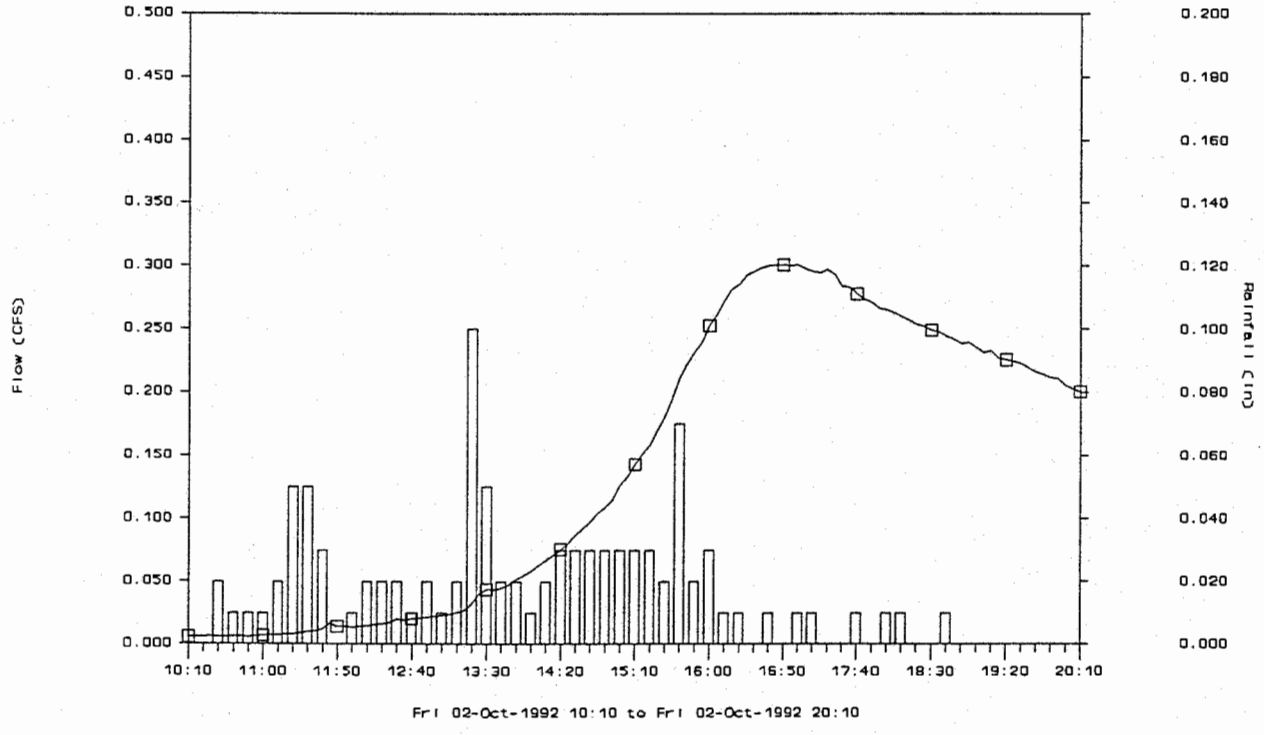
Peak Flow Rate:	0.30	(cfs)
Max Flow Depth:	0.29	(feet)
Total Sampled Vol:	370-4,080	(cf)
Total Runoff Vol:	19,000	(cf)
Baseflow Runoff Vol:	670	(cf)

Antecedent Precipitation

24 Hour:	0.03	(inches)
48 Hour:	0.03	(inches)
72 Hour:	0.03	(inches)
Last rain >0.1":	6	(days)

Grab Sample Time:	14:02	(hhmm EST)
Flow Weighted Sample Times:	13:47-18:41	(hhmm EST)
Composite Flow Interval:	340	(cf)
No. of Samples:	11	

LOW DENSITY RESIDENTIAL - RICHARDSON RD.



RICHARDSON RD. - January 26, 1993

A rainfall event of 2.01 inches, resulting from a frontal weather system, was sampled on January 26, 1993. The total rainfall event duration was 32 hours 20 minutes, from 13:20, January 25, until 21:20 on January 26. Runoff only began at 18:30 on January 25, after 0.47 inches of rain was received, with the more intense rainfall falling between 00:20 and 05:45 on January 26. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 0.72, 0.52, and 0.44 inches per hour, respectively. The maximum flow rate was 1.31 cfs (0.54 feet in depth) during the event.

Antecedent rainfall for the 24-hour period prior to 13:20, January 25, was 0.02 inches, with no additional rainfall for the 48-hour and 72-hour prior periods. The most recent rainfall event (>0.1 inches) prior to the sampling was 1.27 inches, received between 17:25 and 23:15 on January 15, 11 days prior. The previous analytical data reported from this site were from an event on October 2, 1992.

Sampling routines initiated at 01:40, grab samples were collected at 02:40, and flow-weighted composites were secured between 01:55 and 04:37 on January 26, or over a total period of 2 hours 57 minutes.

The sampled event produced a total of 17,200 cf of runoff. Composite samples were collected between 1,080 and 2,820 cf of the cumulative runoff, or until 16 percent of the cumulative runoff had occurred. Grab samples were collected after 1,620 cf of runoff.

The rainfall from the sampled event exceeded the January criteria (1.95 inches) by 0.06 inches. The hydraulic characteristics of the site, however, require substantial amounts of rain in order to generate any runoff; for this site, the sample collected was considered representative.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: RICHARDSON RD. SITE ID: 003 STORM DATE: 01-26-93

Site Characteristics

Drainage Area:	11.5	(acres)
% Impervious:	20	%
Land Use:	Low Density Residential	

Storm Precipitation Data Summary

Site Precipitation:	2.01	(inches)
Maximum Intensity:		
5 min:	0.72	(inches/hr)
15 min:	0.52	(inches/hr)
30 min:	0.44	(inches/hr)

Storm Flow Data Summary

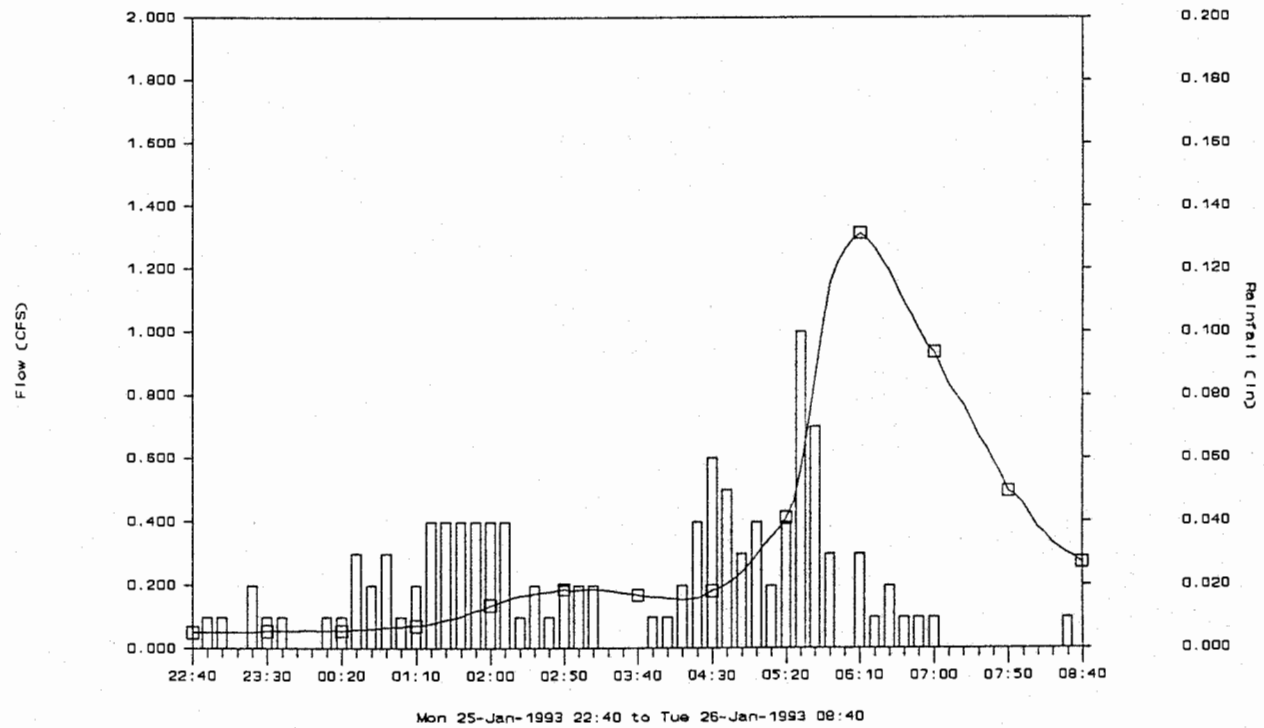
Peak Flow Rate:	1.31	(cfs)
Max Flow Depth:	0.54	(feet)
Total Sampled Vol:	1,080-2,820	(cf)
Total Runoff Vol:	17,200	(cf)
Baseflow Runoff Vol:	0	(cf)

Antecedent Precipitation

24 Hour:	0.02	(inches)
48 Hour:	0.02	(inches)
72 Hour:	0.02	(inches)
Last rain >0.1":	11	(days)

Grab Sample Time:	02:40	(hhmm EST)
Flow Weighted Sample Times:	01:40-04:37	(hhmm EST)
Composite Flow Interval:	140	(cf)
No. of Samples:	12	

LOW DENSITY RESIDENTIAL - RICHARDSON RD.



RICHARDSON RD. - February 26, 1993

A rainfall event of 1.16 inches, resulting from a frontal weather system, was sampled on February 26, 1993. The total rainfall event duration was 3 hours 30 minutes, or from 08:55 until 12:25. Runoff did not begin at the site until 10:45. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 0.84, 0.68, and 0.56 inches per hour, respectively. The maximum flow rate was 0.07 cfs (0.15 feet in depth) during the event.

Antecedent rainfall for the 24- and 48-hour periods prior to 08:55 was 0.00 inches. Rainfall in the 72-hour period prior was 0.03 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.19 inches, received between 16:15 and 16:50 on February 22, 4 days prior. The previous analytical data reported from this site were from an event on January 26.

Sampling routines initiated at 12:12, grab samples were collected at 13:12, and flow-weighted composites were secured between 12:25 and 15:52, or over a total period of 3 hours 40 minutes. A grab sample collected at 10:54, before peak flow had developed was also processed.

The sampled event produced a total of 2,320 cf of runoff. Composite samples were collected between 150 and 960 cf of the cumulative runoff, or until 41 percent of the total event runoff had occurred. The grab sample was collected after 380 cf of cumulative runoff.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: RICHARDSON RD. SITE ID: 003 STORM DATE: 02-26-93

Site Characteristics

Drainage Area:	11.5	(acres)
% Impervious:	20	%
Land Use:	Low Density Residential	

Storm Precipitation Data Summary

Site Precipitation:	1.16	(inches)
Maximum Intensity:		
5 min:	0.84	(inches/hr)
15 min:	0.68	(inches/hr)
30 min:	0.56	(inches/hr)

Storm Flow Data Summary

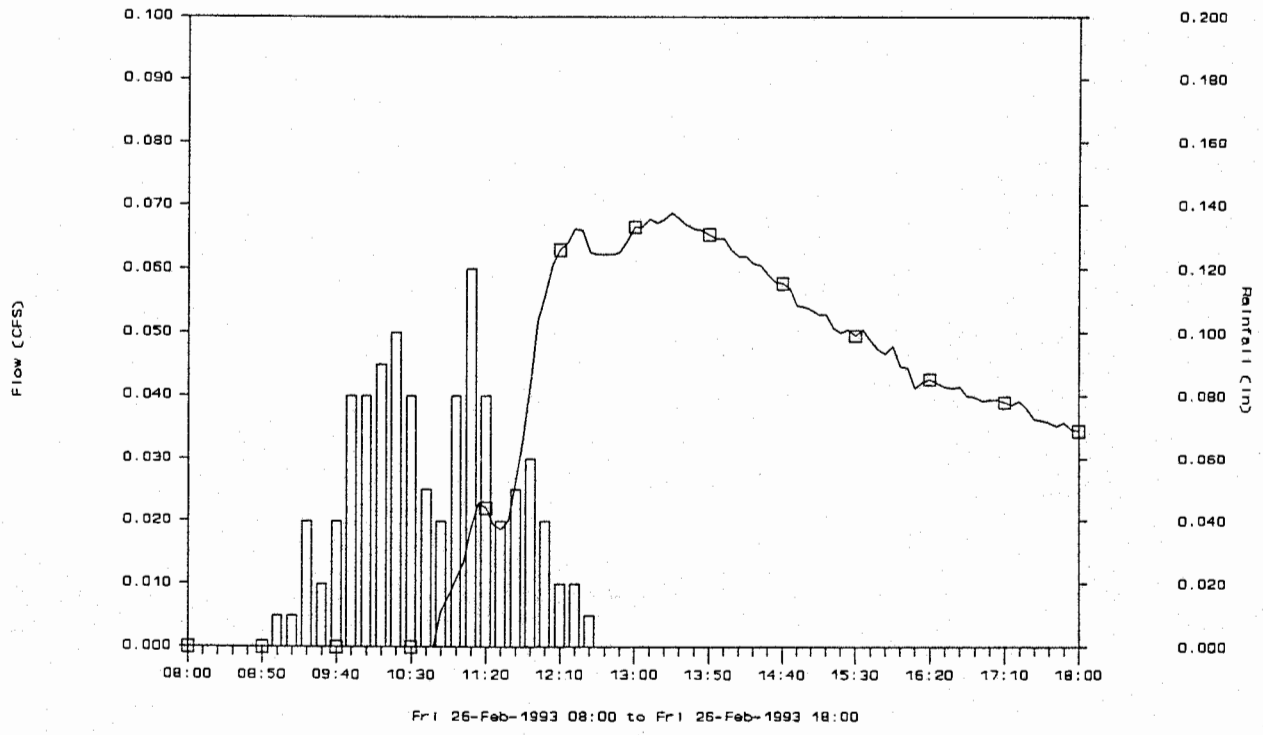
Peak Flow Rate:	0.07	(cfs)
Max Flow Depth:	0.15	(feet)
Total Sampled Vol:	150-960	(cf)
Total Runoff Vol:	2,320	(cf)
Baseflow Runoff Vol:	0	(cf)

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.03	(inches)
Last rain >0.1":	4	(days)

Grab Sample Time:	10:54, 13:12	(hhmm EST)
Flow Weighted Sample Times:	12:12-15:52	(hhmm EST)
Composite Flow Interval:	100	(cf)
No. of Samples:	8	

LOW DENSITY RESIDENTIAL - RICHARDSON RD.



RICHARDSON RD. - April 1, 1993

A rainfall event of 1.61 inches, resulting from a frontal weather system, was sampled on April 1, 1993. The total event duration was 5 hours 35 minutes, from 02:00 until 07:35. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 1.92, 1.24, and 0.92 inches per hour, respectively. Maximum flow rates were slightly greater than 9.9 cfs (1.08 feet in depth) during the event.

Antecedent rainfall for the 72-hour period prior to sampling was 0.00 inches. The most recent rainfall event prior to the sampling was 0.30 inches, received between 10:45 and 16:20 on March 17, 15 days prior. The previous analytical data reported for this site was from an event on February 26.

Sampling routines initiated at 02:23, grab samples were collected at 03:23, and flow-weighted composites were secured between 02:48 and 04:09 and between 04:39 and 06:26, or over a total period of 4 hours and 3 minutes.

Due to the high flow conditions, the sampling routine was rapidly completed and was restarted with additional sample bottles in order to sample at least 3 hours of the event. A delay in restarting the sampler produced a gap of 21 minutes out of the total 4 hour and 3 minute sampling time during which no flow weighted composites were collected. This gap represented approximately 11% of the flow which occurred during the entire compositing period. The two groups of composited samples were combined and analyzed as a single sample.

The high flow rates additionally produced water depths slightly in excess of the capacity of the flume (1.08 feet maximum depth recorded, compared to a 1.00 foot flume depth. Water depths were greater than 1.00 feet from 03:25 to 05:20. Ditch cross section at the flume is roughly rectangular and the water levels exceeding the flume by less than 1 inch was judged not to have impacted the flow weighting routine substantially.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: RICHARDSON RD. SITE ID: 003 STORM DATE: 04-01-93

Site Characteristics

Drainage Area:	11.5	(acres)
% Impervious:	20	%
Land Use:	Low Density Residential	

Storm Precipitation Data Summary

Site Precipitation:	1.61	(inches)
Maximum Intensity:		
5 min:	1.92	(inches/hr)
15 min:	1.24	(inches/hr)
30 min:	0.92	(inches/hr)

Storm Flow Data Summary

Peak Flow Rate:	>9.9	(cfs)
Max Flow Depth:	1.08	(feet)
Total Sampled Vol:	1->103,010*	(cf)
Total Runoff Vol:	>142,040*	(cf)
Baseflow Runoff Vol:	0	(cf)

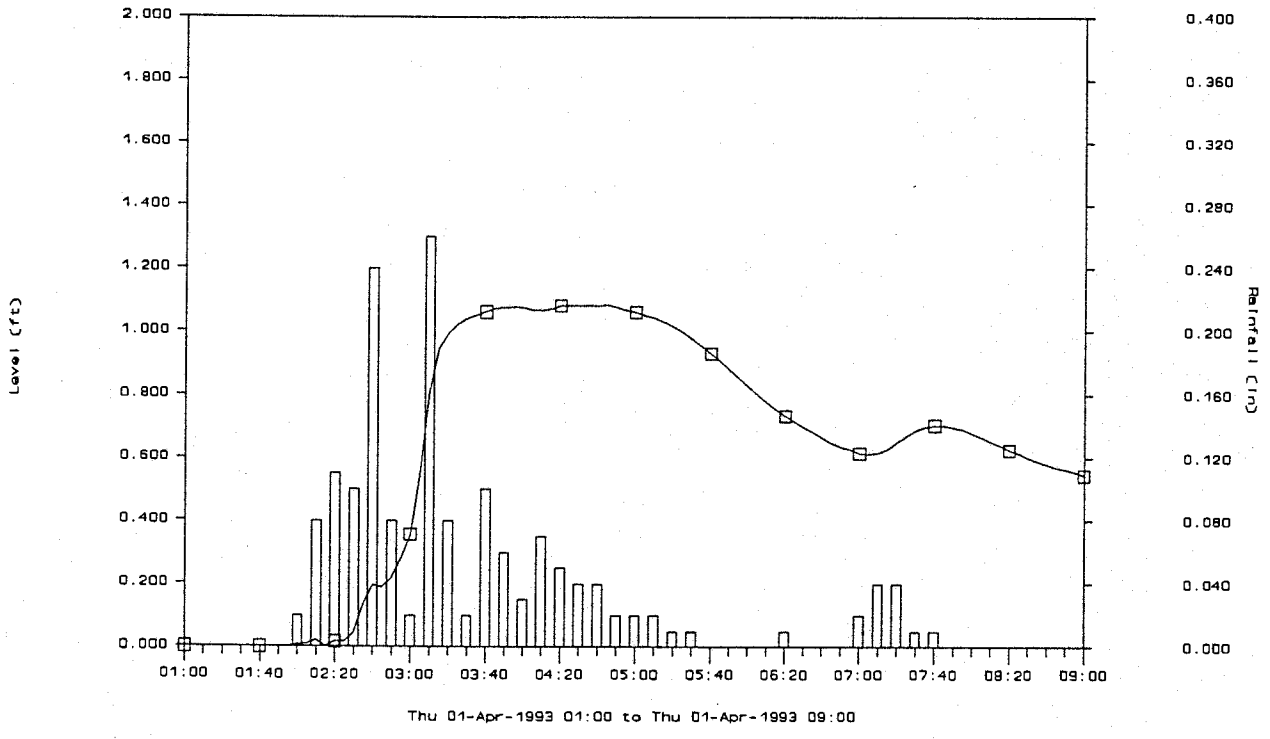
*See Text

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	15	(days)

Grab Sample Time:	03:23	(hhmm EST)
Flow Weighted Sample Times:	02:23-06:26*	(hhmm EST)
Composite Flow Interval:	4000	(cf)
No. of Samples:	24	

LOW DENSITY RESIDENTIAL - RICHARDSON RD.



The sampled event produced a total of more than 142,040 cf of runoff up until the next rain event on April 5 at 23:40. Composite samples were collected between 1 and 103,010 cf of the cumulative runoff, or until 72% of the runoff had occurred. Grab samples were collected at 10,670 cf of total runoff. Runoff rates were slightly less than 0.01 cfs when the next event began.

MEDIUM DENSITY RESIDENTIAL - BELL MEADE DR.

One of the two medium density residential land uses sampled consists of a basin 17 acres in area, approximately 35 percent DCIA, and located at 5057 Bell Meade Dr., in Sarasota County. The residences consist of single family homes at densities near 5.5 units per acre and were constructed between 1959 and 1980. At the sampling site, the drainage from the basin consists of a 36 inch CMP with a slope of 0.70 percent. The above dimensions, together with a roughness coefficient of 0.024, were used in Manning's equation for the computation of flow from level measurements.

Runoff from the sampling site discharges into a major drainageway for Sarasota County. Except under the most extreme rainfall, the sampling site does not experience backwater conditions. No storms with backwater conditions were sampled. The pervious area and high groundwater tables in this basin provide for an extended recession limb of the storm event hydrograph. Accordingly, events were considered to be complete for the purpose of calculating runoff totals once either successive flow measurements differed by less than 2 percent or when three successive level measurements each differed by less than 0.008 feet (0.1 inch).

BELL MEADE DR. - August 22, 1992

A rainfall event of 0.92 inches, resulting from a frontal weather system, was sampled on August 22, 1992. The total rainfall event duration was 3 hours 25 minutes, from 16:15 until 19:40, with the bulk of the rainfall (0.87 inches) occurring between 16:15 and 17:20. From 17:20 until 19:40, only intermittent rain was received. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 2.64, 2.12, and 1.36 inches per hour, respectively. The maximum flow rate was 11.5 cfs (1.28 feet in depth) during the event.

Antecedent rainfall for the 72-hour period prior to 16:15 was 0.00 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.71 inches, received between 14:05 and 15:45 on August 11, 11 days prior. No previous analytical data had been reported for this site. Baseflow of less than 0.02 cfs was present as the event began.

Sampling routines initiated at 16:18, grab samples were collected at 16:33, and flow-weighted composites were secured between 16:27 and 17:39, or over a total period of 1 hour 21 minutes. Some parameters in the grab and flow weighted composite were replicated for analysis as allowed by sample volume.

The sampled event produced a total of 21,500 cf of runoff until baseflow stabilized at 0.13 cfs, at 19:00, approximately one and a half hours after the bulk of the rainfall ended. Of the 21,500 cf, 21,340 cf could be attributed to the event, and the remainder (160 cf) to baseflow. Composite samples were collected between 190 and 20,160 cf of the cumulative runoff, or until 94 percent of the total runoff had occurred. The grab was collected after 910 cf of runoff.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: BELL MEADE DRIVE SITE ID: 004 STORM DATE: 08-22-92

Site Characteristics

Drainage Area:	17.0	(acres)
% Impervious:	35	%
Land Use:	Medium Density Residential	

Storm Precipitation Data Summary

Site Precipitation:	0.92	(inches)
Maximum Intensity:		
5 min:	2.64	(inches/hr)
15 min:	2.12	(inches/hr)
30 min:	1.36	(inches/hr)

Storm Flow Data Summary

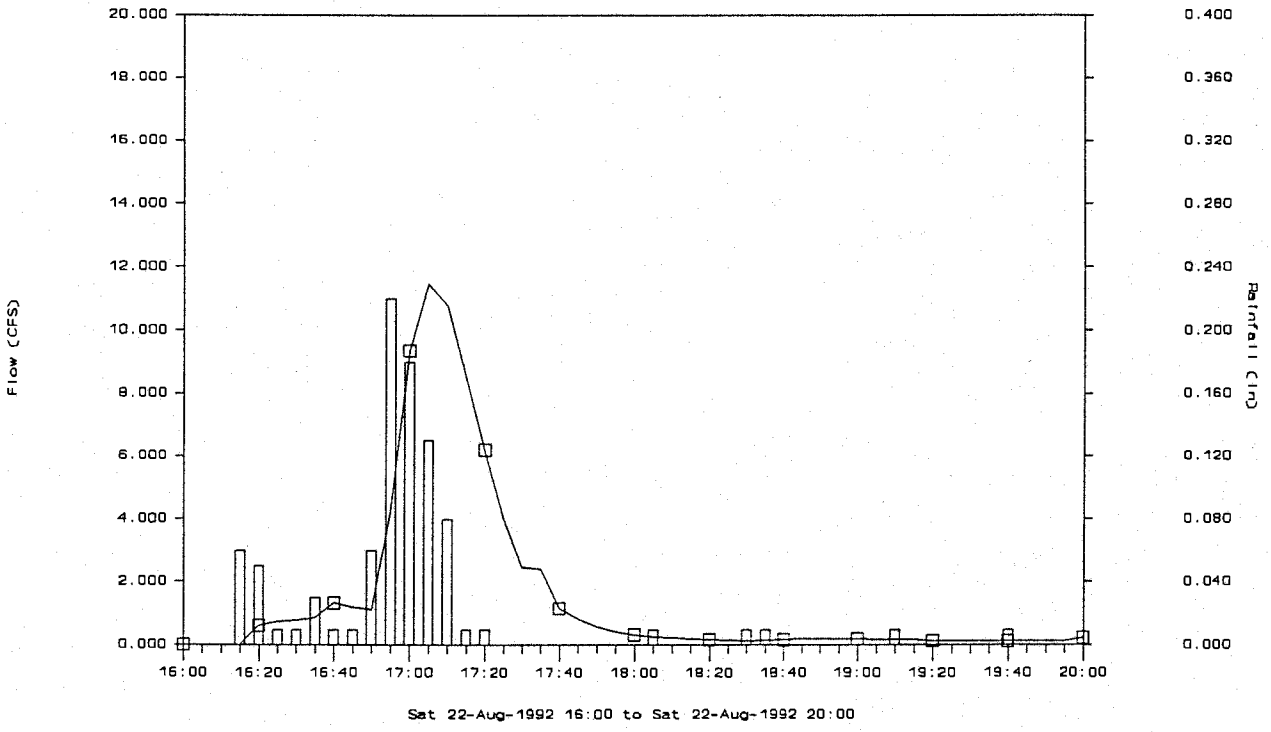
Peak Flow Rate:	11.5	(cfs)
Max Flow Depth:	1.28	(feet)
Total Sampled Vol:	190-20,160	(cf)
Total Runoff Vol:	21,500	(cf)
Baseflow Runoff Vol:	160	(cf)

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	11	(days)

Grab Sample Time:	16:33	(hhmm EST)
Flow Weighted Sample Times:	16:18-17:39	(hhmm EST)
Composite Flow Interval:	375	(cf)
No. of Samples:	54	

MEDIUM DENSITY RESIDENTIAL - BELL MEADE DR.



BELL MEADE DR. - September 25, 1992

A rainfall event of 0.60 inches was sampled on September 25, 1992. The total rainfall event duration was 2 hours 45 minutes, from 18:35 until 21:20. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 1.56, 1.24, and 0.72 inches per hour, respectively. The maximum flow rate was 2.86 cfs (0.62 feet in depth) during the event.

Antecedent rainfall for the 24 hour period prior to 18:35 was 0.00 inches, while the 48- and 72-hour antecedent periods totalled 0.07 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.27 inches, received between 12:50 and 13:50 on September 22, 3 days (76 hours) prior. The previous analytical data reported from this site were from an event on August 22. A baseflow of 0.08 cfs was present as the event began.

Sampling routines initiated at 20:24, grab samples were collected at 20:40, and flow-weighted composites were secured between 20:33 and 22:09, or over a total period of 1 hour 45 minutes.

The sampled event produced a total of 7,670 cf of runoff until levels stabilized. Of the 7,670 cf, 6,690 cf could be attributed to the event, and the remainder (970 cf) to baseflow. Composite samples were collected between 1,660 and 7,540 cf of the cumulative runoff, or until 98 percent of the event total had occurred. The grab was collected after 3,770 cf of runoff. Baseflow rates had stabilized at 0.21 cfs by the end of the event.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: BELL MEADE DRIVE | SITE ID: 004 | STORM DATE: 09-25-92

Site Characteristics

Drainage Area:	17.0	(acres)
% Impervious:	35	%
Land Use:	Medium Density Residential	

Storm Precipitation Data Summary

Site Precipitation:	0.60	(inches)
Maximum Intensity:		
5 min:	1.56	(inches/hr)
15 min:	1.24	(inches/hr)
30 min:	0.72	(inches/hr)

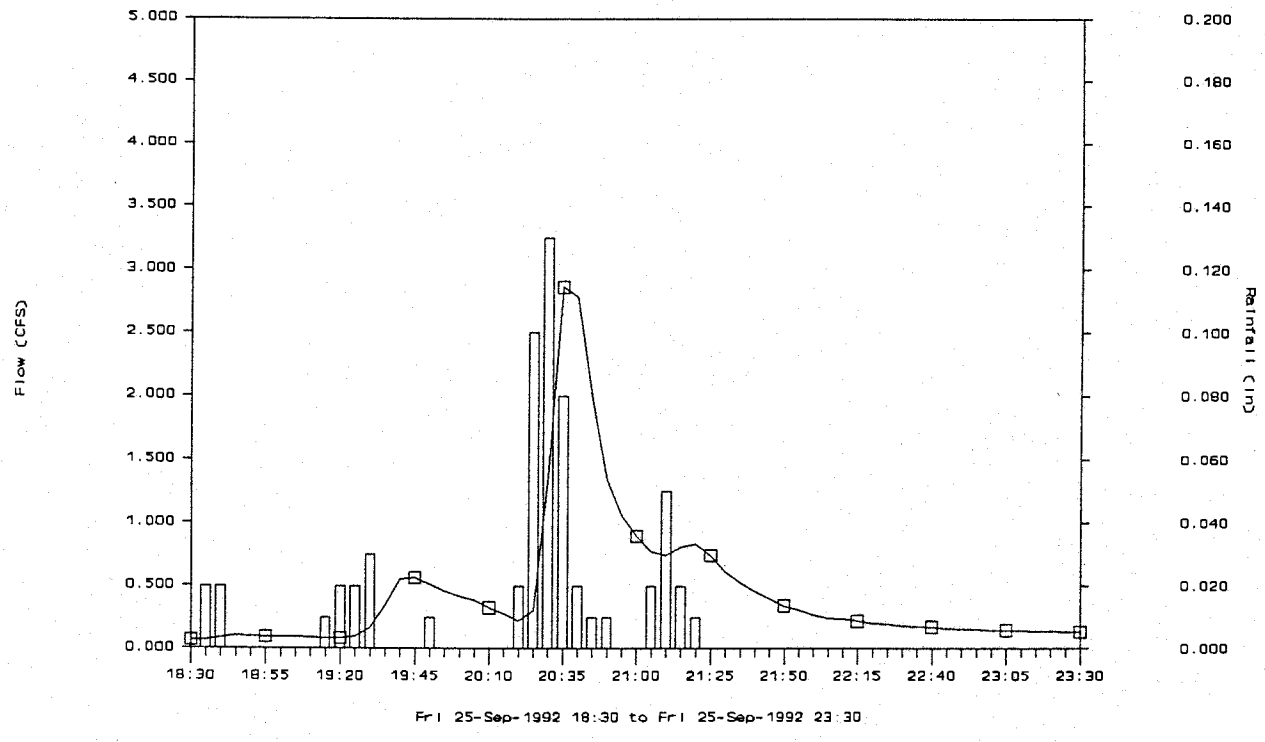
Storm Flow Data Summary

Peak Flow Rate:	2.86	(cfs)
Max Flow Depth:	0.62	(feet)
Total Sampled Vol:	1,660-7,540	(cf)
Total Runoff Vol:	7,670	(cf)
Baseflow Runoff Vol:	970	(cf)

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.07	(inches)
72 Hour:	0.07	(inches)
Last rain >0.1":	3	(days)
	76	(hours)
Grab Sample Time:	20:40	(hhmm EST)
Flow Weighted Sample Times:	20:24-22:09	(hhmm EST)
Composite Flow Interval:	900	(cf)
No. of Samples:	7	

MEDIUM DENSITY RESIDENTIAL - BELL MEADE DR.



BELL MEADE DR. - November 27, 1992

A rainfall event of 0.35 inches, resulting from a frontal weather system, was sampled on November 27, 1992. The total rainfall event duration was 4 hours 30 minutes, from 08:00 until 12:30. Maximum rainfall intensities for 5-, 15, and 30-minute periods were 0.48, 0.32, and 0.18 inches per hour, respectively. The maximum flow rate was 0.62 cfs (0.30 feet in depth) during the event.

Antecedent rainfall for the 72-hour period prior to 08:00 was 0.00 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.29 inches, received between 08:05 and 08:55 on November 13, 14 days prior. The previous analytical data reported from this site were from an event on September 25. A baseflow of 0.04 cfs was present as the event began.

Sampling routines initiated at 10:54, grab samples were collected at 11:00, and flow-weighted composites were secured between 11:13 and 12:33, or over a total period of 1 hour 39 minutes.

The sampled event produced a total of 3,890 cf of runoff until the levels stabilized with base flow at 0.14 cfs. Of the 3,890 cf, 3,750 cf could be attributed to the event, and the remainder (130 cf) to baseflow. Composite samples were collected between 1,370 and 3,560 cf of the cumulative runoff, or until 92 percent of the event runoff had occurred. The grab samples were collected at 1,370 cf of runoff.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: BELL MEADE DRIVE SITE ID: 004 STORM DATE: 11-27-92

Site Characteristics

Drainage Area:	17.0	(acres)
% Impervious:	35	%
Land Use:	Medium Density Residential	

Storm Precipitation Data Summary

Site Precipitation:	0.35	(inches)
Maximum Intensity:		
5 min:	0.48	(inches/hr)
15 min:	0.32	(inches/hr)
30 min:	0.18	(inches/hr)

Storm Flow Data Summary

Peak Flow Rate:	0.62	(cfs)
Max Flow Depth:	0.30	(feet)
Total Sampled Vol:	1,370-3,560	(cf)
Total Runoff Vol:	3,890	(cf)
Baseflow Runoff Vol:	130	(cf)

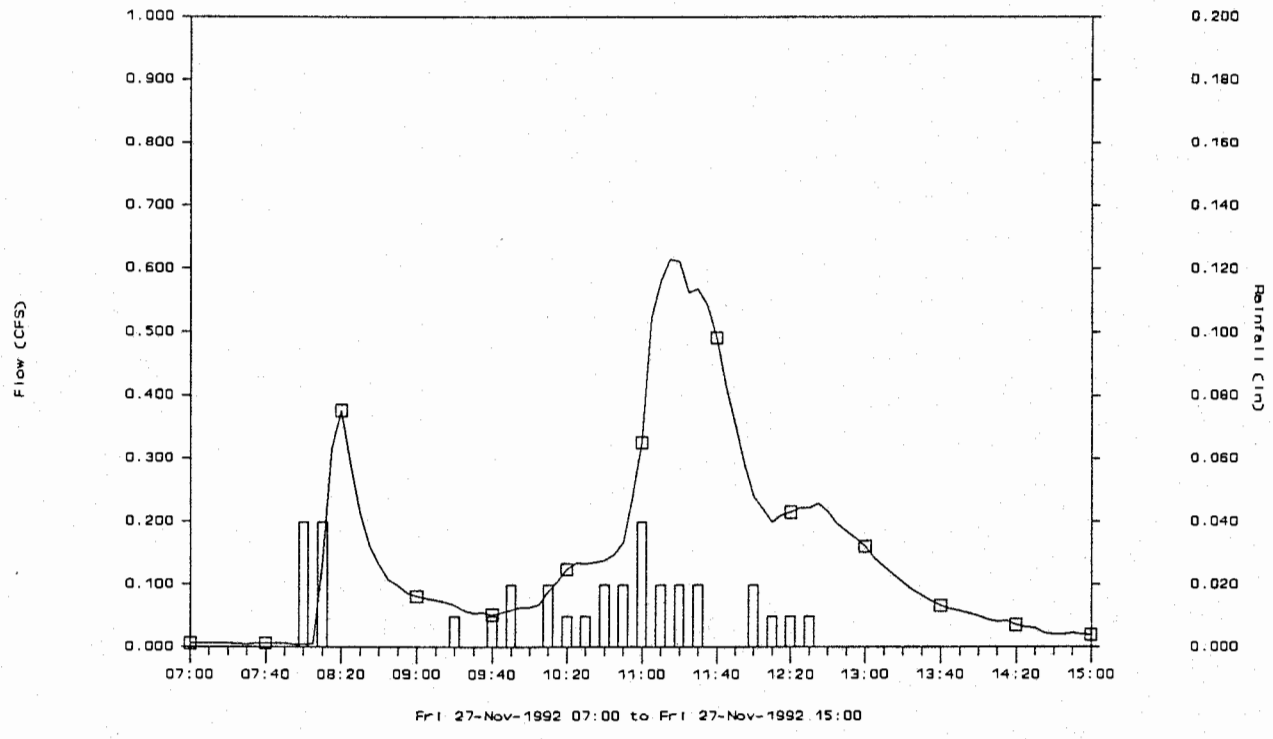
Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	14	(days)

Grab Sample Time:	11:00	(hhmm EST)
Flow Weighted Sample Times:	10:54-12:33	(hhmm EST)

Composite Flow Interval:	900	(cf)
No. of Samples:	3	

MEDIUM DENSITY RESIDENTIAL - BELL MEADE DR.



COMMERCIAL - INDIAN AVE.

The commercial land use which was sampled consisted of a basin 16.6 acres in area, with approximately 89 percent DCIA, located in the City of Venice. The major land use within the basin is a large shopping center (grocery, hardware, dry cleaner, etc.), constructed in the 1960's, with a large parking area adjacent to U.S. 41 (Business). A tire distributor is located at one corner of the lot. The sampling site is located at the southeast corner of the intersection of Indian Ave. and Bahama St. in the City of Venice, and receives runoff from U.S. 41, as well as the shopping center.

At the sampling site, drainage from the basin flows northward, contained within a 30 inch RCP, at a slope of 0.35 percent. Runoff from U.S. 41 enters the RCP through a grating at the site. The above dimensions, together with a roughness coefficient of 0.012, were used in Manning's equation for the computation of flow from level measurements.

Runoff from the sampling site continues northward, discharging eventually into the Intracoastal Waterway. The sampling site does not typically experience backwater conditions, but has been observed to flow at surcharged conditions.

INDIAN AVE. - August 22, 1992 - Bacteria Only

A rainfall event of 0.18 inches was sampled on August 22, 1992. The total rainfall event duration was 10 minutes, from 16:25 until 16:35. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 1.56, 0.72, and 0.36 inches per hour, respectively. The maximum flow rate was 9.48 cfs (1.04 feet in depth) during the event.

Antecedent rainfall for the 72_hour period prior to 16:25 was 0.00 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.14 inches, received between 13:40 and 16:25 on August 16, 6 days prior. No previous analytical data had been reported for this site. Baseflow of 0.01 cfs was present as the event began.

Sampling routines initiated at 16:28 and grab samples were collected at 16:43. An insufficient sample was collected for the flow-weighted composite, and so the grab samples were processed for bacteriological parameters only.

The sampled event produced a total of 9,320 cf of runoff of which 260 cf was baseflow. The grab sample was collected after 5,640 cf. Runoff rates were still at 0.02 cfs when the next event began.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: INDIAN AVENUE | SITE ID: 005 | STORM DATE: 08-22-92

Site Characteristics

Drainage Area:	16.6	(acres)
% Impervious:	89	%
Land Use:	Commercial	

Storm Precipitation Data Summary

Site Precipitation:	0.18	(inches)
Maximum Intensity:		
5 min:	1.56	(inches/hr)
15 min:	0.72	(inches/hr)
30 min:	0.36	(inches/hr)

Storm Flow Data Summary

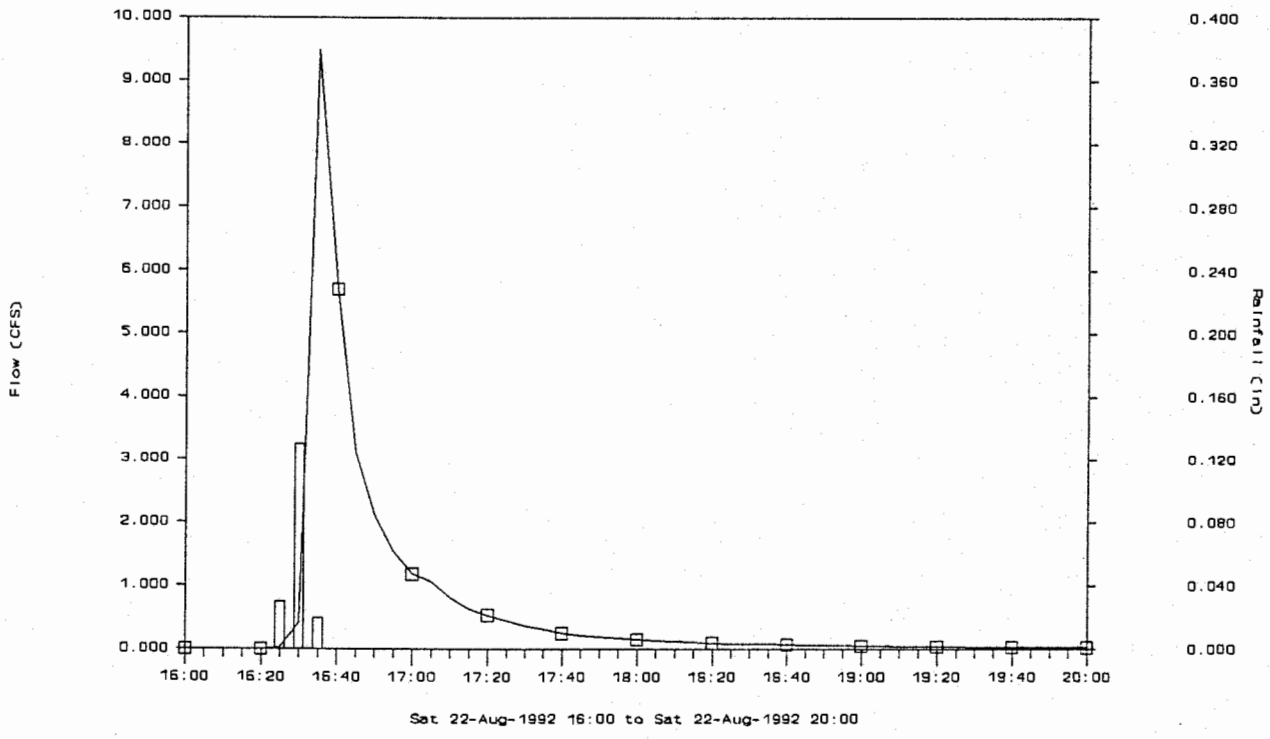
Peak Flow Rate:	9.48	(cfs)
Max Flow Depth:	1.04	(feet)
Total Sampled Vol:	N/A	(cf)
Total Runoff Vol:	9,320	(cf)
Baseflow Runoff Vol:	260	(cf)

*Grab sample processed for bacteria only
N/A=Not applicable

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	6	(days)
Grab Sample Time:	16:43	(hhmm EST)
Flow Weighted Sample Times:	N/A*	(hhmm EST)
Composite Flow Interval:	N/A	(cf)
No. of Samples:	N/A	

COMMERCIAL - INDIAN AVE.



INDIAN AVE. - October 2, 1992

A rainfall event of 1.79 inches, resulting from a frontal weather system, was sampled on October 2, 1992. The total rainfall event duration was 24 hours 50 minutes, from 03:40 until 04:30 on October 3. Rainfall intensities were very low for the initial portion of the event. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 1.32, 0.88, and 0.54 inches per hour, respectively. The maximum flow rate was 13.03 cfs (1.24 feet in depth) during the event.

Antecedent rainfall for the 24-hour and 48-hour periods prior to 03:40 was 0.04 inches. The antecedent rainfall during the prior 72-hour period totalled 0.06 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.30 inches, received between 16:35 and 16:45 on September 27, 5 days prior. The previous analytical data reported from this site were from an event on August 22, 1992. A baseflow of 0.01 cfs was present as the event began.

Sampling routines initiated at 12:56, grab samples were collected at 13:06, and flow-weighted composites were secured between 12:58 and 17:57, or over a total period of 5 hours 1 minute.

The sampled event produced a total of 95,800 cf of runoff up until the next rain event. Of the 95,800 cf, 94,900 cf could be attributed to the event, and the remainder (900 cf) to baseflow. Composite samples were collected between 20,600 and 66,300 cf of the cumulative runoff, or until 69 percent of the total runoff for the event had occurred. Runoff rates were still at 0.02 cfs when the next event began.

Due to laboratory error, the flow-weighted sample from this event was not analyzed for pesticides. The remainder of the analyses were processed normally.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: INDIAN AVENUE | SITE ID: 005 | STORM DATE: 10-02-92

Site Characteristics

Drainage Area:	16.6	(acres)
% Impervious:	89	%
Land Use:	Commercial	

Storm Precipitation Data Summary

Site Precipitation:	1.79	(inches)
Maximum Intensity:		
5 min:	1.32	(inches/hr)
15 min:	0.88	(inches/hr)
30 min:	0.54	(inches/hr)

Storm Flow Data Summary

Peak Flow Rate:	13.03	(cfs)
Max Flow Depth:	1.24	(feet)
Total Sampled Vol:	20,600-66,300	(cf)
Total Runoff Vol:	95,800	(cf)
Baseflow Runoff Vol:	900	(cf)

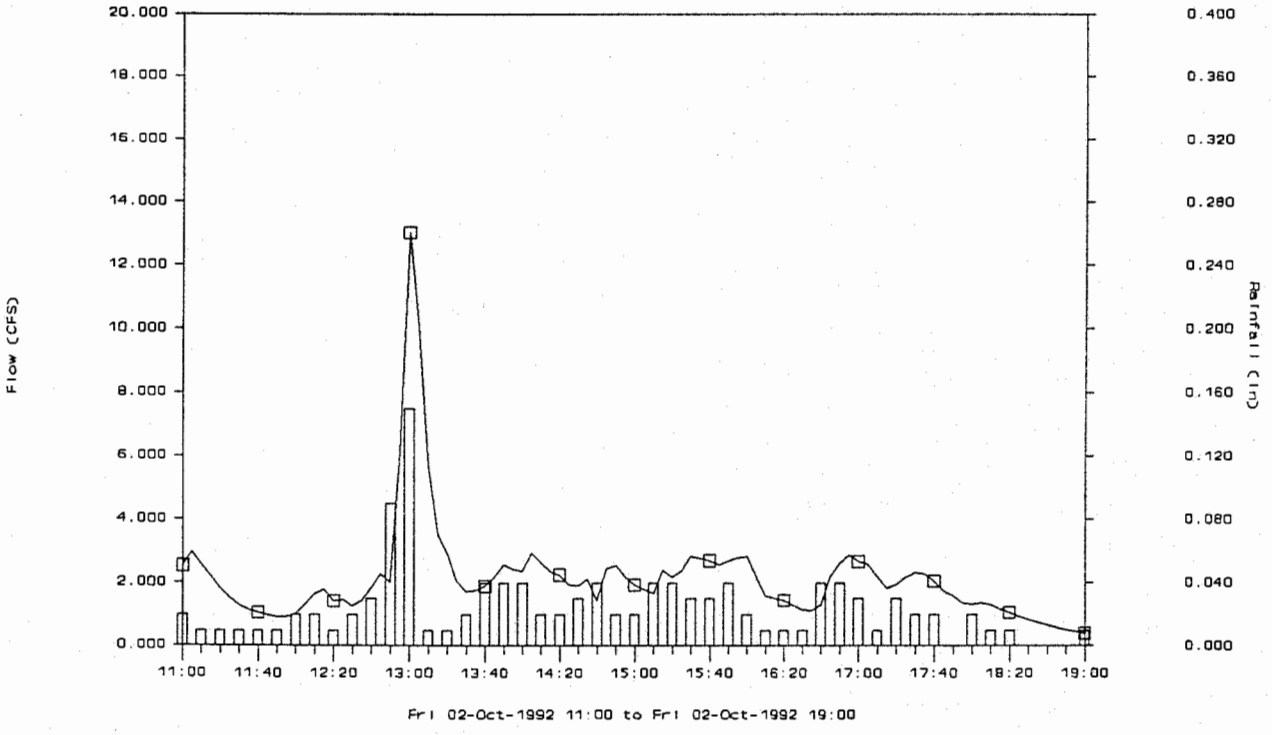
Antecedent Precipitation

24 Hour:	0.04	(inches)
48 Hour:	0.04	(inches)
72 Hour:	0.06	(inches)
Last rain >0.1":	5	(days)

Grab Sample Time:	13:06	(hhmm EST)
Flow Weighted Sample Times:	12:56-17:57	(hhmm EST)

Composite Flow Interval:	2400	(cf)
No. of Samples:	20	

COMMERCIAL - INDIAN AVE.



INDIAN AVE. - January 14, 1993

A rainfall event of 0.84 inches was sampled on January 14, 1993. The total rainfall event duration was 2 hours, from 14:25 until 16:25. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 1.32, 1.00, and 0.82 inches per hour, respectively. The maximum flow rate was 19.12 cfs (1.58 feet in depth) during the event.

Antecedent rainfall for the 72-hour period prior to 14:25 was 0.00 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 1.49 inches, received between January 8, 17:45 and January 9, 05:30, 5 days prior. The previous analytical data reported from this site were from an event on October 2. A baseflow of 0.01 cfs was present as the event began.

Sampling routines initiated at 14:28, grab samples were collected at 14:33, and flow-weighted composites were secured between 14:35 and 15:13, or over a total period of 45 minutes.

The sampled event produced a total of 47,800 cf of runoff, of which 47,300 could be attributed to the event and the remainder (500 cf) to baseflow. Composite samples were collected between 120 and 12,900 cf of the cumulative runoff, or until 27 percent of the total runoff had occurred.

While the flow-weighted composite sample did not represent either the entire event or a three-hour period of runoff, analytical samples were processed as the sampled portion represented both the first flush of runoff, and also the portion with some of the highest runoff velocities. As a result, analytical data from this event can be expected to represent more of a worst-case scenario for this land use than would have otherwise been presented.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: INDIAN AVENUE | SITE ID: 005 | STORM DATE: 01-14-93

Site Characteristics

Drainage Area:	16.6	(acres)
% Impervious:	89	%
Land Use:	Commercial	

Storm Flow Data Summary

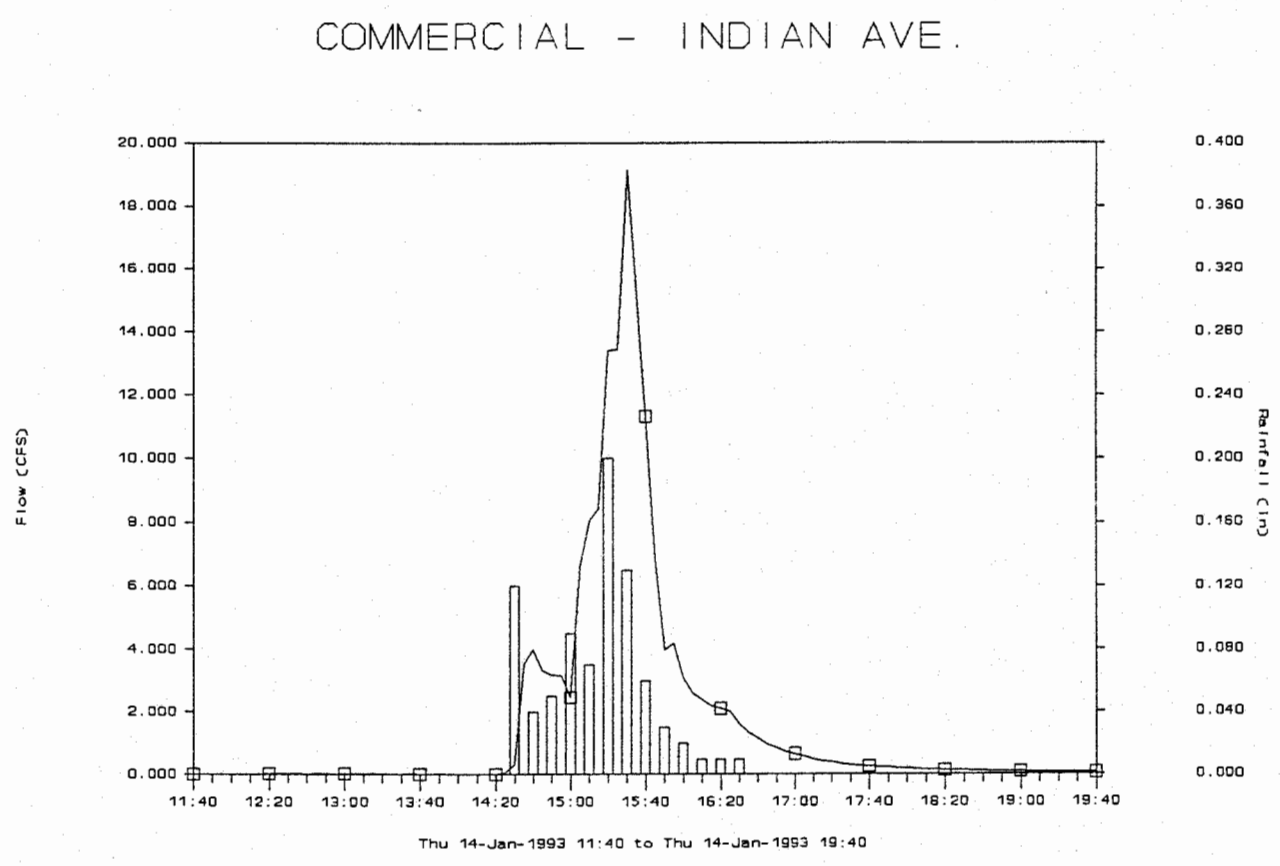
Peak Flow Rate:	19.12	(cfs)
Max Flow Depth:	1.58	(feet)
Total Sampled Vol:	120-12,900	(cf)
Total Runoff Vol:	47,800	(cf)
Baseflow Runoff Vol:	500	(cf)

Storm Precipitation Data Summary

Site Precipitation:	0.84	(inches)
Maximum Intensity:		
5 min:	1.32	(inches/hr)
15 min:	1.00	(inches/hr)
30 min:	0.82	(inches/hr)

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	5	(days)
Grab Sample Time:	14:33	(hhmm EST)
Flow Weighted Sample Times:	14:28-15:13	(hhmm EST)
Composite Flow Interval:	900	(cf)
No. of Samples:	12	



INDIAN AVE. - January 25, 1993

A rainfall event of 1.59 inches, resulting from a frontal weather system, was sampled on January 25, 1993. The total rainfall event duration was 18 hours 45 minutes, from 12:55, January 25, until 07:40, January 26. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 0.60, 0.44, and 0.36 inches per hour, respectively. The maximum flow rate was 5.55 cfs (0.78 feet in depth) during the event.

Antecedent rainfall for the 72-hour period prior to 12:55 was 0.00 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.19 inches, received between 06:30 and 08:25 on January 16, 9 days prior. The previous analytical data reported from this site were from an event on January 14. A baseflow of 0.02 cfs was present as the event began.

Sampling routines initiated at 13:21, grab samples were collected at 13:26, and flow-weighted composites were secured between 13:35 and 19:48, or over a total period of 6 hours 22 minutes. Due to the rainfall amounts received, the sampling routine was completed prior to the required duration and was restarted with additional sample containers in order to sample at least 3 hours of the event. A delay in restarting the sampler produced a gap of 20 minutes during which no flow-weighted composites were collected. This gap represented approximately 9 percent of the flow which occurred during the entire compositing period. The two groups of composited samples were combined and analyzed as a single sample.

The sampled event produced a total of 93,300 cf of runoff until the next rain event. Of the 93,300 cf, 91,600 was a result of the event and the remainder (1,700 cf) attributed to baseflow. Composite samples were collected between 1,460 and 45,300 cf of the cumulative runoff, or until 49 percent of the total runoff had occurred. Runoff rates were still at 0.03 cfs when the next event began.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: INDIAN AVENUE | SITE ID: 005 | STORM DATE: 01-25-93

Site Characteristics

Drainage Area:	16.6	(acres)
% Impervious:	89	%
Land Use:	Commercial	

Storm Precipitation Data Summary

Site Precipitation:	1.59	(inches)
Maximum Intensity:		
5 min:	0.60	(inches/hr)
15 min:	0.44	(inches/hr)
30 min:	0.36	(inches/hr)

Storm Flow Data Summary

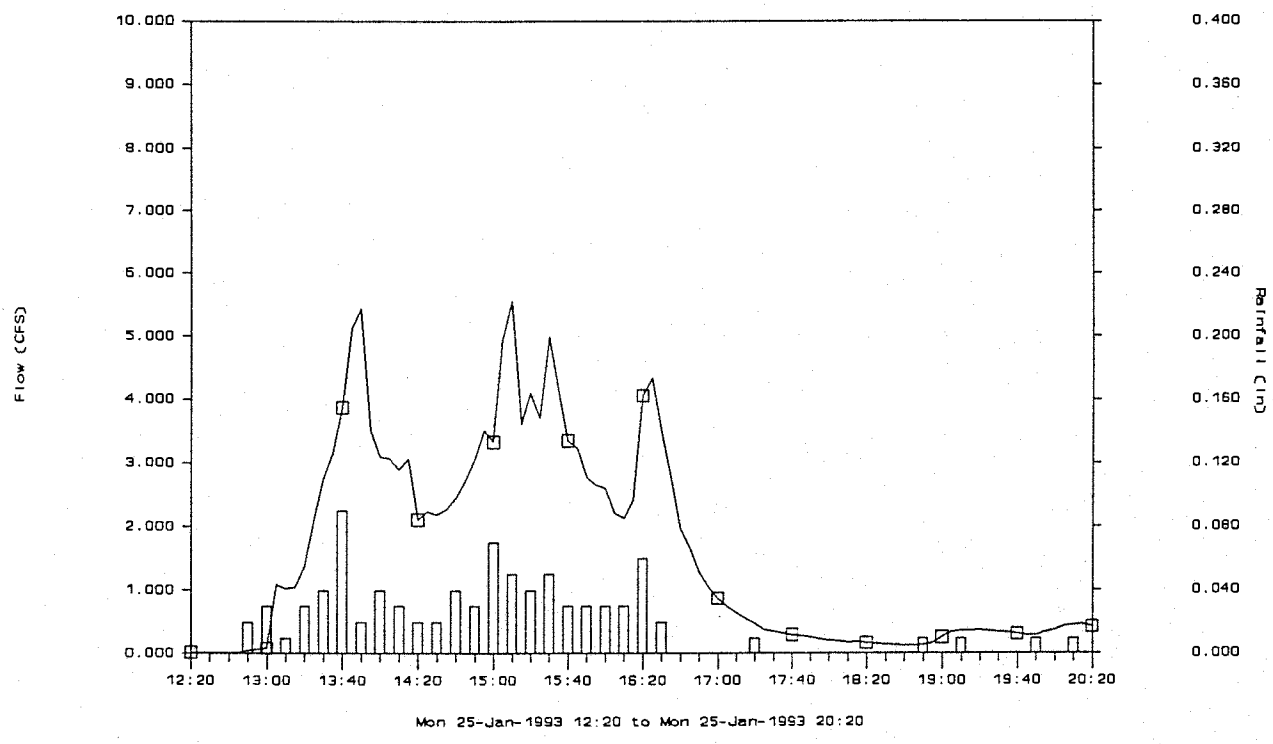
Peak Flow Rate:	5.55	(cfs)
Max Flow Depth:	0.78	(feet)
Total Sampled Vol:	1,460-45,300*	(cf)
Total Runoff Vol:	93,300	(cf)
Baseflow Runoff Vol:	1,700	(cf)

*See Text

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	9	(days)
Grab Sample Time:	13:26	(hhmm EST)
Flow Weighted Sample Times:	13:21-19:48*	(hhmm EST)
Composite Flow Interval:	2000	(cf)
No. of Samples:	24	

COMMERCIAL - INDIAN AVE.



INDIAN AVE. - March 3, 1993

A rainfall event of 0.59 inches, resulting from a frontal weather system, was sampled on March 3, 1993. The total rainfall event duration was 3 hours 5 minutes, from 21:50, March 3, until 00:55, March 4. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 1.68, 1.16, and 0.88 inches per hour, respectively. The maximum flow rate was 14.7 cfs (1.33 feet in depth) during the event.

Antecedent rainfall for the 72-hour period prior to 21:50 was 0.00 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 1.09 inches, received between 10:10 and 13:25 on February 26, 7 days prior. The previous analytical data reported for this site were from an event on January 25. A baseflow of 0.01 cfs was present as the event began.

Sampling routines initiated at 22:12, grab samples were collected at 22:17, and flow-weighted composites were secured between 22:32 and 23:48, or over a total period of 1 hour 36 minutes.

The sampled event produced a total of 25,100 cf of runoff when levels stabilized. Of the 25,100 cf, 24,900 cf was the result of the event and the remainder (200 cf) the result of baseflow. Composite samples were collected between 670 and 23,400 cf of the cumulative runoff, or until 93 percent of the event runoff had occurred.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: INDIAN AVENUE | SITE ID: 005 | STORM DATE: 03-03-93

Site Characteristics

Drainage Area:	16.6	(acres)
% Impervious:	89	%
Land Use:	Commercial	

Storm Precipitation Data Summary

Site Precipitation:	0.59	(inches)
Maximum Intensity:		
5 min:	1.68	(inches/hr)
15 min:	1.16	(inches/hr)
30 min:	0.88	(inches/hr)

Storm Flow Data Summary

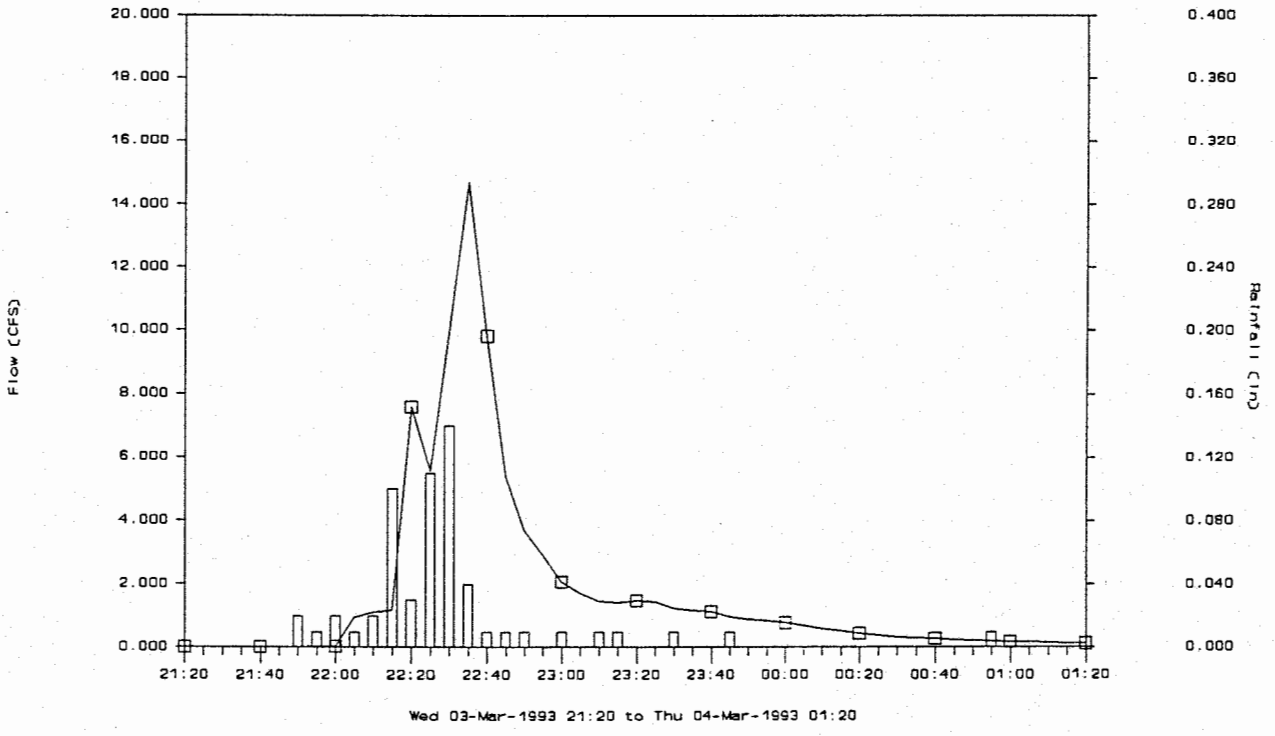
Peak Flow Rate:	14.7	(cfs)
Max Flow Depth:	1.33	(feet)
Total Sampled Vol:	670-23,400	(cf)
Total Runoff Vol:	25,100	(cf)
Baseflow Runoff Vol:	200	(cf)

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	7	(days)

Grab Sample Time:	22:17	(hhmm EST)
Flow Weighted Sample Times:	22:12-23:48	(hhmm EST)
Composite Flow Interval:	6000	(cf)
No. of Samples:	3	

COMMERCIAL - INDIAN AVE.



INDIAN AVE. - April 5, 1993

A rainfall event of 1.61 inches, resulting from a frontal weather system, was sampled on April 5, 1993. The total event duration was 5 hours 30 minutes, from 23:55, April 4, until 05:25, April 5, with the bulk of the rain (1.59 inches) received before 02:50. Maximum rainfall intensities for 5, 15, and 30 minute periods were 4.32, 3.76, and 2.32 inches per hour, respectively. Surcharged conditions were observed for 20 minutes during the peak of the event (01:30 to 01:50). Maximum water depths were 3.94 feet.

Antecedent rainfall for the 24- and 48-hour periods prior to sampling were 0.00 inches, while the 72-hour period totalled 0.05 inches. The most recent rainfall event prior to the sampling was 1.30 inches, received between 03:25 and 09:30 on April 1, 4 days prior. The previous analytical data reported for this site was from an event on March 3, 1993.

Sampling routines initiated at 00:59, grab samples were collected at 01:04, and flow-weighted composites were secured between 01:07 and 04:50, or over a total period of 3 hours 51 minutes. Due to the amount and intensity of rainfall received, however, the initial flow-weighted sampling regime was rapidly completed, samples being collected between 01:07 and 01:31. A delay in restarting the sampler with additional sample containers resulted in a second flow-weighted composite sample collected between 02:29 and 04:50. While the total period sampled was 3 hours 51 minutes, there was a 54-minute gap in the total collection, which included some portion of the peak flow and approximately 66% of the total flow during the entire compositing period. Accordingly, while grab samples were processed normally, the two flow-weighted composites were analyzed separately, to permit an assessment of the differences in water quality over the course of the storm, and to allow for mathematical compositing of the entire event collected.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: INDIAN AVENUE | SITE ID: 005 | STORM DATE: 04-05-93

Site Characteristics

Drainage Area:	16.6	(acres)
% Impervious:	89	%
Land Use:	Commercial	

Storm Precipitation Data Summary

Site Precipitation:	1.61	(inches)
Maximum Intensity:		
5 min:	4.32	(inches/hr)
15 min:	3.76	(inches/hr)
30 min:	2.32	(inches/hr)

Storm Flow Data Summary

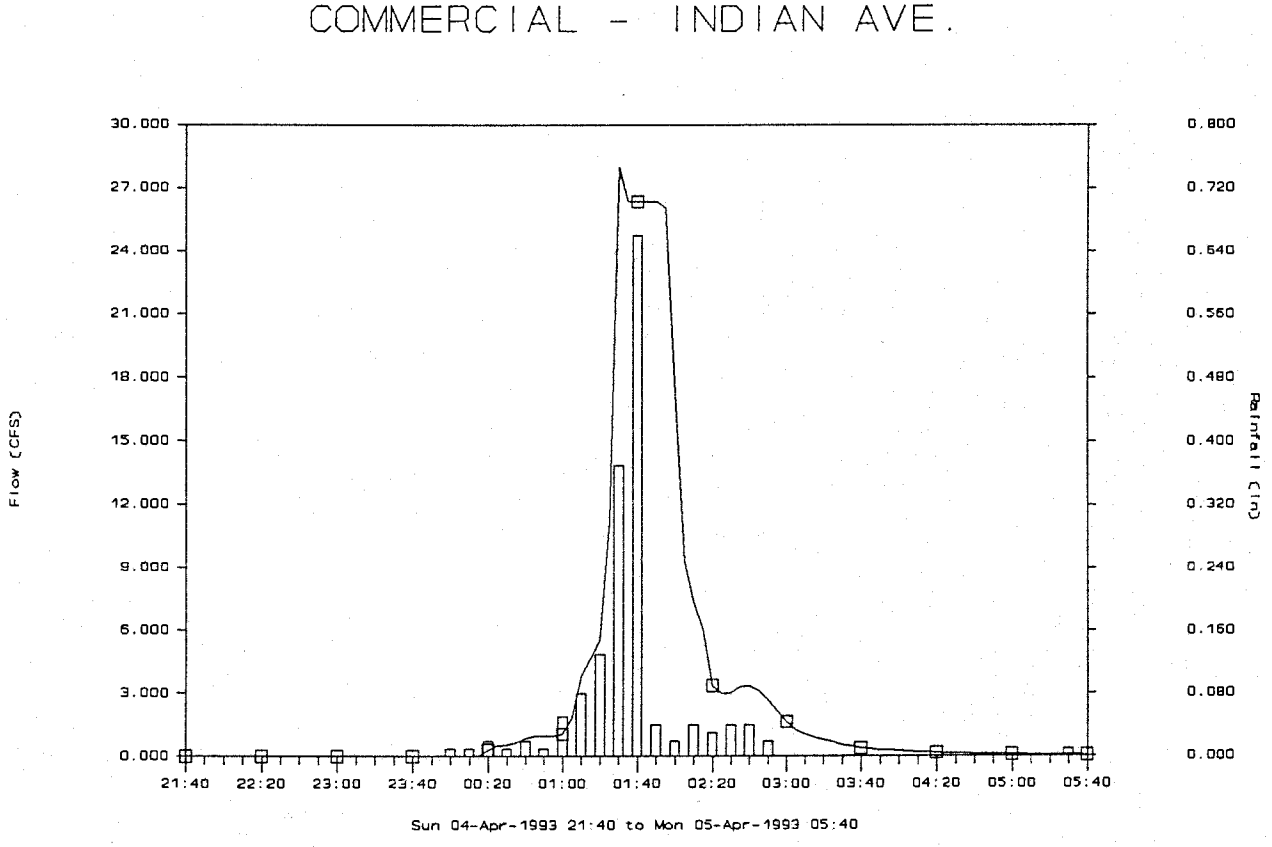
Peak Flow Rate:	>28	(cfs)
Max Flow Depth:	3.94	(feet)
Total Sampled Vol:	2,100-80,400*	(cf)
Total Runoff Vol:	80,940	(cf)
Baseflow Runoff Vol:	0	(cf)

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.05	(inches)
Last rain >0.1":	4	(days)

Grab Sample Time:	01:04	(hhmm EST)
Flow Weighted Sample Times:	00:59-04:50*	(hhmm EST)
Composite Flow Interval:	1400	(cf)
No. of Samples:	21	

*See Text



The sampled event produced in excess of 80,940 cf of runoff. Composite samples were collected between 2,100 and 80,400 cf of the cumulative runoff, or until roughly 99% of the runoff had occurred. Grab samples were collected at 2,640 cf of total runoff.

INDIAN AVE. - April 9, 1993

A rainfall event of 0.35 inches, resulting from a frontal weather system, was sampled on April 9, 1993. The total event duration was 2 hours 35 minutes, from 09:40 until 12:15. Maximum rainfall intensities for 5, 15, and 30 minute periods were 0.84, 0.48, and 0.28 inches per hour, respectively. The maximum flow rate was 4.61 cfs (0.71 feet in depth) during the event.

Antecedent rainfall for the 24- and 48-hour periods prior to sampling were 0.00 inches, while the 72-hour period totalled 0.03 inches. The most recent rainfall event prior to the sampling was 1.61 inches, received between 23:55, April 4, and 02:50, April 5, 4 days prior. The previous analytical data reported for this site was from the prior event on April 4-5, 1993.

Sampling routines initiated at 11:09, grab samples were collected at 11:14, and flow-weighted composites were secured between 11:28 and 15:23, or over a total period of 3 hours 55 minutes.

The sampled event produced in excess of 14,490 cf of runoff. Composite samples were collected between 1,570 and 14,430 cf of the cumulative runoff, or until over 99% of the runoff had occurred. Grab samples were collected at 2,600 cf of total runoff.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: INDIAN AVENUE | SITE ID: 005 | STORM DATE: 04-09-93

Site Characteristics

Drainage Area:	16.6	(acres)
% Impervious:	89	%
Land Use:	Commercial	

Storm Precipitation Data Summary

Site Precipitation:	0.35	(inches)
Maximum Intensity:		
5 min:	0.84	(inches/hr)
15 min:	0.48	(inches/hr)
30 min:	0.28	(inches/hr)

Storm Flow Data Summary

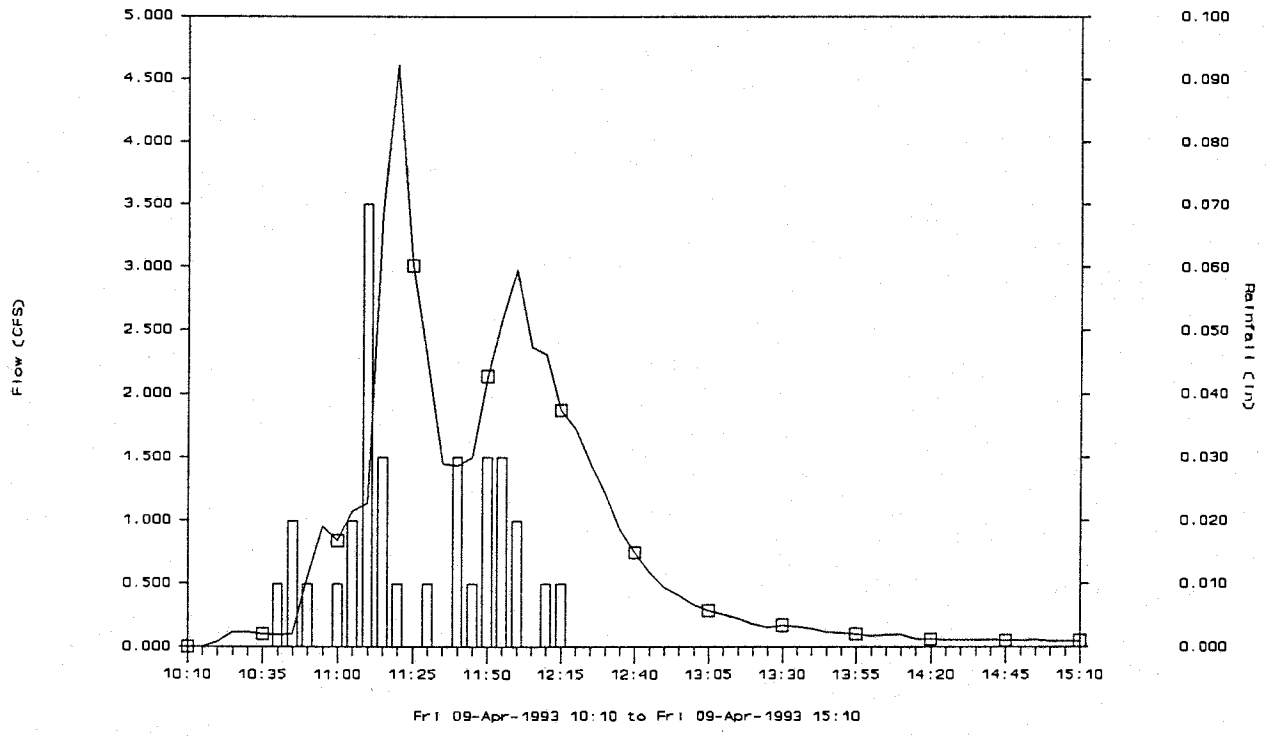
Peak Flow Rate:	4.61	(cfs)
Max Flow Depth:	0.71	(feet)
Total Sampled Vol:	1,570-14,430	(cf)
Total Runoff Vol:	14,490	(cf)
Baseflow Runoff Vol:	0	(cf)

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.03	(inches)
Last rain >0.1":	4	(days)

Grab Sample Time:	11:14	(hhmm EST)
Flow Weighted Sample Times:	11:09-15:23	(hhmm EST)
Composite Flow Interval:	4500	(cf)
No. of Samples:	3	

COMMERCIAL - INDIAN AVE.



OPEN - VENICE WELLFIELD

The open land use site consists of a basin 17.8 acres in area, with approximately 5 percent DCIA. The area is parkland owned by the City of Venice and has no residential units, but does have one of the wells for the City's water supply. The potable production zone is isolated from the surficial aquifer, and the City's withdrawals have virtually no impact on stormwater runoff from this site.

The site is heavily vegetated with pine and palmetto flatwood which experienced a substantial burn during the summer of 1992, prior to site installation. This site contains a considerable amount of depressional storage, and many rainfall events result in no discharge at all (dependent on antecedent dry conditions), or in substantially delayed runoff (peaking 2 to 4 hours after the rainfall event terminates). Again because of the storage and porous soils, if runoff occurs, baseflows (interflows from the event) are elevated for many days after a rainfall. The site discharges into Curry Creek, a dredged canal, which is bordered by oak and palm communities.

At the sampling site, a primary device (1 ft H flume) was installed to obtain accurate flow measurements in the ditch leading to Curry Creek. Discharges were computed from level measurements at the throat of the flume using software internal to the flowmeters.

VENICE WELLFIELD - September 13, 1992

A rainfall event of 2.37 inches, resulting from a frontal weather system, was sampled on September 13, 1992. The total rainfall event duration was 3 hours 50 minutes, from 16:20 until 20:10. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 5.52, 5.20, and 3.66 inches per hour, respectively.

Due to the intensity of the rainfall, flow rapidly (within a period of 20 minutes) increased until the level of flow was greater than the maximum depth of the flume. After this initial increase, water depths remained relatively consistent, averaging 1.24 feet, and with a minimum and maximum of 1.13 and 1.28 feet, respectively. Flows are calculated by software internal to the flowmeters, and flow at depths greater than the 1.00 feet are calculated as if the depths were exactly 1.00 feet (1.97 cfs). Accordingly, the discharges calculated for this event are undoubtedly low. However, the consistency of the water levels once over the top of the flume allows for the assumption that discharge rates were also fairly consistent. (The cross-sectional area above the flume is rectangular within the range of depths experienced.) The flow compositing carried out using the artificially low discharge rates should, therefore, produce a sample that is a representative flow-weighted composite of the discharge during the sampling period.

Antecedent rainfall for the 72-hour period prior to 16:20 was 0.00 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.14 inches, received between 18:20 and 18:55, on September 8, 5 days prior. No previous analytical data had been reported for this site.

Sampling routines initiated at 16:23, grab samples were collected at 16:38, and flow-weighted composites were secured between 16:42 and 20:27, or over a total period of 4 hours 4 minutes. Water depths were greater than 1.00 feet by 16:45 and remained above the top of the flume until 01:45, September 14.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: VENICE WELLFIELD SITE ID: 006 STORM DATE: 09-13-92

Site Characteristics

Drainage Area:	17.8	(acres)
% Impervious:	5	%
Land Use:	Open	

Storm Precipitation Data Summary

Site Precipitation:	2.37	(inches)
Maximum Intensity:		
5 min:	5.52	(inches/hr)
15 min:	5.20	(inches/hr)
30 min:	3.66	(inches/hr)

Storm Flow Data Summary

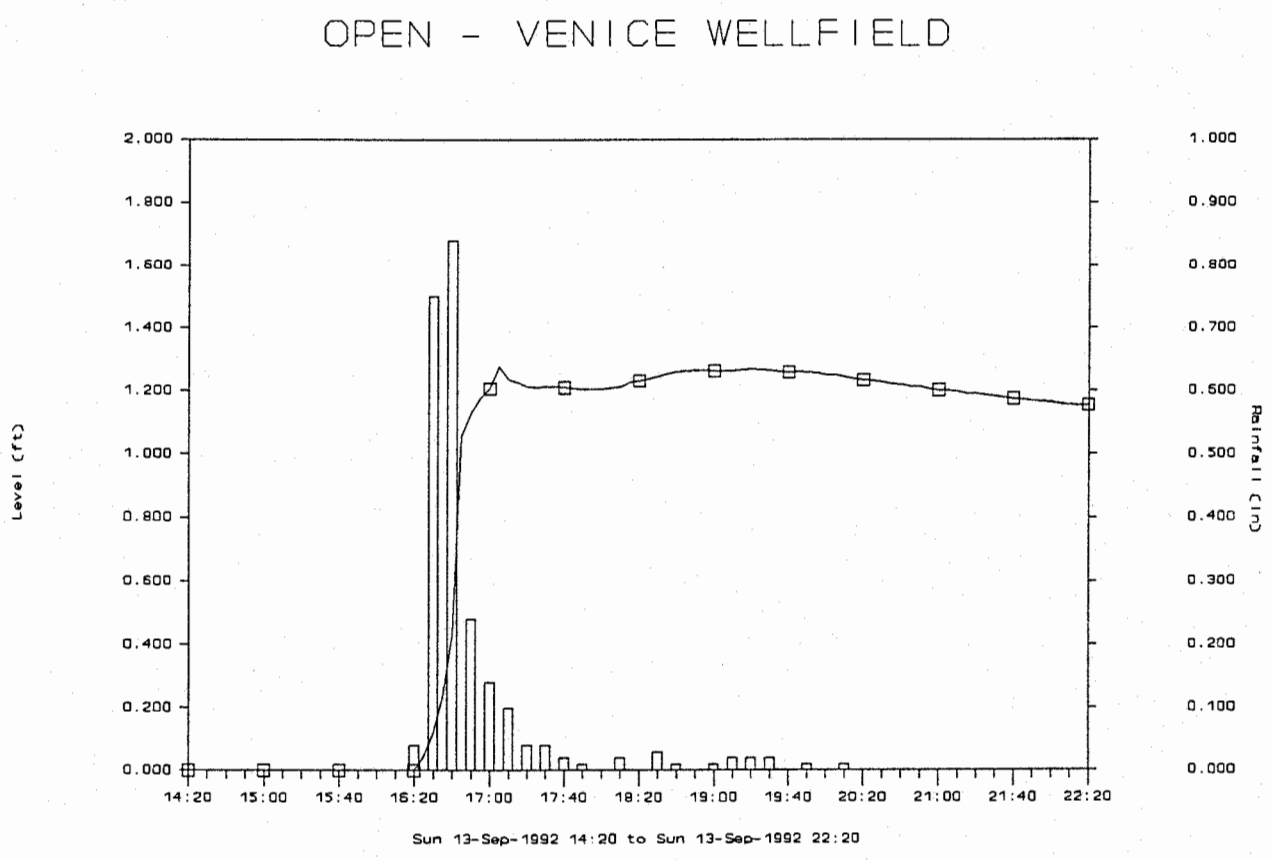
Peak Flow Rate:	>2	(cfs)
Max Flow Depth:	1.28	(feet)
Total Sampled Vol:	1->26,700*	(cf)
Total Runoff Vol:	>130,400*	(cf)
Baseflow Runoff Vol:	0	(cf)

*See Text

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	5	(days)

Grab Sample Time:	16:38	(hhmm EST)
Flow Weighted Sample Times:	16:23-20:27	(hhmm EST)
Composite Flow Interval:	500	(cf)
No. of Samples:	54	



The sampled event produced at least 130,400 cf of runoff until the next rain event at 13:45, September 15. Composite samples were nominally collected between 1 and 26,700 cf of the cumulative runoff. Runoff rates were still at 0.15 cfs when the next event began.

VENICE WELLFIELD - October 2, 1992

A rainfall event of 2.35 inches, resulting from a frontal weather system, was sampled on October 2, 1992. The total rainfall event duration was 34 hours 5 minutes, from 18:50, October 1, until 04:55, October 3. Rainfall during the initial portions of the storm was intermittent with the bulk of the rain (2.19 inches) occurring after 09:50, October 2. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 0.96, 0.72, and 0.54 inches per hour, respectively. The maximum flow rate was 1.97 cfs (1.01 feet in depth) during the event. While 1.01 feet are greater than the nominal depth of the 1.0 ft flume, this reading was only obtained during one 5-minute period. All other readings during the event were below the top of the flume. The 1.01 ft reading is not considered to substantially affect the accuracy of the flow compositing.

Antecedent rainfall for the 72 hour period prior to 18:50, October 1, was 0.00 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 2.05 inches, received between 15:40 and 18:50 on September 26, 5 days prior. The previous analytical data reported for this site were from an event on September 13. A baseflow of 0.02 cfs was present as the event began.

Sampling routines initiated at 10:59, grab samples were collected at 12:59, and flow-weighted composites were secured between 11:19 and 15:37, or over a total period of 4 hours 38 minutes.

The sampled event produced a total of 150,600 cf of runoff up until the next rain event at 23:00, on October 3. At that time, flow were still at 0.41 cfs. Of the 150,600 cf, 146,900 cf could be attributed to the event, and the remainder (3,700 cf) to baseflow. Composite samples were collected between 2,230 and 9,690 cf of the cumulative runoff, or until 6 percent of the total runoff had occurred.

Due to laboratory error, the flow-weighted sample from this event was not analyzed for pesticides. The remainder of the analyses were processed normally. The rainfall from the

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: VENICE WELLFIELD | SITE ID: 006 | STORM DATE: 10-02-92

Site Characteristics

Drainage Area:	17.8	(acres)
% Impervious:	5	%
Land Use:	Open	

Storm Precipitation Data Summary

Site Precipitation:	2.35	(inches)
Maximum Intensity:		
5 min:	0.96	(inches/hr)
15 min:	0.72	(inches/hr)
30 min:	0.54	(inches/hr)

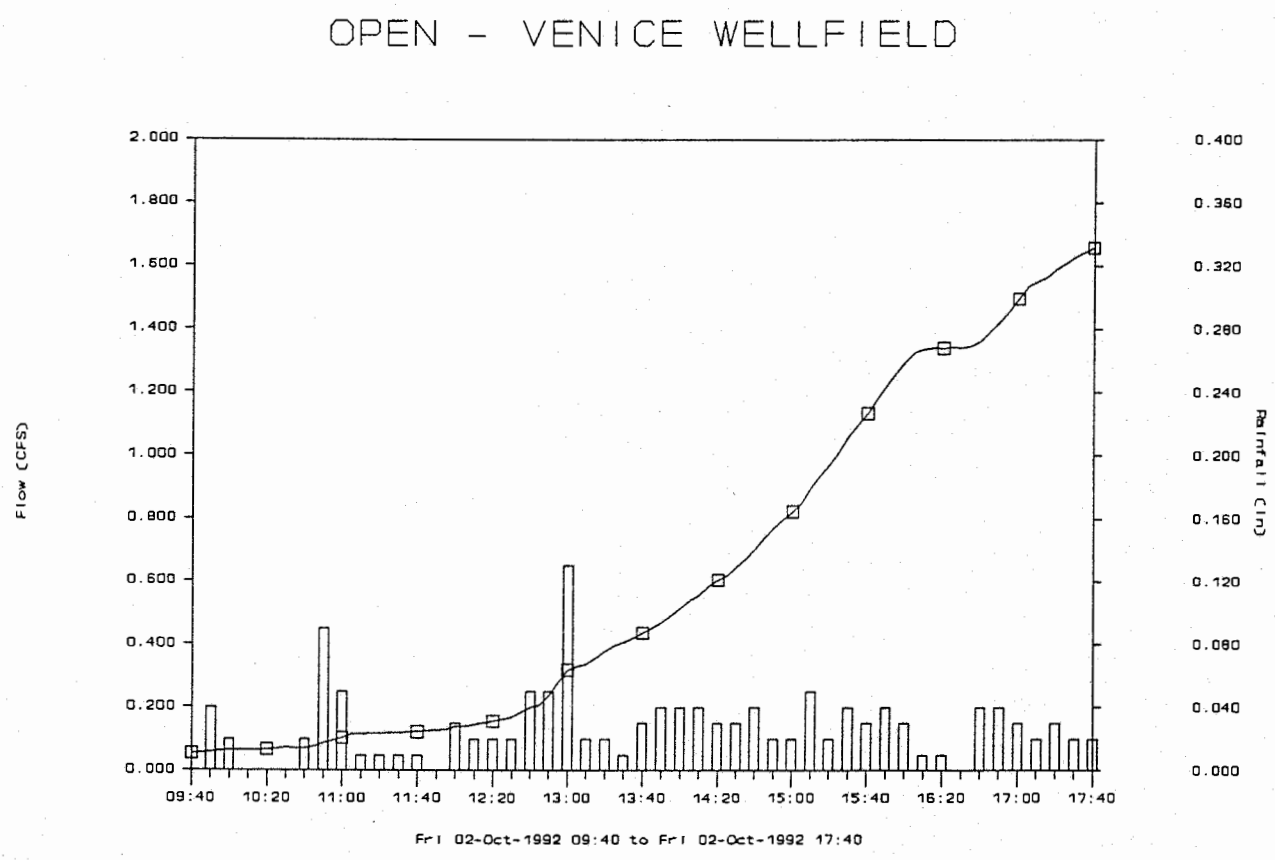
Storm Flow Data Summary

Peak Flow Rate:	1.97	(cfs)
Max Flow Depth:	1.01	(feet)
Total Sampled Vol:	2,230-9,690	(cf)
Total Runoff Vol:	150,600	(cf)
Baseflow Runoff Vol:	3,700	(cf)

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	5	(days)

Grab Sample Time:	12:59	(hhmm EST)
Flow Weighted Sample Times:	10:59-15:37	(hhmm EST)
Composite Flow Interval:	500	(cf)
No. of Samples:	14	



sampled event exceeded the October criteria (1.99 inches) by 0.36 inches. The hydraulic characteristics of the site, however, require substantial amounts of rain in order to generate any runoff, and for this site, the sample collected was considered representative.

VENICE WELLFIELD - March 13, 1993

A rainfall event of 3.24 inches, resulting from a frontal weather system, was sampled on March 13, 1993. The rainfall was initially intense, with 3.14 inches falling within 2 hours 35 minutes, between 00:25 and 03:00. Another 0.10 inches was received intermittently from 04:00 until 13:25, March 13. The total rainfall event duration was 13 hours. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 5.40, 4.08, and 3.80 inches per hour, respectively.

Again due to the intensity of the rainfall, flow increased rapidly (within a period of 45 minutes) until the level of flow was greater than the maximum depth of the flume. After the first hour of flow, during which water depths increased to 1.41 feet, water depths remained relatively consistent for the duration of the flow compositing, averaging 1.49 feet, with a minimum and maximum of 1.37 and 1.56 feet, respectively. Flows are calculated by software internal to the flowmeters, and flow at depths greater than the 1.00 feet are calculated as if the depths were exactly 1.00 feet (1.97 cfs). Accordingly, the total discharges calculated for this event are undoubtedly low. Unlike the storm on September 13, however, the first hour of the flow compositing program was accurately performed. The latter two and a half hours were undersampled, as calculated flow were erroneously low, thus weighting the results obtained from the flow-weighted composite towards the initial portion of the event. Since the initial portions of the event were emphasized, and due to the difficulty in obtaining runoff from this site, the samples were retained and processed normally.

Antecedent rainfall for the 72 hour period prior to 00:25 was 0.00 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.52 inches, received between 21:50 and 23:55 on March 3, 10 days prior. The previous analytical data reported for this site were from an event on October 2.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: VENICE WELLFIELD | SITE ID: 006 | STORM DATE: 03-13-93

Site Characteristics

Drainage Area:	17.8	(acres)
% Impervious:	5	%
Land Use:	Open	

Storm Precipitation Data Summary

Site Precipitation:	3.24	(inches)
Maximum Intensity:		
5 min:	5.40	(inches/hr)
15 min:	4.08	(inches/hr)
30 min:	3.80	(inches/hr)

Storm Flow Data Summary

Peak Flow Rate:	>>2	(cfs)
Max Flow Depth:	1.56	(feet)
Total Sampled Vol:	1->>19,000	(cf)
Total Runoff Vol:	>>123,700	(cf)
Baseflow Runoff Vol:	0	(cf)

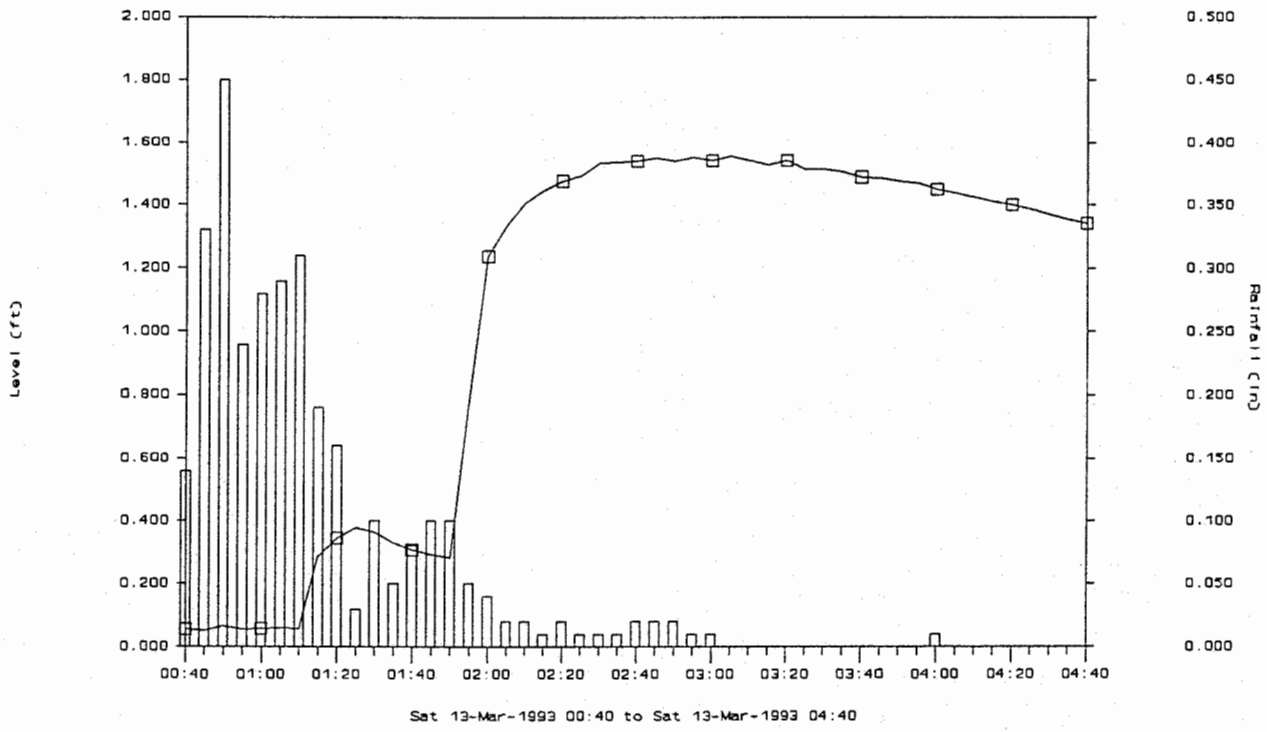
Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	10	(days)

Grab Sample Time:	01:55	(hhmm EST)
Flow Weighted Sample Times:	00:55-04:29	(hhmm EST)

Composite Flow Interval:	1600	(cf)
No. of Samples:	12	

OPEN - VENICE WELLFIELD



Sampling routines initiated at 00:55, grab samples were collected at 01:55, and flow-weighted composites were secured between 01:16 and 04:29, or over a total period of 3 hours 34 minutes. Water depths exceeded the flume depth from 02:00 until 10:05.

The sampled event produced in excess of 123,700 cf of runoff until the next rain event on March 17. Composite samples were nominally collected between 1 and 19,000 of the cumulative runoff. Runoff rates were less than 0.01 cfs when the next event began.

The rainfall from the sampled event exceeded the March criteria (2.35 inches) by 0.89 inches. The hydraulic characteristics of the site, however, require substantial amounts of rain in order to generate any runoff, and for this site, the sample collected was considered representative.

VENICE WELLFIELD - March 17, 1993

A rainfall event of 1.14 inches, resulting from a frontal weather system, was sampled on March 17, 1993. The total rainfall event duration was 6 hours 5 minutes, from 09:55 until 16:00. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 1.44, 0.76, and 0.52 inches per hour, respectively. The maximum flow rate was 1.31 cfs (0.84 feet in depth) during the event.

Antecedent rainfall for the 72-hour period prior to 09:55 was 0.00 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 3.24 inches, received between 00:25 and 13:25 on March 13, 4 days prior. The previous analytical data reported for this site were from an event on March 13. A baseflow of less than 0.01 cfs was present as the event began.

Sampling routines initiated at 11:54, grab samples were collected at 12:54, and flow-weighted composites were secured between 12:53 and 16:16, or over a total period of 4 hours 22 minutes. The runoff received rapidly completed the initial sampling routine and there was a 15-minute delay in restarting the sampler with additional sample containers during which no flow-weighted composites were collected. This gap represented approximately 15 percent of the flow which occurred during the entire compositing period. The two groups of composited samples were combined and analyzed as a single sample.

The sampled event produced a total of 70,700 cf of runoff until flow stabilized. Composite samples were collected between 77 and 5,310 cf of the cumulative runoff, or until 8 percent of the total runoff had occurred. Runoff rates were still at 0.08 cfs when the next event began.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: VENICE WELLFIELD | SITE ID: 006 | STORM DATE: 03-17-93

Site Characteristics

Drainage Area:	17.8	(acres)
% Impervious:	5	%
Land Use:	Open	

Storm Precipitation Data Summary

Site Precipitation:	1.14	(inches)
Maximum Intensity:		
5 min:	1.44	(inches/hr)
15 min:	0.76	(inches/hr)
30 min:	0.52	(inches/hr)

Storm Flow Data Summary

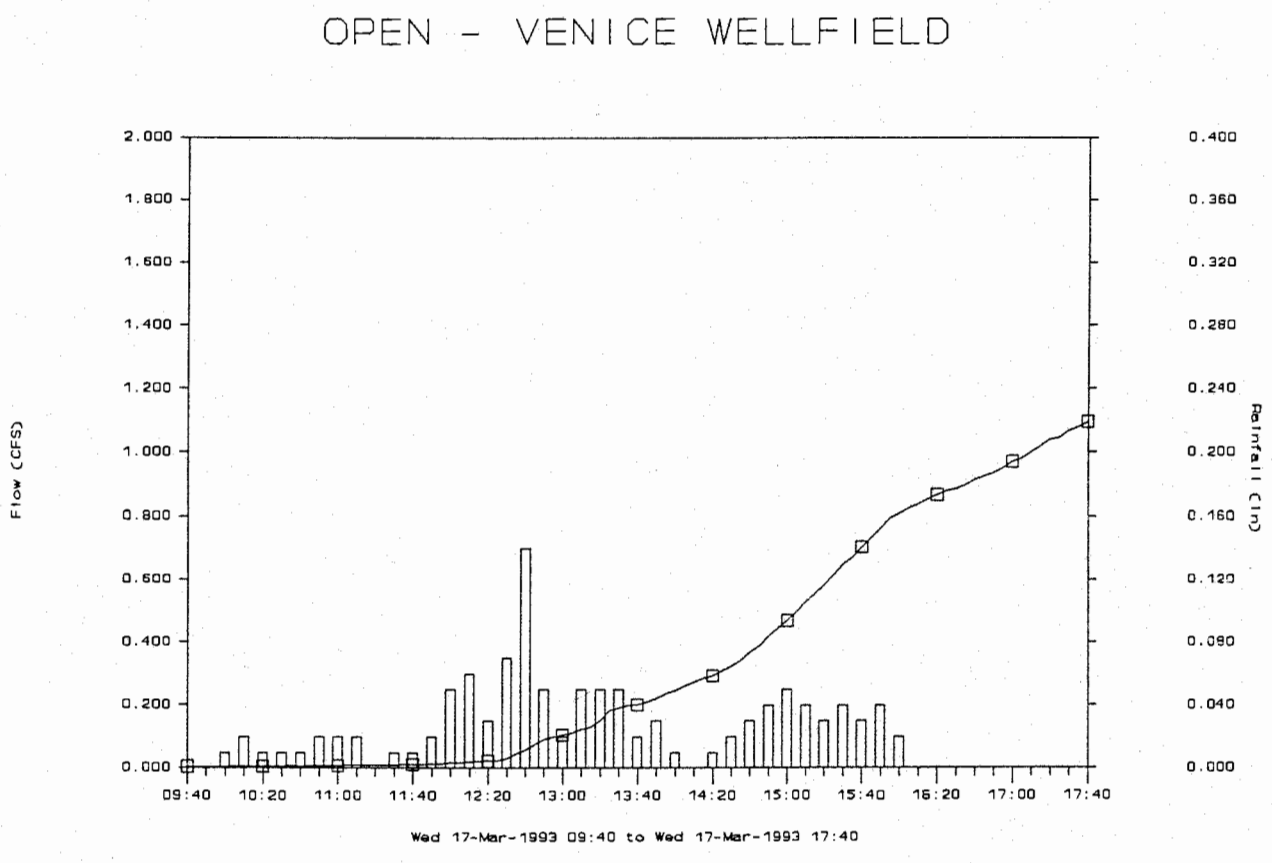
Peak Flow Rate:	1.31	(cfs)
Max Flow Depth:	0.84	(feet)
Total Sampled Vol:	77-5,310*	(cf)
Total Runoff Vol:	70,700	(cf)
Baseflow Runoff Vol:	820	(cf)

*See Text

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	4	(days)

Grab Sample Time:	12:54	(hhmm EST)
Flow Weighted Sample Times:	11:54-16:16*	(hhmm EST)
Composite Flow Interval:	320	(cf)
No. of Samples:	16	



VENICE WELLFIELD - April 15, 1993

A rainfall event of 1.68 inches, resulting from a frontal weather system, was sampled on April 15 and 16, 1993. The total event duration was 5 hours 30 minutes, from 16:50 until 22:20, April 15. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 2.40, 1.20, and 0.74 inches per hour, respectively. The maximum flow rate was 1.62 cfs (0.92 feet in depth) during the event.

Antecedent rainfall for the 72-hour period prior to sampling was 0.00 inches. The most recent rainfall event prior to the sampling was 0.28 inches, received between 09:50 and 12:25 on April 9, 6 days prior. The previous analytical data reported for this site was from March 17, 1993.

Sampling routines initiated at 21:29, grab samples were collected at 22:29, and flow-weighted composites were secured between 21:34, April 15, and 00:48, April 16, or over a total period of 3 hours 19 minutes.

The sampled event produced a total of 76,350 cf of runoff, with flow continuing until April 19. Composite samples were collected between 80 and 16,400 cf of the cumulative runoff, or until over 21% of the runoff had occurred. Grab samples were collected at 3,850 cf of total runoff.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: VENICE WELLFIELD SITE ID: 006 STORM DATE: 04-15-93

Site Characteristics

Drainage Area:	17.8	(acres)
% Impervious:	5	%
Land Use:	Open	

Storm Precipitation Data Summary

Site Precipitation:	1.68	(inches)
Maximum Intensity:		
5 min:	2.40	(inches/hr)
15 min:	1.20	(inches/hr)
30 min:	0.74	(inches/hr)

Storm Flow Data Summary

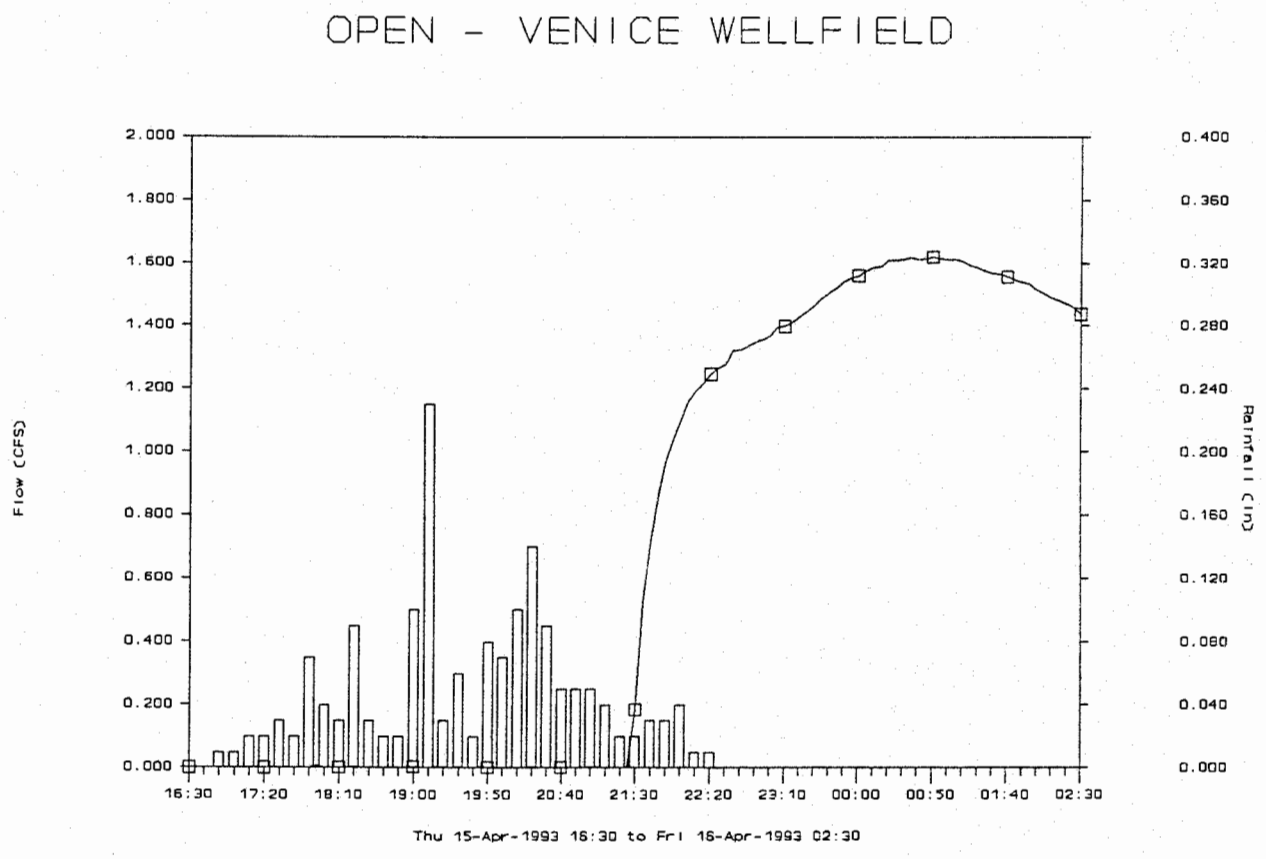
Peak Flow Rate:	1.62	(cfs)
Max Flow Depth:	0.92	(feet)
Total Sampled Vol:	80-16,400	(cf)
Total Runoff Vol:	76,350	(cf)
Baseflow Runoff Vol:	0	(cf)

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	6	(days)

Grab Sample Time:	22:39	(hhmm EST)
Flow Weighted Sample Times:	21:29-00:48	(hhmm EST)

Composite Flow Interval:	1400	(cf)
No. of Samples:	12	



MEDIUM DENSITY RESIDENTIAL - BRIARWOOD RD.

The second of the two medium density residential land uses sampled consisted of a basin 14 acres in area, with approximately 35 percent DCIA, located at 455 Briarwood Rd., in the City of Venice. The residential units consist of single family homes, constructed between 1956 and 1975, at approximately 6 units per acre. At the sampling site the drainage from the basin consists of a 24 inch CMP with a slope of 1.39 percent. The above dimensions, together with a roughness coefficient of 0.024, were used in Manning's equation for the computation of flow from level measurements.

Runoff from the sampling site discharges into a series of stormwater ponds at the rear of the property. The level in the stormwater ponds have partially submerged the outfall on occasion, but was not observed to produce a backwater at the sampling site.

BRIARWOOD RD. - September 13, 1992

A rainfall event of 0.96 inches was sampled on September 13, 1992. The total rainfall event duration was 4 hours 15 minutes, from 16:40 until 20:55. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 2.76, 1.96, and 1.32 inches per hour, respectively. The maximum flow rate was 1.44 cfs (0.43 feet in depth) during the event.

Antecedent rainfall for the 24-hour period prior to 16:40 was 0.07 inches, a total of 0.10 inches for the 48 hours prior, and a total of 0.14 inches for the 72 hours prior to the sampling. No runoff was generated from any of this rainfall. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.13 inches, received from 16:45 until 17:10, on September 7, 6 days prior. No analytical data had previously been reported for this site.

Sampling routines initiated at 16:41, grab samples were collected at 16:56, and flow-weighted composites were secured between 16:48 and 18:42, or over a total period of 2 hours 1 minute.

The sampled event produced a total of 3,200 cf of runoff. Composite samples were collected between 1 and 2,980 cf, or of 93 percent of the cumulative runoff.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: BRIARWOOD ROAD | SITE ID: 007 | STORM DATE: 09-13-92

Site Characteristics

Drainage Area:	14.0	(acres)
% Impervious:	35	%
Land Use:	Medium Density Residential	

Storm Precipitation Data Summary

Site Precipitation:	0.96	(inches)
Maximum Intensity:		
5 min:	2.76	(inches/hr)
15 min:	1.96	(inches/hr)
30 min:	1.32	(inches/hr)

Storm Flow Data Summary

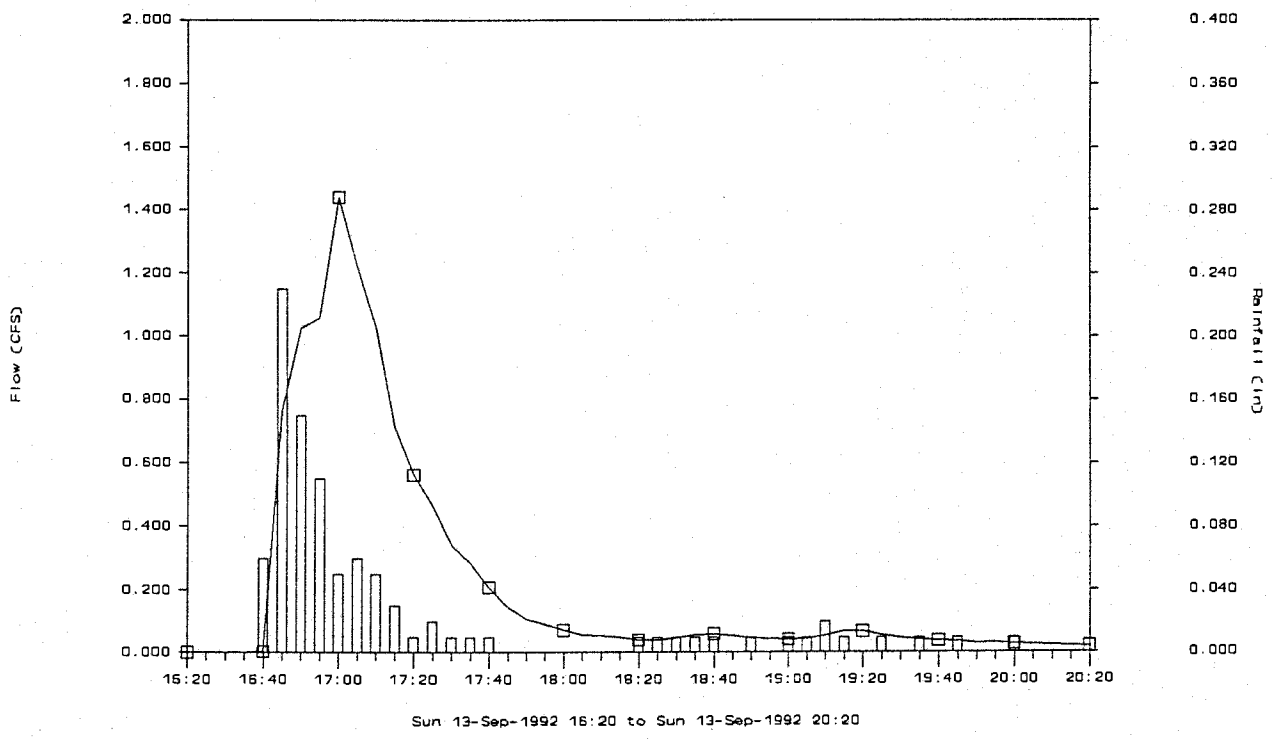
Peak Flow Rate:	1.44	(cfs)
Max Flow Depth:	0.43	(feet)
Total Sampled Vol:	1-2,980	(cf)
Total Runoff Vol:	3,200	(cf)
Baseflow Runoff Vol:	0	(cf)

Antecedent Precipitation

24 Hour:	0.07	(inches)
48 Hour:	0.10	(inches)
72 Hour:	0.14	(inches)
Last rain >0.1":	6	(days)

Grab Sample Time:	16:56	(hhmm EST)
Flow Weighted Sample Times:	16:41-18:42	(hhmm EST)
Composite Flow Interval:	300	(cf)
No. of Samples:	10	

MEDIUM DENSITY RESIDENTIAL - BRIARWOOD RD.



BRIARWOOD RD. - January 8, 1993

A rainfall event of 1.71 inches, resulting from a frontal weather system, was sampled on January 8, 1993. The total rainfall event duration was 7 hours 45 minutes, or from 17:55 until 01:40, on January 9. Another 0.07 inches was received intermittently until 05:25 on January 9. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 1.20, 1.00, and 0.82 inches per hour, respectively. The maximum flow rate was 0.97 cfs (0.35 feet in depth) during the event.

Antecedent rainfall for the 72-hour period prior to 17:55 was 0.00 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.34 inches received between 17:10 and 18:15 on January 1, 7 days prior. The previous analytical data reported for this site were from an event on September 13.

Sampling routines initiated at 18:01 and grab samples were collected at 18:06, but due to an equipment malfunction, sampling did not continue for the entire event or for three hours. Flow weighted composites were secured between 18:13 and 19:18 until a pump jammed, over a total period of 1 hour 5 minutes. Due to the difficulty in sampling this station, however, and the collection of the first flush of the storm, the sample was processed for all parameters.

The sampled event produced a total of 5,700 cf of runoff. The grab sample was collected at 170 cf of cumulative runoff for the event and the composite samples collected between 110 and 2,170 cf or of 38 percent of the cumulative runoff.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: BRIARWOOD ROAD | SITE ID: 007 | STORM DATE: 01-08-93

Site Characteristics

Drainage Area:	14.0	(acres)
% Impervious:	35	%
Land Use:	Medium Density Residential	

Storm Precipitation Data Summary

Site Precipitation:	1.71	(inches)
Maximum Intensity:		
5 min:	1.20	(inches/hr)
15 min:	1.00	(inches/hr)
30 min:	0.82	(inches/hr)

Storm Flow Data Summary

Peak Flow Rate:	0.97	(cfs)
Max Flow Depth:	0.35	(feet)
Total Sampled Vol:	110-2,170	(cf)
Total Runoff Vol:	5,700	(cf)
Baseflow Runoff Vol:	0	(cf)

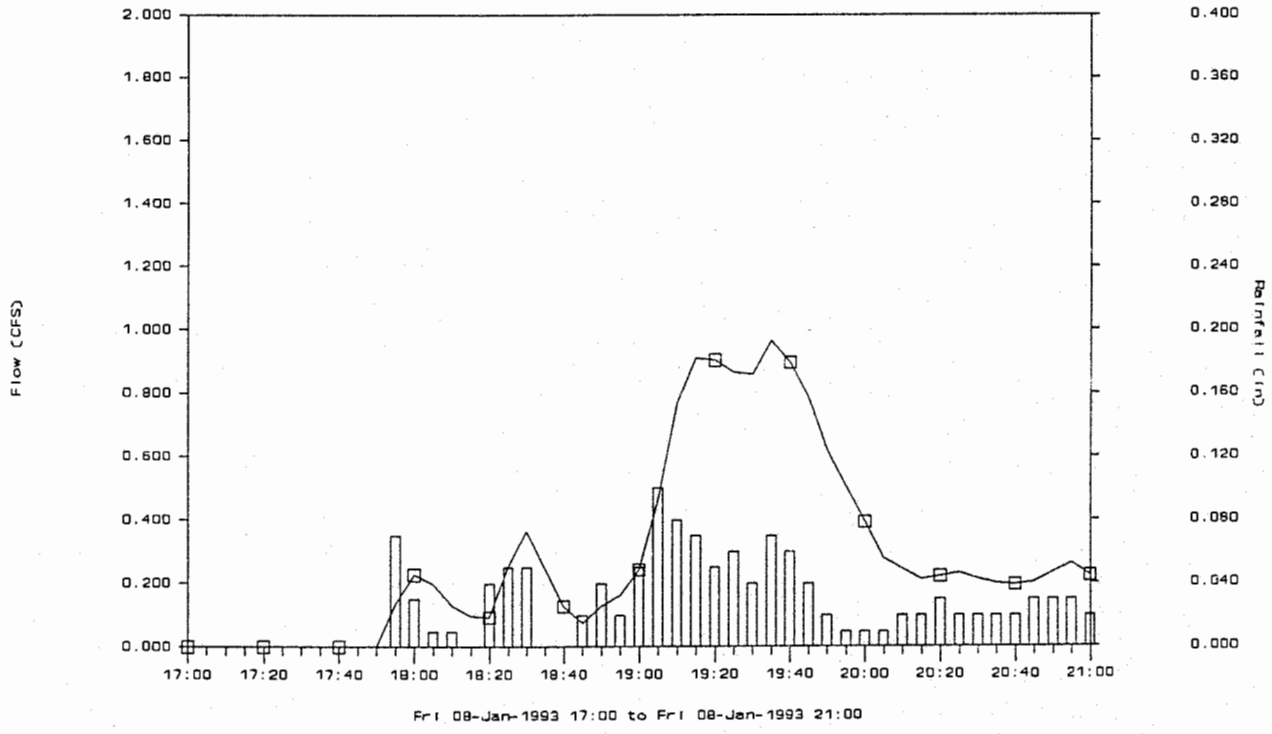
Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	7	(days)

Grab Sample Time:	18:06	(hhmm EST)
Flow Weighted Sample Times:	18:10-19:18	(hhmm EST)

Composite Flow Interval:	350	(cf)
No. of Samples:	6	

MEDIUM DENSITY RESIDENTIAL - BRIARWOOD RD.



BRIARWOOD RD. - January 14, 1993

A rainfall event of 0.74 inches was collected on January 14, 1993. The total rainfall event duration was 2 hours 25 minutes, or from 14:45 until 17:10. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 1.56, 1.00, and 0.82 inches per hour, respectively. The maximum flow rate was 0.72 cfs (0.30 feet in depth) during the event.

Antecedent rainfall for the 24-hour period prior to 14:45 was 0.01 inches and for the 48 and 72 hours prior totalled 0.05 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 1.78 inches, received between 17:55, January 8, and 05:25, January 9, 8 days prior. The previous analytical data reported for this site were from an event on January 8.

Sampling routines initiated at 15:24, grab samples were collected at 15:29, and flow-weighted composites were secured between 15:31 and 17:44, or over a total period of 2 hours 20 minutes. The sampled event produced a total of 2,210 cf of runoff. The grab sample was collected at 300 cf and composite samples were collected between 130 and 2,180 cf of the cumulative runoff, or of 99 percent of the total runoff.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: BRIARWOOD ROAD | SITE ID: 007 | STORM DATE: 01-14-93

Site Characteristics

Drainage Area:	14.0	(acres)
% Impervious:	35	%
Land Use:	Medium Density Residential	

Storm Precipitation Data Summary

Site Precipitation:	0.74	(inches)
Maximum Intensity:		
5 min:	1.56	(inches/hr)
15 min:	1.00	(inches/hr)
30 min:	0.82	(inches/hr)

Storm Flow Data Summary

Peak Flow Rate:	0.72	(cfs)
Max Flow Depth:	0.30	(feet)
Total Sampled Vol:	130-2,180	(cf)
Total Runoff Vol:	2,210	(cf)
Baseflow Runoff Vol:	0	(cf)

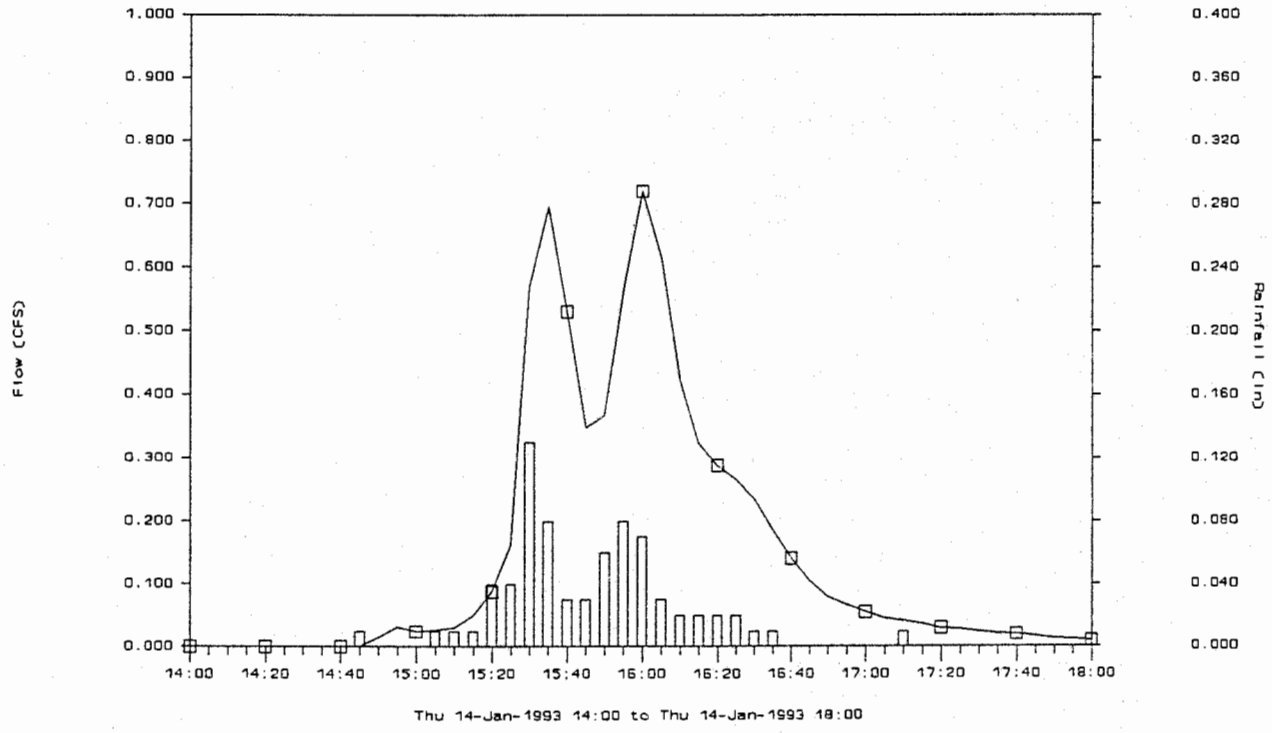
Antecedent Precipitation

24 Hour:	0.01	(inches)
48 Hour:	0.05	(inches)
72 Hour:	0.05	(inches)
Last rain >0.1":	8	(days)

Grab Sample Time:	15:29	(hhmm EST)
Flow Weighted Sample Times:	15:24-17:44	(hhmm EST)

Composite Flow Interval:	200	(cf)
No. of Samples:	11	

MEDIUM DENSITY RESIDENTIAL - BRIARWOOD RD.



BRIARWOOD RD. - February 22, 1993 - Bacteria Only

A rainfall event of 0.17 inches, resulting from a frontal weather system, was sampled on February 22, 1993. The total event duration was 35 minutes, from 16:45 until 17:20. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 0.60, 0.48, and 0.30 inches per hour, respectively. Maximum flow rates were 0.35 cfs (0.21 feet in depth) during the event.

Antecedent rainfall for the 72-hour period prior was 0.00 inches. The most recent rainfall event prior to the sampling was 0.38 inches, received between 9:25 and 9:35 on February 12, 10 days prior. The previous analytical data reported for this site was from an event on January 14, 1993.

Grab samples were collected at 17:10. Insufficient sample was collected for the analysis of all parameters from the flow-weighted composite, and so the sample was processed for bacteriological parameters alone. The sampled event produced a total of 340 cf of runoff.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: BRIARWOOD ROAD | SITE ID: 007 | STORM DATE: 02-22-93

Site Characteristics

Drainage Area:	14.0	(acres)
% Impervious:	35	%
Land Use:	Medium Density Residential	

Storm Precipitation Data Summary

Site Precipitation:	0.17	(inches)
Maximum Intensity:		
5 min:	0.60	(inches/hr)
15 min:	0.48	(inches/hr)
30 min:	0.30	(inches/hr)

Storm Flow Data Summary

Peak Flow Rate:	0.35	(cfs)
Max Flow Depth:	0.21	(feet)
Total Sampled Vol:	N/A	(cf)
Total Runoff Vol:	340	(cf)
Baseflow Runoff Vol:	0	(cf)

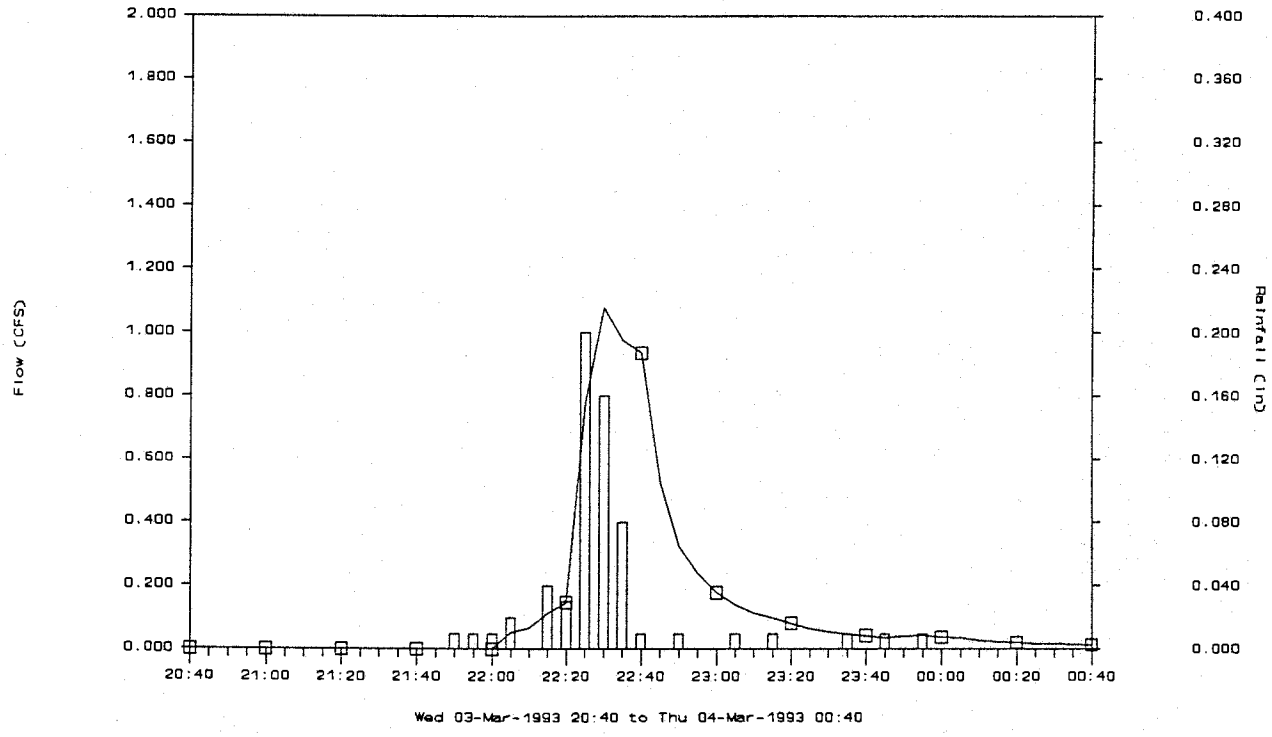
Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	10	(days)

Grab Sample Time:	17:10	(hhmm EST)
Flow Weighted Sample Times:	N/A	(hhmm EST)
Composite Flow Interval:	N/A	(cf)
No. of Samples:	N/A*	

N/A=Not applicable
*Grab sample processed for bacteria only

MEDIUM DENSITY RESIDENTIAL - BRIARWOOD RD.



BRIARWOOD RD. - February 26, 1993

A rainfall event of 1.23 inches, resulting from a frontal weather system, was sampled on February 26, 1993. The total rainfall event duration was 4 hours 25 minutes, from 10:10 until 14:35. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 1.68, 1.28, and 1.06 inches per hour, respectively. The maximum flow rate was 0.94 cfs (0.35 feet in depth) during the event.

Antecedent rainfall for the 72-hour period prior to 10:10 was 0.00 inches. The most recent rainfall event (>0.1 inches) prior to the sampling was 0.17 inches, received between 16:45 and 17:20 on February 22, 4 days prior. The previous analytical data reported for this site were from an event on February 22.

Sampling routines initiated at 10:40, grab samples were collected at 10:45. Due to the amount of rainfall received, the initial flow-weighted sampling regime was rapidly completed, samples being collected between 10:44 and 11:13. A delay in restarting the sampler with additional sample containers resulted in a second flow-weighted composite sample collected between 12:17 and 13:46 on February 26. While the total period sampled was 3 hours 6 minutes, there was a 1 hour 4 minute gap in the total collection. Accordingly, while grab samples were processed normally, the two flow-weighted composites were analyzed separately, to permit an assessment of the differences in water quality over the course of the storm, and to allow for mathematical compositing of the entire event collected.

The sampled event produced a total of 4,010 cf of runoff. Composite samples were collected between 70 and 1,430 cf and between 2,750 and 3,810 cf of the cumulative runoff, or until 95 percent of the total runoff had occurred.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: BRIARWOOD ROAD | SITE ID: 007 | STORM DATE: 02-26-93

Site Characteristics

Drainage Area:	14.0	(acres)
% Impervious:	35	%
Land Use:	Medium Density Residential	

Storm Precipitation Data Summary

Site Precipitation:	1.23	(inches)
Maximum Intensity:		
5 min:	1.68	(inches/hr)
15 min:	1.28	(inches/hr)
30 min:	1.06	(inches/hr)

Storm Flow Data Summary

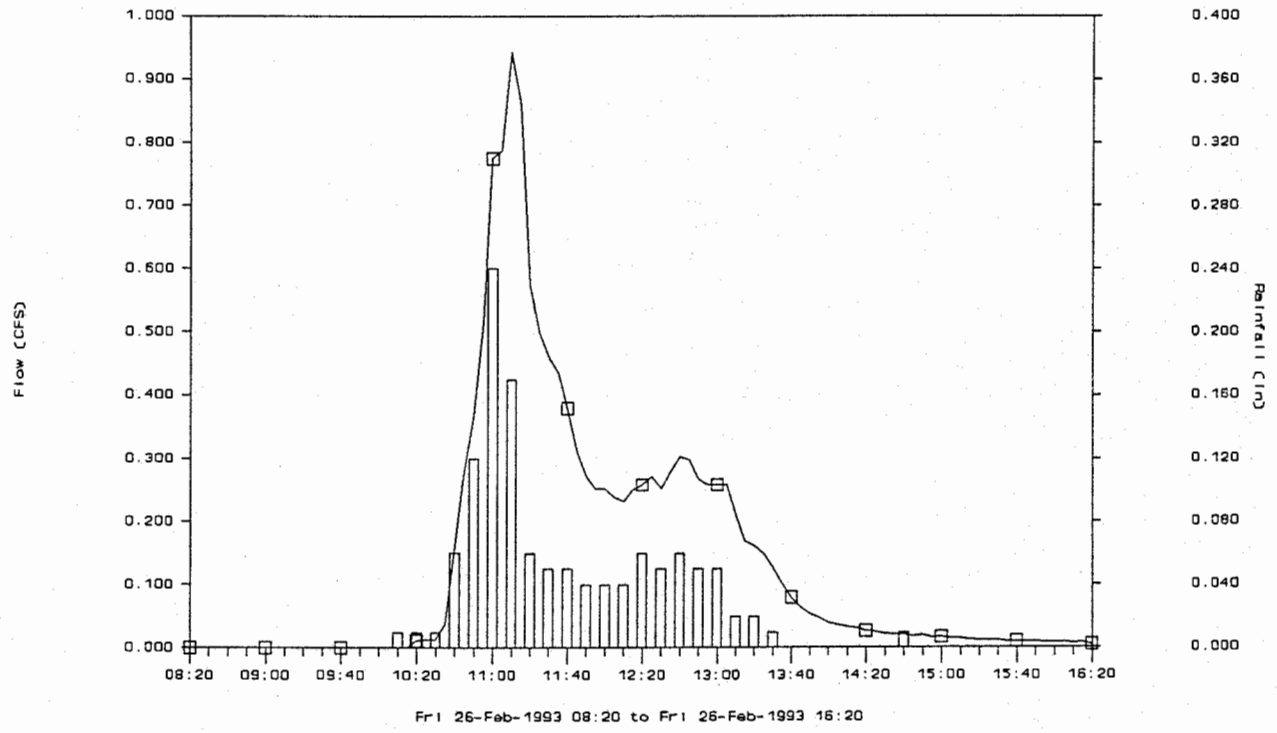
Peak Flow Rate:	0.94	(cfs)
Max Flow Depth:	0.35	(feet)
Total Sampled Vol:	70-3,810*	(cf)
Total Runoff Vol:	4,010	(cf)
Baseflow Runoff Vol:	0	(cf)

*See Text

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.00	(inches)
72 Hour:	0.00	(inches)
Last rain >0.1":	4	(days)
Grab Sample Time:	10:45	(hhmm EST)
Flow Weighted Sample Times:	10:40-13:46*	(hhmm EST)
Composite Flow Interval:	100	(cf)
No. of Samples:	24	

MEDIUM DENSITY RESIDENTIAL - BRIARWOOD RD.



BRIARWOOD RD. - March 3, 1993

A rainfall event of 0.63 inches, resulting from a frontal weather system, was sampled on March 3, 1993. The total rainfall event duration was 2 hours 5 minutes, from 21:50 until 23:55. Maximum rainfall intensities for 5-, 15-, and 30-minute periods were 2.40, 1.76, and 1.04 inches per hour, respectively. The maximum flow rate was 1.08 cfs (0.37 feet in depth) during the event.

Antecedent rainfall for the 24-hour period prior to 21:50 was 0.00 inches, while rainfall totalled 0.01 inches in the prior 48 hours and 72 hours. Previous analytical data reported for this site were also from an event on February 26.

Sampling routines initiated at 22:16, grab samples were collected at 22:21, and flow-weighted composites were secured between 22:31 and 22:59, or over a total period of 43 minutes.

The sampled event produced a total of 1,860 cf of runoff. Grab samples were collected at 110 cf and composite samples were collected between 70 and 1,630 cf of the cumulative runoff, or until 88 percent of the total runoff had been occurred.

NPDES PART 2 STORM EVENT SUMMARY DATA

SITE NAME: BRIARWOOD ROAD | SITE ID: 007 | STORM DATE: 03-03-93

Site Characteristics

Drainage Area:	14.0	(acres)
% Impervious:	35	%
Land Use:	Medium Density Residential	

Storm Precipitation Data Summary

Site Precipitation:	0.63	(inches)
Maximum Intensity:		
5 min:	2.40	(inches/hr)
15 min:	1.76	(inches/hr)
30 min:	1.04	(inches/hr)

Storm Flow Data Summary

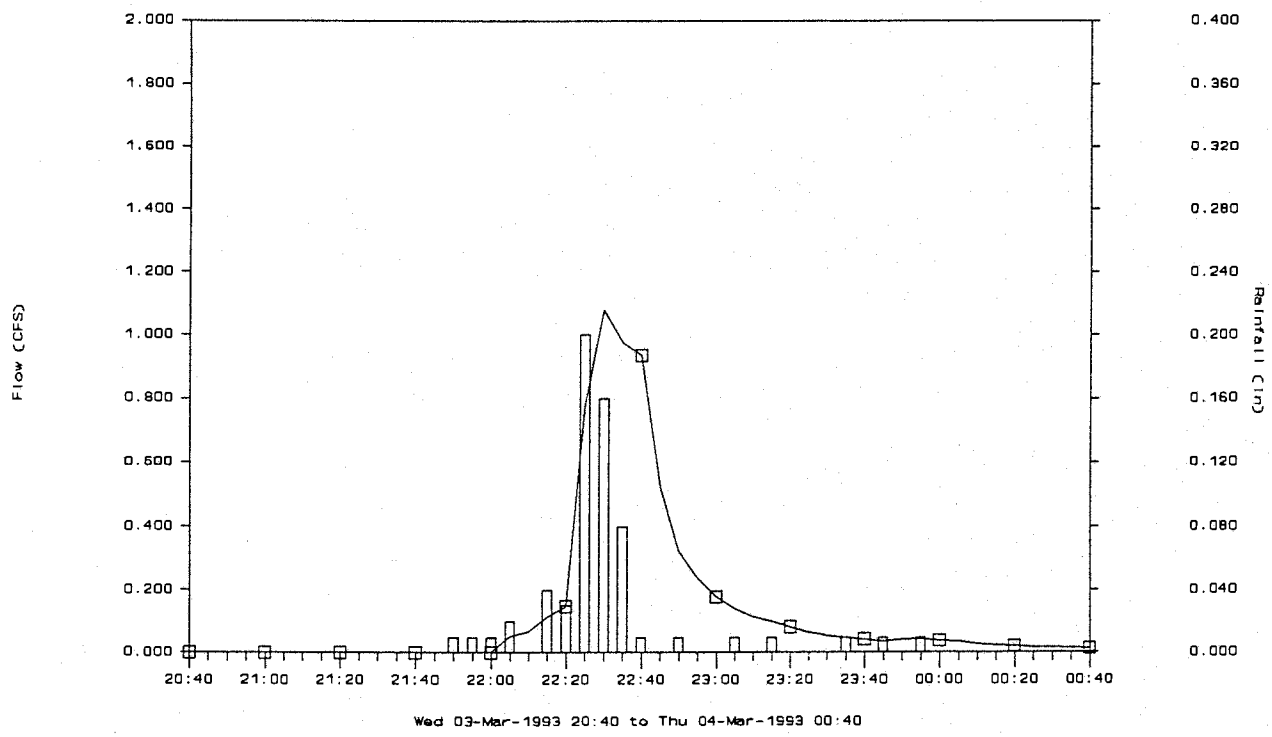
Peak Flow Rate:	1.08	(cfs)
Max Flow Depth:	0.37	(feet)
Total Sampled Vol:	70-1,630	(cf)
Total Runoff Vol:	1,860	(cf)
Baseflow Runoff Vol:	0	(cf)

Antecedent Precipitation

24 Hour:	0.00	(inches)
48 Hour:	0.01	(inches)
72 Hour:	0.01	(inches)
Last rain >0.1":	5	(days)

Grab Sample Time:	22:21	(hhmm EST)
Flow Weighted Sample Times:	22:16-22:59	(hhmm EST)
Composite Flow Interval:	400	(cf)
No. of Samples:	3	

MEDIUM DENSITY RESIDENTIAL - BRIARWOOD RD.



REFERENCES

Grant, D.M. 1989. ISCO Open Channel Flow Measurement. Third Edition. ISCO Environmental Division, Lincoln, NE

Requirement:

40 CFR 122.26 (d) (2) (iii)

Characterization data. *When "quantitative data" for a pollutant are required under paragraph (d)(2)(iii)(A)(3) of this paragraph, the applicant must collect a sample of effluent in accordance with 40 CFR 122.21(g)(7) and analyze it for the pollutant in accordance with analytical methods approved under 40 CFR part 136. When no analytical method is approved the applicant may use any suitable method but must provide a description of the method. The applicant must provide information characterizing the quality and quantity of discharges covered in the permit application, including:*

(B) Estimates of the annual pollutant load of the cumulative discharges to waters of the United States from all identified municipal outfalls and the event mean concentration of the cumulative discharges to waters of the United States from all identified municipal outfalls during a storm event (as described under §122.21(c)(7)) for BOD_5, COD, TSS, dissolved solids, total nitrogen, total ammonia plus organic nitrogen, total phosphorus, dissolved phosphorus, cadmium, copper, lead, and zinc. Estimates shall be accompanied by a description of the procedures for estimating constituent loads and concentrations, including any modelling, data analysis, and calculation methods;

40 CFR 122.26 (d) (2) (iii) (B)

ESTIMATION OF ANNUAL POLLUTANT LOADING

Estimates of annual loadings were developed based on land-use specific runoff concentrations and estimates of the runoff volume. The inputs, sources of data and calculations are extensively detailed in the ensuing sections. The core model calculations have been previously reviewed by EPA as the public domain version developed for FDER. The capabilities of that version are documented in a Compendium of Watershed-Scale Management Models for TMDL Development (EPA841-R-92-002).

Summary tables begin with Table 10 and a discussion of the resultant estimates begins on page 3B-49 in accordance with the requirements to estimate cumulative annual loads. It should be noted that the watershed EMCs include storm loadings from both urban and non-urban sources, some of which are exempt from stormwater NPDES regulations.

INTRODUCTION TO THE WATERSHED MANAGEMENT MODEL

The Nonpoint Source Pollutant loading estimates were produced using the Watershed Management Model (WMM) developed by CDM. The WMM is a spreadsheet model used to estimate seasonal and annual nonpoint source loads from direct runoff based upon event mean concentrations (EMCs) and runoff volumes. Data required to use the nonpoint source model include EMCs for each pollutant type, land use, average annual precipitation, annual baseflow, and average baseflow pollutant concentrations. This model was designed to run on Lotus® software and is based on the WMM developed for the Florida Department of Environmental

Regulation (FDER) by CDM. The features and limitations of the WMM are summarized below. Model capabilities include:

- Lotus 1-2-3® as the spreadsheet shell program (Release 2.3).

- Estimates of annual runoff pollution load for nutrients (total phosphorus, dissolved phosphorus, total nitrogen, ammonia plus organic nitrogen), heavy metals (lead, copper, zinc, cadmium), and oxygen demand and sediment (BOD_5, COD, total suspended solids, total dissolved solids) based upon EMCs, land use, percent impervious, and annual rainfall.

- Estimates of runoff pollution load reduction due to partial or full-scale implementation of onsite or regional Best Management Practices (BMPs).

- Reduction in runoff pollution load due to uptake or removal in stream courses.

- An estimate of annual pollution loads from stream baseflow.

- Estimates of point source loads for comparison with relative magnitude of nonpoint pollution loads.

- Estimate of pollution loads from septic tanks.

The model is a planning level tool that provides a basis for evaluation of the long-term nonpoint pollution loading reductions and management strategies. Stormwater pollution control strategies may be identified and evaluated for nonstructural controls, including land use controls and buffer zones, and for structural BMPs including onsite and regional detention basins. Combinations of nonstructural and structural controls can be evaluated to develop a stormwater management plan. Within a given watershed, multiple subbasins can be evaluated. This provides information

regarding the relative contribution of nonpoint pollution loadings from various areas within a watershed which can be used for targeting control measures to those areas which are responsible for generating the majority of the pollutant load.

At its simplest form, the WMM calculates loads as the product of runoff and a mean concentration in that runoff. For a given pollutant, both the mean concentration and the amount of runoff vary by land use. The Nonpoint Pollution module of WMM uses these land-use specific runoff rates and runoff concentrations, coupled with annual rainfall amounts to arrive at "pounds per acre per year" pollutant loadings for each land-use type. These loading rates are then multiplied by the number of acres of each land-use, and summed by sub-basin or watershed to arrive at a total annual loading. Pollutant loading analyses include the 12 constituents which are required under Part 2 of a NPDES municipal stormwater permit application.

Table 1 presents the EMCs and percent imperviousness values used in the WMM for each land use. The development of the EMC and imperviousness parameters are described in the next section.

SARASOTA COUNTY MS4
NPDES PERMIT APPLICATION PART 2

TABLE 1
MEAN EMCS
mg/l

Land Use	% Impervious	BOD	COD	TSS	TDS	Nutrients TP	SP	TKN	NO23	Heavy Metals Pb	Cu	Zn	Cd
Forest/Open	1.0%	8.0	51	216	100	0.16	0.06	0.82	0.20	0.00	0.00	0.00	0.000
Pasture/Range Land	1.0%	8.0	51	216	100	0.16	0.06	0.82	0.20	0.00	0.00	0.00	0.000
Agriculture/Cropland	1.0%	8.0	51	216	100	1.13	0.42	2.99	0.75	0.00	0.00	0.00	0.000
LDSF	20.0%	10.8	83	140	100	0.39	0.16	1.50	0.37	0.05	0.05	0.05	0.002
MDSF/Institutional	30.0%	10.8	83	140	100	0.39	0.16	1.50	0.37	0.05	0.05	0.05	0.002
HDR	40.0%	10.8	83	140	100	0.33	0.16	1.32	0.33	0.08	0.05	0.06	0.002
Commercial	85.0%	9.7	61	91	100	0.15	0.10	1.06	0.12	0.24	0.04	0.12	0.002
Light Industrial	70.0%	9.7	61	91	100	0.15	0.10	1.06	0.12	0.24	0.04	0.12	0.002
Water	25.0%	3.1	19	91	100	0.17	0.12	0.50	0.48	0.01	0.04	0.15	0.001
Major Highway	90.0%	9.7	103	142	100	0.15	0.10	1.06	0.12	0.24	0.05	0.12	0.002
Extractive	40.0%	30.0	60	30	500	0.15	0.10	1.06	0.12	0.03	0.04	0.10	0.007

RAINFALL/RUNOFF RELATIONSHIPS

Nonpoint pollution loading rates (lbs/acre/year) for different land use categories are based upon annual runoff volumes and EMCs for different pollutants. An average pollutant concentration in runoff from a storm event can be calculated as the total pollutant mass divided by the total volume of runoff. Obviously, the "first-flush" concentrations will be higher, but generally these correspond to fairly low runoff volumes and then the concentration diminishes as the flow increases. The "average" concentration therefore represents the entire storm. Averaging the mean concentration of many storms from the same site, or same type of land use results in an EMC which is representative of the typical concentration from that land use. One of the keys to effective transfer of literature values for nonpoint pollution loading factors to a particular study area is to make adjustments for actual runoff volumes for that watershed. In order to calculate annual runoff volumes for each subbasin, the pervious and impervious fractions of each land use category are used as the basis for determining rainfall/runoff relationships.

ANNUAL RUNOFF VOLUME

Annual runoff volumes for the pervious/impervious areas in each land use category are calculated by multiplying the average annual rainfall volume by a runoff coefficient. A runoff coefficient of 0.95 is typically used for impervious areas (i.e., 95 percent of the rainfall is assumed to be converted to runoff from the impervious fraction of each land use). A pervious area runoff coefficient of 0.15 is typically used. These typical values were used in the Sarasota WMM. The total average annual surface runoff from land use "L" is calculated by weighting the impervious and pervious area runoff factors for each land use category as follows:

$$R_L = [\, C_P + (C_I - C_P) IMP_L]^* I$$

Where: R_L = total average annual surface runoff from land use "L" (in/yr)

IMP_L = fractional imperviousness of land use "L" from Table 1

I = long-term average annual precipitation (in/yr)

C_P = pervious area runoff coefficient = 0.15

C_I = impervious area runoff coefficient = 0.95

Total runoff in a watershed is the area-weighted sum of R_L for all land uses.

Insofar as possible, impervious area percentages presented in Table 1 are based on several local studies, including the Sarasota Bay National Estuary Program (SBNEP) Nonpoint Source Study, the Big Slough Watershed Study and the Sarasota County Stormwater Utility Study.

It should be noted that the impervious area percentages do not necessarily represent directly connected impervious area (DCIA). Using a single family residence as an example, rain falls on rooftops, sidewalks, and driveways. The sum of these areas may represent 30 percent of the total lot. However, much of the rain that falls on the roof drains to the grass and infiltrates to the ground or runs off the property and thus does not run directly to the street. Thus, not all of the 30 percent impervious area actually contributes as impervious area and the DCIA percentage is less than the total impervious area percentage. The DCIA percentage varies as a function of total imperviousness, as illustrated in Figure 1.

NONPOINT POLLUTION EVENT MEAN CONCENTRATIONS

During the Nationwide Urban Runoff Program (NURP), EMCs were measured for various land uses and pollutants during 2,000-plus rainstorms across the country. Comparison of these results indicated that for a given land use, the EMCs for many pollutants did not vary appreciably from one part of the country to another. Therefore, extrapolation, or even pooling of data can be performed without introducing significant errors in the estimates, and these nationally derived values were used for the core of EMC data in Table 1.

Nonpoint pollution monitoring studies throughout the U.S. over the past 10 years have shown that annual "per acre" discharges of urban stormwater pollution (e.g., nutrients, metals, BOD,

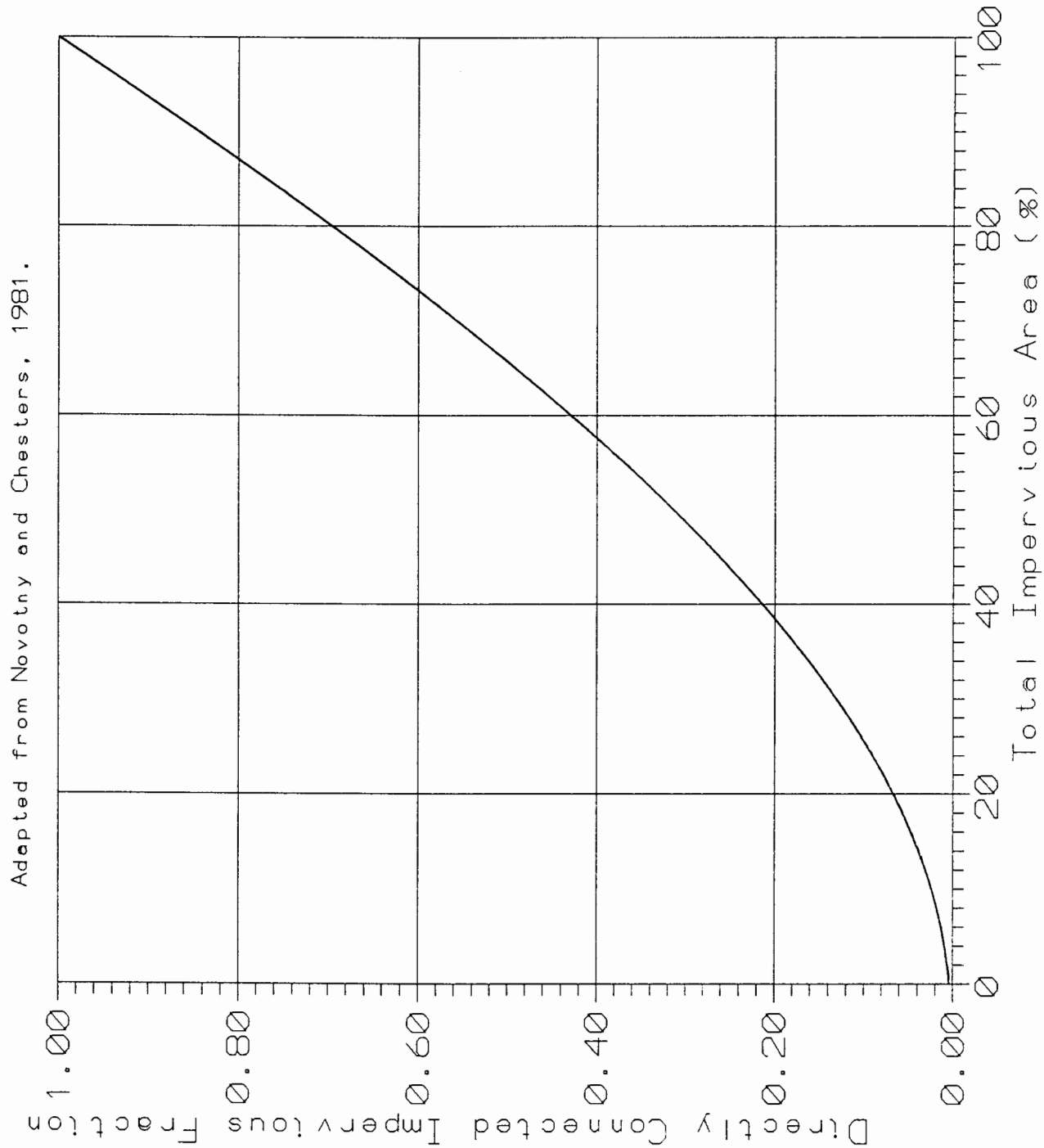

Adapted from Novotny and Chesters, 1981.
Directly Connected Impervious Fraction
1.00
0.80
0.60
0.40
0.20
0.00
0
20
40
60
80
100
Total Impervious Area (%)

Figure 1.

fecal coliforms) are positively related to the amount of imperviousness in the land use (i.e., the more imperviousness the greater the nonpoint pollution load), and that the EMC is fairly consistent for a given land use.

Lead, cadmium, copper and zinc are heavy metals which typically exhibit higher nonpoint pollutant loadings than other metals found in urban runoff. These heavy metals may be viewed as surrogates for a wide range of toxicants that have been identified in previous field monitoring studies of urban runoff pollution (USEPA, 1983). The lead loading factors in Table 1 reflect single land use monitoring data collected in the early 1980s during the NURP field studies (NVPDC, 1983). It is conceivable that lead loading factors will be reduced in future years as older automobiles which can use leaded gasoline are retired.

EVENT MEAN CONCENTRATIONS

Except as noted below, EMCs for all land uses are based on the pooled USEPA NURP study national EMC statistics (EPA, 1983). Highway runoff data reported by the Federal Highway Administration (FHWA, 1990) is applied to major highways. Only four land use groups were considered in the NURP study final report: residential (RES), commercial (COMM), mixed commercial/residential (MIXED), and open/nonurban (OPEN). Only four monitoring sites under NURP were characterized as industrial and these sites did not represent heavy industrial land uses, but rather light industrial park land use. The industrial sites were combined with the commercial sites for the evaluation of national statistics. The FHWA highway runoff data are treated as a separate land use category (Transportation).

Several sites in Tampa, Florida were monitored during the NURP study. Additional urban runoff quality was collected at Tampa and St. Petersburg by the USGS (1984) and nonurban values were derived from the open watersheds of Tampa Bay by CDM (1984). These values were used to revise the national values obtained from the NURP study. The loading factors in Table 1 represent the best regional estimates presently available and coincide with the values

used recently in the completion of the Sarasota Bay National Estuary Program loading assessment.

EMC monitoring data collected by NURP and FHWA were determined to be lognormally (base e) distributed. The lognormal distribution allows the EMC data to be described by two parameters: the mean or median, which is a measure of central tendency, and the standard deviation or coefficient of variation (standard deviation divided by the mean), which is a measure of the dispersion or spread of the data. The median value should be used for comparisons between EMCs for individual sites or groups of sites because it is less influenced by a small number of large values which is typical of lognormally distributed data. For computations of annual mass loads, it is more appropriate to use the mean value since large infrequent events can comprise a significant portion of the annual pollutant loads. Mean values of EMCs were used for the present loading estimates.

To estimate pollutant loads discharged to receiving waters from a municipality, median EMCs are converted to mean values (USEPA, 1983; Novotny, 1992) by the following relationship:

$$M = T * (1 + CV^2)^{+1/2}$$

Where: M = arithmetic mean
T = median
CV = coefficient of variation = standard deviation/mean

EMC data for TDS and cadmium were not analyzed in the final NURP report (EPA, 1983) although these constituents were routinely analyzed at several of the NURP sites. Cadmium was analyzed during part of the priority pollutant scans performed on 121 samples of the more than 2,300 runoff samples analyzed as part of the NURP. The priority pollutant scans were performed at 61 sites (two storm events per site) at 20 of the NURP project sites. Cadmium was

detected in 48 percent of the limited number of NURP priority pollutant samples. Cadmium concentrations detected as part of the priority pollutant scan ranged from 0.1 to 14 μg/L. Under the Knoxville NURP project (TVA, 1984), cadmium and TDS were routinely analyzed for all stormwater samples and the following geometric EMCs were reported:

Monitoring	TDS (mg/L)	Cadmium (μg/L)
Residential (R1)	103	1.5
Residential (R2)	59	0.6
Central Business District	84	1.0
Strip Commercial	63	0.9

The Tampa NURP study reported mean cadmium concentrations in pooled runoff data of 2.5 μg/L (Metcalf & Eddy, 1983). The Long Island NURP study reported stormwater concentrations of cadmium ranging from 0.0 to 1.0 μg/L at the NURP monitoring sites (Long Island Regional Planning Board, 1982). Monitoring data collected during 1976 and 1977 in Northern Virginia for single land use watersheds reported mean cadmium concentrations of 1.4 μg/L to 5.0 μg/L (NVPDC, 1978). Note that the Northern Virginia cadmium concentrations were not EMCs, but arithmetic means of samples collected during storm events. Based on this information, default EMCs for TDS and cadmium were set at 100 mg/L and 2.0 μg/L, respectively. These EMCs are assumed to apply to all urban land uses. The coefficient of variation for TDS is assumed equal to that for TSS. The coefficient of variation for cadmium was assumed equal to lead.

NONPOINT POLLUTION LOADING FACTORS

The model is based upon nonpoint pollution loading (expressed as lbs/yr) that vary by land use. The loading is a function of runoff (and thus rainfall and degree of imperviousness) and a

characteristic concentration of pollutant in the runoff. The pollution loading M_L is computed for land use "L" by the following equation:

$$M_L = EMC_L * R_L * K * A_L$$

Where:

M_L = annual loading for land use "L" (lb/yr)

EMC_L = event mean concentration of runoff from land use "L" (mg/l); EMC_L varies by land use and by pollutant

R_L = total average annual surface runoff from land use "L"

K = 0.2266, a unit conversion constant

A_L = area of land use "L" (acres).

By multiplying the pollutant characteristic loading by the acreage in each land use and summing for all land uses, the total annual pollution load from a subbasin can be computed. The EMC file is not changed for various land use scenarios within a given study watershed, but any number of land use files can be created (dependent only upon storage available in the host computer) to examine and compare different land use scenarios (e.g. existing versus future) or land use management scenarios. Table 2 presents the existing land use distribution for Sarasota County by basin. Figure 2 illustrates the location of those basins.

SARASOTA COUNTY MS4
NPDES PERMIT APPLICATION PART 2

TABLE 2
LAND USE

SUBBASIN NAME:	DIRECT TO BAY	WHITAKER BAY.	HUDSON BAY.	PHILLIPPI CR.	MATHENEY CR.	CLOWERS CR.	CATFISH CR.
Land Use	Acres	Acres	Acres	Acres	Acres	Acres	Acres
Forest/Open	33	947	37	5,255	245	326	1,892
Pasture/Range Land	0	9	0	7,610	0	0	750
Agriculture/Cropland	0	0	0	0	0	0	0
LDSF Residential	9	237	0	5,096	84	33	153
MDSF Residential/Instit.	0	2,063	741	12,696	913	256	558
HDSF/MF Residential	0	629	53	1,491	164	200	62
Commercial/CBD	0	460	197	888	200	152	37
Light Industrial	0	633	9	691	95	10	298
Water	1,272	164	1	2,596	31	27	481
Major Highway	0	137	0	260	0	0	2
Extractive	0	0	0	369	0	0	0
Total	1,314	5,279	1,038	36,952	1,732	1,004	4,233

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TABLE 2
LAND USE (Cont.)

SUBBASIN NAME:	NORTH CR.	SOUTH CR.	SHAKETT CR.	CURRY CR.	HATCHETT CR.	ALLIGATOR CR.	WOODMERE
Land Use	Acres	Acres	Acres	Acres	Acres	Acres	Acres
Forest/Open	1,649	5,815	3,797	1,221	1,424	1,949	1,071
Pasture/Range Land	100	3,464	320	1,140	115	191	101
Agriculture/Cropland	0	0	0	0	0	0	0
LDSF Residential	174	223	1,529	554	241	3	119
MDSF Residential/Instit.	179	905	229	610	408	3,144	619
HDSF/MF Residential	29	42	54	361	387	33	174
Commercial/CBD	0	30	32	7	192	165	13
Light Industrial	27	31	0	43	85	71	12
Water	200	2,262	983	567	539	509	266
Major Highway	0	18	62	83	14	0	0
Extractive	0	0	18	79	0	0	0
Total	2,358	12,790	7,026	4,665	3,405	6,063	2,375

SARASOTA COUNTY MS4
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TABLE 2
LAND USE (Cont.)

SUBBASIN NAME:	FORKED CR.	GODFREY CR.	AINGER CR.	COW PEN SL.	MYAKKA	DEER PR.	BIG SLOUGH
Land Use	Acres	Acres	Acres	Acres	Acres	Acres	Acres
Forest/Open	2,483	3,266	6,255	9,697	40,041	12,414	44,646
Pasture/Range Land	891	160	1,147	12,299	19,946	1,000	18,181
Agriculture/Cropland	0	0	0	0	0	0	0
LDSF Residential	813	338	604	2,239	6,692	0	13
MDSF Residential/Instit.	556	926	65	143	758	0	2,074
HDSF/MF Residential	147	30	7	122	115	0	536
Commercial/CBD	42	131	0	0	7	0	100
Light Industrial	0	20	27	154	181	0	219
Water	873	832	1,654	6,914	29,791	7,711	15,401
Major Highway	83	0	0	54	129	0	728
Extractive	17	0	0	197	294	0	21
Total	5,904	5,702	9,759	31,820	97,954	21,124	81,920

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TABLE 2
LAND USE (Cont.)

SUBBASIN NAME:	LITTLE SALT	BRADEN RIVER	CITY OF SARA.	COUNTY N.	CITY OF VEN.	COUNTY S.	LONGBOAT
Land Use	Acres	Acres	Acres	Acres	Acres	Acres	Acres
Forest/Open	2,015	1,643	240	441	685	724	780
Pasture/Range Land	19	1,104	0	0	0	0	0
Agriculture/Cropland	0	0	0	46	0	0	0
LDSF Residential	15	165	20	395	0	612	273
MDSF Residential/Instit.	669	63	1,885	1,470	1,127	1,077	48
HDSF/MF Residential	439	0	321	289	365	31	328
Commercial/CBD	42	0	590	137	417	19	26
Light Industrial	0	0	30	0	78	0	3
Water	458	763	1,628	1,281	311	962	677
Major Highway	10	74	112	33	517	11	3
Extractive	0	571	0	0	0	0	0
Total	3,667	4,383	4,828	4,091	3,500	3,436	2,136

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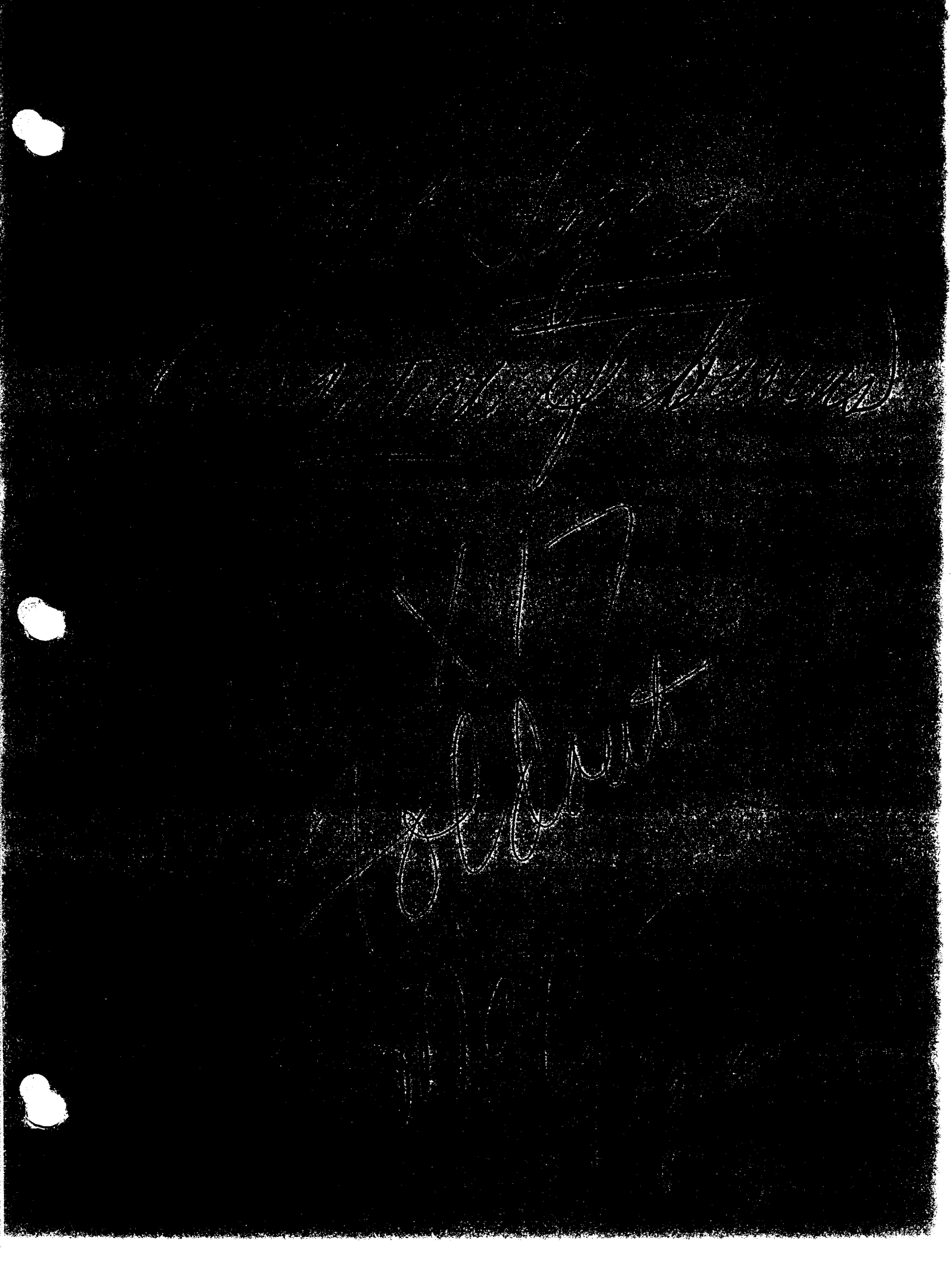
NPDES PERMIT APPLICATION PART 2

TABLE 2
LAND USE (Cont.)

SUBBASIN NAME:	CITY ISL.	SIESTA KEY	CASEY KEY	MANASOTA KEY	TOTALS
Land Use	Acres	Acres	Acres	Acres	Acres
Forest/Open	253	235	228	316	152,023
Pasture/Range Land	0	0	0	0	68,547
Agriculture/Cropland	0	0	0	0	46
LDSF Residential	209	9	108	348	21,308
MDSF Residential/Instit.	247	1,210	208	0	35,846
HDSF/MF Residential	73	552	3	0	7,038
Commercial/CBD	90	49	2	0	4,024
Light Industrial	0	6	0	0	2,723
Water	1,092	643	457	289	81,634
Major Highway	12	0	0	0	2,341
Extractive	0	0	0	0	1,567
Total	1,975	2,705	1,005	953	377,097



LAND USE

The land use mapping is based on a 1992 update to the aerial survey and land use maps completed by the County in 1986. This survey was the basis of the current land use map used in the County's Comprehensive Plan, APOXSEE. Using the ARC-INFO Geographic Information System (GIS) software and the County's GIS database, the land use information developed from this survey was assigned to appropriate categories for modeling shown on Table 2. A description of each general land use category follows.

Residential Land Uses

Residential land use has been analyzed and compiled into three separate categories because of the large percentage of residential land use within the Sarasota County area (approximately 17 percent). Since this is the largest urban land use type within the County, it was considered important to differentiate between the various types of residential development.

Residential Low Density land use are areas with less than 2 dwelling units per acre (du/a). These areas are generally in the form of ranch style developments and located along the edge of the urban development. Residential Low Density covers approximately 5.7 percent of the County. The Residential Medium Density consists of 2 du/a through 5 du/a. This represents the typical urban neighborhood and covers approximately 9.5 percent of the County. Finally, the Residential High Density areas consist of more than 6 du/a. These areas are typically zero lot line houses, townhouses, apartments, condominiums, and manufactured housing. Residential High Density covers approximately 1.9 percent of the County.

Commercial/CBD

The Commercial and Central Business District (CBD) land use category covers land uses such as retail and wholesale sales and services, professional office complexes, cultural and entertainment centers, health care facilities, tourist facilities, and automotive repair and gas stations. This land use does not include any manufacturing, however, some small light manufacturing businesses may be located within areas designated as Commercial and Services. This land use makes up approximately 1.1 percent of the County.

Light Industrial

The Industrial land use includes all manufacturing and industrial processes. This includes the processing activities, such as food and minerals present within the County. The industrial land use category also includes water and wastewater treatment facilities and solid waste management facilities. There is no Heavy Industrial land use in Sarasota County. The Industrial category makes up only 0.7 percent of the County.

Extractive

The Extractive land use consists of all mining or resource-based activity within the County. The extractive activities currently occurring within the county are generating borrow material for use as fill in urban developments or for solid waste management. The Extractive land use category makes up 0.4 percent of the County.

Major Highway

The highway land use category covers all major roadways, airports, and rail facilities. The minor transportation network was not delineated and has been included within other land use categories. The highway land use category makes up 0.6 percent of the County.

MDSF/Institutional

The Institutional land use includes all publicly owned lands with the exception of parks and churches. These include schools, military bases, hospitals, correctional institutions, and other government-owned property. This land use category makes up 0.5 percent of the County. For purposes of loading assessment this land use was combined with medium density residential.

Agricultural

The Agricultural land use category includes all agricultural areas. Agriculture within Sarasota County typically includes citrus, tomatoes, celery, and peppers.

Forest/Open

The Open Lands category is the largest land use category within the County and covers approximately 40.3 percent of the County. These areas are concentrated in the eastern portion of the County, and include forested land.

For purposes of loading assessment, recreational land use was combined with Forest/Open. The Recreational land use category includes public swimming pools, golf courses, racetracks, marinas, parks, stadiums (not associated with educational facilities), historical sites, and other recreational lands. The Recreational land use category makes up 0.8 percent of the County.

The land use codes used in APOXSEE do not distinguish between agricultural and pastoral lands. True agricultural land use (row crops, citrus, etc.) is a relatively small acreage. By contrast, some very large rangeland/improved pastureland areas in the eastern portion of the County are classified as "agriculture." For this reason, the APOXSEE land use codes for agriculture were generally modeled as pasture/rangeland, which accounts for 18.2 percent of the County.

Water

The Water land use category includes all rivers, lakes, wetlands, bays and the intracoastal waterway. The majority of the features identified would be considered waters of the United States. This category comprises approximately 23.6 percent of the County.

Comparison of Land Use Assignments

Land use definitions and coverage for the MS4 application were taken from the County's ArcInfo GIS database. Recently, a similar loading analysis based on land-use was developed for the Sarasota Bay National Estuary Program (SBNEP). There are several differences between these definitions and the land use coverage used in the SBNEP loading assessment, which result in some basin differences.

The SBNEP study area extended into Manatee County, and did not include all of Sarasota County covered by the current permitting process. At the time the SBNEP land use coverage was established, Manatee County's GIS system was unavailable to CDM. CDM contacted the SWFWMD for assistance in obtaining land use coverage for both Sarasota and Manatee Counties. SWFWMD agreed to assist, but only on a deferred schedule (e.g. 1 year) which would not meet the needs of the Sarasota Bay program.

Despite the availability of Sarasota County's GIS database, for consistency CDM chose to manually assign land use coverage to both counties from recent aerial photography. Basin boundaries were established on USGS quadrangles from previous studies (CDM, 1987; Briley Wild, 1984). Sarasota County's GIS database was derived from photo interpretation of aerials by another consultant. As expected, there are differences in the definitions and interpretations.

For example, there is only one County land use category for agriculture (Intensive Agriculture), but none for pastoral practices. From a pollution perspective, the difference in loading potential

between row crops, citrus and open grazing rangeland is quite different, but remains only marginally different from a land use planning perspective. Within the County's GIS, these land uses are treated the same. Field inspection of the areas defined as "Agricultural" in the County's database indicates that the majority of the land is rangeland and/or improved pasture, which is similar to open lands in terms of pollution generation.

While this could have become a potential problem for the present use of the database, the SBNEP results indicate that under the existing land uses, the pollutant contribution from agricultural practices are not a significant loading to the overall system. Intensive agriculture accounted for only 9 percent of the land use in the National Estuary study area. Despite the relative insignificance of agriculture to a holistic system approach, within specific watersheds the contribution from agriculture may be significant to local water quality problems.

Table 3 presents a comparison of the land use codes used in the County's APOXSEE, in the SBNEP and the land uses modeled for the present permitting process. The land-use sub-divisions in the County's GIS were retained and assigned to the WMM land-use categories. Percent DCIA for each land-use was taken from the nearest equivalent land-use defined in the SBNEP program. For example, in the County's GIS database, mobile home parks are a sub-category of the County's High Density Residential (>6 du/acre) land-use. Therefore this land-use was included with other high density land uses in the present evaluation. For both the SBNEP project and the present evaluation, high density residential was modelled as a 40% DCIA, but mobile home parks were modelled as a 60% DCIA in the SBNEP evaluation. While such differences in loading with the SBNEP evaluation exist, the net result is generally not significant. Table 4 provides a comparison of acreage, runoff and annual loads predicted for Phillippi Creek, Whitaker Bayou and South Creek.

TABLE 3 - LAND USE ASSIGNMENTS		
APOXSEE LAND USE	***NPDES MODEL ASSIGNMENTS (DCIA)***	***SBNEP ASSIGNMENTS (DCIA)***
RESIDENTIAL, LOW DENSITY (Less than 2 du/acre)		
FIXED SINGLE FAMILY UNITS	LOW DENSITY SINGLE FAMILY (20%)	LDSF (1 du/acre @ 20%)
MOBILE HOME UNITS	(ditto)	(ditto)
MIXED SINGLE/MOBILE HOME	(ditto)	(ditto)
LOW DENSITY GOLF COMMUNITY	(ditto)	OPEN/RECREATION (1%)
RESIDENTIAL, MEDIUM DENSITY (2-5 du/acre)		
FIXED SINGLE FAMILY UNITS	MEDIUM DENSITY SINGLE FAMILY/INSTITUTIONAL (30%)	MDSF (4.5 du/acre @ 30%)
MOBILE HOME UNITS	(ditto)	(ditto)
MIXED SINGLE/MOBILE HOME	(ditto)	(ditto)
MEDIUM DENSITY GOLF COMMUNITY	(ditto)	(ditto)
RESIDENTIAL HIGH DENSITY (Greater than 6 du/acre)		
FIXED SINGLE FAMILY UNITS	HIGH DENSITY SINGLE FAMILY/MULTI FAMILY (40%)	HDSF (7.5 du/acre @ 40%)
MOBILE HOME UNITS	(ditto)	MOBILE HOME (60%)

TABLE 3 - LAND USE ASSIGNMENTS (CONTINUED)		
APOXSEE LAND USE	***NPDES MODEL ASSIGNMENTS (DCIA)***	***SBNEP ASSIGNMENTS (DCIA)***
RESIDENTIAL HIGH DENSITY (Greater than 6 du/acre)		
MULTIPLE FAMILY UNITS, <2 STORIES	HIGH DENSITY SINGLE FAMILY/MULTI FAMILY (40%)	MULTI FAMILY BUILDING (50%)
MULTIPLE FAMILY UNITS, >3 STORIES	(ditto)	(ditto)
MIXED UNITS (FIXED AND MOBILE HOMES)	(ditto)	HDSF (7.5 du/acre @ 40%)
RESIDENTIAL HIGH DENSITY GOLF COMMUNITY	(ditto)	MULTI FAMILY BUILDING (50%)
RECREATIONAL VEHICLE PARKS	(ditto)	MOBILE HOME (60%)
COMMERCIAL AND SERVICES		
RETAIL SALES AND SERVICES	COMMERCIAL/CBD (85%)	COMMERCIAL/SERVICES (85%)
WHOLESALE SALES AND SERVICES	(ditto)	(ditto)
PROFESSIONAL SERVICES	(ditto)	(ditto)
CULTURE AND ENTERTAINMENT	(ditto)	(ditto)
TOURIST SERVICES	(ditto)	(ditto)
OIL AND GAS STORAGE	(ditto)	(ditto)
MIXED COMMERCIAL AND SERVICES	(ditto)	(ditto)
CEMETERIES	(ditto)	(ditto)

TABLE 3 - LAND USE ASSIGNMENTS (CONTINUED)		
APOXSEE LAND USE	***NPDES MODEL ASSIGNMENTS (DCIA)***	***SBNEP ASSIGNMENTS (DCIA)***
INDUSTRIAL		
FOOD PROCESSING	LIGHT INDUSTRIAL (70%)	INDUSTRIAL (70%)
TIMBER PROCESSING	(ditto)	(ditto)
MINERAL PROCESSING	(ditto)	(ditto)
OIL AND GAS PROCESSING	N/A	N/A
OTHER LIGHT INDUSTRIAL	(ditto)	(ditto)
OTHER HEAVY INDUSTRIAL	(ditto)	(ditto)
EXTRACTIVE		
STRIP MINES	EXTRACTIVE (40%)	STP AND POWER PLANTS (40%)
SAND/GRAVEL/BORROW PITS	(ditto)	(ditto)
OIL AND GAS FIELDS	N/A	N/A
RECLAIMED LANDS	(ditto)	(ditto)
HOLDING PONDS	(ditto)	WATER BODY (100%)

TABLE 3 - LAND USE ASSIGNMENTS (CONTINUED)		
APOXSEE LAND USE	**NPDES MODEL ASSIGNMENTS (DCIA)**	**SBNEP ASSIGNMENTS (DCIA)**
INSTITUTIONAL		
EDUCATIONAL FACILITIES	MDSF/INSTITUTIONAL (30%)	INSTITUTIONAL (40%)
RELIGIOUS	(ditto)	(ditto)
MILITARY	(ditto)	(ditto)
MEDICAL AND HEALTH CARE	(ditto)	(ditto)
GOVERNMENTAL	(ditto)	(ditto)
CORRECTIONAL	(ditto)	(ditto)
OTHER INSTITUTIONAL	(ditto)	(ditto)
COMMERCIAL CHILD CARE	(ditto)	(ditto)
RECREATIONAL		
SWIMMING BEACH	FOREST/OPEN (1%)	OPEN/RECREATION (1%)
GOLF COURSE	(ditto)	(ditto)
RACE TRACKS	(ditto)	(ditto)
MARINAS AND FISH CAMPS	(ditto)	(ditto)
PARKS AND ZOOS	(ditto)	(ditto)
COMMUNITY RECREATIONAL FACILITIES	(ditto)	(ditto)
STADIUMS	(ditto)	(ditto)
HISTORIC SITES	(ditto)	(ditto)
OTHER RECREATIONAL	(ditto)	(ditto)

TABLE 3 - LAND USE ASSIGNMENTS (CONTINUED)		
APOXSEE LAND USE	***NPDES MODEL ASSIGNMENTS (DCIA)***	***SBNEP ASSIGNMENTS (DCIA)***
OPEN LAND		
UNDEVELOPED LAND WITHIN URBAN AREAS	FOREST/OPEN (1%)	RANGELAND/WOODLAND (1%)
INACTIVE LANDS WITH STREETS, NO STRUCTURES	(ditto)	Or OPEN/RECREATION (1%)
URBAN LAND IN TRANSITION	(ditto)	Or FORESTED UPLANDS (1%)
OTHER OPEN LAND	(ditto)	as Appropriate
WATER FEATURES		
LAKES UNDER 100 ACRES	WATER (25%)	WATERBODY (100%)
		Or WETLANDS (100%)
		As Appropriate
TRANSPORTATION, UTILITIES		
AIRPORTS	MAJOR HIGHWAY (90%)	TRANSPORTATION (90%)
RAILROADS	(ditto)	(ditto)
ROADS AND HIGHWAYS	(ditto)	(ditto)
WATER SUPPLY PLANTS	LIGHT INDUSTRIAL (70%)	STP AND POWER PLANTS (40%)
SEWAGE TREATMENT PLANTS	(ditto)	(ditto)
SOLID WASTE DISPOSAL	ROAD (90%)	COMMERCIAL (85%)

TABLE 3 - LAND USE ASSIGNMENTS (CONTINUED)		
APOXSEE LAND USE	***NPDES MODEL ASSIGNMENTS (DCIA)***	***SBNEP ASSIGNMENTS (DCIA)***
AGRICULTURAL AREAS		
	PASTURE/RANGELAND (1%) (see Text)	CROPLAND (1%)
		Or CITRUS (1%)
		Or RANGELAND (1%)
		As Appropriate
HABITATS		
MESIC AND XERIC HAMMOCKS	FOREST/OPEN (1%)	RANGELAND/WOODLAND (1%)
PINE PRAIRIES	(ditto)	Or OPEN/RECREATIONAL (1%)
HIGH DRY SCRUBS	(ditto)	Or FORESTED UPLANDS (1%)

Table 4
Comparison of NPDES Model Results and SBNEP Model Results

	Phillippi Creek	Whitaker Bayou	South Creek
Total Acreage			
NPDES	36,952	5,279	12,790
SBNEP	36,396	5,015	12,995
Percent Difference	1.5%	5.1%	1.6%
Percent Impervious			
NPDES	21.2%	36.5%	8.2%
SBNEP	21.0%	40.5%	9.1%
Percent Difference	0.9%	10.5%	10.5%
Streamflow (inches)			
NPDES	23.08	29.29	17.83
SBNEP	23.50	31.34	18.99
Percent Difference	1.8%	6.8%	6.3%
Total Phosphorus (lbs/year)			
NPDES	57,479	9,415	11,848
SBNEP	61,460	9,400	11,740
Percent Difference	6.7%	0.2%	0.9%
Total Nitrogen (lbs/yr)			
NPDES	289,488	51,185	61,643
SBNEP	290,350	50,830	60,630
Percent Difference	0.3%	0.7%	1.7%
Lead (lbs/year)			
NPDES	9,760	3,821	633
SBNEP	9,520	3,760	600
Percent Difference	2.5%	1.6%	5.4%
Zinc (lbs/year)			
NPDES	11,106	2,643	2,762
SBNEP	10,150	2,760	1,520
Percent Difference	9.0%	4.3%	58.0%
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Note: Loadings are combined stormwater runoff and baseflow and do not include BMPs.

BEST MANAGEMENT PRACTICES

A Best Management Practice (BMP) is defined as any program, technology, process, siting criteria, operating method, measure or device which controls, prevents, removes or reduces pollution. Insofar as Florida Department of Environmental Regulation requires stormwater BMPs, the effect of structural stormwater BMPs was included in the estimate of annual loads. The present use of the term shall be restricted to those elements that can serve to eliminate, or minimize the pollutants carried by stormwater in an MS4 and include:

- Nonstructural Controls: Practices that are intended to improve runoff quality by reducing the generation and accumulation of potential stormwater runoff contaminants at or near their sources. Nonstructural controls that can be analyzed by the model include: development density restrictions, restrictions on industrial/commercial land uses (or other highly impervious uses), land acquisition, and buffer zones. Other source controls, such as public education are more difficult to quantify, and there is very little available in the literature to assist the user in assigning load reductions.

- Structural Stormwater Controls: Practices that are aimed at controlling the volume and discharge rate of runoff from urban areas as well as reducing the magnitude of pollutants in the discharge water through physical containment or flow restrictions designed to allow settling, physical removal through filtration, percolation, chemical precipitation or flocculation, and/or biological uptake. (FDER, 1988)

The use of a specific BMP depends on the site conditions and the needs, such as: water quality protection, flood control, aquifer recharge, or volume control. Nonstructural controls are analyzed with WMM by modifying land use types and DCIAs. Structural BMPs are represented by direct application of removal efficiencies in the WMM.

In Sarasota County, structural BMPs are permitted by the SWFWMD. A database of permitted activities was obtained and was used as the basis for estimating BMP coverage. In some cases, the type of land use served by each BMP could not be determined from the SWFWMD database. Of the 13,000 acres served by BMPs, 8,548 acres could be reasonably identified as to the type of urban or developed land use served. This value was applied to 73,500 acres of existing developed land for an estimated 12 percent BMP coverage of the urbanized land uses.

Due to the high groundwater table in Sarasota County, the great majority (81 percent) of all areas served by BMPs are served by wet detention. A review of the SWFWMD database revealed 720 BMPs serving 13,000 acres. Table 5 presents the distribution by basin for all the BMPs in the County. Based on the high percentage of local use, all BMPs were assumed to be wet detention facilities.

BMP POLLUTANT REMOVAL EFFICIENCIES

The WMM applies a constant removal efficiency for each pollutant to all land use types to simulate structural BMPs. Pollutant removal efficiencies were derived from USEPA NURP study and other literature sources.

Wet Detention Ponds

The USEPA NURP study monitored several wet detention ponds serving small urban watersheds in different locations throughout the U.S. (USEPA, 1983). For wet detention ponds with average hydraulic residence times of 2 weeks or greater, average pollutant removal rates were on the order of 40 to 50 percent for total-P and 20 to 40 percent for total-N. For other pollutants which are removed primarily by sedimentation processes, the average removal rates were as follows: 80 to 90 percent for TSS; 70 to 80 percent for lead; 40 to 50 percent for zinc;

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TABLE 5
BMP COVERAGE DATABASE

LAND USE	DIRECT TO BAY	WHITAKER BAY	HUDSON BAY.	PHILLIPPI CR.	MATHENEY CR.	CLOWERS CR.	CATFISH CR.
Forest/Open	0%	0%	0%	0%	0%	0%	0%
Pasture/Range Land	0%	0%	0%	0%	0%	0%	0%
Agriculture/Cropland	0%	0%	0%	0%	0%	0%	0%
LDSF Residential	0%	0%	0%	0%	0%	0%	0%
MDSF Resid./Institutional	0%	4%	5%	11%	2%	25%	27%
HDSF Resid./MF Resid.	0%	0%	0%	9%	0%	1%	0%
Commercial/CBD	0%	38%	8%	67%	16%	75%	90%
Light Industrial	0%	4%	2%	18%	40%	0%	4%
Water	0%	0%	0%	0%	0%	0%	0%
Major Highway	0%	54%	0%	83%	0%	0%	90%
Extractive	0%	0%	0%	0%	0%	0%	0%

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TABLE 5
BMP COVERAGE DATABASE (Cont.)

LAND USE	NORTH CR.	SOUTH CR.	SHAKETT CR.	CURRY CR.	HATCHETT CR.	ALLIGATOR CR.	WOODMERE
Forest/Open	0%	0%	0%	0%	0%	0%	0%
Pasture/Range Land	0%	0%	0%	0%	0%	0%	0%
Agriculture/Cropland	0%	0%	0%	0%	0%	0%	0%
LDSF Residential	0%	0%	0%	0%	0%	0%	0%
MDSF Resid./Institutional	76%	55%	90%	9%	54%	20%	1%
HDSF Resid./MF Resid.	0%	0%	0%	2%	0%	0%	0%
Commercial/CBD	0%	15%	21%	90%	23%	20%	90%
Light Industrial	62%	0%	0%	58%	6%	18%	0%
Water	0%	0%	0%	0%	0%	0%	0%
Major Highway	0%	0%	29%	90%	51%	0%	0%
Extractive	0%	0%	0%	0%	0%	0%	0%

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TABLE 5
BMP COVERAGE DATABASE (Cont.)

LAND USE	FORKED CR.	GODFREY CR.	AINGER CR.	COW PEN SL.	MYAKKA	DEER PR.	BIG SLOUGH
Forest/Open	0%	0%	0%	0%	0%	0%	0%
Pasture/Range Land	0%	0%	0%	0%	0%	0%	0%
Agriculture/Cropland	0%	0%	0%	0%	0%	0%	0%
LDSF Residential	0%	0%	0%	0%	0%	0%	0%
MDSF Resid./Institutional	1%	2%	90%	90%	90%	0%	47%
HDSF Resid./MF Resid.	0%	90%	0%	13%	0%	0%	8%
Commercial/CBD	83%	9%	0%	0%	90%	0%	64%
Light Industrial	0%	79%	40%	11%	90%	0%	6%
Water	0%	0%	0%	0%	0%	0%	0%
Major Highway	0%	0%	0%	0%	56%	0%	0%
Extractive	0%	0%	0%	0%	0%	0%	0%

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TABLE 5
BMP COVERAGE DATABASE (Cont.)

LAND USE	LITTLE SALT	BRADEN RIVER	CITY OF SARA.	COUNTY N.	CITY OF VEN.	COUNTY S.	LONGBOAT
Forest/Open	0%	0%	0%	0%	0%	0%	0%
Pasture/Range Land	0%	0%	0%	0%	0%	0%	0%
Agriculture/Cropland	0%	0%	0%	0%	0%	0%	0%
LDSF Residential	0%	0%	0%	0%	0%	0%	0%
MDSF Resid./Institutional	11%	0%	2%	7%	5%	1%	19%
HDSF Resid./MF Resid.	2%	0%	2%	7%	0%	0%	0%
Commercial/CBD	0%	0%	0%	34%	8%	3%	0%
Light Industrial	0%	0%	18%	0%	8%	0%	0%
Water	0%	0%	0%	0%	0%	0%	0%
Major Highway	0%	0%	18%	62%	1%	87%	0%
Extractive	0%	0%	0%	0%	0%	0%	0%

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TABLE 5
BMP COVERAGE DATABASE (Cont.)

LAND USE	CITY ISL.	SIESTA KEY	CASEY KEY	MANASOTA KEY
Forest/Open	0%	0%	0%	0%
Pasture/Range Land	0%	0%	0%	0%
Agriculture/Cropland	0%	0%	0%	0%
LDSF Residential	0%	0%	0%	0%
MDSF Resid./Institutional	1%	0%	4%	0%
HDSF Resid./MF Resid.	1%	0%	0%	0%
Commercial/CBD	34%	3%	0%	0%
Light Industrial	0%	0%	0%	0%
Water	0%	0%	0%	0%
Major Highway	0%	0%	0%	0%
Extractive	0%	0%	0%	0%

and 20 to 40 percent for BOD and chemical oxygen demand (COD). The average pollutant removal rates shown in Table 6 were used for wet detention ponds in Sarasota County, based upon efficiencies reported for Florida studies, by the USEPA NURP, and other studies.

The effectiveness of BMPs in reducing nonpoint source loads is computed for each land use in each subbasin. Up to two BMPs per land use can be specified. The percent reduction in nonpoint pollutant load in each subbasin of the watershed is calculated as:

$$P_{L,SB} = (AC_{1,SB} * REM_1) + (AC_{2,SB} * REM_2)$$

Where:

P_L = percent of annual nonpoint pollution load captured in subbasin SB by application of the two BMP types on land use "L",

$AC_{1,SB}$; $AC_{2,SB}$ = fractional area coverage of BMP type 1 and BMP type 2, respectively, on subbasin SB

REM_1; REM_2 = removal efficiency of BMP type 1 and BMP type 2 (if used), respectively; REM varies by pollutant type

BASEFLOW LOADING FACTORS

Some watersheds exhibit dry weather flow due to baseflow or interflow. To determine whether baseflow discharges are a significant component of the average annual flow volume discharged from a watershed, an estimate of baseflow rate and quality should be included in the nonpoint pollution loading modeling analyses. The baseflow loading analysis also provides a reasonable basis for comparison of the relative magnitude of pollutant loadings during dry weather periods versus storm events. Typically, baseflow discharges are fairly constant and do not exhibit wide

TABLE 6 BMP EFFICIENCIES SARASOTA COUNTY MS4 NPDES PERMIT APPLICATION PART 2	
CONSTITUENT	**WET DETENTION**
BOD	30%
COD	50%
TSS	70%
TDS	0%
Total-P	50%
Dissolved-P	80%
TKN	30%
NO2 + NO3	80%
Lead	80%
Copper	75%
Zinc	50%
Cadmium	50%

ranges of pollutant concentrations. Baseflow pollutant loading factors must be specified for the watershed. Baseflow pollutant loading factors are developed based upon available ambient water quality monitoring data. Annual or monthly baseflow discharge rates (cfs/sq-mi) are normally estimated from daily flow records at local USGS gages.

ANNUAL BASEFLOW VOLUME ESTIMATES

Sarasota County baseflow quantities were derived from measured stream flow records at the Myakka River State Park USGS gaging station and the estimated runoff volume from annual rainfall records.

Annual average rainfall (Myakka NWS):		57.95 in
Pervious C:		0.15
Streamflow, Annual:		14.5 in
Runoff:	0.15 * 57.95" =	8.7 in
Baseflow:	(14.5" - 8.7") =	5.8 in

BASEFLOW CONCENTRATIONS

Insofar as possible, ambient water quality monitoring data collected from the Myakka River were used to represent baseflow (dry weather) concentrations of nutrients and heavy metals. These baseflow concentrations are assumed to be representative of baseflow water quality which is not impacted by point source discharges. Baseflow is adjusted within the model for increases in impervious area. If impervious area increases to 50 percent, then the baseflow is reduced accordingly.

For each subbasin and land use scenario, baseflow volumes are multiplied by the appropriate concentrations shown below to derive baseflow pollutant loadings discharged from the study watershed.

- Total P: 0.30 mg/L
- Total N: 1.00 mg/L
- Lead: 0.003 mg/L
- Zinc: 0.05 mg/L

All other parameters were set to default values as developed for the WMM software as follows:

- BOD 2 mg/L
- COD 4 mg/L
- TSS 5 mg/L
- TDS 370 mg/L
- Dissolved P 0.2 mg/L
- $NO_2 + NO_3$ - N 0.3 mg/L
- Copper 0.001 mg/L
- Cadmium 0.001 mg/L

POINT SOURCE DISCHARGES

The Co-applicants clearly understand that the present regulations are directed at stormwater impacts. However, the watershedwide approach to impact evaluation, and even the concept of setting total daily maximum loading (TDML) goals cannot be performed without putting the current set of regulations into perspective. Within that framework, a separate evaluation was conducted to determine the contribution from wastewater sources (WWTPs and septic tanks). These evaluations and probable control measures were not carried forward into the management plan assessment [40 CFR 122.26 (d)(2)(v)]. However, existing sources and impacts have been identified and are discussed in the following sections.

Pollutant loadings from point source discharges such as package wastewater treatment plants (WWTP), regional WWTPs, and industrial sources were estimated to determine the relative contributions of point versus nonpoint pollution loadings. An inventory of package plants and industrial discharges within each subbasin was developed from utility location maps and discharge permit data. Package plants and industrial dischargers were assumed to be discharging effluent at their permit limits where compliance monitoring data are not available. In many cases the permits do not include all constituents which are required under the NPDES regulation. In these cases, the package plant discharges were represented by the following effluent concentrations which are based on typical effluent limits for secondary WWTPs (EPA, 1986; UCD, 1984):

- BOD 30 mg/L
- COD 60 mg/L
- TSS 30 mg/L
- TDS 500 mg/L
- Total Phosphorus 12 mg/L
- Dissolved Phosphorus 3 mg/L
- $NO_2 + NO_3$ - N 1 mg/L
- Pb 0.03 mg/L
- Cu 0.035 mg/L
- Zn 0.1 mg/L
- Cd 0.007 mg/L
- Total Nitrogen 16 mg/L
- TKN 15 mg/L

A point source loading was developed for each plant discharge which accounted for the change in load delivered to the receiving surface water on the type of discharge. Discharge types vary throughout the County, but are predominantly either percolation ponds or spray irrigation. The majority of the treatment plants in the County are secondary treatment plants, none of which

have a discharge direct to a surface water. Five advanced wastewater treatment (AWT) plants exist in the County with limited direct discharges. Table 7 presents a listing of the treatment plants by basin, with average annual flows, discharge method, and level of treatment. Only the plants with a flow of 0.1 mgd or greater were used in the loading assessment. Table 8 contains the point source loadings used in the present evaluation.

Disposal by irrigation was assumed to result in a 75 percent loss of effluent, based on the measured fraction of rainfall recovered in streamflow. Nutrient reductions were set at 95 percent for irrigation, based on a golf course nutrient budget developed for SBNEP. No reductions in TDS or nitrate+nitrite were assumed. Removal of nutrients by percolation ponds was set at 90 percent. Nitrogen loadings were reduced based on soil transport and actual distance to surface water.

FAILING SEPTIC TANK IMPACTS

Many of the residential developments, as well as commercial and industrial establishments within the County, use septic tanks and soil absorption fields for wastewater treatment and disposal. Septic tank systems typically have a limited useful life expectancy and failures are known to occur, causing localized water quality impacts.

Annual septic tank failure rates reported for areas across the U.S. range from about 1 to 3 percent. For average annual conditions, it is conservative to assume that septic tank systems failures would be unnoticed or ignored for five years before repair or replacement occurred. Therefore, during an average year, 5 to 15 percent of the septic tanks systems in the watershed are assumed to be failing. Based on the number of repair/replacement permits granted by Sarasota County, a value of 8 percent was used for all basins.

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TABLE 7
WASTEWATER TREATMENT PLANTS

* PLANTS >0.1 MGD

	PLANT NAME	AVERAGE FLOW (MGD)	DISCHARGE METHOD	LEVEL OF TREATMENT
	B - Whitaker Bayou			
*	Dolomite Util. Tri-Par	0.231	Perc. Ponds/Irr.	Secondary
	Kensington Park Util.-1 (Monica)	0.095	Perc. Ponds/Irr.	Secondary
*	City of Sarasota	6.535	Irr./Surface Wa.	AWT
*	Kensington Park Util.-2 (27th)	0.265	Perc. Ponds/Irr.	Secondary
	D - Phillipi Creek			
*	Meadowood Uitl.	0.530	Perc. Ponds/Irr.	Secondary
*	Dolomite Util. Fruitville	0.146	Perc. Ponds	Secondary
*	Atlantic Util.	0.852	Irrigation	Secondary
*	Tamaron Utilities	0.117	Perc./Evap Ponds	Secondary
*	Florida Cities (South Gate)	1.094	Prec. Ponds/S. Wa.	AWT
*	Sarasota County/Bent Tree	0.428	Perc. Ponds/Irr.	Secondary
*	Camelot Lakes MHP	0.122	Prec. Ponds	Secondary
	Burzenski Nursing Home	0.004	Perc. Ponds	Secondary
	Village Oaks Util.\Condo	0.017	Drainfield	
	Woodland Park Util.	0.018	Perc./Evap Ponds	Secondary
	Sun-N-Fun Resort	0.058	Perc./Evap Ponds	Secondary
	Skyline Corporation	0.001	Perc./Evap Ponds	Secondary
	Peterson Manufacturing Co.	0.001	Perc. Ponds	Secondary
	Beekman Place Util.	0.008	Perc. Ponds	Secondary
	Hilton Industries	0.004	Drainfield	Secondary
	Sylvan Lea	0.000	Perc./Evap Ponds	Secondary
	Beneva Nursing Pavilion	0.025	Drainfield	Secondary
	Beneva Creek Util.	0.004	Drainfield	Secondary
	Bahia Vista Estates	0.019	Perc. Ponds	Secondary
	Yoders Too Restaurant	0.003	Drainfield	Secondary
	Sarasota Septage Treatment	0.035	Perc. Ponds	Secondary
	Bath & Racquet Club	0.004	Drainfield	Secondary
	Oakwood Gardens Apts.	0.003	Drainfield	Secondary
	Woodbridge Estates	0.003	Drainfield	Secondary
	Barclay House Apts.	0.005	Perc, Ponds	Secondary
	Lake Forest Util./Condo	0.002	Drainfield	Secondary
	Proctor Road	0.011	Drainfield	Secondary
	Rehab. Institute of Sarasota	0.011	Drainfield	Secondary
	Bee Ridge Util.	0.010	Drainfield	Secondary
	Lake Tippecanoe	0.034	Perc./Evap Pond	Secondary

Irr - Irrigation
Perc - Percolation Pond
Evap - Evaporation Pond

SARASOTA COUNTY MS4
NPDES STORMWATER PERMIT APPLICATION PART 2

TABLE 7
WASTEWATER TREATMENT PLANTS (Cont.)

* PLANTS >0.1 MGD

	PLANT NAME	AVERAGE FLOW (MGD)	DISCHARGE METHOD	LEVEL OF TREATMENT
	Southfield Util.	0.030	Perc./Evap Pond	Secondary
	Country Manor	0.010	Drainfield	Secondary
	Longwood Run	0.084	Perc./Evap Ponds	Secondary
	Fruitville School (Gulf Gate)	0.003	Drainfield	Secondary
	E - Matheney Creek			
*	Florida Cities (Gulf Gate)	1.402	Surface Water	AWT
	F - Clowers Creek			
*	Central County Util.	0.744	Perc. Ponds	Secondary
	G - Catfish Creek			
	Ashton Elementary School		Drainfield	Secondary
	Racine Hydraulics (Dana Corp.)	0.005	Perc./Evap ponds	Secondary
	Sunrise Util.	0.062	Spray Irr.	Secondary
	Royal Palms MHP	0.011	Perc/Evap Ponds	Secondary
	Flight Deck Restaurant	0.004	Drainfield	Secondary
	Venetian MHP	0.017	Perc/Evap Ponds	Secondary
	H - North Creek			
	Tri-State MHP	0.004	Perc. Ponds	Secondary
	I - South Creek			
	Twin Lakes Park	0.004	Perc./Evap Ponds	Secondary
	Oscar Scherer State Park	0.005	Drainfield	Secondary
	J - Shakett Creek			
	Spanish Lakes MHP	0.055	Perc. Ponds	Secondary
	Mission Valley Country Club	0.004	Spray Irr.	Secondary
	Kings Gate Club	0.047	Perc. Ponds	Secondary
	Kings Gate Association	0.010	Perc. Ponds	Secondary
	Royal Coachman Resort	0.021	Perc. Ponds	Secondary
	City of Venice (East Side) (@ Knights Trail 15% Total flow)	0.340	Spray	AWT
	K - Curry Creek			
*	City of Venice (East Side)	1.929	Spray/Reuse	AWT

Irr - Irrigation
Perc - Percolation Pond
Evap - Evaporation Pond

SARASOTA COUNTY MS4
NPDES STORMWATER PERMIT APPLICATION PART 2

TABLE 7
WASTEWATER TREATMENT PLANTS (Cont.)

* PLANTS >0.1 MGD

	PLANT NAME	AVERAGE FLOW (MGD)	DISCHARGE METHOD	LEVEL OF TREATMENT
	L - Hatchett Creek			
	Nokomis Elementary School	0.004	Drainfield	Secondary
	City of Venice Eastside Plant (15%)	0.340	Spray/Reuse	AWT
	M - Alligator Creek			
*	Venice Gardens/Plant 1	0.721	Perc./Spray	Secondary
*	Venice Gardens/Plant 2	0.363	Perc. Ponds	Secondary
*	Plantation Util.	0.157	Perc. Ponds	Secondary
	South County Courthouse	0.003	Drainfield	Secondary
	Florida Pines MHP	0.005	Perc. Ponds	Secondary
	N - Woodmere			
	Mike Clarke Dev. Inc.	0.011		Secondary
	Circlewoods of Venice	0.046	Perc. Ponds	Secondary
	Gulfview Util.	0.006	Perc. Ponds	Secondary
	O - Forked Creek			
	Englewood Colf & Country Club	0.021	Perc. Ponds	Secondary
	Oak Grove MHP	0.007	Drainfield	Secondary
	Morstar/Lemon Bay Shopping Ctr.	0.010	Drainfield	Secondary
	Brook to Bay (MHP)			Secondary
	Englewood Isles Util. Co.	0.085	Perc. Ponds	Secondary
	P - Godfrey Creek			
	Englewood Elk's Lodge	0.004	Drainfield	Secondary
	Giorgios Inc.	0.002	Drainfield	Secondary
	Englewood Util. Corp.	0.053	Perc. Ponds	Secondary
	El Jobean Philharmonic	0.007		Secondary
	Deer Creek MHP	0.005	Drainfield	Secondary
	Q - Ainger			
	FMF Util. Inc.			Secondary
	S - Myakka River			
	Oak Ford	0.000	Drainfield	Secondary
	Myakka River State Park #1	0.003	Perc. Ponds	Secondary
	Myakka River State Park #2	0.004	Perc. Ponds	Secondary
	Venice Ranch MHP	0.015	Perc. Ponds	Secondary
	Venice Campgrounds	0.006	Perc. Ponds	Secondary
	Ramblers Rest Resort	0.022	Perc. Ponds	Secondary

Irr - Irrigation
Perc - Percolation Pond
Evap - Evaporation Pond

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NPDES STORMWATER PERMIT APPLICATION PART 2

TABLE 7
WASTEWATER TREATMENT PLANTS (Cont.)

* PLANTS >0.1 MGD

	PLANT NAME	AVERAGE FLOW (MGD)	DISCHARGE METHOD	LEVEL OF TREATMENT
	Manatee Community College	0.009	Drainfield	Secondary
	Myakka Mobile Home Court MHP	0.003	Perc./Spray	Secondary
*	City of Sarasota (HiHat Ranch Reuse to Howard Creek) (306 days annualized)	5.479	Irr./Surface Wa.	AWT
	U - Big Slough			
*	General Development Util.	0.783	Inject/Spray	Secondary
	V - Little Salt Creek			
*	Myakka Util.	0.110	Perc./Spray	Secondary
	X - Coastal City of Sarasota			
	Robinhood Util.	0.009	Drainfield	Secondary
	Field Club	0.003	Drainfield	Secondary
	Y - Coastal Sarasota County North			
	Sarasota Fish Co. Restaurant	0.002	Drainfield	Secondary
	Skandia/Heron Bay Club	0.002	Perc./Evap Ponds	Secondary
	Arbors MHP	0.018	Perc. Ponds	Secondary
	Leopard Boutique	0.001	Drainfield	Secondary
	Hynautics Inc.	0.001	Perc. Ponds	Secondary
	Life Care Inc.	0.003	Drainfield	Secondary
*	South Bay Util.	0.121	Drainfields	Secondary
	Happy Haven MHP	0.003	Perc. Ponds	Secondary
	Lake Village MHP	0.027	Perc. Ponds	Secondary
	The Trails Unlimited	0.032		Secondary
	Fairwinds Condo	0.004	Drainfield	Secondary
	Lyons Cove Inc.	0.001	Drainfield	Secondary
	Z - Coastal City of Venice			
	Palm & Pines MHP	0.004	Perc. Ponds	Secondary
	AA - Coastal Sarasota County South			
	Super Bowl	0.001	Drainfield	Secondary
*	City of Venice (Island Beach)	0.500	Spray	Secondary
	Japanese Gardens MHP	0.024	Prec./Drainfields	Secondary
	Polynesian Village MHP	0.024	Drainfield	Secondary

Irr - Irrigation
Perc - Percolation Pond
Evap - Evaporation Pond

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NPDES STORMWATER PERMIT APPLICATION PART 2

TABLE 7
WASTEWATER TREATMENT PLANTS (Cont.)

* PLANTS >0.1 MGD

	PLANT NAME	AVERAGE FLOW (MGD)	DISCHARGE METHOD	LEVEL OF TREATMENT
	Shady Haven MHP	0.002	Drainfield	Secondary
	Englewood Elementary School	0.002	Drainfield	Secondary
	Holiday Ventures	0.041	Perc. Ponds	Secondary
	Tangerine Woods Util.	0.029	Perc. Ponds	Secondary
	AD - Siesta Key			
*	Siesta Key Utilities Authority	1.857	Surface Water	AWT

Irr - Irrigation
Perc - Percolation Pond
Evap - Evaporation Pond

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TABLE 8
WWM FLOW WEIGHTED POINT SOURCE INPUT
(Pounds/year)

SUBBASIN NAME:	WHITAKER BAY	PHILLIPPI CR.	MATHENEY CR	CLOWERS CR.	SHAKETT CR.	CURRY CR.	ALLIGATOR CR	MYAKKA
BOD	16,535	1,499	4,691	347	274	1,462	11,332	4,173
COD	73,328	38,967	255,880	13,891	1,097	5,849	22,664	16,693
TSS	18,691	999	2,985	232	274	1,462	11,332	4,173
TDS	2,361,585	5,000,739	2,132,330	1,157,550	548,313	2,924,338	1,888,635	8,346,547
TP	4,313	3,497	2,132	1,215	55	292	4,533	835
DP	3,594	1,998	4,265	695	55	292	1,133	835
TKN	18,332	42,963	6,397	1,389	82	439	6,705	1,252
NO2&NO3	9,346	33,471	426	10,649	1,645	8,773	3,777	25,040
PB	101	25	128	7	2	9	11	25
CU	119	30	149	8	2	10	13	29
ZN	338	85	0	23	5	29	38	83
CD	25	5	30	2	0	1	3	4

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TABLE 8
WWM FLOW WEIGHTED POINT SOURCE INPUT (Cont.)
(Pounds/year)

SUBBASIN NAME:	BIG SLOUGH	LITTLE SALT	COUNTY N.	COUNTY S.	SIESTA KEY
BOD	3,655	1,097	183	5,118	16,998
COD	7,311	2,193	2,193	10,235	22,664
TSS	3,655	1,097	183	5,118	5,666
TDS	1,218,474	182,771	182,771	1,705,864	2,832,952
TP	1,462	439	439	2,047	3,400
DP	366	110	110	512	5,666
TKN	1,828	274	2,358	2,559	6,799
NO2&NO3	2,437	366	1,353	3,412	3,400
PB	4	1	1	5	170
CU	4	93	1	6	198
ZN	12	4	4	17	567
CD	1	0	0	1	40

multiplier. Because of the uncertainties, a range of multipliers provided within the modeling framework and are tabulated. The range of increases in annual per acre loadings attributed to septic tanks is:

Septic Tank Loading Rate Multipliers				
NUTRIENTS	**TP**	**DP**	**TKN**	**Nitrate**
LDSF & MDSF: Low	7.3	7.3	13.6	13.6
LDSF & MDSF: Medium	9.5	9.5	18.0	18.0
LDSF & MDSF: High	15.0	15.0	27.3	27.3
ODS	**BOD**	**COD**	**TSS**	**TDS**
LDSF & MDSF: Low	4.5	4.5	9.1	9.1
LDSF & MDSF: Medium	4.5	4.5	9.1	9.1
LDSF & MDSF: High	4.5	4.5	9.1	9.1
METALS	**LEAD**	**CU**	**ZINC**	**CD**
LDSF & MDSF: Low	4.5	4.5	9.1	9.1
LDSF & MDSF: Medium	4.5	4.5	9.1	9.1
LDSF & MDSF: High	4.5	4.5	9.1	9.1

Septic tank failures typically have only a limited impact on overall nonpoint pollution discharges because the increased annual loading rates are applied only to the fraction of nonsewered residential development that are predicted to have a failing septic tank system during an average year. Based upon this methodology, failing septic tank systems typically would contribute less than 10 percent of total nonpoint loadings. Table 9 presents the area coverage and failure rate for each basin in Sarasota County. Figure 3 shows the areas of coverage throughout the County.

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TABLE 9
SEPTIC TANK FAILURE DATA

SUBBASIN NAME:	DIRECT TO BAY	WHITAKER BAY.	HUDSON BAY.	PHILLIPPI CR.	MATHENEY CR.	CLOWERS CR.
Failure Rate	8%	8%	8%	8%	8%	8%
Percent Unsewered	0%	28%	1%	31%	24%	23%
Area Impacted (% of DA)	0%	2%	0%	2%	2%	2%

SUBBASIN NAME:	CATFISH CR.	NORTH CR.	SOUTH CR.	SHAKETT CR.	CURRY CR.	HATCHETT CR.
Failure Rate	8%	8%	8%	8%	8%	8%
Percent Unsewered	34%	30%	3%	0%	0%	0%
Area Impacted (% of DA)	3%	2%	0%	0%	0%	0%

SUBBASIN NAME:	ALLIGATOR CR.	WOODMERE	FORKED CR.	GODFREY CR.	AINGER CR.	COW PEN SL.
Failure Rate	8%	8%	8%	8%	8%	8%
Percent Unsewered	0%	0%	0%	0%	0%	10%
Area Impacted (% of DA)	0%	0%	0%	0%	0%	1%

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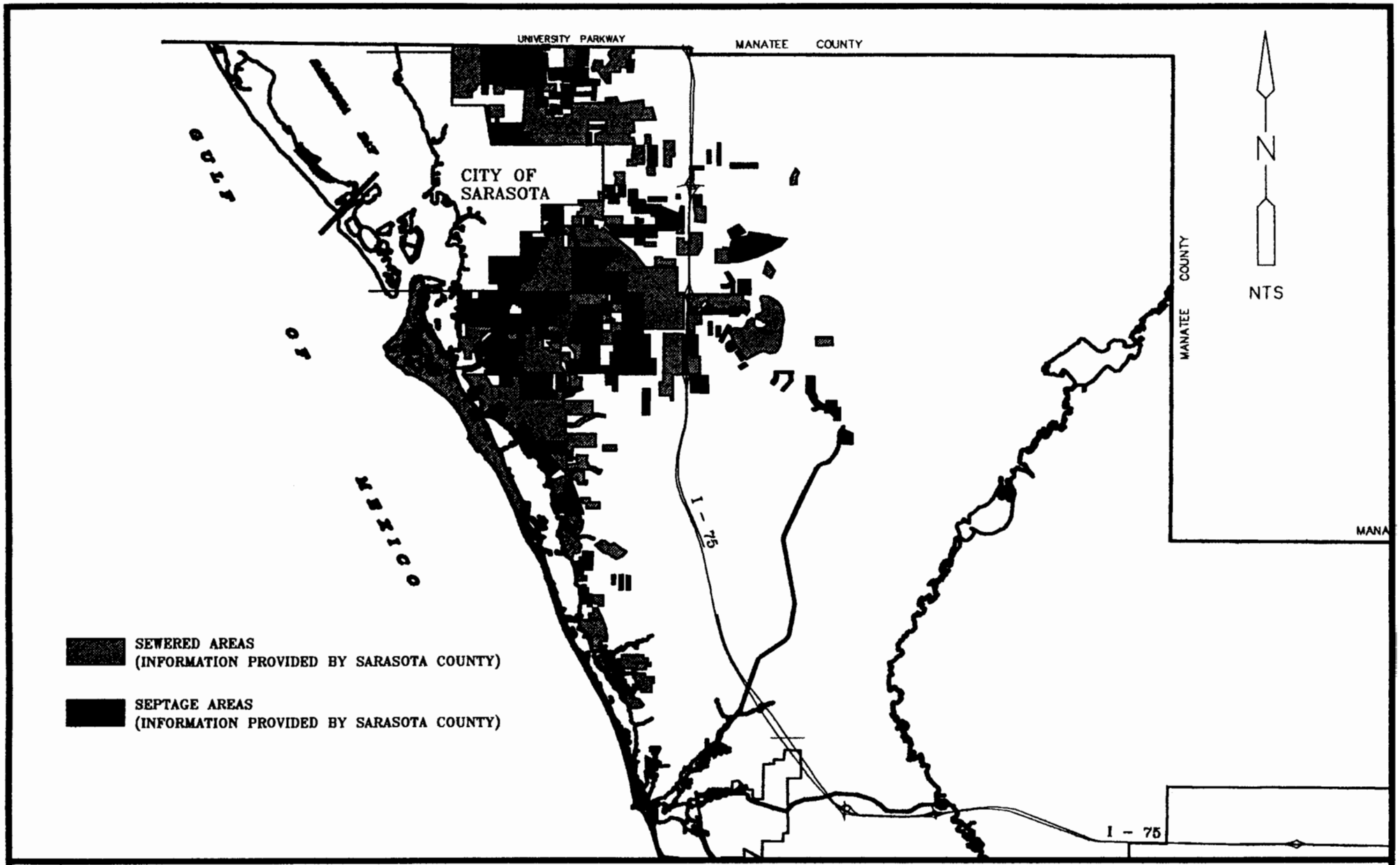
TABLE 9
SEPTIC TANK FAILURE DATA (Cont.)

SUBBASIN NAME:	MYAKKA	DEER PR.	BIG SLOUGH	LITTLE SALT	BRADEN RIVER	CITY OF SARA.
Failure Rate	8%	8%	8%	8%	8%	8%
Percent Unsewered	0%	0%	0%	0%	0%	13%
Area Impacted (% of DA)	0%	0%	0%	0%	0%	1%

SUBBASIN NAME:	COUNTY N.	CITY OF VEN.	COUNTY S.	LONGBOAT	CITY ISL.	SIESTA KEY
Failure Rate	8%	8%	8%	8%	8%	8%
Percent Unsewered	25%	0%	0%	0%	0%	0%
Area Impacted (% of DA)	2%	0%	0%	0%	0%	0%

SUBBASIN NAME:	CASEY KEY	MANASOTA KEY
Failure Rate	8%	8%
Percent Unsewered	88%	0%
Area Impacted (% of DA)	7%	0%



SARASOTA COUNTY
SEPTIC/SEWERED AREAS

CDM
environmental engineers, scientists, planners, & management consultants

Figure N 3

RESULTS

The existing annual loading (pound/year) for average meteorological conditions is given in Table 10 as the sum of stormwater is baseflows. As expected, the total mass is generally related to watershed size. Table 11 a normalized yield in terms of pounds/acre/year. Inspection of Table 11 reveals a different pattern in which the yield rate is generally related to the degree of urbanization (and imperviousness) within the watershed.

Table 12 provides the annual average EMC for each constituent and each watershed. The values given reflect stormwater only, and would be slightly different in cases where wastewater discharges were occurring. However, the combination of AWT quality direct discharges and wastewater reuse for irrigation generally minimizes the impact of wastewater loadings as illustrated in Table 13. The wastewater contribution shown in Table 13 includes estimated septic tank ("working" and "failed") loadings as well.

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TABLE 10
EXISTING ANNUAL LOADING (lbs/yr)
FROM STORMWATER AND BASEFLOW

	BOD	COD	TSS	TDS	Total-P	Dissolved-P
	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)
DIRECT TO BAY	21,600	123,000	555,900	1,078,600	1,400	970
WHITAKER BAY.	305,000	2,119,100	3,626,700	4,694,100	9,100	4,500
HUDSON BAY.	67,400	473,900	770,600	945,100	2,100	1,000
PHILLIPPI CR.	1,552,100	10,381,900	20,773,900	30,576,100	55,200	26,000
MATHENEY CR.	100,100	699,000	1,198,300	1,523,800	3,200	1,500
CLOWERS CR.	48,900	318,500	583,500	860,800	1,500	690
CATFISH CR.	129,200	810,400	2,132,900	3,237,800	4,500	2,300
NORTH CR.	56,800	345,100	1,078,900	1,716,800	2,200	1,100
SOUTH CR.	279,300	1,670,400	5,822,200	9,335,500	11,300	6,200
SHAKETT CR.	191,800	1,241,000	3,386,200	5,284,000	7,600	3,900
CURRY CR.	163,800	1,041,900	2,442,000	3,804,000	5,700	2,900
HATCHETT CR.	123,500	803,700	1,828,100	2,728,000	4,200	2,200
ALLIGATOR CR.	243,600	1,655,200	3,362,700	4,874,100	9,000	4,200
WOODMERE	81,500	561,100	1,322,900	1,835,600	3,200	1,600
FORKED CR.	173,900	1,166,100	3,051,100	4,504,200	6,700	3,500
GODFREY CR.	163,900	1,063,800	2,899,700	4,305,500	6,400	3,300
AINGER CR.	202,100	1,207,700	4,450,500	7,036,200	8,400	4,700
COW PEN SL.	707,900	4,144,600	14,584,200	23,769,100	28,600	16,100
MYAKKA	2,061,600	12,165,700	44,223,200	73,325,600	90,100	52,000
DEER PR.	382,300	2,186,500	9,347,500	15,600,000	18,000	11,000
BIG SLOUGH	1,707,500	10,335,600	37,934,800	59,547,800	68,700	38,900
LITTLE SALT	119,600	808,900	2,006,300	2,821,600	4,500	2,300
BRADEN RIVER	191,100	757,500	1,939,500	4,723,800	4,100	2,400
CITY OF SARA.	238,100	1,679,700	3,187,700	4,275,600	8,200	4,300
COUNTY NORTH	166,000	1,163,900	2,368,900	3,420,000	6,700	3,400
CITY OF VEN.	214,200	1,681,300	2,830,700	3,205,500	5,900	3,100
COUNTY SOUTH	124,100	875,300	1,910,500	2,761,100	5,300	2,600
LONGBOAT	66,800	452,100	1,143,600	1,687,700	2,700	1,500
CITY ISL.	61,100	406,400	1,021,400	1,635,800	2,600	1,500
SIESTA KEY	128,000	930,000	1,788,200	2,296,900	5,000	2,500
CASEY KEY	28,900	194,300	508,100	801,500	1,300	720
MANASOTA KEY	26,800	180,900	465,800	733,400	1,200	630
TOTAL	10,128,500	63,644,500	184,546,500	288,945,600	394,600	213,510

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TABLE 10 (Cont.)
EXISTING ANNUAL LOADING (lbs/yr)
FROM STORMWATER AND BASEFLOW

	TKN	NO2&NO3	TN	Lead	Copper	Zinc	Cadmium
	(lbs/yr)	(lbs/yr)		(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)
DIRECT TO BAY	4,300	3,200	7,500	50	250	970	10
WHITAKER BAY.	40,900	8,700	49,600	3,200	1,100	2,500	50
HUDSON BAY.	9,200	2,000	11,200	700	260	500	10
PHILLIPPI CR.	222,800	56,600	279,400	7,500	5,200	10,300	280
MATHENEY CR.	13,800	3,100	16,900	910	380	730	20
CLOWERS CR.	6,600	1,400	8,000	330	150	340	10
CATFISH CR.	19,000	5,100	24,100	860	350	1,100	20
NORTH CR.	8,900	2,500	11,400	120	100	380	0
SOUTH CR.	44,800	14,900	59,700	520	680	2,700	40
SHAKETT CR.	29,700	9,000	38,700	610	570	1,600	30
CURRY CR.	23,000	6,500	29,500	600	510	1,200	30
HATCHETT CR.	17,700	4,800	22,500	920	420	1,200	20
ALLIGATOR CR.	36,500	9,200	45,700	1,200	830	1,700	50
WOODMERE	12,300	3,600	15,900	320	280	590	10
FORKED CR.	26,400	8,100	34,500	690	570	1,500	30
GODFREY CR.	25,200	7,600	32,800	690	510	1,400	30
AINGER CR.	32,700	11,300	44,000	280	460	1,900	20
COW PEN SL.	110,400	39,900	150,300	1,400	2,000	7,700	100
MYAKKA	336,800	136,400	473,200	3,400	7,500	28,800	330
DEER PR.	65,600	30,100	95,700	400	1,600	6,700	70
BIG SLOUGH	271,900	94,700	366,600	4,000	4,100	17,800	220
LITTLE SALT	17,800	5,200	23,000	530	390	920	20
BRADEN RIVER	17,600	5,200	22,800	410	370	1,300	40
CITY OF SARA.	33,700	10,000	43,700	2,500	1,200	2,900	50
COUNTY NORTH	25,400	8,200	33,600	1,000	800	1,900	30
CITY OF VEN.	27,800	5,900	33,700	3,000	900	2,100	40
COUNTY SOUTH	19,500	6,500	26,000	520	580	1,300	20
LONGBOAT	10,200	3,700	13,900	340	300	820	10
CITY ISL.	9,700	4,100	13,800	390	370	1,100	10
SIESTA KEY	18,900	5,800	24,700	740	600	1,200	20
CASEY KEY	4,800	2,000	6,800	100	160	450	10
MANASOTA KEY	4,400	1,600	6,000	80	120	330	0
TOTAL	1,548,300	516,900	2,065,200	38,310	33,610	105,930	1,630

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TABLE 11
EXISTING TOTAL ANNUAL YIELD RATE (lbs/acre/yr)
FOR STORMWATER AND BASEFLOW

	BOD	COD	TSS	TDS	Total-P	Dissolved-P
	(lbs/acre/yr)	(lbs/acre/yr)	(lbs/acre/yr)	(lbs/acre/yr)	(lbs/acre/yr)	(lbs/acre/yr)
DIRECT TO BAY	20	90	420	820	1.1	0.7
WHITAKER BAY.	60	400	690	890	1.7	0.8
HUDSON BAY.	60	460	740	910	2.0	1.0
PHILLIPPI CR.	40	280	560	830	1.5	0.7
MATHENEY CR.	60	400	690	880	1.9	0.9
CLOWERS CR.	50	320	580	860	1.5	0.7
CATFISH CR.	30	190	500	760	1.1	0.6
NORTH CR.	20	150	460	730	0.9	0.5
SOUTH CR.	20	130	460	730	0.9	0.5
SHAKETT CR.	30	180	480	750	1.1	0.6
CURRY CR.	40	220	520	820	1.2	0.6
HATCHETT CR.	40	240	540	800	1.2	0.6
ALLIGATOR CR.	40	270	550	800	1.5	0.7
WOODMERE	30	240	560	770	1.3	0.7
FORKED CR.	30	200	520	760	1.1	0.6
GODFREY CR.	30	190	510	760	1.1	0.6
AINGER CR.	20	120	460	720	0.9	0.5
COW PEN SL.	20	130	460	750	0.9	0.5
MYAKKA	20	120	450	750	0.9	0.5
DEER PR.	20	100	440	740	0.9	0.5
BIG SLOUGH	20	130	460	730	0.8	0.5
LITTLE SALT	30	220	550	770	1.2	0.6
BRADEN RIVER	40	170	440	1,080	0.9	0.5
CITY OF SARA.	50	350	660	890	1.7	0.9
COUNTY NORTH	40	280	580	840	1.6	0.8
CITY OF VEN.	60	480	810	920	1.7	0.9
COUNTY SOUTH	40	250	560	800	1.5	0.8
LONGBOAT	30	210	540	790	1.3	0.7
CITY ISL.	30	210	520	830	1.3	0.8
SIESTA KEY	50	340	660	850	1.8	0.9
CASEY KEY	30	190	510	800	1.3	0.7
MANASOTA KEY	30	190	490	770	1.3	0.7
AVERAGE	35	233	543	809	1.3	0.7

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TABLE 11 (Cont.)
EXISTING TOTAL ANNUAL YIELD RATE (lbs/acre/yr)
FOR STORMWATER AND BASEFLOW

	TKN	NO2&NO3	TN	Lead	Copper	Zinc	Cadmium
	(lbs/acre/yr)	(lbs/acre/yr)	(lbs/acre/yr)	(lbs/acre/yr)	(lbs/acre/yr)	(lbs/acre/yr)	(lbs/acre/yr)
DIRECT TO BAY	3.3	2.5	5.8	0.04	0.2	0.7	0.005
WHITAKER BAY.	7.8	1.7	9.5	0.6	0.2	0.5	0.010
HUDSON BAY.	8.9	1.9	10.8	0.7	0.3	0.5	0.012
PHILLIPPI CR.	6.0	1.5	7.5	0.2	0.1	0.3	0.008
MATHENEY CR.	8.0	1.8	9.8	0.5	0.2	0.4	0.010
CLOWERS CR.	6.6	1.4	8.0	0.3	0.1	0.3	0.007
CATFISH CR.	4.5	1.2	5.7	0.2	0.08	0.3	0.004
NORTH CR.	3.8	1.1	4.9	0.05	0.04	0.2	0.002
SOUTH CR.	3.5	1.2	4.7	0.04	0.05	0.2	0.003
SHAKETT CR.	4.2	1.3	5.5	0.1	0.08	0.2	0.004
CURRY CR.	4.9	1.4	6.3	0.1	0.1	0.3	0.007
HATCHETT CR.	5.2	1.4	6.6	0.3	0.1	0.3	0.005
ALLIGATOR CR.	6.0	1.5	7.5	0.2	0.1	0.3	0.008
WOODMERE	5.2	1.5	6.7	0.1	0.1	0.2	0.005
FORKED CR.	4.5	1.4	5.9	0.1	0.1	0.3	0.005
GODFREY CR.	4.4	1.3	5.7	0.1	0.09	0.2	0.005
AINGER CR.	3.4	1.2	4.6	0.03	0.05	0.2	0.002
COW PEN SL.	3.5	1.3	4.8	0.04	0.06	0.2	0.003
MYAKKA	3.4	1.4	4.8	0.03	0.08	0.3	0.003
DEER PR.	3.1	1.4	4.5	0.02	0.07	0.3	0.003
BIG SLOUGH	3.3	1.2	4.5	0.05	0.05	0.2	0.003
LITTLE SALT	4.9	1.4	6.3	0.1	0.1	0.3	0.004
BRADEN RIVER	4.0	1.2	5.2	0.1	0.09	0.3	0.010
CITY OF SARA.	7.0	2.1	9.1	0.5	0.2	0.6	0.010
COUNTY NORTH	6.2	2.0	8.2	0.2	0.2	0.5	0.007
CITY OF VEN.	7.9	1.7	9.6	0.9	0.3	0.6	0.011
COUNTY SOUTH	5.7	1.9	7.6	0.2	0.2	0.4	0.006
LONGBOAT	4.8	1.7	6.5	0.2	0.1	0.4	0.005
CITY ISL.	4.9	2.1	7.0	0.2	0.2	0.6	0.006
SIESTA KEY	7.0	2.1	9.1	0.3	0.2	0.4	0.009
CASEY KEY	4.8	2.0	6.8	0.1	0.2	0.4	0.005
MANASOTA KEY	4.6	1.7	6.3	0.1	0.1	0.3	0.004
AVERAGE	5.2	1.6	6.7	0.2	0.1	0.4	0.006

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TABLE 12
EXISTING ANNUAL EMCs FOR STORMWATER

	RUNOFF	BOD	COD	TSS	TDS	Total-P	Dissolved-P
	(inches/year)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
DIRECT TO BAY	20	3.7	20	90	180	0.2	0.2
WHITAKER BAY.	26	10.0	70	120	150	0.3	0.1
HUDSON BAY.	27	10.5	70	120	150	0.3	0.2
PHILLIPPI CR.	19	10.1	70	130	200	0.4	0.2
MATHENEY CR.	25	10.3	70	120	160	0.3	0.2
CLOWERS CR.	23	9.4	60	110	170	0.3	0.1
CATFISH CR.	15	8.8	60	150	220	0.3	0.2
NORTH CR.	12	8.7	50	160	260	0.3	0.2
SOUTH CR.	13	7.7	50	160	260	0.3	0.2
SHAKETT CR.	14	8.8	60	160	240	0.3	0.2
CURRY CR.	16	9.7	60	140	220	0.3	0.2
HATCHETT CR.	18	8.8	60	130	190	0.3	0.2
ALLIGATOR CR.	19	9.6	70	130	190	0.4	0.2
WOODMERE	16	9.5	70	150	210	0.4	0.2
FORKED CR.	15	8.9	60	160	230	0.3	0.2
GODFREY CR.	15	8.8	60	150	230	0.3	0.2
AINGER CR.	12	7.8	50	170	270	0.3	0.2
COW PEN SL.	13	7.8	50	160	260	0.3	0.2
MYAKKA	13	7.0	40	150	250	0.3	0.2
DEER PR.	13	6.1	30	150	250	0.3	0.2
BIG SLOUGH	12	7.6	50	170	260	0.3	0.2
LITTLE SALT	16	9.2	60	150	220	0.3	0.2
BRADEN RIVER	15	13.2	50	130	330	0.3	0.2
CITY OF SARA.	25	8.7	60	120	160	0.3	0.2
COUNTY NORTH	21	8.5	60	120	170	0.3	0.2
CITY OF VEN.	28	9.8	80	130	150	0.3	0.1
COUNTY SOUTH	19	8.6	60	130	190	0.4	0.2
LONGBOAT	17	8.0	50	140	200	0.3	0.2
CITY ISL.	21	6.7	40	110	180	0.3	0.2
SIESTA KEY	22	9.4	70	130	170	0.4	0.2
CASEY KEY	18	7.1	50	120	200	0.3	0.2
MANASOTA KEY	16	7.9	50	140	220	0.4	0.2

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TABLE 12 (Cont.)
EXISTING ANNUAL EMCs FOR STORMWATER

	TKN	NO2&NO3	TN	Lead	Copper	Zinc	Cadmium
	(mg/L)	(mg/L)		(mg/L)	(mg/L)	(mg/L)	(mg/L)
DIRECT TO BAY	0.7	0.5	1.2	0.01	0.04	0.16	0.001
WHITAKER BAY.	1.3	0.3	1.6	0.11	0.04	0.08	0.002
HUDSON BAY.	1.4	0.3	1.7	0.11	0.04	0.08	0.002
PHILLIPPI CR.	1.4	0.4	1.8	0.05	0.03	0.07	0.002
MATHENEY CR.	1.4	0.3	1.7	0.09	0.04	0.08	0.002
CLOWERS CR.	1.3	0.3	1.6	0.06	0.03	0.07	0.001
CATFISH CR.	1.3	0.3	1.6	0.06	0.02	0.08	0.001
NORTH CR.	1.4	0.4	1.8	0.02	0.02	0.06	0.001
SOUTH CR.	1.2	0.4	1.6	0.01	0.02	0.07	0.001
SHAKETT CR.	1.4	0.4	1.8	0.03	0.03	0.07	0.001
CURRY CR.	1.4	0.4	1.8	0.04	0.03	0.07	0.002
HATCHETT CR.	1.3	0.3	1.6	0.07	0.03	0.08	0.001
ALLIGATOR CR.	1.4	0.4	1.8	0.05	0.03	0.07	0.002
WOODMERE	1.4	0.4	1.8	0.04	0.03	0.07	0.001
FORKED CR.	1.4	0.4	1.8	0.04	0.03	0.08	0.002
GODFREY CR.	1.3	0.4	1.7	0.04	0.03	0.08	0.002
AINGER CR.	1.3	0.4	1.7	0.01	0.02	0.07	0.001
COW PEN SL.	1.2	0.4	1.6	0.02	0.02	0.08	0.001
MYAKKA	1.1	0.5	1.6	0.01	0.03	0.10	0.001
DEER PR.	1.0	0.5	1.5	0.01	0.02	0.11	0.001
BIG SLOUGH	1.2	0.4	1.6	0.02	0.02	0.08	0.001
LITTLE SALT	1.4	0.4	1.8	0.04	0.03	0.07	0.001
BRADEN RIVER	1.2	0.4	1.6	0.03	0.03	0.09	0.003
CITY OF SARA.	1.2	0.4	1.6	0.09	0.04	0.11	0.002
COUNTY NORTH	1.3	0.4	1.7	0.05	0.04	0.10	0.002
CITY OF VEN.	1.3	0.3	1.6	0.14	0.04	0.10	0.002
COUNTY SOUTH	1.4	0.5	1.9	0.04	0.04	0.09	0.001
LONGBOAT	1.2	0.4	1.6	0.04	0.04	0.10	0.001
CITY ISL.	1.1	0.4	1.5	0.04	0.04	0.12	0.001
SIESTA KEY	1.4	0.4	1.8	0.05	0.04	0.09	0.002
CASEY KEY	1.2	0.5	1.7	0.02	0.04	0.11	0.001
MANASOTA KEY	1.3	0.5	1.8	0.02	0.04	0.10	0.001

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TABLE 13 PERCENTAGE OF EXISTING TOTAL ANNUAL LOADING			
	STORMWATER (%)	**BASEFLOW (%)**	**WASTEWATER (%)**
Runoff	72	25	3
BOD	90	8	2
COD	96	3	1
TSS	99	1	< 1
TDS	37	45	18
Total P	58	27	15
Dissolved-P	50	33	17
TKN	66	24	10
NO_2 & NO_3	55	17	28
Lead	94	3	3
Copper	95	1	4
Zinc	78	20	2
Cadmium	66	22	12

REFERENCES

American Water Resources Association, Nonpoint Pollution: 1988-Policy, Economy, Management and Appropriate Technology, Ed. Dr. Vladimir Novotny, Proceedings from AWRA Symposium TPS884.

APOXSEE, 1988. Sarasota County Comprehensive Plan, Compiled by the Sarasota County Planning Dept.

Briley, Wild & Associates, 1984. Master Stormwater Drainage Plan Areas A and B, Manatee County. Prepared for Manatee County Government.

CDM, 1984. Tributary Streamflows and Pollutant Loadings Delivered to Tampa Bay. Prepared for Florida Department of Environmental Regulation.

CDM, 1987. Sarasota County Stormwater Master Plan Final Report. Prepared for Sarasota County Government.

CDM, 1992. A Review of Structural Best Management Practices, Prepared for Atlanta Stormwater Management Task Force.

CDM, 1992. Watershed Management Model Users Manual, 3.10.

Federal Highway Administration, 1990. Pollution Loadings and Impacts from Highway Stormwater Runoff, Volume III: Analytical Investigation and Research Report FHWARD880081, McLean, Virginia.

Florida Department of Environmental Regulation, 1988. The Florida Development Manual: A Guide to Sound Land and Water Management. Nonpoint Source Management Section.

Metcalf and Eddy, Inc., 1983. Tampa Nationwide Urban Runoff Program Phase II Task II.2 Rainfall Quality Analysis. Prepared for the City of Tampa, FL.

Metropolitan Washington Council of Governments, 1987. Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs.

Northern Virginia Planning District Commission, 1983. Washington Metropolitan Area Urban Runoff Demonstration Project. Prepared for Metropolitan Washington Council of Governments, Washington D.C.

Novotny, V., January 1992. Unit Pollutant Loads: Their Fit in Abatement Strategies, Water Environment & Technology.

Novotny and Chesters, 1981, Handbook of Nonpoint Pollution, Van Nostrand Rheinhold Company.

Schueler et al. 1991. A Current Assessment of Urban Management Practices, Techniques for Reducing Nonpoint Source Pollution in the Coastal Zone, Draft, Prepared for U.S.E.P.A. Office of Wetlands, Technical Guidance to Implement Section 6217(g) of the Coastal Zone Act.

Southwest Florida Water Management District, 1988. Management and Storage of Surface Waters, Permit Information Manual.

Tennessee Valley Authority, Chatanooga, TN., 1984. The Relationship of Urban Runoff to Land Use and Groundwater Resources: Knoxville, Tennessee 19811982.

U. S. Environmental Protection Agency, 1986. Design Manual Municipal Wastewater Disinfection Water Engineering Research Laboratory, Cincinnati, OH. EPA/625/186/021.

University of California, Davis (UCD), 1984. Irrigation With Reclaimed Municipal Wastewater A Guidance Manual prepared for California State Water Resources Control Board.

U. S. Environmental Protection Agency, December 1983. Final Report of the Nationwide Urban Runoff Program, Office of Water, Washington D.C.

USGS, 1984. Water Quality Characteristics of Urban Runoff and Estimates of Annual Loads in the Tampa Bay Area, Florida, 197580 (WRI 834181).