Data Interpretation

NJ Department of Environmental Protection
Division of Watershed Management

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Data Interpretation
What did you accomplish so far:

- ✓ Completed your sampling project successfully
  - Lab results
  - Field data
  - Reviewed your data
- ✓ Completed your stream survey
  - Field notes
  - Gathered information about your stream

Data Interpretation

- What is your Monitoring objective?
- Types of Monitoring
  - TMDL development
  - BMP effectiveness
  - watershed assessment

Data Interpretation

Basic requirements to start analyzing your data

- Know your water quality parameters
  - How they interact
  - Acceptable ranges
  - Significant, …
- Know your watershed
- knowledge about lab test methods
- Computer skills, make the job easy!

Data Interpretation

Where do I start ?

- Organize your data and your field notes
  - Follow a consistent data reporting
- Data tables:
  - Help you better manage your data
  - Help analyze data
  - Easy to spot errors

Data Interpretation
What are you trying to answer?
" the objective of your monitoring"

- Are the Surface Water Quality standards (SWQS) met ?
- Is there a trend in water quality?
- If SWQS is violated, then …
  - How much
  - How frequent
  - Seasonal Pattern- is weather a factor?
  - Spatial pattern
- How your data compare to other data sets for the same stream?
- How reliable are your data ?

Data Analysis
How reliable is your data?

- Analyze QA/QC results
  - Blanks – ambient blank, field blank, …
  - Reference samples
  - Replicate samples - duplicate, concurrent, sequential, split
  - Spike samples- concurrent, split

- Do your own QA/QC
  - Correlation between parameters
  - Look for outliers
  - Compare total to dissolved fraction

SB PENNSAUKEN CREEK, upstream of STP

Date	Time	Temp C	flow cfs	Dissolved O2	% saturation	BOD 5	Total TKN	Dissolved TKN	Total NH3	Dissolved NH3	Total NO3+NO2	Dissolved NO3+NO2	Total P	Dissolved P	DF.Ortho P
06/18/02	850	16.4	1.02	5.14	52.6	4.5	0.755	0.632	0.245	0.271	0.639	0.648	0.049	0.03	0.02
06/25/02	1000	20.3	0.89	4.95	53.7	1	0.742	0.314	0.394	0.39	0.719	0.703	0.03	0.03	0.02
07/23/02	1000	22.2	1.08	5.45	62.5	1.2	0.969	0.457	0.33	0.301	0.589	0.606	0.131	0.08	0.047
08/21/02	1215	21.8	0.65	5.48	62.6	1	0.375	0.124	0.083	0.085	0.732	0.74	0.088	0.043	0.02
09/17/02	1200	19.1	1.24	5.5	59.3	1	0.474	0.249	0.143	0.132	0.671	0.691	0.273	**0.188**	**0.054**
10/01/02	1200	18.1	1.36	6.4	67.7	1	**0.180**	**0.335**	0.053	0.08	0.65	0.655	0.148	**0.03**	**0.105**

NB PENNSAUKEN CREEK, Church Rd. Mt. Laural

Date	Time	Temp C	flow cfs	Dissolved O2	% saturation	BOD 5	Total TKN	Dissolved TKN	Total NH3	Dissolved NH3	Total NO3+NO2	Dissolved NO3+NO2	Total P	Dissolved P	DF.Ortho P
06/18/02	900	15.7	0.240	6.000	74.0	1.000	1.819	2.016	0.369	0.377	0.328	0.325	0.216	0.037	0.020
06/25/02	1000	19.5	0.300	5.300	57.8	1.400	.522	.499	0.140	0.145	0.507	0.499	0.132	0.030	0.023
07/23/02	1000	21.1	0.510	5.500	61.5	1.200	.641	.312	0.085	0.076	0.237	0.251	0.278	**0.107**	**0.026**
08/21/02	1100	20.2	0.110	4.300	46.6	1.000	0.258	0.201	0.036	0.034	0.041	0.030	0.276	0.082	0.020
09/17/02	945	17.8	0.160	4.100	43.1	1.000	.311	.182	0.095	0.106	0.165	0.176	**0.249**	**1.974**	**0.020**
10/01/02	900	17.7	0.260	6.400	67.9	1.200	0.343	0.17	0.030	0.030	0.137	0.140	0.425	0.179	0.089

NB Cooper River upstream of SB Cooper River

Date	Time	Temp C	flow cfs	Dissolved O2	% saturation	BOD 5	Total TKN	Dissolved TKN	Total NH3	Dissolved NH3	Total NO3+NO2	Dissolved NO3+NO2	Total P	Dissolved P	DF.Ortho P
6/18/2002	1100	17.1	6.94	8.10	84.0	<1.0	0.591	0.479	0.163	0.133	0.582	0.584	**0.10**	**0.357**	**0.034**
6/25/02	1100	20.8	7.14	7.35	82.1	<1.0	**0.056**	**0.360**	0.156	0.153	0.627	0.629	0.075*	**<0.03**	**0.128**
7/23/2002	1100	22.9	4.97	7.06	82.2	<1.0	0.453	0.351	0.148	0.151	0.695	0.682	0.186	**0.085**	**0.047**
8/21/2002	0900	21.9	2.70	6.96	79.5	<1.0	0.193	0.141	0.15	0.118	0.927	0.914	0.161	**0.133**	**0.051**
9/17/02	0905	19.0	3.38	6.8	73.3	<1.0	0.434	0.391	0.124	0.114	0.791	0.798	0.197	**0.132**	**0.049**
10/1/2002	750	16	3.79	8.38	84.9	1.7 **	0.343	0.351	0.107	0.104	0.729	0.752	**0.08**	**<0.03**	**0.092**

NORTH BRANCH COOPER RIVER AT KRESSON NJ															
Date	Time	Temp C	flow cfs	Dissolved O2	% saturation	BOD 5	Total TKN	Dissolved TKN	Total NH3	Dissolved NH3	Total NO3+NO2	Dissolved NO3+NO2	Total P	Dissolved P	DF.Ortho P
6/18/2002	1000	15.3	0.67	7.4	73.3	<1.0	1.237	<0.03	0.088	0.076	0.154	0.138	<0.03	<0.03	<0.02
6/25/02	0845	19.4	0.18	5.80	63.0	<1.0	0.653	0.490	0.096	0.105	0.171	0.182	<0.03	<0.03	<0.02
7/23/2002	0905	21.8	0.02	1.27	14.5	<1.0	0.717	0.883	0.132	0.102	<0.02	<0.02	0.121	0.069	0.053
8/21/2002		no flow	no flow												
9/17/02	0930	19.1	0.10	1.1	3.3	1.4**	1.763	1.235	0.471	0.455	0.068	0.093	0.237	**0.143**	**0.074**
10/1/02	0900	16.4	no flow	1.09	5.6	<1.0	**0.445**	**1.346**	0.095	0.107	**0.140**	**<0.02**	0.054	**<0.03**	**0.098**

Data Analysis

- Data management
  - Consistent data reporting
  - Data analysis methods
- Data tables
- Graphs
- Summary statistics

Tables

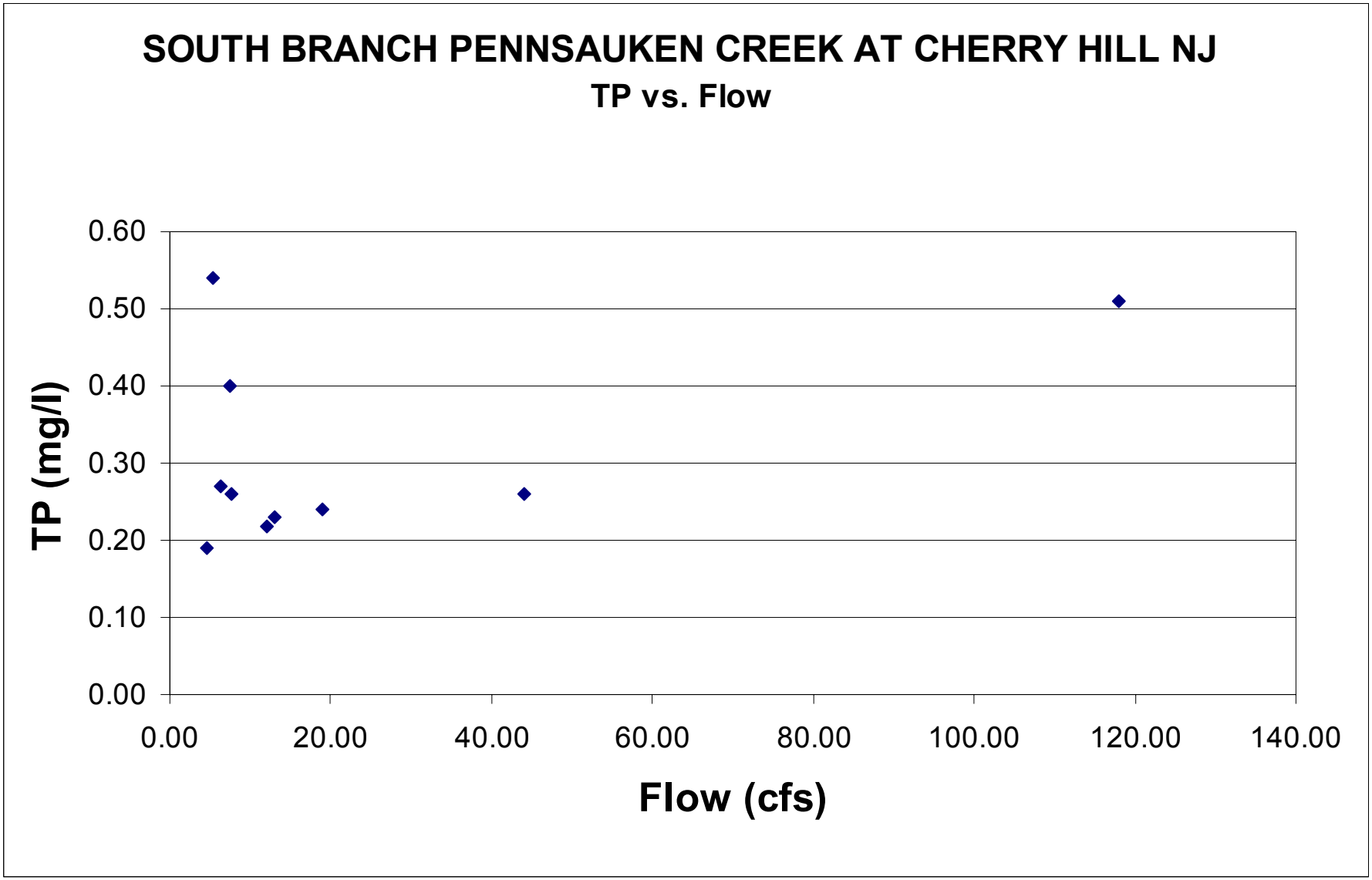
			Fecal Coliform data from	Raw Data ->
Station ID	Date	FLOW (cfs)	MPN and #/100ml	DO NOT DELETE ---
01367265	07/19/99		5400	
01367625	6/8/1998		110	
01367625	6/17/1998		230	
01367625	7/20/1998		130	
01367625	8/19/1998		790	
01367625	9/15/1998		460	
01367625	06/22/99		1700	
01367625	06/24/99		2400	
01367625	06/29/99		490	
01367625	07/07/99		5400	
01367625	06/28/00		310	
01367625	07/03/00		16000	
01367625	07/10/00		2200	

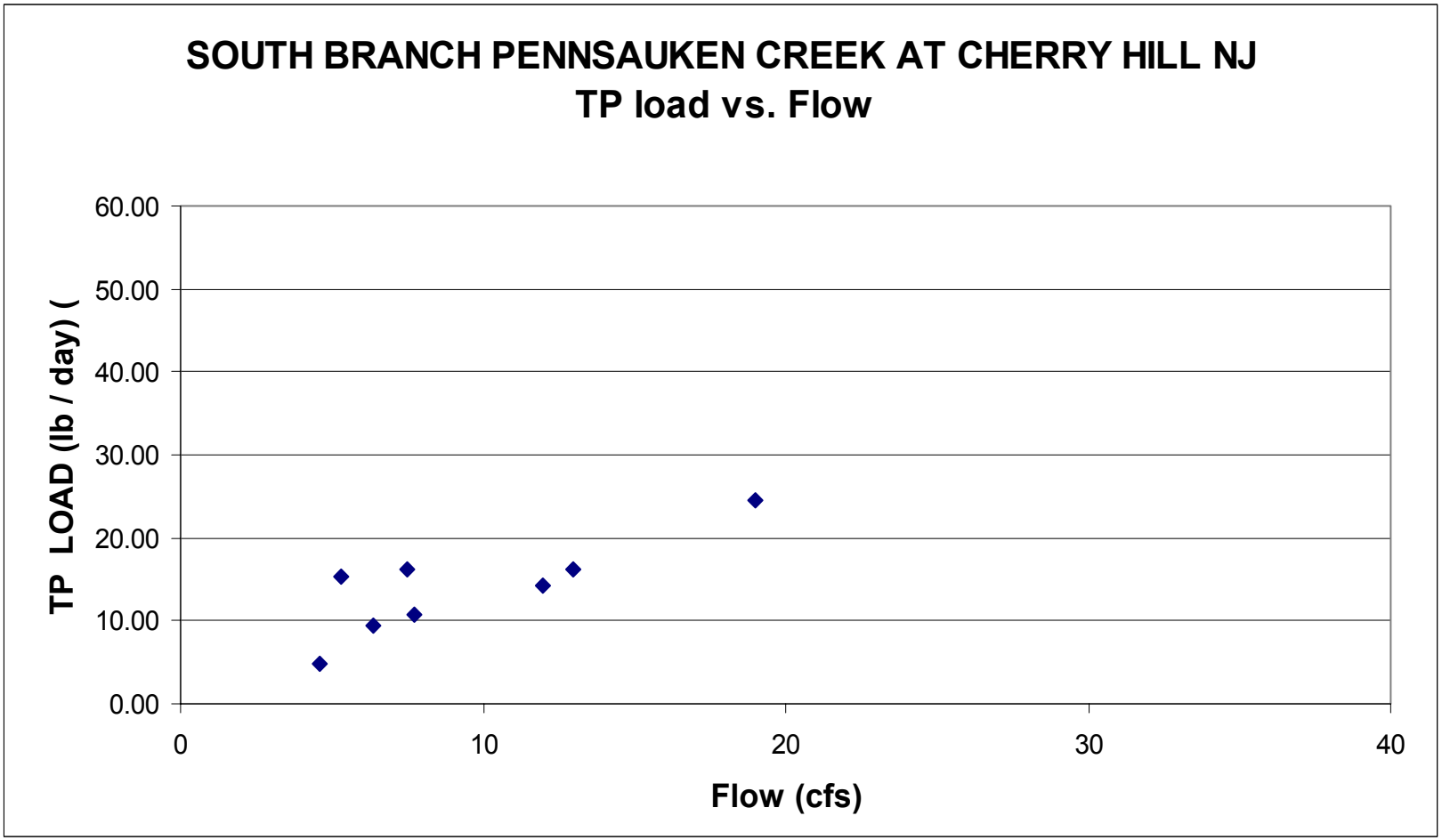
Tables

STAID	SNAME	DATES	TIMES	00061	00666	00671	00665
STATION NUMBER	STATION NAME	DATES	TIMES	DISCHARGE, INST. CF	PHOSPHORUS DISS. (MG/L AS P	PHOSPHORUS ORTHO (MG/L AS P)	PHOSPHORUS TOTAL (MG/L AS P)
1408009	Mingamahone Brook	11/24/1997	11:01	6.0	0.010		0.010
1408009	Mingamahone Brook	3/3/1998	9:35	12.0	0.010		0.010
1408009	Mingamahone Brook	6/3/1998	10:00	5.6	0.012		0.030
1408009	Mingamahone Brook	6/15/1998	8:55				
1408009	Mingamahone Brook	7/22/1998	9:45				
1408009	Mingamahone Brook	9/1/1998	12:55	1.3	0.010		0.053
1408009	Mingamahone Brook	9/16/1998	11:30				
1408009	Mingamahone Brook	11/17/1998	9:15	1.4	0.050		0.044
1408009	Mingamahone Brook	1/25/1999	10:00	22.0	0.050		0.050
1408009	Mingamahone Brook	5/26/1999	9:40	5.0	0.050		0.033
1408009	Mingamahone Brook	8/10/1999	12:02	0.6	0.050		0.034
1408009	Mingamahone Brook	11/8/1999	11:10	3.9	0.007		0.035
1408009	Mingamahone Brook	2/8/2000	11:45	3.6	0.003		0.028
1408009	Mingamahone Brook	5/11/2000	10:50	6.5	0.007		0.046
1408009	Mingamahone Brook	5/11/2000	10:51				
1408009	Mingamahone Brook	8/3/2000	10:40				
1408009	Mingamahone Brook	8/9/2000	9:10	2.1	0.015		0.056

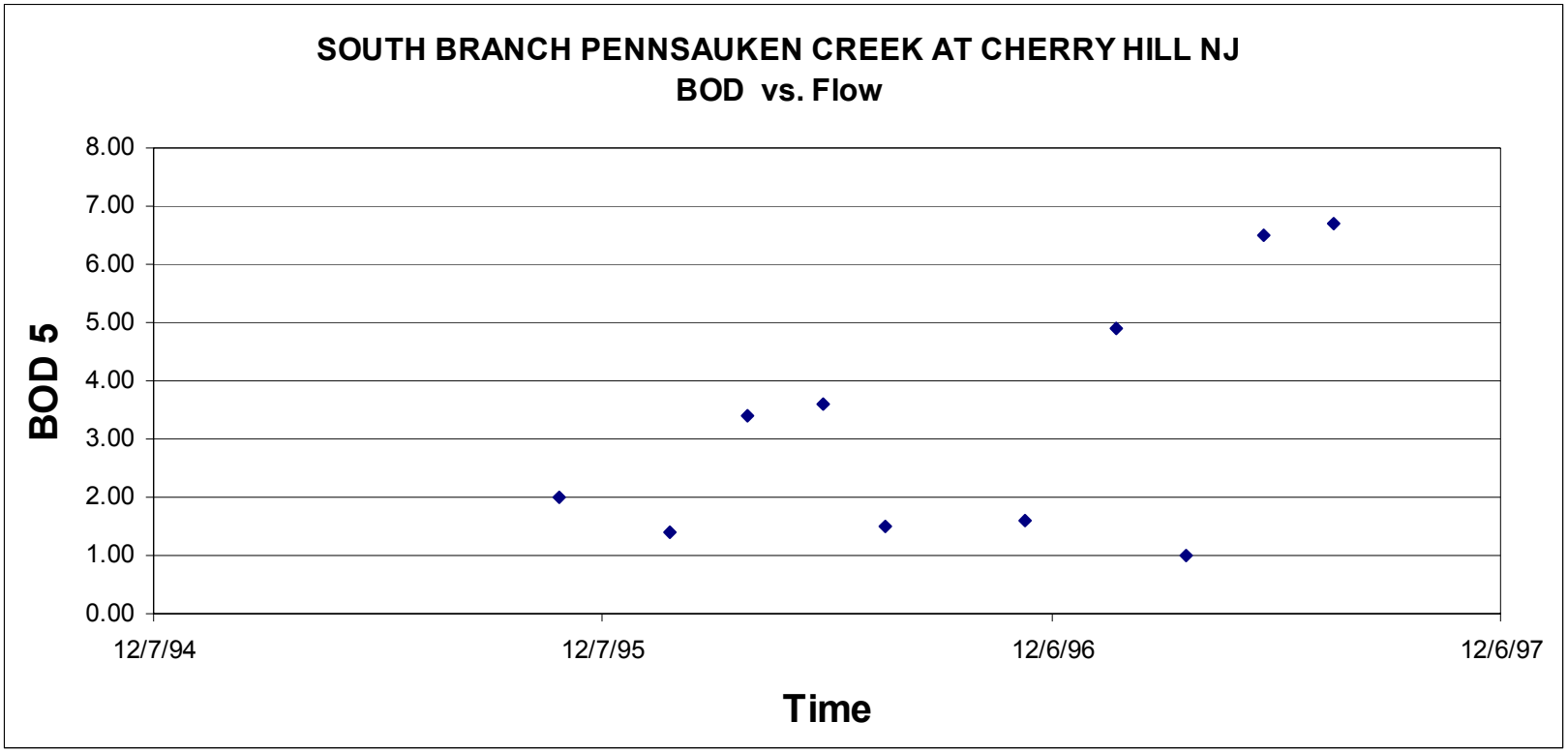
Data Analysis
Graphs

- Excellent way to display your data and results
- Analyze trends and correlations
- Graphical Solutions

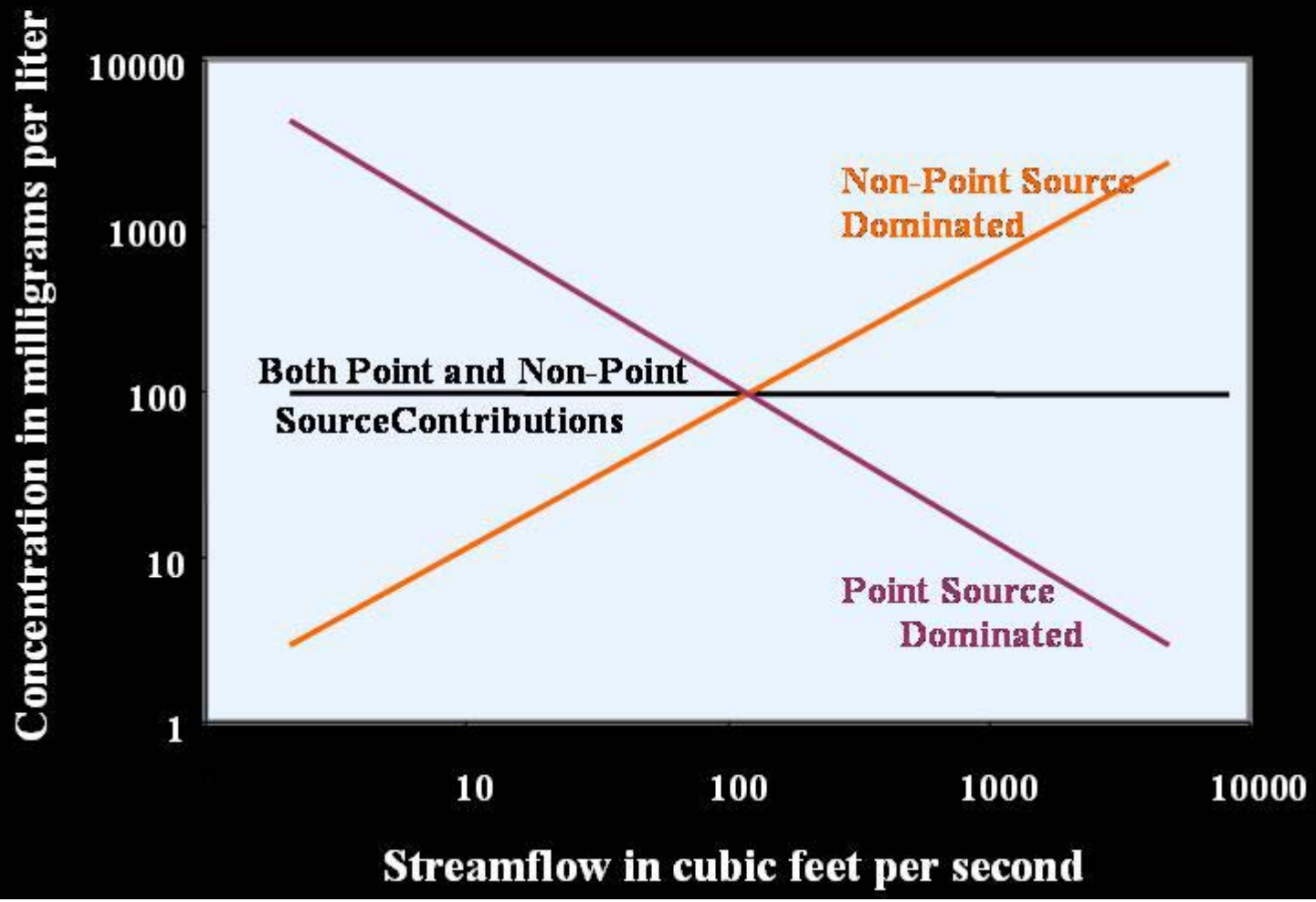

SOUTH BRANCH PENNSAUKEN CREEK AT CHERRY HILL NJ
TP vs. Flow
TP (mg/l)
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
Flow (cfs)

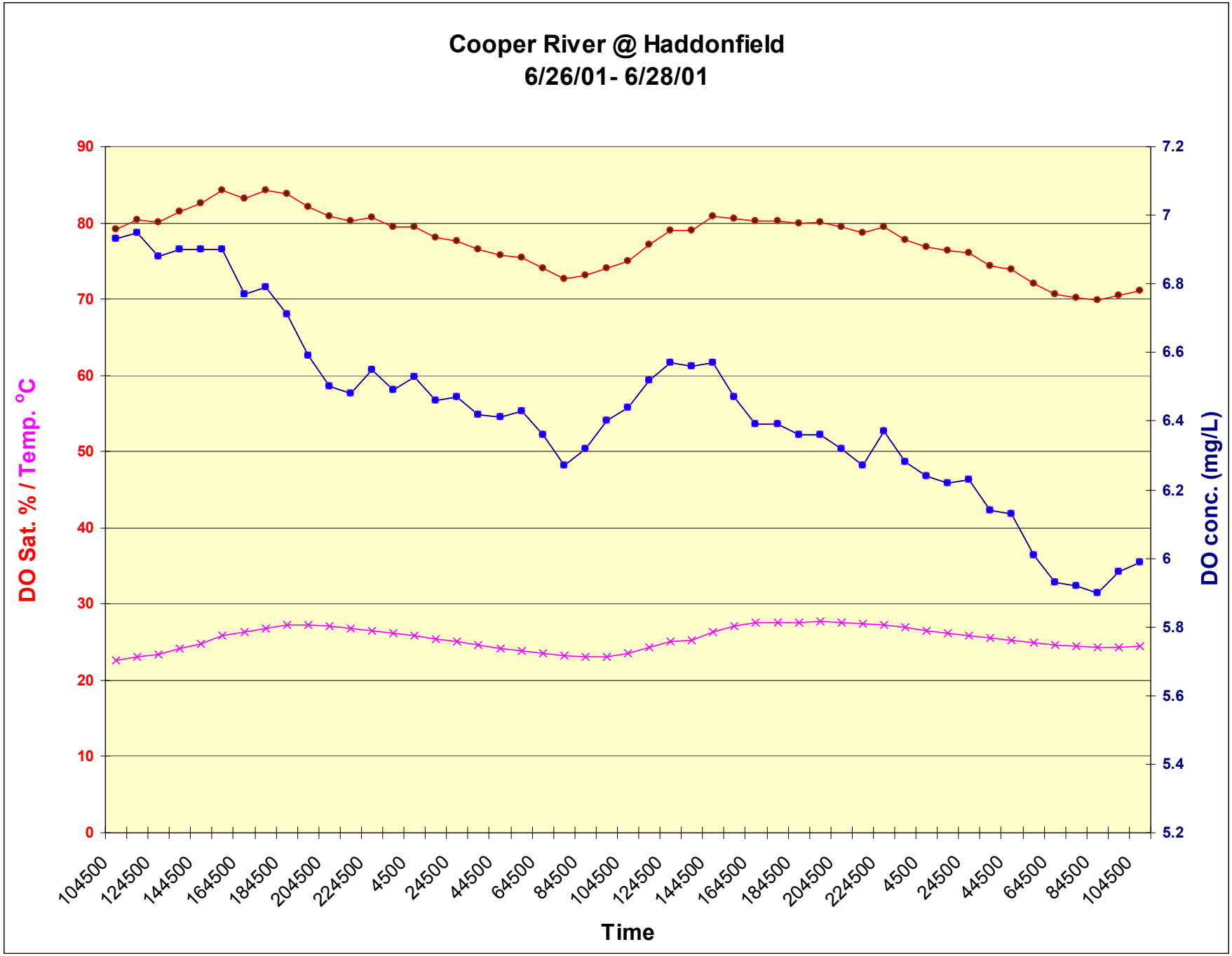

SOUTH BRANCH PENNSAUKEN CREEK AT CHERRY HILL NJ
TP load vs. Flow
TP LOAD (lb / day) (
60.00
50.00
40.00
30.00
20.00
10.00
0.00
0
10
20
30
40
Flow (cfs)

Data Analysis
time vs. concentration graph



Flow vs. Concentration:
Point, Non-Point, Mixed Sources




Cooper River @ Haddonfield
6/26/01- 6/28/01
DO Sat. % / Temp. °C
DO conc. (mg/L)
Time
90
80
70
60
50
40
30
20
10
0
7.2
7
6.8
6.6
6.4
6.2
6
5.8
5.6
5.4
5.2
104500
124500
144500
164500
184500
204500
224500
4500
24500
44500
64500
84500
104500
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204500
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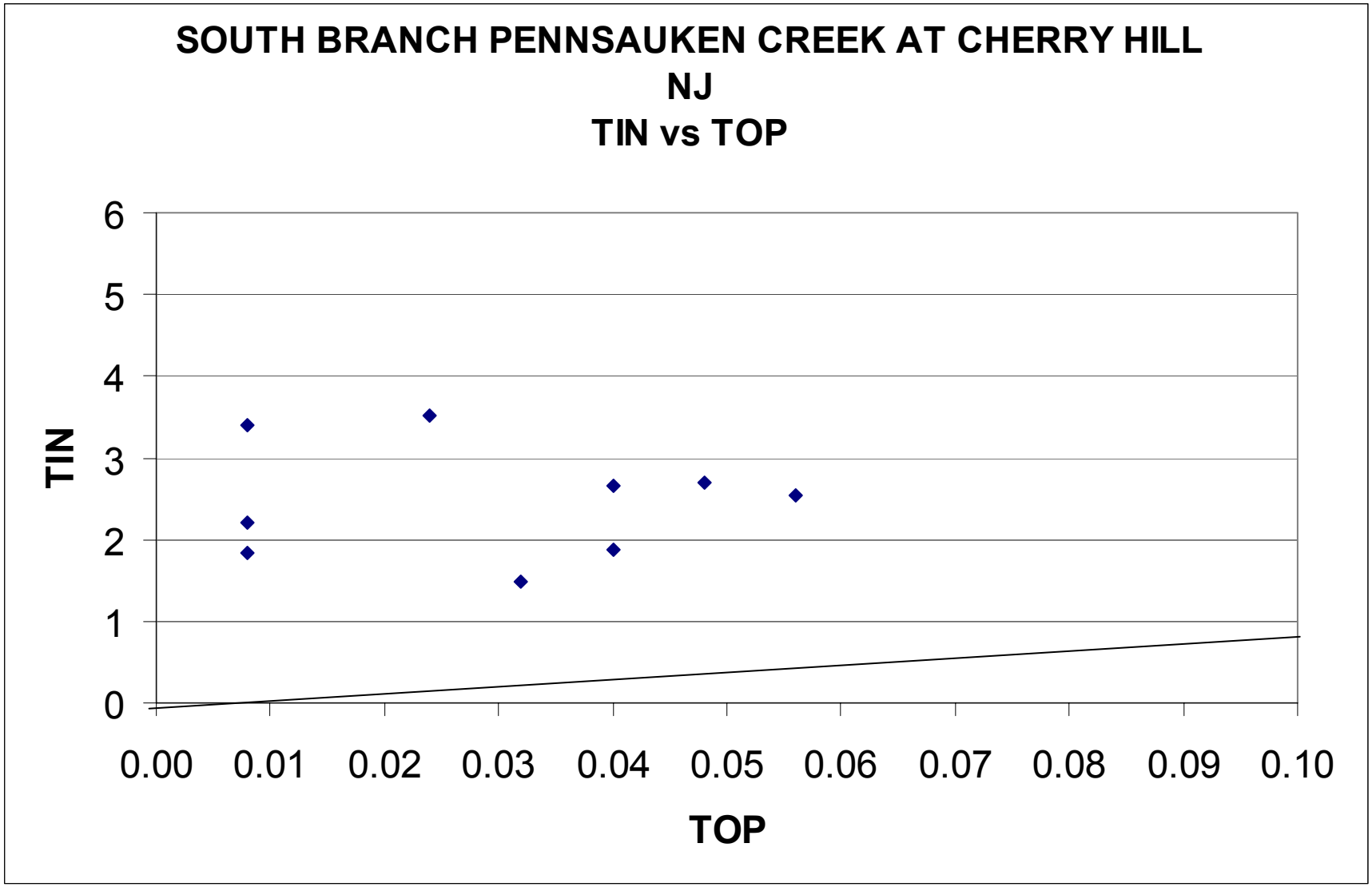
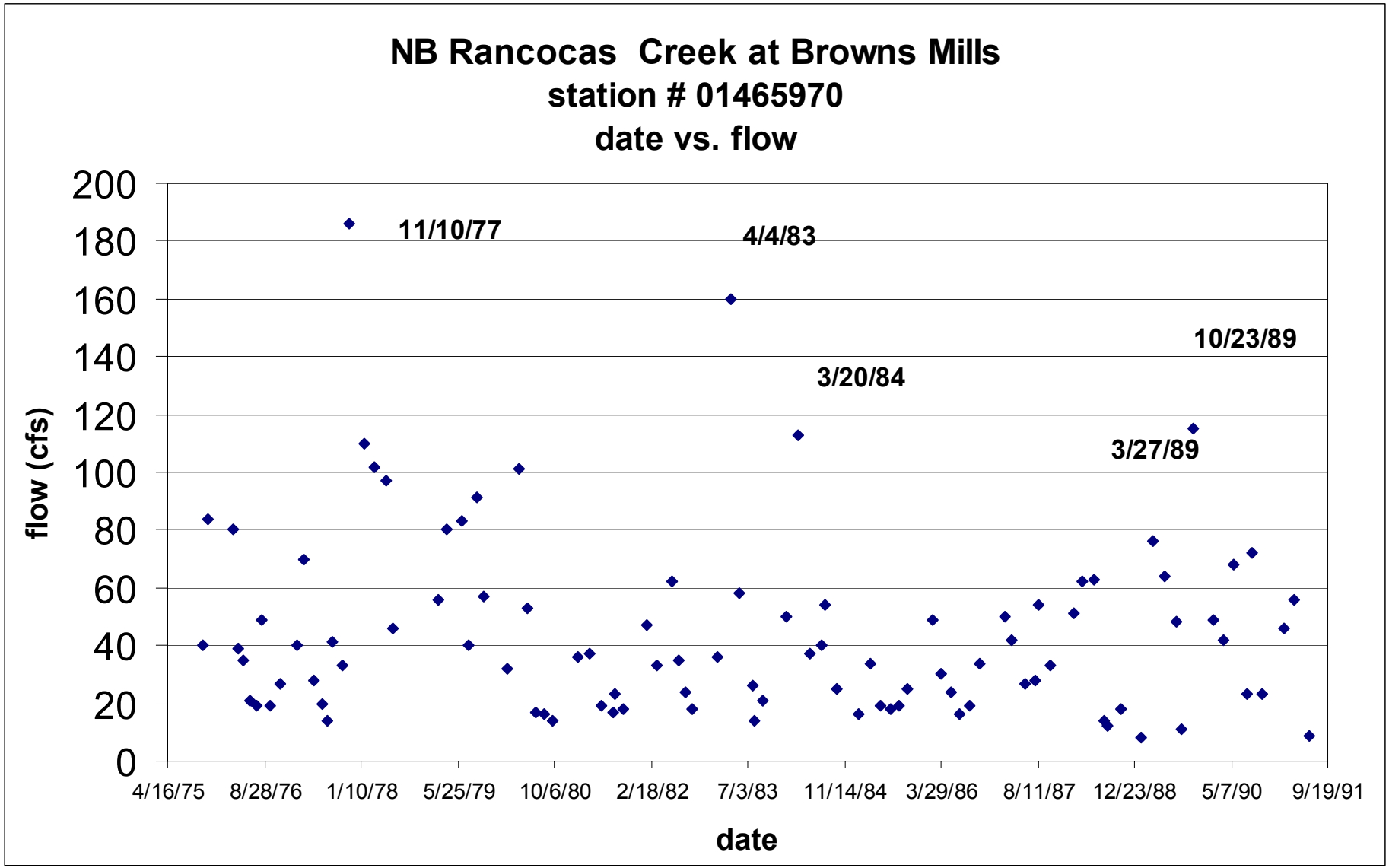
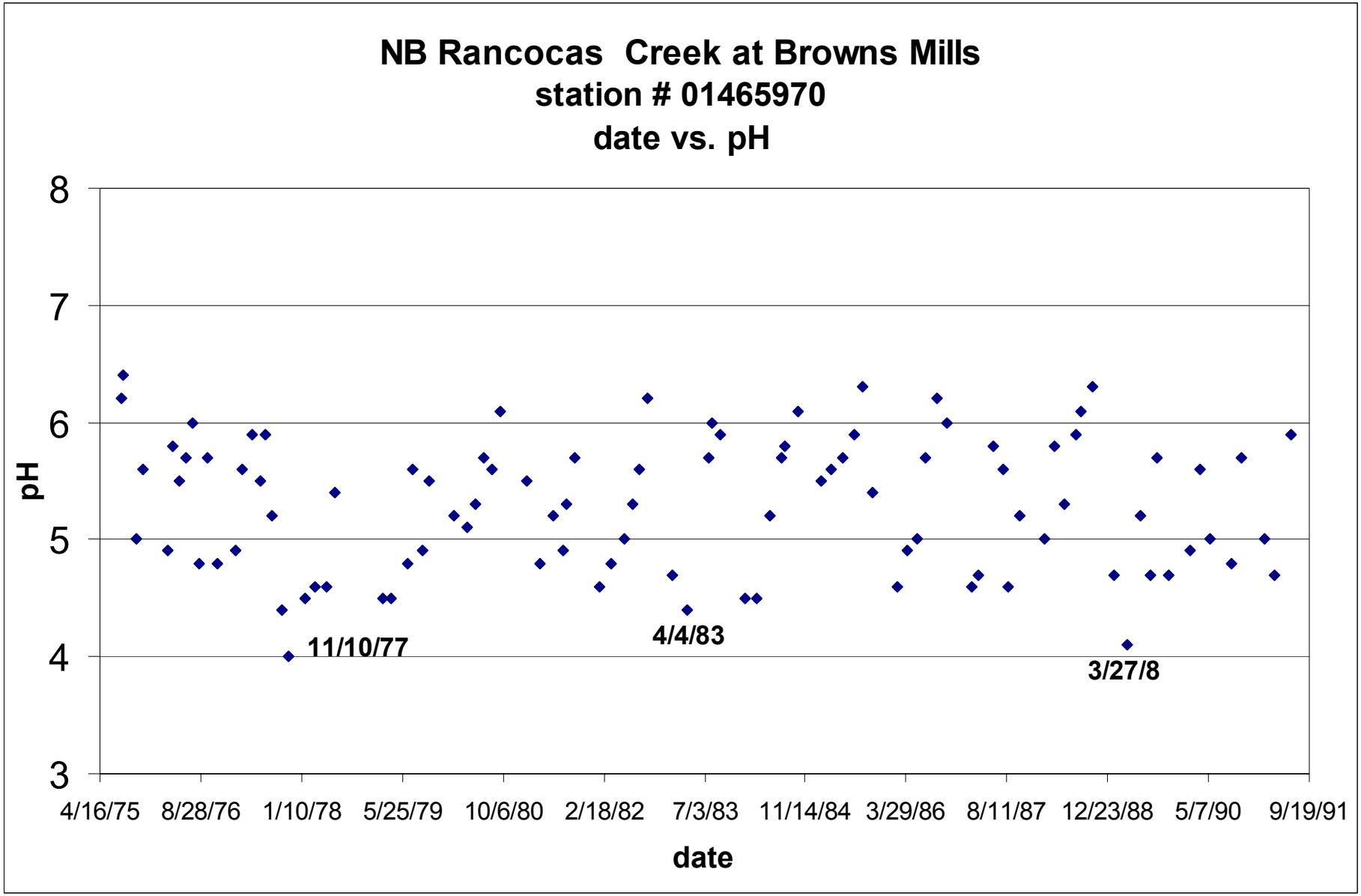
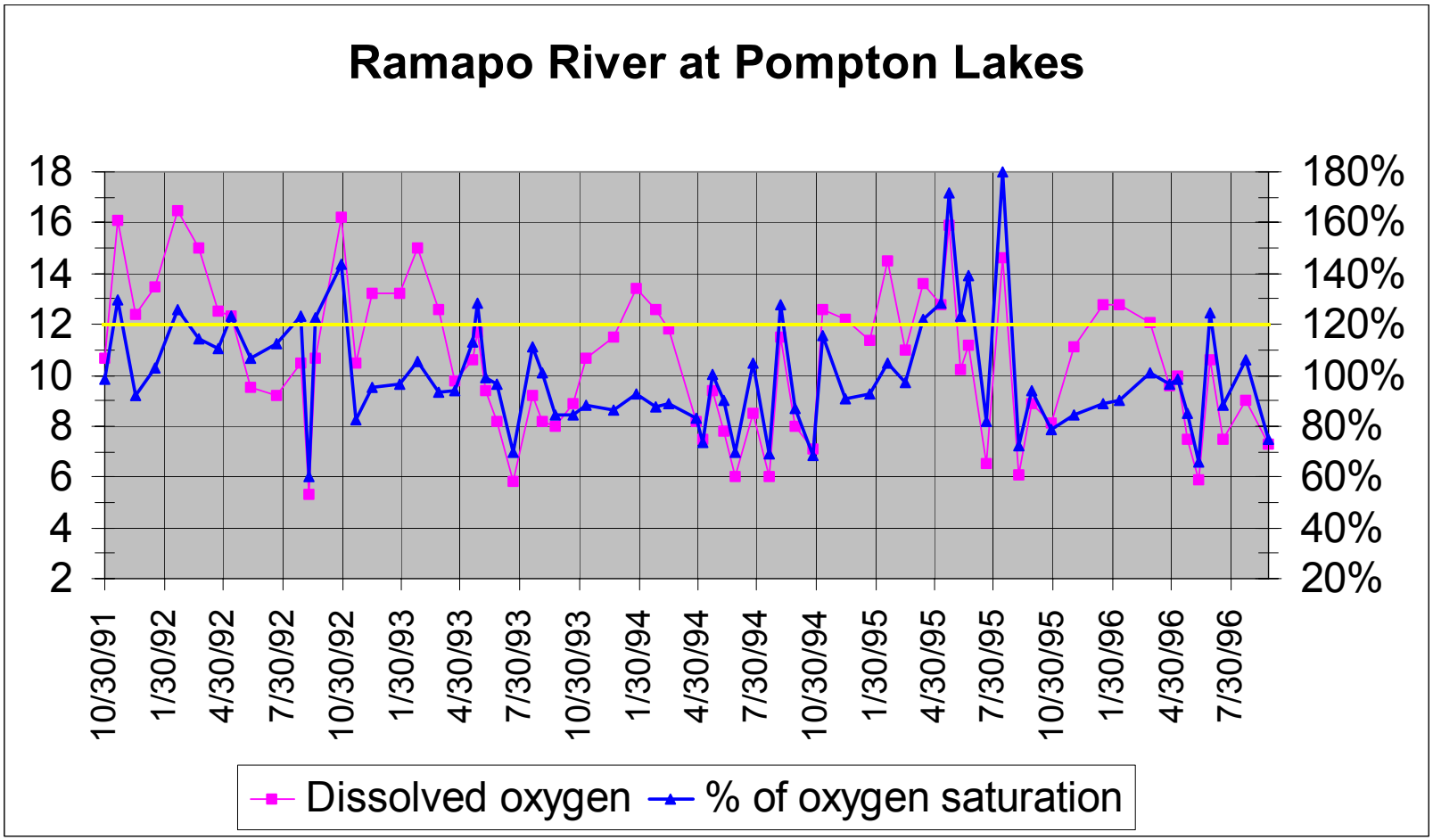
4500
24500
44500
64500
84500
104500

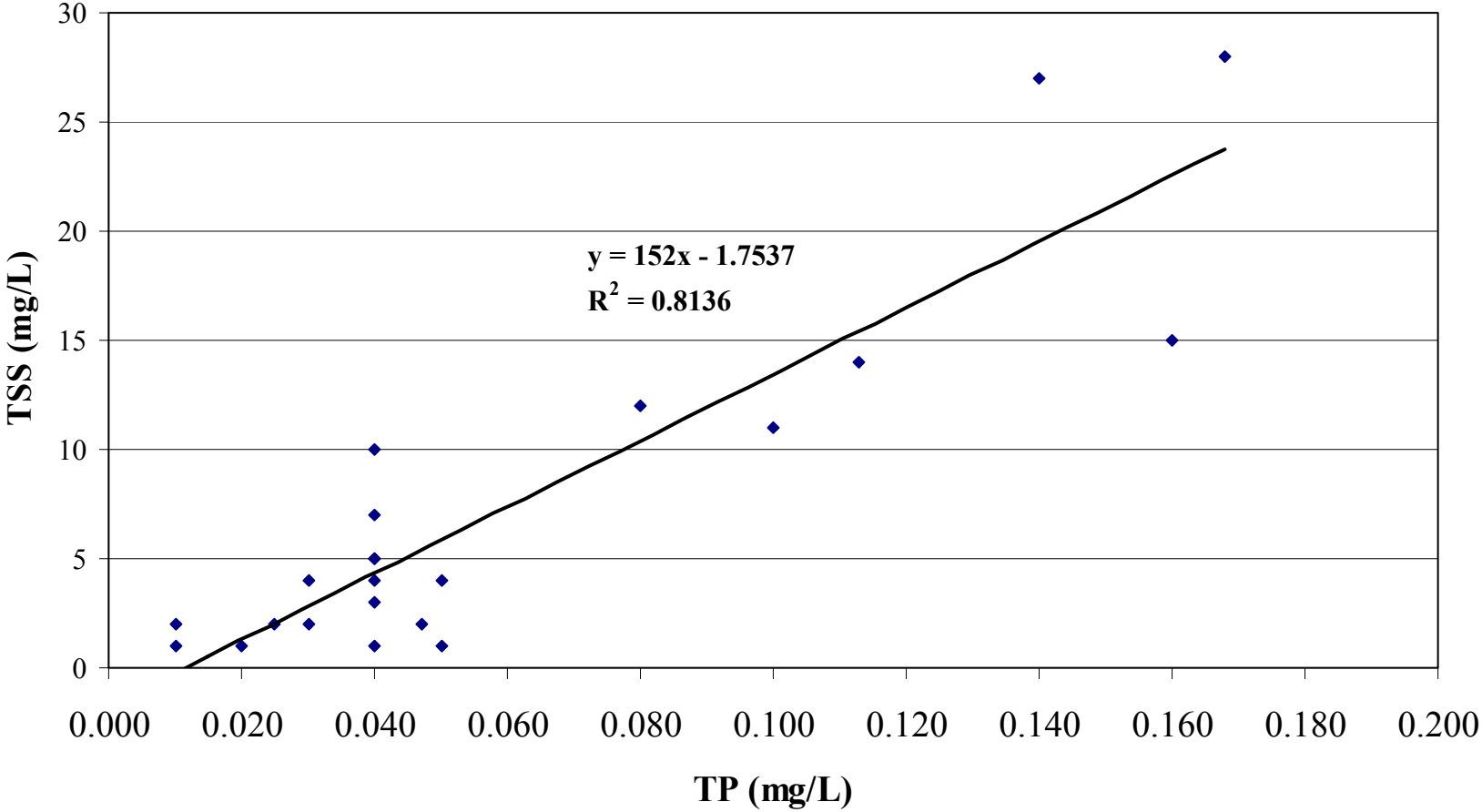

SOUTH BRANCH PENNSAUKEN CREEK AT CHERRY HILL
NJ
TIN vs TOP
TIN
6
5
4
3
2
1
0
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
TOP

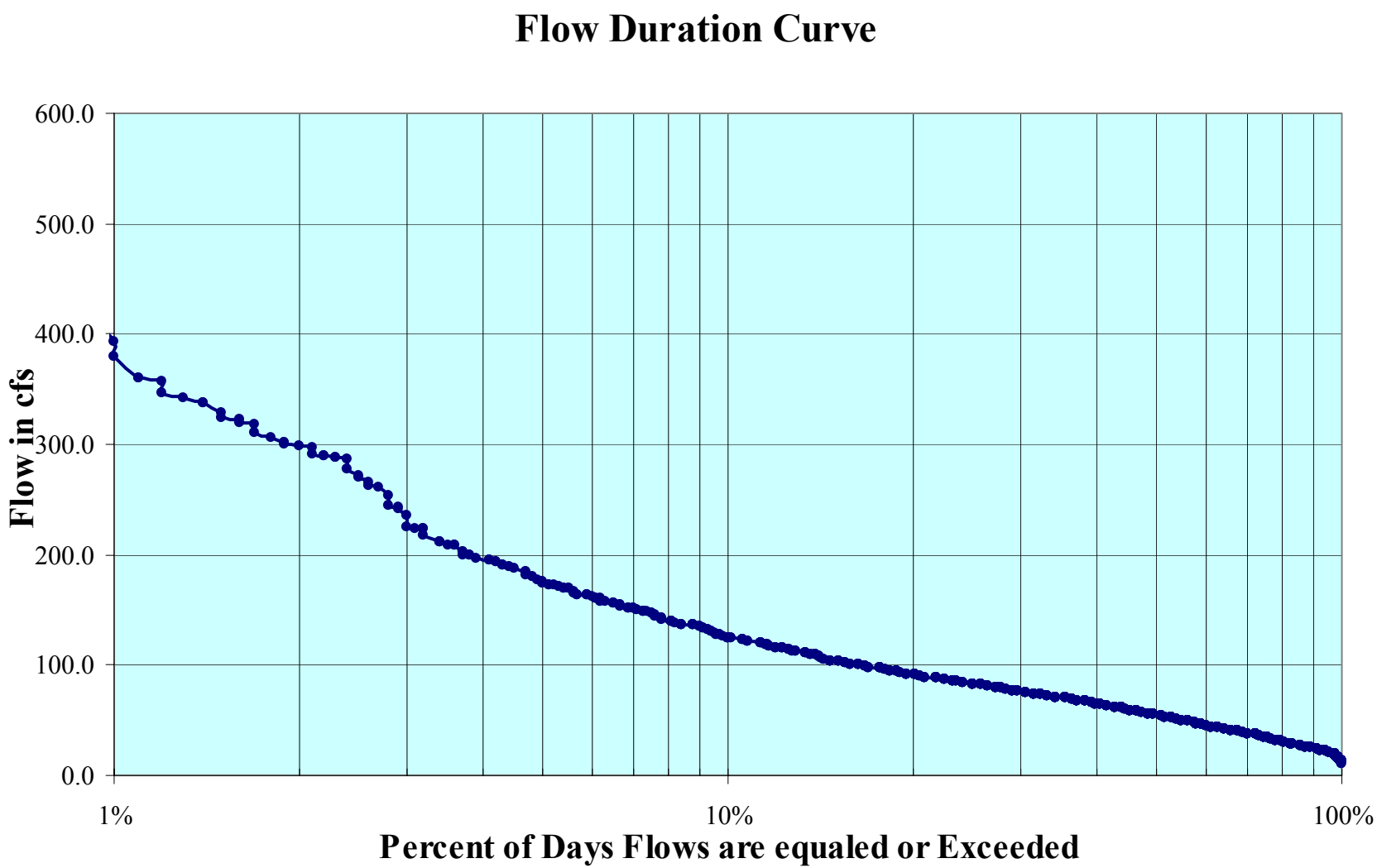

NB Rancocas Creek at Browns Mills
station # 01465970
date vs. flow
flow (cfs)
200
180
160
140
120
100
80
60
40
20
0
11/10/77
4/4/83
3/20/84
10/23/89
3/27/89
4/16/75
8/28/76
1/10/78
5/25/79
10/6/80
2/18/82
7/3/83
11/14/84
3/29/86
8/11/87
12/23/88
5/7/90
9/19/91
date


NB Rancocas Creek at Browns Mills
station # 01465970
date vs. pH
8
7
6
5
4
3
pH
11/10/77
4/4/83
3/27/8
4/16/75
8/28/76
1/10/78
5/25/79
10/6/80
2/18/82
7/3/83
11/14/84
3/29/86
8/11/87
12/23/88
5/7/90
9/19/91
date

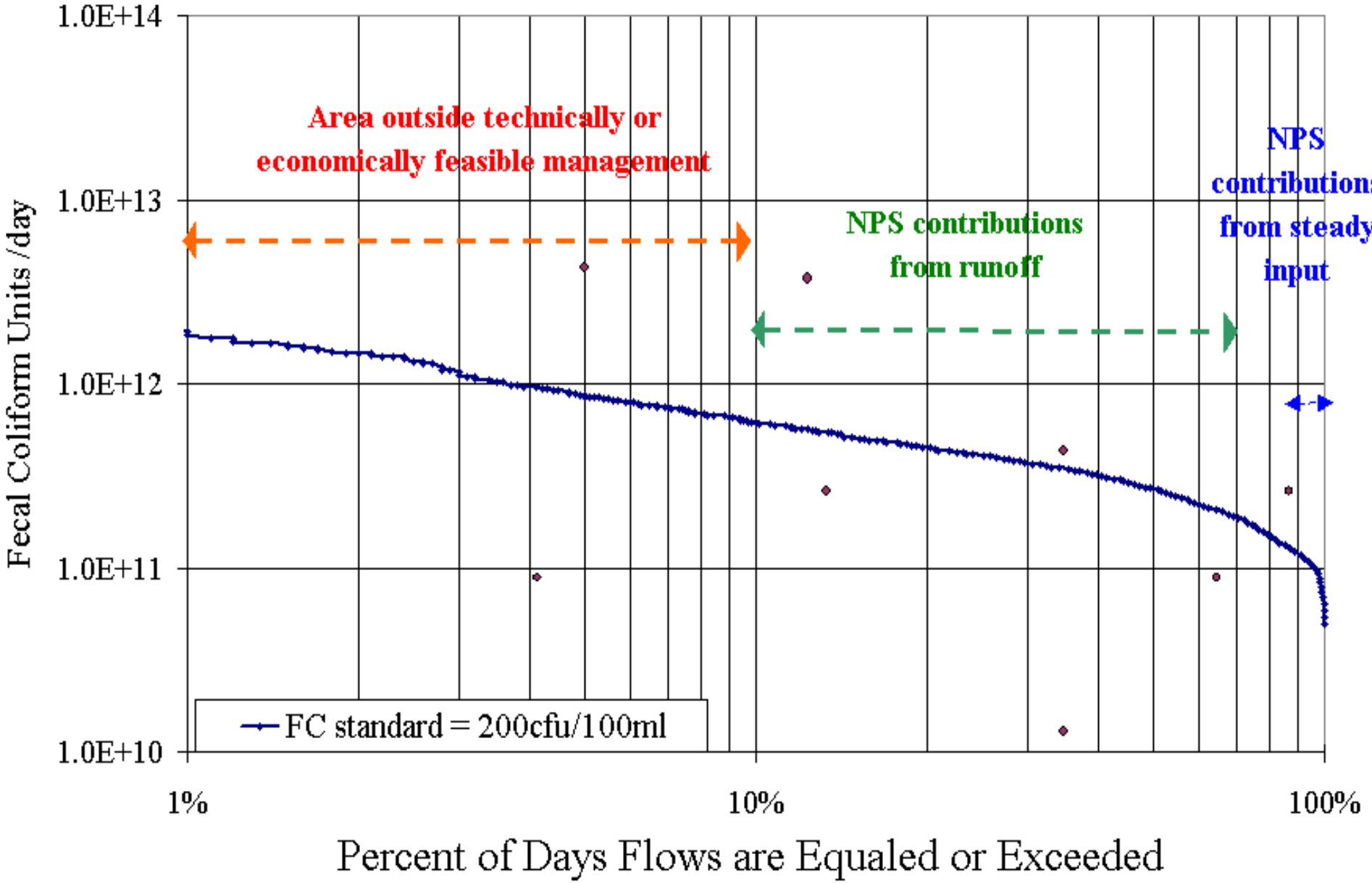

Ramapo River at Pompton Lakes
18
16
14
12
10
8
6
4
2
180%
160%
140%
120%
100%
80%
60%
40%
20%
10/30/91
1/30/92
4/30/92
7/30/92
10/30/92
1/30/93
4/30/93
7/30/93
10/30/93
1/30/94
4/30/94
7/30/94
10/30/94
1/30/95
4/30/95
7/30/95
10/30/95
1/30/96
4/30/96
7/30/96
Dissolved oxygen
% of oxygen saturation

Total suspended solids compared with total phosphorus measurements at the Manasquan River at Squankum, NJ station for water years 1996-2000




Flow Duration Curve
600.0
500.0
400.0
300.0
200.0
100.0
0.0
Flow in cfs
1%
10%
100%
Percent of Days Flows are equaled or Exceeded

Load Duration Curve



Simple Statistics

- Central Tendency:
  - Average or mean
  - Median
  - Min/max
  - Geometric mean
- Variability:
  - Range
  - Standard deviation

Station #	Date		MPN and #/100ml
01443500	2/1/1996		20
01443500	4/3/1996		20
01443500	6/19/1996		260
01443500	8/1/1996		9200
01443500	10/28/1996		2120
01443500	1/21/1997		20
01443500	4/10/1997		20
01443500	6/18/1997		20
01443500	8/7/1997		130
01443500	6/11/1998		210
01443500	7/7/1998		110
01443500	7/23/1998		130
01443500	8/5/1998		20
01443500	8/27/1998		1100
	median =	**120**	
	Average=	**956**	
	geometric mean =	**121**	
	max=	**9200**	
	min=	**20**	
	count=	**14**	