

**Evaluation of Water Quality Standards  
in Watershed Streams  
Using the Protocols of the DEC/DEP MOU, Addendum E**

**New York City Water Supply**

**Report for 2011**



Prepared by: Bureau of Water Supply  
Watershed Water Quality Science & Research  
Report Dated September 2012



## 1. Introduction

In September 1997, the New York State Department of Environmental Conservation (DEC) and the New York City Department of Environmental Protection (DEP) finalized a Memorandum of Understanding (MOU) governing several aspects of enforcement protocols in the New York City water supply watersheds. Addendum E of the MOU describes a series of methods to examine routine stream sampling data collected by DEP's Division of Watershed Water Quality Operations to evaluate water quality. According to Addendum E, DEP will submit reports describing the results of this analysis along with any other documentation of water quality concerns (*e.g.*, exceedances of TMDLs, results of non-routine special sampling efforts, biomonitoring information).

## 2. Data Analysis Description

Fecal and total coliform bacteria, pH, total phosphorus, dissolved oxygen, total ammonia, and nitrate-nitrite are the analytes routinely examined by these protocols. However, according to Addendum E, any constituent listed in 6 NYCRR §703 can be included in this analysis. The means of the analytes were calculated for each site, and compared to the stream water quality guidance values listed in Table I of Addendum E, which is reproduced here as Table 1. Values below detection were converted to one-half the detection limit for the purpose of calculating mean values. Mean coliform concentrations were calculated in the log system. Coliform values listed as "too numerous to count" in the dataset were not used in the summary statistics for each sampling site because they could not be converted into a numerical value. To calculate the compliance of streams with the Addendum E pH standards ( $6.5 \leq \text{pH} \leq 8.5$ ) this protocol converts pH values to hydrogen ion concentrations, calculates the mean, and compares the mean to the pH standards also expressed as hydrogen ion concentrations (*i.e.*,  $0.31623 \geq [\text{H}^+] \geq 0.0031623$ ).

---

Table 1. Water Quality Guidance Values used to compare routine stream monitoring data.

---

<u>Parameter</u>	<u>Guidance Value</u>
pH	$6.5 \leq \text{pH} \leq 8.5$
fecal coliform bacteria	$\leq 200 \text{ CFU } 100\text{ml}^{-1}$
total coliform bacteria	$\leq 2400 \text{ CFU } 100\text{ml}^{-1}$
total phosphorus	$\leq 50 \mu\text{g L}^{-1}$
dissolved oxygen	$\geq 6 \text{ mg L}^{-1}$
total ammonia ( $\text{NH}_3 + \text{NH}_4\text{-N}$ )	$\leq 2 \text{ mg L}^{-1}$
nitrate-nitrite ( $\text{NO}_3 + \text{NO}_2\text{-N}$ )	$\leq 10 \text{ mg L}^{-1}$

---

Summary statistics for all sites for the year 2011 can be found in Appendix A. Maps showing routine stream sample sites, surface discharging WWTPs, and stream biomonitoring sites are included as Appendix B. Table 2 lists the 48 sites with contraventions of water quality standards out of the 137 sites analyzed. The 21 sites at which mean concentrations contravened the Table 1 guidance values are noted in the third column of Table 2.

Most of the sites in Table 2 are there not because their mean concentrations actually contravened the Table 1 guidance values, but because there were more than two contraventions of the spike concentration values at

the site. A spike is defined in the Addendum as “...an ambient water quality concentration found to be above the [guidance] value by three standard deviations of the...mean at a given site.” The concept of the spike concentration is important because most loading from non-point sources occurs during rainfall events. Since the routine samples are collected on a fixed frequency basis, average values from the routine sampling data may not reveal sites that occasionally receive excessive non-point loading. Such sites could be considered for special investigation. If there are a total of more than two spikes at a site, they are listed in the fourth column of Table 2. If the number of samples taken at a site during the sample period was unusually high (>30) or low (<10), it is so noted in the table.

Addendum E also specifies the application of a t-test to examine differences in concentrations of the seven constituents listed in Table 1 between sampling sites that are paired above and below selected wastewater treatment plant (WWTP) discharges. This test looks at the difference between the upstream and downstream concentrations, subtracts an allowable amount of increase (one half of the guidance value or one standard unit in the case of pH) and determines if the result is statistically less than zero at the 95% confidence level. The null hypothesis for this test is that the difference is greater than or equal to zero, that is, that the plant is increasing in-stream concentrations above an allowable amount. To reject the null hypothesis, and so conclude that the plant is not increasing in-stream concentrations above an allowable amount, the t-statistic must fall within the lower tail (or the upper tail in the case of alkaline pH and dissolved oxygen). The results of this analysis are listed in Table 3.

The second column of Table 3 lists those analytes for which the WWTP was found by this test to be a significant source, and whose mean concentrations at the downstream sampling site contravene the water quality guidelines listed in Table 1. WWTPs with entries in this column may be considered sources of water quality problems.

The third column of Table 3 lists those analytes for which the WWTP was found by this test to be a significant source, but whose mean concentrations at the downstream site do not contravene the Table 1 guidelines. For these analytes, the WWTP can be considered to be a significant source, but not a significant problem.

New York State does not have a numeric water quality standard for phosphorus. In the past, DEP has used the DEC phosphorus guidance value of  $20 \mu\text{g L}^{-1}$  when determining Phosphorus Restricted Basins and the Phase I TMDLs. The Phase II TMDLs, which were approved by EPA in October 2000, incorporate a site-specific guidance value of  $15 \mu\text{g L}^{-1}$  for source water reservoirs (New Croton, Cross River, Croton Falls, Kensico, West Branch, Rondout and Ashokan), and apply the existing New York State guidance value of  $20 \mu\text{g L}^{-1}$  for upstream reservoirs. For this stream water analysis, a  $50 \mu\text{g L}^{-1}$  guidance value is used. This value, intended to protect downstream impoundments from eutrophication, was taken from the Federal Water Quality Criteria “Gold Book”, and has been accepted by New York State.

If a reservoir is listed as phosphorus restricted (“P-restricted”) as of this report’s time frame, it is so noted in Table 2. DEC removed Cannonsville Reservoir from the list of phosphorus restricted reservoirs in 2002, and added Bog Brook Reservoir and New Croton Reservoir in 2002 and 2004 respectively. One phosphorus restricted reservoir in the Croton System, Bog Brook Reservoir, is not listed in Table 2 because, for 2011, it had no stream sites meeting the criteria for inclusion.

### 3. Discussion

For the year 2011, 2,104 samples from 137 stream sample sites were analyzed. Of these, 48 sites are listed in Table 2. As in previous Addendum E water quality reports, most of the sites listed in Table 2 are there because of intermittently high concentrations (“spikes”) of coliform bacteria, from sources other than WWTPs. See “Likely sources” in Table 2.)

Regarding pollutants from WWTPs, Addendum E analysis since 1997 has shown that sites downstream of WWTPs have often had excess total phosphorus (TP) concentrations. For 2011, however, only 3 stream sample sites had a mean TP > 50  $\mu\text{g L}^{-1}$  and none are located downstream of a WWTP. These low numbers continue to indicate a significant reduction in phosphorus loading in general, and in particular from WWTPs.

Previous Addendum E reports have shown by t-test analysis that, as each plant has been upgraded, it is no longer a source of unacceptably high levels of phosphorus, and is therefore no longer listed for phosphorus in the second column of Table 3. For 2011, of the 11 WWTPs analyzed by this method all plants have been upgraded. Yorktown Heights WWTP was the last to be upgraded, and is no longer listed in the second column of Table 3. For the second year in a row since the report was started there are no entries in Table 3, another sign of improved water quality.

Addendum E reports for 1998 through 2010 reported that stream sample sites with mean TP > 50  $\mu\text{g L}^{-1}$  often exhibited a significant correlation between phosphorus and turbidity measurements (Spearman’s correlation analysis, at  $p < 0.1$ ). In 2011, there were three sites with mean TP > 50  $\mu\text{g L}^{-1}$  and with sufficient turbidity data required to perform the analysis. Three sites exhibited a significant correlation between phosphorus and turbidity measurements, which is a slight increase from two sites in 2010, however it is a decrease from four sites in 2009. Due to improved water quality and changes to the sampling schedule the number of sites still available for this analysis is low. However, the TP/turbidity correlation continues to suggest that management strategies, such as stormwater retrofit and whole farm planning that reduce turbidity and/or suspended solids also mitigate non-point source TP loading.

It should be noted that four sites had no contraventions of water quality standards and are not listed in Table 2. However, all four were assessed as being slightly or moderately impaired using biomonitoring protocols. They are:

- MUSCOOT9 (site no. 112) located in Town of Somers on Muscoot River, Southern Basins Croton Watershed: Slightly impaired.
- Site 150 tributary to Croton Falls, Northern Basins Croton Watershed: Slightly impaired.
- Site 141 Tonetta Brook, Northern Basins Croton Watershed: Moderately impaired.
- BELLEGIG (site no. 229) Giggle Hollow, Catskill System: Slightly impaired. Note that this assessment may not be an accurate reflection of the site’s water quality, given that the community was dominated by a few highly sensitive taxa, a situation frequently encountered in headwater streams.

Given the severity of Tropical Storms Irene and Lee and their wide-ranging impacts throughout the watershed, the effects of the storms on West of Hudson benthic communities was remarkably light. At most sites, the impact was evidenced by markedly lower taxa counts than those observed in previous years. Other metrics were relatively unaffected, with EPT counts (the number of mayfly, stonefly, and caddisfly taxa) and HBI values (a measure of organic pollution) actually better than normal. In most cases, the low taxa counts did not translate into lower assessments; in fact, of the 22 sites with a prior sampling record, only 5

received assessments lower than their previous ones. Four sites received improved assessments and the rest remained unchanged.

While taxa numbers dropped everywhere, and did so with little obvious impact, a small number of sites were severely scoured by the high flows caused by the storms. As a result, subsample counts were far below the 100-count subsample mandated by the NYS Stream Biomonitoring Unit's protocols, rendering those sites' final assessments unreliable indicators of water quality. Thus, the subsample at Site 206 on the Batavia Kill had only 7 organisms, which undoubtedly contributed greatly to the 4.44 score, far less than the long-term mean of 8.13. The stream channel at this location was severely disrupted, as it was along the entire length of the Batavia Kill. The other sites with very low abundance were all in the Delaware System: Site 315 on Chestnut Creek (12 organisms in the subsample), Site 310 on Rondout Creek (23 organisms), Site 328 on Red Brook (30 organisms), Site 347 on Sugarloaf Brook (52 organisms), and Site 337, an unnamed tributary to Emory Brook (71 organisms). All were rated slightly impaired, but as with the Schoharie Creek site, these results must be discounted based on the low subsample numbers. A small number of sites could not be accessed because of the storms; therefore, no data are available for these streams' communities in 2011. These sites were located on the West Kill (Sites 258 and 259) and on Schoharie Creek in Prattsville (Site 204).

Table 2. List of routine stream sampling sites with contraventions of water quality guidelines in 2011.

Reservoir basin	Site	Mean contravened water quality guidelines	Number of samples contravening spike threshold	Likely sources	Notes
<b>East-of-Hudson</b>					
Kensico	E10	total coli.	7-fecal coli.; 8-total coli.	highway runoff; wildlife	Site not sampled for nutrients.
	E11		8-fecal coli.; 6-total coli.	urban runoff; wildlife	
	E9	total coli.; fecal coli.	10-fecal coli.; 8-total coli.	urban runoff; wildlife	Site not sampled for nutrients.
	MB-1	total coli.; fecal coli.	15-fecal coli.; 8-total coli.	urban runoff; wildlife	
	N5-1	total coli.; fecal coli.; TP	11-fecal coli.; 8-total coli.	urban runoff; wildlife	Significant TP/turbidity correlation. Benthic monitoring '97: slightly impaired.
	N12	fecal coli.	7-fecal coli.; 7-total coli.	urban runoff; wildlife	
	WHIP	total coli.	8-fecal coli.; 9-total coli.	urban runoff; wildlife	Benthic monitoring '05, '09 - slightly impaired.
	BG9		7-fecal coli.; 6-total coli.	urban runoff; wildlife	
New Croton (P-restricted)	HUNTER1		7-fecal coli.; 12-total coli.	urban runoff; wildlife	Significant TP/turbidity correlation. Benthic monitoring '00, '01, '02, '03, '04, '05, '06, '07, '08, '09, '10 - slightly impaired.

Table 2. List of routine stream sampling sites with contraventions of water quality guidelines in 2011.

Reservoir basin	Site	Mean contravened water quality guidelines	Number of samples contravening spike threshold	Likely sources	Notes
New Croton (P-restricted)	CORNELL1		6-fecal coli.; 12-total coli.	urban runoff; wildlife	Site sampled for bact. only.
	CATHY7		4-fecal coli.; 8-total coli.	urban runoff; wildlife; construction site	Site sampled for bact. only. Benthic monitoring '05, '06 - slightly impaired.
	FRENCH5		4-fecal coli.; 7-total coli.	urban runoff; wildlife	Site sampled for bact. only.
	COLABAUGH1		5-fecal coli.; 8-total coli.	urban runoff; wildlife	Site sampled for bact. only.
	ILLINGTON1		4-fecal coli.; 5-total coli.	urban runoff; wildlife	Site sampled for bact. only.
	KITCHAWAN1		4-fecal coli.; 7-total coli.	urban runoff; wildlife	Site sampled for bact. only.
	NCBAILEY1		4-fecal coli.; 8-total coli.	urban runoff; wildlife	Site sampled for bact. only. Benthic monitoring '05, '06 - slightly impaired.
	PURDY1		5-fecal coli.; 9-total coli.	urban runoff; wildlife	Site sampled for bact. only.
	SAWMILL1		5-fecal coli.; 7-total coli.	urban runoff; wildlife	Site sampled for bact. only. Benthic monitoring '05 - slightly impaired.
	GEDNEY3		5-fecal coli.; 9-total coli.	urban runoff; wildlife	Site sampled for bact. only.
	WHITE2		2-fecal coli.; 7-total coli.	urban runoff; wildlife	Site sampled for bact. only.

Table 2. List of routine stream sampling sites with contraventions of water quality guidelines in 2011.

Reservoir basin	Site	Mean contravened water quality guidelines	Number of samples contravening spike threshold	Likely sources	Notes
New Croton (P-restricted)	KISCO3	total coli.; fecal coli.	9-fecal coli.; 13-total coli.	urban runoff; wildlife	Significant TP/turbidity correlation. Benthic monitoring '95, '96, '01, '06 - slightly impaired.
	KISCO5		1-pH	urban runoff; wildlife	Small no.of samples: n=1. Site not sampled for nutrients. Benthic monitoring '11 - moderately impaired
Muscoot (P-restricted)	HMILL1		1-pH	urban runoff; wildlife	Small no.of samples: n=2. Located below Yorktown Heights WWTP. Benthic monitoring '07, '10, '11 - moderately impaired; '08, '09 - slightly impaired.
	HMILL7	fecal coli.	11-fecal coli.; 11-total coli.; 1-pH; 1-NH3	urban runoff; wildlife	Located above Yorktown Heights WWTP. Benthic monitoring: '94, '98, '99, '07, '08, '09, '10 –slightly impaired; '95, '00, '04, '06, '11 –moderately impaired.
	HMILL4	total coli.; fecal coli.	14-fecal coli.; 16-total coli.; 1-pH; 1-NH3	municipal WWTP; urban runoff, wildlife	Located below Yorktown Heights WWTP. Benthic monitoring: '94, '98, '06, '08 – moderately impaired; '95, '99, '00, '07 – severely impaired; '09, '10, '11 -slightly impaired.

Table 2. List of routine stream sampling sites with contraventions of water quality guidelines in 2011.

Reservoir basin	Site	Mean contravened water quality guidelines	Number of samples contravening spike threshold	Likely sources	Notes
Muscoot (P-restricted)	MUSCOOT5		8-fecal coli.; 9-total coli.	municipal WWTP; urban runoff; wildlife	Located below Yorktown Heights WWTP. Benthic monitoring: '95-moderately impaired; '96, '99, '01, '06 – slightly impaired.
	PLUM2		8-fecal coli.; 9-total coli.	urban runoff; wildlife	Benthic monitoring: '98 – moderately impaired; '99, '00, '04 – slightly impaired.
	STONE5	fecal coli.	13-fecal coli.; 11-total coli.	WWTP; urban runoff; wildlife	Downstream from WWTP on Broad Brook; Benthic monitoring upstream: '97, '98, '01, '02, '04, '05, '06, '07, '08, '10, '11 - slightly impaired;
	HOLLY12		4-fecal coli.; 3-total coli.	urban runoff; wildlife	Site located in Town of Southeast, on Holly stream.
Cross River	CROSS2		6-fecal coli.; 9-total coli.	wildlife	Site located in Ward Pound Reservation (county park).
Amawalk (P-restricted)	MUSCOOT 10		10-fecal coli.; 9-total coli.	urban runoff; wildlife	Benthic monitoring '06 – slightly impaired.
Titicus (P-restricted)	TITICUS3	TP	4-fecal coli.; 7-total coli.	urban runoff; wildlife	
Croton Falls (P-restricted)	MIKE2	total coli.; fecal coli.	11-fecal coli.; 12-total coli	municipal WWTP; wildlife, agriculture	Located below Carmel #2 WWTP; Benthic monitoring '99, '00, '05, '10 – slightly impaired.

Table 2. List of routine stream sampling sites with contraventions of water quality guidelines in 2011.

Reservoir basin	Site	Mean contravened water quality guidelines	Number of samples contravening spike threshold	Likely sources	Notes
Middle Branch (P-restricted)	MIDBR3		8-fecal coli.; 7-total coli.	urban runoff; wildlife	Benthic monitoring upstream: '00, '01, '10 – slightly impaired.
East Branch (P-restricted)	EASTBR		2-fecal coli.; 4-total coli.	urban runoff; wildlife	Benthic monitoring '06, '08, '09, '10, '11 – slightly impaired.
	HH7		4-fecal coli.; 5-total coli.	urban runoff; wildlife	Large no.of samples: n=40.
	MUDTRIB1		3-fecal coli.; 6-total coli.	urban runoff, wildlife; WWTPs	Located below Patterson V. and Cornwall Meadows WWTPs. Site sampled for bact. only.
	BB5		4-fecal coli.; 9-total coli.	urban runoff; wildlife	Benthic monitoring: '94, '95, '98, '99, '00, '01, '02, '03, '05, '08, '10 - slightly impaired. '04 – moderately impaired. Site sampled for bact. only.
West Branch	GYPSYTRL1		2-fecal coli.; 3-total coli.	urban runoff; wildlife	Benthic monitoring: '00, '01, '09 – slightly impaired.
	LONGPD1		9-fecal coli.; 9-total coli.	urban runoff; wildlife	Benthic monitoring: '00, '03, '10 - slightly impaired.
	HORSEPD12		3-fecal coli.; 4-total coli.		Benthic monitoring: '10, '11 - slightly impaired.
	WESTBR7		1-fecal coli.; 1-total coli.	urban runoff; wildlife	

Table 2. List of routine stream sampling sites with contraventions of water quality guidelines in 2011.

Reservoir basin	Site	Mean contravened water quality guidelines	Number of samples contravening spike threshold	Likely sources	Notes
	LEETOWN3		1-fecal coli.; 3-total coli.	urban runoff; wildlife	
<b>Catskill District</b>					
Esopus	AEHG	pH (acid)		acid precipitation	
Schoharie	S10	TP	1-TP	urban runoff; wildlife	Benthic monitoring '06 – not impaired; '08, '09, '10 - slightly impaired.
	SBKHG	pH (acid)			
	SSHG	pH (acid)			
<b>Delaware District</b>					
Cannonsville	C-7		3-fecal coli.	urban runoff; agriculture; wildlife.	
Neversink	NK6	pH (acid)	1-fecal coli.	acid precipitation	
	NK4	pH (acid)		wildlife	Benthic monitoring '08, '10 – slightly impaired.
	NCG	pH (acid)	1-pH	acid precipitation	Benthic monitoring '11 – slightly impaired.
Rondout	RRHG	pH (acid)	1-pH	acid precipitation	Benthic monitoring '06 – slightly impaired.
	RDOA	pH (acid)		acid precipitation	

Table 3. WWTPs shown by t-tests of upstream/downstream sampling to be sources of contraventions of water quality standards at the downstream site for 2011.

WWTP (and upstream/downstream sample sites)	Parameters excessively contributed to by WWTP, and the mean at downstream site contravenes Table 1 guidelines.	Parameters excessively contributed to by WWTP, but the mean at downstream site does not contravene Table 1 guidelines.
Yorktown Heights (HMILL7 / HMILL4)	<i>none</i>	<i>None</i>
Margaretville (PMSA / PMSB)	“	“
Pine Hill (E3 / E15)	“	“
Grand Gorge (S8 / S9)	“	“
Tannersville (S1 / S2)	“	“
Hobart (WDHOM / WDHOB)	“	“
Delhi (DTPA / DTPB)	“	“
Walton (WSPA / WSPB)	“	“
Mountainside (DCDA / DCDB) (Subsurface Industrial Discharge)	“	“
Grahamsville (RGA / RGB)	“	“
Roxbury Run (EDRA / EDRB)	“	“
Stamford (WDSTM / WDSTB)	“	“

APPENDIX A. SUMMARY STATISTICS FOR EACH SAMPLING SITE FOR 2011.

The four lines for each site display, respectively, n (number of samples), maximum, minimum, and mean values (in boldface). Where "nd" is noted next to a value, the minimum (and occasionally the maximum) was below detection and the displayed value is one-half the detection limit, which was the quantity used to calculate mean concentrations. Coliform values listed as "too numerous to count" in the dataset were not used in the summary statistics.

site	pH	fecal coliform (CFU 100ml <sup>-1</sup> )	total coliform (CFU 100ml <sup>-1</sup> )	total phosphorus (µg l <sup>-1</sup> )	dissolved oxygen (mg l <sup>-1</sup> )	total ammonia (mg l <sup>-1</sup> )	nitrate-nitrite (mg l <sup>-1</sup> )
<b>East-of-Hudson District</b>							
ANGLE5	1	0	0	0	1	0	0
	7.88	.	.	.	9.43	.	.
	7.88	.	.	.	9.43	.	.
	<b>7.880</b>	.	.	.	<b>9.43</b>	.	.
BB5	0	24	24	0	0	0	0
	.	11000	170000	.	.	.	.
	.	5(nd)	120	.	.	.	.
	.	<b>65</b>	<b>1400</b>	.	.	.	.
BG9	12	16	15	12	11	0	12
	7.3	4600	28000	71	14.22	.	0.547
	6.9	4(nd)	50(nd)	10	5.04	.	0.138
	<b>7.162</b>	<b>154</b>	<b>1300</b>	<b>29.5</b>	<b>9.71</b>	.	<b>0.2732</b>
CATHY7	0	23	24	0	0	0	0
	.	1400	28000	.	.	.	.
	.	3(nd)	170	.	.	.	.
	.	<b>49</b>	<b>959</b>	.	.	.	.
COLABAUGH	0	24	24	0	0	0	0
	.	710	17000	.	.	.	.
	.	3(nd)	25(nd)	.	.	.	.
	.	<b>39</b>	<b>1349</b>	.	.	.	.
CORNELL1	0	24	24	0	0	0	0
	.	7000	80000	.	.	.	.
	.	8	290	.	.	.	.
	.	<b>106</b>	<b>2398</b>	.	.	.	.
CROFALTRI	1	0	0	0	1	0	0
	7.68	.	.	.	9.63	.	.
	7.68	.	.	.	9.63	.	.
	<b>7.680</b>	.	.	.	<b>9.63</b>	.	.
CROSS2	12	24	24	12	12	0	12
	7.84	3200	19000	91	14.77	.	0.373
	7.44	8(nd)	67	9	8.38	.	0.058
	<b>7.665</b>	<b>89</b>	<b>1572</b>	<b>31.5</b>	<b>11.5</b>	.	<b>0.1904</b>
E10	12	16	15	0	11	0	0
	7.82	16000	92000	.	14.35	.	.
	7.5	3(nd)	200	.	4.91	.	.
	<b>7.688</b>	<b>178</b>	<b>4000</b>	.	<b>10.8</b>	.	.

APPENDIX A. SUMMARY STATISTICS FOR EACH SAMPLING SITE FOR 2011.

The four lines for each site display, respectively, n (number of samples), maximum, minimum, and mean values (in boldface). Where "nd" is noted next to a value, the minimum (and occasionally the maximum) was below detection and the displayed value is one-half the detection limit, which was the quantity used to calculate mean concentrations. Coliform values listed as "too numerous to count" in the dataset were not used in the summary statistics.

site	pH	fecal coliform (CFU 100ml <sup>-1</sup> )	total coliform (CFU 100ml <sup>-1</sup> )	total phosphorus (µg l <sup>-1</sup> )	dissolved oxygen (mg l <sup>-1</sup> )	total ammonia (mg l <sup>-1</sup> )	nitrate-nitrite (mg l <sup>-1</sup> )
E11	12	16	14	12	11	0	12
	7.41	32000	190000	76	11.06	.	1.309
	6.7	3(nd)	170	13	0.98	.	0.024
	<b>7.184</b>	<b>182</b>	<b>2000</b>	<b>33.6</b>	<b>7.22</b>	<b>.</b>	<b>0.2418</b>
E9	12	17	15	0	11	0	0
	7.6	20000	190000	.	8.13	.	.
	6.78	5(nd)	330	.	2.61	.	.
	<b>7.025</b>	<b>296</b>	<b>2900</b>	<b>.</b>	<b>5.19</b>	<b>.</b>	<b>.</b>
EASTBR	10	24	24	10	10	0	10
	7.34	8000	80000	53	13.21	.	0.37
	6.78	3(nd)	91	13	4.2	.	0.01(nd)
	<b>7.136</b>	<b>39</b>	<b>1000</b>	<b>30.1</b>	<b>7.47</b>	<b>.</b>	<b>0.1206</b>
FRENCH5	0	24	24	0	0	0	0
	.	1800	21000	.	.	.	.
	.	3(nd)	67	.	.	.	.
	<b>.</b>	<b>27</b>	<b>1396</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>
GEDNEY3	0	24	24	0	0	0	0
	.	8500	130000	.	.	.	.
	.	5(nd)	140	.	.	.	.
	<b>.</b>	<b>95</b>	<b>1396</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>
GYPSYTRL1	11	24	24	12	10	0	12
	7.5	460	5500	38	14.36	.	0.191
	6.85	4	40	8	7.68	.	0.01(nd)
	<b>7.207</b>	<b>31</b>	<b>500</b>	<b>20.8</b>	<b>10.7</b>	<b>.</b>	<b>0.0468</b>
HH7	10	24	24	10	10	0	10
	7.75	19000	70000	247	14.58	.	0.473
	7.2	3(nd)	67	8	9.15	.	0.153
	<b>7.457</b>	<b>55</b>	<b>714</b>	<b>35.5</b>	<b>11.8</b>	<b>.</b>	<b>0.2974</b>
HMILL1	1	0	0	0	1	1	0
	7.93	.	.	.	8.77	0.02	.
	7.93	.	.	.	8.77	0.02	.
	<b>7.930</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>8.77</b>	<b>0.0200</b>	<b>.</b>
HMILL4	1	24	25	0	1	1	0
	7.66	2100	13000	.	8.46	0.03	.
	7.66	16	470	.	8.46	0.03	.
	<b>7.660</b>	<b>246</b>	<b>3500</b>	<b>.</b>	<b>8.46</b>	<b>0.0300</b>	<b>.</b>

APPENDIX A. SUMMARY STATISTICS FOR EACH SAMPLING SITE FOR 2011.

The four lines for each site display, respectively, n (number of samples), maximum, minimum, and mean values (in boldface). Where "nd" is noted next to a value, the minimum (and occasionally the maximum) was below detection and the displayed value is one-half the detection limit, which was the quantity used to calculate mean concentrations. Coliform values listed as "too numerous to count" in the dataset were not used in the summary statistics.

site	pH	fecal coliform (CFU 100ml <sup>-1</sup> )	total coliform (CFU 100ml <sup>-1</sup> )	total phosphorus (µg l <sup>-1</sup> )	dissolved oxygen (mg l <sup>-1</sup> )	total ammonia (mg l <sup>-1</sup> )	nitrate-nitrite (mg l <sup>-1</sup> )
HMILL7	1	24	25	0	1	1	0
	7.66	4300	14000	.	8.42	0.03	.
	7.66	25(nd)	50(nd)	.	8.42	0.03	.
	<b>7.660</b>	<b>234</b>	<b>1800</b>	<b>.</b>	<b>8.42</b>	<b>0.0300</b>	<b>.</b>
HOLLY12	10	12	12	10	10	0	10
	7.68	1600	11000	44	15.35	.	0.817
	7.25	10	160	14	8.94	.	0.323
	<b>7.519</b>	<b>72</b>	<b>1196</b>	<b>30.4</b>	<b>11.6</b>	<b>.</b>	<b>0.5702</b>
HORSEPD12	12	24	24	11	10	0	11
	7.91	840	9000	30	15.5	.	0.518
	7.1	4(nd)	50(nd)	9	8.8	.	0.14
	<b>7.597</b>	<b>49</b>	<b>1000</b>	<b>18.1</b>	<b>11.5</b>	<b>.</b>	<b>0.3341</b>
HUNTER1	11	24	25	10	11	0	10
	8.18	140000	410000	75	16.3	.	0.97
	7.43	8(nd)	200	13	8.92	.	0.398
	<b>7.769</b>	<b>196</b>	<b>2000</b>	<b>30.2</b>	<b>12.0</b>	<b>.</b>	<b>0.6136</b>
ILLINGTON	0	24	24	0	0	0	0
	.	1300	20000	.	.	.	.
	.	5(nd)	67(nd)	.	.	.	.
	<b>.</b>	<b>42</b>	<b>874</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>
KISCO3	10	24	25	10	10	0	10
	7.79	14000	64000	69	14.77	.	1.074
	7.29	19(nd)	330	12	8.05	.	0.248
	<b>7.543</b>	<b>224</b>	<b>2700</b>	<b>37.7</b>	<b>11.8</b>	<b>.</b>	<b>0.6115</b>
KITCHAWAN	0	24	24	0	0	0	0
	.	1700	70000	.	.	.	.
	.	3(nd)	50(nd)	.	.	.	.
	<b>.</b>	<b>73</b>	<b>1249</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>
LEETOWN3	12	23	24	12	11	0	12
	8.33	440	4000	45	14.3	.	0.373
	7.14	3(nd)	83	9	6.99	.	0.01(nd)
	<b>7.510</b>	<b>27</b>	<b>670</b>	<b>19.9</b>	<b>10.9</b>	<b>.</b>	<b>0.1783</b>
LONGPD1	12	24	25	12	11	0	12
	7.9	4200	9400	39	15.58	.	0.362
	7.45	8	25(nd)	9	8.51	.	0.062
	<b>7.680</b>	<b>146</b>	<b>1700</b>	<b>21.6</b>	<b>11.5</b>	<b>.</b>	<b>0.2045</b>

APPENDIX A. SUMMARY STATISTICS FOR EACH SAMPLING SITE FOR 2011.

The four lines for each site display, respectively, n (number of samples), maximum, minimum, and mean values (in boldface). Where "nd" is noted next to a value, the minimum (and occasionally the maximum) was below detection and the displayed value is one-half the detection limit, which was the quantity used to calculate mean concentrations. Coliform values listed as "too numerous to count" in the dataset were not used in the summary statistics.

site	pH	fecal coliform (CFU 100ml <sup>-1</sup> )	total coliform (CFU 100ml <sup>-1</sup> )	total phosphorus (µg l <sup>-1</sup> )	dissolved oxygen (mg l <sup>-1</sup> )	total ammonia (mg l <sup>-1</sup> )	nitrate-nitrite (mg l <sup>-1</sup> )
MB-1	13	24	15	12	13	0	12
	9.08	19000	66000	136	13.72	.	0.718
	7.2	14(nd)	250	16	7.35	.	0.225
	<b>7.532</b>	<b>648</b>	<b>3500</b>	<b>48.8</b>	<b>9.88</b>	<b>.</b>	<b>0.3876</b>
MB-3	0	9	2	0	0	0	0
	.	37000	38000	.	.	.	.
	.	83	4300	.	.	.	.
	<b>.</b>	<b>3146</b>	<b>12783</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>
MIDBR3	11	24	25	11	9	0	11
	8.09	500	11000	77	15.5	.	0.669
	7.39	20	67	15	8.35	.	0.122
	<b>7.810</b>	<b>116</b>	<b>1300</b>	<b>31.8</b>	<b>11.5</b>	<b>.</b>	<b>0.3705</b>
MIKE2	11	24	24	12	10	0	12
	7.93	1800	11000	64	15	.	4.946
	7.18	20	99	19	8.49	.	0.381
	<b>7.580</b>	<b>221</b>	<b>2482</b>	<b>38.4</b>	<b>11.4</b>	<b>.</b>	<b>2.4708</b>
MUDTRIB1	0	24	24	0	0	0	0
	.	8000	80000	.	.	.	.
	.	5	200	.	.	.	.
	<b>.</b>	<b>73</b>	<b>1140</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>
MUSCOOT10	12	24	25	11	11	0	11
	7.62	1700	14000	73	13.3	.	1.433
	7	20	330	22	4.74	.	0.153
	<b>7.313</b>	<b>185</b>	<b>1800</b>	<b>42.0</b>	<b>8.95</b>	<b>.</b>	<b>0.4985</b>
MUSCOOT5	10	24	25	10	10	0	10
	7.96	1600	35000	65	15.52	.	1.852
	7.48	5(nd)	83	16	10.05	.	0.414
	<b>7.740</b>	<b>100</b>	<b>1200</b>	<b>28.4</b>	<b>12.4</b>	<b>.</b>	<b>0.8994</b>
N12	12	16	15	12	12	0	12
	8.39	1900	27000	44	14.04	.	1.735
	7.12	29	420	9	8.95	.	0.749
	<b>7.720</b>	<b>222</b>	<b>2300</b>	<b>21.5</b>	<b>11.8</b>	<b>.</b>	<b>1.0290</b>
N5-1	11	22	15	12	12	0	12
	7.68	9600	75000	137	14.75	.	1.482
	7.1	16	250	16	6.31	.	0.526
	<b>7.443</b>	<b>397</b>	<b>4800</b>	<b>55.3</b>	<b>10.8</b>	<b>.</b>	<b>0.9923</b>

APPENDIX A. SUMMARY STATISTICS FOR EACH SAMPLING SITE FOR 2011.

The four lines for each site display, respectively, n (number of samples), maximum, minimum, and mean values (in boldface). Where "nd" is noted next to a value, the minimum (and occasionally the maximum) was below detection and the displayed value is one-half the detection limit, which was the quantity used to calculate mean concentrations. Coliform values listed as "too numerous to count" in the dataset were not used in the summary statistics.

site	pH	fecal coliform (CFU 100ml <sup>-1</sup> )	total coliform (CFU 100ml <sup>-1</sup> )	total phosphorus (µg l <sup>-1</sup> )	dissolved oxygen (mg l <sup>-1</sup> )	total ammonia (mg l <sup>-1</sup> )	nitrate-nitrite (mg l <sup>-1</sup> )
NCBAILEY1	0	24	24	0	0	0	0
	.	960	10000	.	.	.	.
	.	8(nd)	270	.	.	.	.
	.	<b>70</b>	<b>866</b>	.	.	.	.
PLUM2	10	24	25	10	10	0	10
	8.21	2600	26000	58	16.03	.	1.296
	7.53	3(nd)	200	13	7.07	.	0.498
	<b>7.828</b>	<b>88</b>	<b>1100</b>	<b>27.3</b>	<b>12.0</b>	.	<b>0.9016</b>
PURDY1	0	24	24	0	0	0	0
	.	1800	15000	.	.	.	.
	.	3(nd)	100(nd)	.	.	.	.
	.	<b>43</b>	<b>762</b>	.	.	.	.
SAWMILL1	0	24	24	0	0	0	0
	.	7500	170000	.	.	.	.
	.	8	200	.	.	.	.
	.	<b>77</b>	<b>746</b>	.	.	.	.
STONE5	11	24	24	10	11	0	10
	8.94	4100	110000	86	15.44	.	0.99
	7.68	32(nd)	470	13	8.59	.	0.608
	<b>7.995</b>	<b>215</b>	<b>2145</b>	<b>36.6</b>	<b>11.8</b>	.	<b>0.7591</b>
TITICUS3	10	24	24	10	10	0	10
	8.61	21000	110000	204	14.71	.	0.844
	7.65	3(nd)	130	16	8.59	.	0.209
	<b>8.012</b>	<b>88</b>	<b>1196</b>	<b>50.9</b>	<b>12.0</b>	.	<b>0.5584</b>
WESTBR7	12	24	24	12	11	0	12
	7.7	330	4200	22	14.8	.	0.103
	7.29	3(nd)	50(nd)	7	8.31	.	0.01(nd)
	<b>7.472</b>	<b>37</b>	<b>490</b>	<b>13.3</b>	<b>11.2</b>	.	<b>0.0358</b>
WHIP	12	20	15	12	12	0	12
	8.19	1200	35000	51	13.68	.	1.299
	7.28	20(nd)	290	10	8.13	.	0.243
	<b>7.667</b>	<b>151</b>	<b>3100</b>	<b>24.6</b>	<b>11.4</b>	.	<b>0.7987</b>
WHITE2	0	24	24	0	0	0	0
	.	760	13000	.	.	.	.
	.	4	50(nd)	.	.	.	.
	.	<b>32</b>	<b>830</b>	.	.	.	.

APPENDIX A. SUMMARY STATISTICS FOR EACH SAMPLING SITE FOR 2011.

The four lines for each site display, respectively, n (number of samples), maximum, minimum, and mean values (in boldface). Where "nd" is noted next to a value, the minimum (and occasionally the maximum) was below detection and the displayed value is one-half the detection limit, which was the quantity used to calculate mean concentrations. Coliform values listed as "too numerous to count" in the dataset were not used in the summary statistics.

site	pH	fecal coliform (CFU 100ml <sup>-1</sup> )	total coliform (CFU 100ml <sup>-1</sup> )	total phosphorus (µg l <sup>-1</sup> )	dissolved oxygen (mg l <sup>-1</sup> )	total ammonia (mg l <sup>-1</sup> )	nitrate-nitrite (mg l <sup>-1</sup> )
<b>CATSKILL DISTRICT</b>							
ABCG	12	10	0	12	10	12	12
	7.45	320	.	39	17.39	0.01(nd)	0.35
	6.85	1(nd)	.	9	10.9	0.01(nd)	0.05
	<b>7.156</b>	<b>9</b>	<b>.</b>	<b>16.1</b>	<b>12.9</b>	<b>0.0100(nd)</b>	<b>0.1767</b>
AEAWDL	1	0	0	0	1	0	0
	7.32	.	.	.	10.6	.	.
	7.32	.	.	.	10.6	.	.
	<b>7.320</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>10.6</b>	<b>.</b>	<b>.</b>
AEHG	9	6	0	9	9	9	9
	7.15	14	.	19	17.8	0.01(nd)	0.39
	5.92	1	.	7	10.5	0.01(nd)	0.15
	<b>6.341</b>	<b>4</b>	<b>.</b>	<b>9.8</b>	<b>12.2</b>	<b>0.0100(nd)</b>	<b>0.2522</b>
ASCHG	12	6	0	12	10	12	12
	7.02	5	.	17	14.42	0.01(nd)	0.45
	6.34	1(nd)	.	6	10.7	0.01(nd)	0.2
	<b>6.673</b>	<b>2</b>	<b>.</b>	<b>10.3</b>	<b>12.6</b>	<b>0.0100(nd)</b>	<b>0.3108</b>
BATAVIA KILL	1	0	0	0	1	0	0
	7.89	.	.	.	9.3	.	.
	7.89	.	.	.	9.3	.	.
	<b>7.890</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>9.30</b>	<b>.</b>	<b>.</b>
BK	12	11	0	12	10	12	12
	7.66	45	.	40	15.93	0.01(nd)	0.25
	6.84	1(nd)	.	6	10.3	0.01(nd)	0.025(nd)
	<b>7.313</b>	<b>5</b>	<b>.</b>	<b>15.7</b>	<b>12.9</b>	<b>0.0100(nd)</b>	<b>0.0817</b>
BNV	12	11	0	12	10	12	12
	7.69	260	.	36	14.77	0.01(nd)	0.49
	6.78	2	.	8	10.9	0.01(nd)	0.14
	<b>7.258</b>	<b>17</b>	<b>.</b>	<b>16.3</b>	<b>12.6</b>	<b>0.0100(nd)</b>	<b>0.2333</b>
BRD	12	12	0	12	10	12	12
	7.58	40	.	32	14.82	0.01(nd)	0.32
	6.82	1(nd)	.	8	10.4	0.01(nd)	0.025(nd)
	<b>7.246</b>	<b>5</b>	<b>.</b>	<b>20.3</b>	<b>12.3</b>	<b>0.0100(nd)</b>	<b>0.1525</b>
E10I	11	8	0	11	9	11	11
	7.3	29	.	14	14.96	0.01(nd)	0.17
	6.85	1(nd)	.	5	10.4	0.01(nd)	0.025(nd)
	<b>7.053</b>	<b>6</b>	<b>.</b>	<b>8.3</b>	<b>12.6</b>	<b>0.0100(nd)</b>	<b>0.0518</b>

APPENDIX A. SUMMARY STATISTICS FOR EACH SAMPLING SITE FOR 2011.

The four lines for each site display, respectively, n (number of samples), maximum, minimum, and mean values (in boldface). Where "nd" is noted next to a value, the minimum (and occasionally the maximum) was below detection and the displayed value is one-half the detection limit, which was the quantity used to calculate mean concentrations. Coliform values listed as "too numerous to count" in the dataset were not used in the summary statistics.

site	pH	fecal coliform (CFU 100ml <sup>-1</sup> )	total coliform (CFU 100ml <sup>-1</sup> )	total phosphorus (µg l <sup>-1</sup> )	dissolved oxygen (mg l <sup>-1</sup> )	total ammonia (mg l <sup>-1</sup> )	nitrate-nitrite (mg l <sup>-1</sup> )
E16I	14	11	0	12	12	12	12
	7.76	74	.	44	21.09	0.01(nd)	0.32
	6.58	4(nd)	.	10	9.8	0.01(nd)	0.025(nd)
	<b>7.215</b>	<b>13</b>	.	<b>19.6</b>	<b>14.0</b>	<b>0.0100(nd)</b>	<b>0.1417</b>
E5	12	10	0	11	10	11	11
	7.85	160	.	31	14.93	0.01(nd)	0.28
	6.93	1(nd)	.	2.5(nd)	10.2	0.01(nd)	0.06
	<b>7.289</b>	<b>7</b>	.	<b>13.4</b>	<b>12.0</b>	<b>0.0100(nd)</b>	<b>0.1300</b>
LBK	11	10	0	11	9	11	11
	7.65	30	.	15	16.3	0.01(nd)	0.09
	6.95	2	.	9	9.6	0.01(nd)	0.025(nd)
	<b>7.237</b>	<b>8</b>	.	<b>11.0</b>	<b>12.8</b>	<b>0.0100(nd)</b>	<b>0.01(nd)</b>
M-1	0	0	0	0	1	0	0
	.	.	.	.	11.7	.	.
	.	.	.	.	11.7	.	.
	.	.	.	.	<b>11.7</b>	.	.
S10	12	10	0	11	10	11	11
	8.38	160	.	535	15.64	0.01(nd)	0.3
	6.48	2(nd)	.	8	8.8	0.01(nd)	0.025(nd)
	<b>7.484</b>	<b>15</b>	.	<b>72.7</b>	<b>12.1</b>	<b>0.0100(nd)</b>	<b>0.1364</b>
S3	1	0	0	0	1	0	0
	7.32	.	.	.	11.2	.	.
	7.32	.	.	.	11.2	.	.
	<b>7.320</b>	.	.	.	<b>11.2</b>	.	.
S4	13	11	0	12	11	12	12
	7.48	60	.	15	15.36	0.02	0.33
	6.58	1(nd)	.	5	8.5	0.01(nd)	0.025(nd)
	<b>7.106</b>	<b>7</b>	.	<b>8.8</b>	<b>11.9</b>	<b>0.0108(nd)</b>	<b>0.1600</b>
S5I	12	11	0	12	10	12	12
	8.23	180	.	85	15.59	0.11	0.42
	6.9	1(nd)	.	7	9.2	0.01(nd)	0.025(nd)
	<b>7.462</b>	<b>10</b>	.	<b>22.5</b>	<b>12.6</b>	<b>0.0242</b>	<b>0.1792</b>
S6I	12	12	0	12	10	12	12
	8.3	200	.	53	15.99	0.02	1.04
	6.87	2(nd)	.	17	8.8	0.01(nd)	0.025(nd)
	<b>7.604</b>	<b>13</b>	.	<b>25.6</b>	<b>12.5</b>	<b>0.0108(nd)</b>	<b>0.3158</b>

APPENDIX A. SUMMARY STATISTICS FOR EACH SAMPLING SITE FOR 2011.

The four lines for each site display, respectively, n (number of samples), maximum, minimum, and mean values (in boldface). Where "nd" is noted next to a value, the minimum (and occasionally the maximum) was below detection and the displayed value is one-half the detection limit, which was the quantity used to calculate mean concentrations. Coliform values listed as "too numerous to count" in the dataset were not used in the summary statistics.

site	pH	fecal coliform (CFU 100ml <sup>-1</sup> )	total coliform (CFU 100ml <sup>-1</sup> )	total phosphorus (µg l <sup>-1</sup> )	dissolved oxygen (mg l <sup>-1</sup> )	total ammonia (mg l <sup>-1</sup> )	nitrate-nitrite (mg l <sup>-1</sup> )
S7I	12	11	0	12	10	12	12
	8.61	92	.	98	15.41	0.01(nd)	0.2
	6.99	1(nd)	.	7	9.4	0.01(nd)	0.025(nd)
	<b>7.636</b>	<b>7</b>	<b>.</b>	<b>19.3</b>	<b>12.4</b>	<b>0.0100(nd)</b>	<b>0.0700</b>
SBKHG	11	9	0	12	7	12	12
	6.63	10	.	19	16.71	0.01(nd)	0.36
	6.1	1(nd)	.	6	11.9	0.01(nd)	0.11
	<b>6.425</b>	<b>3</b>	<b>.</b>	<b>10.7</b>	<b>13.4</b>	<b>0.0100(nd)</b>	<b>0.2483</b>
SCL	11	10	0	11	9	11	11
	7.82	320	.	65	15.59	0.01(nd)	0.33
	6.91	2(nd)	.	11	10.1	0.01(nd)	0.07
	<b>7.273</b>	<b>15</b>	<b>.</b>	<b>34.4</b>	<b>12.8</b>	<b>0.0100(nd)</b>	<b>0.1509</b>
SCL-A	11	0	0	0	9	0	0
	7.33	.	.	.	18.85	.	.
	6.75	.	.	.	10.6	.	.
	<b>7.033</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>13.7</b>	<b>.</b>	<b>.</b>
SCL-B	11	0	0	0	9	0	0
	7.57	.	.	.	15.94	.	.
	6.83	.	.	.	10.9	.	.
	<b>7.145</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>13.1</b>	<b>.</b>	<b>.</b>
SEK	11	11	0	12	7	12	12
	7.56	480	.	96	17.43	0.01(nd)	0.25
	6.9	2(nd)	.	5	10.7	0.01(nd)	0.025(nd)
	<b>7.255</b>	<b>11</b>	<b>.</b>	<b>20.9</b>	<b>13.5</b>	<b>0.0100(nd)</b>	<b>0.1158</b>
SSHG	10	9	0	11	6	11	11
	6.84	6	.	19	16.92	0.01(nd)	0.61
	6.14	1(nd)	.	2.5(nd)	11.8	0.01(nd)	0.11
	<b>6.369</b>	<b>2</b>	<b>.</b>	<b>7.8</b>	<b>13.8</b>	<b>0.0100(nd)</b>	<b>0.2836</b>
SSMA	11	10	0	12	7	12	12
	6.84	16	.	12	16.58	0.01(nd)	0.25
	6.4	1(nd)	.	2.5(nd)	11.5	0.01(nd)	0.025(nd)
	<b>6.657</b>	<b>4</b>	<b>.</b>	<b>7.0</b>	<b>13.5</b>	<b>0.0100(nd)</b>	<b>0.0675</b>
SSMB	11	12	0	12	7	12	12
	7.09	760	.	65	16.82	0.01(nd)	0.24
	6.61	1(nd)	.	7	11.5	0.01(nd)	0.025(nd)
	<b>6.894</b>	<b>9</b>	<b>.</b>	<b>14.3</b>	<b>13.7</b>	<b>0.0100(nd)</b>	<b>0.0833</b>

APPENDIX A. SUMMARY STATISTICS FOR EACH SAMPLING SITE FOR 2011.

The four lines for each site display, respectively, n (number of samples), maximum, minimum, and mean values (in boldface). Where "nd" is noted next to a value, the minimum (and occasionally the maximum) was below detection and the displayed value is one-half the detection limit, which was the quantity used to calculate mean concentrations. Coliform values listed as "too numerous to count" in the dataset were not used in the summary statistics.

site	pH	fecal coliform (CFU 100ml <sup>-1</sup> )	total coliform (CFU 100ml <sup>-1</sup> )	total phosphorus (µg l <sup>-1</sup> )	dissolved oxygen (mg l <sup>-1</sup> )	total ammonia (mg l <sup>-1</sup> )	nitrate- nitrite (mg l <sup>-1</sup> )
STHHG	12	11	0	12	10	12	12
	7.43	270	.	45	15.73	0.01(nd)	0.38
	6.48	1(nd)	.	12	8.3	0.01(nd)	0.025(nd)
	<b>7.010</b>	<b>5</b>	<b>.</b>	<b>21.2</b>	<b>12.2</b>	<b>0.0100(nd)</b>	<b>0.2358</b>
SWK	10	10	0	11	6	11	11
	7.93	120	.	66	18.21	0.01(nd)	0.29
	6.94	2(nd)	.	9	10.1	0.01(nd)	0.025(nd)
	<b>7.500</b>	<b>9</b>	<b>.</b>	<b>36.3</b>	<b>13.4</b>	<b>0.0100(nd)</b>	<b>0.1236</b>
SWKHG	8	4	0	8	5	8	8
	7.09	14	.	15	16.8	0.01(nd)	0.31
	6.41	1(nd)	.	2.5(nd)	12.24	0.01(nd)	0.15
	<b>6.645</b>	<b>3</b>	<b>.</b>	<b>9.8</b>	<b>13.7</b>	<b>0.0100(nd)</b>	<b>0.2175</b>
WDL	12	12	0	12	10	12	12
	7.68	22	.	52	17.46	0.01(nd)	0.29
	6.61	1(nd)	.	9	10.5	0.01(nd)	0.07
	<b>7.117</b>	<b>7</b>	<b>.</b>	<b>25.1</b>	<b>12.5</b>	<b>0.0100(nd)</b>	<b>0.1433</b>

APPENDIX A. SUMMARY STATISTICS FOR EACH SAMPLING SITE FOR 2011.

The four lines for each site display, respectively, n (number of samples), maximum, minimum, and mean values (in boldface). Where "nd" is noted next to a value, the minimum (and occasionally the maximum) was below detection and the displayed value is one-half the detection limit, which was the quantity used to calculate mean concentrations. Coliform values listed as "too numerous to count" in the dataset were not used in the summary statistics.

site	pH	fecal coliform (CFU 100ml <sup>-1</sup> )	total coliform (CFU 100ml <sup>-1</sup> )	total phosphorus (µg l <sup>-1</sup> )	dissolved oxygen (mg l <sup>-1</sup> )	total ammonia (mg l <sup>-1</sup> )	nitrate-nitrite (mg l <sup>-1</sup> )
<b>DELAWARE DISTRICT</b>							
C-7	11	12	0	12	12	12	12
	7.47	510	.	23	13.72	0.03	0.47
	6.74	4	.	9	8.2	0.01(nd)	0.11
	<b>7.000</b>	<b>52</b>	<b>.</b>	<b>14.8</b>	<b>11.4</b>	<b>0.0117(nd)</b>	<b>0.2833</b>
C-8	11	12	0	12	12	12	12
	7.51	140	.	28	13.58	0.02	0.42
	7.03	8	.	7	7.9	0.01(nd)	0.05
	<b>7.257</b>	<b>25</b>	<b>.</b>	<b>13.8</b>	<b>11.2</b>	<b>0.0117(nd)</b>	<b>0.2225</b>
CCBHG	12	10	0	12	12	12	12
	7.02	100	.	22	13.79	0.01(nd)	0.5
	6.11	1(nd)	.	12	8.3	0.01(nd)	0.12
	<b>6.686</b>	<b>5</b>	<b>.</b>	<b>16.1</b>	<b>11.0</b>	<b>0.0100(nd)</b>	<b>0.2817</b>
CDG	12	12	0	12	12	12	12
	8.15	220	.	50	13.86	0.02	0.85
	6.45	6	.	17	8.6	0.01(nd)	0.025(nd)
	<b>7.225</b>	<b>27</b>	<b>.</b>	<b>28.8</b>	<b>11.4</b>	<b>0.0133(nd)</b>	<b>0.5346</b>
CEBG	11	12	0	12	12	12	12
	7.91	230	.	26	14.24	0.02	0.45
	6.84	2	.	6	8.2	0.01(nd)	0.025(nd)
	<b>7.189</b>	<b>11</b>	<b>.</b>	<b>13.3</b>	<b>11.6</b>	<b>0.0108(nd)</b>	<b>0.2046</b>
CEBHG	12	12	0	12	13	12	12
	7.08	36	.	32	13.48	0.02	0.54
	6.57	1(nd)	.	8	7.6	0.01(nd)	0.025(nd)
	<b>6.827</b>	<b>4</b>	<b>.</b>	<b>14.0</b>	<b>11.0</b>	<b>0.0108(nd)</b>	<b>0.1971</b>
CLDG	12	12	0	12	12	12	12
	8.96	1300	.	29	14.39	0.02	0.5
	6.53	3	.	9	8.8	0.01(nd)	0.025(nd)
	<b>7.448</b>	<b>34</b>	<b>.</b>	<b>17.3</b>	<b>11.7</b>	<b>0.0117(nd)</b>	<b>0.2254</b>
CTNBG	12	12	0	12	12	12	12
	8.93	130	.	65	13.83	0.03	0.57
	6.99	4	.	15	9.1	0.01(nd)	0.025(nd)
	<b>7.413</b>	<b>33</b>	<b>.</b>	<b>31.1</b>	<b>11.4</b>	<b>0.0133(nd)</b>	<b>0.2638</b>
CTNHG	11	11	0	11	11	11	11
	7.31	76	.	41	13.67	0.01(nd)	0.52
	6.55	1(nd)	.	10	8.4	0.01(nd)	0.2
	<b>6.765</b>	<b>4</b>	<b>.</b>	<b>18.8</b>	<b>11.1</b>	<b>0.0100(nd)</b>	<b>0.3318</b>

APPENDIX A. SUMMARY STATISTICS FOR EACH SAMPLING SITE FOR 2011.

The four lines for each site display, respectively, n (number of samples), maximum, minimum, and mean values (in boldface). Where "nd" is noted next to a value, the minimum (and occasionally the maximum) was below detection and the displayed value is one-half the detection limit, which was the quantity used to calculate mean concentrations. Coliform values listed as "too numerous to count" in the dataset were not used in the summary statistics.

site	pH	fecal coliform (CFU 100ml <sup>-1</sup> )	total coliform (CFU 100ml <sup>-1</sup> )	total phosphorus (µg l <sup>-1</sup> )	dissolved oxygen (mg l <sup>-1</sup> )	total ammonia (mg l <sup>-1</sup> )	nitrate-nitrite (mg l <sup>-1</sup> )
CWBA	8	8	0	8	8	8	8
	8.05	370	.	115	14.18	0.04	0.73
	7.06	8	.	24	9.1	0.01(nd)	0.18
	<b>7.393</b>	<b>38</b>	<b>.</b>	<b>43.5</b>	<b>11.6</b>	<b>0.0213</b>	<b>0.4163</b>
CWBB	8	7	0	8	8	8	8
	7.83	390	.	94	14.02	0.04	0.77
	7.1	6	.	27	9.3	0.01(nd)	0.34
	<b>7.368</b>	<b>53</b>	<b>.</b>	<b>42.4</b>	<b>11.6</b>	<b>0.0188</b>	<b>0.4875</b>
EDRB	1	0	0	0	1	0	0
	7.31	.	.	.	9.9	.	.
	7.31	.	.	.	9.9	.	.
	<b>7.310</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>9.90</b>	<b>.</b>	<b>.</b>
NCG	13	9	0	12	13	12	12
	6.45	38	.	11	13.6	0.04	0.38
	5.31	1(nd)	.	2.5(nd)	5.7	0.01(nd)	0.1
	<b>6.055</b>	<b>6</b>	<b>.</b>	<b>6.5</b>	<b>10.5</b>	<b>0.0142(nd)</b>	<b>0.2017</b>
NK4	13	9	0	12	13	12	12
	6.9	56	.	10	13.81	0.01(nd)	0.2
	6.06	1	.	2.5(nd)	8.2	0.01(nd)	0.06
	<b>6.465</b>	<b>4</b>	<b>.</b>	<b>4.3</b>	<b>11.1</b>	<b>0.0100(nd)</b>	<b>0.1283</b>
NK6	13	12	0	12	13	12	12
	6.64	240	.	45	12.89	0.04	0.85
	6.19	1	.	14	7.1	0.01(nd)	0.19
	<b>6.439</b>	<b>18</b>	<b>.</b>	<b>21.8</b>	<b>10.3</b>	<b>0.0175</b>	<b>0.4308</b>
P-13	11	10	0	12	12	12	12
	7.65	110	.	20	14.16	0.02	0.48
	6.76	2	.	9	8.5	0.01(nd)	0.08
	<b>7.209</b>	<b>18</b>	<b>.</b>	<b>14.1</b>	<b>11.5</b>	<b>0.0117(nd)</b>	<b>0.2942</b>
P-21	12	12	0	12	12	12	12
	7.78	250	.	20	14.27	0.01(nd)	0.4
	6.98	1(nd)	.	8	8.8	0.01(nd)	0.025(nd)
	<b>7.365</b>	<b>17</b>	<b>.</b>	<b>14.5</b>	<b>11.7</b>	<b>0.0100(nd)</b>	<b>0.2229</b>
P-50	12	9	0	12	11	12	12
	8.24	110	.	118	14.2	0.01(nd)	0.33
	7.02	2	.	9	8.3	0.01(nd)	0.025(nd)
	<b>7.445</b>	<b>13</b>	<b>.</b>	<b>23.3</b>	<b>11.6</b>	<b>0.0100(nd)</b>	<b>0.1458</b>

APPENDIX A. SUMMARY STATISTICS FOR EACH SAMPLING SITE FOR 2011.

The four lines for each site display, respectively, n (number of samples), maximum, minimum, and mean values (in boldface). Where "nd" is noted next to a value, the minimum (and occasionally the maximum) was below detection and the displayed value is one-half the detection limit, which was the quantity used to calculate mean concentrations. Coliform values listed as "too numerous to count" in the dataset were not used in the summary statistics.

site	pH	fecal coliform (CFU 100ml <sup>-1</sup> )	total coliform (CFU 100ml <sup>-1</sup> )	total phosphorus (µg l <sup>-1</sup> )	dissolved oxygen (mg l <sup>-1</sup> )	total ammonia (mg l <sup>-1</sup> )	nitrate-nitrite (mg l <sup>-1</sup> )
P-60	12	9	0	12	12	12	12
	7.73	180	.	10	14.72	0.01(nd)	0.38
	6.79	2	.	2.5(nd)	8.7	0.01(nd)	0.09
	<b>7.115</b>	<b>11</b>	<b>.</b>	<b>6.6</b>	<b>11.8</b>	<b>0.0100(nd)</b>	<b>0.2567</b>
P-7	12	11	0	12	12	12	12
	7.45	320	.	33	16.99	0.01(nd)	0.47
	6.92	4	.	12	8.4	0.01(nd)	0.15
	<b>7.151</b>	<b>25</b>	<b>.</b>	<b>18.8</b>	<b>11.5</b>	<b>0.0100(nd)</b>	<b>0.3133</b>
P-8	11	12	0	12	12	12	12
	7.32	210	.	21	14.25	0.02	0.49
	6.93	1	.	8	8.6	0.01(nd)	0.13
	<b>7.155</b>	<b>13</b>	<b>.</b>	<b>14.3</b>	<b>11.5</b>	<b>0.0108(nd)</b>	<b>0.3325</b>
PBKG	13	10	0	12	12	12	12
	7.28	380	.	19	14.75	0.01(nd)	0.32
	6.66	3	.	7	8.3	0.01(nd)	0.025(nd)
	<b>6.991</b>	<b>28</b>	<b>.</b>	<b>12.8</b>	<b>11.6</b>	<b>0.0100(nd)</b>	<b>0.2029</b>
PBRA	12	10	0	12	11	12	12
	7.69	16	.	168	14.62	0.01(nd)	0.36
	7.04	1(nd)	.	9	8.4	0.01(nd)	0.025(nd)
	<b>7.350</b>	<b>4</b>	<b>.</b>	<b>25.0</b>	<b>11.3</b>	<b>0.0100(nd)</b>	<b>0.1629</b>
PBRB	12	10	0	12	11	12	12
	7.8	350	.	149	14.24	0.01(nd)	0.33
	6.94	4	.	6	8.4	0.01(nd)	0.025(nd)
	<b>7.479</b>	<b>22</b>	<b>.</b>	<b>23.0</b>	<b>11.4</b>	<b>0.0100(nd)</b>	<b>0.1804</b>
PDRY	12	10	0	12	11	12	12
	7.48	170	.	14	15.02	0.01(nd)	0.33
	6.84	1	.	5	8.3	0.01(nd)	0.06
	<b>7.094</b>	<b>18</b>	<b>.</b>	<b>9.5</b>	<b>11.8</b>	<b>0.0100(nd)</b>	<b>0.2067</b>
PMSB	13	8	0	12	12	12	12
	7.7	130	.	24	15.36	0.02	0.41
	6.88	2	.	9	8.4	0.01(nd)	0.08
	<b>7.240</b>	<b>21</b>	<b>.</b>	<b>16.2</b>	<b>11.6</b>	<b>0.0108(nd)</b>	<b>0.2475</b>
PROXG	12	9	0	12	11	12	12
	6.91	670	.	69	13.06	0.04	0.33
	6.53	3	.	17	7	0.01(nd)	0.07
	<b>6.745</b>	<b>27</b>	<b>.</b>	<b>40.3</b>	<b>10.4</b>	<b>0.0158(nd)</b>	<b>0.2100</b>

APPENDIX A. SUMMARY STATISTICS FOR EACH SAMPLING SITE FOR 2011.

The four lines for each site display, respectively, n (number of samples), maximum, minimum, and mean values (in boldface). Where "nd" is noted next to a value, the minimum (and occasionally the maximum) was below detection and the displayed value is one-half the detection limit, which was the quantity used to calculate mean concentrations. Coliform values listed as "too numerous to count" in the dataset were not used in the summary statistics.

site	pH	fecal coliform (CFU 100ml <sup>-1</sup> )	total coliform (CFU 100ml <sup>-1</sup> )	total phosphorus (µg l <sup>-1</sup> )	dissolved oxygen (mg l <sup>-1</sup> )	total ammonia (mg l <sup>-1</sup> )	nitrate-nitrite (mg l <sup>-1</sup> )
RD1	13	11	0	12	13	12	12
	6.94	26	.	19	14.35	0.02	0.19
	6.41	1	.	6	8.6	0.01(nd)	0.025(nd)
	<b>6.645</b>	<b>5</b>	<b>.</b>	<b>11.0</b>	<b>11.4</b>	<b>0.0108(nd)</b>	<b>0.0842</b>
RD4	13	11	0	12	13	12	12
	6.86	34	.	12	14.36	0.02	8.48
	6.37	1	.	5	8.5	0.01(nd)	0.025(nd)
	<b>6.637</b>	<b>5</b>	<b>.</b>	<b>7.7</b>	<b>11.4</b>	<b>0.0108(nd)</b>	<b>0.7383</b>
RDOA	13	9	0	12	13	12	12
	7.57	48	.	9	14.41	0.01(nd)	0.32
	6.17	1	.	2.5	9	0.01(nd)	0.025(nd)
	<b>6.502</b>	<b>8</b>	<b>.</b>	<b>6.3</b>	<b>11.5</b>	<b>0.0100(nd)</b>	<b>0.1213</b>
RGA	12	12	0	12	12	12	12
	6.96	140	.	25	13.95	0.01(nd)	0.29
	6.44	1	.	10	7.5	0.01(nd)	0.12
	<b>6.804</b>	<b>10</b>	<b>.</b>	<b>13.9</b>	<b>11.1</b>	<b>0.0100(nd)</b>	<b>0.1975</b>
RGB	13	11	0	12	13	12	12
	6.99	180	.	25	14.24	0.01(nd)	0.31
	6.47	2	.	8	7.2	0.01(nd)	0.15
	<b>6.764</b>	<b>16</b>	<b>.</b>	<b>14.1</b>	<b>11.0</b>	<b>0.0100(nd)</b>	<b>0.2175</b>
RK	1	0	0	0	1	0	0
	6.71	.	.	.	9.1	.	.
	6.71	.	.	.	9.1	.	.
	<b>6.710</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>9.10</b>	<b>.</b>	<b>.</b>
RRHG	11	6	0	11	11	11	11
	6.02	6	.	7	13.99	0.02	0.37
	5	1(nd)	.	2.5(nd)	8.8	0.01(nd)	0.08
	<b>5.514</b>	<b>2</b>	<b>.</b>	<b>3.8(nd)</b>	<b>11.7</b>	<b>0.0109(nd)</b>	<b>0.2055</b>
WDBN	12	11	0	12	13	12	12
	8.18	120	.	28	13.57	0.02	0.63
	6.93	1(nd)	.	7	9.1	0.01(nd)	0.08
	<b>7.278</b>	<b>19</b>	<b>.</b>	<b>15.8</b>	<b>11.3</b>	<b>0.0125(nd)</b>	<b>0.3633</b>
WDHOA	13	12	0	12	13	12	12
	7.88	340	.	51	13.8	0.03	1.1
	6.59	10	.	15	9	0.01(nd)	0.39
	<b>7.218</b>	<b>50</b>	<b>.</b>	<b>29.4</b>	<b>11.5</b>	<b>0.0142(nd)</b>	<b>0.6850</b>

APPENDIX A. SUMMARY STATISTICS FOR EACH SAMPLING SITE FOR 2011.

The four lines for each site display, respectively, n (number of samples), maximum, minimum, and mean values (in boldface). Where "nd" is noted next to a value, the minimum (and occasionally the maximum) was below detection and the displayed value is one-half the detection limit, which was the quantity used to calculate mean concentrations. Coliform values listed as "too numerous to count" in the dataset were not used in the summary statistics.

site	pH	fecal coliform (CFU 100ml <sup>-1</sup> )	total coliform (CFU 100ml <sup>-1</sup> )	total phosphorus (µg l <sup>-1</sup> )	dissolved oxygen (mg l <sup>-1</sup> )	total ammonia (mg l <sup>-1</sup> )	nitrate- nitrite (mg l <sup>-1</sup> )
WSPB	1	0	0	0	1	0	0
	7.33	.	.	.	10.5	.	.
	7.33	.	.	.	10.5	.	.
	<b>7.330</b>	.	.	.	<b>10.5</b>	.	.

**APPENDIX B**

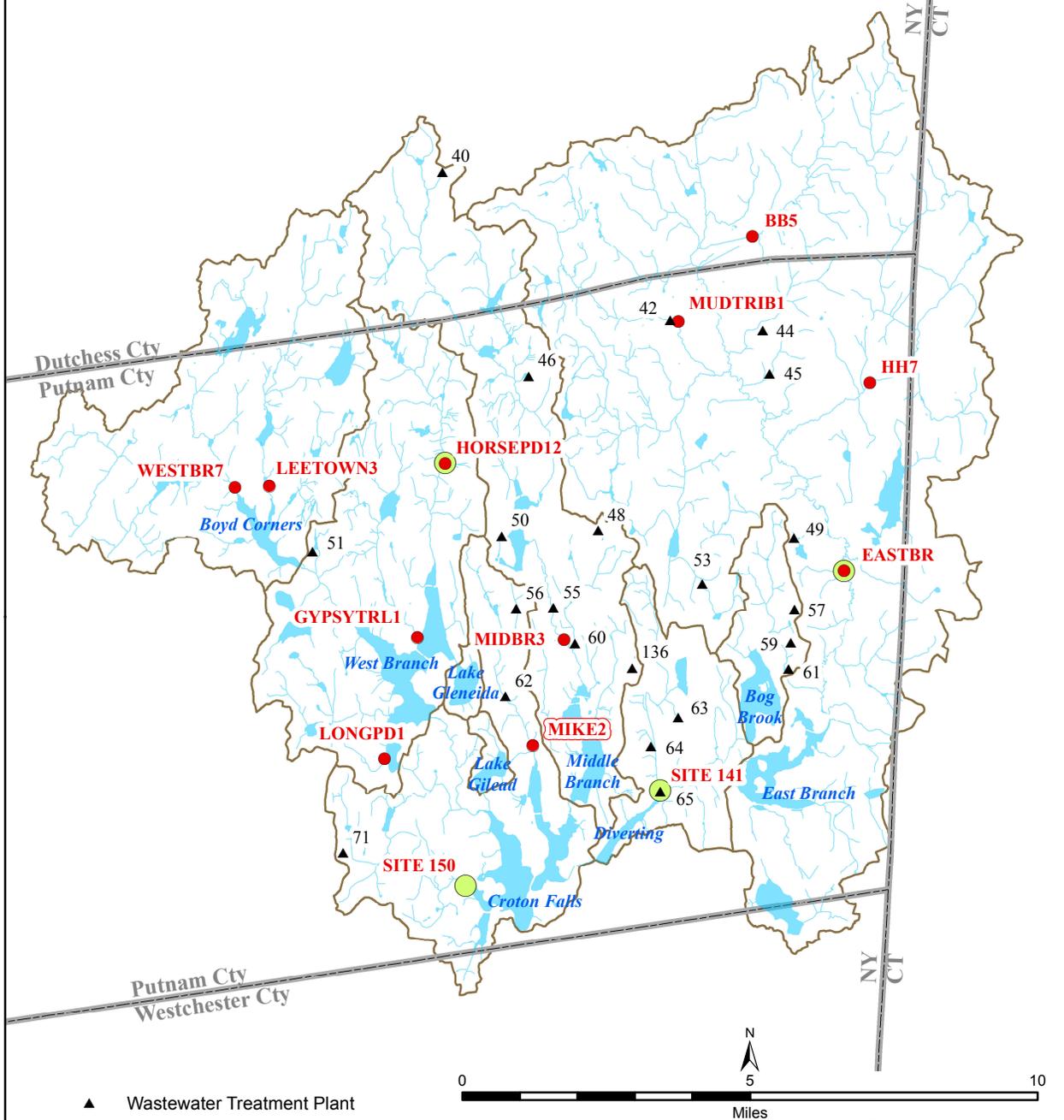
**SITE MAPS**



# Northern Basins of the Croton Watershed

## Stream Sample Sites and Wastewater Treatment Plants

### 2011



- ▲ Wastewater Treatment Plant
- Hydrology Sampling Site
- Biomonitoring Site

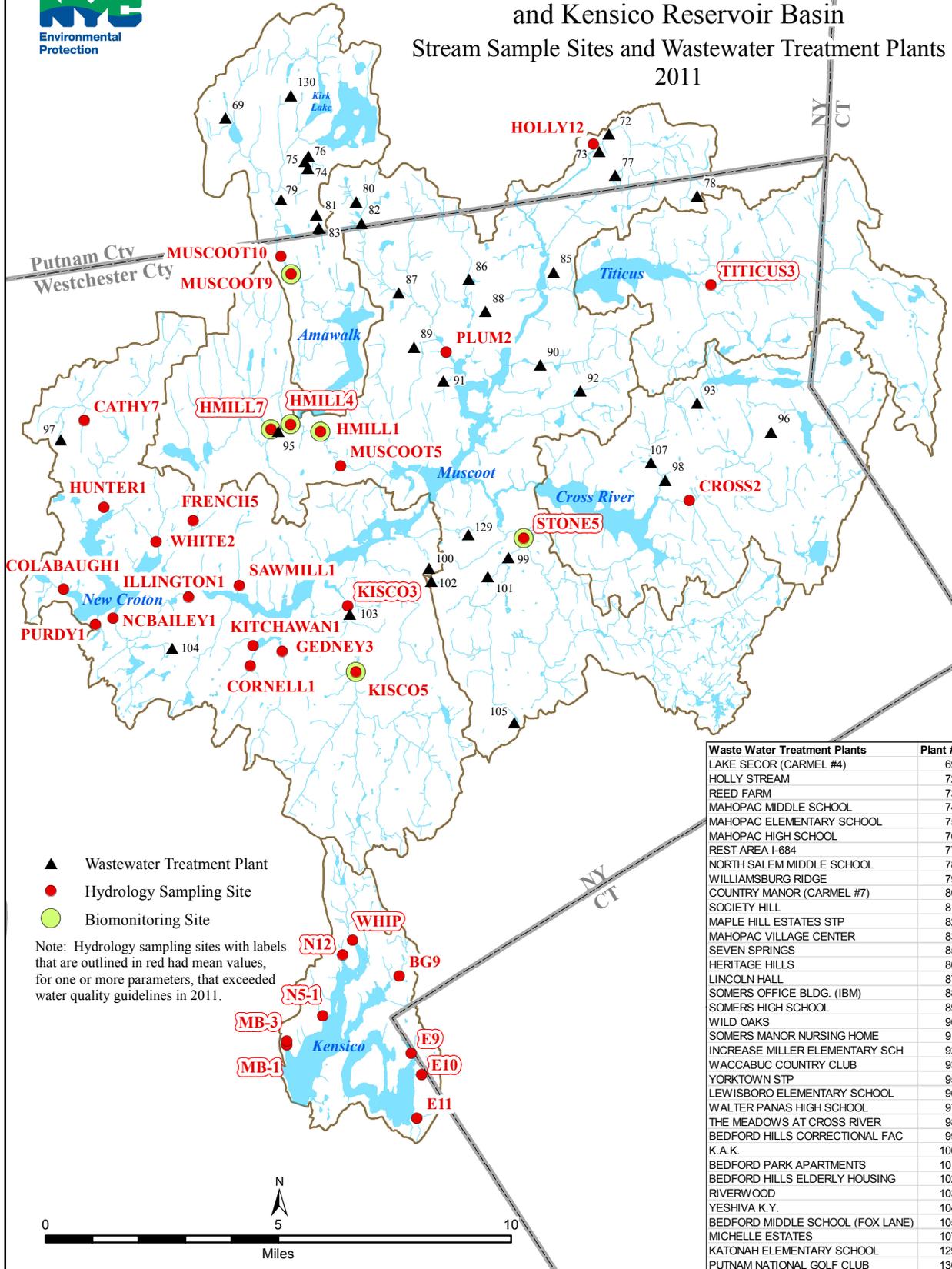
Note: Hydrology sampling sites with labels that are outlined in red had mean values, for one or more parameters, that exceeded water quality guidelines in 2011.

Waste Water Treatment Plants	Plant #	Waste Water Treatment Plants	Plant #
CAMP LUDINGTON	40	HILL SPARROW	56
PATTERSON HAMLET	42	MOUNT EBO	57
THUNDER RIDGE SKI AREA	44	TOWNE CENTRE SOUTHEAST	59
WATCHTOWER SOCIETY	45	HUNTERS GLEN	60
PUTNAM NURSING & REHABILITATION	46	TRACY TERTIARY (CLOCKTOWER)	61
FOX RUN	48	CARMEL SD#2 STP	62
CAMP RE	49	BLACKBERRY HILL	63
FRANGEL	50	BREWSTER HEIGHTS	64
CLEAR POOL CAMP	51	BREWSTER STP	65
BREWSTER SCHOOLS	53	MAHOPAC STP	71
GEORGE FISCHER MIDDLE SCHOOL	55	THE HIGHLANDS	136



# Southern Basins of the Croton Watershed and Kensico Reservoir Basin

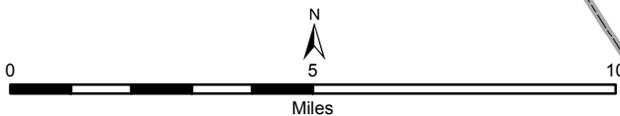
## Stream Sample Sites and Wastewater Treatment Plants 2011



Waste Water Treatment Plants	Plant #
LAKE SECOR (CARMEL #4)	69
HOLLY STREAM	72
REED FARM	73
MAHOPAC MIDDLE SCHOOL	74
MAHOPAC ELEMENTARY SCHOOL	75
MAHOPAC HIGH SCHOOL	76
REST AREA I-684	77
NORTH SALEM MIDDLE SCHOOL	78
WILLIAMSBURG RIDGE	79
COUNTRY MANOR (CARMEL #7)	80
SOCIETY HILL	81
MAPLE HILL ESTATES STP	82
MAHOPAC VILLAGE CENTER	83
SEVEN SPRINGS	85
HERITAGE HILLS	86
LINCOLN HALL	87
SOMERS OFFICE BLDG. (IBM)	88
SOMERS HIGH SCHOOL	89
WILD OAKS	90
SOMERS MANOR NURSING HOME	91
INCREASE MILLER ELEMENTARY SCH	92
WACCABUC COUNTRY CLUB	93
YORKTOWN STP	95
LEWISBORO ELEMENTARY SCHOOL	96
WALTER PANAS HIGH SCHOOL	97
THE MEADOWS AT CROSS RIVER	98
BEDFORD HILLS CORRECTIONAL FAC	99
K.A.K.	100
BEDFORD PARK APARTMENTS	101
BEDFORD HILLS ELDERLY HOUSING	102
RIVERWOOD	103
YESHIVA K.Y.	104
BEDFORD MIDDLE SCHOOL (FOX LANE)	105
MICHELLE ESTATES	107
KATONAH ELEMENTARY SCHOOL	129
PUTNAM NATIONAL GOLF CLUB	130

- ▲ Wastewater Treatment Plant
- Hydrology Sampling Site
- Biomonitoring Site

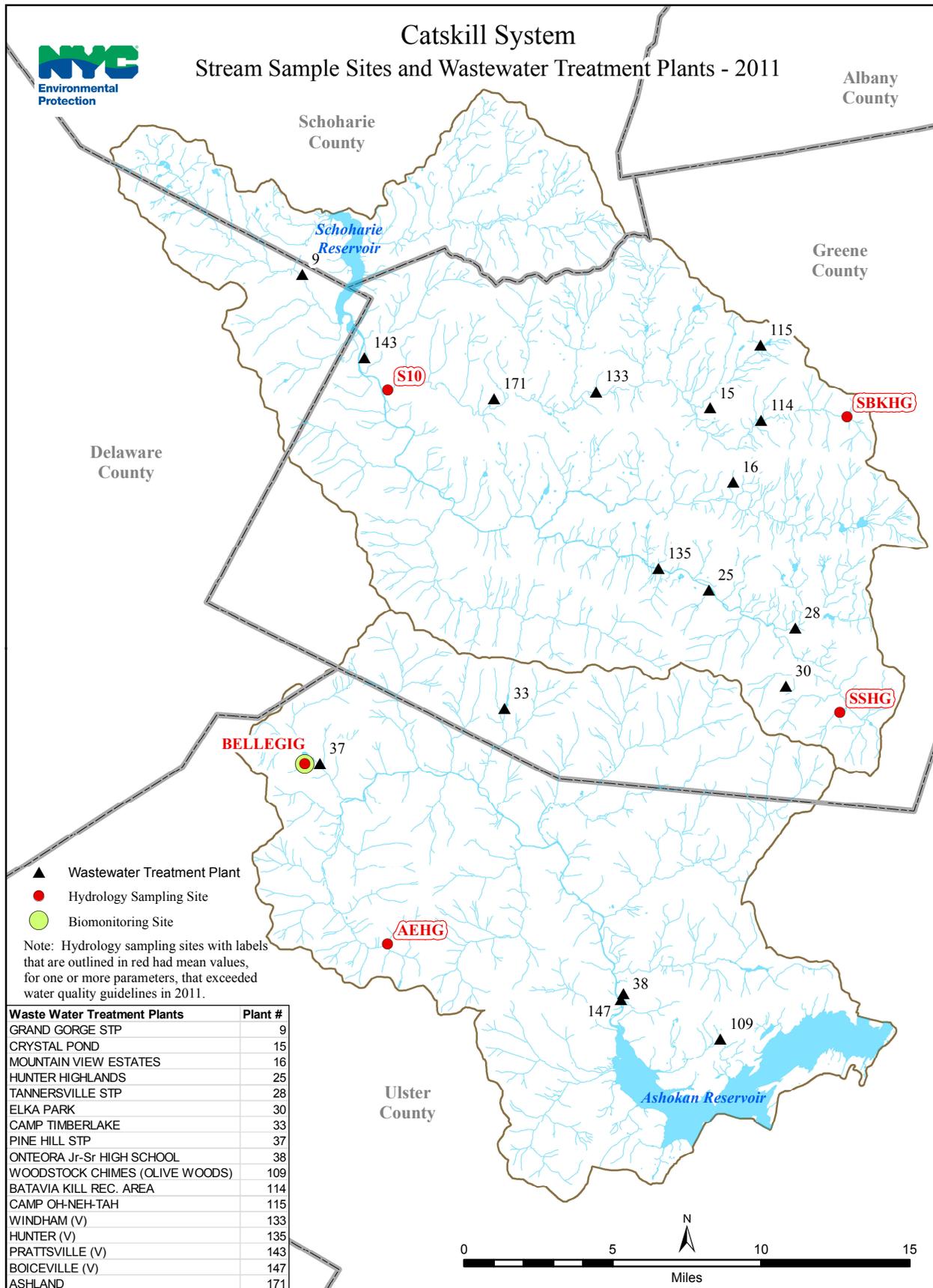
Note: Hydrology sampling sites with labels that are outlined in red had mean values, for one or more parameters, that exceeded water quality guidelines in 2011.





# Catskill System

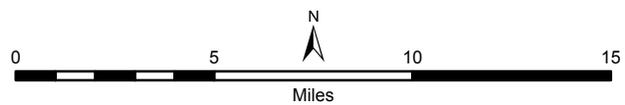
## Stream Sample Sites and Wastewater Treatment Plants - 2011



- ▲ Wastewater Treatment Plant
- Hydrology Sampling Site
- Biomonitoring Site

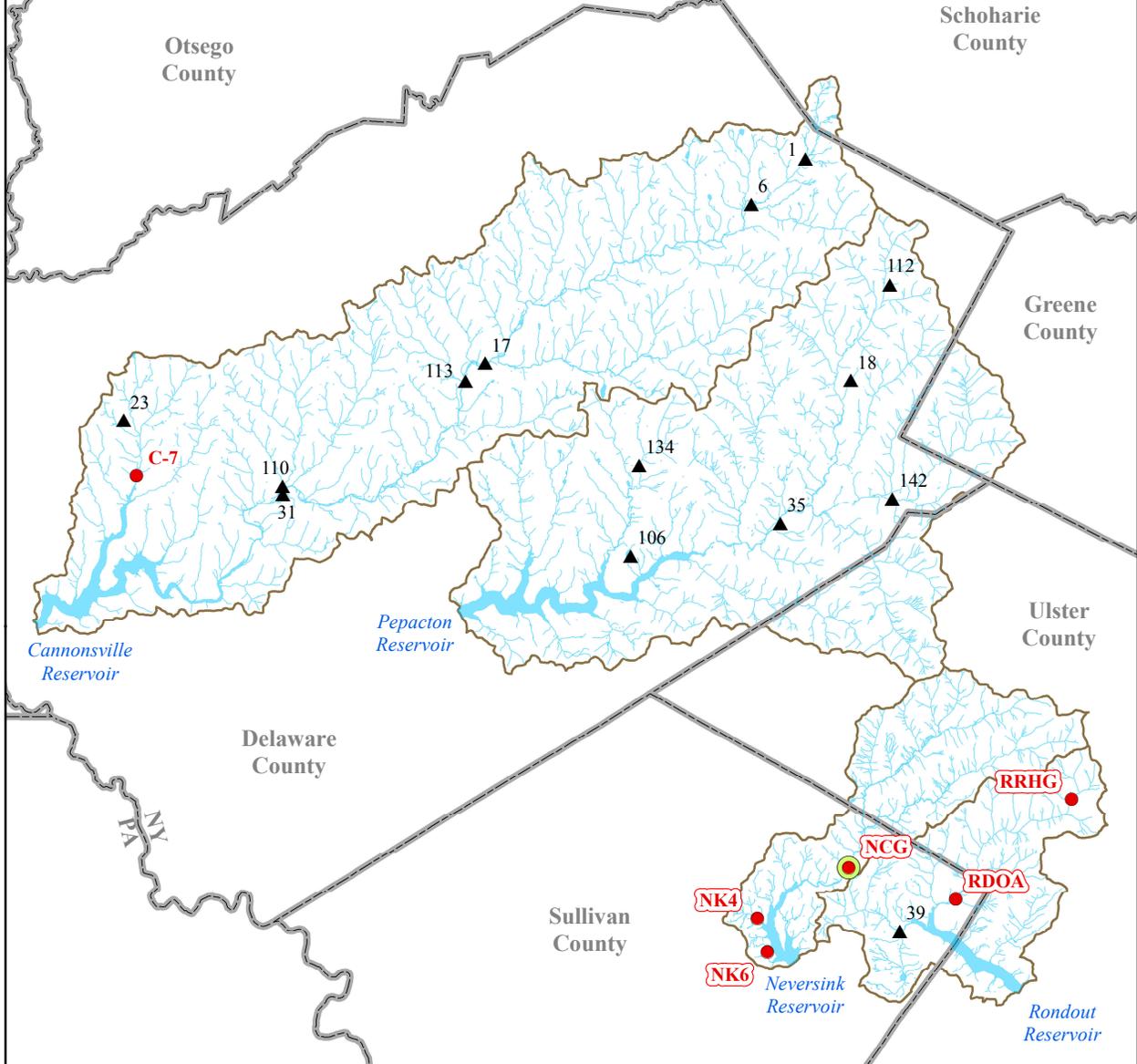
Note: Hydrology sampling sites with labels that are outlined in red had mean values, for one or more parameters, that exceeded water quality guidelines in 2011.

Waste Water Treatment Plants	Plant #
GRAND GORGE STP	9
CRYSTAL POND	15
MOUNTAIN VIEW ESTATES	16
HUNTER HIGHLANDS	25
TANNERSVILLE STP	28
ELKA PARK	30
CAMP TIMBERLAKE	33
PINE HILL STP	37
ONTEORA Jr-Sr HIGH SCHOOL	38
WOODSTOCK CHIMES (OLIVE WOODS)	109
BATAVIA KILL REC. AREA	114
CAMP OH-NEH-TAH	115
WINDHAM (V)	133
HUNTER (V)	135
PRATTSVILLE (V)	143
BOICEVILLE (V)	147
ASHLAND	171





# Delaware System Stream Sample Sites and Wastewater Treatment Plants 2011



Waste Water Treatment Plants	Plant #
STAMFORD (V)	1
HOBART (V)	6
DELHI (V)	17
ROXBURY RUN	18
DELAWARE BOCES	23
WALTON (V)	31
MARGARETVILLE (V)	35
GRAHAMSVILLE (V)	39
CAMP L'MAN A'CHAI (TAI CHI)	106
KRAFT INC. (cooling water)	110
MOUNTAINSIDE FARMS (subsurface industrial discharge)	112
MORNINGSTAR FOODS / DAIRYVEST (cooling water)	113
ANDES (V)	134
FLEISCHMANN'S (V)	142

- ▲ Wastewater Treatment Plant
- Hydrology Sampling Site
- Biomonitoring Site

Note: Hydrology sampling sites with labels that are outlined in red had mean values, for one or more parameters, that exceeded water quality guidelines in 2011.

