WATER QUALITY STANDARDS REVIEW
STREAM REDESIGNATION EVALUATION

WISSAHICKON CREEK
MONTGOMERY COUNTY
Segment: Source to Route 73 Bridge
Stream Code: 00844
Drainage List F

WATER QUALITY MONITORING SECTION (APF)
DIVISION OF WATER QUALITY STANDARDS
BUREAU OF WATER STANDARDS AND FACILITY REGULATION
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OCTOBER 2006

GENERAL WATERSHED DESCRIPTION

Wissahickon Creek is a tributary to the Schuylkill River in the Delaware River drainage. The basin is located in Landsdale, Montgomery, Upper Gwynedd, Horsham, Worchester, Lower Gwynedd, Whitpain, Upper Dublin, Abington, Whitemarsh, Springfield, and Cheltenham Townships in Montgomery County and Philadelphia County and the Boroughs of North Wales, Landsdale, and Ambler. The Wissahickon Creek is a freestone stream that drains approximately 64.0mi^2 and flows in a southerly direction. The surrounding area is characterized by low relief topography, which is portrayed on the Lansdale, Ambler, and Germantown 7.5-minute series USGS quadrangles.

The Wissahickon Creek basin is currently designated Trout Stocking (TSF), which provides for the maintenance of stocked trout from February 15 to July 31, and the maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat. Wissahickon Creek was evaluated for a less restrictive use redesignation to Warm Water Fishes (WWF) based on a petition submitted by Upper Gwynedd Township, Montgomery County on March 23, 2004. The Environmental Quality Board (EQB) accepted the petition for study on June 15, 2004. The petitioner requested redesignation of the stream reach from the headwaters to the Route 73 (Skippack Pike) Bridge in Whitemarsh Township (Montgomery County) based on current water quality, aquatic life, and land use conditions and alleged that the petitioned section is not being stocked with trout by the Pennsylvania Fish and Boat Commission (PFBC). This report covers the portion of the basin from the source to the Route 73 Bridge.

Much of the Wissahickon Creek watershed is listed on the State's Integrated Water Quality Monitoring and Assessment Report list of impaired waters (303(d)) with impairments due to problems associated with elevated nutrient levels, low dissolved oxygen concentrations, siltation, water/flow variability, oil and grease, and pathogens. Land use within the petitioned portion of the watershed is characterized by an urban setting consisting of low (34%) and high density residential development (8%). Wooded areas interspersed with homes makes up 40% of the land use. Land ownership is mostly private with public land located in the very lower portion of the petitioned area within Fort Washington State Park. The watershed is within the Piedmont physiographic province.

WATER QUALITY AND USES

Surface Water

Historically, water quality conditions reflect the number of sewage discharges present in the Wissahickon Creek basin. Historical surveys conducted by the Commonwealth document that eutrophic conditions were caused by high nutrient concentrations related to sewage treatment plant and industrial discharges (Table 1-2, Figure 1) (summary in Boyer 1997).

The Department has collected data, which continue to show eutrophic conditions. Water quality data collected in 1988, 1995, and 1996 show elevated nutrient levels throughout the watershed (Tables 3). Starting in headwater areas, the main stem, as well as Sandy Run; a major tributary, exhibited high nutrient levels and was characterized as having marginal or poor overall stream conditions (Boyer 1989; 1995; 1997). Data from an algal assay conducted in 1993, indicated that Wissahickon Creek was nutrient enriched from high instream nitrogen and phosphorus concentrations and that algal production was trace element limited (Schubert 1996).

Boyer (1997) calculated that 26 permitted facilities discharged a total of 21.2 cubic feet/second (cfs) of treated effluent into the Wissahickon Creek Basin. The average daily flow of the stream at Bells Mill Road (RM 6.6) is 63.0 cfs and the Q_{7-10} is 8.5 cfs. The calculated treated effluent represents 34% of the average stream flow and almost 250% of the Q_{7-10} flow.

Dissolved oxygen (DO) has been monitored in Wissahickon Creek in relation to the high nutrient levels. Boyer (1997) sampled 4 stations on Wissahickon Creek and 1 station on Sandy Run during August. DO concentrations at all 5 of these stations were above the TSF Chapter 93 minimum instantaneous criterion of 4 mg/l for August (5.3 – 10.5 mg/l) (Table 4). Sampling was conducted in 1999 at 16 locations on Wissahickon Creek, Sandy Run, and Pine Run in July 1999 (Boyer 1999). Of over 120 readings the DO criterion for July (5.0 mg/l) was violated 43 times at these stations (Table 5). However, almost all of these represent a “DO sag” where DO concentrations commonly are at their lowest levels in the early morning hours prior to sunrise and photosynthetic production of DO. Problematic locations (5-WC, 7-WC, 1-SR, and 2-SR) are in the upper reaches of these streams, which are dominated by treated wastewater. In most cases, the DO concentrations at downstream locations did not drop below the 5.0 mg/l criterion. A notable downstream exception was at 13-WC and 15-WC, which are below the Ambler Borough Sewage Treatment Plant discharge and Sandy Run, also effluent dominated.

Everett (2002) monitored DO measurements at 8 locations on Wissahickon Creek, Sandy Run, and Pine Run during July 2002 (Figure 2). Most of these 8 stations targeted problem stations (5-WC, 7-WC, 13-WC, 15-WC & 2-SR) identified in Boyer (1999). Similarly to Boyer’s 1999 study, Everett DO data displays DO sags during darkness and early morning hours that drop below the 5.0 mg/l July criterion. Other tributary locations (2-PR and 3-PR and 7-SR) did not exhibit DO concentrations below the criterion threshold.

Data collected by the National Institute for Environmental Renewal (NIER 1998) and the Philadelphia Water Department (Butler et al. 2001; PWD 2005 unpublished data) is generally consistent with water quality measurements collected by the Department. Both NIER and PWD collected DO data. These results also showed increased incidence of DO concentrations that exceed TSF Chapter 93 criteria in the upper portion of Wissahickon Creek and fewer DO criteria exceedences in the lower petitioned portion with the same evidence of early morning DO sags.

Currently, there are 27 permitted discharges, 80 groundwater withdrawals, 7 surface water withdrawals, 1 land disposal (single resident spray irrigation), 10 ground water recharge points, and 12 on-lot septic discharges within the Wissahickon Creek drainage basin. The stream also is impacted by non-point sources from the agricultural, residential, commercial, and industrial areas. In spite of these stressors, Wissahickon Creek demonstrated water quality at or near applicable TSF criteria.

Aquatic Biota

The Department collected habitat and benthic macroinvertebrate data at 3 sampling locations on August 22-23, 2005. Previous Department surveys include those conducted by Strekal (1974; 1976) and Boyer (1988; 1997).

Benthos. Benthic macroinvertebrate collection efforts employed the PA-DEP RBP benthic sampling methodology, which is a modification of EPA's Rapid Bioassessment Protocols (RBPs; Plafkin, et al 1989; Barbour et al. 1999). Benthic samples were collected from 3 stations (9-WC, 13-WC, and 15-WC) on the main stem of Wissahickon Creek (Table 6). The benthic community was dominated by facultative/tolerant taxa displaying fair taxonomic diversity with a mean of 12 taxa per station. The assemblages exhibited low percentages of pollution intolerant EPT (Ephemeroptera, Plecoptera, and Trichoptera) taxa and Hilsenhoff Biotic Index (HBI) scores in the 5.5 - 6.5 range. HBI scores above 5 reflect benthic dominance by pollution tolerant taxa, often indicating the presence of significant organic pollution.

During previous surveys, Strekal (1974; 1976) and Boyer (1989; 1997) found benthic macroinvertebrate assemblages that reflected fair station diversity with most of the taxa being classified as pollution "tolerant" or "facultative," similar to DEP's 2005 survey (Tables 7-8). Department data is generally consistent with macroinvertebrate samples collected by the PFBC (Wnuk et.al. 1994) and the Philadelphia Water Department (Butler et. al. 2001).

Habitat. Instream habitat conditions were evaluated at 3 stations; 9-WC, 13-WC, and 15-WC (Table 9). The habitat evaluation consisted of rating twelve habitat parameters to derive a station habitat score. The habitat scores for Wissahickon Creek ranged from 177 to 180; reflecting suboptimal habitat conditions. Habitat analysis conducted by the Philadelphia Water Department (Butler et. al. 2001), using a rating scale similar to the Departments' assessment, also indicated suboptimal habitat conditions.

Fish. Fisheries surveys have been conducted within the petitioned area or immediately downstream by DEP (Strekal 1974; Boyer 1989; 1997), PFBC (Wnuk et.al. 1994), and PWD (Butler et. al. 2001; PWD 2005). Based on fish assemblage data collected by Boyer (1989, 1997), at least 22 species of fish are known to reside in the petitioned portion of Wissahickon Creek (Table 10). A section of Wissahickon Creek within the petitioned area, from Joshua Road downstream to the Route 73 Bridge, is also within the reach stocked by the PFBC. The PFBC has stocked Wissahickon Creek since 1970 and currently stocks this section once pre-season and twice in-season. Trout have been documented to occur within the stocked section of the petitioned area into June and July (Table 11). The PWD also documented the presence of trout approximately 1 mile upstream of the stocking limit in June 2005 (PWD 2005).

Because of the significant volumes of treated wastewater assimilated by this stream, most of the sites exhibit low species abundance comprised of fish taxa characterized as pollution tolerant and generalist feeding guilds. The community lacks an abundance of top-predators, which is indicative of an unbalanced fishery. American eel have been found throughout the mainstem of the Wissahickon.

PUBLIC RESPONSE AND PARTICIPATION SUMMARY

The Department provided public notice of this aquatic life use evaluation and requested any technical data from the general public through publication in the Pennsylvania Bulletin on July 10, 2004 (34 Pa.B 3650). A similar notice was also published in The Reporter, Landsdale, PA on July 6, 2004. In addition, the Ambler, Lansdale, and North Wales Boroughs; the Lower Gwynedd, Montgomery, Upper Dublin, Upper Gwynedd, Whitemarsh, and Whitpain Townships; and the Montgomery County Planning Commission were notified of the redesignation evaluation in a letter dated June 25, 2004. Chris Crockett from the Philadelphia Water Department provided water chemistry, habitat, and biological data for Wissahickon Creek.

The Department received letters from Whitemarsh Township and the Philadelphia Water Department in opposition to the requested designation change. Whitemarsh Township expressed concerns that a WWF reclassification may adversely affect recreational activities of their citizens as well as those of the other downstream communities. The Philadelphia Water Department (PWD) withdraws water from the Wissahickon Creek to provide about 25% of the drinking water needs of 325,000 Philadelphians. Consequently, the PWD actively monitors the water quality of Wissahickon Creek and has expressed concerns over taste and odor problems and increased treatment costs.

Further, they are concerned that a WWF redesignation would adversely affect both the native fish communities and the Wissahickon Creek trout fishery.

CONCLUSIONS

Wissahickon Creek is impacted by many sources including municipal and industrial wastewater discharges and non-point sources from both residential and agricultural land use. The first permanent flow for Wissahickon Creek is located downstream from the North Wales Borough sewage treatment plant discharge. Throughout its course, the Wissahickon Creek is highly augmented by treated discharges. Both these point and non-point sources contribute to elevated nutrient concentrations. Elevated nutrient concentrations contribute to fluctuations in DO levels where early morning “sags” sometimes violate Chapter 93 TSF DO criteria. These violations are most prevalent within portions of the stream where stream flow is effluent dominated. The middle portion of the study section shows few TSF DO violations indicating the streams ability to recover from the high effluent loads. The lower portion of the study reach, including below the confluence with Sandy Run again shows DO “sags” and violations of TSF DO criteria from increased nutrient loads coming from local sources.

While the above summary generally characterizes the Wissahickon Creek as a stream impacted by numerous point and non-point sources, there are indications that the basin’s water quality conditions are not irretrievable. In reporting conditions surveyed in 1976, Strekal described impacted stream reaches with recovery zones downstream. Boyer (1997) observed that, overall, the water quality and biotic conditions have slowly improved during his several investigations since 1988. He described improving fish populations as one moves downstream - specifically noting reproducing bass populations and holdover stocked trout in the lower reaches of Wissahickon Creek. Some tributaries display better water quality that contributes to the improving conditions downstream.

Additionally, despite the compromised water quality conditions in the upper reaches, PFBC maintains an active stocking program in Wissahickon Creek. A section of the stream within the petitioned area, from Joshua Road downstream to the Route 73 Bridge, is stocked with catchable sized trout. Trout have been documented upstream of the stocked area and persist throughout the stocking season. American eel have been found through the watershed.

When considering a petition request to redesignate a waterbody with a less restrictive use, the Department must evaluate the existing use of that waterbody as defined at § 93.1 and review the less restrictive regulatory use in § 93.4 for applicability. A waterbody considered for redesignation may not be redesignated to a less restrictive use than its existing use. Based on the information presented and discussed above, the Department finds that the Wissahickon Creek has supported and continues to support a TSF existing use.

RECOMMENDATIONS

Based on the existing use findings of this report and data and file information gathered pertinent to the petitioned area, the Department recommends that the Wissahickon Creek basin from its source to the Route 73 Bridge remain designated TSF. The findings of this study do not indicate that the original TSF designation was inappropriate. Trout stocking is an existing use that will expand throughout the upper watershed as wastewater loading is attenuated. The Department also recommends that Migratory Fishes (MF) designation be added due to the presence of American Eel.

REFERENCES

Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency, Office of Water; Washington, D.C.

Boyer, M.R. 1989. Aquatic Biological Investigation, Wissahickon Creek, August and November 1988. PA DEP file information, Norristown, PA.

Boyer. M.R. 1995. Unpublished water chemistry data for Wissahickon Creek, July 1995. PA DEP file information. Norristown, PA.

Boyer. M.R. 1997. Aquatic Biological Investigation, Wissahickon Creek, June, August, and September 1996. PA DEP file information. Norristown, PA.

Boyer. M.R. 1999. Supplemental Diurnal Dissolved Oxygen Data. PA DEP file information. Norristown, PA.

Butler. L.H., J.A. Perillo, and W. J. Richardson. 2001. Biological Assessment of the Wissahickon Watershed (Spring 2001). Philadelphia Water Department file report.

Everett, A. 2004. Data from DEP Wissahickon Watershed 2002 Diel Dissolved Oxygen Survey performed in conjunction with 2002 time of travel study. 2002. PA DEP file information Norristown, PA.

NIER. 1998. Instream Water Quality Data for the Wissahickon Creek. National Institute of Environmental Renewal. file information.

Plafkin, J.L., M.T. Barbour, K.D. Porter, S.K. Gross, and R.M. Hughes. 1989. Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates and Fish. U.S. Environmental Protection Agency, Office of Water Regulation and Standards, Washington, D.C. EPA 440-4-89-001.

Philadelphia Water Department. 2005. Biological Assessment of the Wissahickon Watershed. file information.

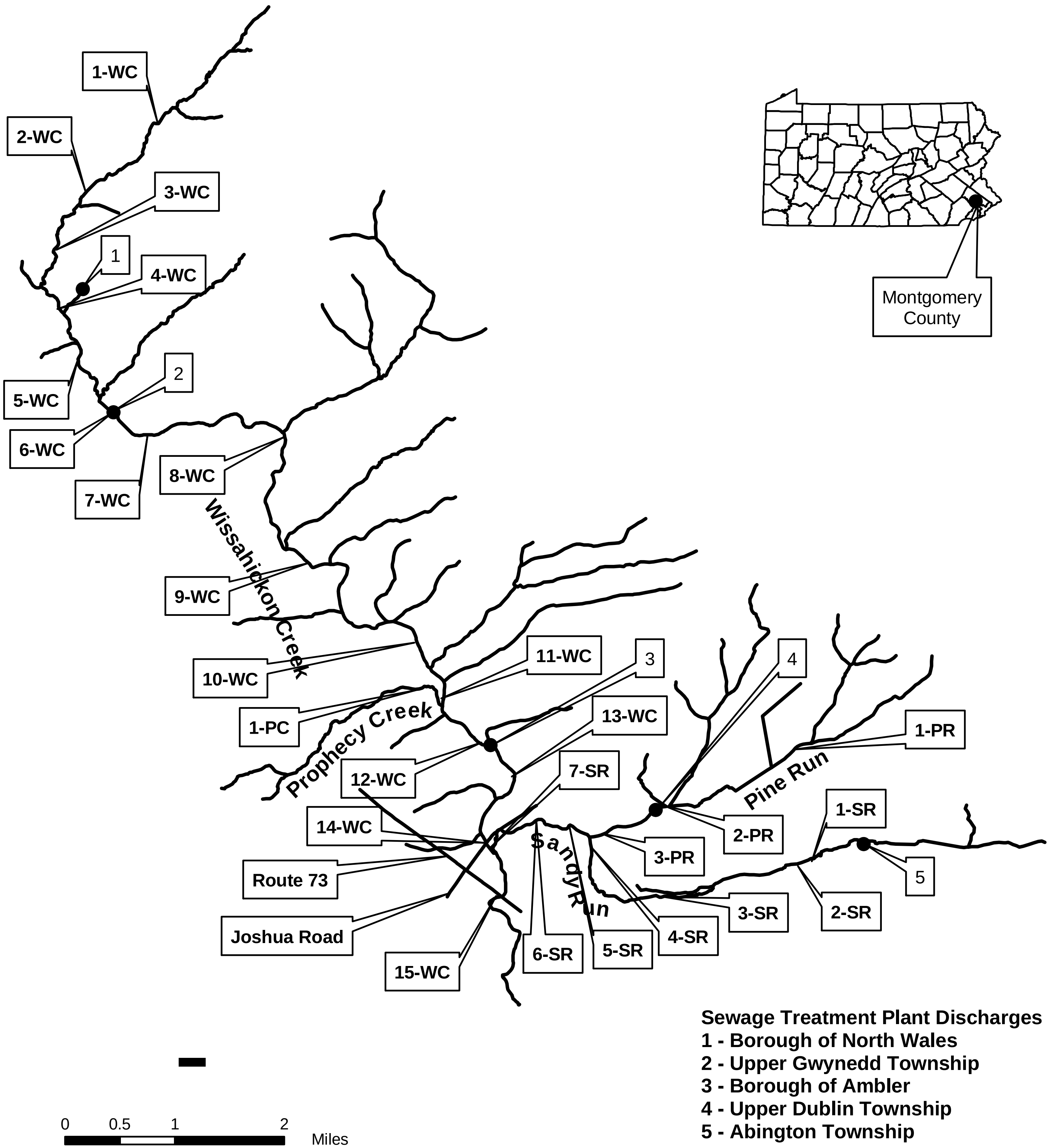
Schubert, S. T. 1996. Aquatic Biological Investigation: Algal Assay, Wissahickon Creek, June and September, 1993. PA DEP file information, Norristown, PA.

Strekal, T.A. 1974. Aquatic Biological Investigation, Prophecy and Wissahickon Creeks, June 1974. PA DEP file information, Norristown, PA.

Strekal, T.A. 1976. Aquatic Biological Investigation, Wissahickon Creek, September 1976. PA DEP file information, Norristown, PA.

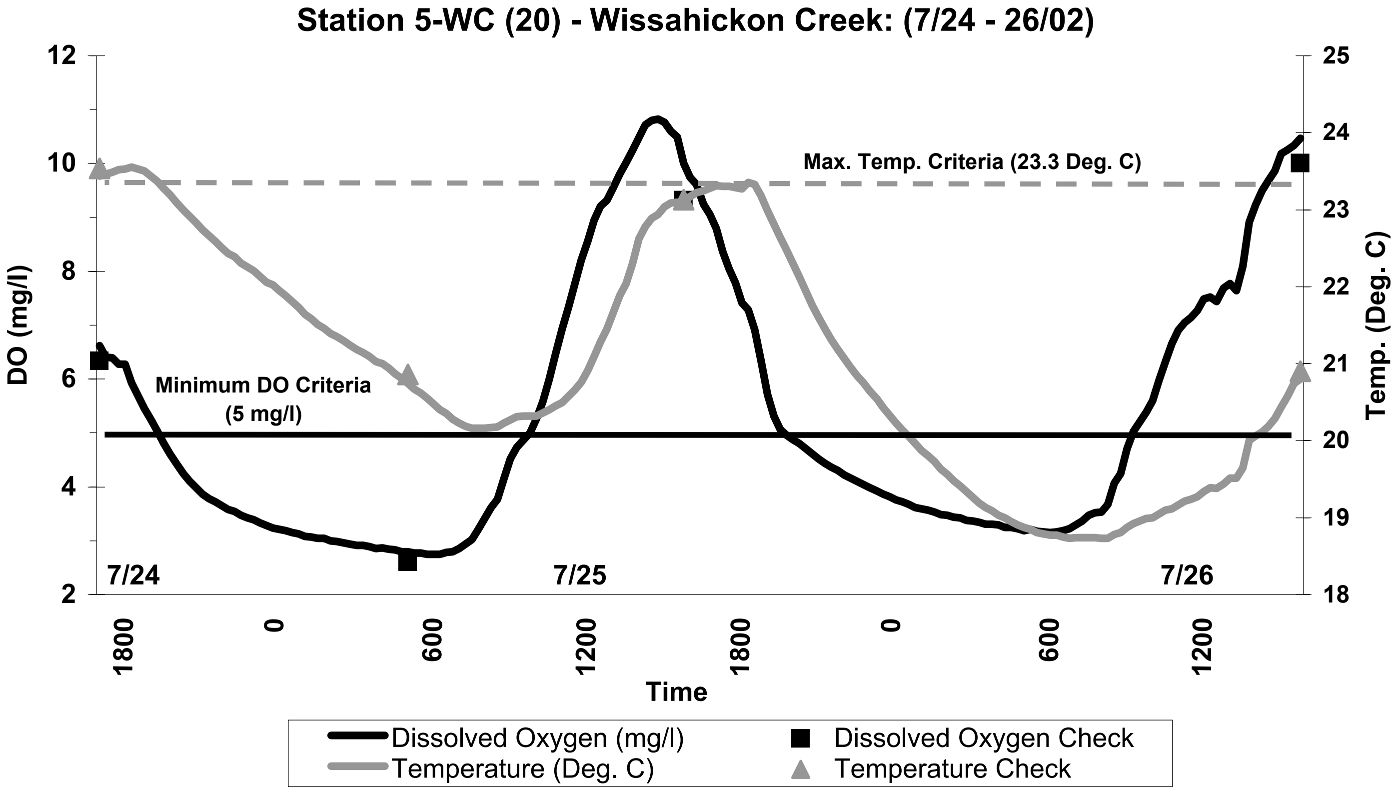
Wnuk, R., M. Kaufmann, and J. Soldo. 1994. Wissahickon Creek (603F), Sections 02 and 04, Fisheries Management Report. Pennsylvania Fish and Boat Commission. file information.

Figure 1.
Wissahickon Creek Sampling Locations



Sewage Treatment Plant Discharges
1 - Borough of North Wales
2 - Upper Gwynedd Township
3 - Borough of Ambler
4 - Upper Dublin Township
5 - Abington Township

FIGURE 2.
WATER CHEMISTRY TEMPERATURE & DO
DEP (EVERETT 2002)



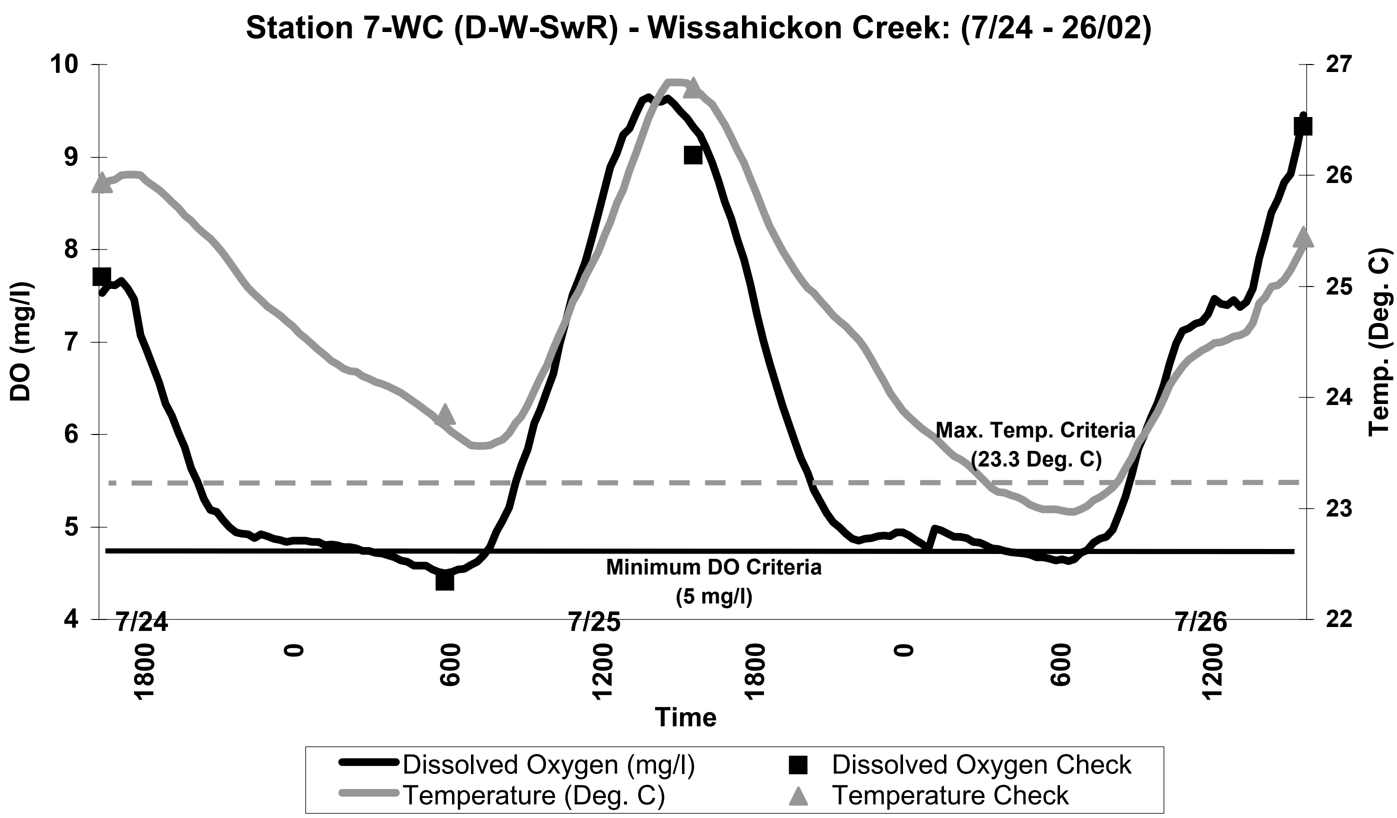
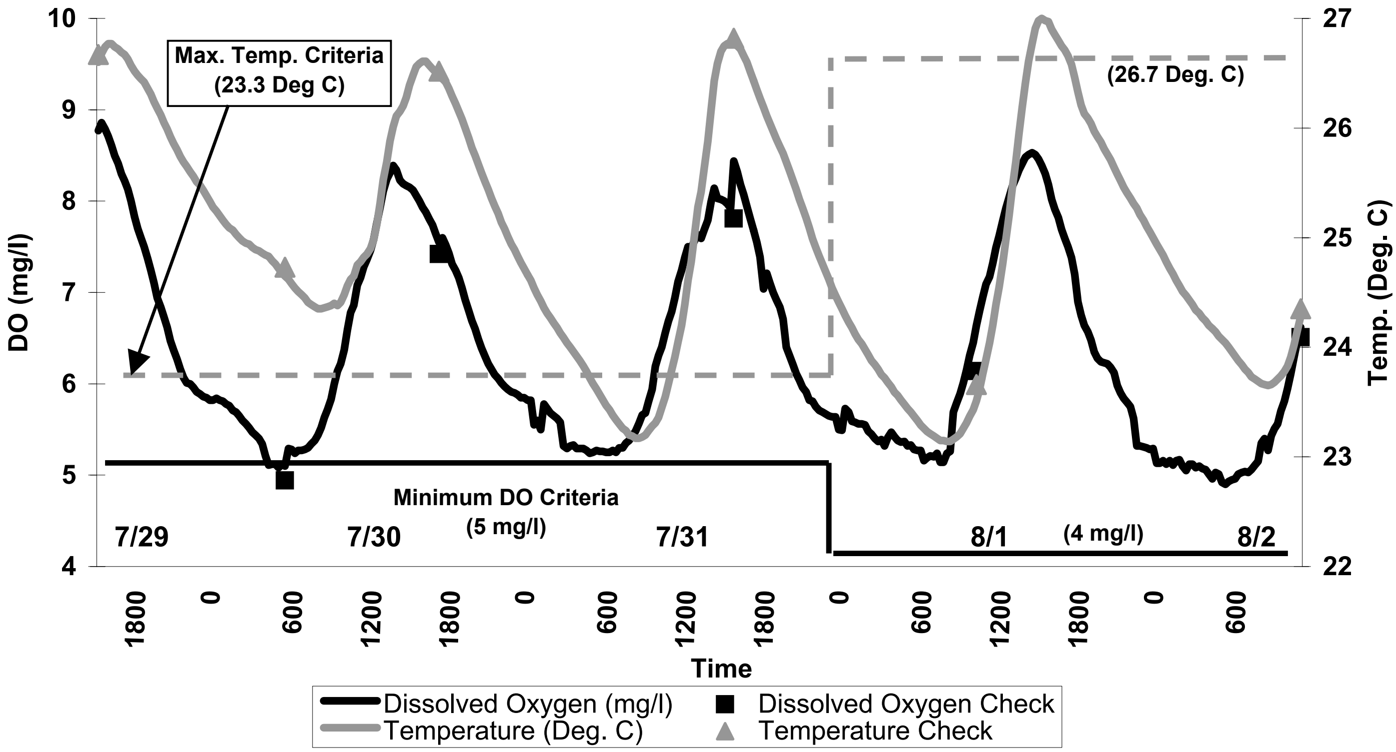


FIGURE 2. (cont.)
WATER CHEMISTRY TEMPERATURE & DO
DEP (EVERETT 2002)

Station 13-WC (41) - Wissahickon Creek: (7/29 - 8/2/02)



Station 15_WC (35) - Wissahickon Creek: (7/29 - 8/2/02)

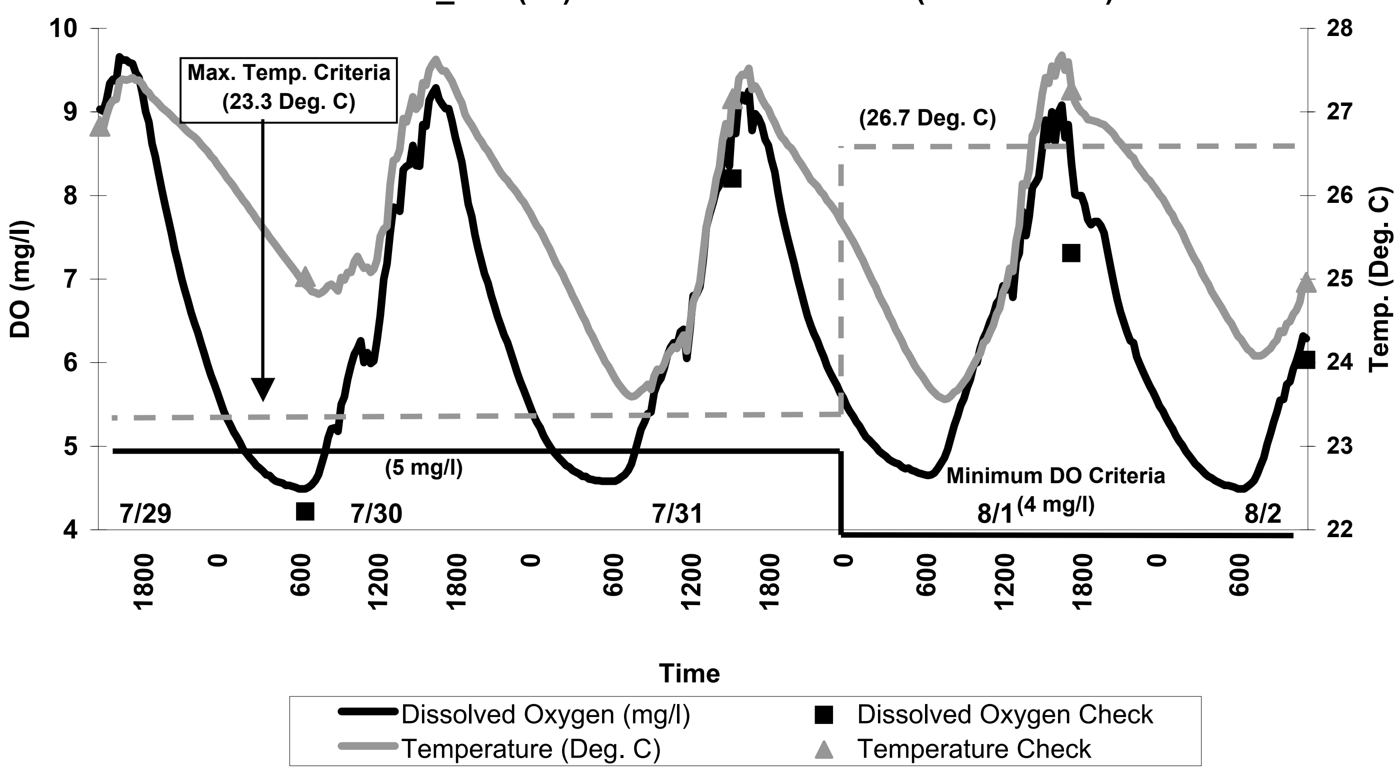
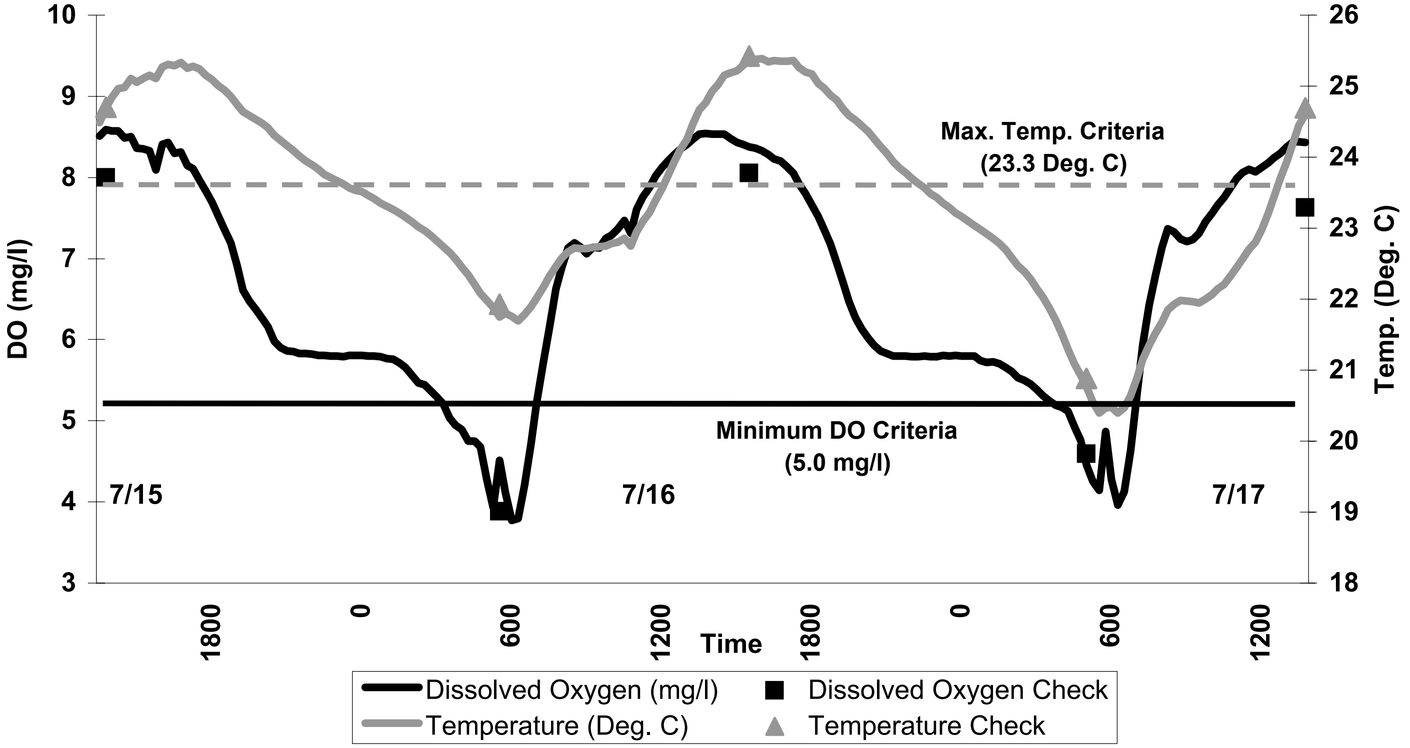


FIGURE 2. (cont.)
WATER CHEMISTRY TEMPERATURE & DO
DEP (EVERETT 2002)

Station 2-SR (D-S-TwR) - Sandy Run: (7/15 - 17/02)



Station 7-SR (16) - Sandy Run: (7/15 - 17/02)

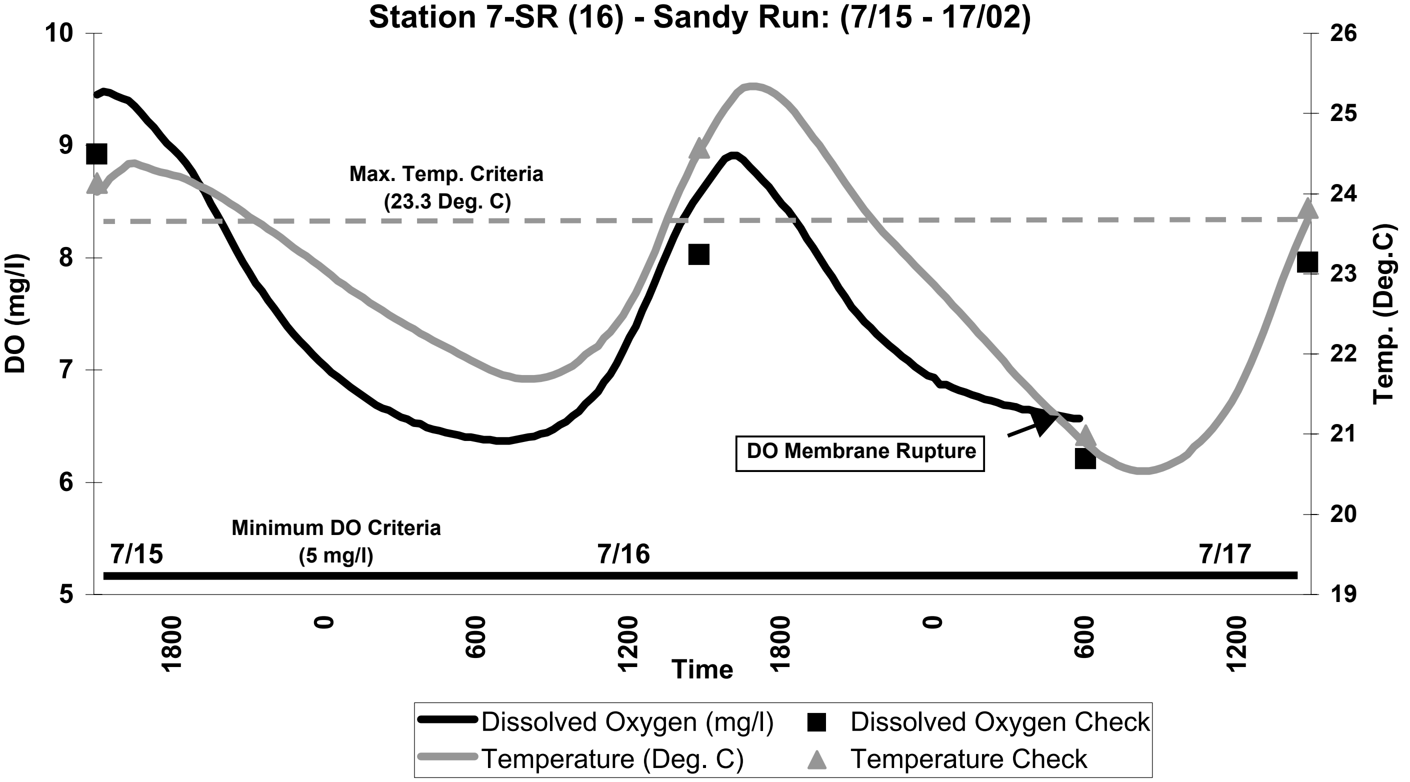
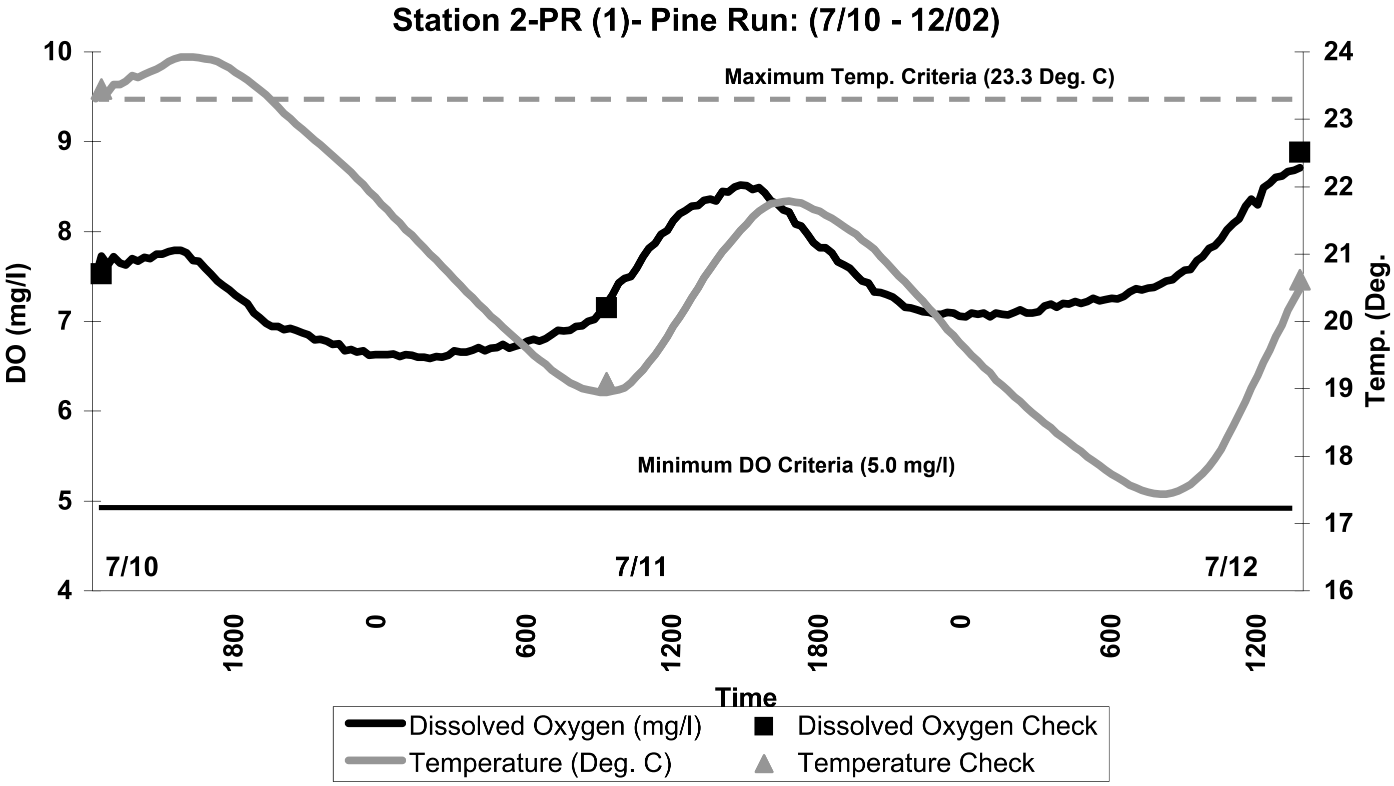


FIGURE 2. (cont.)
WATER CHEMISTRY TEMPERATURE & DO
DEP (EVERETT 2002)



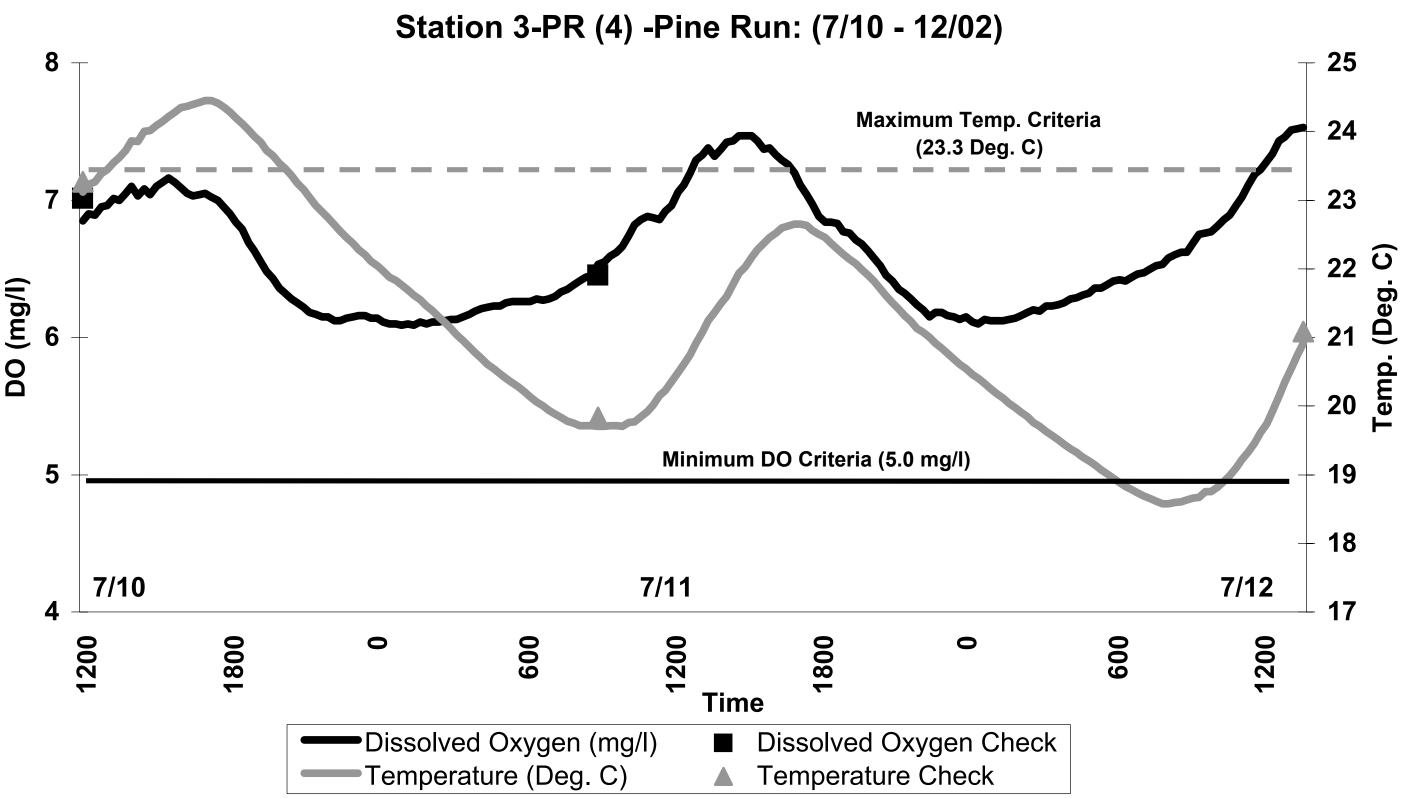


TABLE 1.
WISSAHICKON CREEK - WATER CHEMISTRY
DEP (Strekal, 1976)

September 21, 1976		Station				
		3-WC	5-WC	8-WC	10-WC	15-WC
Strekal station		1	2	3	4	5
Parameter	Units	Field				
Temp.	^oC	10.5	11	12	11.5	12.5
Diss. O_2	mg/l	7.9	5.8	8.6	10.4	6.2
Laboratory						
pH	std units	7.2	7.4	7.5	7.7	7.4
BOD-5 day	mg/l	4.4	8.9	1.9	1.7	3.9
Chemical Oxygen Demand	mg/l	21	36.8	25.8	22	32.7
Alkalinity	mg/l	89	145	133	87	170
NH_3-N	mg/l	0.05	2.17	0.18	0.08	0.98
NO_2-N	mg/l	0.01	0.765	0.045	0.012	0.558
NO_3-N	mg/l	0.64	11.2	3.45	1.35	3.99
PO_4	mg/l	0.49	12.4	20.1	5.49	13.4
SO_4-total	mg/l	54	196	141	55	71
Turbidity	JTU	7	13	4	7	7
Conductance	µmhos/cm	562	1248	1040	546	785
Total Coliform	col/100ml	5600	18000	7300	1300	14000
Fecal Coliform	col/100ml	230	900	120	200	1100

TABLE 2.
STATION LOCATIONS
WISSAHICKON CREEK, MONTGOMERY COUNTY

STATION	LOCATION
1-WC	Wissahickon Creek at Hancock Street, Upper Gwynedd Township, Montgomery County. Lat: 40.2278 Long: -75.2744 RMI: 22.90
2 WC	Wissahickon Creek at Wissahickon Avenue, Upper Gwynedd Township, Montgomery County. Lat: 40.2214 Long: -75.2818 RMI: 21.57
3-WC	Wissahickon Creek 0.3 km downstream of Summneytown Pike Upper Gwynedd Township Montgomery County. Lat: 40.2142 Long: -75.2917 RMI: 20.88
4-WC	Wissahickon Creek along Moyer Road upstream N. Wales STP, Upper Gwynedd Township, Montgomery County. Lat: 40.2137 Long: -75.2917 RMI: 20.30
5-WC	Wissahickon Creek at North Wales Road, Upper Gwynedd Township, Montgomery County. Lat: 40.1988 Long: -75.2892 RMI: 19.86
6-WC	Wissahickon Creek vicinity of Upper Gwynedd Twp STP, Upper Gwynedd Township, Montgomery County. Lat: 40.1904 Long: -75.2850 RMI: 19.00
7-WC	Wissahickon Creek at Swedesford Road, Upper Gwynedd Township, Montgomery County. Lat: 40.1866 Long: -75.2787 RMI: 17.84
8-WC	Wissahickon Creek at Plymouth Road, Upper Gwynedd Township, Montgomery County. Lat: 40.1867 Long: -75.2550 RMI: 16.91
9-WC	Wissahickon Creek at Blue Bell Pike, Whitpain Township, Montgomery County. Lat: 40.1691 Long: -75.2510 RMI: 15.75
10-WC	Wissahickon Creek at Mount Pleasant Avenue, Whitpain Township, Montgomery County. Lat: 40.1588 Long: -75.2328 RMI: 13.81

11 WC	Wissahickon Creek at Butler Pike Upper Dublin Township, Montgomery County. Lat: 40.1516 Long: -75.2281 RMI: 13.40
12-WC	Wissahickon Creek below Ambler Borough STP Discharge, Upper Dublin Township, Montgomery County. Lat: 40.1443 Long: -75.2207 RMI: 12.80
13-WC	Wissahickon Creek at Morris Road, Whitemarsh Township, Montgomery County. Lat: 40.1395 Long: -75.2167 RMI: 12.11
14-WC	Wissahickon Creek at Lafayette Road Whitemarsh Township, Montgomery County Lat: 40.1320 Long: -75.2222 RMI: 11.65
15-WC	Wissahickon Creek at Route 73, Whitemarsh Township, Montgomery County. Lat: 40.1240 Long: -75.2202 RMI: 10.78
1-PC	Prophecy Creek Whitpain Township, Montgomery County Lat: 40.1514 Long: -75.2295
1-SR	Sandy Run at Route 152 Upper Dublin Township, Montgomery County Lat: 40.1274 Long: -75.1664 RMI: 3.79
2-SR	Sandy Run at Twining Road Upper Dublin Township, Montgomery County Lat: 40.1270 Long: -75.1686 RMI: 3.77
3-SR	Sandy Run at Walnut Street Springfield Township, Montgomery County Lat: 40.1237 Long: -75.1968 RMI: 1.92
4-SR	Sandy Run at confluence with Pine Run Whitemarsh Township, Montgomery County Lat: 40.1315 Long: -75.2040 RMI: 1.20
5-SR	Sandy Run 1.5 km upstream of mouth, Whitemarsh Township, Montgomery County. Lat: 40.1331 Long: -75.2070 RMI: 1.0

6-SR	Sandy Run at Bethlehem Pike Whitemarsh Township, Montgomery County. Lat: 40.1336 Long: -75.2140 RMI: 0.58
7-SR	Sandy Run at Mouth Whitemarsh Township, Montgomery County. Lat: 40.1296 Long: -75.2202 RMI: 0.00
1-PR	Pine Run at Susquehanna Road Upper Dublin Township, Montgomery County Lat: 40.1420 Long: -75.1686 RMI: 2.13
2-PR	Pine Run upstream Upper Dublin STP Upper Dublin Township, Montgomery County Lat: 40.1353 Long: -75.1879 RMI: 0.77
3-PR	Pine Run at Mouth Whitemarsh Township, Montgomery County Lat: 40.1315 Long: -75.2040 RMI: 1.20

TABLE 3.
WISSAHICKON CREEK - WATER CHEMISTRY
DEP (Boyer; 1989, 1995, 1997)

	Station	1-WC	2-WC	3-WC		4-WC	5-WC			7-WC	8-WC	
	Boyer (1989) station		1			2	3				4	
	Boyer (1995) station			1				2		3		
	Boyer (1997) station	1			2				3			4
	Date	8-9/1996	8/1988	7/1995	8-9/1996	8/1988	8/1988	7/1995	8-9/1996	7/1995	8/1988	8-9/1996
Parameter	Units	Field										
Temp.	^oC	25.2	24.7	21.6	25.6	22.7	22.0	22	21.5	25.7	26.6	21.7
Diss. O_2	mg/l	7.6	4.9	8.3	7.9	11.4	8.5	10.2	8.5	11.8	11.3	9.2
pH	std units	7.83	7.63	7.04	7.63	7.43	7.51	7.72	7.44	8.11	8.51	7.85
Conductance	µmhos/cm	1700	780	240	280	422	488	450	400	1450	850	900
		Laboratory										
Conductance	µmhos/cm	-	748	-	-	478	597	-	-	-	869	-
pH	std units	-	7.8	-	-	7.9	7.8	-	-	-	8.3	-
Color	PT/C	-	<5.0	-	-	<5.0	<5.0	-	-	-	<5.0	-
BOD-5 day	mg/l	1.5	2	1.8	1.2	1	4	1.2	1.2	1.5	0.9	0.6
Chemical Oxygen Demand	mg/l	13	-	10	15	-	-	12	10	28	-	15
Alkalinity	mg/l	76	122	52	66	136	166	70	84	240	104	94
Residue-total	mg/l	1184	-	186	218	-	-	462	330	1006	-	672
Diss. Solids	mg/l	1182	522	172	218	398	442	458	330	990	670	668
Susp. Solids	mg/l	<2	2.0	14	<2	<2.0	10.0	4	<2	16	<2.0	4
Settleable Solids	ml/l	<.2	-	<.2	<.2	-	-	<.2	<.2	<.2	-	<.2
NH_3-N	mg/l	<.02	0.06	0.12	<.02	0.06	0.08	<.02	<.02	0.06	0.06	<.02
NO_2-N	mg/l	0.01	0.004	0.03	0.018	0.006	0.288	0.02	0.014	0.034	0.02	0.022
NO_3-N	mg/l	1.53	<.04	1.03	0.71	0.97	16.1	8.03	4.21	3.93	12.6	6.76
N-Kjeldahl	mg/l	0.96	-	0.91	0.39	-	-	0.89	0.47	1.99	-	1.32
P-total	mg/l	0.19	0.10	0.12	0.04	-	-	1.21	0.63	0.93	-	1.73
Carbon, organic-total	mg/l	4.3	-	7.2	5.7	-	-	5.7	5	0.98	-	5.9
Hardness-total	mg/l	198	180	57	79	180	170	120	112	158	190	159
Ca-total	mg/l	51.7	46	14	23	58	51	24	31.6	43.3	57	46.6
Mg-total	mg/l	17.4	20	4.7	7.12	17	16	9.08	11.1	15.5	19	18.2
Cl	mg/l	476	64		29	64	92	-	55	-	128	108
SO_4-total	mg/l	33.8	251	21	23.3	72	75	52	40.1	398	196	184
Cadmium-total	µg/l	<.2	<0.2	<.2	0.42	<0.2	<0.2	<.2	<.2	0.3	0.26	0.4
Chromium-total	µg/l	4.2	9.2	<4	<4	<4.0	4.6	<4	<4	4.6	<4.0	<4
Cu-total	µg/l	23	<50	<10	<10	<50	<50	11	22	29	<50	47
Fe-total	µg/l	56	240	651	283	<100	400	154	78	275	<100	156
Pb-total	µg/l	2.1	<4.0	2.2	2.4	<4.0	<4.0	<1	2	4.8	4	5.4
Mn-total	µg/l	<10	80	85	13	<50	<50	14	11	83	<50	16
Ni-total	µg/l	<25	60	<25	<25	<50	<50	<25	<25	38	<50	<25
Zn-total	µg/l	<10	40	12	22	10	20	<10	13	107	60	65
Al-total	µg/l	330	<150	506	421	<150	850	<135	303	191	<150	236
Mercury-total	µg/l	<.2	-	<.2	<.2	-	-	<.2	<.2	<.2	-	<.2
Total Residual Chlorine	mg/l	-	0.1	-	-	0.08	0.02	-	-	-	0.07	-
Turbidity	NTU	<1	2.80	9.8	1.3	<1.0	6.4	1.3	<1	1	1.75	1.2
Total Coliform	col/100ml	5500	3000	19000	3800	2000	4000	11000	2500	6300	2000	5600
Fecal Coliform	col/100ml	3000	130	1700	580	170	190	500	240	1200	590	480
Total Fecal Strep	col/100ml	5800	780	1400	280	240	480	800	220	940	310	280

TABLE 3 (cont.)

WISSAHICKON CREEK - WATER CHEMISTRY

DEP (Boyer; 1989, 1995, 1997)

Station		9-WC	10-WC			13-WC				15-WC			6-SR		
Boyer (1989) station			5			6				8			7		
Boyer (1995) station		4					5							6	
Boyer (1997) station				5				6			8				7
Date		7/1995	8/1988	6/1996	8-9/1996	8/1988	7/1995	6/1996	8-9/1996	8/1988	6/1996	8-9/1996	8/1988	7/1995	6/1996
Parameter	Units	Field													
Temp.	^oC	23.6	27.9	23.7	22.4	25.5	24.1	20.5	22.5	26.7	20.6	20	26.1	23.6	19.8
Diss. O_2	mg/l	11.8	11.0	10.2	10	9.1	8.4	8.2	11.9	8.5	7.6	8	8.4	7	7.6
pH	std units	8.41	8.74	8	8.11	8.06	7.99	7.64	8.08	8.18	7.55	7.69	8.05	7.54	7.5
Conductance	µmhos/cm	1000	1050	600	620	790	465	400	700	700	440	-	580	700	340
		Laboratory													
Conductance	µmhos/cm	-	855	-	-	757	-	-	-	627	-	-	529	-	-
pH	std units	-	8.7	-	-	7.9	-	-	-	7.9	-	-	7.9	-	-
Color	PT/C	-	<5.0	-	-	5	-	-	-	<5.0	-	-	<5.0	-	-
BOD-5 day	mg/l	0.9	1.6	3.7	0.78	3.6	1.5	7.1	0.87	2.0	4.7	1.2	1.2	1.2	4.2
Chemical Oxygen Demand	mg/l	20	-	19	13	-	38	26	18	-	26	20	-	18	24
Alkalinity	mg/l	158	118	102	96	116	100	78	94	120	74	82	136	112	80
Residue-total	mg/l	650	-	638	430	-	626	356	490	-	374	374	-	660	336
Diss. Solids	mg/l	642	622	622	430	578	606	340	488	486	352	356	464	660	300
Susp. Solids	mg/l	8	<2.0	16	<2	14.0	20	16	2	<2.0	22	18	<2.0	<2	36
Settleable Solids	ml/l	<.2	-	<.2	<.2	-	<.2	<.2	<.2	-	<.2	<.2	-	<.2	<.2
NH_3-N	mg/l	0.02	0.05	0.08	<.02	0.09	0.05	0.16	0.12	0.07	0.17	0.06	0.15	0.07	0.26
NO_2-N	mg/l	0.014	0.054	0.046	0.014	0.028	0.014	0.048	0.038	0.060	0.062	0.028	0.088	0.058	0.076
NO_3-N	mg/l	1.6	3.67	4.83	4.35	9.57	8.04	4.7	8.19	6.30	2.98	5.29	5.91	11.4	2.96
N-Kjeldahl	mg/l	1.23	-	1.14	0.59	-	1.95	1.58	1.12	-	0.89	0.81	-	1.35	1.02
P-total	mg/l	1.08	-	0.76	0.67	3.52	3.41	1.06	1.77	2.64	0.74	1.16	3.19	2.54	0.53
Carbon, organic-total	mg/l	7.2	-	5.8	4.5	-	8	8.3	6.1	-	7.7	6.8	-	6.5	7.1
Hardness-total	mg/l	137	182	168.9	147	195	162	109.5	130	179	103.9	111	161	186	100.4
Ca-total	mg/l	38.9	56	41.6	41.6	61	50.1	32	52.9	52	26.4	37	45	42.1	25
Mg-total	mg/l	13.5	18	14.3	10.1	17	12.7	10.1	11.6	17	9.28	11.8	19	18.1	10.5
Cl	mg/l	-	103	107	72	116	-	74	90	85	57	57	71	-	43
SO_4-total	mg/l	190	235	147	87	129	70	74.6	62.9	103	56.2	41.2	54	48	22.5
Cadmium-total	µg/l	0.7	0.34	<.2	0.2	0.27	<.2	0.75	<.2	0.23	<.2	0.83	<0.2	<.2	<.2
Chromium-total	µg/l	<4	<4.0	5.8	<4	6.0	11.6	4.1	<4	<4.0	4.2	<4	<4.0	<4	<4
Cu-total	µg/l	28	<50	20	28	50.0	113	37	45	<50	28	27	<50	75	18
Fe-total	µg/l	157	<100	309	160	160	3020	1110	173	<100	1420	705	<100	315	1480
Pb-total	µg/l	3.1	<4.0	2.9	4.1	5	10.4	5.3	3.6	<4.0	6.9	3.2	<4.0	1.5	14.3
Mn-total	µg/l	58	<50	59	44	<50	269	85	18	<50	82	30	<50	39	80
Ni-total	µg/l	34	<50	<25	<25	<50	34	<25	<25	<50	<25	<25	<50	<25	<25
Zn-total	µg/l	74	50	58	27	40	74	62	19	20	48	40	30	41	43
Al-total	µg/l	<135	<150	<135	239	240	2520	975	240	<150	1300	721	<150	198	1280
Mercury-total	µg/l	<.2	-	<.2	<.2	-	<.2	<.2	0.213	-	<.2	<.2	-	<.2	<.2
Total Residual Chlorine	mg/l	-	0.04	-	-	0.1	-	-	-	0.12	-	-	0.02	-	-
Turbidity	NTU	<1	1.90	2.9	2.8	11.6	6.8	29	3.1	2.20	38	13.8	2.8	1.4	35
Total Coliform	col/100ml	5900	4000	2100	2300	5000	3500	43000	1600	35000	82000	41000	80000	3900	83000
Fecal Coliform	col/100ml	460	260	1000	880	2000	340	21000	120	6000	29000	15000	51000	1400	34000
Total Fecal Strep	col/100ml	540	140	300	140	160	550	29000	60	210	54000	29000	420	1700	34000

7
8-9/1996
22
7.2
7.49
-
-
-
-
1.8
15
80
310
294
16
<.2
0.09
0.034
3.84
0.59
0.66
6.5
105
29.1
12.7
39
23.6
0.25
<4
23
806
4.9
32
<25
27
733
<.2
-
18.7
120000
38000
24000

TABLE 4.
WISSAHICKON CREEK - TEMP - DO MONITORING
DEP (Boyer; 1997)

Station	Boyer (1997) Station	Time	DO (mg/l)	Temp (C)
August 23, 1996				
9-WC	W-1 Blue Bell Penlynn Pike Bridge	9:50	8.3	23.6
		12:45	10.5	24.8
14-WC	W-2 50' upstream of Lafayette Rd. Bridge	8:40	6.8	22.6
		12:25	9.2	23.6
14-WC	W-3 50' upstream of confl. w/ Sandy Run	12:15	9.2	23.6
7-SR	S-1 Sandy Run mouth	9:25	5.3	22.1
		12:10	7.5	23.2
15-WC	W-4 30' downstream with confl. w/ Sandy Run	9:10	6.5	22.4
		12:00	8.9	23.4
August 30, 1996				
5-WC	W-1 North Wales Road Bridge	7:37	6.4	18.1
		11:02	9.2	19.1
9-WC	W-2 Blue Bell Penlynn Pike Bridge	7:19	6.8	20.4
		11:14	10.1	21.8
13-WC	W-3 Morris Road Bridge	7:08	7.2	19.6
		11:25	8.9	21
7-SR	S-1 Sandy Run mouth	6:58	7.8	19.3
		11:33	8.2	20
15-WC	W-4 30' downstream with confl. w/ Sandy Run	6:51	6.7	19.7
		11:41	8.1	20.3

TABLE 5.
WISSAHICKON CREEK - WATER CHEMISTRY
DEP (Boyer; 1999)

July 16, 1999

Location	Time	DO (mg/l)	Temp (C)
5-WC	3:10 am	**1.65**	21.3
	4:51 am	**1.5**	21.0
	6:38 am	**1.95**	20.5
7-WC	3:26 am	**4.7**	24.5
	5:04 am	**4.4**	24.2
	6:50 am	5	24.0
8-WC	3:42 am	6.7	23.8
	5:19 am	6.3	23.3
	7:04 am	6.35	23.0
12-WC	3:57 am	6.3	22.0
	5:34 am	5.8	21.8
	7:21 am	6.08	21.5
13-WC	4:10 am	5.3	21.9
	5:46 am	**4.9**	21.5
	6:14 am	5.1	21.5
	7:32 am	5.03	21.5
15-WC	4:23 am	5.2	22.3
	6:01 am	**4.9**	22.0
	7:46 am	5.2	21.8

July 20, 1999

Location	Time	DO (mg/l)	Temp (C)
6-WC	3:10 am	**2.4**	24.8
- upstream	4:55 am	**2.6**	24.3
	6:15 am	**2.7**	23.9
6-WC	3:18 am	6.2	26.5
- downstream	5:02 am	6.0	26.5
	6:22 am	6.0	26.1
7-WC	3:30 am	**4.85**	26
	5:11 am	**4.85**	24.9
	6:46 am	**4.9**	25.5
12-WC	3:47 am	5.3	25.5
	5:28 am	5.0	25.3
	7:02 am	5.0	25
13-WC	4:02 am	**4.35**	24
	5:35 am	**4.3**	24
	7:16 am	**4.0**	24
	8:49 am	**4.7**	24
15-WC	4:14 am	**4.65**	25
	5:51 am	**4.7**	24.8
	7:30 am	**4.7**	24.5

July 23, 1999

Location	Time	DO (mg/l)	Temp (C)
6-WC	3:14 am	**3.6**	23.8
- upstream	5:06 am	**3.55**	23.5
	7:12 am	**3.9**	23.5
7-WC	3:23 am	**4.7**	26.0
	5:16 am	**4.5**	26.0
	7:21 am	5.1	25.9
8-WC	3:37 am	6.45	25.5
	5:31 am	6.2	25.3
	7:31 am	6.1	25.2
12-WC	3:54 am	5.7	24.8
	5:47 am	5.4	24.5
	7:46 am	5.6	24.3
13-WC	4:04 am	**4.85**	24.0
	6:00 am	**4.6**	24.0
	7:54 am	**4.7**	24.0
15-WC	4:17 am	5.25	24.0
	6:12 am	5.05	24.0
	8:09 am	5.2	23.9

* Bold values indicate concentrations below Chapter 93 criteria for July 1 - 31

July 21-22, 1999

Location	Time	DO (mg/l)	Temp (C)
1-SR	3:56 am	5.9	23.9
2-SR	1:12 pm	8.4	25.1
	1:19 pm	8.2	25.1
	2:41 pm	8.8	25.4
	3:52 pm	9.0	25.5
	4:05 am	5.15	23.8
	5:12 am	**4.8**	23.7
	5:20 am	**4.7**	23.7
	6:53 am	**4.7**	23.6
3-SR	1:43 pm	8.1	24.0
	2:58 pm	8.45	24.3
	4:09 pm	8.4	24.9
	4:19 am	6.05	22.5
	5:34 am	5.7	22.1
	7:08 am	5.7	22.0
4-SR	12:19 pm	9.6	24.8
	2:12 pm	9.85	24.2
	3:25 pm	9.7	24.0
	3:09 am	6.05	23.0
	4:48 am	6.1	23.0
	6:18 am	6	23.0
6-SR	1:56 pm	9.6	24.8
	3:10 pm	9.3	24.5
	3:13 pm	9.25	24.4
	4:30 am	5.95	23.2
	5:45 am	5.8	23.1
	7:21 am	5.85	23.0
15-WC	5.56 am	**4.75**	23.2
	7:30 am	**4.9**	23.1
2-PR	12:38 pm	6	23.1
	2:22 pm	6.7	23.9
	3:36 pm	6.95	24.0
	3:22 am	5.3	23.0
	4:58 am	5.1	22.7
	6:30 am	5	22.7
3-PR	12:18 pm	6.45	24.1
	2:09 pm	7.1	24.9
	3:23 pm	7.0	25.0
	3:06 am	5.55	23.0
	4:44 am	5.6	23.0
	6:15 am	5.5	22.9

July 27, 1999

Location	Time	DO (mg/l)	Temp (C)
1-SR	3:49 am	5.15	24.0
	7:05 am	**4.9**	23.2
	8:50 am	**4.9**	23.5
2-SR	3:58 am	**4.0**	23.9
	5:40 am	**3.1**	23.3
	7:15 am	**2.7**	23.0
	7:32 am	**3.5**	23.0
	8:40 am	6.8	23.9
	8:58 am	7.1	24.0
3-SR	4:13 am	5.6	22.5
	5:52 am	5.6	22.0
	7:54 am	5.5	21.5
4-SR	3:09 am	5.8	23.9
	5:06 am	5.9	23.2
	6:25 am	5.8	23.0
6-SR	4:24 am	5.75	23.8
	6:13 am	5.75	23.2
	8:11 am	5.8	23.2
15-WC	4:40 am	**4.6**	24.0
	6:02 am	**4.6**	23.5
	8:20 am	5.05	23.3
1-PR	3:38 am	6.25	22.0
	5:31 am	6.5	21.2
	6:48 am	6.5	21.1
2-PR	3:22 am	5.1	24.1
	5:19 am	**4.85**	23.8
	6:34 am	**4.7**	23.3
3-PR	3:07 am	5.5	23.5
	5:05 am	5.5	23.0
	6:22 am	5.5	22.9

TABLE 6.
SEMI-QUANTITATIVE BENTHIC MACROINVERTEBRATE DATA
Wissahickon Creek, Montgomery County
August 22-23, 2005

Station #		9-WC	13-WC	15-WC
MAYFLIES				
Baetidae	***Baetis***	13	15	12
CADDISFLIES				
Hydropsychidae	***Cheumatopsyche***	25	90	61
	Hydropsyche	17	20	50
Hydroptilidae	***Hydroptila***	1	-	-
	Leucotrichia	3	-	-
Philopotamidae	***Chimarra***	31	-	-
TRUE FLIES				
Chironomidae		13	32	45
Empididae	***Hemerodromia***	-	-	1
MISC. INSECT TAXA				
Elmidae	***Stenelmis***	62	16	21
Odonata		-	1	-
Zygoptera	***Argia***	2	-	-
Nymphulinae	***Petrophila***	-	1	2
NON-INSECT TAXA				
Isopoda	***Gammarus***	4	2	1
Sphaeridae		5	-	-
Planariidae		32	10	12
Oligochaeta		2	18	1
Nemertea		4	-	-
Hirudinea		-	7	1
	Total Taxa	14	11	11
	% Dominant	29	42.5	29.5
	Modified EPT	1	0	0
	Modified % Mayflies	0	0	0
	Hilsenhoff	5.8	6.3	5.8

TABLE 7.
BENTHIC MACROINVERTEBRATE DATA
Wissahickon Creek, Montgomery County
(Strekal 1974, 1976)

	Station #	1-PC	11-WC	5-WC	8-WC	10-WC	15-WC
	Strekal (1976) Station	Prophecy	Wissahickon	2	3	4	5
	Date	6/5-17/1974		12/29/1975			
MAYFLIES							
Baetidae	***Callibaetis***	-	-	C	C	-	-
	Baetis	C	C	-	C	R	-
	Cleon	-	-	-	-	-	R
Baetiscidae	***Caenis***	-	-	-	R	R	-
Heptageniidae	***Stenonema***	C	-	-	-	-	-
CADDISFLIES							
Hydroptilidae	***Hydroptila***	-	-	-	C	C	-
Hydropsychidae	***Cheumatopsyche***	R	R	-	C	A	-
	Hydropsyche	A	R	-	C	A	-
Philopotamidae	***Chimarra***	-	-	-	R	C	-
TRUE FLIES							
Chironomidae		C	C	-	-	-	-
Empididae	***Hemerodromia***	-	C	-	-	-	-
Simuliidae		C	R	-	-	-	-
Tipulidae	***Antocha***	R	-	-	-	-	-
	Tipula	R	-	-	-	-	-
MISC. INSECT TAXA							
Dytiscidae	***Dytiscus***	-	-	R	-	-	-
Elmidae	***Stenelmis***	C	-	-	R	C	-
Hydrophilidae	***Berosus***	-	-	C	R	R	-
Psephenidae	***Ectopria***	-	-	-	C	C	-
	Psephenus	-	-	-	C	C	-
Aeschnidae	***Boyeria***	R	-	-	-	-	-
Coenagrionidae	***Argia***	-	-	R	-	-	-
	Ischnura	-	-	-	-	-	R
Corydalidae	***Chauliodes***	R	-	-	-	-	-
Lepidoptera		-	R	-	-	-	-
NON-INSECT TAXA							
Asellidae	***Asellus***	R	C	-	A	C	A
Cambaridae	***Cambarus***	C	C	-	-	-	-
Gammaridae	***Gammarus***	R	-	-	-	-	-
Hirudinea		-	R	-	C	A	A
Planariidea	***Dugesia***	R	R	-	-	-	-
Physidae	***Physa***	R	A	-	-	-	-
Oligochaeta		R	R	R	R	R	R
	Total Taxa	17	13	5	14	13	5

TABLE 8.
BENTHIC MACROINVERTEBRATE DATA
Wissahickon Creek, Montgomery County
(Boyer 1989, 1997)

	Station	1-WC	2-WC	3-WC	4-WC	5-WC		8-WC		10-WC		13-WC		15-WC		6-SR	
	Boyer (1989) station		1		2	3		4		5		6		8		7	
	Boyer (1997) station	1		2			3		4		5		6		8		7
	Date	8-9/1996	8-10/1988	8-9/1996	8-10/1988	8-10/1988	8-9/1996	8-10/1988	8-9/1996	8-10/1988	8-9/1996	8-10/1988	8-9/1996	8-10/1988	8-9/1996	8-10/1988	8-9/1996
<u>MAYFLIES</u>																	
Baetidae	***Baetis***	**-**	**X**	**-**	**-**	**X**	**P**	**X**	**C**	**X**	**A**	**X**	**C**	**X**	**P**	**X**	**P**
Caenidae	***Caenis***	**-**	**-**	**-**	**X**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Tricorythidae	***Tricorythodes***	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**X**	**P**	**X**	**C**	**-**	**-**	**-**	**-**
<u>CADDISFLIES</u>																	
Hydroptilidae	***Hydroptila***	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**P**	**-**	**P**	**-**	**-**	**X**	**-**	**-**	**-**
	Leucotrichia	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**P**	**-**	**P**	**-**	**-**	**-**	**-**
Hydropsychidae	***Cheumatopsyche***	**C**	**X**	**-**	**-**	**-**	**A**	**-**	**A**	**X**	**A**	**X**	**A**	**X**	**A**	**X**	**A**
	Hydropsyche	**-**	**X**	**-**	**-**	**X**	**C**	**X**	**A**	**X**	**A**	**X**	**C**	**X**	**C**	**X**	**C**
Philopotamidae	***Chimarra***	**P**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**X**	**-**	**-**	**-**	**-**	**-**		**-**
<u>TRUE FLIES</u>																	
Chironomidae		**-**	**-**	**-**	**-**	**-**	**P**	**X**	**P**	**-**	**P**	**-**	**-**	**-**	**-**	**-**	**-**
	Cryptochironomus	**-**	**-**	**-**	**-**	**X**	**-**	**-**	**-**	**-**	**-**	**-**	**P**	**-**	**-**	**-**	**P**
	Dicrotendipes	**-**	**-**	**-**	**-**	**X**	**P**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Endochironomus	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**P**	**-**	**-**
	Polypedilum	**P**	**X**	**-**	**-**	**X**	**P**	**X**	**-**	**X**	**P**	**X**	**C**	**X**	**A**	**X**	**A**
	Pseudochironomus	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**P**	**-**	**-**	**-**	**-**	**-**	**-**
Diamesinae	***Diamesa***	**-**	**-**	**-**	**-**	**-**	**P**	**-**	**P**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	Potthastia	**-**	**-**	**-**	**-**	**-**	**P**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Orthocladiinae	***Brillia***	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**P**
	Cardiocladius	**-**	**-**	**-**	**-**	**-**	**P**	**X**	**-**	**-**	**-**	**-**	**-**	**-**	**P**	**X**	**-**
	Cricotopus	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**P**	**-**	**P**	**-**	**C**	**-**	**P**	**-**	**P**
	Eukiefferiella	**-**	**X**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	
	Orthocladius	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**X**	**-**	**-**	
Tanypodinae	***Pentaneura***	**P**	**-**	**-**	**-**	**-**	**-**	**-**	**P**	**-**	**P**	**X**	**C**	**X**	**C**	**-**	**C**
Empididae	***Hemerodromia***	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**P**	**X**	**P**	**-**	**P**	**-**	**P**
Simuliidae	***Simulium***	**-**	**X**	**-**	**-**	**X**	**P**	**X**	**-**	**X**	**P**	**X**	**P**	**X**	**P**	**-**	**P**
Tabanidae	***Tabanus***	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**X**	
Tipulidae	***Antocha***	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**P**	**-**	**-**
	Tipula	**-**	**X**	**-**	**-**	**X**	**P**	**-**	**-**	**X**	**P**	**-**	**-**	**-**	**-**	**-**	**P**

TABLE 8. (CONT.)

	Station	1-WC	2-WC	3-WC	4-WC	5-WC		8-WC		10-WC		13-WC		15-WC		6-SR	
	Boyer (1989) station		1		2	3		4		5		6		8		7	
	Boyer (1997) station	1		2			3		4		5		6		8		7
	Date	8-9/1996	8-10/1988	8-9/1996	8-10/1988	8-10/1988	8-9/1996	8-10/1988	8-9/1996	8-10/1988	8-9/1996	8-10/1988	8-9/1996	8-10/1988	8-9/1996	8-10/1988	8-9/1996
MISC. INSECT TAXA																	
Arrenuridae	***Hydrachnidia***	-	-	-	-	-	**P**	-	-	-	**P**	-	-	-	-	-	-
Sialidae	***Sialis***	**P**	-	-	-	-	-	**X**	-	**X**	**P**	-	-	-	**P**	-	-
Dytiscidae	***Laccophilus***	-	**X**	**P**	**X**	-	-	-	-	-	-	-	-	-	-	-	-
Elmidae	***Ancyronyx***	-	-	-	-	-	-	-	-	-	-	-	-	-	**P**	-	-
	Optioservus	-	-	-	-	**X**	-	-	-	-	**P**	-	-	-	-	-	-
	Stenelmis	**P**	**X**	-	-	**X**	**P**	**X**	**A**	**X**	**A**	**X**	**A**	**X**	**A**	**X**	**A**
	Oulimnius	-	-	-	-	-	-	-	-	-	-	-	-	**X**	-	-	-
Haliplidae	***Haliplus***	-	-	**P**	-	-	-	-	-	-	-	-	-	-	-	-	-
	Peltodytes	-	-	-	**X**	-	-	-	-	-	-	-	-	-	-	-	-
Hydrophilidae	***Berosus***	-	**X**	-	**X**	**X**	**P**	-	**P**	**X**	-	-	-	-	-	-	-
	Helochares	-	**X**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hydrochara	-	-	-	-	**X**	-	-	-	**X**	-	**X**	-	-	-	-	-
	Tropisternus	-	**X**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Corixidae	***Cenocorixa***	-	-	**P**	-	-	-	-	-	**X**	-	-	-	-	-	-	-
Psephenidae	***Ectopria***	-	-	-	-	**X**	**P**	**X**	**P**	**X**	**P**	-	-	-	-	**X**	-
	Psephenus	-	-	-	**X**	-	-	**X**	**C**	**X**	**A**	**X**	**P**	-	**P**	**X**	-
Coenagrionidae	***Argia***	-	-	-	-	**X**	**P**	**X**	**P**	**X**	**P**	-	-	-	-	-	-
	Coenagrion	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Corydalidae	***Corydalus***	-	-	-	-	-	-	**X**	**P**	-	**C**	-	**P**	**X**	**P**	-	-
	Nigronia	-	-	-	-	-	-	-	-	-	-	**X**	-	**X**	**P**	-	-
Lestidae	***Archilestes***	-	**X**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lepidoptera		-	**X**	-	-	-	-	-	-	**X**	-	-	-	-	-	-	-
NON-INSECT TAXA																	
Cambaridae	***Orconectes***	**P**	-	-	**X**	-	**P**	-	-	-	-	-	-	**X**	**P**	-	**P**
Crangonyctidae	***Crangonyx***	**P**	-	-	-	-	**C**	-	-	-	**P**	-	-	-	-	-	-
Gammaridae	***Gammarus***	-	-	-	**X**	-	-	-	-	-	-	-	-	-	**P**	-	-
Asellidae	***Asellus***	**C**	**X**	-	**X**	**X**	**C**	**X**	**P**	**X**	**P**	-	-	**X**	**P**	**X**	**P**
	Lirceus	**P**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Planariidea	***Dugesia***	-	-	-	**X**	**X**	**P**	-	**P**	-	**P**	-	-	-	-	-	-
	Planaria	-	-	-	-	-	-	-	-	-	-	-	-	-	**P**	-	**P**
Hirudinea		-	**X**	-	-	**X**	-	**X**	-	**X**	-	-	-	**X**	-	**X**	-
Glossiphoniidae	***Placobdella***	**P**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Erpobdellidae	***Erpobdella***	**P**	-	-	-	-	**P**	-	**P**	-	-	-	**P**	-	**P**	-	**P**
Ancylidae	***Ferrissia***	-	-	-	-	-	**P**	-	-	-	**P**	-	-	-	**P**	-	-
Lymnaeidae	***Stagnicola***	-	-	**P**	-	-	**C**	-	-	-	-	-	-	-	-	-	-
Physidae	***Physa***	-	**X**	-	-	-	-	**X**	-	**X**	-	**X**	-	-	-	**X**	-
	Physella	**P**	-	**P**	-	-	**C**	-	-	-	-	-	-	-	-	-	-
Planorbidae	***Planorbella***	-	-	-	-	-	**C**	**X**	**P**	-	-	-	**P**	-	-	-	-
	Planorbula	**P**	-	**P**	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyraulus	-	-	-	-	-	-	-	-	-	-	-	-	-	**P**	-	-
Sphaeriidae	***Pisidium***	-	-	-	-	-	**P**	-	-	-	-	-	-	-	-	-	-
Oligochaeta		-	-	-	-	-	-	**X**	-	-	-	-	-	-	-	-	-
Lumbriculidae		**P**	-	**P**	-	-	**P**	-	**P**	-	**P**	-	**P**	-	**P**	-	**P**
	Total Taxa	15	16	7	9	17	27	17	19	21	27	13	17	15	25	12	17

A - Abundant >100
C - Common 25-100
P - Present <25

TABLE 9.
HABITAT ASSESSMENT SUMMARY
Wissahickon Creek, Montgomery County

HABITAT PARAMETER	scoring range	August 22-23, 2005		
		9-WC	15-WC	13-WC
1. instream cover	0 - 20	14	16	16
2. epifaunal substrate	0 - 20	11	13	13
3. embeddedness	0 - 20	12	14	11
4. velocity/depth	0 - 20	14	16	16
5. channel alterations	0 - 20	18	16	18
6. sediment deposition	0 - 20	16	13	12
7. riffle frequency	0 - 20	14	11	16
8. channel flow status	0 - 20	14	15	15
9. bank condition	0 - 20	16	15	15
10. bank vegetation protection	0 - 20	16	16	17
11. grazing/disruptive pressures	0 - 20	16	17	17
12. riparian vegetation zone width	0 - 20	16	17	14
Total Score	0 - 240	177	179	180
Rating		Suboptimal	Suboptimal	Suboptimal

TABLE 10.
FISH - Species Occurrence
Wissahickon Creek, Montgomery County
DEP (Boyer 1989)

		2-WC	3-WC	4-WC	5-WC		8-WC		10-WC		13-WC		15-WC	
	Boyer (1989) station	1		2	3		4		5		6		8	
	Boyer (1997) station		2			3		4		5		6		8
	Date	8, 11/1988	8-9/1996	8, 11/1988	8, 11/1988	8-9/1996	8, 11/1988	8-9/1996	8, 11/1988	8-9/1996	8, 11/1988	8-9/1996	8, 11/1988	8-9/1996
Common name	Scientific name													
American eel	*Anguilla rostrata*	**-**	**-**	**-**	**R**	**-**	**R**	**P**	**P**	**P**	**-**	**R**	**P**	**P**
Carp	*Cyprinus carpio*	**-**	-	**-**	**-**	**-**	**-**	**-**	**R**	**-**	**-**	**-**	**-**	**-**
Golden shiner	*Notemigonus crysoleucas*	**P**	**P**	**P**	**-**	**P**	**-**	-	**-**	**-**	**-**	-	**-**	-
Satinfin shiner	*Cyprinella analostana*	**-**	**-**	**-**	**-**	**-**	**-**	**P**	**-**	**-**	**-**	**P**	**-**	**P**
Common shiner	*Luxilus cornutus*	**-**	**P**	**-**	**-**	**P**	**C**	**A**	**C**	**C**	**P**	**C**	**A**	**P**
Spotfin shiner	*Notropis spilopterus*	**-**	**-**	**-**	**-**	**-**	**-**	-	**-**	**-**	**P**	-	**C**	-
Spottail shiner	*N. hudsonius*	**-**	**-**	**-**	**-**	**-**	**-**	**P**	**-**	**-**	**-**	**-**	**-**	**P**
Swallowtail shiner	*N. procne*	**-**	**-**	**-**	**-**	**-**	**-**	**P**	**P**	**-**	**R**	**R**	**P**	**P**
Fathead minnow	*Pimephales promelas*	**-**	**A**	**-**	**-**	**P**	**-**	-	**-**	**-**	**-**	-	**-**	**P**
Blacknose dace	*Rhinichthys atratulus*	**-**	**-**	**-**	**P**	**A**	**-**	**A**	**A**	**A**	**C**	**A**	**C**	**P**
Longnose dace	*R. cataractae*	**-**	**-**	**-**	**-**	**-**	**-**	**C**	**C**	**A**	**C**	**A**	**C**	**C**
White sucker	*Catostomus commersoni*	**P**	**C**	**C**	**-**	**P**	**-**	**C**	**P**	**A**	**P**	**P**	**-**	**A**
Yellow bullhead	*Ameiurus natalis*	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**R**	**-**	**-**	**-**	**-**
Brown bullhead	*A. nebulosus*	**-**	**-**	**-**	**R**	**-**	**-**	-	**R**	**-**	**-**	**-**	**-**	**-**
Banded killifish	*Fundulus diaphanus*	**C**	**A**	**C**	**A**	**A**	**C**	**P**	**-**	**P**	**-**	**P**	**-**	**P**
Mummichog	*F. heteroclitus*	**-**	**-**	**P**	**R**	**P**	**R**	**-**	**-**	**-**	**-**	**-**	**-**	-
Rock bass	*Ambloplites rupestris*	**-**	**-**	**-**	**-**	**-**	**-**	-	**-**	**-**	**-**	**-**	**-**	**-**
Redbreast sunfish	*Lepomis auritus*	**-**	**P**	**-**	**C**	**C**	**C**	**P**	**C**	**P**	**P**	**P**	**P**	**P**
Green sunfish	*L. cyanellus*	**P**	**-**	**P**	**-**	**P**	**-**	-	**-**	**-**	**-**	**-**	**R**	**R**
Pumpkinseed	*L. gibbosus*	**P**	**P**	**-**	**R**	**-**	**P**	**P**	**P**	**-**	**-**	-	**-**	-
Bluegill	*L. macrochirus*	**-**	**-**	**-**	**-**	**-**	**R**	**-**	**-**	**R**	**P**	**-**	**-**	**-**
Largemouth bass	*Micropterus salmoides*	**-**	**-**	**-**	**-**	**-**	**R**	-	**R**	**-**	**-**	**-**	**-**	**R**
Tessellated darter	*Etheostoma olmstedi*	**-**	**-**	**-**	**-**	**P**	**-**	**P**	**-**	**C**	**R**	**C**	**-**	**P**
	Total Species:	5	7	5	7	12	8	10	11	10	9	10	8	14

A-Abundant (>500); C-Common (25-49); P-Present (3-24); R-Rare (1-2)

TABLE 11.
FIESH - Species Occurrence

PFBC and PWD

Station		7-WC		10-WC		13-WC	15-WC			5-SR
	*	W 15	1850	W 13	1475	1210	0202	W 10	1075	W 11
Common name	Scientific name	7/2001	6/2005	7/2001	6/2005	6/2005	6/1992	7/2001	6/2005	7/2001
Brown trout	*Salmo trutta*	**-**	**-**	**-**	**-**	**2**	**P**	**8**	**7**	**-**
Rainbow trout	*Oncorhynchus mykiss*	**-**	**-**	**-**	**-**	**3**	**R**	**-**	**1**	**-**
American eel	*Anguilla rostrata*	**3**	**X**	**6**	**X**	**-**	**P**	**-**	**-**	**1**
Common carp	*Cyprinus carpio*	**-**	**-**	**-**	**-**	**-**	**P**	**-**	**X**	**3**
Golden shiner	*Notemigonus crysoleucas*	**1**	**X**	**-**	**-**	**X**	**-**	**-**	**-**	**-**
Satinfin shiner	*Cyprinella analostana*	**-**	**-**	**32**	**X**	**X**	**C**	**103**	**X**	**114**
Common shiner	*Luxilus cornutus*	**332**	**X**	**116**	**-**	**X**	**C**	**149**	**X**	**34**
Spotfin shiner	*Cyprinella spiloptera*	**-**	**-**	**-**	**-**	**X**	**-**	**9**	**X**	**2**
Spottail shiner	*Notropis hudsonius*	**2**	**-**	**17**	**-**	**X**	**C**	**23**	**X**	**21**
Swallowtail shiner	*N. procne*	**-**	**-**	**-**	**-**	**X**	**-**	**34**	**X**	**13**
Fathead minnow	*Pimephales promelas*	**2**	**X**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
Blacknose dace	*Rhinichthys atratulus*	**265**	**X**	**48**	**X**	**X**	**-**	**40**	**X**	**6**
Longnose dace	*R. cataractae*	**-**	**-**	**57**	**X**	**X**	**C**	**230**	**X**	**52**
Banded killifish	*Fundulus diaphanus*	**64**	**X**	**31**	**X**	**X**	**A**	**22**	**-**	**7**
Mummichog	*F. heteroclitus*	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
Goldfish	*Carassius auratus*	**-**	**X**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Creek chub	*Semotilus atromaculatus*	**-**	**-**	**10**	**-**	**X**	**-**	**20**	**-**	**14**
White sucker	*Catostomus commersoni*	**33**	**X**	**128**	**X**	**X**	**R**	**160**	**X**	**69**
Yellow bullhead	*Ameiurus natalis*	**-**	**-**	**-**	**X**	**X**	**-**	**9**	**X**	**1**
Brown bullhead	*A. nebulosus*	**-**	**X**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Smallmouth bass	*Micropterus dolomieu*	**-**	**-**	**12**	**X**	**X**	**-**	**-**	**X**	**-**
Largemouth bass	*M. salmoides*	**-**	**-**	**1**	**-**	**X**	**-**	**8**	**-**	**-**
Rock bass	*Ambloplites rupestris*	**-**	**-**	**1**	**-**	**X**	**R**	**2**	**-**	**1**
Redbreast sunfish	*Lepomis auritus*	**150**	**X**	**205**	**X**	**X**	**P**	**38**	**X**	**9**
Green sunfish	*L. cyanellus*	**5**	**X**	**11**	**X**	**X**	**R**	**8**	**X**	**3**
Pumpkinseed	*L. gibbosus*	**3**	**-**	**11**	**X**	**X**	**P**	**26**	**X**	**2**
Bluegill	*L. macrochirus*	**-**	**-**	**-**	**-**	**X**	**-**	**21**	**-**	**13**
Tessellated darter	*Etheostoma olmstedi*	**15**	**X**	**89**	**-**	**X**	**-**	**26**	**X**	**3**
	Total Species:	12	12	16	11	22	14	20	17	20

A = abundant (>100); C = Common (26 - 100); P = Present (3 - 25); R = Rare (<3)

* Stations W 10, 11, 13, and 15 and 1075, 1210, 1475, and 1850 were sampled by Philadelphia Water Department
* Station 0202 was sampled by PFBC