CRUM CREEK
CHESTER AND DELAWARE COUNTIES

WATER QUALITY STANDARDS REVIEW
STREAM REDESIGNATION EVALUATION REPORT

SEGMENT: BASIN, FROM SOURCE TO SPRINGTON RESERVOIR

DRAINAGE LIST: G

STREAM CODE: 00692

WATER QUALITY MONITORING AND ASSESSMENT SECTION (DSB)

DIVISION OF WATER QUALITY ASSESSMENT AND STANDARDS

BUREAU OF WATER SUPPLY AND WASTEWATER MANAGEMENT

DEPARTMENT OF ENVIRONMENTAL PROTECTION

JANUARY 2001

REVISED OCTOBER 2002

GENERAL WATERSHED DESCRIPTION

Crum Creek flows through Chester and Delaware Counties and is a tributary to the Delaware River (Figure 1). Only the portion of the basin upstream of the Springton (Geist) Reservoir was the subject of this evaluation. This candidate basin covers an area of 11.6 square miles and contains 35.5 stream miles. It is located in Easttown and Willistown Townships and Malvern Borough in Chester County and Edgemont and Newtown Townships in Delaware County. The Crum Creek basin currently has the protected water use designation of High Quality-Cold Water Fishes (HQ-CWF) from the source to the junction of the Newtown, Edgemont, and Willistown Township borders and Cold Water Fishes (CWF) from there to the Springton Reservoir. As a result of a petition submitted by the Willistown Conservation Trust, the candidate basin was evaluated for redesignation as Exceptional Value Waters (EV). This report is based on field surveys conducted in May and December of 2000.

Land use in the candidate basin is mostly a mixture of low density residential and pasture with a limited amount of second growth hardwood forest. The northern portion of the basin contains the boroughs of Green Tree and Malvern. State Route 3 traverses the lower portion of the watershed.

WATER QUALITY AND USES

Surface Water:
No long-term water quality data were available to allow a direct comparison to water quality criteria. Grab samples were collected at 6 stations in the Crum Creek basin during the December 2000 survey (Tables 1 & 2). These samples indicated that water quality was generally good; however, the instantaneous nature of grab samples precludes a direct comparison to applicable water quality criteria. The indigenous aquatic community is a better indicator of long-term conditions than one-time grab samples and is used as a measure of ecological significance.

There are no surface water withdrawals for public water supply in the candidate basin. Four NPDES permitted discharges are located in this watershed (#'s: PA00 – 51667, 51659, 55051, and 55034). These are all single-family residences with permitted discharges under 400 gallons/day (gpd). In addition a permit has been issued to Joyfor Joint Venture (PA0057924) for a discharge into Unnamed Tributary 00716 (Figure 1) with a permitted flow of 50,000 gpd. This facility had not been constructed at the time the field survey was conducted and this report was written.

Aquatic Biota:
Habitat assessment and biological sampling was conducted at 6 locations during the May 2000 survey. An evaluation of physical habitat assessments revealed that Station 2CC and reference Station R2 scored in the Optimal category while the rest of the stations received Suboptimal habitat scores for benthic macroinvertebrates and fish (Table 3). Habitat scores ranged from 167 to 198 for the Crum Creek stations. Low scoring parameters included lack of an adequate riparian zone, vegetative cover and disruptive pressure on the banks, and limited velocity/depth

regimes. Station R2 scored somewhat higher than Station R1 mainly because of better bank and riparian zone conditions.

Benthic macroinvertebrate samples were collected at 6 stations (Table 4) using sampling techniques adapted from the EPA Rapid Bioassessment Protocols. Taxonomic diversity was good with a mean of nearly 28 total taxa per station. Individuals from several genera that are sensitive to water quality degradation were common. In June 1999 the Pennsylvania Fish and Boat Commission (PFBC) collected a total of 21 species of fish at 4 stations (Figure 1 & Table 5). Wild brown trout were present at all stations including a biomass of 34 kg/ha at Station 104. The other species collected were a mixture of cold, cool, and warm water species. Waters in all portions of the candidate basin were found to support their designated uses.

BIOLOGICAL USE QUALIFICATIONS

The biological use qualifying criterion applied to Crum Creek was the integrated benthic macroinvertebrate score test described at § 93.4b(a)(2)(i)(A). This score is calculated from a subsample of approximately 100 individuals which were randomly selected from each total sample and enumerated following EPA's RBP III protocols (Table 6). Selected benthic macroinvertebrate community metrics generated from these subsamples were compared to a reference station with a comparable drainage area (Table 7). Both reference stations are located in the French Creek (01548) basin, one on the main stem and the other on Birch Run (01563), a small tributary. Both stations are located on EV waters. All sampling was conducted over a two-day period to minimize the effects of seasonal variation. This comparison was done using the following metrics which were selected as being indicative of community health: taxa richness; modified EPT index (total number of intolerant Ephemeroptera, Plecoptera, and Trichoptera taxa); modified Hilsenhoff Biotic Index; percent dominant taxon; and percent modified mayflies.

Based on these five metrics, Station 3WB, located on the West Branch Crum Creek (a small tributary) had a biological condition score greater than 92% of the reference station score that qualifies for an EV designation under the Department's regulatory criterion found at § 93.4b(b)(1)(v). The remaining stations all had scores less than 83% of the reference station score which does not meet the threshold required for designation as High Quality Waters (§ 93.4b(a)(2)(i)(A)).

None of the other antidegradation qualifying requirements listed in § 93.4b applies to this watershed.

PUBLIC RESPONSE AND PARTICIPATION SUMMARY

The Department provided public notice of this redesignation evaluation and requested any technical data from the general public through publication in the Pennsylvania Bulletin on April 22, 2000 (30 Pa.B 2071). A similar notice was also published in the Philadelphia Inquirer on April 21, 2000. In addition, Easttown, Edgemont, Newtown, and Willistown Townships along

with Malvern Borough were all notified of the evaluation in a letter dated April 19, 2000. The Delaware County Planning Department and the Chester County Planning Commission were also notified at the same time. No data on water chemistry, instream habitat, or the aquatic community were received in response to these notifications.

A draft of this report was submitted to the above stakeholders including the petitioner, along with a request for comments, on September 20, 2002. Comments were received from the Chester County Planning Commission and Chester County Water Resources Authority in letters dated October 10 and 4, 2002, respectively. Both agencies were in strong support of the recommendation to upgrade the designated use of the West Branch Crum Creek to EV.

RECOMMENDATIONS

Based on applicable regulatory criteria, the Department recommends that the use designation of the West Branch Crum Creek (00728) basin be changed from HQ-CWF to EV based on biological condition scores greater than 92% of the reference station score. This upgrade would affect 5.88 stream miles. The remainder of the candidate basin should retain the current use designations. This recommendation provides less protection for the majority of the basin than the EV designation requested by the petitioner.

FIGURE 1.
CRUM CREEK
CHESTER AND DELAWARE COUNTIES

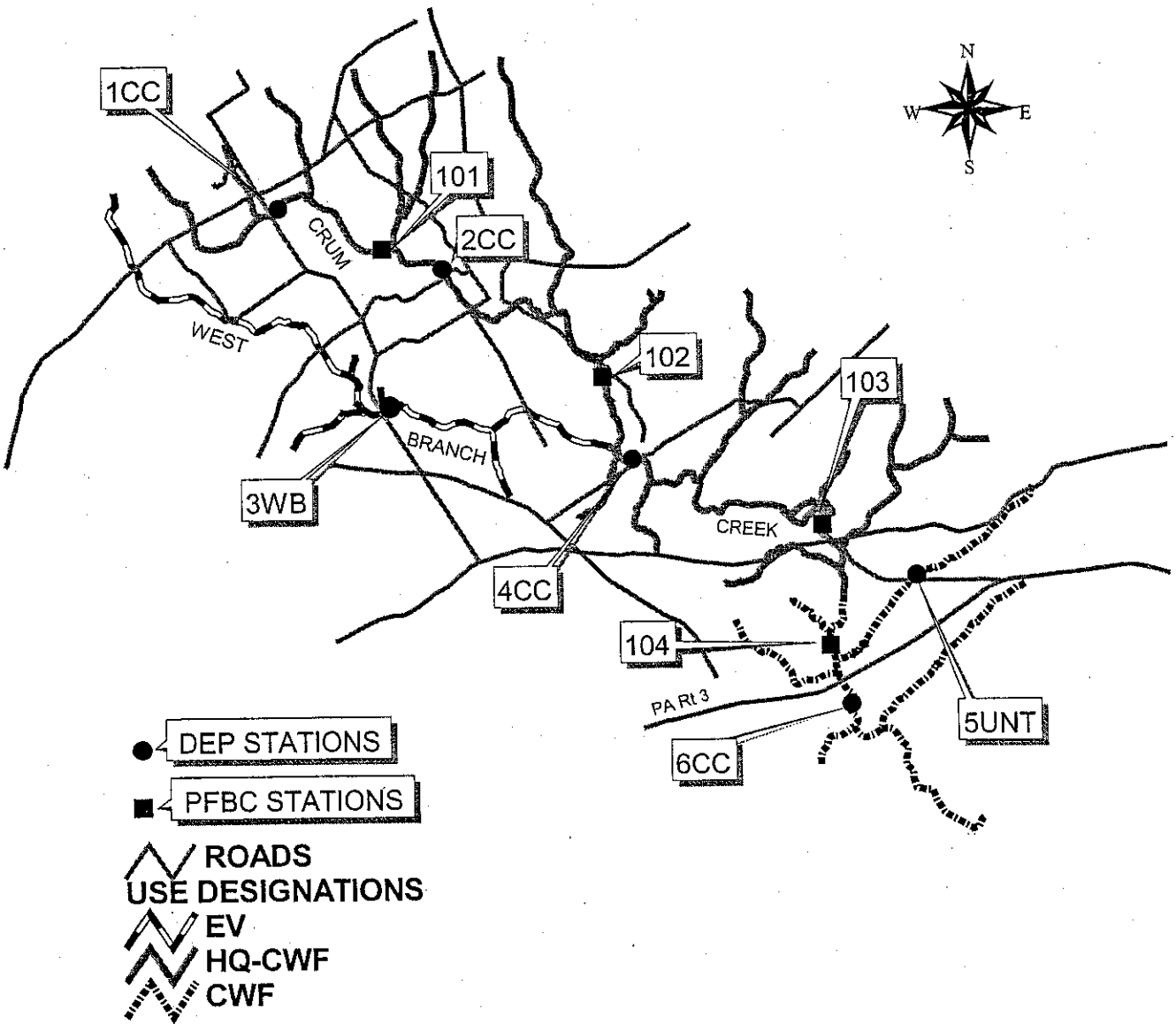

TABLE 1
STATION LOCATIONS
CRUM CREEK
CHESTER AND DELAWARE COUNTIES

STATION	LOCATION
1CC	Crum Creek (00692) approximately 80 meters downstream from the SR2015 crossing. Willistown Township, Chester County Lat: 40 01 25 Long: 75 30 19 RMI: 23.06
2CC	Crum Creek approximately 50 meters upstream of the Jaffrey Road (T382) crossing. Willistown Township, Chester County Lat: 40 01 03 Long: 75 29 04 RMI: 21.58
3WB	West Branch Crum Creek (00728) approximately 30 meters downstream of SR2015 crossing. Willistown Township, Chester County Lat: 40 00 15 Long: 75 29 34 RMI: 1.94
4CC	Crum Creek approximately 20 meters upstream of the Barr Road (T367) bridge. Willistown Township, Chester County Lat: 39 59 55 Long: 75 27 41 RMI: 19.21
5UNT	Unnamed Tributary to Crum Creek (00617) approximately 15 meters upstream of the Boot Road (T337) crossing. Newtown Township, Delaware County Lat: 39 59 09 Long: 75 25 41 RMI: 0.79
6CC	Crum Creek approximately 300 meters downstream of the SR 3 bridge Edgemont and Newtown Township boundary, Delaware County Lat: 39 58 23 Long: 75 26 09 RMI: 15.51
R1	Birch Run (01563) approximately 30 meters upstream of the mouth. West Vincent Township, Chester County Lat: 40 08 51 Long: 75 37 17 RMI: 0.1
R2	French Creek (01548) approximately 30 meters downstream of the T517 crossing. South Coventry Township, Chester County Lat: 40 10 17 Long: 75 41 26 RMI: 14.55

TABLE 2
WATER CHEMISTRY[1]
CRUM CREEK, CHESTER AND DELAWARE COUNTIES
DECEMBER 8, 2000

STATION	1CC	2CC	3WB	4CC	5UNT	6CC
Field Parameters						
Temp (°C)	5.0	4.3	3.7	3.5	2.3	2.3
pH	7.3	7.8	7.2	7.3	7.3	7.0
Cond (µmhos)	200	234	203	195	343	219
Diss. O_2	9.2	11.3	10.9	12.0	11.2	12.7
Laboratory Parameters						
pH	6.8	7.1	6.9	7.0	7.1	6.9
Alkalinity	46	54	44	48	52	48
Acidity	0	0	0	0	0	0
Hardness	72	92	82	77	138	84
T Diss. Sol.	90	118	92	86	190	134
Susp.Sol.	<2	8	14	10	26	<2
NH3 N	<.02	<.02	<.02	<.02	<.02	<.02
NO2 N	0.03	<.01	<.01	<.01	<.01	<.01
NO3 N	2.21	2.20	1.94	1.92	1.26	2.19
Total P	0.03	0.01	0.01	<0.01	<0.01	<0.01
Ca	14.3	15.1	16.5	15.6	31.4	18.4
Mg	8.8	13.1	10.0	9.17	14.4	9.12
Cl	21	25	27	20	61	23
SO_4	<20	<20	<20	<20	26	24
As*	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
As Diss	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Cd*	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Cd Diss	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Cr*	<50	<50	<50	<50	<50	<50
Cu*	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Cu Diss	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Fe*	254	193	197	194	55	165
Pb*	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Pb Diss	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Mn*	61	30	28	18	<10	19
Ni*	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Ni Diss	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Zn*	18.1	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Zn Diss	16.4	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Al*	35.2	55.7	32.7	32.5	29.7	60.2

[1] Except for pH & conductance and indicated otherwise, all values are total concentrations in mg/l

* Total concentrations in ug/l

TABLE 3
HABITAT ASSESSMENT SUMMARY
CRUM CREEK, CHESTER AND DELAWARE COUNTIES
MAY 9-10, 2000

HABITAT PARAMETER	STATIONS[1]							
	1CC	2CC	3WB	4CC	5UNT	6CC	R1	R2
1. instream cover	15	16	17	17	15	12	16	15
2. epifaunal substrate	14	15	18	16	16	14	17	17
3. embeddedness	16	17	16	15	17	11	15	18
4. velocity/depth	13	15	14	15	12	14	14	14
5. channel alterations	12	18	13	16	13	17	17	17
6. sediment deposition	17	16	17	17	17	13	17	18
7. riffle frequency	15	14	16	14	15	15	18	13
8. channel flow status	14	15	14	16	16	17	18	16
9. bank condition	16	17	14	16	17	15	12	16
10. bank vegetation protection	15	18	15	17	18	16	14	18
11. grazing/disruptive pressures	12	18	12	14	14	18	11	18
12. riparian vegetation zone width	8	19	10	12	10	17	9	13
Total Score	167	198	176	185	180	179	178	193
Rating[2]	SUB	OPT	SUB	SUB	SUB	SUB	SUB	OPT

[1] Refer to Figure 1. and Table 1. for station locations.

[2] OPT = Optimal; SUB = Suboptimal

TABLE 4
BENTHIC MACROINVERTEBRATE TAXA LIST
CRUM CREEK, CHESTER AND DELAWARE COUNTIES
MAY 9-10, 2000

TAXA	STATION							
	1CC	2CC	3WB	4CC	5UNT	6CC	R1	R2
Ephemeroptera (mayflies)								
Ameletidae; *Ameletus*					R			
Baetidae; *Acentrella*							C	C
Baetis	P	C	P	C		R	A	P
Caenidae; *Caenis*		P				P		
Ephemerellidae; *Drunella*							A	A
Ephemerella	P	A	VA	VA	VA	VA	VA	VA
Eurylophella	P	C			R	C		
Serratella		P		P		A		
Timpanoga				P		C		P
Heptageniidae; *Epeorus*							P	P
Stenacron			R					R
Stenonema	P	A	C		A	P	P	P
Isonychiidae; *Isonychia*		P		P		P	P	P
Leptophlebiidae; *Paraleptophlebia*			R	C			P	
Plecoptera (stoneflies)								
Chloroperlidae; *Alloperla*				R				
Leuctridae; *Leuctra*		P	P	C		R	R	
Nemouridae; *Amphinemura*	VA	P	A	A	VA	R		
Perlidae; *Acroneuria*			P	P			C	C
Eccoptura					R			
Perlesta	C	A	R		R		R	
Perlodidae; *Isoperla*			R		P			
Tricoptera (caddisflies)								
Glossosomatidae; *Agapetus*	P				P			R
Glossosoma				R				
Hydropsychidae; *Cheumatopsyche*	P	C	A	A	P	C		A
Diplectrona	R	P	C	P	P	R		
Hydropsyche	P	C	A	A	C	A	P	A
Limnephilidae; *Apatania*			R					
Philopotamidae; *Chimarra*	P	P	P	C	R			R
Dolophilodes			P	P	C		C	R
Polycentropodidae; *Polycentropus*	R	R	R	P				
Rhyacophilidae; *Rhyacophila*			P	R	P			P
Uenoidae; *Neophylax*	R						R	R
Lepidoptera (moths)								
Pyralidae; *Petrophila*							R	
Diptera (true flies)								
Dolichopodidae sp.					R			
Simuliidae; *Simulium*	C	P	P	P			P	
Tabanidae; *Chrysops*			R					
Tipulidae; *Antocha*		P				P	P	P
Tipula		R	P		R			
Chironomidae	VA	A	A	VA	C	A	C	C

TAXA	STATION							
	1CC	2CC	3WB	4CC	5UNT	6CC	R1	R2
Megaloptera (dobson-, fishflies)								
Corydalidae; *Nigronia*		P	P					R
Corydalus				P				P
Sialidae; *Sialis*	R	P		R				
Odonata (dragon-, damselflies)								
Aeshnidae; *Boyeria*		R			R			
Cordulegastridae; *Cordulegaster*					R			
Gomphidae; *Ophiogomphus*								R
Stylogomphus		C	C	R	P		R	P
Calopterygidae; *Calopteryx*					R			
Coenagrionidae; *Argia*		P						
Coleoptera (aquatic beetles)								
Dytiscidae; *Agabus*	P							
Dryopidae; *Helichus*						R		
Elmidae; *Optioservus*	C	A	C	A	P	P	R	C
Dubiraphia		R						
Macronychus						R		
Oulimnius		P	P	R		R		
Stenelmis	A	A	A	VA	A	C	R	C
Hydrophilidae; *Berosus*		R			R			
Psephenidae; *Psephenus*	A	A	P	A	P	P	A	P
Ectopria				R				
Ptilodactylidae; *Anchytarsus*	R		P					
Non-Insect Taxa								
Oligochaeta	P	P		P		P		P
Isopoda (aquatic sowbugs)								
Asellidae; *Caecidotea*	P							
Decapoda (crayfish)								
Cambaridae; *Cambarus*	P	R					R	
Gastropoda (univalves, snails)								
Physidae	P							
Pleuroceridae								P
Pelecypoda (bivalve clams)								
Corbiculidae; *Corbicula*						P		
Sphaeriidae		P		P		P		
Unionidae								R
Number of taxa in total sample	25	33	29	30	26	24	23	29

VA = very abundant, > 99 organisms
A = abundant, 25-99 organisms
C = common, 10-24 organisms
P = present, 3-9 organisms
R = rare, < 3 organisms

TABLE 5
FISHES[1]
CRUM CREEK
CHESTER AND DELAWARE COUNTIES

SPECIES NAME	STATION			
	101	102	103	104
American eel, *Anguilla rostrata*			P	P
Rainbow trout, *Oncorhynchus mykiss*[3]			R	
Brown trout, *Salmo trutta*[2]	P	P	A	C
Brook trout, *Salvelinus fontinalis*[3]			R	
Cutlips minnow, *Exoglossum maxillingua*	X	C	X	X
Common shiner, *Luxillus cornutus*	X	C		C
Spottail shiner, *Notropis hudsonius*			R	X
Blacknose dace, *Rhinichthys atratulus*	X	A	A	X
Creek chub, *Semotilis atromaculatus*	X	P	P	X
Fallfish, *Semotilis corporalis*	X	P	C	X
White sucker, *Catostomus commersoni*	X	A	A	X
Yellow bullhead, *Ameiurus natalis*	X		P	X
Brown bullhead, *Ameiurus nebulosus*				X
Margined madtom, *Noturus insignis*		P	C	X
Green sunfish, *Lepomis cyanellus*		R	X	X
Redbreast sunfish, *Lepomis auritus*		R	P	P
Pumpkinseed, *Lepomis gibbosus*		R	P	P
Bluegill, *Lepomis macrochirus*	P	R	R	
Largemouth bass, *Micropterus salmoides*				X
Tessellated darter, *Etheostoma olmstedi*	X	C	C	X
Yellow perch, *Perca flavescens*			R	

1 - Data collected by the Pennsylvania Fish and Boat Commission (June 1999)

2 - Mostly wild with a few stocked individuals

3 - Only stocked individuals

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

X = present but no relative abundance determined

TABLE 6
SEMI-QUANTITATIVE BENTHIC MACROINVERTEBRATE DATA
CRUM CREEK, CHESTER AND DELAWARE COUNTIES
MAY 9-10, 2000

TAXA	STATION							
	1CC	2CC	3WB	4CC	5UNT	6CC	R1	R2
Ephemeroptera (mayflies)								
Baetidae; *Acentrella*							6	5
Baetis	3	7	2	2			8	1
Caenidae; *Caenis*		5				2		
Ephemerellidae; *Drunella*							32	27
Ephemerella	1	10	65	26	53	27	48	53
Eurylophella	2					5		
Serratella		1		1		3		1
Timpanoga						8		1
Heptageniidae; *Epeorus*							3	
Stenonema	3	2	5		8	1	1	1
Isonychiidae; *Isonychia*				1		3	1	2
Leptophlebiidae; *Paraleptophlebia*			1	3				
Plecoptera (stoneflies)								
Leuctridae; *Leuctra*		4	2	3				
Nemouridae; *Amphinemura*	24	4	9	4	26			
Perlidae; *Acroneuria*				1			4	1
Perlesta		23						1
Perlodidae; *Isoperla*			1					
Tricoptera (caddisflies)								
Hydropsychidae; *Cheumatopsyche*	2	4	5	5		1		10
Diplectrona	1		2		2			
Hydropsyche	1	1	4	4	3	7	1	1
Hydroptilidae; *Hydroptila*		1						
Philopotamidae; *Chimarra*	2				1			
Dolophilodes					2		5	
Polycentropodidae; *Polycentropus*		1		1				
Rhyacophilidae; *Rhyacophila*				1				1
Uenoidae; *Neophylax*	1							
Diptera (true flies)								
Simuliidae; *Simulium*	3	4	1	1		1		
Tipulidae; *Antocha*						1	1	
Tipula		1						
Chironomidae	41	13	8	20	3	42	6	2
Megaloptera (dobson-, fishflies)								
Corydalidae; *Nigronia*		1	1					
Corydalus				1				
Sialidae; *Sialis*	1							
Odonata (dragon-, damselflies)								
Gomphidae; *Stylogomphus*			1		1			1
Coenagrionidae; *Argia*		1						

TAXA	STATION							
	1CC	2CC	3WB	4CC	5UNT	6CC	R1	R2
Coleoptera (aquatic beetles)								
Dytiscidae; *Agabus*	1							
Elmidae; *Optioservus*	5	7	6	9	1	1		
Oulimnius		2						
Stenelmis	18	12	9	76	15	7		5
Psephenidae; *Psephenus*	11	8	1	8	9	4	12	1
Ptilodactylidae; *Anchytarsus*	1		2					
Non-Insect Taxa								
Oligochaeta	1	1		1		1		
Gastropoda (univalves, snails)								
Physidae	1							
Pleuroceridae								1
Pelecypoda (bivalve clams)								
Corbiculidae; *Corbicula*						2		

TABLE 7
RBP METRIC COMPARISON
CRUM CREEK, CHESTER COUNTY
MAY 9-10, 2000

METRIC[1]	STATION							
	1CC	2CC	3WB	4CC	5UNT	6CC	R1	R2
1. TAXA RICHNESS	20	22	18	19	12	17	13	18
Cand/Ref (%)	154	169	138	105	92	94	xxx	xxx
Biol. Cond. Score	6	6	6	6	6	6	6	6
2. MOD. EPT INDEX	7	6	7	8	6	6	8	10
Cand/Ref (%)	87	75	87	80	75	60	xxx	xxx
Biol. Cond. Score	6	4	6	6	4	4	6	6
3. MOD. HBI	4.8	4.4	2.5	4.2	2.5	4.1	2.0	2.1
Cand-Ref	2.8	2.4	0.5	2.1	0.5	2.0	xxx	xxx
Biol. Cond. Score	0	0	6	0	6	0	6	6
4. % DOMINANT TAXA	34	20	52	45	43	36	38	46
Cand-Ref	<0	<0	14	<0	5	<0	xxx	xxx
Biol. Cond. Score	6	6	6*	6	6	6	6	6
5. % MOD. MAYFLIES	3	11	57	18	49	40	71	78
Ref-Cand	68	60	14	60	22	38	xxx	xxx
Biol. Cond. Score	0	0	4	0	2	2	6	6
TOTAL BIOLOGICAL CONDITION SCORE	18	16	28	18	24	18	30	30
% COMPARABILITY TO REFERENCE	60	53	93	60	80	60		

[1] - Stations 1CC, 2CC, 3WB, and 5UNT compared to R1
Stations 4CC and 6CC compared to R2

* - Dominant taxon with a Hilsenhoff score < 3