Bioassessment of the Aquatic Macroinvertebrate Communities Collected From Sites in Wyomissing Creek and Selected Tributaries, Berks County, Pennsylvania, 2012

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And
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EXECUTIVE SUMMARY

On November 12 and 13, 2012 the water quality, habitat, and aquatic macroinvertebrate communities were sampled in the 15.7 square miles of Wyomissing Creek watershed, Berks County, Pennsylvania at nine sites.

For aquatic macroinvertebrates, a set of eight metrics was calculated to evaluate the community composition and health in each studied reach of Wyomissing Creek watershed: total taxa (species) richness, EPT richness, percent EPT, percent dominant taxon (single), HBI, Shannon-Weaver Index (log e), percent sensitive individuals, and percent Chironomidae. An Index of Biotic Integrity (PA-IBI) was also calculated to determine the Aquatic Life Use (ALU) and attaining/not attaining status of the sampled sites.

Results of the aquatic macroinvertebrate study showed no specific chemical water quality or habitat stressors for the nine sites, with the exception of WC002. The most upstream sites WC007 through WC010, located in the more forested undisturbed land uses, were not similar to the downstream sites WC001 through WC005 which had more developed land uses. No specific cause and effect that explained site differences due to sediments were determined. However, it is certainly possible that even though the bottom substrate appeared to be capable of supporting diverse macroinvertebrate communities, in reality there is active habitat impairment occurring due to alterations caused by scouring and deposition due to stormwater issues. Land use practices, tributary impacts, nutrients, and sedimentation effects caused by narrow riparian zone width and bank erosion, and natural factors from a downstream progression may contribute impacts to the aquatic macroinvertebrate communities.

It is important to sample aquatic macroinvertebrate communities over the longer term to best assess conditions of stream variability. Often an aquatic community proves more sensitive to an impairment at any given time and under any given stream condition. It is also important to continue studies of this design over longer time periods to determine a "baseline" condition and reduce data variability due to a range of factors.

INTRODUCTION

On November 12 and 13, 2012, a baseline study consisting of ten sites, one was dry and not sampled, was conducted on Wyomissing Creek and selected tributaries from just above the confluence with the Schuylkill River upstream to headwater sites. The study was initiated by the Berks County Conservation District and the Wyomissing Creek Watershed Coalition. The study goals were to establish current Aquatic Life Use conditions by gathering data on Wyomissing Creek and selected tributaries for water quality, in stream/riparian habitat, and benthic macroinvertebrate communities.

The field collection work was conducted in partnership with the Berks County Conservation District Watershed Specialist. Suburban Water Testing Labs of Reading, PA was contracted by the conservation district to conduct the water quality analysis.

METHODS

Study Sites

The Wyomissing Creek watershed is located in Berks County, Pennsylvania (Figure 1). It originates in Brecknock Township, just north of Knauers and flows in a northeasterly direction for approximately 8.4 miles before its meeting with the Schuylkill River in the Reading, PA area. The 15.7 square mile watershed contains a total of 20.8 miles of stream. According to the United States Geological Survey- StreamStats and the 2004 TMDL Report, approximately 38% of the land area is covered by forest and approximately 37% is urban land use. Also, approximately 4.4 miles in the Wyomissing Creek watershed flows through an agricultural land use. Municipalities within the watershed area include Brecknock, Cumru, Mohnton, Reading, Shillington, Spring, West Reading, and Wyomisssing (pers. comm., K. Keppen).

The Wyomissing Creek is listed as High Quality-Cold Water Fishery (HQ-CWF) under its Pennsylvania Chapter 93 Designated Use. There is a 2.5 mile stretch of the Wyomissing Creek watershed located from the State Route 222 Bridge to the Museum Road Bridge in Reading, PA that is listed as Class A wild trout producing waters by the Pennsylvania Fish and Boat Commission.

Ten sampling sites were chosen (Table 1) from the most upstream site (WC010) off Wyomissing Road (undisturbed) downstream to (WC001) located ~2400 meters above the confluence with the Schulykill River. Site selection was driven by the presence of a defined 100 meter reach, that included a riffle type habitat, and the site was in an area of interest to the clients. Note that at the time of sampling site WC004 was found have a dry streambed so it was not sampled and there is no data presented in this report for that site.

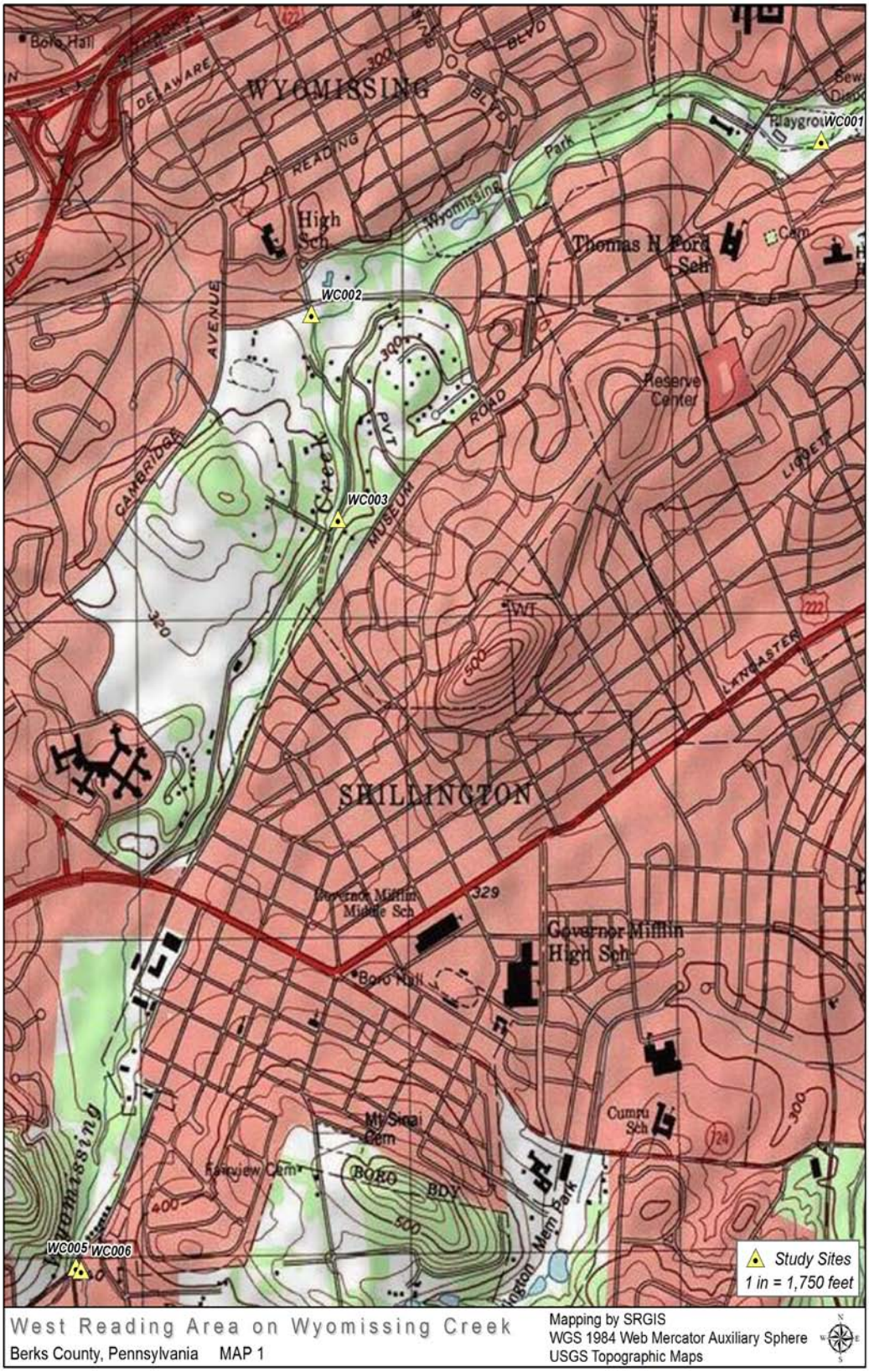

Figure 1. Map of the Wyomissing Creek study area showing the locations of sites WC001 through WC006. See Table 1 for site locations and brief descriptions.

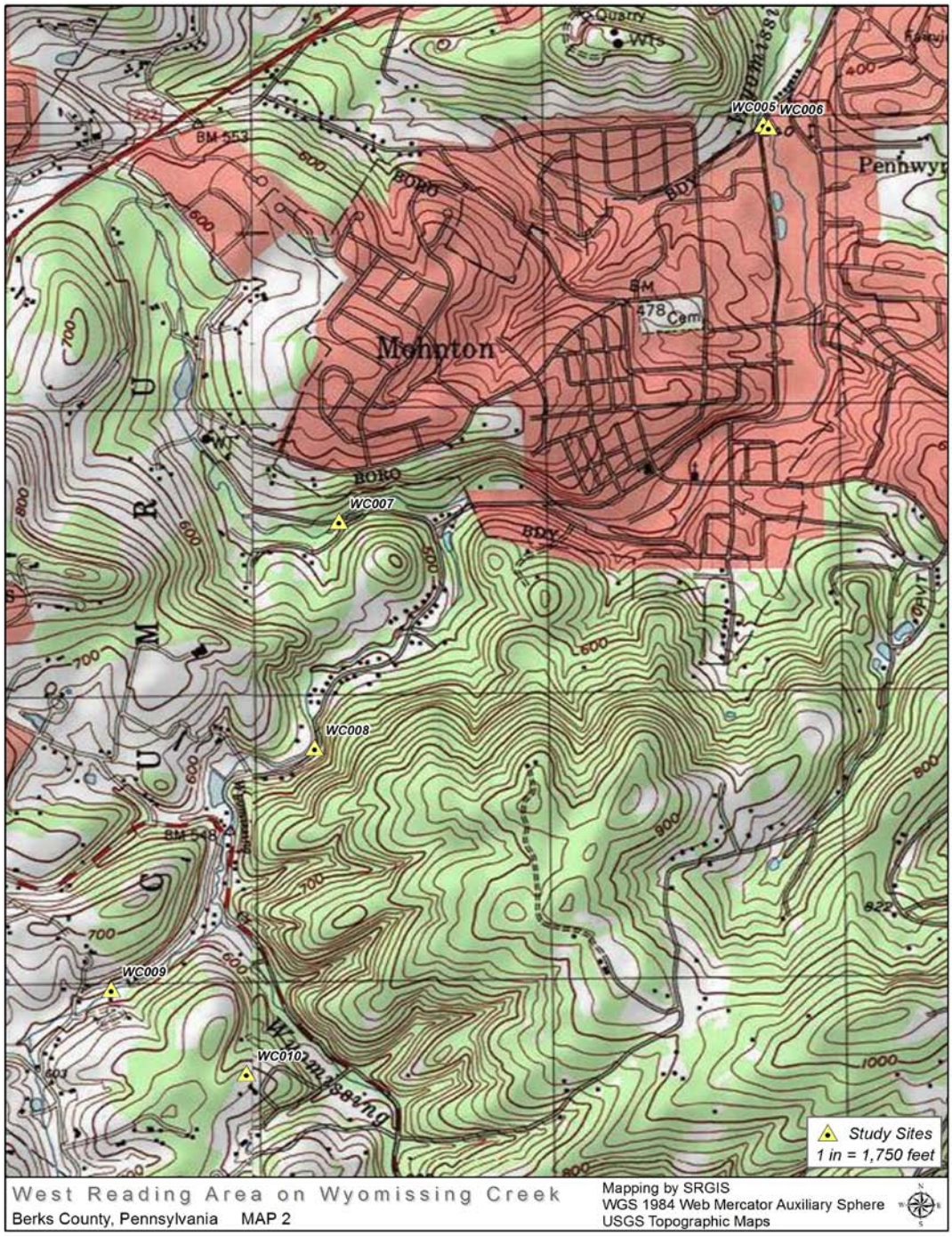

Figure 2. Map of the Wyomissing Creek study area showing the locations of sites WC007 through WC010. See Table 1 for site locations and brief descriptions.

Table 1. Site locations and descriptions for Wyomissing Creek and tributaries.

Site	Latitude/Longitude	Description
WC001	40.32698N/-75.94689W	Mainstem Wyomissing Cr., above JMA, next to playground
WC002	40.32207N/-75.96923W	Off Old Mill Road Bridge
WC003	40.31627N/-75.96807W	Off Old Wyomissing & Lauers Ln. below bridge
WC004	40.30385N/-75.97854W	UNT 01839
WC005	40.29510N/-75.97954W	Off Wyomissing Ave. & Mohnton Blvd.
WC006	40.29502N/-75.97932W	Mainstem upstream UNT 01840 off Wyomissing Ave.
WC007	40.28261N/-75.99653W	Off gravel lane-Rudloff Ln.
WC008	40.27548N/-75.99754W	Off Wyomissing Road
WC009	40.26788N/-76.00564W	Off Yorkshire Road
WC010	40.26925N/-76.00060W	Off Wyomissing Road

Water Quality and Physical Habitat

The following water quality parameters were measured with a Yellow Springs Instrument (YSI) 556 handheld multi-parameter meter at each site: temperature (ºC.), pH (standard units), dissolved oxygen (mg/l), percent dissolved oxygen, specific conductance (uS/cm), and total dissolved solids (g/l). Total alkalinity was measured by use of a Hach kit. These water quality parameters have an influence on what benthic macroinvertebrate community will inhabit a particular stream or stream reach.

A physical habitat assessment was conducted at each of the nine sites over a measured 100 meter reach (Plafkin *et al.* 1989 and Barbour *et al*. 1999). With this approach 12 key habitat factors were evaluated and scored on a scale of 0 to 20, with 0 being the worst condition and 20 the best. The scores for each factor are then combined to provide a total score for the site, with the maximum possible score being 240. This combined score is used to assess the overall habitat quality at the site. Data collection forms from PADEP (2009) for high-gradient streams were employed in the physical characterization and enabled documentation of general land use (site sketches and digital photographs were also completed), a description of stream origin and type, summary of riparian vegetation features, and measures of instream parameters like width, depth, flow, and substrate composition by use of macroscopic observation. The combination of information on both physical characters and water quality provides insight into the ability of a stream to support healthy and diverse aquatic communities, and to the presence/absence of a variety of potential stressors to the overall stream ecosystem.

Macroinvertebrate Collections

Benthic macroinvertebrate samples were collected according to PADEP protocol (http://files.dep.state.pa.us/Water/Drinking%20Water%20and%20Facility%20Regulation/WaterQualityPortalFiles/Methodology/ice_2009am.pdf). The crew used a D-frame net

with 500-micron mesh in the best available habitat in the stream reach, usually riffles. Samples consisted of a composite of six (6) kick samples from riffle areas in a 100-meter stream reach, with each kick disturbing approximately one (1) square meter immediately upstream of the net for approximately one (1) minute.

Laboratory Procedures

Macroinvertebrates

During laboratory processing, the macroinvertebrate sample was placed into a pan marked with 28 grids. Debris from four grids was randomly selected from the pan, extracted using a four-square inch circular "cookie cutter," and placed into another identical gridded empty pan. From this second pan, organisms were picked from randomly selected grids until a 200-organism sub-sample (+/- 40 organisms) was obtained. The number of grids picked was entered onto the bench sheet. Organisms present in the sub-sample were identified to genus level, when possible, and enumerated, with the following exceptions: midges were identified to the family level of Chironomidae; roundworms and proboscis worms were identified to the level of phylum; flatworms were identified to the class level of Turbellaria; segmented worms, aquatic earthworms, and Tubificidae were identified to the class level of Oligochaeta; water mites were identified as Hydracarina. All data were entered into an EcoAnalysts, Inc. proprietary taxonomic data base and a suite of macroinvertebrate community metrics (Appendix I and II) were calculated including the PADEP Index of Biotic Integrity (IBI). Excel spreadsheets and IBI scores were provided to the Berks County Conservation District.

Sample Identification

Macroinvertebrates

Taxonomy and systematics are the sciences of identifying organisms. Taxonomy is the science of assigning correct names to organisms. Systematics focuses on the developmental relationships and organization among species and species-groups. Traditional aquatic invertebrate taxonomy uses morphological characters as the primary means of identification. Therefore, an extensive library of taxonomic literature is maintained by EcoAnalysts, as well as a reference collection of specimens verified by nationally known taxonomists. These were used to aid in the identification of invertebrates for this project.

Where possible, identifications were made to the genus/species-level. This taxonomic level of effort corresponds to U.S.Environmental Protection Agency Rapid Bioassessment Protocols Level III biological assessment protocols (Barbour *et al.* 1999). Because the determining characters of invertebrate species are often found only on the adult male, which has distinctive morphological and genitalia characters, reliable species-level identification of immature stages is often impossible. Often, the larvae of different species within the same genus can be physically indistinguishable from each other. Therefore, genus-level determinations are common in macroinvertebrate data sets. Some taxonomists use distributional data in order to identify specimens further; however, this practice is discouraged because many distribution records are outdated. The practice of identifying only adult male macroinvertebrate specimens past genus-level has been

accepted by the scientists and regulatory agencies participating in USEPA Region 10's Aquatic Biological Assessment Workgroup, and more recently by USEPA Region 8.

Quality Control of Taxonomic Identifications for Macroinvertebrates

Ten percent of the samples were subject to re-identification to ensure ≥ 90% taxonomic similarity.

Biological Assessment

The benthic macroinvertebrate data were entered into an EcoAnalysts proprietary database to perform data summaries, calculate community metrics, and produce selected statistical analyses. A large suite of metric values were calculated (including those employed by PA DEP) to determine which were the most descriptive for these analyses. The interpretation of these metrics was guided by the hypothesized response of each to an environmental disturbance. The community metrics along with water quality and physicochemical parameter values were used to determine the overall health of the benthic macroinvertebrate community at each of the nine sites. Macroinvertebrate pollution tolerance values were obtained from Barbour *et al.* (1999), PA DEP (2007) and (Klemm *et al.* 1990).

RESULTS AND DISCUSSION

Study Site Observations

A brief narrative of each of the nine sites (see Figure 1) is included to better describe the unique characters encountered in sampling. Other specific characters of each site are given in (Tables 2 and 3) and in the attached photographic CD of each site. Straight line distances between sites were roughly calculated using Google Earth.

WC001- This was the most downstream site, located about 2400 meters upstream of the confluence with the Schuylkill River, and defines the lower limit of the study area. The site was located within a suburban land use (playground) with a narrow riparian zone. The creek was about 10 meters wide and 0.1 meters deep with some large woody debris. The reach was dominated by riffle habitat. The substrate was about 80% cobble.

WC002- This unnamed tributary (UNT) site was located about 1971 meters upstream of WC001 in an area of suburban open space land use with a narrow riparian zone on both banks. The reach had little riffle habitat and a deep pool upstream of the bridge containing a dense population of fish. The stream width was about 5 meters and depth ≤0.1 meters. There was a moderate amount of large woody debris. The dominant substrate type was coarse gravel at >50%.

WC003- This mainstem site was located about 652 meters upstream of WC002 in a park area at an old mill with some residential land use. The reach was dominated by a riffle/run flow and width was 8 meters and depth 0.1 meters. The dominant substrate type was cobble/boulder at 70%.

WC005- This site was located on an UNT about 2550 meters upstream of WC003 in a suburban park area with a limited forested land use and a narrow strip of riparian vegetation. This tributary reach was about 3 meters wide and <0.1 meters deep with noticeable bank erosion and sedimentation and with little forest buffer. Riffles were the dominant morphology and the dominant substrate was cobble.

WC006- This mainstem site was located off Wyomissing Avenue about 20 meters directly across from WC005. The dominant landuse was a suburban park with little riparian vegetation. The width was about 8 meters and it averaged 0.1 meters deep with a deeper riffle and pool. Cobble made up 80% of the bottom substrate which was soft and somewhat unstable.

WC007- This UNT site was located about 2000 meters upstream of WC006 in an area of mostly forested land use and a few residences. The tributary was about 3 meters wide and 0.1 meters deep and with a concrete wall on the left bank below the reach. Much of this reach consisted of a good riffle/pool mix. Cobble was the dominant bottom substrate.

WC008- This mainstem site was located about 800 meters upstream of WC007 on a steep gradient closely paralleling Wyomissing Avenue. The area was dominated by residences with some forested land use and had a narrow riparian zone. The width of the creek was about 4 meters and depth 0.1 meters and mostly of riffle/run type morphology. Cobble was the dominant bottom substrate at 70%.

WC009- This UNT site was located about 1100 meters upstream of WC008 and paralleled Yorkshire Road. The width was about 2 meters and 0.1 meters in depth and located within a mostly forested land use. This reach had a good riffle/run sequence and a pipeline crossing. There was scattered herbaceous vegetation along both banks. Some 70% of the bottom substrate was cobble.

WC010- This mainstem site was located about 550 meters upstream of WC009 off Wyomissing Road in a low density residential area. The creek was 3 meters wide and 0.1 meters deep with a deep run at the top of the reach. About 65% of the bottom substrate was cobble mixed with coarse gravel/sand. The riparian vegetation was sparse with a mix of mature trees, bamboo, and mowed lawn.

Table 2. Chemical and physical measurements taken in the field November 12-13, 2012. Most measurements were taken with an YSI 556 multimeter. Alkalinity was determined in the field by Hach kit.

Sites	Temperature (ºC)	Specific Conductance (µS/cm)	Dissolved Oxygen (mg/l)	% Oxygen Saturation	pH (standard units)	Alkalinity (mg/l)	Total Diss. Solids (g/l)
WC001	10.57	568	12.48	112.2	7.99	200	0.369
WC002	12.98	879	12.98	110.8	8.01	280	0.571
WC003	10.85	391	11.79	106.7	7.64	140	0.254
WC005	11.81	466	11.50	106.1	7.75	140	0.304
WC006	11.87	260	11.11	102.8	6.95	80	0.169
WC007	9.75	324	11.02	97.1	7.36	100	0.211
WC008	10.31	169	10.75	95.9	7.31	60	0.110
WC009	10.63	189	10.62	96.0	7.22	60	0.123
WC010	9.80	136	10.56	93.2	7.07	60	0.088

Table 3. Habitat assessment and scoring in Wyomissing Creek and selected tributaries November 12-13, 2012.

Site	**WC001**	**WC002**	**WC003**	**WC005**	**WC006**	**WC007**	**WC008**	**WC009**	**WC010**
Parameters									
Instream Cover (fish)	13	7	16	17	17	17	18	16	17
Epifaunal Substrate	17	11	16	14	17	17	17	17	18
Embeddedness	16	9	17	12	15	16	17	15	17
Velocity/Depth Regimes	15	10	15	10	17	17	15	15	10
Channel Alteration	16	13	15	10	18	15	6	18	18
Sediment Deposition	18	8	18	14	16	18	18	17	17
Frequency of Riffles	16	6	17	12	16	17	18	18	18
Channel Flow Status	18	15	18	18	17	18	18	18	18
Condition of Banks	13	7	11	8	13	18	14	12	14
Bank Vegetative Protection	15	8	11	6	8	18	10	18	16
Grazing and Other Disruptive Pressure	12	8	13	8	8	17	12	17	13
Riparian Vege. Zone Width	3	3	1	2	4	10	2	13	4
Total Score	**172**	**105**	**168**	**131**	**166**	**198**	**165**	**194**	**180**
Classification	**Suboptimal**	**Marginal**	**Suboptimal**	**Suboptimal**	**Suboptimal**	**Optimal**	**Suboptimal**	**Optimal**	**Suboptimal**

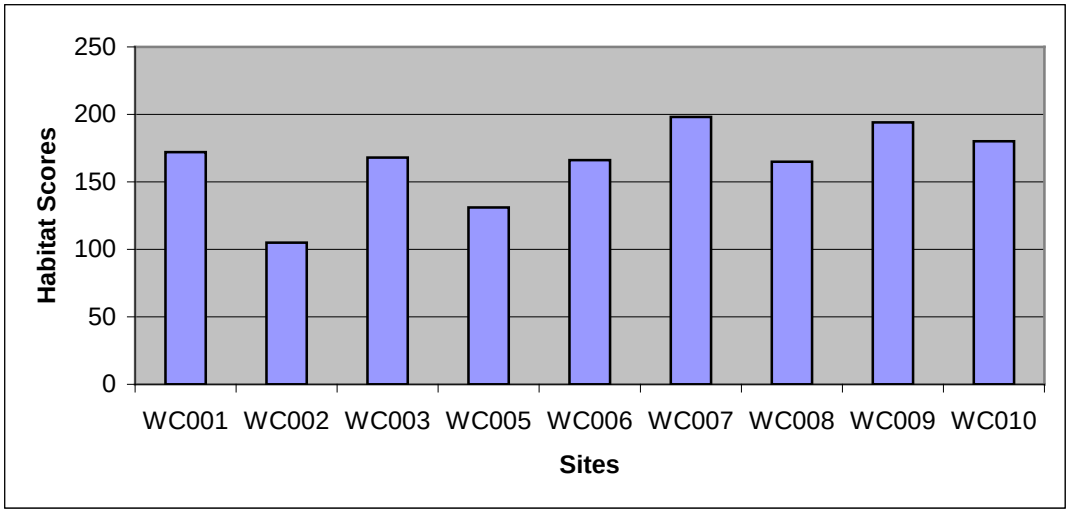

Figure 3. Habitat assessment scores for Wyomissing Creek and selected tributaries 2012.

The habitat scores by category and total (240 is maximum) are given in Table 3. A detailed explanation of each parameter is given in Barbour *et al.* (1999). The scores were subjectively ranked in this study as follows: optimal: 240-192; suboptimal: 180-132; marginal: 120-72; and poor: ≤ 60. Gaps between these scoring ranges were ranked based on best professional judgment.

An examination of the habitat assessment data revealed that among the nine sites six were considered optimal, two suboptimal, and one site as marginal. Habitat scores ranged from a high of 198 at WC007 to a low of 105 at WC002. Most sites exhibited marginal/poor scores for riparian vegetative width and bank stability; however, most sites exhibited optimal/suboptimal scores for suitable in stream substrates. Sites WC002 and WC005 had notable fine sediments covering the bottom. All nine sites have habitat considered to be capable of supporting healthy benthic macroinvertebrate communities with the possible exception of WC002.

Aquatic Community Status and Health

Macroinvertebrate Community Analysis

Taxa (species) richness (number of discrete taxa/species) represents the diversity within the sample (Figure 3). Increasing diversity correlates with increasing health of the community and suggests that niche space, water quality, habitat, and food sources are adequate to support the survival and propagation of many species. The species (taxa) richness values ranged from a high of 35 at WC005 and WC009 to a low of 23 at WC002. Species (taxa) richness values >30 are considered representative of a healthy macroinvertebrate community, and five of the nine values exceeded that threshold.

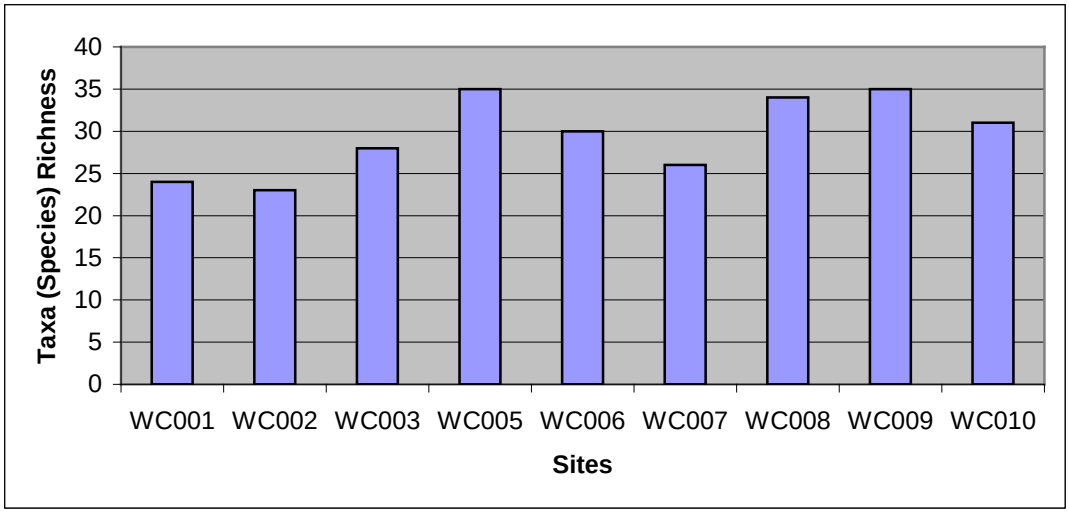

Figure 4. Taxa (Species) Richness 2012.

EPT richness denotes the total number of species of mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera) found in a sub sample (Figure 4). These insects are considered to be mostly clean water organisms, and their presence generally is correlated with good water quality (Lenat and Penrose 1996). Values ranged from a high of 20 at WC009 to a low of 4 at WC002. A value >20 is considered to be representative of a healthy macroinvertebrate community but only WC009 met this benchmark value with WC008 and WC010 at 19.

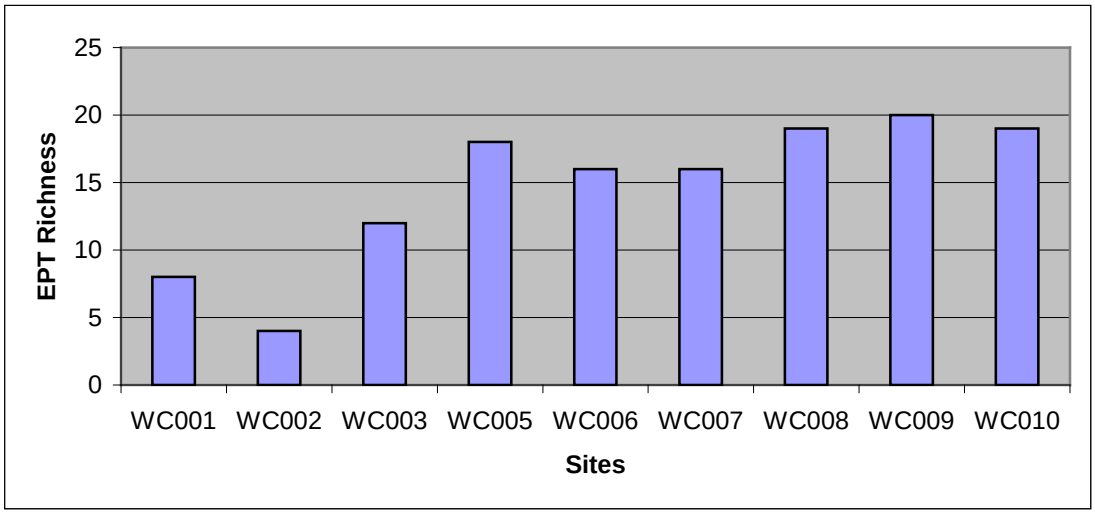

Figure 5. EPT Richness 2012.

Percent EPT is a metric comparing the percentage of the taxa consisting of mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera) to the total number of organisms (Figure 5). The values ranged from a high of 84% at WC007 to a low of 28% at WC002. Values for all sites were near or over 50% except at WC002, WC003, and WC005. A value >50% is indicative of a balanced community.

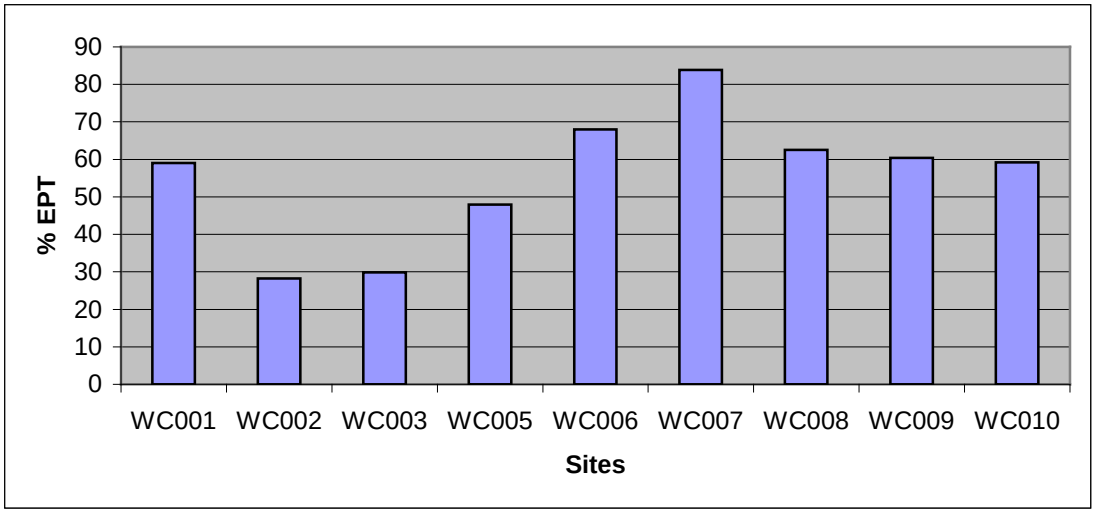

Figure 6. Percent EPT 2012.

Dominance is a simple measure of community balance, or evenness, of the distribution of individuals among the species (Figure 6). Simple dominance is the percent contribution of the most numerous species. High dominance values indicate unbalanced communities strongly dominated by one or more very numerous species. The percent dominant taxon ranged from a high of 31% at WC002 to a low of 15% at WC006 and WC010. Values of <30% indicate a healthy community. Only one site, WC002 exceeded this threshold.

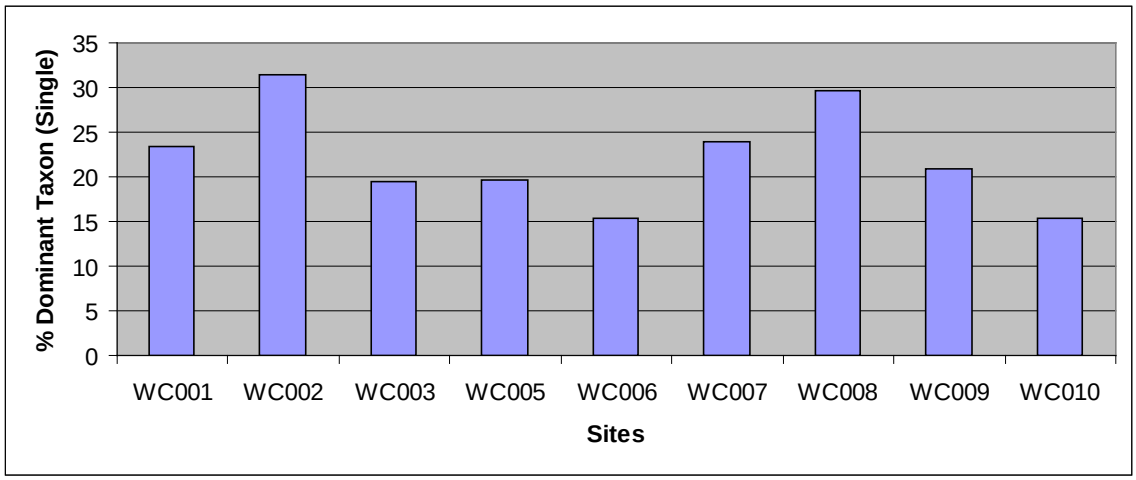

Figure 7. Percent Dominant Taxon (Single) 2012.

Table 4. Hilsenhoff Biotic Index (HBI) Scores.

Biotic Index	Water Quality	Degree of Organic Pollution
0.00 – 3.50	Excellent	None Apparent
3.51 – 4.50	Very Good	Possible Slight
4.51 – 5.50	Good	Some
5.51 – 6.50	Fair	Fairly Significant
6.51 – 7.50	Fairly Poor	Significant
7.51 – 8.50	Poor	Very Significant
8.51 – 10.00	Very Poor	Severe

The Hilsenhoff Biotic Index (HBI) was calculated by multiplying the number of individuals of each species by its assigned tolerance value, summing these products, and dividing by the total number of individuals (Hilsenhoff 1977, 1987, 1988).Tolerance refers to an organism's ability to withstand organic pollution. On a 0-10 scale (see Table 4), tolerance values range from intolerant (0) to tolerant (10). High HBI scores are indicative of organic (sewage) pollution, while low scores are indicative of clean water conditions. Values ranged from excellent at WC007, WC008, and WC009 to fair at WC001, WC002, and WC003 (Figure 7). Individual scores ranged from fair, 6.15 at WC002 to excellent, 3.01 at WC008. A value ≤ 4.0 is considered desireable.

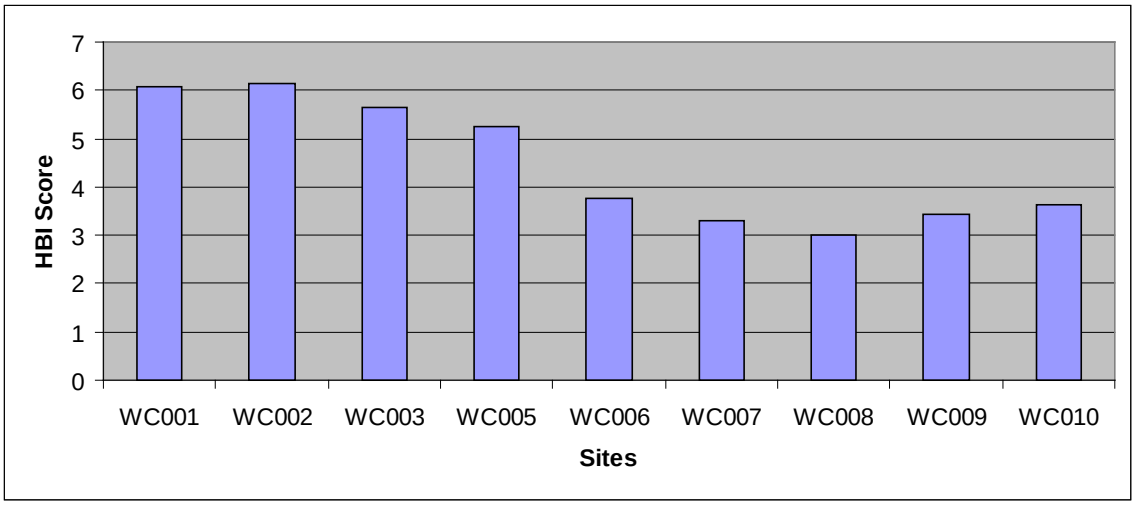

Figure 8. Hilsenhoff Biotic Index (HBI) Scores 2012.

The Shannon-Weaver H' Index (log e) species diversity values combine species richness and community balance (evenness) and are calculated using the formula given by Weber (1973). High species diversity values usually indicate diverse, well-balanced communities, while low values indicate the presence of a stressor(s) or impact. The Shannon-Weaver Index values calculated for the sites are shown on (Figure 8). The lowest index value of 2.22 was recorded at WC002 while the highest value of 2.84 was found to occur at WC010. A good water quality value is considered to be > 2.75.

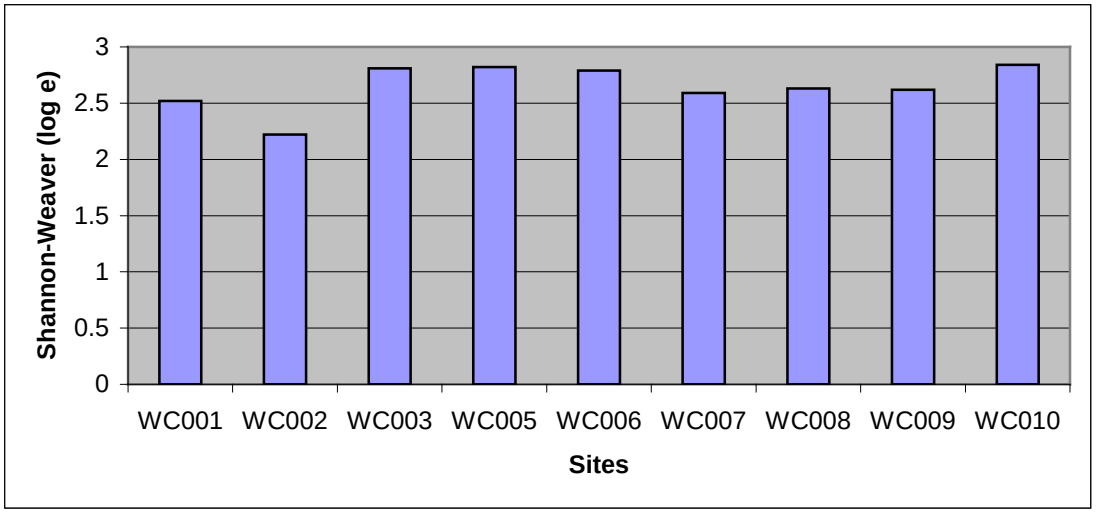

Figure 9. Shannon-Weaver Index (log e) Scores 2012.

The percent sensitive individuals is the percentage of the total number of individuals in a sample that have a tolerance value of 0-3 on a 0-10 scale with 0 being very intolerant and 10 very tolerant (Figure 9). Thus higher percentages usually indicate less organic pollution. The greatest percent value was 66% at WC007 and lowest was 2.5% at WC001.

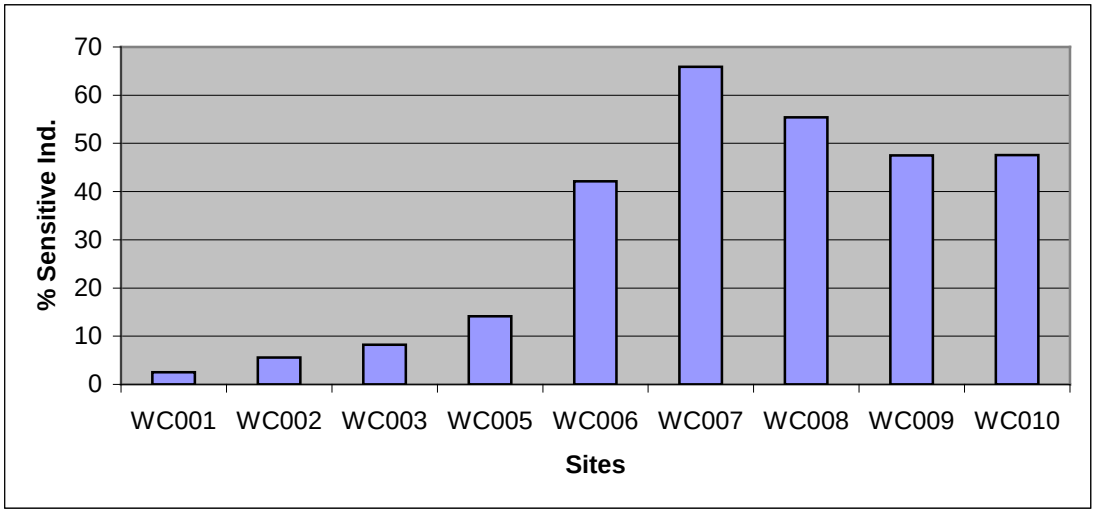

Figure 10. Percent Sensitive Individuals 2012.

Non-biting flies (Diptera) of the family Chironomidae represent a diverse group of insects found in nearly all freshwater ecosystems. The group encompasses a variety of feeding strategies, has a wide range of tolerance values, and many larvae have distinct habitat preferences. Higher percentages may indicate water or habitat quality impairment (Figure 10). The percent Chironomidae ranged from a high of 31% at WC002 to a low of 2% at WC001. A balanced community will have 5% to 30% Chironomidae.

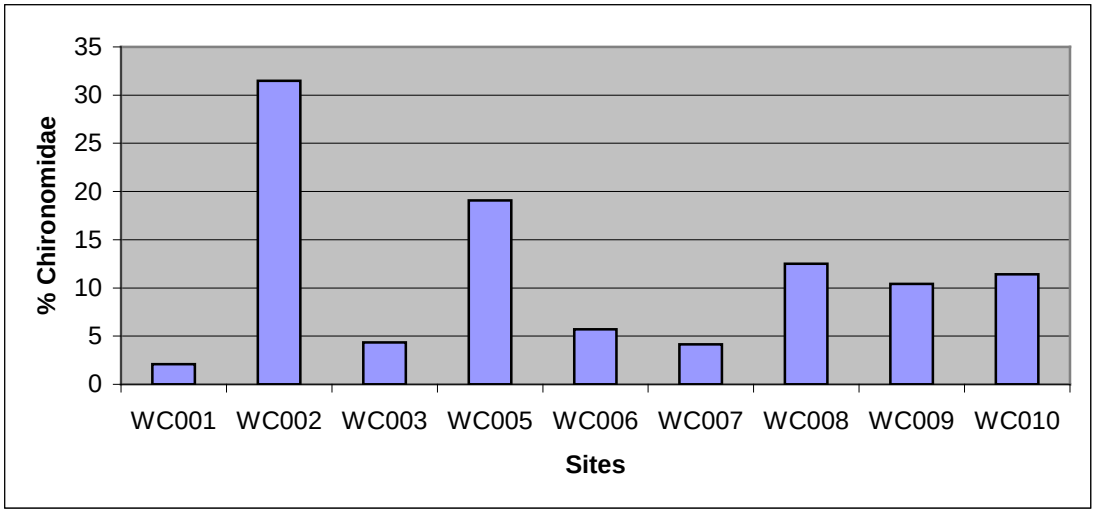

Figure 11. Percent Chironomidae 2012.

The PA Index of Biotic Integrity (PA-IBI) for riffle/run habitats is calculated by a series of 6 metric scores- total taxa richness, Ephemeroptera + Plecoptera + Trichoptera (PTV 0-4 only), Beck's Index, v. 3, Shannon Diversity, Hilsenhoff Biotic Index (HBI), and Percent Sensitive Individuals (PTV 0-3) (PADEP 2009), comparing expected to observed values, and adding for a final value (maximum score 100). Scores ranged from a high of 81.0 at WC008 to a low of 33.6 at WC002 (Figure 11). In order to attain the Aquatic Life Use (ALU) a score of ≥63 is needed to be met for macroinvertebrate samples collected between November and May. Four sites did not meet this benchmark value- WC001, WC002, WC003, and WC005.

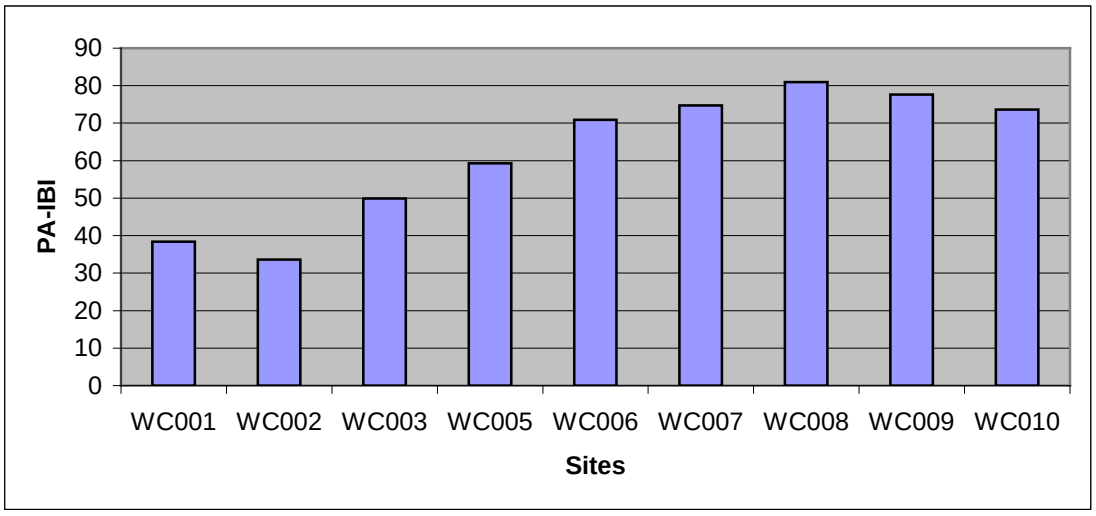

Figure 12. PA Index of Biotic Integrity (IBI) 2012.

An examination of the metric results (Barbour *et al.*1995) reveals aquatic macroinvertebrate assemblages in Wyomissing Creek and tributaries at the nine sampling sites are represented by habitat scores that are capable of supporting a diverse macroinvertebrate community with the exception of WC002. However, looking collectively at taxa richness, EPT taxa richness, percent EPT, percent dominant taxon, HBI, Shannon-Weaver Index, percent sensitive individuals, and percent Chironomidae

indicates Wyomissing Creek and selected tributaries at WC006, WC007, WC008, WC009, and WC010 are supportive of a healthy macroinvertebratecommunity while sites WC001, WC002, WC003, and possibly WC005 currently are not supportive.

Figure 1 - Wyomissing Creek Watershed
Berks County

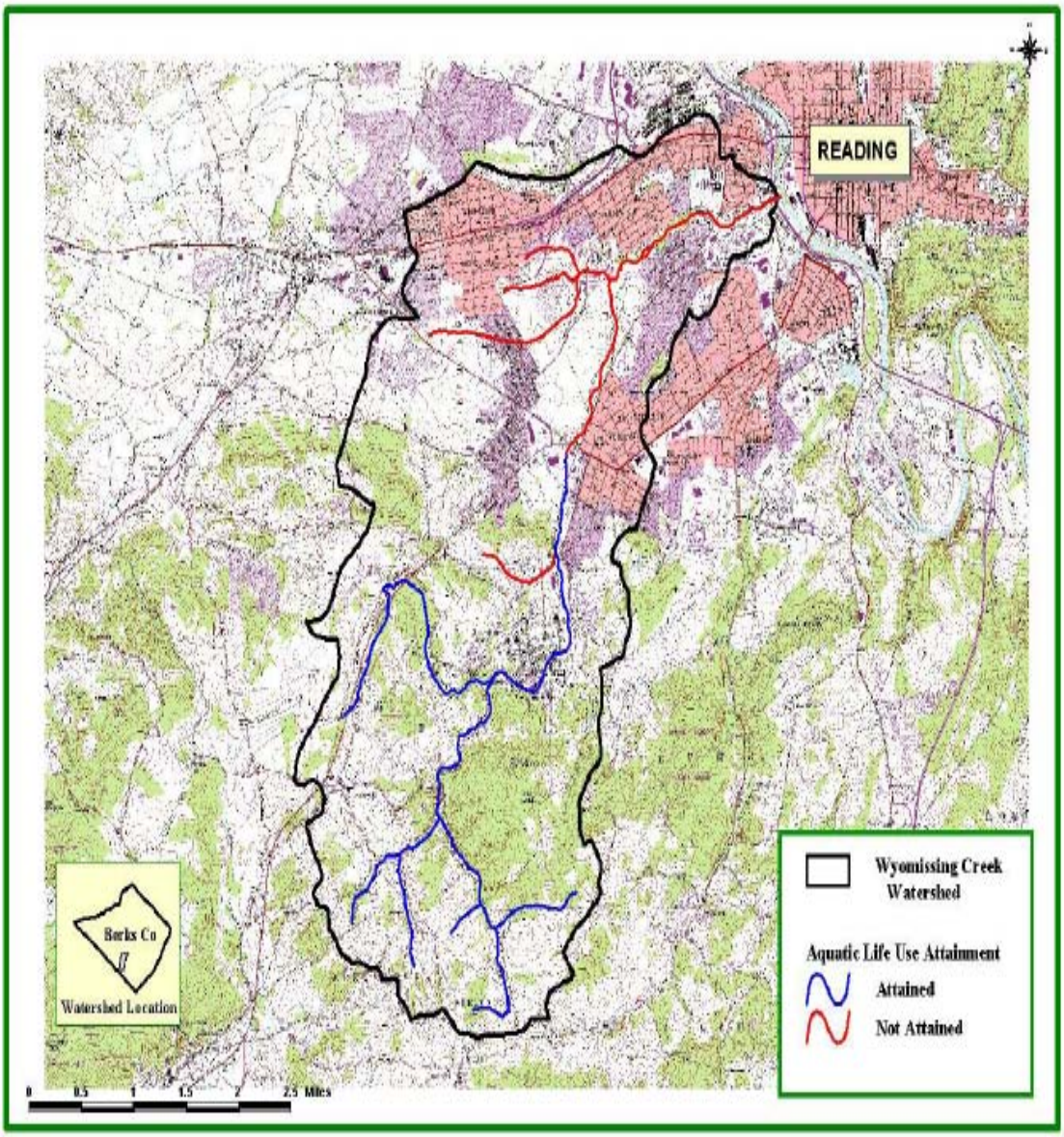

Figure 13. Status of Aquatic Life Use (ALU) Attainment

The impairment status has not changed from the previous assessments. Site locations WC001 and WC003 on the Wyomissing Creek mainstem and the unnamed tributary sites at WC002 and WC005 remain as impaired while WC006, WC008, and WC010 on the mainstem and WC007 and WC009 both tributary sites are attaining ALU. In fact, WC008 had an Index of Biotic Integrity (IBI) score of 81.0 reflecting an HQ/EV potential status.

Upon analysis of the eight metrics examined (Figures 4-11) to define the aquatic macroinvertebrate response to existing water quality conditions it is evident that sites WC001, WC002, WC003, and somewhat less evident site WC005 are impaired. As stated previously in the report, habitat factors do not appear to limit the potential of the presence of a healthy macroinvertebrate community with the exception of WC002. Not surprisingly the more upstream sites had a greater percentage of forested land use than the more residential/suburban downstream areas.

While these differences could reflect a land use impact as forested riparian buffer zones are reduced in size and residential uses dominate, it must be kept in mind that the creek tends to naturally have higher temperatures, greater width, and less gradient as it moves downstream toward the confluence with the Schylkill River. In general, the percent EPT, Shannon Diversity, and percent sensitive individuals values were lower and HBI scores, percent dominant taxon, and percent Chironomidae were higher downstream of WC006. Interestingly, the percent dominance for the top three taxa at the nine sites upstream and including WC006 included a mayfly or stonefly. These insects are considered among the most sensitive to a wide range of aquatic pollutants.

The extensive water quality analysis of instream chemistry conducted by Suburban Water Testing Labs, Reading, PA covered a range of inorganics such as total dissolved solids, total suspended solids, chlorides, sulfates, turbidity, and nutrients and a range of metals. The results (Appendix III) basically showed signature concentrations indicative of urban and forested land uses where the nitrogen, chloride, sulfate, and TDS concentrations were greatest at WC001 and WC002 and lowest at WC008, WC009, and WC010.

Macroinvertebrate Species Inventory

In this study 83 distinct taxa were collected from the nine sites on WyomissingCreek and selected tributaries: Phylum Arthropoda-72; Phylum Annelida- 1; Phylum Mollusca-6; Phylum Chelicerata-1; and Other-3. Within the class Insecta there were 68 distinct taxa-Ephemeroptera (mayflies)-11; Odonata (dragonflies and damselflies)-3; Plecoptera (stoneflies)-8; Hemiptera (true bugs) - 1; Coleoptera (beetles) - 11; Diptera (true flies)-13; and Trichoptera (caddisflies) - 21.

No state or federally listed endangered or threatened species were collected or observed during this study.

CONCLUSIONS

A study of the water quality, habitat, and aquatic macroinvertebrate communities was conducted from November 12-13, 2012 at nine sites on Wyomissing Creek and selected tributaries in Berks County, Pennsylvania covering about 20 stream miles. The study area began from about 2400 meters above the confluence with the Schuylkill River and continued upstream to the headwater areas.

The basic water quality and habitat data at the nine sites did not appear to limit the ability of Wyomissing Creek and selected tributaries (with the exception of WC002) to support a healthy and diverse aquatic macroinvertebrate community. However, there were noticeable differences between sites located at the most upstream reaches that were

mostly forested and less disturbed versus the more downstream urban/suburban land use sites which were reflected in their macroinvertebrate community assemblages.

Overall the aquatic macroinvertebrate community within the study area on Wyomissing Creek seems to lack any direct quantifiable response to a specific stressor to explain site differences. Although the Wyomissing Watershed currently has a Total Maximum Daily Load (TMDL) that is sediment driven only site WC002 appeared to show a direct cause of impairment due to sediments. In addition, watersheds like Wyomissing are known to exhibit scouring and deposition of sediments from stormwater episodes which make the bottom unstable for macroinvertebrate colonization and even though habitat scores appear supportive the macroinvertebrate communities actually exhibit poor IBI scores. Changes in land use practices moving down the watershed, tributary stream impacts, and a lack of riparian zone width, which may add to some increased nutrient concentrations and sedimentation can also cause community shifts. Natural biological changes in the macroinvertebrate community also occur as the creek completes its downstream progression.

It is the recommendation of this study that the information and data be shared with PADEP so that they can revisit the TMDL and reassess if the existing situation is truly and significantly sediment driven or if habitat alteration due to scour and deposition, which does not require a TMDL, more accurately defines the problem. The lack of a TMDL will not solve the problems and stormwater issues may need to be addressed in order to allow the Wyomissing Watershed affected streams to recover.

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APPENDIX I: TAXA LIST 2012

Berks Co PA Bioassessment 2012

Data are not adjusted for subsampling

	Stream	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek
	Site #	1	2	3	5	6	7	8	9	10
	Device	D-Frame	D-Frame	D-Frame	D-Frame	D-Frame	D-Frame	D-Frame	D-Frame	D-Frame
	Habitat	Riffle	Riffle	Riffle	Riffle	Riffle	Riffle	Riffle	Riffle	Riffle
	Collection Date	11-12-2012	11-12-2012	11-12-2012	11-12-2012	11-12-2012	11-13-2012	11-13-2012	11-13-2012	11-13-2012
	Percent Subsampled	33.33	38.54	35.42	100.00	62.50	14.58	18.23	18.75	12.50
	EcoAnalysts Sample ID	6253.1-1	6253.1-2	6253.1-3	6253.1-4	6253.1-5	6253.1-6	6253.1-7	6253.1-8	6253.1-9
Ephemeroptera	Acentrella sp.	0	0	0	0	1	0	1	0	0
	Baetis sp.	3	1	3	1	0	0	0	2	2
	Ephemerella sp.	0	0	4	1	35	2	71	43	13
	Eurylophella sp.	0	0	0	1	0	3	0	0	0
	Heptageniidae	0	0	0	0	0	0	0	0	4
	Isonychia sp.	0	0	1	0	0	0	0	0	4
	Leptohyphidae	0	0	0	1	0	0	0	0	0
	Leptophlebiidae	0	0	0	0	1	0	4	1	0
	Maccaffertium sp.	0	0	0	5	19	8	6	16	6
	Rhithrogena sp.	0	0	0	0	0	0	1	0	0
	Serratella sp.	0	0	0	0	1	0	13	29	35
Odonata	Cordulegaster sp.	0	0	0	0	0	0	0	1	0
	Gomphidae	0	0	0	0	1	1	0	0	0
	Stylogomphus sp.	0	0	0	0	0	2	0	0	0
Plecoptera	Acroneuria sp.	0	0	1	2	12	6	6	3	2
	Allocapnia sp.	0	0	4	2	0	24	0	0	0
	Capniidae	0	0	0	3	12	52	11	2	3
	Chloroperlidae	0	0	1	0	6	0	0	0	0
	Isoperla sp.	0	0	0	0	0	0	1	0	0
	Nemouridae	0	0	0	0	0	0	0	1	0
	Taeniopterygidae	0	0	0	0	0	3	0	0	0
	Taeniopteryx sp.	0	0	0	0	2	34	3	3	12
Hemiptera	Corixidae	0	0	1	0	0	0	0	0	0
Coleoptera	Ancyronyx sp.	1	0	0	0	0	0	0	0	0
	Dubiraphia sp.	0	0	0	0	0	0	1	0	0
	Ectopria sp.	0	0	0	0	0	0	1	1	1
	Helichus sp.	0	0	0	0	0	0	1	0	0
	Macronychus sp.	0	0	0	3	1	1	0	0	0

Berks Co PA Bioassessment 2012

Data are not adjusted for subsampling

	Stream	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek
	Site #	1	2	3	5	6	7	8	9	10
	Device	D-Frame	D-Frame	D-Frame	D-Frame	D-Frame	D-Frame	D-Frame	D-Frame	D-Frame
	Habitat	Riffle	Riffle	Riffle	Riffle	Riffle	Riffle	Riffle	Riffle	Riffle
	Collection Date	11-12-2012	11-12-2012	11-12-2012	11-12-2012	11-12-2012	11-13-2012	11-13-2012	11-13-2012	11-13-2012
	Percent Subsampled	33.33	38.54	35.42	100.00	62.50	14.58	18.23	18.75	12.50
	EcoAnalysts Sample ID	6253.1-1	6253.1-2	6253.1-3	6253.1-4	6253.1-5	6253.1-6	6253.1-7	6253.1-8	6253.1-9
	Microcylloepus sp.	2	0	0	0	0	0	0	0	0
	Optioservus sp.	1	9	10	8	11	4	21	50	13
	Oulimnius sp.	2	0	10	0	8	0	20	3	34
	Promoresia sp.	0	0	0	0	0	0	3	1	3
	Psephenus sp.	0	0	12	8	13	1	4	3	0
	Stenelmis sp.	8	0	45	4	10	0	0	0	0
Diptera-Chironomidae	Chironomidae	5	68	10	37	13	9	30	25	26
Diptera	Antocha sp.	2	12	8	6	4	0	0	1	2
	Bezzia/Palpomyia sp.	0	0	0	0	0	0	1	0	4
	Ceratopogoninae	0	0	0	0	0	0	1	0	0
	Empididae	0	0	0	0	0	0	0	0	1
	Hemerodromia sp.	0	1	4	2	1	0	1	2	0
	Hexatoma sp.	0	0	0	0	0	0	3	0	0
	Myxosargus sp.	0	0	0	1	0	0	0	0	0
	Neoplasta sp.	0	2	0	0	0	0	0	0	0
	Simulium sp.	0	2	0	7	0	0	0	1	0
	Tipula sp.	1	1	4	1	1	6	1	0	0
	Tipulidae	0	1	0	0	0	0	0	0	0
	Trichoclinocera sp.	0	0	0	0	0	0	0	0	1
Trichoptera	Ceratopsyche sp.	24	5	17	2	24	2	11	6	19
	Cheumatopsyche sp.	56	49	14	38	34	15	4	17	7
	Chimarra sp.	30	0	17	5	1	18	0	5	0
	Diplectrona sp.	0	0	0	0	0	6	4	1	11
	Dolophilodes sp.	0	0	0	0	1	4	3	3	0
	Glossosoma sp.	0	0	0	1	0	1	1	1	0
	Goera sp.	0	0	0	0	0	0	0	0	3
	Hydropsyche sp.	19	0	3	21	2	2	1	2	1
	Hydropsychidae	7	6	2	3	0	0	0	0	2
	Lepidostoma sp.	0	0	0	0	0	0	0	1	0

Berks Co PA Bioassessment 2012

Data are not adjusted for subsampling

	Stream	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek
	Site #	1	2	3	5	6	7	8	9	10
	Device	D-Frame	D-Frame	D-Frame	D-Frame	D-Frame	D-Frame	D-Frame	D-Frame	D-Frame
	Habitat	Riffle	Riffle	Riffle	Riffle	Riffle	Riffle	Riffle	Riffle	Riffle
	Collection Date	11-12-2012	11-12-2012	11-12-2012	11-12-2012	11-12-2012	11-13-2012	11-13-2012	11-13-2012	11-13-2012
	Percent Subsampled	33.33	38.54	35.42	100.00	62.50	14.58	18.23	18.75	12.50
	EcoAnalysts Sample ID	6253.1-1	6253.1-2	6253.1-3	6253.1-4	6253.1-5	6253.1-6	6253.1-7	6253.1-8	6253.1-9
	Leptoceridae	0	0	0	0	0	0	1	0	0
	Leucotrichia sp.	1	0	0	0	0	0	0	0	0
	Micrasema sp.	0	0	0	0	0	0	0	0	1
	Mystacides sp.	0	0	0	0	1	0	0	0	0
	Neophylax sp.	0	0	0	0	0	0	0	1	1
	Polycentropodidae	0	0	0	2	0	0	0	0	0
	Polycentropus sp.	0	0	2	0	0	0	1	1	0
	Psychomyia sp.	1	0	0	0	0	0	0	0	0
	Rhyacophila sp.	0	0	0	2	3	2	7	7	8
	Trichoptera	0	0	0	1	0	0	0	0	1
	Uenoidae	0	0	0	2	0	0	0	0	0
Gastropoda	Ferrissia sp.	3	1	0	1	0	0	0	0	0
	Gastropoda	0	0	1	0	0	0	0	0	0
	Gyraulus sp.	0	1	0	0	0	0	0	0	0
	Micromenetus sp.	4	1	0	0	0	0	0	0	0
	Physa sp.	0	1	0	1	0	0	0	1	0
Bivalvia	Sphaeriidae	0	0	1	0	0	0	1	1	2
Annelida	Oligochaeta	27	13	23	1	2	3	0	3	0
Acari	Acari	11	8	19	11	5	7	1	1	4
Crustacea	Cambaridae	0	0	1	0	0	0	0	0	0
	Crangonyx sp.	6	0	0	1	0	1	0	1	0
	Gammarus sp.	3	12	0	0	0	0	0	0	0
	Ostracoda	0	1	0	0	0	0	0	0	0
Other Organisms	Nematoda	0	2	0	5	0	0	0	0	0
	Turbellaria	21	18	11	0	2	0	0	0	0
Nemertea	Nemertea	1	1	2	4	1	0	0	0	2
	TOTAL	**239**	**216**	**231**	**194**	**228**	**217**	**240**	**240**	**228**

APPENDIX II: METRICS 2012

Berks Co PA Bioassessment 2012
Data are adjusted for subsampling
****Calculations use EcoAnalysts Inc. standard attributes****

Stream	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek
Site #	**1**	**2**	**3**	**5**	**6**	**7**	**8**	**9**	**10**
Device	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**
Habitat	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**
Collection Date	**11-12-2012**	**11-12-2012**	**11-12-2012**	**11-12-2012**	**11-12-2012**	**11-13-2012**	**11-13-2012**	**11-13-2012**	**11-13-2012**
Percent Subsampled	**33.33**	**38.54**	**35.42**	**100.00**	**62.50**	**14.58**	**18.23**	**18.75**	**12.50**
EcoAnalysts Sample ID	**6253.1-1**	**6253.1-2**	**6253.1-3**	**6253.1-4**	**6253.1-5**	**6253.1-6**	**6253.1-7**	**6253.1-8**	**6253.1-9**
Abundance Measures									
Corrected Abundance	717.00	559.44	651.42	194.00	364.80	1488.62	1317.60	1279.20	1824.00
EPT Abundance	423.00	157.99	194.58	93.00	248.00	1248.52	823.50	772.85	1080.00
Dominance Measures									
Dominant Taxon	Cheumatopsyche sp.	Chironomidae	Stenelmis sp.	Cheumatopsyche sp.	Ephemerella sp.	Capniidae	Ephemerella sp.	Optioservus sp.	Serratella sp.
Dominant Abundance	168.00	176.12	126.90	38.00	56.00	356.72	389.79	266.50	280.00
2nd Dominant Taxa	Chimarra sp.	Cheumatopsyche sp.	Oligochaeta	Chironomidae	Cheumatopsyche sp.	Taeniopteryx sp.	Chironomidae	Ephemerella sp.	Oulimnius sp.
2nd Dominant Abundance	90.00	126.91	64.86	37.00	54.40	233.24	164.70	229.19	272.00
3rd Dominant Taxa	Oligochaeta	Turbellaria	Acari	Hydropsyche sp.	Ceratopsyche sp.	Allocapnia sp.	Optioservus sp.	Serratella sp.	Chironomidae
3rd Dominant Abundance	81.00	46.62	53.58	21.00	38.40	164.64	115.29	154.57	208.00
% Dominant Taxon	23.43	31.48	19.48	19.59	15.35	23.96	29.58	20.83	15.35
% 2 Dominant Taxa	35.98	54.17	29.44	38.66	30.26	39.63	42.08	38.75	30.26
% 3 Dominant Taxa	47.28	62.50	37.66	49.48	40.79	50.69	50.83	50.83	41.67
Richness Measures									
Species Richness	24.00	23.00	28.00	35.00	30.00	26.00	34.00	35.00	31.00
EPT Richness	8.00	4.00	12.00	18.00	16.00	16.00	19.00	20.00	19.00
Ephemeroptera Richness	1.00	1.00	3.00	5.00	5.00	3.00	6.00	5.00	6.00
Plecoptera Richness	0.00	0.00	3.00	3.00	4.00	5.00	4.00	4.00	3.00
Trichoptera Richness	7.00	3.00	6.00	10.00	7.00	8.00	9.00	11.00	10.00
Chironomidae Richness	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Oligochaeta Richness	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00
Non-Chiro. Non-Olig. Richness	22.00	21.00	26.00	33.00	28.00	24.00	33.00	33.00	30.00

Berks Co PA Bioassessment 2012
Data are adjusted for subsampling
****Calculations use EcoAnalysts Inc. standard attributes****

Stream	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek
Site #	**1**	**2**	**3**	**5**	**6**	**7**	**8**	**9**	**10**
Device	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**
Habitat	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**
Collection Date	**11-12-2012**	**11-12-2012**	**11-12-2012**	**11-12-2012**	**11-12-2012**	**11-13-2012**	**11-13-2012**	**11-13-2012**	**11-13-2012**
Percent Subsampled	**33.33**	**38.54**	**35.42**	**100.00**	**62.50**	**14.58**	**18.23**	**18.75**	**12.50**
EcoAnalysts Sample ID	**6253.1-1**	**6253.1-2**	**6253.1-3**	**6253.1-4**	**6253.1-5**	**6253.1-6**	**6253.1-7**	**6253.1-8**	**6253.1-9**
Rhyacophila Richness	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Community Composition									
% Ephemeroptera	1.26	0.46	3.46	4.64	25.00	5.99	40.00	37.92	28.07
% Plecoptera	0.00	0.00	2.60	3.61	14.04	54.84	8.75	3.75	7.46
% Trichoptera	57.74	27.78	23.81	39.69	28.95	23.04	13.75	18.75	23.68
% EPT	59.00	28.24	29.87	47.94	67.98	83.87	62.50	60.42	59.21
% Coleoptera	5.86	4.17	33.33	11.86	18.86	2.76	21.25	24.17	22.37
% Diptera	3.35	40.28	11.26	27.84	8.33	6.91	15.42	12.08	14.91
% Oligochaeta	11.30	6.02	9.96	0.52	0.88	1.38	0.00	1.25	0.00
% Baetidae	1.26	0.46	1.30	0.52	0.44	0.00	0.42	0.83	0.88
% Brachycentridae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.44
% Chironomidae	2.09	31.48	4.33	19.07	5.70	4.15	12.50	10.42	11.40
% Ephemerellidae	0.00	0.00	1.73	1.03	15.79	2.30	35.00	30.00	21.05
% Hydropsychidae	44.35	27.78	15.58	32.99	26.32	11.52	8.33	10.83	17.54
% Odonata	0.00	0.00	0.00	0.00	0.44	1.38	0.00	0.42	0.00
% Perlidae	0.00	0.00	0.43	1.03	5.26	2.76	2.50	1.25	0.88
% Pteronarcyidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Simuliidae	0.00	0.93	0.00	3.61	0.00	0.00	0.00	0.42	0.00
Functional Group Composition									
% Filterers	56.90	28.70	23.81	40.21	27.19	21.66	10.00	15.00	20.18
% Gatherers	20.92	49.54	25.54	25.26	28.95	8.29	58.75	45.00	49.12
% Predators	13.39	14.35	16.45	11.34	13.16	7.37	9.17	6.25	8.77
% Scrapers	5.86	5.56	29.00	15.46	23.25	6.45	15.42	30.83	13.60
% Shredders	0.42	0.93	3.46	3.09	6.58	54.84	6.67	2.92	7.02
% Piercer-Herbivores	0.00	0.00	0.43	0.00	0.00	0.00	0.00	0.00	0.00
% Unclassified	2.51	0.93	0.87	4.64	0.88	1.38	0.00	0.00	1.32

Berks Co PA Bioassessment 2012

Data are adjusted for subsampling
****Calculations use EcoAnalysts Inc. standard attributes****

Stream	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek
Site #	**1**	**2**	**3**	**5**	**6**	**7**	**8**	**9**	**10**
Device	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**
Habitat	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**
Collection Date	**11-12-2012**	**11-12-2012**	**11-12-2012**	**11-12-2012**	**11-12-2012**	**11-13-2012**	**11-13-2012**	**11-13-2012**	**11-13-2012**
Percent Subsampled	**33.33**	**38.54**	**35.42**	**100.00**	**62.50**	**14.58**	**18.23**	**18.75**	**12.50**
EcoAnalysts Sample ID	**6253.1-1**	**6253.1-2**	**6253.1-3**	**6253.1-4**	**6253.1-5**	**6253.1-6**	**6253.1-7**	**6253.1-8**	**6253.1-9**
Filterer Richness	5.00	4.00	7.00	7.00	5.00	6.00	6.00	8.00	7.00
Gatherer Richness	8.00	6.00	7.00	8.00	9.00	5.00	8.00	9.00	6.00
Predator Richness	2.00	5.00	6.00	5.00	7.00	4.00	9.00	6.00	6.00
Scraper Richness	5.00	4.00	3.00	8.00	4.00	4.00	7.00	8.00	7.00
Shredder Richness	1.00	2.00	2.00	3.00	3.00	5.00	4.00	4.00	3.00
Piercer-Herbivore Richness	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
Unclassified	3.00	2.00	1.00	4.00	2.00	2.00	0.00	0.00	2.00
Diversity/Evenness Measures									
Shannon-Weaver H' (log 10)	1.09	0.96	1.22	1.23	1.21	1.13	1.14	1.14	1.24
Shannon-Weaver H' (log 2)	3.63	3.20	4.06	4.07	4.02	3.74	3.79	3.78	4.10
Shannon-Weaver H' (log e)	2.52	2.22	2.81	2.82	2.79	2.59	2.63	2.62	2.84
Margalef's Richness	3.50	3.48	4.17	6.45	4.92	3.42	4.59	4.75	4.00
Pielou's J'	0.79	0.71	0.84	0.79	0.82	0.80	0.74	0.74	0.83
Simpson's Heterogeneity	0.89	0.83	0.92	0.90	0.92	0.89	0.87	0.89	0.92
Biotic Indices									
% Indiv. w/ HBI Value	97.49	98.15	99.13	95.36	99.12	98.62	99.58	100.00	96.49
Hilsenhoff Biotic Index	5.16	5.41	5.01	4.79	3.44	2.73	2.84	3.50	3.30
% Indiv. w/ MTI Value	66.11	56.48	65.80	58.25	52.63	43.78	43.75	54.58	58.33
Metals Tolerance Index	4.49	4.29	4.01	4.58	3.95	1.92	2.93	3.53	2.97
% Indiv. w/ FSBI Value	34.31	34.72	21.65	45.36	40.79	14.75	52.50	65.00	36.40
Fine Sediment Biotic Index	23.00	26.00	32.00	46.00	44.00	28.00	55.00	54.00	44.00
FSBI - average	0.96	1.13	1.14	1.31	1.47	1.08	1.62	1.54	1.42
FSBI - weighted average	2.89	2.87	3.62	3.40	3.32	2.94	3.94	3.75	4.28
% Indiv. w/ TPM Value	37.66	67.59	28.14	68.56	57.46	42.86	62.92	62.92	32.02
Temp. Pref. Metric - average	0.79	0.96	1.25	1.29	1.43	1.85	1.50	1.91	1.65
TPM - weighted average	1.76	3.41	2.89	3.02	4.14	5.54	5.59	4.42	4.64

Berks Co PA Bioassessment 2012

Data are adjusted for subsampling
****Calculations use EcoAnalysts Inc. standard attributes****

Stream	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek
Site #	**1**	**2**	**3**	**5**	**6**	**7**	**8**	**9**	**10**
Device	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**
Habitat	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**
Collection Date	**11-12-2012**	**11-12-2012**	**11-12-2012**	**11-12-2012**	**11-12-2012**	**11-13-2012**	**11-13-2012**	**11-13-2012**	**11-13-2012**
Percent Subsampled	**33.33**	**38.54**	**35.42**	**100.00**	**62.50**	**14.58**	**18.23**	**18.75**	**12.50**
EcoAnalysts Sample ID	**6253.1-1**	**6253.1-2**	**6253.1-3**	**6253.1-4**	**6253.1-5**	**6253.1-6**	**6253.1-7**	**6253.1-8**	**6253.1-9**
Karr BIBI Metrics									
Long-Lived Taxa Richness	3.00	2.00	5.00	4.00	4.00	3.00	4.00	3.00	2.00
Clinger Richness	13.00	10.00	15.00	23.00	19.00	17.00	23.00	25.00	21.00
% Clingers	60.67	41.67	65.37	69.07	78.95	77.42	76.25	82.50	71.49
Intolerant Taxa Richness	2.00	0.00	4.00	7.00	9.00	10.00	14.00	12.00	11.00
% Tolerant Individuals	3.86	2.91	3.72	1.08	0.55	0.20	0.00	0.31	0.00
% Tolerant Taxa	4.17	17.39	7.14	5.71	3.33	3.85	0.00	5.71	0.00
Coleoptera Richness	5.00	1.00	4.00	4.00	5.00	3.00	7.00	5.00	4.00
Montana DEQ Metrics									
MT Biotic Index	5.16	5.41	5.01	4.79	3.44	2.73	2.84	3.50	3.30
C-Gatherers + C-Filterers	77.82	78.24	49.35	65.46	56.14	29.95	68.75	60.00	69.30
% Scraper + % Shredder	6.28	6.48	32.47	18.56	29.82	61.29	22.08	33.75	20.61
% Univoltine	7.53	35.65	14.29	28.35	15.79	52.07	27.08	18.33	32.46
% Multivoltine	39.33	45.37	17.32	32.47	19.74	9.68	10.00	23.33	21.05
% Semivoltine	4.18	4.63	31.17	10.82	15.35	5.07	11.25	22.50	6.14
Community Tolerance Quotient	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
% Hydropsychinae	41.42	25.00	14.72	31.44	26.32	8.76	6.67	10.42	11.84
Lake Metrics									
% Orthocladiinae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Orthocladiinae Richness	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Chironomini	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chironomini Richness	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Tanytarsini	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Chironomus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Tanytarsus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Dicrotendipes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Berks Co PA Bioassessment 2012

Data are adjusted for subsampling
****Calculations use EcoAnalysts Inc. standard attributes****

Stream	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek
Site #	**1**	**2**	**3**	**5**	**6**	**7**	**8**	**9**	**10**
Device	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**
Habitat	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**
Collection Date	**11-12-2012**	**11-12-2012**	**11-12-2012**	**11-12-2012**	**11-12-2012**	**11-13-2012**	**11-13-2012**	**11-13-2012**	**11-13-2012**
Percent Subsampled	**33.33**	**38.54**	**35.42**	**100.00**	**62.50**	**14.58**	**18.23**	**18.75**	**12.50**
EcoAnalysts Sample ID	**6253.1-1**	**6253.1-2**	**6253.1-3**	**6253.1-4**	**6253.1-5**	**6253.1-6**	**6253.1-7**	**6253.1-8**	**6253.1-9**
% Dicrotendipes + Chironomus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Corbicula	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Manayunkia speciosa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Intolerant	0.86	0.00	3.06	6.49	32.30	51.40	53.97	38.75	43.18
% Intolerant Indiv. (S.CA)	0.84	0.00	3.03	6.19	32.02	50.69	53.75	38.75	41.67
% Individuals w/ CAHBI value	29.71	27.78	34.63	37.11	21.49	35.94	22.08	32.50	20.61
% Intolerant Indiv. (CAHBI)	0.00	0.00	1.25	8.33	44.90	70.51	45.28	16.67	25.53
% Sensitive EPT (CAHBI)	0.00	0.00	1.25	8.33	44.90	70.51	45.28	16.67	25.53
% Non-Insect Individuals (S.CA)	31.80	27.31	25.11	12.37	4.39	5.07	0.83	2.92	3.51
% Non-Insect Taxa	33.33	47.83	25.00	20.00	13.33	11.54	5.88	14.29	9.68
% Crustacea + Mollusca	6.69	7.87	1.30	1.55	0.00	0.46	0.42	1.25	0.88
Average Abundance (per Taxon)	29.88	24.32	23.27	5.54	12.16	57.25	38.75	36.55	58.84
NYDEC PMA Metrics									
% Crustacea	3.77	6.02	0.43	0.52	0.00	0.46	0.00	0.42	0.00
% Mollusca	2.93	1.85	0.87	1.03	0.00	0.00	0.42	0.83	0.88
% Non-Chironomidae	66.11	41.20	70.56	68.56	89.91	90.78	86.67	86.67	85.09

Berks Co PA Bioassessment 2012
PA ICE IBI Metrics and Scores
****Calculations use PADEP standard attributes****

	Stream	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek	UNT Wyomissing Creek	Wyomissing Creek
	Site #	**1**	**2**	**3**	**5**	**6**	**7**	**8**	**9**	**10**
	Device	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**	**D-Frame**
	Habitat	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**	**Riffle**
	Collection Date	**11-12-2012**	**11-12-2012**	**11-12-2012**	**11-12-2012**	**11-12-2012**	**11-13-2012**	**11-13-2012**	**11-13-2012**	**11-13-2012**
	Percent Subsampled	**33.33**	**38.54**	**35.42**	**100.00**	**62.50**	**14.58**	**18.23**	**18.75**	**12.50**
	EcoAnalysts Sample ID	**6253.1-1**	**6253.1-2**	**6253.1-3**	**6253.1-4**	**6253.1-5**	**6253.1-6**	**6253.1-7**	**6253.1-8**	**6253.1-9**
2009 PA riffle freestone metrics										
	Taxa Richness	24	23	28	35	30	26	34	35	31
	EPT Richness (0-4)	2	0	6	10	13	13	15	15	13
	Beck's Index, version 3	3	0	8	11	16	19	24	22	17
	HBI	6.09	6.15	5.63	5.25	3.76	3.31	3.01	3.43	3.62
	Shannon Diversity	2.52	2.22	2.81	2.82	2.79	2.59	2.63	2.62	2.84
	% Sensitive ind. (0-3)	2.51	5.56	8.26	14.14	42.11	65.90	55.42	47.50	47.58
Metric Scores										
	Taxa Richness	0.727	0.697	0.848	1.000	0.909	0.788	1.000	1.000	0.939
	EPT Richness	0.105	0.000	0.316	0.526	0.684	0.684	0.789	0.789	0.684
	Beck's Index, version 3	0.079	0.000	0.211	0.289	0.421	0.500	0.632	0.579	0.447
	HBI	0.482	0.475	0.539	0.586	0.769	0.824	0.862	0.810	0.787
	Shannon Diversity	0.880	0.775	0.983	0.987	0.975	0.907	0.918	0.917	0.995
	% Sensitive Ind. (0-3)	0.030	0.066	0.098	0.167	0.498	0.780	0.656	0.562	0.563
	IBI	**38.4**	**33.6**	**49.9**	**59.3**	**70.9**	**74.7**	**81.0**	**77.6**	**73.6**

APPENDIX III: WATER QUALITY DATA 2012

Suburban Water Testing Labs

Results Report

Order ID: 12110735

Berks County Conservation District
1238 County Welfare Road
Suite 200
Leesport, PA 19533
Attn: Kathryn O'Brien

Project: Wyomissing Creek
PWSID:

Sample Number: 12110735-01 Site: 001 Customer Sample ID:
Collector: KO Collect Date: 11/12/2012 9:25 AM Sample Type: Grab

Department / Test / Parameter	Result	Units	Method	R.L.	Prep Date	By	Analysis Date	By
Inorganics								
Alkalinity, Total (to pH 4.5)	137	mg/L as CaCO3	SM 2320-B	10			11/15/12 14:53	MAW
Ammonia as N	<0.10	mg/L as N	ASTM D6919-03	0.1	11/15/12	ENY	11/16/12 10:06	ENY
Chloride	61.2	mg/L	EPA 300.0	5			11/13/12 17:27	ENY
Hardness, Total as CaCO3	215	mg/L	SM 2340-C	10			11/13/12 12:06	KPH
Nitrate / Nitrite (Combined)								
Nitrate as N	3.3	mg/L	EPA 300.0	1			11/13/12 17:27	ENY
Nitrite as N	0.2	mg/L	EPA 300.0	0.1			11/13/12 17:27	ENY
Nitrogen, Nitrate-Nitrite	3.5	mg/L	EPA 300.0	1			11/13/12 17:27	ENY
Orthophosphate as P	0.08	mg/L	SM 4500-P-E	0.02			11/13/12 18:25	APR
Sulfate	28.9	mg/L	EPA 300.0	5			11/13/12 17:27	ENY
Total Dissolved Solids (TDS)	320	mg/L	SM 2540-C	25			11/13/12 17:16	TRH
Total Kjeldahl Nitrogen (TKN)	0.64	mg/L	EPA 351.2	0.5	11/14/12	KPH	11/15/12 13:40	ENY
Total Nitrogen	4.1	mg/L	Calculation				11/21/12 12:34	RJZ
Total Phosphorous as P	<0.02	mg/L	SM 4500-P-B/F	0.02	11/13/12	APR	11/14/12 11:24	ENY
Total Suspended Solids (TSS)	<4.0	mg/L	SM 2540-D	4			11/14/12 13:58	MAW
Turbidity	0.3	NTU	EPA 180.1	0.1			11/13/12 12:52	KPH
Metals								
Aluminum	0.006	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV
Calcium	62.7	mg/L	SM 3111-B	5	11/16/12	RPV	11/20/12 16:14	RPV
Copper	<0.001	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Iron	0.023	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV
Lead	<0.001	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Magnesium	18.4	mg/L	SM 3111-B	0.5	11/16/12	RPV	11/20/12 16:14	RPV
Manganese	0.005	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Nickel	0.0007	mg/L	EPA 200.8	0.0004	11/15/12	RPV	11/19/12 14:45	RPV
Zinc	<0.005	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV

Comments:

Report Generated On:11/21/2012 17:42 12110735 Page 1 of 5
SWTL_ResultsByOrderID Revision# 1.4 Effective: 11/15/2011

Suburban Water Testing Laboratories, Inc
1037F MacArthur Road, Reading, PA 19605
Phone: 800-433-6595 Fax: 610-375-4090 Website: h2otest.com

PA DEP # 06-00208

Suburban Water Testing Labs

Sample Number: 12110735-02 Site: 002 Customer Sample ID:

Collector: KO Collect Date: 11/12/2012 11:00 AM Sample Type:

Department / Test / Parameter	Result	Units	Method	R.L.	Prep Date	By	Analysis Date	By
Inorganics								
Alkalinity, Total (to pH 4.5)	232	mg/L as CaCO3	SM 2320-B	10			11/15/12 14:53	MAW
Ammonia as N	<0.10	mg/L as N	ASTM D6919-03	0.1	11/15/12	ENY	11/16/12 10:06	ENY
Chloride	108	mg/L	EPA 300.0	5			11/13/12 17:27	ENY
Hardness, Total as CaCO3	320	mg/L	SM 2340-C	10			11/13/12 12:06	KPH
Nitrate / Nitrite (Combined)								
Nitrate as N	4.4	mg/L	EPA 300.0	1			11/13/12 17:27	ENY
Nitrite as N	<0.1	mg/L	EPA 300.0	0.1			11/13/12 17:27	ENY
Nitrogen, Nitrate-Nitrite	4.4	mg/L	EPA 300.0	1			11/13/12 17:27	ENY
Orthophosphate as P	0.09	mg/L	SM 4500-P-E	0.02			11/13/12 18:25	APR
Sulfate	38.4	mg/L	EPA 300.0	5			11/13/12 17:27	ENY
Total Dissolved Solids (TDS)	491	mg/L	SM 2540-C	25			11/13/12 17:16	TRH
Total Kjeldahl Nitrogen (TKN)	<0.50	mg/L	EPA 351.2	0.5	11/14/12	KPH	11/15/12 13:40	ENY
Total Nitrogen	4.4	mg/L	Calculation				11/21/12 12:34	RJZ
Total Phosphorous as P	<0.02	mg/L	SM 4500-P-B/F	0.02	11/13/12	APR	11/14/12 11:24	ENY
Total Suspended Solids (TSS)	<4.0	mg/L	SM 2540-D	4			11/14/12 13:58	MAW
Turbidity	0.4	NTU	EPA 180.1	0.1			11/13/12 12:52	KPH
Metals								
Aluminum	0.007	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV
Calcium	91.2	mg/L	SM 3111-B	5	11/16/12	RPV	11/20/12 16:14	RPV
Copper	<0.001	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Iron	0.013	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV
Lead	<0.001	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Magnesium	27.3	mg/L	SM 3111-B	0.5	11/16/12	RPV	11/20/12 16:14	RPV
Manganese	0.004	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Nickel	0.0009	mg/L	EPA 200.8	0.0004	11/15/12	RPV	11/19/12 14:45	RPV
Zinc	<0.005	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV

Comments:

Sample Number: 12110735-03 Site: 003 Customer Sample ID:

Collector: KO Collect Date: 11/12/2012 12:15 PM Sample Type: Grab

Department / Test / Parameter	Result	Units	Method	R.L.	Prep Date	By	Analysis Date	By
Inorganics								
Alkalinity, Total (to pH 4.5)	98.0	mg/L as CaCO3	SM 2320-B	10			11/15/12 14:53	MAW
Ammonia as N	<0.10	mg/L as N	ASTM D6919-03	0.1	11/15/12	ENY	11/16/12 10:06	ENY
Chloride	35.6	mg/L	EPA 300.0	5			11/13/12 17:27	ENY
Hardness, Total as CaCO3	146	mg/L	SM 2340-C	10			11/13/12 12:06	KPH
Nitrate / Nitrite (Combined)								
Nitrate as N	2.8	mg/L	EPA 300.0	1			11/13/12 17:27	ENY
Nitrite as N	0.1	mg/L	EPA 300.0	0.1			11/13/12 17:27	ENY

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Department / Test / Parameter	Result	Units	Method	R.L.	Prep Date	By	Analysis Date	By
Nitrogen, Nitrate-Nitrite	2.9	mg/L	EPA 300.0	1			11/13/12 17:27	ENY
Orthophosphate as P	0.08	mg/L	SM 4500-P-E	0.02			11/13/12 18:25	APR
Sulfate	19.2	mg/L	EPA 300.0	5			11/13/12 17:27	ENY
Total Dissolved Solids (TDS)	216	mg/L	SM 2540-C	25			11/13/12 17:16	TRH
Total Kjeldahl Nitrogen (TKN)	0.62	mg/L	EPA 351.2	0.5	11/14/12	KPH	11/15/12 13:40	ENY
Total Nitrogen	3.5	mg/L	Calculation				11/21/12 12:34	RJZ
Total Phosphorous as P	<0.02	mg/L	SM 4500-P-B/F	0.02	11/13/12	APR	11/14/12 11:24	ENY
Total Suspended Solids (TSS)	<4.0	mg/L	SM 2540-D	4			11/14/12 13:58	MAW
Turbidity	0.5	NTU	EPA 180.1	0.1			11/13/12 12:52	KPH
Metals								
Aluminum	0.007	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV
Calcium	46.2	mg/L	SM 3111-B	5	11/16/12	RPV	11/20/12 16:14	RPV
Copper	<0.001	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Iron	0.037	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV
Lead	<0.001	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Magnesium	12.0	mg/L	SM 3111-B	0.5	11/16/12	RPV	11/20/12 16:14	RPV
Manganese	0.006	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Nickel	0.0006	mg/L	EPA 200.8	0.0004	11/15/12	RPV	11/19/12 14:45	RPV
Zinc	<0.005	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV

Comments:

Sample Number: 12110735-04 Site: 006 Customer Sample ID:

Collector: KO Collect Date: 11/12/2012 2:45 PM Sample Type:

Department / Test / Parameter	Result	Units	Method	R.L.	Prep Date	By	Analysis Date	By
Inorganics								
Alkalinity, Total (to pH 4.5)	66.0	mg/L as CaCO3	SM 2320-B	10			11/15/12 14:53	MAW
Ammonia as N	<0.10	mg/L as N	ASTM D6919-03	0.1	11/15/12	ENY	11/16/12 10:06	ENY
Chloride	24.9	mg/L	EPA 300.0	5			11/13/12 17:27	ENY
Hardness, Total as CaCO3	92	mg/L	SM 2340-C	10			11/13/12 12:06	KPH
Nitrate / Nitrite (Combined)								
Nitrate as N	2.4	mg/L	EPA 300.0	1			11/13/12 17:27	ENY
Nitrite as N	0.1	mg/L	EPA 300.0	0.1			11/13/12 17:27	ENY
Nitrogen, Nitrate-Nitrite	2.5	mg/L	EPA 300.0	1			11/13/12 17:27	ENY
Orthophosphate as P	0.07	mg/L	SM 4500-P-E	0.02			11/13/12 18:25	APR
Sulfate	16.1	mg/L	EPA 300.0	5			11/13/12 17:27	ENY
Total Dissolved Solids (TDS)	171	mg/L	SM 2540-C	25			11/13/12 17:16	TRH
Total Kjeldahl Nitrogen (TKN)	0.54	mg/L	EPA 351.2	0.5	11/14/12	KPH	11/15/12 13:40	ENY
Total Nitrogen	3.0	mg/L	Calculation				11/21/12 12:34	RJZ
Total Phosphorous as P	<0.02	mg/L	SM 4500-P-B/F	0.02	11/13/12	APR	11/14/12 11:24	ENY
Total Suspended Solids (TSS)	<4.0	mg/L	SM 2540-D	4			11/14/12 13:58	MAW
Turbidity	0.7	NTU	EPA 180.1	0.1			11/13/12 12:52	KPH
Metals								
Aluminum	0.046	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV

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Department / Test / Parameter	Result	Units	Method	R.L.	Prep Date	By	Analysis Date	By
Calcium	29.9	mg/L	SM 3111-B	5	11/16/12	RPV	11/20/12 16:14	RPV
Copper	<0.001	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Iron	0.110	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV
Lead	<0.001	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Magnesium	6.5	mg/L	SM 3111-B	0.5	11/16/12	RPV	11/20/12 16:14	RPV
Manganese	0.018	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Nickel	0.0006	mg/L	EPA 200.8	0.0004	11/15/12	RPV	11/19/12 14:45	RPV
Zinc	<0.005	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV

Comments:

Sample Number: 12110735-05 Site: 005 Customer Sample ID:

Collector: KO Collect Date: 11/12/2012 1:50 PM Sample Type:

Department / Test / Parameter	Result	Units	Method	R.L.	Prep Date	By	Analysis Date	By
Inorganics								
Alkalinity, Total (to pH 4.5)	101	mg/L as CaCO3	SM 2320-B	10			11/15/12 14:53	MAW
Ammonia as N	<0.10	mg/L as N	ASTM D6919-03	0.1	11/15/12	ENY	11/16/12 10:06	ENY
Chloride	60.4	mg/L	EPA 300.0	5			11/13/12 17:27	ENY
Hardness, Total as CaCO3	172	mg/L	SM 2340-C	10			11/13/12 12:06	KPH
Nitrate / Nitrite (Combined)								
Nitrate as N	2.7	mg/L	EPA 300.0	1			11/13/12 17:27	ENY
Nitrite as N	0.1	mg/L	EPA 300.0	0.1			11/13/12 17:27	ENY
Nitrogen, Nitrate-Nitrite	2.8	mg/L	EPA 300.0	1			11/13/12 17:27	ENY
Orthophosphate as P	0.03	mg/L	SM 4500-P-E	0.02			11/13/12 18:25	APR
Sulfate	23.8	mg/L	EPA 300.0	5			11/13/12 17:27	ENY
Total Dissolved Solids (TDS)	284	mg/L	SM 2540-C	25			11/13/12 17:16	TRH
Total Kjeldahl Nitrogen (TKN)	0.52	mg/L	EPA 351.2	0.5	11/14/12	KPH	11/15/12 13:40	ENY
Total Nitrogen	3.3	mg/L	Calculation				11/21/12 12:34	RJZ
Total Phosphorous as P	<0.02	mg/L	SM 4500-P-B/F	0.02	11/13/12	APR	11/14/12 11:24	ENY
Total Suspended Solids (TSS)	<4.0	mg/L	SM 2540-D	4			11/14/12 13:58	MAW
Turbidity	0.7	NTU	EPA 180.1	0.1			11/13/12 12:52	KPH
Metals								
Aluminum	0.008	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV
Calcium	54.8	mg/L	SM 3111-B	5	11/16/12	RPV	11/20/12 16:14	RPV
Copper	0.001	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Iron	0.105	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV
Lead	<0.001	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Magnesium	12.8	mg/L	SM 3111-B	0.5	11/16/12	RPV	11/20/12 16:14	RPV
Manganese	0.039	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Nickel	0.0008	mg/L	EPA 200.8	0.0004	11/15/12	RPV	11/19/12 14:45	RPV
Zinc	<0.005	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV

Comments:

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Approved By:
Rebecca J. Zettlemoyer
Laboratory Manager

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PA DEP # 06-00208

Suburban Water Testing Labs

Results Report

Order ID: 12110899

Berks County Conservation District
1238 County Welfare Road
Suite 200
Leesport, PA 19533
Attn: Kathryn O'Brien

Project: Wyomissing Creek
PWSID:

Sample Number: 12110899-01 Site: 007 Customer Sample ID:
Collector: KO Collect Date: 11/13/2012 11:30 AM Sample Type: Grab

Department / Test / Parameter	Result	Units	Method	R.L.	Prep Date	By	Analysis Date	By
Inorganics								
Alkalinity, Total (to pH 4.5)	66.0	mg/L as CaCO3	SM 2320-B	10			11/19/12 11:16	MAW
Ammonia as N	<0.10	mg/L as N	ASTM D6919-03	0.1	11/16/12	ENY	11/17/12 9:55	ENY
Chloride	42.0	mg/L	EPA 300.0	5			11/14/12 18:36	ENY
Hardness, Total as CaCO3	100	mg/L	SM 2340-C	10			11/15/12 18:00	KPH
Nitrate / Nitrite (Combined)								
Nitrate as N	2.0	mg/L	EPA 300.0	1			11/14/12 18:36	ENY
Nitrite as N	<0.1	mg/L	EPA 300.0	0.1			11/14/12 18:36	ENY
Nitrogen, Nitrate-Nitrite	2.0	mg/L	EPA 300.0	1			11/14/12 18:36	ENY
Orthophosphate as P	0.10	mg/L	SM 4500-P-E	0.02			11/14/12 18:40	APR
Sulfate	13.5	mg/L	EPA 300.0	5			11/14/12 18:36	ENY
Total Dissolved Solids (TDS)	154	mg/L	SM 2540-C	25			11/15/12 17:45	TRH
Total Kjeldahl Nitrogen (TKN)	0.53	mg/L	EPA 351.2	0.5	11/19/12	KPH	11/20/12 11:30	JGY
Total Nitrogen	2.5	mg/L	Calculation				11/21/12 12:34	RJZ
Total Phosphorous as P	0.02	mg/L	SM 4500-P-B/F	0.02	11/15/12	JGY	11/16/12 12:42	ENY
Total Suspended Solids (TSS)	6.4	mg/L	SM 2540-D	4			11/16/12 14:20	MAW
Turbidity	8.5	NTU	EPA 180.1	0.1			11/14/12 18:11	KPH
Metals								
Aluminum	0.331	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV
Calcium	30.3	mg/L	SM 3111-B	5	11/16/12	RPV	11/20/12 16:14	RPV
Copper	0.003	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Iron	0.499	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV
Lead	<0.001	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Magnesium	8.2	mg/L	SM 3111-B	0.5	11/16/12	RPV	11/20/12 16:14	RPV
Manganese	0.028	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Nickel	0.0010	mg/L	EPA 200.8	0.0004	11/15/12	RPV	11/19/12 14:45	RPV
Zinc	0.006	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV

Comments:

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Suburban Water Testing Labs

Sample Number: 12110899-02 Site: 008 Customer Sample ID:

Collector: KO Collect Date: 11/13/2012 1:15 PM Sample Type: Grab

Department / Test / Parameter	Result	Units	Method	R.L.	Prep Date	By	Analysis Date	By
Inorganics								
Alkalinity, Total (to pH 4.5)	37.0	mg/L as CaCO3	SM 2320-B	10			11/19/12 11:16	MAW
Ammonia as N	<0.10	mg/L as N	ASTM D6919-03	0.1	11/16/12	ENY	11/17/12 9:55	ENY
Chloride	12.6	mg/L	EPA 300.0	5			11/14/12 18:36	ENY
Hardness, Total as CaCO3	59	mg/L	SM 2340-C	10			11/15/12 18:00	KPH
Nitrate / Nitrite (Combined)								
Nitrate as N	1.9	mg/L	EPA 300.0	1			11/14/12 18:36	ENY
Nitrite as N	<0.1	mg/L	EPA 300.0	0.1			11/14/12 18:36	ENY
Nitrogen, Nitrate-Nitrite	1.9	mg/L	EPA 300.0	1			11/14/12 18:36	ENY
Orthophosphate as P	0.06	mg/L	SM 4500-P-E	0.02			11/14/12 18:40	APR
Sulfate	12.6	mg/L	EPA 300.0	5			11/14/12 18:36	ENY
Total Dissolved Solids (TDS)	92.9	mg/L	SM 2540-C	25			11/15/12 17:45	TRH
Total Kjeldahl Nitrogen (TKN)	<0.50	mg/L	EPA 351.2	0.5	11/19/12	KPH	11/20/12 11:30	JGY
Total Nitrogen	1.9	mg/L	Calculation				11/21/12 12:34	RJZ
Total Phosphorous as P	<0.02	mg/L	SM 4500-P-B/F	0.02	11/15/12	JGY	11/16/12 12:42	ENY
Total Suspended Solids (TSS)	6.8	mg/L	SM 2540-D	4			11/16/12 14:20	MAW
Turbidity	8.1	NTU	EPA 180.1	0.1			11/14/12 18:11	KPH
Metals								
Aluminum	0.211	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV
Calcium	19.7	mg/L	SM 3111-B	5	11/16/12	RPV	11/20/12 16:14	RPV
Copper	0.001	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Iron	0.399	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV
Lead	<0.001	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Magnesium	3.6	mg/L	SM 3111-B	0.5	11/16/12	RPV	11/20/12 16:14	RPV
Manganese	0.051	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Nickel	0.0008	mg/L	EPA 200.8	0.0004	11/15/12	RPV	11/19/12 14:45	RPV
Zinc	0.006	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV

Comments:

Sample Number: 12110899-03 Site: 009 Customer Sample ID:

Collector: KO Collect Date: 11/13/2012 2:15 PM Sample Type:

Department / Test / Parameter	Result	Units	Method	R.L.	Prep Date	By	Analysis Date	By
Inorganics								
Alkalinity, Total (to pH 4.5)	50.0	mg/L as CaCO3	SM 2320-B	10			11/19/12 11:16	MAW
Ammonia as N	<0.10	mg/L as N	ASTM D6919-03	0.1	11/16/12	ENY	11/17/12 9:55	ENY
Chloride	12.0	mg/L	EPA 300.0	5			11/14/12 18:36	ENY
Hardness, Total as CaCO3	68	mg/L	SM 2340-C	10			11/15/12 18:00	KPH
Nitrate / Nitrite (Combined)								
Nitrate as N	2.4	mg/L	EPA 300.0	1			11/14/12 18:36	ENY
Nitrite as N	<0.1	mg/L	EPA 300.0	0.1			11/14/12 18:36	ENY

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Department / Test / Parameter	Result	Units	Method	R.L.	Prep Date	By	Analysis Date	By
Nitrogen, Nitrate-Nitrite	2.4	mg/L	EPA 300.0	1			11/14/12 18:36	ENY
Orthophosphate as P	0.08	mg/L	SM 4500-P-E	0.02			11/14/12 18:40	APR
Sulfate	13.3	mg/L	EPA 300.0	5			11/14/12 18:36	ENY
Total Dissolved Solids (TDS)	80.0	mg/L	SM 2540-C	25			11/15/12 17:45	TRH
Total Kjeldahl Nitrogen (TKN)	<0.50	mg/L	EPA 351.2	0.5	11/19/12	KPH	11/20/12 11:30	JGY
Total Nitrogen	2.4	mg/L	Calculation				11/21/12 12:34	RJZ
Total Phosphorous as P	<0.02	mg/L	SM 4500-P-B/F	0.02	11/15/12	JGY	11/16/12 12:42	ENY
Total Suspended Solids (TSS)	<4.0	mg/L	SM 2540-D	4			11/16/12 14:52	MAW
Turbidity	4.2	NTU	EPA 180.1	0.1			11/14/12 18:11	KPH
Metals								
Aluminum	0.092	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV
Calcium	25.3	mg/L	SM 3111-B	5	11/16/12	RPV	11/20/12 16:14	RPV
Copper	<0.001	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Iron	0.177	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV
Lead	<0.001	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Magnesium	3.6	mg/L	SM 3111-B	0.5	11/16/12	RPV	11/20/12 16:14	RPV
Manganese	0.038	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Nickel	0.0006	mg/L	EPA 200.8	0.0004	11/15/12	RPV	11/19/12 14:45	RPV
Zinc	<0.005	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV

Comments:

Sample Number: 12110899-04 Site: 010 Customer Sample ID:

Collector: KO Collect Date: 11/13/2012 3:30 PM Sample Type: Grab

Department / Test / Parameter	Result	Units	Method	R.L.	Prep Date	By	Analysis Date	By
Inorganics								
Alkalinity, Total (to pH 4.5)	32.0	mg/L as CaCO3	SM 2320-B	10			11/19/12 11:16	MAW
Ammonia as N	<0.10	mg/L as N	ASTM D6919-03	0.1	11/16/12	ENY	11/17/12 9:55	ENY
Chloride	11.9	mg/L	EPA 300.0	5			11/14/12 18:36	ENY
Hardness, Total as CaCO3	44	mg/L	SM 2340-C	10			11/15/12 18:00	KPH
Nitrate / Nitrite (Combined)								
Nitrate as N	1.5	mg/L	EPA 300.0	1			11/14/12 18:36	ENY
Nitrite as N	<0.1	mg/L	EPA 300.0	0.1			11/14/12 18:36	ENY
Nitrogen, Nitrate-Nitrite	1.5	mg/L	EPA 300.0	1			11/14/12 18:36	ENY
Orthophosphate as P	0.08	mg/L	SM 4500-P-E	0.02			11/14/12 18:40	APR
Sulfate	10.5	mg/L	EPA 300.0	5			11/14/12 18:36	ENY
Total Dissolved Solids (TDS)	47.1	mg/L	SM 2540-C	25			11/15/12 17:45	TRH
Total Kjeldahl Nitrogen (TKN)	<0.50	mg/L	EPA 351.2	0.5	11/19/12	KPH	11/20/12 11:30	JGY
Total Nitrogen	1.5	mg/L	Calculation				11/21/12 12:34	RJZ
Total Phosphorous as P	<0.02	mg/L	SM 4500-P-B/F	0.02	11/15/12	JGY	11/16/12 12:42	ENY
Total Suspended Solids (TSS)	<4.0	mg/L	SM 2540-D	4			11/16/12 14:52	MAW
Turbidity	2.3	NTU	EPA 180.1	0.1			11/14/12 18:11	KPH
Metals								
Aluminum	0.042	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV

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PA DEP # 06-00208

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Department / Test / Parameter	Result	Units	Method	R.L.	Prep Date	By	Analysis Date	By
Calcium	16.6	mg/L	SM 3111-B	5	11/16/12	RPV	11/20/12 16:14	RPV
Copper	0.001	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Iron	0.127	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV
Lead	<0.001	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Magnesium	2.6	mg/L	SM 3111-B	0.5	11/16/12	RPV	11/20/12 16:14	RPV
Manganese	0.024	mg/L	EPA 200.8	0.001	11/15/12	RPV	11/19/12 14:45	RPV
Nickel	0.0005	mg/L	EPA 200.8	0.0004	11/15/12	RPV	11/19/12 14:45	RPV
Zinc	<0.005	mg/L	EPA 200.8	0.005	11/15/12	RPV	11/19/12 14:45	RPV

Comments:

All results meet the requirements of SWTL's TNI (NELAC) Accredited Quality System unless otherwise noted.
All results reported on an As Received (Wet Weight) basis unless otherwise noted.

Approved By:
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