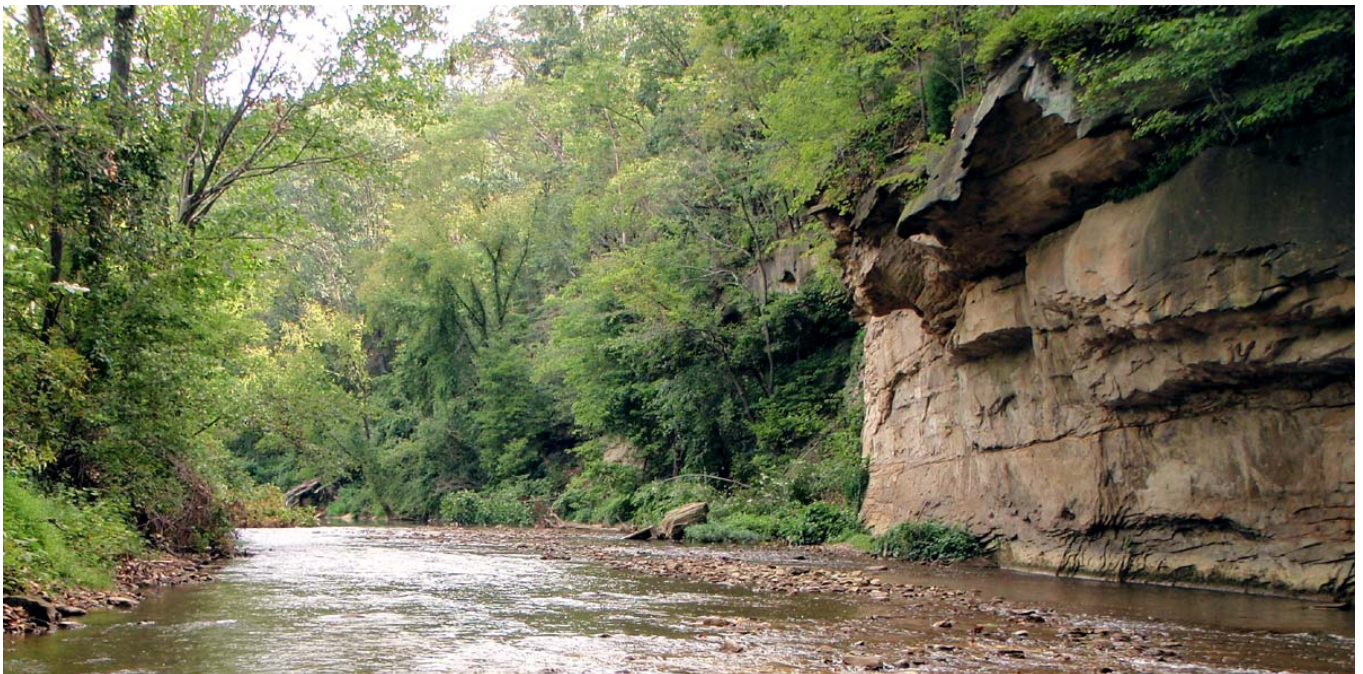




**Appendices to
Biological and Water Quality Study
of the Wheeling Creek Watershed
2010 & 2011**

Belmont, Jefferson and Harrison Counties



OHIO EPA Technical Report EAS/2013-02-04

Division of Surface Water
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APPENDICES

Biological and Water Quality Study Of Wheeling Creek Watershed 2010 & 2011

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Appendix 1. Notice to Users, Mechanisms for Water Quality Improvement and Methods

NOTICE TO USERS

Ohio EPA incorporated biological criteria into the Ohio Water Quality Standards (WQS; Ohio Administrative Code 3745-1) regulations in February 1990 (effective May 1990). These criteria consist of numeric values for the Index of Biotic Integrity (IBI) and Modified Index of Well-Being (MIwb), both of which are based on fish assemblage data, and the Invertebrate Community Index (ICI), which is based on macroinvertebrate assemblage data. Criteria for each index are specified for each of Ohio's five ecoregions (as described by Omernik and Gallant 1988), and are further organized by organism group, index, site type, and aquatic life use designation. These criteria, along with the existing chemical and whole effluent toxicity evaluation methods and criteria, figure prominently in the monitoring and assessment of Ohio's surface water resources.

The following documents support the use of biological criteria by outlining the rationale for using biological information, the methods by which the biocriteria were derived and calculated, the field methods by which sampling must be conducted, and the process for evaluating results:

Ohio Environmental Protection Agency. 1987a. Biological criteria for the protection of aquatic life: Volume I. The role of biological data in water quality assessment. Div. Water Qual. Monit. & Assess., Surface Water Section, Columbus, Ohio.

_____. 1987b. Biological criteria for the protection of aquatic life: Volume II. Users manual for biological field assessment of Ohio surface waters. Div. Water Qual. Monit. & Assess., Surface Water Section, Columbus, Ohio.

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_____. 1989b. Biological criteria for the protection of aquatic life: Volume III. Standardized biological field sampling and laboratory methods for assessing fish and macroinvertebrate communities. Div. Water Quality Plan. & Assess., Ecol. Assess. Sect., Columbus, Ohio.

_____. 1990. The use of biological criteria in the Ohio EPA surface water monitoring and assessment program. Div. Water Qual. Plan. & Assess., Ecol. Assess. Sect., Columbus, Ohio.

Rankin, E.T. 1989. The qualitative habitat evaluation index (QHEI): rationale, methods, and application. Div. Water Qual. Plan. & Assess., Ecol. Assess. Sect., Columbus, Ohio.

Since the publication of the preceding guidance documents, the following new publications by the Ohio EPA have become available. These publications should also be consulted as they represent the latest information and analyses used by the Ohio EPA to implement the biological criteria.

DeShon, J.E. 1995. Development and application of the invertebrate community index (ICI), pp. 217-243. in W.S. Davis and T. Simon (eds.). Biological Assessment and Criteria: Tools for Risk-based Planning and Decision Making. Lewis Publishers, Boca Raton, FL.

Ohio Environmental Protection Agency. 2006. Methods for assessing habitat in flowing waters: Using

- the Qualitative Habitat Evaluation Index (QHEI). Ohio EPA Tech. Bull. EAS/2006-06-1. Revised by the Midwest Biodiversity Institute for Div. of Surface Water, Ecol. Assess. Sect., Groveport, Ohio.
- _____. 2014a. 2014 Updates to Biological criteria for the protection of aquatic life: Volume II and Volume II Addendum. Users manual for biological field assessment of Ohio surface waters. Div. of Surface Water, Ecol. Assess. Sect., Columbus, Ohio.
- _____. 2014b. 2014 Updates to Biological criteria for the protection of aquatic life: Volume III. Standardized biological field sampling and laboratory methods for assessing fish and macroinvertebrate communities. Div. of Surface Water, Ecol. Assess. Sect., Columbus, Ohio.
- Rankin, E. T. 1995. The use of habitat assessments in water resource management programs, pp. 181-208. in W. Davis and T. Simon (eds.). *Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making*. Lewis Publishers, Boca Raton, FL.
- Yoder, C.O. 1995. Policy issues and management applications for biological criteria, pp. 327-344. in W. Davis and T. Simon (eds.). *Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making*. Lewis Publishers, Boca Raton, FL.
- Yoder, C.O. and E.T. Rankin. 1995a. Biological criteria program development and implementation in Ohio, pp. 109-144. in W. Davis and T. Simon (eds.). *Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making*. Lewis Publishers, Boca Raton, FL.
- Yoder, C.O. and E.T. Rankin. 1995b. Biological response signatures and the area of degradation value: new tools for interpreting multimetric data, pp. 263-286. in W. Davis and T. Simon (eds.). *Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making*. Lewis Publishers, Boca Raton, FL.
- Yoder, C.O. and E.T. Rankin. 1995c. The role of biological criteria in water quality monitoring, assessment, and regulation. *Environmental Regulation in Ohio: How to Cope With the Regulatory Jungle*. Inst. of Business Law, Santa Monica, CA. 54 pp.
- Yoder, C.O. and M.A. Smith. 1999. Using fish assemblages in a State biological assessment and criteria program: essential concepts and considerations, pp. 17-63. in T. Simon (ed.). *Assessing the Sustainability and Biological Integrity of Water Resources Using Fish Communities*. CRC Press, Boca Raton, FL.

These documents and this report may be obtained by contacting:

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FOREWORD

What is a Biological and Water Quality Survey?

A biological and water quality survey, or “biosurvey”, is an interdisciplinary monitoring effort coordinated on a waterbody specific or watershed scale. This effort may involve a relatively simple setting focusing on one or two small streams, one or two principal stressors, and a handful of sampling sites or a much more complex effort including entire drainage basins, multiple and overlapping stressors, and tens of sites. Each year the Ohio EPA conducts biosurveys in 4-5 watersheds study areas with an aggregate total of 250-300 sampling sites.

The Ohio EPA employs biological, chemical, and physical monitoring and assessment techniques in biosurveys in order to meet three major objectives: 1) determine the extent to which use designations assigned in the Ohio Water Quality Standards (WQS) are either attained or not attained; 2) determine if use designations assigned to a given water body are appropriate and attainable; and 3) determine if any changes in key ambient biological, chemical, or physical indicators have taken place over time, particularly before and after the implementation of point source pollution controls or best management practices. The data gathered by a biosurvey is processed, evaluated, and synthesized in a biological and water quality report. Each biological and water quality study contains a summary of major findings and recommendations for revisions to WQS, future monitoring needs, or other actions which may be needed to resolve existing impairment of designated uses. While the principal focus of a biosurvey is on the status of aquatic life uses, the status of other uses such as recreation and water supply, as well as human health concerns are also addressed.

The findings and conclusions of a biological and water quality study may factor into regulatory actions taken by the Ohio EPA (*e.g.*, NPDES permits, Director’s Orders, the Ohio Water Quality Standards [OAC 3745-1], Water Quality Permit Support Documents [WQPSDs]), and are eventually incorporated into State Water Quality Management Plans, the Ohio Nonpoint Source Assessment, and the biennial Integrated Water Quality Monitoring and Assessment Report (305[b] and 303[d]).

Hierarchy of Indicators

A carefully conceived ambient monitoring approach, using cost-effective indicators consisting of ecological, chemical, and toxicological measures, can ensure that all relevant pollution sources are judged objectively on the basis of environmental results. Ohio EPA relies on a tiered approach in attempting to link the results of administrative activities with true environmental measures. This integrated approach includes a hierarchical continuum from administrative to true environmental indicators (Figure 1). The six “levels” of indicators include: 1) actions taken by regulatory agencies (permitting, enforcement, grants); 2) responses by the regulated community (treatment works, pollution prevention); 3) changes in discharged quantities (pollutant loadings); 4) changes in ambient conditions (water quality, habitat); 5) changes in uptake and/or assimilation (tissue contamination, biomarkers, wasteload allocation); and, 6) changes in health, ecology, or other effects (ecological condition, pathogens). The results of administrative activities (levels 1 and 2) can be linked to efforts to improve water quality (levels 3, 4, and 5) which should translate into the environmental “results” (level 6). Thus, the aggregate effect of billions of dollars spent on water pollution control since the early 1970s can now be determined with quantifiable measures of environmental condition.

Superimposed on this hierarchy is the concept of stressor, exposure, and response indicators. *Stressor* indicators generally include activities which have the potential to degrade the aquatic environment such as pollutant discharges (permitted and unpermitted), land use effects, and habitat modifications. *Exposure* indicators are those which measure the effects of stressors and can include whole effluent toxicity tests, tissue residues, and biomarkers, each of which provides evidence of biological exposure to

a stressor or bioaccumulative agent. *Response* indicators are generally composite measures of the cumulative effects of stress and exposure and include the more direct measures of community and population response that are represented here by the biological indices which comprise Ohio's biological criteria. Other response indicators could include target assemblages, *i.e.*, rare, threatened, endangered, special status, and declining species or bacterial levels which serve as surrogates for the recreational uses. These indicators represent the essential technical elements for watershed-based management approaches. The key, however, is to use the different indicators *within* the roles which are most appropriate for each.

Describing the causes and sources associated with observed impairments revealed by the biological criteria and linking this with pollution sources involves an interpretation of multiple lines of evidence including water chemistry data, sediment data, habitat data, effluent data, biomonitoring results, land use data, and biological response signatures within the biological data itself. Thus the assignment of principal causes and sources of impairment represents the association of impairments (defined by response indicators) with stressor and exposure indicators. The principal reporting venue for this process on a watershed or subbasin scale is a biological and water quality report. These reports then provide the foundation for aggregated assessments such as the Integrated Report, the Ohio Nonpoint Source Assessment, and other technical bulletins.

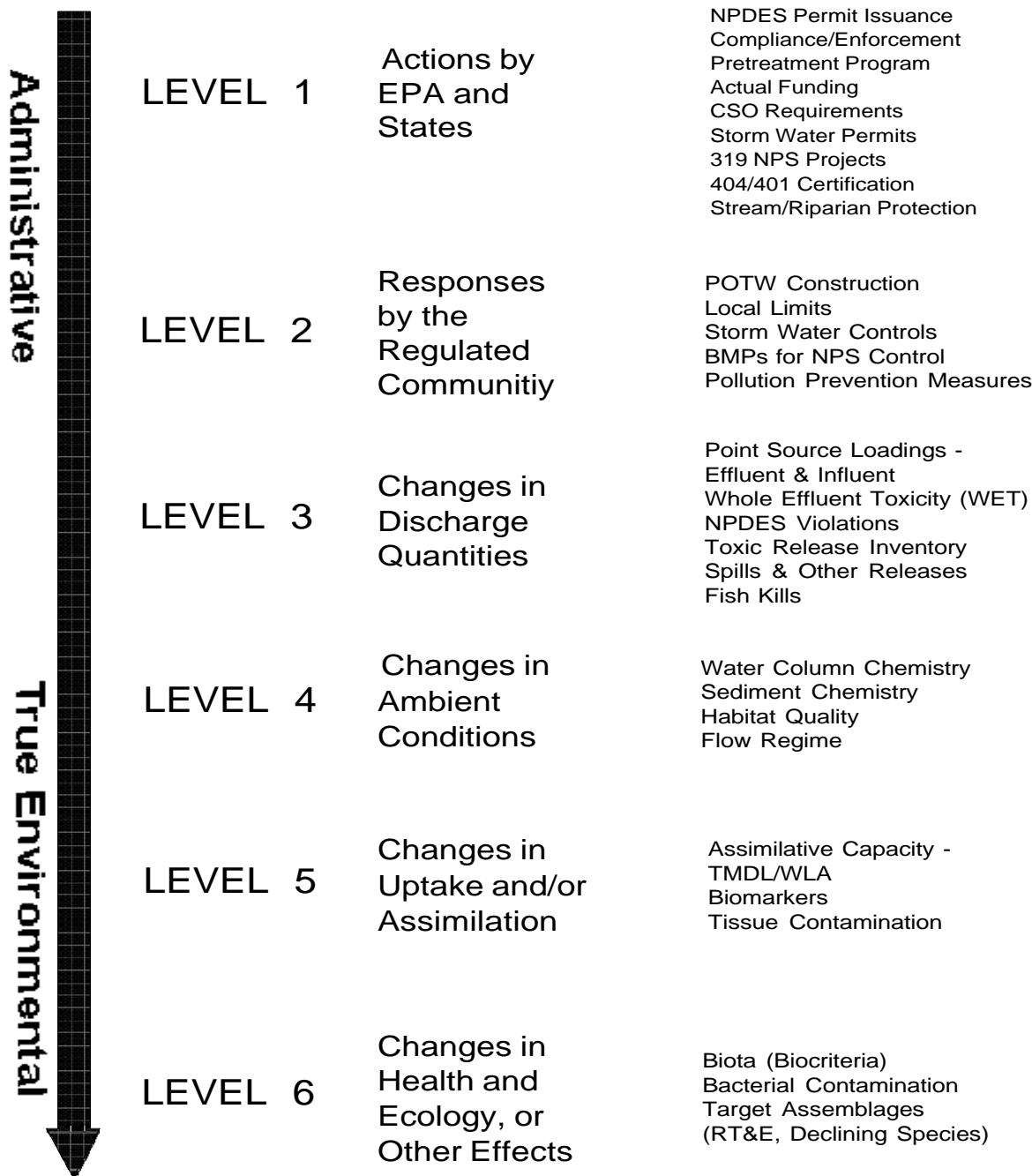


Figure 1. Hierarchy of administrative and environmental indicators which can be used for water quality management activities such as monitoring and assessment, reporting, and the evaluation of overall program effectiveness. This is patterned after a model developed by the U.S. EPA.

Ohio Water Quality Standards: Designated Aquatic Life Use

The Ohio Water Quality Standards (WQS; Ohio Administrative Code 3745-1) consist of designated uses and chemical, physical, and biological criteria designed to represent measurable properties of the environment that are consistent with the goals specified by each use designation. Use designations consist of two broad groups, aquatic life and non-aquatic life uses. In applications of the Ohio WQS to the management of water resource issues in Ohio's rivers and streams, the aquatic life use criteria frequently result in the most stringent protection and restoration requirements, hence their emphasis in biological and water quality reports. Also, an emphasis on protecting for aquatic life generally results in water quality suitable for all uses. The five different aquatic life uses currently defined in the Ohio WQS are described as follows:

- 1) *Warmwater Habitat (WWH)* - this use designation defines the "typical" warmwater assemblage of aquatic organisms for Ohio rivers and streams; *this use represents the principal restoration target for the majority of water resource management efforts in Ohio.*
- 2) *Exceptional Warmwater Habitat (EWH)* - this use designation is reserved for waters which support "unusual and exceptional" assemblages of aquatic organisms which are characterized by a high diversity of species, particularly those which are highly intolerant and/or rare, threatened, endangered, or special status (*i.e.*, declining species); *this designation represents a protection goal for water resource management efforts dealing with Ohio's best water resources.*
- 3) *Coldwater Habitat (CWH)* - this use is intended for waters which support assemblages of coldwater organisms and/or those which are stocked with salmonids with the intent of providing a put-and-take fishery on a year round basis which is further sanctioned by the Ohio DNR, Division of Wildlife; this use should not be confused with the Seasonal Salmonid Habitat (SSH) use which applies to the Lake Erie tributaries which support periodic "runs" of salmonids during the spring, summer, and/or fall.
- 4) *Modified Warmwater Habitat (MWH)* - this use applies to streams and rivers which have been subjected to extensive, maintained, and essentially permanent hydromodifications such that the biocriteria for the WWH use are not attainable *and where the activities have been sanctioned by state or federal law*; the representative aquatic assemblages are generally composed of species which are tolerant to low dissolved oxygen, silt, nutrient enrichment, and poor quality habitat.
- 5) *Limited Resource Water (LRW)* - this use applies to small streams (usually <3 mi² drainage area) and other water courses which have been irretrievably altered to the extent that no appreciable assemblage of aquatic life can be supported; such waterways generally include small streams in extensively urbanized areas, those which lie in watersheds with extensive drainage modifications, those which completely lack water on a recurring annual basis (*i.e.*, true ephemeral streams), or other irretrievably altered waterways.

Chemical, physical, and/or biological criteria are generally assigned to each use designation in accordance with the broad goals defined by each. As such the system of use designations employed in the Ohio WQS constitutes a "tiered" approach in that varying and graduated levels of protection are provided by each. This hierarchy is especially apparent for parameters such as dissolved oxygen, ammonia-nitrogen, temperature, and the biological criteria. For other parameters such as heavy metals,

the technology to construct an equally graduated set of criteria has been lacking, thus the same WQS criteria may apply to two or three different use designations.

Ohio Water Quality Standards: Non-Aquatic Life Uses

In addition to assessing the appropriateness and status of aquatic life uses, each biological and water quality survey also addresses non-aquatic life uses such as recreation, water supply, and human health concerns as appropriate. The recreation uses most applicable to rivers and streams are the Primary Contact Recreation (PCR) and Secondary Contact Recreation (SCR) uses. The criterion for designating the PCR use can be having a water depth of at least one meter over an area of at least 100 square feet or, lacking this, where frequent human contact is a reasonable expectation. If a water body does not meet either criterion, the SCR use applies. The attainment status of PCR and SCR is determined using bacterial indicators (*e.g.*, fecal coliform, *E. coli*) and the criteria for each are specified in the Ohio WQS.

Attainment of recreation uses are evaluated based on monitored bacteria levels. The Ohio Water Quality Standards state that all waters should be free from any public health nuisance associated with raw or poorly treated sewage (Administrative Code 3745-1-04, Part F). Additional criteria (Administrative Code 3745-1-07) apply to waters that are designated as suitable for full body contact such as swimming (PCR) or for partial body contact such as wading (SCR). These standards were developed to protect human health, because even though fecal coliform bacteria are relatively harmless in most cases, their presence indicates that the water has been contaminated with fecal matter.

Water supply uses include Public Water Supply (PWS), Agricultural Water Supply (AWS), and Industrial Water Supply (IWS). Public Water Supplies are simply defined as segments within 500 yards of a potable water supply or food processing industry intake. The Agricultural Water Supply (AWS) and Industrial Water Supply (IWS) use designations generally apply to all waters unless it can be clearly shown that they are not applicable. An example of this would be an urban area where livestock watering or pasturing does not take place, thus the AWS use would not apply. Chemical criteria are specified in the Ohio WQS for each use and attainment status is based primarily on chemical-specific indicators. Human health concerns are additionally addressed with fish tissue data, but any consumption advisories are issued by the Ohio Department of Health.

MECHANISMS FOR WATER QUALITY IMPAIRMENT

The following paragraphs are provided to present the varied causes of impairment that affect the resource quality of lotic systems in Ohio. While the various perturbations are presented under separate headings, it is important to remember that they are often interrelated and cumulative in terms of the detrimental impact that can result.

Habitat and Flow Alterations

Habitat alteration, such as channelization, negatively impacts biological communities directly by limiting the complexity of living spaces available to aquatic organisms. Consequently, fish and macroinvertebrate communities are not as diverse. Indirect impacts include the removal of riparian trees and field tiling to facilitate drainage. Following a rain event, most of the water is quickly removed from tiled fields rather than filtering through the soil, recharging ground water, and reaching the stream at a lower volume and more sustained rate. As a result, small streams more frequently go dry or become intermittent. Urbanization impacts include removal of riparian trees, influx of storm water runoff, straightening and piping of stream channels, and riparian vegetation removal.

Tree shade is important because it limits the energy input from the sun, moderates water temperature, and limits evaporation. Removal of the tree canopy further degrades conditions because it eliminates an important source of coarse organic matter essential for a balanced ecosystem. Riparian vegetation aids in nutrient uptake, may decrease runoff rate into streams, and helps keep soil in place. Erosion impacts channelized streams more severely due to the lack of a riparian buffer zone to slow runoff, trap sediment and stabilize banks. Additionally, deep trapezoidal channels lack a functioning flood plain and therefore cannot expel sediment as would occur during flood events along natural watercourses. The confinement of flow within an artificially deep channel accelerates the movement of water downstream, exacerbating flooding of neighboring properties.

The lack of water movement under low flow conditions can exacerbate impacts from organic loading and nutrient enrichment by limiting re-aeration of the stream. The amount of oxygen soluble in water decreases as temperature increases. This is one reason why tree shade is so important. The two main sources of oxygen in water are diffusion from the atmosphere and plant photosynthesis. Turbulence at the water surface is critical because it increases surface area and promotes diffusion, but channelization eliminates turbulence produced by riffles, meanders, and debris snags. Plant photosynthesis produces oxygen, but at night, respiration reverses the process and consumes oxygen. Conversely, oxygen concentrations can become supersaturated during the day, due to abnormally high amounts of photosynthesis, causing gas bubble stress to both fish and invertebrate communities. Oxygen is also used by bacteria that decay dead organic matter. Nutrient enrichment can promote the growth of nuisance algae that subsequently dies and serves as food for bacteria. Under these conditions, oxygen can be depleted unless it is replenished from the air.

Siltation and Sedimentation

Whenever the natural flow regime is altered to facilitate drainage, increased amounts of sediment are likely to enter streams either by overland transport or increased bank erosion. The removal of wooded riparian areas furthers the erosion process. Channelization keeps all but the highest flow events confined within the artificially high banks. As a result, areas that were formerly flood plains and allowed for the removal of sediment from the primary stream channel no longer serve this function. As water

levels fall following a rain event, interstitial spaces between larger rocks fill with sand and silt and the diversity of available habitat to support fish and macroinvertebrates is reduced. Silt also can clog the gills of both fish and macroinvertebrates, reduce visibility thereby excluding site feeding fish species, and smother the nests of lithophilic fishes. Lithophilic spawning fish require clean substrates with interstitial voids in which to deposit eggs. Conversely, pioneering species benefit. They are generalists and best suited for exploiting disturbed and less heterogeneous habitats. The net result is a lower diversity of aquatic species compared with a typical warmwater stream with natural habitats.

Sediment also impacts water quality, recreation, and drinking water. Nutrients absorbed to soil particles remain trapped in the watercourse. Likewise, bacteria, pathogens, and pesticides which also attach to suspended or bedload sediments become concentrated in waterways where the channel is functionally isolated from the landscape. Community drinking water systems address these issues with more costly advanced treatment technologies.

Nutrient Enrichment

The element of greatest concern is phosphorus because it is critical for plant growth and is often the limiting nutrient. The form that can be readily used by plants and therefore can stimulate nuisance algae blooms is orthophosphate (PO_4^{3-}). The amount of phosphorus tied up in the nucleic acids of food and waste is actually quite low. This organic material is eventually converted to orthophosphate by bacteria. The amount of orthophosphate contained in synthetic detergents is a great concern however. It was for this reason that the General Assembly of the State of Ohio enacted a law in 1990 to limit phosphorus content in household laundry detergents sold in the Lake Erie drainage basin to 0.5% by weight. Inputs of phosphorus originate from both point and nonpoint sources. Most of the phosphorus discharged by point sources is soluble. Another characteristic of point sources is they have a continuous impact and are human in origin, for instance, effluents from municipal sewage treatment plants. The contribution from failed on-lot septic systems can also be significant, especially if they are concentrated in a small area. The phosphorus concentration in raw waste water is generally 8-10 mg/l and after secondary treatment is generally 4-6 mg/l. Further removal requires the added cost of chemical addition. The most common methods use the addition of lime or alum to form a precipitate, so most phosphorus (80%) ends up in the sludge.

A characteristic of phosphorus discharged by nonpoint sources is that the impact is intermittent and associated with storm water runoff. Most of this phosphorus is bound tightly to soil particles and enters streams from erosion, although some comes from tile drainage. Urban storm water is more of a concern if combined sewer overflows are involved. The impact from rural storm water varies depending on land use and management practices and includes contributions from livestock feedlots and pastures and row crop agriculture. Crop fertilizer includes granular inorganic types and organic types such as manure or sewage sludge. Pasture land is especially a concern if the livestock have access to the stream. Large feedlots with manure storage lagoons create the potential for overflows and accidental spills. Land management is an issue because erosion is worse on streams without any riparian buffer zone to trap runoff. The impact is worse in streams that are channelized because they no longer have a functioning flood plain and cannot expel sediment during flooding. Oxygen levels must also be considered, because phosphorus is released from sediment at higher rates under anoxic conditions.

There is no numerical phosphorus criterion established in the Ohio Water Quality Standards, but there is a narrative criterion that states phosphorus should be limited to the extent necessary to prevent nuisance growths of algae and weeds (Administrative Code, 3745-1-04, Part E). Phosphorus loadings from large volume point source dischargers in the Lake Erie drainage basin are regulated by NPDES permit limits. The permit limit is a concentration of 1.0 mg/l in final effluent. Research conducted by the Ohio EPA indicates that a significant correlation exists between phosphorus and the health of aquatic

communities (Miltner and Rankin, 1998). It was concluded that biological community performance in headwater and wadeable streams was highest where phosphorus concentrations were lowest. It was also determined that the lowest phosphorus concentrations were associated with the highest quality habitats, supporting the notion that habitat is a critical component of stream function. The report recommends WWH total phosphorus targets of 0.08 mg/l in headwater streams (<20 mi² watershed size), 0.10 mg/l in wadeable streams (>20-200 mi²) and 0.17 mg/l in small rivers (>200-1000 mi²).

Organic Enrichment and Low Dissolved Oxygen

The amount of oxygen soluble in water is low and it decreases as temperature increases. This is one reason why tree shade is so important. The two main sources of oxygen in water are diffusion from the atmosphere and plant photosynthesis. Turbulence at the water surface is critical because it increases surface area and promotes diffusion. Drainage practices such as channelization eliminate turbulence produced by riffles, meanders, and debris snags. Although plant photosynthesis produces oxygen by day, it is consumed by the reverse process of respiration at night. Oxygen is also consumed by bacteria that decay organic matter, so it can be easily depleted unless it is replenished from the air. Sources of organic matter include poorly treated waste water, sewage bypasses, and dead plants and algae. Dissolved oxygen criteria are established in the Ohio Water Quality Standards to protect aquatic life. The minimum and average limits are tiered values and linked to use designations (Administrative Code 3745- 1-07, Table 7-1).

Ammonia

Ammonia enters streams as a component of fertilizer and manure run-off and wastewater effluent. Ammonia gas (NH₃) readily dissolves in water to form the compound ammonium hydroxide (NH₄OH). In aquatic ecosystems, an equilibrium is established as ammonia shifts from a gas to undissociated ammonium hydroxide to the dissociated ammonium ion (NH₄⁺). Under normal conditions (neutral pH 7.0 and temperature 25°C), almost none of the total ammonia is present as gas, only 0.55% is present as ammonium hydroxide, and the rest is ammonium ion. Alkaline pH shifts the equation toward gaseous ammonia production, so the amount of ammonium hydroxide increases. This is important because while the ammonium ion is almost harmless to aquatic life, ammonium hydroxide is very toxic and can reduce growth and reproduction or cause mortality.

The concentration of ammonia in raw sewage is high, sometimes as much as 20-30 mg/l. Treatment to remove ammonia involves gaseous stripping to the atmosphere, biological nitrification and de-nitrification, and assimilation into plant and animal biomass. The nitrification process requires a long detention time and aerobic conditions like that provided in extended aeration treatment plants. Under these conditions, bacteria first convert ammonia to nitrite (*Nitrosomonas*) and then to nitrate (*Nitrobacter*). Nitrate can then be reduced by the de-nitrification process (*Pseudomonas*) and nitrogen gas and carbon dioxide are produced as by-products.

Ammonia criteria are established in the Ohio Water Quality Standards to protect aquatic life. The maximum and average limits are tiered values based on sample pH and temperature and linked to use designations (Administrative Code 3745-1-07, Tables 7-2 through 7-8).

Metals

Metals can be toxic to aquatic life and hazardous to human health. Although they are naturally occurring elements many are extensively used in manufacturing and are byproducts of human activity. Certain metals like copper and zinc are essential in the human diet, but excessive levels are usually detrimental. Lead and mercury are of particular concern because they often trigger fish consumption advisories. Mercury is used in the production of chlorine gas and caustic soda and in the manufacture of batteries and fluorescent light bulbs. In the environment it forms inorganic salts, but bacteria convert these to

methyl-mercury and this organic form builds up in the tissues of fish. Extended exposure can damage the brain, kidneys, and developing fetus. The Ohio Department of Health (ODH) issued a statewide fish consumption advisory in 1997 advising women of child bearing age and children six and under not to eat more than one meal per week of any species of fish from waters of the state because of mercury. Lead is used in batteries, pipes, and paints and is emitted from burning fossil fuels. It affects the central nervous system and damages the kidneys and reproductive system. Copper is mined extensively and used to manufacture wire, sheet metal, and pipes. Ingesting large amounts can cause liver and kidney damage. Zinc is a by-product of mining, steel production, and coal burning and used in alloys such as brass and bronze. Ingesting large amounts can cause stomach cramps, nausea, and vomiting.

Metals criteria are established in the Ohio Water Quality Standards to protect human health, wildlife, and aquatic life. Three levels of aquatic life standards are established (Administrative Code 3745-1-07, Table 7-1) and limits for some elements are based on water hardness (Administrative Code 3745-1-07, Table 7-9). Human health and wildlife standards are linked to either the Lake Erie (Administrative Code 3745-1-33, Table 33- 2) or Ohio River (Administrative Code 3745-1-34, Table 34-1) drainage basins. The drainage basins also have limits for additional elements not established elsewhere that are identified as Tier I and Tier II values.

Bacteria

High concentrations of either fecal coliform bacteria or *Escherichia coli* (*E. coli*) in a lake or stream may indicate contamination with human pathogens. People can be exposed to contaminated water while wading, swimming, and fishing. Fecal coliform bacteria are relatively harmless in most cases, but their presence indicates that the water has been contaminated with feces from a warm-blooded animal. Although intestinal organisms eventually die off outside the body, some will remain virulent for a period of time and may be dangerous sources of infection. This is especially a problem if the feces contained pathogens or disease producing bacteria and viruses. Reactions to exposure can range from an isolated illness such as skin rash, sore throat, or ear infection to a more serious wide spread epidemic. Some types of bacteria that are a concern include *Escherichia*, which cause diarrhea and urinary tract infections, *Salmonella*, which cause typhoid fever and gastroenteritis (food poisoning), and *Shigella*, which cause severe gastroenteritis or bacterial dysentery. Some types of viruses that are a concern include polio, hepatitis A, and encephalitis. Disease causing microorganisms such as cryptosporidium and giardia are also a concern.

Since fecal coliform bacteria are associated with warm-blooded animals, there are both human and animal sources. Human sources, including effluent from sewage treatment plants or discharges by on-lot septic systems, are a more continuous problem. Bacterial contamination from combined sewer overflows are associated with wet weather events. Animal sources are usually more intermittent and are also associated with rainfall, except when domestic livestock have access to the water. Large livestock farms store manure in holding lagoons and this creates the potential for an accidental spill. Liquid manure applied as fertilizer is a runoff problem if not managed properly and it sometimes seeps into field tiles.

Bacteria criteria for the recreational use are established in the Ohio Water Quality Standards to protect human health. The maximum and average limits are tiered *E. coli* values and linked to use designation, but only apply during the May 1-October 15 recreation season (Administrative Code 3745-1-07, Table 7-13). The standards also state that streams must be free of any public health nuisance associated with raw or poorly treated sewage during dry weather conditions (Administrative Code 3745-1-04, Part F).

Sediment Contamination

Chemical quality of sediment is a concern because many pollutants bind strongly to soil particles and are persistent in the environment. Some of these compounds accumulate in the aquatic food chain and trigger fish consumption advisories, but others are simply a contact hazard because they cause skin cancer and tumors. The physical and chemical nature of sediment is determined by local geology, land use, and contribution from manmade sources. As some materials enter the water column they are attracted to the surface electrical charges associated with suspended silt and clay particles. Others simply sink to the bottom due to their high specific gravity. Sediment layers form as suspended particles settle, accumulate, and combine with other organic and inorganic materials. Sediment is the most physically, chemically, and biologically reactive at the water interface because this is where it is affected by sunlight, current, wave action, and benthic organisms. Assessment of the chemical nature of this layer can be used to predict ecological impact.

Sediment data are evaluated using Ohio Sediment Reference Values (SRVs; Ohio EPA 2008), along with guidelines established in *Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems* (MacDonald *et.al.* 2000), and *Ecological Screening Levels (ESLs)* (U.S. EPA 2003). The Ohio EPA system was derived from samples collected at ecoregional reference sites. Specific SRVs are site specific ecoregional based metals concentrations and are used to identify contaminated stream reaches. The MacDonald guidelines are consensus based using previously developed values. The system predicts that sediments below the threshold effect concentration (TEC) are absent of toxicity and those greater than the probable effect concentration (PEC) are toxic. ESL values, considered protective benchmarks, were derived by US EPA Region 5 using a variety of sources and methods.

Sediment samples collected by the Ohio EPA are measured for a number of physical and chemical properties. Physical attributes included percent particle size distribution (sand $\geq 60\mu$, silt 5-59 μ , clay $\leq 4\mu$), percent solids, and percent organic carbon. Most locations sampled had an abundance of sediment, and no difficulties were experienced in locating ample volumes of sediment for analysis. Fine grained sediments are deposited in flood plains of natural streams during periods of high flow. This scenario changes if the stream is impounded by a dam or channelized. Chemical attributes included metals, volatile and semi-volatile organic compounds, pesticides, and polychlorinated biphenyls (PCBs).

MATERIALS and METHODS

All biological, chemical, and physical habitat data collection, processing, and analysis methods and procedures adhere to those specified in the Surface Water Field Sampling Manual for water column chemistry, bacteria and flows (Ohio EPA 2013), Biological Criteria for the Protection of Aquatic Life, Volumes II - III (Ohio EPA 1987b, 1989a, 1989b, 2014a, 2014b), and The Qualitative Habitat Evaluation Index (QHEI): Rationale, Methods, and Application (Rankin 1989).

Determining Use Attainment Status

Use attainment status is a term describing the degree to which environmental indicators are either above or below criteria specified by the Ohio Water Quality Standards (WQS; Ohio Administrative Code 3745-1). Assessing aquatic use attainment status involves a primary reliance on the Ohio EPA biological criteria (OAC 3745-1-07; Table 7-15). These are confined to ambient assessments and apply to rivers and streams outside of mixing zones. Numerical biological criteria are based on multimetric biological indices including the IBI and MIwb, indices measuring the response of the fish community, and the ICI, which indicates the response of the macroinvertebrate community. Three attainment status results are possible at each sampling location - full, partial, or non-attainment. Full attainment means that all of the applicable indices meet the biocriteria. Partial attainment means that one or more of the applicable indices fails to meet the biocriteria. Non-attainment means that none of the applicable indices meet the

biocriteria or one of the organism groups reflects poor or very poor performance. An aquatic life use attainment table is constructed based on the sampling results and is arranged from upstream to downstream and includes the sampling locations indicated by river mile, the applicable biological indices, the use attainment status (*i.e.*, full, partial, or non), the Qualitative Habitat Evaluation Index (QHEI), and a sampling location description.

Habitat Assessment

Physical habitat was evaluated using the QHEI developed by the Ohio EPA for streams and rivers in Ohio (Rankin 1989 and 1995, Ohio EPA 2006). Various attributes of the habitat are scored based on the overall importance of each to the maintenance of viable, diverse, and functional aquatic faunas. The type(s) and quality of substrates, amount and quality of instream cover, channel morphology, extent and quality of riparian vegetation, pool, run, and riffle development and quality, and gradient are some of the habitat characteristics used to determine the QHEI score which generally ranges from 20 to less than 100. The QHEI is used to evaluate the characteristics of a stream segment, as opposed to the characteristics of a single sampling site. As such, individual sites may have poorer physical habitat due to a localized disturbance yet still support aquatic communities closely resembling those sampled at adjacent sites with better habitat, provided water quality conditions are similar. QHEI scores from hundreds of segments around the state have indicated that values greater than 60 are *generally* conducive to the existence of warmwater faunas whereas scores less than 45 generally cannot support a warmwater assemblage consistent with the WWH biological criteria. Scores greater than 75 frequently reflect habitat conditions which have the ability to support exceptional warmwater faunas.

Sediment and Surface Water Assessment

Fine grain sediment samples were collected in the upper 4 inches of bottom material at each location using decontaminated stainless steel scoops and excavated using nitrile gloves. Decontamination of sediment sampling equipment followed the procedures outlined in the Ohio EPA sediment sampling guidance manual (Ohio EPA 2012). Sediment grab samples were homogenized in stainless steel pans (material for VOC analysis was not homogenized), transferred into glass jars with teflon® lined lids, placed on ice (to maintain 4°C) in a cooler, and shipped to Ohio EPA Division of Environmental Services. Sediment data is reported on a dry weight basis. Surface water samples were collected, preserved and delivered in appropriate containers to Ohio EPA Division of Environmental Services. Surface water samples were evaluated using comparisons to Ohio Water Quality Standards criteria, reference conditions, or published literature. Sediment evaluations were conducted using guidelines established in MacDonald et al. (2000), U.S. EPA (2003) and Ohio EPA (2008).

Recreation Use Assessment

Recreation use attainment was determined using the criteria established in OAC 3745-1-41:

- 1) *E. coli* is the only indicator organism used to evaluate recreation.
- 2) The recreation season extends from May 1 – Oct. 31.
- 3) Geometric mean content is computed on a seasonal basis.
- 4) Geometric mean content is the sole basis of use attainment status when 2 or more samples are taken.
- 5) Primary Contact Recreation (PCR) includes three separate categories each with specific numerical criteria: Class A – high use paddling streams, Class B – most typical streams and Class C – historically channelized streams that drain < 3.1 mi².

Macroinvertebrate Community Assessment

Macroinvertebrates were collected from artificial substrates and from the natural habitats. The artificial substrate collection provided quantitative data and consisted of a composite sample of five modified

Hester-Dendy multiple-plate samplers colonized for six weeks. At the time of the artificial substrate collection, a qualitative multihabitat composite sample was also collected. This sampling effort consisted of an inventory of all observed macroinvertebrate taxa from the natural habitats at each site with no attempt to quantify populations other than notations on the predominance of specific taxa or taxa groups within major macrohabitat types (e.g., riffle, run, pool, margin). Detailed discussion of macroinvertebrate field and laboratory procedures is contained in Biological Criteria for the Protection of Aquatic Life: Volume III, Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities (Ohio EPA 1989b, 2014b).

Fish Community Assessment

Fish were sampled using pulsed DC electrofishing methods. Fish were processed in the field, and included identifying each individual to species, counting, weighing, and recording any external abnormalities. Discussion of the fish community assessment methodology used in this report is contained in Biological Criteria for the Protection of Aquatic Life: Volume III, Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities (Ohio EPA 1989b, 2014b).

Causal Associations

Using the results, conclusions, and recommendations of this report requires an understanding of the methodology used to determine the use attainment status and assigning probable causes and sources of impairment. The identification of impairment in rivers and streams is straightforward - the numerical biological criteria are used to judge aquatic life use attainment and impairment (partial and non-attainment). The rationale for using the biological criteria, within a weight of evidence framework, has been extensively discussed elsewhere (Karr *et al.* 1986; Karr 1991; Ohio EPA 1987a, Ohio EPA 1987b; Yoder 1989; Miner and Borton 1991; Yoder 1991; Yoder 1995). Describing the causes and sources associated with observed impairments relies on an interpretation of multiple lines of evidence including water chemistry data, sediment data, habitat data, effluent data, land use data, and biological results (Yoder and Rankin 1995a, 1995b, and 1995c). Thus the assignment of principal causes and sources of impairment in this report represent the association of impairments (based on response indicators) with stressor and exposure indicators. The reliability of the identification of probable causes and sources is increased where many such prior associations have been identified, or have been experimentally or statistically linked together. The ultimate measure of success in water resource management is the restoration of lost or damaged ecosystem attributes including aquatic community structure and function. While there have been criticisms of misapplying the metaphor of ecosystem "health" compared to human patient "health" (Suter 1993), in this document we are referring to the process for evaluating biological integrity and causes or sources associated with observed impairments, not whether human health and ecosystem health are analogous concepts.

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Appendix Table A2. Wheeling Creek watershed chemical/physical surface water sampling results, 2010 and 2011. NA = not analyzed. PT = result is estimated; sample not analyzed within required holding time. B = result is an estimate. Analyte was detected in the associated method/trip/field blank as well as in the sample.

		Site Location: Wheeling Ck @ CR 72 (Mt Hope Rd) River Mile: 27.83 Storet: 203460											
Parameter		6/23/2010 7/7/2010 7/27/2010 8/9/2010 9/13/2010 9/22/2010						9/23/2010 10/18/2010					
Acidity	mg/L	<5.0	NA	<5.0	<5.0	5	NA	5	<5.0				
Alkalinity	mg/L	220	NA	255	274	290	NA	270	288				
Aluminum	ug/L	<200	<200	<200	<200	<200	NA	<200	<200				
Ammonia	mg/L	<0.050	NA	<0.050	<0.050	0.064	NA	<0.050	<0.050				
Arsenic	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	NA	<2.0	<2.0				
Barium	ug/L	35	37	38	38	37	NA	39	34				
Cadmium	ug/L	<0.20	<0.20	0.51	<0.20	<0.20	NA	<0.20	<0.20				
Calcium	mg/L	166	183	194	190	195	NA	213	230				
CBOD20	mg/L	NA	NA	NA	NA	NA	NA	<3.0	NA				
Chloride	mg/L	17.6	19.7	20.1	23.9	19.4	NA	19.6	24.6				
Chlorophyll_a	ug/L	NA	NA	NA	NA	NA	1.4	NA	NA				
Chromium	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	NA	<2.0	<2.0				
COD	mg/L	<20	NA	<20	<20	<20	NA	<20	<20				
Conductivity	umhos/cm	1420	NA	1700	1630	1850	NA	1770	1920				
Copper	ug/L	2	2.4	<2.0	<2.0	2	NA	<2.0	2.5				
Hardness, Total	mg/L	415	457	921	866	952	NA	1020	1060				
Iron	ug/L	263	216	149	149	262	NA	202	126				
Lead	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	NA	<2.0	<2.0				
Magnesium	mg/L	84	99	106	95	113	NA	119	119				
Manganese	ug/L	134	126	99	107	105	NA	107	99				
Nickel	ug/L	4.7	4.2	4.1	3.9	3.8	NA	5.1	4.5				
Nitrate+nitrite	mg/L	<0.10	NA	<0.10	<0.10	0.1	NA	<0.10	<0.10				
Nitrite	mg/L	<0.020	<0.020	<0.020	<0.020	<0.020	NA	<0.020	<0.020				
Orthophosphate, di	mg/L	NA	NA	NA	NA	NA	NA	0.011	NA				
Pheophytin_a	ug/L	NA	NA	NA	NA	NA	0.9	NA	NA				
Potassium	mg/L	4	4	5	5	5	NA	6	5				
Selenium	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	NA	<2.0	<2.0				
Sodium	mg/L	43	50	71	66	81	NA	81	83				
Strontium	ug/L	1660	1890	2340	2070	2420	NA	2410	2390				
Sulfate	mg/L	622	707	782	710	715	NA	760	783				
TKN	mg/L	<0.20	NA	0.26	0.34	0.34	NA	0.34	0.41				
Total Dissolved Sol	mg/L	1110	1250	1370	1300	1440	NA	1410	1480				
Total Phosphorus	mg/L	<0.010	NA	0.02	0.014	0.014	NA	0.024	0.017				
Total Suspended S	mg/L	<5	5	<5	<5	8	NA	<5	<5				
Zinc	ug/L	<10	<10	<10	<10	<10	NA	<10	<10				
Field Measurements													
Temperature	°C	26.13	25.31	27.78	25.44	20.75	NA	NA	9.96				
Conductivity	umhos/cm	1224.7	1690.1	1697.3	1646.5	1786.1	NA	NA	1704.1				
Dissolved Oxygen	mg/L	7.01	7.57	8.34	9.09	7.3	NA	NA	14.98				
D.O. Saturation	%	86.9	92.6	106.6	111.4	82	NA	NA	133.3				
pH	S.U.	8.13	8.14	8.15	8.11	8.19	NA	NA	8.35				

Appendix Table A2. Continued.

		Site Location: Wheeling Creek CR 78 (National Oco Rd) River Mile: 25.97 Storet: C03S16						Site Location: Wheeling Ck @ TR 337 (Lee Rd) ust Crabapple Ck River Mile: 22.73 Storet: 300817					
Parameter	Units	6/23/2010	7/7/2010	7/27/2010	8/9/2010	9/13/2010	10/18/2010	3/9/2010	6/23/2010	7/7/2010	7/22/2010	7/27/2010	8/4/2010
Acidity	mg/L	<5.0	NA	<5.0	9.2	<5.0	<5.0	NA	<5	NA	<5	<5	NA
Alkalinity	mg/L	252	NA	270	284	272	285	NA	249	NA	272	271	NA
Aluminum	ug/L	<200	<200	<200	<200	<200	<200	405	<200	<200	<200	<200	NA
Ammonia	mg/L	<0.050	NA	<0.050	<0.050	<0.050	<0.050	0.076	<0.05	NA	<0.05	<0.05	NA
Arsenic	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	<2	<2	NA
Barium	ug/L	47	48	43	46	37	36	36	49	52	50	48	NA
Cadmium	ug/L	<0.20	<0.20	0.34	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2	0.7	NA
Calcium	mg/L	177	189	185	186	189	230	125	163	177	177	178	NA
CBOD20	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2	NA	NA
Chloride	mg/L	13.6	15.2	16.6	17.5	17.3	22.6	NA	19.1	24.1	22.5	25.1	NA
Chlorophyll_a	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.3
Chromium	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	<2	<2	NA
COD	mg/L	<20	NA	<20	<20	<20	<20	<20	<20	NA	<20	<20	NA
Conductivity	umhos/cm	1600	NA	2030	1910	2160	2230	NA	1510	NA	1830	1830	NA
Copper	ug/L	3	<2.0	2.3	2.3	3.1	4.1	<2	2.1	<2	<2	2.5	NA
Hardness, Total	mg/L	442	974	911	913	987	1140	510	407	874	862	893	NA
Iron	ug/L	303	238	199	331	224	286	886	466	540	589	630	NA
Lead	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	<2	<2	NA
Magnesium	mg/L	98	122	109	109	125	137	48	82	105	102	109	NA
Manganese	ug/L	128	94	76	119	55	94	247	71	92	82	76	NA
Mercury	ug/L	NA	NA	NA	NA	NA	NA	<0.2	NA	NA	NA	NA	NA
Nickel	ug/L	5.9	5.6	4.2	4.6	5	5.6	4	4.9	4.6	4.3	4.4	NA
Nitrate+nitrite	mg/L	<0.10	NA	<0.10	<0.10	<0.10	<0.10	1.95	<0.1	NA	0.14	0.13	NA
Nitrite	mg/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.032	<0.02	<0.02	<0.02	<0.02	NA
Orthophosphate, di	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.059	NA	NA
Pheophytin_a	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.1
Potassium	mg/L	4	5	6	6	6	6	3	4	6	6	6	NA
Selenium	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	<2	<2	NA
Sodium	mg/L	68	90	117	113	133	143	40	63	87	98	111	NA
Strontium	ug/L	2470	2890	3170	2960	3310	3470	1290	2290	2860	2920	3100	NA
Sulfate	mg/L	633	834	956	888	948	1060	NA	638	757	764	827	NA
TKN	mg/L	<0.20	NA	0.2	0.22	0.4	<0.20	0.33	<0.2	NA	0.33	0.3	NA
Total Dissolved So	mg/L	1260	1420	1610	1530	1760	1830	NA	1170	1350	1400	1440	NA
Total Phosphorus	mg/L	<0.010	NA	<0.010	<0.010	0.021	0.01	0.037	0.072	NA	0.097	0.106	NA
Total Suspended S	mg/L	<5	<5	<5	<5	<5	<5	NA	<5	5	8	7	NA
Zinc	ug/L	<10	<10	<10	<10	<10	<10	11	<10	<10	<10	<10	NA
Field Measurements													
Temperature	°C	25.06	26.09	27.81	27.08	21.13	10.54	6.98	25.07	26.3	25.88	26.04	NA
Conductivity	umhos/cm	1456.7	1913.6	1931.3	1874.9	2067.1	2053.5	1080.2	1301	1767.7	2045.6	1797.7	NA
Dissolved Oxygen	mg/L	7.63	8.16	8.5	9.71	8.83	13.93	13.79	7.82	9.21	8.76	8.74	NA
D.O. Saturation	%	92.8	101.3	108.8	122.7	99.9	125.8	113.9	95.1	114.7	108.4	108.3	NA
pH	S.U.	8.15	8.11	8.11	8.16	8.15	8.07	8.31	8.21	8.22	8.19	8.25	NA

Appendix Table A2. Continued.

		Site Location: Wheeling Ck @ TR 337 (Lee Rd) ust Crabapple Ck River Mile: 22.73 Storet: 300817											
Parameter	Units	8/9/2010	8/12/2010	9/13/2010	9/22/2010	9/23/2010	9/28/2010	9/30/2010	10/18/2010	11/22/2010	1/10/2011	2/16/2011	4/18/2011
Acidity	mg/L	<5	<5	<5	NA	<5	5	<5	<5	<5	<5	<5	<5
Alkalinity	mg/L	288	269	267	NA	257	270	276	263	285	306	222	199
Aluminum	ug/L	<200	<200	<200	NA	<200	383	<200	<200	<200	<200	<200	459
Ammonia	mg/L	<0.05	0.061	<0.05	NA	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05
Arsenic	ug/L	<2	<2	NA	NA	<2	<2	<2	<2	<2	<2	<2	<2
Barium	ug/L	52	56	41	NA	44	47	38	37	33	41	36	40
Cadmium	ug/L	0.28	<0.2	<0.2	NA	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Calcium	mg/L	180	169	176	NA	188	176	175	194	207	193	152	120
CBOD20	mg/L	NA	3.3	NA	NA	3.2	<3	NA	NA	NA	NA	NA	3.7
Chloride	mg/L	27.1	33.1	33	NA	40.6	39.5	37.6	13.7	39	41.2	29.3	13.2
Chlorophyll_a	mg/m2	NA	NA	NA	458	NA	NA	NA	NA	NA	NA	NA	NA
Chlorophyll_a	ug/L	NA	NA	NA	5.3	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	ug/L	<2	<2	NA	NA	<2	<2	<2	<2	<2	<2	<2	<2
COD	mg/L	<20	<20	NA	NA	<20	<20	20	34	<20	<20	<20	<20
Conductivity	umhos/cm	1790	1800	2020	NA	1900	1820	1860	2010	1940	1660	1250	1050
Copper	ug/L	2.6	3	3.1	NA	2.5	3.3	2.7	3.5	2	2.3	<2	<2
Hardness, Total	mg/L	845	830	909	NA	964	876	857	974	982	836	639	506
Iron	ug/L	620	670	789	NA	676	1250	630	709	611	756	476	866
Lead	ug/L	<2	<2	<2	NA	<2	<2	<2	<2	<2	<2	<2	<2
Magnesium	mg/L	96	99	NA	NA	120	106	102	119	113	86	63	50
Manganese	ug/L	101	118	NA	NA	109	151	86	84	68	341	355	191
Nickel	ug/L	3.9	4.2	4.1	NA	5.3	4.6	4.4	4.4	5.5	6.3	5.2	7.1
Nitrate+nitrite	mg/L	0.12	0.33	0.21	NA	0.27	0.43	0.39	0.37	0.29	1.46	0.81	0.57
Nitrite	mg/L	<0.02	<0.02	<0.02	NA	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Orthophosphate, di	mg/L	NA	0.171	NA	NA	0.39	0.353	NA	NA	NA	NA	NA	0.017
Pheophytin_a	mg/m2	NA	NA	NA	83.1	NA	NA	NA	NA	NA	NA	NA	NA
Pheophytin_a	ug/L	NA	NA	NA	2.4	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	mg/L	7	7	7	NA	9	8	7	7	6	5	4	3
Selenium	ug/L	<2	<2	NA	NA	<2	<2	<2	<2	<2	<2	<2	<2
Sodium	mg/L	113	114	137	NA	141	128	114	132	116	89	54	31
Strontium	ug/L	2930	2850	NA	NA	3150	2850	2680	2880	2750	2310	1650	1270
Sulfate	mg/L	778	753	803	NA	810	774	815	1530	845	662	465	379
TKN	mg/L	0.33	0.51	0.47	NA	0.51	0.41	0.43	0.5	0.43	0.57	0.38	0.35
Total Dissolved Sol	mg/L	1450	1460	1650	NA	1560	1490	1490	1580	1530	1270	920	750
Total Phosphorus	mg/L	0.153	0.275	0.311	NA	0.522	0.486	0.363	0.277	0.212	0.189	0.092	0.028
Total Suspended S	mg/L	7	5	7	NA	6	25	<5	<5	<5	6	<5	16
Zinc	ug/L	<10	13	NA	NA	<10	<10	<10	<10	11	12	<10	<10
Field Measurements													
Temperature	°C	25.76	NA	19.83	NA	NA	NA	15.93	11.63	10.47	0.18	3.28	NA
Conductivity	umhos/cm	1807.3	NA	1960.7	NA	NA	NA	1837	1805.3	1973.5	NA	1333	NA
Dissolved Oxygen	mg/L	9.57	NA	9.2	NA	NA	NA	8.61	17.53	15.42	20.12	16.22	NA
D.O. Saturation	%	118	NA	101.4	NA	NA	NA	87.6	162.2	139	139	122	NA
pH	S.U.	8.33	NA	8.23	NA	NA	NA	7.96	8.3	8.22	8.02	7.73	NA

Appendix Table A2. Continued.

		Site Location: Wheeling Creek @ CR 10 (Fairport - Maynard Rd) River Mile: 17.34 Storet: 301066						Site Location: Wheeling Ck @ CR 10 (Barton -Blaine Rd) River Mile: 9.40 Storet: 203459					
Parameter	Units	6/23/2010	7/7/2010	7/27/2010	8/9/2010	9/13/2010	10/18/2010	6/23/2010	7/7/2010	7/27/2010	8/9/2010	9/13/2010	10/18/2010
Acidity	mg/L	<5	NA	<5	<5	<5	<5	<5	NA	<5	<5	<5	<5
Alkalinity	mg/L	267	NA	270	283	283	305	207	NA	213	232	229	226
Aluminum	ug/L	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
Ammonia	mg/L	<0.05	NA	<0.05	<0.05	<0.05	<0.05	<0.05	NA	<0.05	<0.05	<0.05	<0.05
Arsenic	ug/L	<2	<2	<2	<2	NA	<2	<2	<2	<2	<2	NA	<2
Barium	ug/L	36	33	31	33	25	23	37	37	35	36	27	23
Cadmium	ug/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Calcium	mg/L	194	232	210	204	226	259	166	182	187	191	185	199
Chloride	mg/L	16.5	17.9	17.7	16.9	21.2	22.2	19.7	22.2	23.4	21.7	24.8	29
Chromium	ug/L	<2	<2	<2	<2	NA	<2	<2	<2	<2	<2	NA	<2
COD	mg/L	<20	NA	<20	<20	NA	23	<20	NA	<20	<20	NA	<20
Conductivity	umhos/cm	1990	NA	2330	2240	2540	2550	1750	NA	2170	2100	2400	2410
Copper	ug/L	2.5	2.3	3.4	2.9	4	6.9	2.7	2.6	3.5	3.2	3.9	5
Hardness, Total	mg/L	917	1140	1030	979	1120	1220	415	928	932	913	952	983
Iron	ug/L	301	221	202	362	206	286	358	206	227	309	172	238
Lead	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Magnesium	mg/L	105	135	122	114	NA	140	88	115	113	106	NA	118
Manganese	ug/L	50	34	44	60	NA	33	24	19	33	36	NA	15
Nickel	ug/L	5.8	5.4	5.4	4.5	4.8	5.6	5.5	4.9	4.9	4.5	4.7	5.5
Nitrate+nitrite	mg/L	<0.1	NA	<0.1	<0.1	<0.1	<0.1	0.46		<0.1	<0.1	<0.1	0.13
Nitrite	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Potassium	mg/L	5	5	6	6	7	7	4	5	6	6	6	6
Selenium	ug/L	<2	<2	<2	<2	NA	<2	<2	<2	<2	<2	NA	<2
Sodium	mg/L	123	165	186	177	234	248	114	163	191	177	254	248
Strontium	ug/L	3410	4140	4270	4040	NA	4660	2730	3490	3720	3530	NA	3830
Sulfate	mg/L	919	1170	1190	1120	1110	404	771	1040	1080	1050	1110	1140
TKN	mg/L	<0.2	NA	0.26	0.22	0.29	<0.2	<0.2		<0.2	<0.2	0.32	0.35
Total Dissolved So	mg/L	1650	1940	2000	1870	2140	2150	1420	1700	1780	1740	1980	1980
Total Phosphorus	mg/L	0.016	NA	0.018	0.019	<0.01	0.015	<0.01		0.012	0.013	<0.01	0.015
Total Suspended S	mg/L	<5	<5	<5	5	<5	<5	8	<5	5	<5	6	<5
Zinc	ug/L	<10	<10	<10	<10	NA	<10	<10	<10	<10	<10	NA	<10
Field Measurements													
Temperature	°C	24.99	26.18	24.44	23.32	19.95	11.05	26.45	28	24.73	23.3	21.38	11.91
Conductivity	umhos/cm	1719.4	2416.5	2282.6	2173.9	2386.7	2319.6	1517.8	2062	2155.1	2127.2	2326.1	2198.2
Dissolved Oxygen	mg/L	7.92	8.11	10.32	9.4	11.03	11.46	8.49	8.81	10.65	10.61	10.77	17.25
D.O. Saturation	%	96.2	101	124.5	110.9	122.1	104.8	106	113.2	129	125.2	122.5	160.8
pH	S.U.	8.13	8.1	8.17	8.21	8.15	8.14	8.28	8.22	8.28	8.24	8.29	8.41

Appendix Table A2. Continued.

		Site Location: Wheeling Ck @ Blain (Pease Rd) River Mile: 5.05 Storet: C03S18											
Parameter	Units	3/9/2010	5/24/2010	6/23/2010	7/7/2010	7/22/2010	7/27/2010	8/9/2010	8/12/2010	9/13/2010	9/22/2010	9/28/2010	9/30/2010
Acidity	mg/L	<5	<5	<5	NA	<5	<5	<5	<5	<5	<5	<5	<5
Alkalinity	mg/L	212	229	233	NA	215	199	229	215	222	208	222	253
Aluminum	ug/L	392	277	298	331	288	340	268	291	219	268	645	219
Ammonia	mg/L	0.11	<0.05	<0.05	NA	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Arsenic	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	NA	<2	<2	<2
Barium	ug/L	34	34	40	41	38	36	37	40	29	33	34	28
Cadmium	ug/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Calcium	mg/L	143	183	168	186	184	177	182	180	182	211	199	192
CBOD20	mg/L	3.3	<3	NA	NA	3.3	NA	NA	<3	NA	<3	<3	NA
Chloride	mg/L	34.2	22.9	21.2	24	24	25.4	24.4	12.1	27.3	28.5	31.3	30.8
Chromium	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	NA	<2	<2	<2
COD	mg/L	153	<20	<20	NA	<20	<20	<20	<20	NA	<20	<20	<20
Conductivity	umhos/cm	1220	1680	1750	NA	2120	2190	2100	2160	2390	2320	2250	2270
Copper	ug/L	<2	<2	3.9	2.7	2.4	3.4	3.5	4.2	4.3	3.8	6.3	5.4
Hardness, Total	mg/L	579	457	419	950	900	821	858	865	899	1020	950	945
Iron	ug/L	1080	448	364	347	391	282	422	432	380	435	1200	396
Lead	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Magnesium	mg/L	54	89	88	118	107	92	98	101	NA	119	110	113
Manganese	ug/L	135	43	41	40	52	43	59	55	NA	53	134	44
Mercury	ug/L	<0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	4.4	5.6	5.8	6.3	5.4	4.7	5.4	5.3	6.3	6.9	7.5	6.5
Nitrate+nitrite	mg/L	1.47	<0.1	<0.1	NA	0.17	<0.1	<0.1	<0.1	<0.1	0.66	0.46	0.13
Nitrite	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Orthophosphate, di	mg/L	<0.01	<0.01	NA	NA	<0.01	NA	NA	<0.01	NA	<0.01	<0.01	NA
Potassium	mg/L	3	4	4	5	5	6	6	6	6	7	7	7
Selenium	ug/L	2	2	2	2	2	2	2	2	NA	2	2	2
Sodium	mg/L	62	101	115	161	167	176	168	184	243	246	229	221
Strontium	ug/L	1650	2720	2700	3350	3380	3360	3260	3390	NA	3910	3570	3560
Sulfate	mg/L	458	726	766	1010	978	1080	1020	1280	1090	1100	1100	1050
TKN	mg/L	<0.2	<0.2	<0.2	NA	0.31	<0.2	<0.2	<0.2	0.28	0.36	0.33	0.33
Total Dissolved Sol	mg/L	920	1330	1380	1650	1730	1740	1710	1790	1960	1950	1860	1860
Total Phosphorus	mg/L	<0.01	<0.01	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	0.014	0.02	0.013
Total Suspended S	mg/L	13	5	<5	<5	6	<5	<5	6	<5	<5	27	5
Zinc	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	NA	<10	<10	<10
Field Measurements													
Temperature	°C	6.36	22.1	26.77	28.31	27.06	28.59	21.61	NA	16.34	NA	NA	16.07
Conductivity	umhos/cm	1219.7	1713.3	1512.8	2010.8	1740.2	2071.8	2038.5	NA	2290.1	NA	NA	2225.8
Dissolved Oxygen	mg/L	13.63	10.23	7.97	6.83	9.14	8.64	9.22	NA	9.91	NA	NA	8.58
D.O. Saturation	%	110.9	117.8	100.1	88.2	115.3	112.1	105.3	NA	101.8	NA	NA	87.7
pH	S.U.	8.25	8.18	8.21	8.15	8.23	8.31	8.14	NA	8.22	NA	NA	7.99

Appendix Table A2. Continued.

		Site Location: Wheeling Ck @ Blain (Pease Rd) River Mile: 5.05 Storet: C03S18					Site Location: Wheeling Ck @ Cr 24 (Boydsville Rd) River Mile: 1.64 Storet: 609230					
Parameter	Units	#####	#####	1/10/2011	2/16/2011	4/18/2011	6/23/2010	7/7/2010	7/27/2010	8/9/2010	9/13/2010	10/18/2010
Acidity	mg/L	<5	<5	<5	<5	<5	<5	NA	<5	<5	<5	<5
Alkalinity	mg/L	232	231	288	234	229	192	NA	190	203	205	211
Aluminum	ug/L	211	312	207	333	491	215	<200	206	249	<200	<200
Ammonia	mg/L	<0.05	<0.05	0.051	<0.05	<0.05	<0.05	NA	<0.05	<0.05	<0.05	<0.05
Arsenic	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	<2
Barium	ug/L	25	22	32	31	40	40	42	38	40	31	25
Cadmium	ug/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.28	<0.2	<0.2	<0.2
Calcium	mg/L	215	221	224	172	142	165	177	176	176	182	193
CBOD20	mg/L	NA	NA	NA	NA	<3	NA	NA	NA	NA	NA	NA
Chloride	mg/L	34.1	33.9	40.2	34.4	15.8	24.2	26.4	27.8	26.3	30.4	35.1
Chromium	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	<2
COD	mg/L	<20	<20	<20	<20	<20	<20	NA	<20	<20	NA	<20
Conductivity	umhos/cm	2370	2310	1940	1520	1220	1700	NA	2110	2050	2360	2350
Copper	ug/L	5.5	3.4	3.2	2.1	2.2	2.8	10.8	4.3	3.6	3.5	5.4
Hardness, Total	mg/L	1010	1020	934	718	593	412	891	860	847	879	943
Iron	ug/L	425	633	726	1440	1080	307	215	257	438	204	216
Lead	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Magnesium	mg/L	114	114	91	70	58	86	109	102	99	NA	112
Manganese	ug/L	48	56	149	162	97	28	19	31	43	NA	16
Nickel	ug/L	6.5	7.7	7.6	6.2	7.2	5.5	5.1	4.8	4.6	4.7	5.3
Nitrate+nitrite	mg/L	0.27	0.24	0.84	0.6	0.56	<0.1	NA	0.1	<0.1	<0.1	<0.1
Nitrite	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Orthophosphate, di	mg/L	NA	NA	NA	NA	<0.01	NA	NA	NA	NA	NA	NA
Potassium	mg/L	6	6	5	4	3	4	5	6	6	6	6
Selenium	ug/L	2	2	2	2	2	<2	<2	<2	<2	NA	<2
Sodium	mg/L	235	226	158	96	44	115	157	180	169	230	238
Strontium	ug/L	3680	3480	2860	2190	1590	2630	3150	3360	3210	NA	3350
Sulfate	mg/L	1160	1110	856	626	463	721	993	1060	997	1080	1150
TKN	mg/L	0.27	0.35	1.06	0.29	0.36	<0.2	NA	0.43	<0.2	0.34	0.39
Total Dissolved So	mg/L	1950	1920	1560	1190	892	1380	1630	1720	1680	1930	1920
Total Phosphorus	mg/L	<0.01	0.02	<0.01	0.05	0.02	<0.01	NA	0.013	0.011	<0.01	<0.01
Total Suspended S	mg/L	<5	<5	7	8	20	<5	<5	7	9	<5	<5
Zinc	ug/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	NA	<10
Field Measurements												
Temperature	°C	11.44	10.31	0.21	2.66	NA	26.73	29.5	28.48	22.32	16.83	12.66
Conductivity	umhos/cm	2275.4	2363.2	NA	1466.7	NA	1487.3	2129.6	2049	2017.1	2260.8	2159.2
Dissolved Oxygen	mg/L	12.36	14.3	19.56	15.79	NA	7.18	6.8	7.64	9.15	10.6	12.9
D.O. Saturation	%	114	128.6	135.4	116.8	NA	90.1	89.7	99	105.9	110	122.4
pH	S.U.	8.26	8.02	7.82	7.7	NA	8.21	8.19	8.26	8.2	8.25	8.4

Appendix Table A2. Continued.

		Site Location: Crabapple Ck @ CR 66 (Uniontown - New Athens Rd) River Mile: 2.88 Storet: C03S14						Site Location: Crabapple Ck @ CR 10 (Crabapple Rd) River Mile: 0.16 Storet: C03L05					
Parameter	Units	6/23/2010	7/7/2010	7/27/2010	8/9/2010	9/13/2010	10/18/2010	3/9/2010	6/23/2010	7/7/2010	7/22/2010	7/27/2010	8/4/2010
Acidity	mg/L	12.4	NA	<5	<5	13.5	<5	<5	<5	NA	<5	<5	NA
Alkalinity	mg/L	278	NA	332	327	333	337	277	268	NA	298	295	NA
Aluminum	ug/L	323	308	287	294	<200	<200	<200	<200	<200	<200	<200	NA
Ammonia	mg/L	<0.05	NA	<0.05	<0.05	<0.05	<0.05	0.225	<0.05	NA	<0.05	<0.05	NA
Arsenic	ug/L	<2	<2	<2	<2	NA	<2	<2	<2	<2	<2	<2	NA
Barium	ug/L	37	40	38	39	30	26	21	29	26	28	27	NA
Cadmium	ug/L	<0.2	<0.2	<0.2	0.43	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	NA
Calcium	mg/L	221	243	196	204	193	229	227	238	287	249	228	NA
CBOD20	mg/L	NA	NA	NA	NA	NA	NA	<3	NA	NA	4.1	NA	NA
Chloride	mg/L	10.4	12.5	13.5	10.8	14.1	14.7	27.8	11.7	13.2	11.9	12.8	NA
Chlorophyll_a	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8
Chromium	ug/L	<2	<2	<2	<2	NA	<2	<2	<2	<2	<2	<2	NA
COD	mg/L	<20	NA	<20	<20	NA	21	<20	<20	NA	<20	<20	NA
Conductivity	umhos/cm	2120	NA	2340	2200	2420	2490	2010	2400	NA	2620	2650	NA
Copper	ug/L	4.3	2.7	3.4	3.3	3.9	6.3	<2	3.1	2.5	2.2	3	NA
Hardness, Total	mg/L	1000	1130	934	954	939	1090	1020	1140	1420	1240	1150	NA
Iron	ug/L	944	884	797	906	478	396	1990	1200	930	619	534	NA
Lead	ug/L	2.2	<2	2.3	2.9	2.7	<2	<2	<2	<2	<2	<2	NA
Magnesium	mg/L	110	128	108	108	NA	126	109	133	170	151	140	NA
Manganese	ug/L	239	244	231	303	NA	144	383	146	109	97	93	NA
Mercury	ug/L	NA	NA	NA	NA	NA	NA	<0.2	NA	NA	NA	NA	NA
Nickel	ug/L	7	7.3	5.3	5.7	5.4	5.6	6.5	8.8	8.8	7.5	6.2	NA
Nitrate+nitrite	mg/L	<0.1	NA	<0.1	<0.1	<0.1	<0.1	0.44	<0.1		<0.1	<0.1	NA
Nitrite	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	NA
Orthophosphate, di	mg/L	NA	NA	NA	NA	NA	NA	<0.01	NA	NA	<0.01	NA	NA
Pheophytin_a	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1
Potassium	mg/L	4	5	5	6	6	5	4	5	5	6	6	NA
Selenium	ug/L	<2	<2	<2	<2	NA	<2	<2	<2	<2	<2	<2	NA
Sodium	mg/L	148	188	194	176	240	263	105	161	180	211	214	NA
Strontium	ug/L	3880	4310	4300	3900	NA	4600	3220	4290	4780	4950	4960	NA
Sulfate	mg/L	944	1080	1120	1060	1040	1190	993	1210	1370	1320	1380	NA
TKN	mg/L	<0.2	NA	<0.2	0.28	0.29	0.24	<0.2	<0.2	NA	0.29	0.24	NA
Total Dissolved So	mg/L	1770	1910	1980	1800	2020	2080	1680	2050	2270	2010	2310	NA
Total Phosphorus	mg/L	0.018	NA	0.02	<0.01	0.02	<0.01	<0.01	0.01	NA	<0.01	<0.01	NA
Total Suspended S	mg/L	22	28	17	23	14	8	12	10	8	12	<5	NA
Zinc	ug/L	<10	<10	<10	<10	NA	<10	<10	<10	<10	<10	<10	NA
Field Measurements													
Temperature	°C	25.28	25.45	26.71	25.47	21.67	11.5	8.47	23.91	23.59	26.55	27.32	NA
Conductivity	umhos/cm	1810.1	2439	2338.4	2148.3	2384.3	2300.5	2006.2	1994.1	2772.6	2564.9	2610.2	NA
Dissolved Oxygen	mg/L	7.47	7.42	7.41	8.04	7.66	10.67	11.51	7.06	7.38	8.33	8.02	NA
D.O. Saturation	%	91.4	91.2	93.1	98.7	87.7	98.7	98.9	84.2	87.7	104.5	102	NA
pH	S.U.	8.13	8.05	8.1	8.18	8.15	7.97	8.05	8.12	8.02	8.07	8.06	NA

Appendix Table A2. Continued.

		Site Location: Crabapple Ck @ CR 10 (Crabapple Rd)											
		River Mile: 0.16 Storet: C03L05											
Parameter	Units	8/9/2010	8/12/2010	9/13/2010	9/22/2010	9/28/2010	9/30/2010	10/18/2010	11/22/2010	1/10/2011	2/16/2011	Dup A 4/18/2011	Dup B 4/18/2011
Acidity	mg/L	<5	<5	8.1	7.2	<5	<5	<5	<5	<5	<5	<5	<5
Alkalinity	mg/L	294	310	315	309	334	358	316	352	332	300	248	245
Aluminum	ug/L	<200	<200	<200	<200	<200	<200	<200	<200	267	<200	440	432
Ammonia	mg/L	<0.05	<0.05	<0.05	<0.05	0.069	<0.05	0.082	0.091	0.141	0.118	<0.05	<0.05
Arsenic	ug/L	<2	<2	NA	<2	<2	<2	<2	<2	<2	<2	<2	<2
Barium	ug/L	28	30	21	22	24	24	19	20	23	21	28	28
Cadmium	ug/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Calcium	mg/L	220	228	244	263	259	251	280	282	284	251	210	207
CBOD20	mg/L	NA	3.3	NA	<3	<3	NA	NA	NA	NA	NA	<3	<3
Chloride	mg/L	11.7	26.6	12.2	12.4	13.1	14	14.2	14.7	17	22.6	9	9.1
Chromium	ug/L	<2	<2	NA	<2	<2	<2	<2	<2	<2	<2	<2	<2
COD	mg/L	<20	<20	NA	<20	<20	<20	<20	<20	<20	<20	<20	<20
Conductivity	umhos/cm	2470	2560	2840	2810	2720	2710	2910	2810	2380	2220	1790	1790
Copper	ug/L	3.3	4	3.8	3.6	4.8	5	6	3.4	3.4	2.3	2.1	2.1
Hardness, Total	mg/L	1070	1130	1210	1310	1270	1230	1370	1350	1310	1150	965	953
Iron	ug/L	1040	978	830	1010	2860	1520	1920	2690	5910	2050	1780	1750
Lead	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Magnesium	mg/L	127	137	NA	159	151	147	162	158	145	128	107	106
Manganese	ug/L	122	115	NA	120	203	132	177	197	355	355	310	309
Nickel	ug/L	6.6	6.8	7.9	8.5	8.4	7.2	8.7	9.1	8.4	7.4	11.2	11.3
Nitrate+nitrite	mg/L	<0.1	<0.1	0.12	0.13	0.15	0.12	0.16	0.17	0.19	0.21	0.13	0.14
Nitrite	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Orthophosphate, di	mg/L	NA	<0.01	NA	0.015	<0.01	NA	NA	NA	NA	NA	<0.01	<0.01
Potassium	mg/L	6	6	6	7	7	6	6	6	5	5	4	4
Selenium	ug/L	<2	<2	NA	<2	<2	<2	<2	<2	<2	<2	<2	<2
Sodium	mg/L	192	237	267	307	278	268	309	281	192	153	63	62
Strontium	ug/L	4470	4840	NA	6010	5430	5310	5930	4950	4340	3900	2790	2750
Sulfate	mg/L	1270	1050	1370	1380	1350	1340	1490	1420	1200	1100	869	866
TKN	mg/L	0.27	0.24	0.31	0.31	0.29	0.24	0.32	0.32	0.25	0.32	0.35	0.49
Total Dissolved So	mg/L	2110	2190	2450	2470	2360	2330	2510	2400	2050	1900	1460	1450
Total Phosphorus	mg/L	0.01	<0.01	<0.01	0.012	0.013	0.013	<0.01	0.017	0.012	<0.01	0.019	0.019
Total Suspended S	mg/L	7	<5	6	6	14	8	8	10	23	6	30	30
Zinc	ug/L	<10	NA	NA	<10	<10	<10	<10	<10	<10	<10	<10	<10
Field Measurements													
Temperature	°C	25.53	NA	21.35	NA	NA	16.15	11.85	11.21	0.37	5.12	NA	NA
Conductivity	umhos/cm	2505.1	NA	2708.2	NA	NA	2683.9	2567.6	2878.2	NA	2147.1	NA	NA
Dissolved Oxygen	mg/L	8.22	NA	7.71	NA	NA	8.01	11.72	12.03	19.21	13.64	NA	NA
D.O. Saturation	%	101.2	NA	87.7	NA	NA	82.1	109.3	110.6	133.8	107.9	NA	NA
pH	S.U.	8.12	NA	8.07	NA	NA	7.97	8.11	8.1	8.11	7.62	NA	NA

Appendix Table A2. Continued.

		Site Location: Campbell Run @ mouth from abandoned TR 414 River Mile: 0.03 Storet: 301065						Site Location: Pogue Run @ CR 10 (Fairport-Maynard Rd) River Mile: 0.11 Storet: 301067					
Parameter	Units	6/23/2010	7/7/2010	7/27/2010	8/11/2010	9/13/2010	10/18/2010	6/23/2010	7/7/2010	7/27/2010	8/9/2010	9/13/2010	10/18/2010
Acidity	mg/L	5.4	NA	<5	6.7	<5	<5	<5	NA	<5	<5	<5	<5
Alkalinity	mg/L	291	NA	325	335	345	350	216	NA	253	261	256	234
Aluminum	ug/L	240	<200	222	230	264	257	<200	<200	<200	<200	<200	<200
Ammonia	mg/L	0.067	NA	0.067	0.07	0.102	0.13	<0.05	NA	<0.05	<0.05	<0.05	<0.05
Arsenic	ug/L	<2	<2	<2	<2	NA	<2	<2	<2	<2	<2	NA	<2
Barium	ug/L	21	21	20	22	18	17	61	72	69	61	73	50
Cadmium	ug/L	<0.2	<0.2	0.48	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Calcium	mg/L	261	314	259	263	260	288	124	151	150	135	175	139
Chloride	mg/L	13.5	15.3	12.9	11.8	11.2	22.7	24.7	25.4	28.8	26.6	22.4	10.8
Chromium	ug/L	<2	<2	<2	<2	NA	<2	<2	<2	<2	<2	NA	<2
COD	mg/L	<20	NA	<20	<20	NA	<20	<20	NA	<20	30	NA	<20
Conductivity	umhos/cm	2670	NA	2960	2910	3060	3180	1110	NA	1330	1240	1540	1250
Copper	ug/L	3.4	2.3	4	4.1	4.4	6.6	2.5	<2	<2	<2	8.9	2
Hardness, Total	mg/L	1290	1570	1300	1300	1300	1410	310	612	618	551	713	565
Iron	ug/L	3520	3020	3890	4630	6800	7480	82	66	52	66	53	50
Lead	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Magnesium	mg/L	155	192	159	156	NA	167	43	57	59	52	NA	53
Manganese	ug/L	180	150	140	175	NA	191	17	14	17	16	NA	15
Nickel	ug/L	10.9	10	10.6	9.3	9.5	10	3.3	3	2.8	2.2	2.5	3
Nitrate+nitrite	mg/L	<0.1	NA	0.13	0.13	0.1	0.26	1.52	NA	0.21	<0.1	<0.1	<0.1
Nitrite	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Potassium	mg/L	5	6	7	6	7	7	4	4	4	4	4	4
Selenium	ug/L	<2	2	2	<2	NA	<2	<2	<2	<2	<2	NA	<2
Sodium	mg/L	184	180	226	248	303	330	58	71	76	74	82	69
Strontium	ug/L	4950	5340	5420	5480	NA	6570	1660	2080	2110	1900	NA	1750
Sulfate	mg/L	1350	1550	1610	1570	1470	1180	351	484	488	425	576	695
TKN	mg/L	<0.2	NA	0.23	1.5	0.33	0.28	<0.2	NA	0.22	<0.2	0.34	<0.2
Total Dissolved Sol	mg/L	2400	2540	2620	2560	2640	2700	796	990	1010	918	1180	940
Total Phosphorus	mg/L	<0.01	NA	<0.01	<0.01	0.01	<0.01	0.01	NA	0.018	0.023	0.01	0.016
Total Suspended S	mg/L	17	15	13	17	20	17	<5	<5	<5	<5	<5	<5
Zinc	ug/L	<10	<10	10	22	NA	12	<10	<10	<10	<10	NA	<10
Field Measurements													
Temperature	°C	21.88	23.37	25.47	23.41	20.24	11.28	23.91	23.3	23.28	21.74	17.62	10.42
Conductivity	umhos/cm	2188.4	2995	2872.1	2796.3	2924	2853.8	969.1	1416.4	1335.3	1255	1471.5	1152.2
Dissolved Oxygen	mg/L	8.46	7.73	8.34	7.92	8.59	11.56	7.95	7.73	8.25	7.88	8.03	11.57
D.O. Saturation	%	97.1	91.5	102.7	93.8	95.8	106.5	94.5	91	97.1	90	84.6	103.9
pH	S.U.	7.88	7.96	7.85	7.72	7.84	7.89	8.13	8.05	8.08	8.13	7.8	8.22

Appendix Table A2. Continued.

		Site Location: Cox Run @ TR 432 (Stonehouse - Purseglove Rd) River Mile: 0.03 Storet: 301068						Site Location: Fall Run adj CR 10/CR5 near Crescent River Mile: 0.03 Storet: C03L10					
Parameter	Units	6/23/2010	7/7/2010	7/27/2010	8/9/2010	9/13/2010	10/18/2010	7/8/2010	7/28/2010	8/9/2010	9/13/2010	10/18/2010	
Acidity	mg/L	<5	NA	<5	<5	<5	<5	NA	<5	<5	<5	<5	
Alkalinity	mg/L	263	NA	335	364	386	402	NA	208	243	234	255	
Aluminum	ug/L	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	
Ammonia	mg/L	<0.05	NA	<0.05	<0.05	<0.05	<0.05	NA	<0.05	<0.05	<0.05	<0.05	
Arsenic	ug/L	<2	<2	<2	<2	NA	<2	<2	<2	<2	NA	<2	
Barium	ug/L	34	30	27	26	19	20	51	50	45	37	29	
Cadmium	ug/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Calcium	mg/L	136	130	122	117	94	116	195	233	218	245	274	
Chloride	mg/L	7.2	8.1	9	9.3	9.6	10.4	28.2	30.2	31.8	37.6	41	
Chromium	ug/L	<2	<2	<2	<2	NA	<2	<2	<2	<2	NA	<2	
COD	mg/L	<20	NA	<20	<20	NA	<20	NA	<20	<20	NA	<20	
Conductivity	umhos/cm	1560	NA	1850	1850	2010	2030	NA	2380	2480	3190	3050	
Copper	ug/L	3.1	2.5	3.6	3.7	4.7	6.4	2.7	3.7	5	6	8.3	
Hardness, Total	mg/L	340	638	609	560	453	512	487	837	812	896	981	
Iron	ug/L	292	132	140	158	104	129	154	227	161	156	138	
Lead	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Magnesium	mg/L	76	76	74	65	NA	54	59	62	65	NA	72	
Manganese	ug/L	38	22	20	21	NA	<10	66	92	106	NA	121	
Nickel	ug/L	4.3	3.3	2.9	2.2	<2	2.3	4.2	3.2	3.8	4.7	5	
Nitrate+nitrite	mg/L	0.29	NA	0.28	0.29	0.22	0.14	NA	0.21	0.13	<0.1	<0.1	
Nitrite	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Potassium	mg/L	4	4	5	5	5	5	4	5	6	7	6	
Selenium	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	<2	
Sodium	mg/L	123	180	208	240	325	315	211	278	283	416	393	
Strontium	ug/L	2460	2800	2970	2900	NA	2970	2450	2760	2960	NA	3360	
Sulfate	mg/L	641	709	754	702	688	687	928	1100	1200	1540	1490	
TKN	mg/L	<0.2	NA	<0.2	<0.2	<0.2	<0.2	NA	<0.2	<0.2	0.37	0.29	
Total Dissolved Sol	mg/L	1210	1330	1370	1350	1390	1410	1580	1850	1960	2550	2420	
Total Phosphorus	mg/L	0.012	NA	0.018	<0.01	0.01	0.016	NA	<0.01	<0.01	0.022	<0.01	
Total Suspended S	mg/L	5	5	<5	<5	<5	<5	<5	5	<5	<5	<5	
Zinc	ug/L	<10	<10	<10	<10	NA	<10	<10	<10	<10	NA	<10	
Field Measurements													
Temperature	°C	22.65	22.52	22.3	20.56	19.06	10.72	23.69	23.16	22.31	22.77	11.22	
Conductivity	umhos/cm	1374	1799.9	1865.7	1882.6	1955.3	1903.9	2050.9	2340.9	2379.7	3049.2	2630.8	
Dissolved Oxygen	mg/L	8.32	9.3	9.86	10.19	10.76	13.29	8.1	8	9.09	8.21	12.34	
D.O. Saturation	%	96.7	108	114.1	114	116.8	120.4	96.3	94.2	105.3	96.1	113.4	
pH	S.U.	8.23	8.18	8.27	8.28	8.55	8.32	7.92	7.95	8.15	8.15	8.21	

Appendix Table A2. Continued.

		Site Location: Town Run @ TR 434 (Hells Kitchen Rd) River Mile: 0.28 Storet: C03S01						Site Location: Steep Run dst CR 10 at RR bridge River Mile: 0.03 Storet: 301081					
Parameter	Units	6/23/2010	7/7/2010	7/27/2010	8/9/2010	9/13/2010	10/18/2010	7/8/2010	7/28/2010	8/9/2010	9/13/2010	10/18/2010	
Acidity	mg/L	<5	NA	<5	<5	<5	<5	NA	<5	<5	<5	<5	
Alkalinity	mg/L	263	NA	335	364	386	402	NA	135	125	135	130	
Aluminum	ug/L	<200	<200	<200	<200	<200	<200	5990	5750	3690	1920	8150	
Ammonia	mg/L	<0.05	NA	<0.05	<0.05	<0.05	<0.05	NA	0.433	0.563	0.656	1.33	
Arsenic	ug/L	<2	<2	<2	<2	NA	<2	3.3	3.4	<2	NA	2.6	
Barium	ug/L	34	30	27	26	19	20	42	39	33	25	29	
Cadmium	ug/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Calcium	mg/L	136	130	122	117	94	116	272	321	295	366	357	
Chloride	mg/L	7.2	8.1	9	9.3	9.6	10.4	58.9	62.8	71	64.9	84.2	
Chromium	ug/L	<2	<2	<2	<2	NA	<2	<2	<2	<2	NA	<2	
COD	mg/L	<20	NA	<20	<20	NA	<20	NA	<20	<20	NA	37	
Conductivity	umhos/cm	1560	NA	1850	1850	2010	2030	NA	3590	3570	4570	4000	
Copper	ug/L	3.1	2.5	3.6	3.7	4.7	6.4	8	10.4	11.3	9.8	14.5	
Hardness, Total	mg/L	340	638	609	560	453	512	918	1080	1020	1250	1200	
Iron	ug/L	292	132	140	158	104	129	31300	36300	24600	14600	40700	
Lead	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Magnesium	mg/L	76	76	74	65	NA	54	58	67	70	NA	76	
Manganese	ug/L	38	22	20	21	NA	<10	735	918	1020	NA	1110	
Nickel	ug/L	4.3	3.3	2.9	2.2	<2	2.3	43.3	46	65.9	67.6	64.7	
Nitrate+nitrite	mg/L	0.29	NA	0.28	0.29	0.22	0.14	NA	0.26	0.19	0.17	0.21	
Nitrite	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Potassium	mg/L	4	4	5	5	5	5	6	8	8	10	9	
Selenium	ug/L	<2	<2	<2	<2	<2	<2	<2	3.4	3.8	NA	2.6	
Sodium	mg/L	123	180	208	240	325	315	385	491	479	642	615	
Strontium	ug/L	2460	2800	2970	2900	NA	2970	2620	3200	3080	NA	3530	
Sulfate	mg/L	641	709	754	702	688	687	1470	1850	1970	2460	2200	
TKN	mg/L	<0.2	NA	<0.2	<0.2	<0.2	<0.2	NA	0.69	0.67	1.04	1.48	
Total Dissolved Sol	mg/L	1210	1330	1370	1350	1390	1410	2290	2840	2990	3750	3230	
Total Phosphorus	mg/L	0.012	NA	0.018	<0.01	0.01	0.016	NA	0.092	0.035	0.024	0.111	
Total Suspended S	mg/L	5	5	<5	<5	<5	<5	84	124	67	44	121	
Zinc	ug/L	<10	<10	<10	<10	NA	<10	95	102	81	NA	114	
Field Measurements													
Temperature	°C	25.23	27.21	24.4	23.3	20.61	12.38	22.17	22.38	21.68	20.77	12.59	
Conductivity	umhos/cm	755.8	1052.7	952.1	986.9	964.3	1023.3	2765.4	3616.9	3522.6	4236.9	3416.2	
Dissolved Oxygen	mg/L	8.06	8.43	9.91	9.58	9.73	13.03	7.61	7.87	8.1	8.53	10.39	
D.O. Saturation	%	98.1	106.5	118.9	112.7	108.5	122.3	88	91.6	93	96.5	98.8	
pH	S.U.	8.36	8.15	8.58	8.15	8.54	8.57	7.86	7.86	7.74	7.91	7.78	

Appendix Table A2. Continued.

		Site Location: St. Clairsville WWTP to Town Run Storet: C03W02				
		3/14/11- 3/15/2011				
Parameter	Units					
Alkalinity	mg/L	163				
Aluminum	ug/L	<200				
Ammonia	mg/L	0.817				
Arsenic	ug/L	<2				
Barium	ug/L	75				
Cadmium	ug/L	<0.2				
Calcium	mg/L	117				
CBOD5	mg/L	9.4				
Chloride	mg/L	155				
Chromium	ug/L	<2				
COD	mg/L	34				
Conductivity	umhos/cm	1090				
Copper	ug/L	17.1				
Hardness, Total	mg/L	358				
Iron	ug/L	317				
Lead	ug/L	<2				
Magnesium	mg/L	16				
Manganese	ug/L	65				
Nickel	ug/L	2.8				
Nitrate+nitrite	mg/L	8.66				
Potassium	mg/L	5				
Selenium	ug/L	<2				
Sodium	mg/L	82				
Strontium	ug/L	388				
TKN	mg/L	2.53				
Total Dissolved Sol	mg/L	764				
Total Phosphorus	mg/L	0.995				
Total Suspended S	mg/L	24				
Zinc	ug/L	80				
Field Measurements						
Temperature	°C	5.805				
Conductivity	µmhos/cm	972.65				
Dissolved Oxygen	mg/L	12.325				
D.O. Saturation	%	99.05				
pH	S.U.	7.535				

Appendix Table A3. NPDES effluent summary results (2006-2012) for facilities that discharge to the Wheeling Creek watershed.

(Formerly) Gould Electronics Inc. Bridgeport Facility 01N00250 - outfall 001										
Season	Year	# of Obs.	# Below Detection	Minimum	Percentiles		Maximum	Mean	NPDES Limit	
					50th	95th			Max	Min
pH (S.U.)										
Summer Overall	2006-2012	27	0	7.81	8.42	8.867	8.9	8.4056	9	6.5
Winter Overall	2006-2012	19	0	7.81	8.44	8.932	8.95	8.4658		
Annual Overall	2006-2012	81	0	7.81	8.44	8.9	8.97	8.4552		
Residue, Total Dissolved (mg/l)										
Summer Overall	2006-2012	10	0	0	896	978.7	994	809.8		
Winter Overall	2006-2012	5	0	670	920	1072	1080	922		
Annual Overall	2006-2012	23	0	0	920	1076	1100	878.26		
Flow Rate (MGD)										
Summer Overall	2006-2012	28	0	0.0172	0.0276	0.034595	0.0352	0.028171		
Winter Overall	2006-2012	20	0	0.00021	0.02485	0.03959	0.18	0.030881		
Annual Overall	2006-2012	84	0	0	0.0269	0.035125	0.18	0.0281		
Arsenic, Total Recoverable (ug/l)		1 Detection 2006-2012								
Lead, Total Recoverable (ug/l)		3 Detections 2006-2012								
1,2-Cis-Dichloroethene (ug/l)		0 Detection 2006-2012								
Vinyl Chloride (kg/day)		0 Detection 2006-2012								
Trichloroethylene (ug/l)		0 Detection 2006-2012								

Appendix Table A3 Continued.

St Clairsville WWTP OPC00014 - outfall 001										
Season	Year	# of Obs.	# Below Detection	Minimum			Maximum	Mean	NPDES Limit	
					50th	95th			Weekly	Monthly
Total Suspended Solids (mg/l)										
Summer Overall	2006-2012	227	0	0.8	3	11	15.2	4.0533	30	20
Winter Overall	2006-2012	161	0	0.4	3	15	23	4.664	45	30
Annual Overall	2006-2012	684	0	0.4	3	12.34	36	4.3756		
Total Suspended Solids (kg/day)										
Summer Overall	2006-2012	227	0	0.510975	4.4088	17.122	62.91049	6.3847	107.9	71.9
Winter Overall	2006-2012	161	0	0.783495	5.564	52.145	120.17	12.437	161.8	107.9
Annual Overall	2006-2012	683	0	0.510975	5.1302	30.457	205.6163	9.6261		
CBOD 5 day (mg/l)										
Summer Overall	2006-2012	222	0	0.14	2.6	10.095	26.4	3.7852	22	15
Winter Overall	2006-2012	162	0	0.34	3.1	9.233	29.3	4.0454	40	25
Annual Overall	2006-2012	678	0	0.14	2.79	9.206	29.3	3.8302		
CBOD 5 day (kg/day)										
Summer Overall	2006-2012	222	0	0.20984	3.9243	17.69	41.46846	5.9113	79.1	53.9
Winter Overall	2006-2012	162	0	0.84678	5.9207	30.186	185.3147	10.434	143.8	89.8
Annual Overall	2006-2012	678	0	0.20984	4.9613	26.828	185.3147	8.36		
Nitrogen, Ammonia (NH3) (mg/l)										
Summer Overall	2006-2012	227	0	0.003	0.25	0.978	11.3	0.44238		
Winter Overall	2006-2012	166	0	0.01	0.35	1	5.5	0.4664	1.5	1
Annual Overall	2006-2012	695	0	0.003	0.32	1.082	11.3	0.48082	11.7	7.8
Nitrogen, Ammonia (NH3) (kg/day)										
Summer Overall	2006-2012	227	0	0.005507	0.37172	1.4825	18.22023	0.6716	5.4	3.6
Winter Overall	2006-2012	166	0	0.018471	0.63333	3.6696	16.8705	1.1645	42.1	28
Annual Overall	2006-2012	694	0	0.005507	0.51998	3.5909	18.22023	1.001		
Nitrite Plus Nitrate, Total (mg/l)										
Summer Overall	2006-2012	28	0	0.1	8.535	19.965	22.1	9.8212		
Winter Overall	2006-2012	20	0	5.8	11.8	23.21	25.3	13.196		
Annual Overall	2006-2012	84	0	0.1	11.05	21.385	26.4	11.385		
Nitrite Plus Nitrate, Total (kg/day)										
Summer Overall	2006-2012	28	0	0.115821	13.6	35.726	41.17777	15.315		
Winter Overall	2006-2012	20	0	6.52129	33.345	48.674	52.6872	29.903		
Annual Overall	2006-2012	84	0	0.115821	22.31	48.119	104.709	23.871		
Dissolved Oxygen (mg/l)										
Summer Overall	2006-2012	595	0	5	6.8	7.6	9.7	6.7225		5
Winter Overall	2006-2012	402	0	6.4	9.3	10.8	12.8	9.2818		
Annual Overall	2006-2012	1755	0	5	7.7	10.3	12.8	7.8905		
pH (S.U.)										
Summer Overall	2006-2012	595	0	6.4	7.5	7.8	8	7.4896	9	6.5
Winter Overall	2006-2012	401	0	7.4	7.9	8	8.3	7.8753		
Annual Overall	2006-2012	1754	0	6.4	7.7	8	8.4	7.6582		
Chlorine, Total Residual (mg/l)										
Summer Overall	2006-2012	594	18	0	0.01	0.02135	0.038	0.009153	0.019	
Fecal Coliform (#/100 ml)										
Annual Overall	2006-2012	339	0	1	24	782	2640	151.85		
Flow Rate (MGD)										
Summer Overall	2006-2012	853	0	0.135	0.375	0.9032	2.046	0.42792		
Winter Overall	2006-2012	601	0	0.113	0.539	1.433	2.32	0.63446		
Annual Overall	2006-2012	2553	0	0.068	0.449	1.3044	2.905	0.55352		

Appendix Table A3 Continued.

St Clairsville WWTP OPC00014 - outfall 001										
Season	Year	# of Obs.	# Below Detection	Minimum			Maximum	Mean	NPDES Limit	
					50th	95th			Max	Min
Oil and Grease, Hexane Extr Method (mg/l)									10	
Annual Overall	2006-2012	96	54	0	0	6.675	86.9	2.1141		
Mercury, Total (Low Level) (ng/l)										
Annual Overall	2009-2012	14	0	0.62	4.305	16.111	27.7	6.1217		
Water Temperature (C)										
Summer Overall	2006-2012	595	0	17	22	24	26	21.437		
Winter Overall	2006-2012	401	0	4	10	13	17	9.581		
Annual Overall	2006-2012	1754	0	4	15	23	26	15.57		
Copper, Total Recoverable (ug/l)										
Annual Overall	2006-2012	28	10	0	0.5105	40.95	78	11.609		
Lead, Total Recoverable (ug/l)			2 Detection 2006 - 2012							
Cadmium, Total Recoverable (ug/l)			0 Detection 2006 - 2012							

Appendix Table A3 Continued.

Pennwood Estates Subdivision STP OPH00012 - outfall 001											
Season	Year	# of Obs.	# Below Detection	Minimum	50th		95th	Maximum	Mean	NPDES Limit	
					50th	95th				Weekly	Monthly
Total Suspended Solids (mg/l)										18	12
Summer Overall	2006-2012	244	60	0	1.5	5.85	12	1.9303			
Winter Overall	2006-2012	171	36	0	2	6	9	2.269			
Annual Overall	2006-2012	730	165	0	2	6	18	2.1548			
Total Suspended Solids (kg/day)										7.5	5
Summer Overall	2006-2012	244	60	0	0.08327	0.33951	0.91597	0.12256			
Winter Overall	2006-2012	171	36	0	0.2271	0.87244	2.99772	0.30039			
Annual Overall	2006-2012	724	163	0	0.14383	0.70344	2.99772	0.2167			
CBOD 5 day (mg/l)										15	10
Summer Overall	2006-2012	244	72	0	4	12	15	4.4672			
Winter Overall	2006-2012	171	21	0	5	13.5	16	5.4444			
Annual Overall	2006-2012	730	153	0	5	12	16	4.8507			
CBOD 5 day (kg/day)										6.2	4.2
Summer Overall	2006-2012	244	72	0	0.21007	0.89061	2.15745	0.27964			
Winter Overall	2006-2012	171	21	0	0.5299	1.5821	2.22558	0.6292			
Annual Overall	2006-2012	724	150	0	0.3785	1.3115	3.8607	0.46685			
Nitrogen, Ammonia (NH3) (mg/l)											
Summer Overall	2006-2012	241	2	0	0.17	0.7	2.1	0.24809	2.3	1.5	
Winter Overall	2006-2012	171	0	0.01	0.26	5.32	9.55	1.1999	6	4	
Annual Overall	2006-2012	726	3	0	0.17	2.595	9.55	0.52879			
Nitrogen, Ammonia (NH3) (kg/day)											
Summer Overall	2006-2012	241	2	0	0.011241	0.040537	0.151022	0.015382	0.96	0.62	
Winter Overall	2006-2012	171	0	0.000871	0.034973	0.48764	2.024218	0.13392	2.5	1.7	
Annual Overall	2006-2012	720	3	0	0.014194	0.27875	2.024218	0.053065			
Oil and Grease, Total (mg/l)										10	
Annual Overall	2006-2012	27	23	0	0	5	6.1	0.61481			
Dissolved Oxygen (mg/l)											
Summer Overall	2006-2012	596	0	6.2	7.8	9.9	13.7	8.0574		5	
Winter Overall	2006-2012	405	0	6	10.2	12.58	15.1	10.247		6	
Annual Overall	2006-2012	1767	0	6	9	11.8	15.1	9.1036			
pH (S.U.)										9	6.5
Summer Overall	2006-2012	596	0	5.8	6.8	7.2	7.6	6.8191			
Winter Overall	2006-2012	405	0	6.5	6.9	7.2	7.6	6.8716			
Annual Overall	2006-2012	1767	0	5.8	6.8	7.2	7.6	6.8401			
Chlorine, Total Residual (mg/l)										0.019	
Summer Overall	2006-2012	594	120	0	0.01	0.03	0.05	0.0133			
Fecal Coliform (#/100 ml)											
Annual Overall	2006-2012	192	107	0	0	220.85	820	38.802			
Flow Rate (MGD)											
Summer Overall	2006-2012	853	0	0.003	0.017	0.032	0.082	0.018035			
Winter Overall	2006-2012	599	0	0.008	0.028	0.054	0.62	0.032518			
Annual Overall	2006-2012	2530	0	0.003	0.023	0.05	0.62	0.026238			
Mercury, Total (Low Level) (ng/l)											
Annual Overall	2008-2012	9	0	2.35	17.6	166.16	256	43.983			
Water Temperature (C) 001; Reporting Code: 00010;											
Summer Overall	2006-2012	596	0	14	23	27	30	22.659			
Annual Overall	2006-2012	1766	0	2	16	25	87	16.082			

Appendix Table A3 Continued.

Fox-Shannon WWTP 0PG00063 - Outfall 001										
Season	Year	# of Obs.	# Below Detection	Minimum	Percentiles		Maximum	Mean	NPDES Limit	
					50th	95th			Weekly	Monthly
Total Suspended Solids (mg/l)									18	12
Summer Overall	2006-2012	854	34	0	4	11	19	4.4918		
Winter Overall	2006-2012	556	13	0	5	14	18	5.6349		
Annual Overall	2006-2012	2424	71	0	4	13	29	5.1093		
Total Suspended Solids (kg/day)									51.1	34.1
Summer Overall	2006-2012	854	34	0	4.9697	16.086	41.72584	6.1842		
Winter Overall	2006-2012	556	13	0	6.6048	20.562	40.33296	8.0475		
Annual Overall	2006-2012	2424	71	0	5.6926	19.012	80.78704	7.2373		
CBOD 5 day (mg/l)									15	10
Summer Overall	2006-2012	244	65	0	4.5	12	15	4.7787		
Winter Overall	2006-2012	171	20	0	5	12	15	5.4444		
Annual Overall	2006-2012	730	138	0	5	12.55	15	5.0836		
CBOD 5 day (kg/day)									42.6	28.4
Summer Overall	2006-2012	244	65	0	6.1979	17.113	22.59645	6.6859		
Winter Overall	2006-2012	171	20	0	7.5322	16.393	29.12558	7.8837		
Annual Overall	2006-2012	730	138	0	6.8887	17.141	29.12558	7.2882		
Nitrogen, Ammonia (NH3) (mg/l)										
Summer Overall	2006-2012	854	0	0.04	0.675	1.778	13.86	1.0238	1.67	1.11
Winter Overall	2006-2012	583	1	0	0.37	2.894	4.43	0.7233	4.45	2.9
Annual Overall	2006-2012	2495	1	0	0.54	2.293	13.86	0.85726		
Nitrogen, Ammonia (NH3) (kg/day)										
Summer Overall	2006-2012	854	0	0.050265	0.93166	2.7675	19.35778	1.4203	4.74	3.15
Winter Overall	2006-2012	583	1	0	0.53459	4.6094	10.32881	1.0502	12.6	8.23
Annual Overall	2006-2012	2495	1	0	0.74807	3.3918	19.35778	1.2024		
Oil and Grease, Total (Infrared) (mg/l)									10	
Annual Overall	2008-2012	52	41	0	0	5.5765	7.91	0.67308		
Nitrite Plus Nitrate, Total (mg/l)										
Summer Overall	2006-2012	28	0	1.378	2.4685	8.2621	13.452	3.7621		
Winter Overall	2006-2012	19	0	0.953	6.201	10.028	12.053	5.491		
Annual Overall	2006-2012	83	0	0.467	4.222	9.744	15.127	4.6605		
Nitrite Plus Nitrate, Total (kg/day)										
Summer Overall	2006-2012	28	0	1.867231	3.4533	10.664	17.71871	5.0136		
Winter Overall	2006-2012	19	0	1.114595	8.9793	13.782	14.6493	8.0714		
Annual Overall	2006-2012	83	0	0.671686	5.9018	14.553	18.89438	6.604		
Water Temperature (C)										
Summer Overall	2006-2012	854	0	14	22	24	27	21.493		
Winter Overall	2006-2012	600	0	6	11	15	19	11.655		
Annual Overall	2006-2012	2556	0	6	17	23	27	16.681		
Dissolved Oxygen (mg/l)										6
Summer Overall	2006-2012	854	0	6	7.2	9.3	13.3	7.497		
Winter Overall	2006-2012	600	0	1.1	8.7	11.1	13.8	8.6587		
Annual Overall	2006-2012	2526	0	1.1	7.8	10.7	13.8	8.0552		
pH (S.U.)									9	6.5
Summer Overall	2006-2012	854	0	6.5	6.7	6.9	8.4	6.6869		
Winter Overall	2006-2012	600	0	6.5	6.6	6.8	7.1	6.6032		
Annual Overall	2006-2012	2526	0	6.5	6.6	6.9	8.4	6.6521		
Fecal Coliform (#/100 ml)										
Annual Overall	2006-2012	367	190	0	0	357.6	1970	73.368		

Appendix Table A3 Continued.

Fox-Shannon WWTP OPG00063 - Outfall 001										
Season	Year	# of Obs.	# Below Detection	Minimum	Percentiles		Maximum	Mean	NPDES Limit	
					50th	95th			Max	Min
Flow Rate (MGD)										
Summer Overall	2006-2012	854	0	0.164	0.356	0.4354	0.689	0.36146		
Winter Overall	2006-2012	601	0	0.178	0.362	0.488	0.731	0.37287		
Annual Overall	2006-2012	2557	0	0.164	0.359	0.4702	0.803	0.36796		
Chlorine, Total Residual (mg/l)										
Summer Overall	2006-2012	854	48	0	0.01	0.03	0.05	0.014906		0.019
Mercury, Total (Low Level) (ng/l)										
Annual Overall	2008-2012	13	1	0	11.9	67.4	116	21.027		
Cyanide, Free (mg/l)										
Annual Overall	2006-2012	29	11	0	0.02	0.056	0.104	0.018276		
Copper, Total Recoverable (ug/l)										
Annual Overall	2006-2012	28	22	0	0	30.55	40	4.2886		
Nickel, Total Recoverable (ug/l)			3 Detections 2006 - 2012							
Silver, Total Recoverable (ug/l)			3 Detections 2006 - 2012							
Zinc, Total Recoverable (ug/l)			2 Detections 2006 - 2012							
Cadmium, Total Recoverable (ug/l)			4 Detections 2006 - 2012							
Lead, Total Recoverable (ug/l)			3 Detections 2006 - 2012							
Chromium, Total Recoverable			3 Detections 2006 - 2012							
Chromium, Dissolved Hexavalent (ug/l)			3 Detections 2006 - 2012							

Appendix Table A3 Continued.

Flushing WWTP 0PB00013 - outfall 001										
Season	Year	# of Obs.	# Below Detection	Minimum			Maximum	Mean	NPDES Limit	
					50th	95th			Weekly	Monthly
Total Suspended Solids (mg/l)										
Summer Overall	2006-2012	244	1	0	2	6	12	2.1352	18	12
Winter Overall	2006-2012	184	3	0	2	8.85	27	3.5543	27	18
Annual Overall	2006-2012	744	4	0	2	10	50	3.3669		
Total Suspended Solids (kg/day)										
Summer Overall	2006-2012	244	1	0	0.46177	2.705	11.67067	0.75731	13.6	9.1
Winter Overall	2006-2012	184	3	0	1.3172	10.941	23.45186	2.6968	20.4	13.6
Annual Overall	2006-2012	744	4	0	0.73902	7.3231	78.14284	2.11		
CBOD 5 day (mg/l)										
Summer Overall	2006-2012	242	1	0	2	5	14	2.3264	15	10
Winter Overall	2006-2012	192	1	0	3	6.45	9	3.2577	20	15
Annual Overall	2006-2012	749	2	0	2	6	16	2.8097		
CBOD 5 day (kg/day)										
Summer Overall	2006-2012	242	1	0	0.54126	2.366	5.32928	0.78376	11.4	7.6
Winter Overall	2006-2012	192	1	0	1.4875	5.8657	17.28231	2.0545	15.1	11.4
Annual Overall	2006-2012	749	2	0	0.8187	4.8895	27.97758	1.5469		
Nitrogen, Ammonia (NH3) (mg/l)										
Summer Overall	2006-2012	67	0	0.077	0.23	0.524	1.23	0.25596	2.5	1.5
Winter Overall	2006-2012	65	0	0.04	0.55	11.6	11.8	4.0323	6	4
Annual Overall	2006-2012	217	0	0.018	0.25	11.32	11.8	1.4295		
Nitrogen, Ammonia (NH3) (kg/day)										
Summer Overall	2006-2012	67	0	0.011764	0.051627	0.24099	0.373928	0.078301	1.9	1.1
Winter Overall	2006-2012	65	0	0.026798	0.26979	17.764	33.71205	4.5142	4.5	3
Annual Overall	2006-2012	217	0	0.007692	0.088599	10.398	33.71205	1.4775		
Nitrogen Kjeldahl, Total (mg/l)										
Summer Overall	2009-2012	8	1	0	1.15	2.025	2.2	1.2125		
Winter Overall	2009-2012	3	0	1.2	1.3	1.48	1.5	1.3333		
Annual Overall	2009-2012	15	1	0	1.3	1.85	2.2	1.2867		
Nitrogen Kjeldahl, Total (kg/day)										
Summer Overall	2009-2012	8	1	0	0.24224	0.71805	0.857681	0.31255		
Winter Overall	2009-2012	3	0	0.236184	0.27555	2.189	2.401583	0.9711		
Annual Overall	2009-2012	15	1	0	0.31643	1.4941	2.401583	0.56508		
Nitrite Plus Nitrate, Total (mg/l)										
Summer Overall	2009-2012	8	0	7	24.4	37.12	38.8	25.325		
Winter Overall	2009-2012	3	0	8	21.2	31.46	32.6	20.6		
Annual Overall	2009-2012	15	0	7	21.2	35.44	38.8	21.48		
Nitrite Plus Nitrate, Total (kg/day)										
Summer Overall	2009-2012	8	0	2.728985	5.4951	8.2957	8.974992	5.6248		
Winter Overall	2009-2012	3	0	4.172584	6.9099	12.219	12.80844	7.9636		
Annual Overall	2009-2012	15	0	2.728985	6.003	10.125	12.80844	6.2353		
Phosphorus, Total (P) (mg/l)										
Summer Overall	2009-2012	8	0	0.61	2.69	5.31	6.57	2.8975		
Winter Overall	2009-2012	3	0	1.41	1.58	1.814	1.84	1.61		
Annual Overall	2009-2012	15	0	0.24	1.84	4.05	6.57	2.088		
Phosphorus, Total (P) (kg/day)										
Summer Overall	2009-2012	8	0	0.237812	0.65252	1.0243	1.094168	0.63921		
Winter Overall	2009-2012	3	0	0.334897	0.36215	2.068	2.257488	0.98484		
Annual Overall	2009-2012	15	0	0.101741	0.55291	1.4432	2.257488	0.6534		

Appendix Table A3 Continued.

Flushing WWTP 0PB00013 - outfall 001										
Season	Year	# of Obs.	# Below Detection	Minimum			Maximum	Mean	NPDES Limit	
					50th	95th			Max	Min
Oil and Grease, Hexane Extr Method (mg/l)										
Annual Overall	2006-2012	28	21	0	0	4.315	5.5	0.70357		
Water Temperature (C)										
Summer Overall	2006-2012	596	0	16	22	25	26	21.75		
Winter Overall	2006-2012	416	0	3	8	11	14	7.6947		
Annual Overall	2006-2012	1770	0	3	14	24	26	14.84		
Dissolved Oxygen (mg/l)										
Summer Overall	2006-2012	596	0	6.6	7.6	8.3	9.4	7.5849	5	
Winter Overall	2006-2012	417	0	6.3	11	12	18.8	10.851	6	
Annual Overall	2006-2012	1771	0	6.3	8.9	11.6	118	9.1536		
pH (S.U.)										
Summer Overall	2006-2012	596	0	6.4	7.1	7.6	7.9	7.118		
Winter Overall	2006-2012	417	0	6.5	7.3	7.8	8.3	7.3494		
Annual Overall	2006-2012	1771	0	4.4	7.2	7.7	8.3	7.1853		
Chlorine, Total Residual (mg/l)										
Summer Overall	2006-2012	598	258	0	0	0	0	0	0.019	
Fecal Coliform (#/100 ml)										
Annual Overall	2006-2012	179	64	0	0	114.3	7500	81.587		
Flow Rate (MGD)										
Summer Overall	2006-2012	854	0	0.01	0.07065	0.16928	0.792	0.083571		
Winter Overall	2006-2012	601	0	0	0.1347	0.423	0.8268	0.16819		
Annual Overall	2006-2012	2557	0	0	0.091	0.34536	395	0.28322		
Mercury, Total (Low Level) (ng/l)										
Annual Overall	2009-2012	15	0	1.09	5.51	8.998	9.11	5.1093		
Copper, Total Recoverable (ug/l)										
Annual Overall	2006-2012	14	7	0	5	19.8	25	7.5		
Nickel, Total Recoverable (ug/l)										
0 Detections 2006 - 2012										
Zinc, Total Recoverable (ug/l)										
0 Detections 2006 - 2012										
Cadmium, Total Recoverable (ug/l)										
0 Detections 2006 - 2012										
Lead, Total Recoverable (ug/l)										
0 Detections 2006 - 2012										
Chromium, Total Recoverable (ug/l)										
1 Detections 2006 - 2012										
Chromium, Dissolved Hexavalent (ug/l)										
1 Detections 2006 - 2012										

Appendix Table A3 Continued.

Eastern Ohio Regional Wastewater Authority 0PQ00000 Combined Sewer Overflows					
Season	Year	# of Obs.	Minimum	Maximum	Mean
CSO - 035					
Total Suspended Solids (mg/l)					
Annual	2006	1	124	124	124
Annual	2008	1	186	186	186
Annual	2010	1	204	204	204
Annual Overall	2006-2010	3	124	204	171.33
Flow Rate (MGD)					
Annual	2006	3	0.0517	0.247	0.1409
Annual	2009	3	0.00193	0.26465	0.089807
Annual	2010	2	0.0911	0.1163	0.1037
Annual Overall	2006-2010	8	0.00193	0.26465	0.11244
CBOD 5 day (mg/l)					
Annual	2006	1	47	47	47
Annual	2008	1	68	68	68
Annual	2010	1	143	143	143
Annual Overall	2006-2010	3	47	143	86
Bypass Occurrence, Number per month (No./Month)					
Annual	2006	4	1	1	1
Annual	2009	3	1	1	1
Annual	2010	2	1	1	1
Annual Overall	2006-2010	9	1	1	1
Bypass Duration, Hours per month (Hr/Month)					
Annual	2006	3	0.25	1	0.58333
Annual	2009	3	0.33	7	2.61
Annual	2010	2	0.667	1.8333	1.2502
Annual Overall	2006-2010	8	0.25	7	1.51
CSO - 036					
Total Suspended Solids (mg/l)					
Annual	2006	1	1550	1550	1550
Annual	2010	1	1640	1640	1640
Annual Overall	2006-2010	2	1550	1640	1595
Flow Rate (MGD)					
Annual	2006	3	0.00042	0.00117	0.00075
Annual	2007	1	0.04325	0.04325	0.04325
Annual	2010	2	0.016	0.0847	0.05035
Annual Overall	2006-2010	6	0.00042	0.0847	0.024367
CBOD 5 day (mg/l)					
Annual	2006	1	19	19	19
Annual	2010	1	15	15	15
Annual Overall	2006-2010	2	15	19	17
Bypass Occurrence, Number per month (No./Month)					
Annual	2006	3	1	1	1
Annual	2007	1	1	1	1
Annual	2010	2	1	1	1
Annual Overall	2006-2010	6	1	1	1

Appendix Table A3 Continued.

**Eastern Ohio Regional Wastewater Authority 0PQ00000
Combined Sewer Overflows**

Season	Year	# of Obs.	Minimum	Maximum	Mean
CSO - 036					
Bypass Duration, Hours per month (Hr/Month)					
Annual	2006	3	0.5	2	1.5
Annual	2007	1	1	1	1
Annual	2010	2	0.583	2.25	1.4165
Annual Overall	2006-2010	6	0.5	2.25	1.3888
CSO - 040					
Flow Rate (MGD)					
Annual	2009	1	0.00049	0.00049	0.00049
Annual Overall	2009-2009	1	0.00049	0.00049	0.00049
Bypass Occurrence, Number per month (No./Month)					
Annual	2009	1	1	1	1
Annual Overall	2009-2009	1	1	1	1
Bypass Duration, Hours per month (Hr/Month)					
Annual	2009	1	0.25	0.25	0.25
Annual Overall	2009-2009	1	0.25	0.25	0.25
CSO - 041					
Overflow Occurrence (No./Month)					
Annual	2011	1	2	2	2
Annual	2012	4	1	1	1
Annual Overall	2011-2012	5	1	2	1.2
CSO - 043					
Overflow Occurrence (No./Month)					
Annual	2012	1	1	1	1
Annual Overall	2012-2012	1	1	1	1
CSO - 051					
Total Suspended Solids (mg/l)					
Annual	2006	1	1330	1330	1330
Annual Overall	2006-2006	1	1330	1330	1330
Flow Rate (MGD)					
Annual	2006	1	0.0005	0.0005	0.0005
Annual Overall	2006-2006	1	0.0005	0.0005	0.0005
CBOD 5 day (mg/l)					
Annual	2006	1	62	62	62
Annual Overall	2006-2006	1	62	62	62
Bypass Occurrence, Number per month (No./Month)					
Annual	2006	1	1	1	1
Annual Overall	2006-2006	1	1	1	1
Bypass Duration, Hours per month (Hr/Month)					
Annual	2006	1	3	3	3
Annual Overall	2006-2006	1	3	3	3

Appendix Table A4. Hourly measurements of dissolved oxygen, pH, temperature, and conductivity at stream locations in the Wheeling Creek study area using Datasonde® continuous recorders, 2010.

Wheeling Ck @ TR 337 (Lee Rd) ust Crabapple Ck						Wheeling Ck @ TR 337 (Lee Rd) ust Crabapple Ck					
River Mile: 22.73 Storet: 300817						River Mile: 22.73 Storet: 300817					
Date/Time	Temp.	pH	Spec.Cond	D.O	D.O.	Date/Time	Temp.	pH	Spec.Cond	D.O	D.O.
M/DD/YEAR TIME	°C	SU	mS/cm	% Sat.	mg/l	M/DD/YEAR TIME	°C	SU	mS/cm	% Sat.	mg/l
8/10/10 11:00	24.38	8.07	1744	117.4	9.58	9/21/10 11:00	17.11	8.04	1912	109.3	10.33
8/10/10 12:00	25.55	8.14	1767	131.8	10.52	9/21/10 12:00	18.16	8.13	1921	121.2	11.21
8/10/10 13:00	26.64	8.18	1775	142.5	11.15	9/21/10 13:00	19.4	8.21	1906	131.8	11.89
8/10/10 14:00	27.25	8.21	1757	145.8	11.29	9/21/10 14:00	20.55	8.26	1900	139.8	12.32
8/10/10 15:00	27.49	8.24	1740	142.9	11.02	9/21/10 15:00	21.12	8.28	1914	141.3	12.32
8/10/10 16:00	27.45	8.26	1750	135.9	10.48	9/21/10 16:00	21.03	8.27	1945	136.1	11.88
8/10/10 17:00	27.35	8.26	1766	131.6	10.17	9/21/10 17:00	20.68	8.26	1977	125.9	11.07
8/10/10 18:00	27.11	8.25	1778	121.5	9.43	9/21/10 18:00	20.21	8.24	1997	115.3	10.23
8/10/10 19:00	27.03	8.23	1772	112.5	8.74	9/21/10 19:00	19.88	8.19	1996	102	9.11
8/10/10 20:00	26.94	8.2	1752	102.2	7.96	9/21/10 20:00	19.84	8.16	1984	94.8	8.47
8/10/10 21:00	26.78	8.18	1740	94.2	7.35	9/21/10 21:00	19.87	8.14	1979	90.3	8.06
8/10/10 22:00	26.5	8.15	1733	89.1	6.99	9/21/10 22:00	19.89	8.12	1975	87.9	7.85
8/10/10 23:00	26.18	8.11	1732	86.1	6.79	9/21/10 23:00	19.83	8.11	1963	86.1	7.7
8/11/10 0:00	25.87	8.08	1728	83.9	6.66	9/22/10 0:00	19.67	8.09	1946	85.1	7.63
8/11/10 1:00	25.58	8.05	1724	82.7	6.6	9/22/10 1:00	19.42	8.07	1933	84.1	7.58
8/11/10 2:00	25.32	8.01	1724	81.5	6.54	9/22/10 2:00	19.11	8.03	1919	83.4	7.57
8/11/10 3:00	25.02	7.97	1734	80.7	6.5	9/22/10 3:00	18.8	7.99	1909	82.4	7.52
8/11/10 4:00	24.8	7.95	1760	80.2	6.49	9/22/10 4:00	18.53	7.96	1899	81.8	7.51
8/11/10 5:00	24.63	7.94	1774	80.4	6.53	9/22/10 5:00	18.31	7.93	1891	81.2	7.49
8/11/10 6:00	24.37	7.92	1763	80.2	6.54	9/22/10 6:00	18.13	7.91	1889	80.7	7.47
8/11/10 7:00	24.14	7.91	1740	80.7	6.61	9/22/10 7:00	17.96	7.89	1888	80.9	7.51
8/11/10 8:00	24.08	7.93	1723	83.6	6.86	9/22/10 8:00	17.92	7.88	1889	81.7	7.59
8/11/10 9:00	24.24	7.97	1721	91.8	7.51	9/22/10 9:00	18.18	7.93	1888	90.3	8.34
8/11/10 10:00	24.54	8.01	1732	101.4	8.25	9/22/10 10:00	18.52	7.98	1882	98.2	9.02
8/11/10 11:00	24.96	8.07	1757	112.8	9.11	9/22/10 11:00	19.06	8.1	1877	111.3	10.11
8/11/10 12:00	25.68	8.13	1779	124.6	9.93	9/22/10 12:00	20.11	8.24	1871	128	11.39
8/11/10 13:00	26.46	8.19	1783	137.2	10.77	9/22/10 13:00	21.35	8.32	1869	142.8	12.39
8/11/10 14:00	26.85	8.22	1770	137.8	10.74	9/22/10 14:00	22.29	8.34	1878	150.3	12.81
8/11/10 15:00	26.97	8.25	1774	137.1	10.66	9/22/10 15:00	22.55	8.33	1898	145.8	12.36
8/11/10 16:00	27.11	8.27	1790	131.3	10.19	9/22/10 16:00	22	8.28	1921	127.2	10.9
8/11/10 17:00	27.24	8.27	1796	126.6	9.8	9/22/10 17:00	21.91	8.32	1955	126.4	10.85
8/11/10 18:00	27.22	8.27	1785	122.9	9.52	9/22/10 18:00	21.95	8.29	1954	119.8	10.27
8/11/10 19:00	27.01	8.24	1765	111.7	8.69	9/22/10 19:00	21.78	8.22	1944	106.1	9.13
8/11/10 20:00	26.87	8.22	1747	102.8	8.02	9/22/10 20:00	21.65	8.16	1944	95.9	8.27
8/11/10 21:00	26.66	8.18	1738	94	7.35	9/22/10 21:00	21.58	8.11	1950	90.9	7.85
8/11/10 22:00	26.46	8.15	1740	89.1	7	9/22/10 22:00	21.47	8.08	1945	87.4	7.56
8/11/10 23:00	26.3	8.11	1760	86.1	6.78	9/22/10 23:00	21.42	8.04	1930	85	7.37
8/12/10 0:00	26.04	8.08	1780	84	6.64	9/23/10 0:00	21.34	8	1913	83.5	7.25
8/12/10 1:00	25.82	8.04	1778	82.2	6.53	9/23/10 1:00	21.1	7.97	1895	82.8	7.22
8/12/10 2:00	25.56	8.01	1760	81.2	6.48	9/23/10 2:00	20.78	7.93	1887	81.7	7.17
8/12/10 3:00	25.26	7.98	1748	80.4	6.45	9/23/10 3:00	20.51	7.88	1879	80.9	7.14
8/12/10 4:00	25.06	7.95	1744	80.1	6.45	9/23/10 4:00	20.25	7.85	1875	80.1	7.1
8/12/10 5:00	24.9	7.94	1739	80.1	6.47	9/23/10 5:00	20.12	7.81	1872	79.9	7.11
8/12/10 6:00	24.8	7.93	1738	80	6.48	9/23/10 6:00	19.98	7.78	1874	79.4	7.08
8/12/10 7:00	24.67	7.93	1741	80.2	6.51	9/23/10 7:00	19.72	7.75	1879	79	7.08
8/12/10 8:00	24.58	7.93	1753	81.8	6.64	9/23/10 8:00	19.49	7.74	1882	80.3	7.23
8/12/10 9:00	24.56	7.95	1775	84.9	6.9	9/23/10 9:00	19.45	7.75	1886	85.8	7.73
						9/23/10 10:00	19.76	7.81	1887	97.1	8.69
						9/23/10 11:00	20.67	7.97	1884	114.8	10.09
						9/23/10 12:00	21.57	8.02	1882	131.3	11.35
						9/23/10 13:00	22.72	8.05	1879	146	12.34
						9/23/10 14:00	23.74	8.1	1882	155.7	12.91

Appendix Table A4. Continued.

Wheeling Creek @ CR 10 (Fairport - Maynard Rd)					
River Mile: 17.34 Storet: 301066					
Date/Time	Temp.	pH	Spec.Cond	D.O	D.O.
M/DD/YEAR TIME	°C	SU	mS/cm	% Sat.	mg/l
8/10/10 12:00	23.72	8.04	2270	115.7	9.77
8/10/10 13:00	24.69	8.09	2269	127.1	10.55
8/10/10 14:00	25.6	8.1	2262	136	11.1
8/10/10 15:00	26.31	8.1	2259	139.4	11.24
8/10/10 16:00	26.75	8.09	2254	138	11.03
8/10/10 17:00	26.9	8.07	2253	134.9	10.75
8/10/10 18:00	26.91	8.05	2255	125.5	10.01
8/10/10 19:00	26.76	8.02	2253	114.6	9.16
8/10/10 20:00	26.57	7.98	2259	103.5	8.3
8/10/10 21:00	26.3	7.95	2257	94.6	7.63
8/10/10 22:00	26.09	7.93	2255	89.3	7.22
8/10/10 23:00	25.86	7.92	2260	85.8	6.97
8/11/10 0:00	25.58	7.91	2264	83.5	6.82
8/11/10 1:00	25.29	7.91	2265	82.7	6.79
8/11/10 2:00	25.05	7.91	2265	82.2	6.78
8/11/10 3:00	24.77	7.91	2264	82	6.79
8/11/10 4:00	24.46	7.91	2259	81.8	6.82
8/11/10 5:00	24.2	7.91	2263	81.9	6.86
8/11/10 6:00	23.93	7.91	2258	81.4	6.85
8/11/10 7:00	23.72	7.91	2264	82.6	6.98
8/11/10 8:00	23.51	7.93	2266	84.5	7.17
8/11/10 9:00	23.55	7.96	2272	89.9	7.62
8/11/10 10:00	23.72	7.99	2272	96.7	8.17
8/11/10 11:00	24.01	8.01	2273	103.9	8.73
8/11/10 12:00	24.41	8.04	2270	111.7	9.31
8/11/10 13:00	24.91	8.07	2266	120.6	9.96
8/11/10 14:00	25.38	8.06	2262	122	10
8/11/10 15:00	25.75	8.07	2254	124.6	10.15
8/11/10 16:00	25.85	8.05	2249	118.5	9.63
8/11/10 17:00	26	8.03	2246	115.9	9.4
8/11/10 18:00	26.15	8.02	2246	114.2	9.23
8/11/10 19:00	26.09	8	2245	106	8.58
8/11/10 20:00	26.03	7.97	2248	98.5	7.98
8/11/10 21:00	25.88	7.95	2246	91.9	7.46
8/11/10 22:00	25.73	7.93	2249	87.5	7.12
8/11/10 23:00	25.65	7.92	2253	84.7	6.9
8/12/10 0:00	25.48	7.91	2252	83.1	6.79
8/12/10 1:00	25.27	7.91	2251	82	6.73
8/12/10 2:00	25.02	7.91	2251	81.4	6.72
8/12/10 3:00	24.85	7.91	2250	81.3	6.73
8/12/10 4:00	24.65	7.91	2254	81.3	6.75
8/12/10 5:00	24.43	7.9	2262	81.5	6.79
8/12/10 6:00	24.22	7.91	2264	81.4	6.81
8/12/10 7:00	24.09	7.91	2271	81.7	6.86
8/12/10 8:00	23.99	7.91	2273	82.9	6.97
8/12/10 9:00	23.93	7.92	2270	85.6	7.2
8/12/10 10:00	23.9	7.94	2272	88.4	7.44

Wheeling Creek @ CR 10 (Fairport - Maynard Rd)					
River Mile: 17.34 Storet: 301066					
Date/Time	Temp.	pH	Spec.Cond	D.O	D.O.
M/DD/YEAR TIME	°C	SU	mS/cm	% Sat.	mg/l
9/21/10 12:00	16.42	7.98	2438	110.4	10.57
9/21/10 13:00	17.53	8.09	2434	122.2	11.43
9/21/10 14:00	18.64	8.13	2434	132.1	12.08
9/21/10 15:00	19.45	8.14	2432	138.3	12.44
9/21/10 16:00	20.1	8.14	2432	140.2	12.45
9/21/10 17:00	20.34	8.12	2430	135.4	11.97
9/21/10 18:00	20.43	8.09	2431	125.4	11.06
9/21/10 19:00	20.39	8.06	2435	114.7	10.13
9/21/10 20:00	20.13	8.02	2437	104.7	9.29
9/21/10 21:00	19.79	7.99	2438	98	8.76
9/21/10 22:00	19.52	7.97	2438	92.8	8.34
9/21/10 23:00	19.33	7.96	2442	89.3	8.05
9/22/10 0:00	19.17	7.95	2445	86.8	7.85
9/22/10 1:00	19	7.94	2449	85.3	7.74
9/22/10 2:00	18.82	7.93	2455	84.3	7.68
9/22/10 3:00	18.65	7.93	2459	83.6	7.64
9/22/10 4:00	18.48	7.93	2461	83	7.62
9/22/10 5:00	18.32	7.92	2462	82.6	7.6
9/22/10 6:00	18.15	7.92	2462	82.6	7.63
9/22/10 7:00	17.94	7.92	2462	82.8	7.68
9/22/10 8:00	17.75	7.93	2462	84.4	7.86
9/22/10 9:00	17.79	7.96	2461	91.3	8.5
9/22/10 10:00	17.9	7.98	2458	95.6	8.88
9/22/10 11:00	18.18	8.02	2459	104.9	9.68
9/22/10 12:00	18.77	8.06	2455	115.8	10.56
9/22/10 13:00	19.69	8.1	2454	130.5	11.68
9/22/10 14:00	20.66	8.12	2450	140.1	12.3
9/22/10 15:00	21.18	8.1	2448	142.8	12.41
9/22/10 16:00	21.2	8.08	2438	130.1	11.31
9/22/10 17:00	21.44	8.09	2436	133.2	11.52
9/22/10 18:00	21.4	8.06	2435	123	10.65
9/22/10 19:00	21.33	8.03	2436	112.5	9.75
9/22/10 20:00	21.12	7.99	2433	102.9	8.95
9/22/10 21:00	20.86	7.95	2437	96.2	8.42
9/22/10 22:00	20.67	7.93	2439	91.6	8.04
9/22/10 23:00	20.58	7.91	2440	88	7.74
9/23/10 0:00	20.5	7.92	2445	85.7	7.55
9/23/10 1:00	20.37	7.91	2448	83.7	7.39
9/23/10 2:00	20.19	7.9	2452	82.8	7.34
9/23/10 3:00	20	7.9	2454	81.8	7.28
9/23/10 4:00	19.89	7.9	2455	81.5	7.26
9/23/10 5:00	19.76	7.89	2458	81.5	7.28
9/23/10 6:00	19.63	7.89	2458	81.2	7.27
9/23/10 7:00	19.42	7.89	2456	81.6	7.34
9/23/10 8:00	19.25	7.9	2454	82.5	7.45
9/23/10 9:00	19.12	7.92	2454	86.8	7.86
9/23/10 10:00	19.13	7.94	2453	90.7	8.21
9/23/10 11:00	19.43	7.97	2449	100.6	9.05
9/23/10 12:00	20.1	8.01	2445	111.1	9.86
9/23/10 13:00	21.04	8.04	2440	125.5	10.94

Appendix Table A4 Continued.

Wheeling Cr near Barton, just UST Town Run					
River Mile: 10.99 Storet: C03W15					
Date/Time	Temp.	pH	Spec.Cond	D.O	D.O.
M/DD/YEAR TIME	°C	SU	mS/cm	% Sat.	mg/l
8/10/10 12:00	24.54	8.1	2159	111.5	9.06
8/10/10 13:00	25.66	8.13	2156	116.9	9.3
8/10/10 14:00	26.52	8.13	2152	119	9.32
8/10/10 15:00	27.24	8.13	2137	117.6	9.1
8/10/10 16:00	27.71	8.12	2150	116.7	8.95
8/10/10 17:00	27.97	8.12	2152	113.9	8.69
8/10/10 18:00	28.1	8.1	2149	109.4	8.33
8/10/10 19:00	27.98	8.08	2150	104.4	7.96
8/10/10 20:00	27.54	8.06	2150	98	7.54
8/10/10 21:00	27.03	8.04	2152	93.1	7.22
8/10/10 22:00	26.53	8.02	2158	90.1	7.05
8/10/10 23:00	26.04	8.02	2160	88.5	7
8/11/10 0:00	25.6	8.01	2168	87.5	6.97
8/11/10 1:00	25.22	8.02	2168	87.5	7.02
8/11/10 2:00	24.91	8.01	2167	87.5	7.06
8/11/10 3:00	24.61	8.02	2167	87.5	7.1
8/11/10 4:00	24.35	8.02	2167	87.2	7.11
8/11/10 5:00	24.12	8.02	2168	87.7	7.18
8/11/10 6:00	23.88	8.02	2171	87.8	7.22
8/11/10 7:00	23.63	8.03	2173	88.2	7.29
8/11/10 8:00	23.5	8.04	2175	89.9	7.44
8/11/10 9:00	23.57	8.06	2176	93.8	7.76
8/11/10 10:00	23.86	8.08	2177	98.7	8.12
8/11/10 11:00	24.46	8.1	2179	104.5	8.5
8/11/10 12:00	25.07	8.11	2179	108.2	8.7
8/11/10 13:00	25.67	8.13	2177	111.8	8.89
8/11/10 14:00	26.2	8.13	2176	112.1	8.83
8/11/10 15:00	26.54	8.12	2175	111.6	8.74
8/11/10 16:00	26.78	8.11	2154	106.7	8.32
8/11/10 17:00	27	8.11	2164	106.5	8.27
8/11/10 18:00	27.19	8.1	2160	104.4	8.08
8/11/10 19:00	27.07	8.08	2156	99.7	7.73
8/11/10 20:00	26.83	8.06	2154	95.4	7.43
8/11/10 21:00	26.49	8.04	2158	91.4	7.17
8/11/10 22:00	26.19	8.03	2161	89	7.01
8/11/10 23:00	25.93	8.02	2168	87.8	6.95
8/12/10 0:00	25.66	8.02	2173	87.3	6.94
8/12/10 1:00	25.35	8.02	2175	87.1	6.97
8/12/10 2:00	25.06	8.02	2177	86.9	6.99
8/12/10 3:00	24.8	8.02	2176	87	7.03
8/12/10 4:00	24.57	8.02	2175	87	7.06
8/12/10 5:00	24.36	8.03	2174	87.1	7.1
8/12/10 6:00	24.2	8.03	2171	86.9	7.11
8/12/10 7:00	24.06	8.03	2173	87.2	7.15
8/12/10 8:00	23.96	8.03	2175	88.2	7.24
8/12/10 9:00	23.96	8.04	2175	89.7	7.37
8/12/10 10:00	23.99	8.05	2175	92	7.55

Wheeling Cr near Barton, just UST Town Run					
River Mile: 10.99 Storet: C03W15					
Date/Time	Temp.	pH	Spec.Cond	D.O	D.O.
M/DD/YEAR TIME	°C	SU	mS/cm	% Sat.	mg/l
9/21/10 16:00	20.25	7.93	2351	115.1	10.15
9/21/10 17:00	20.54	7.94	2349	111.6	9.79
9/21/10 18:00	20.78	7.92	2350	106.6	9.31
9/21/10 19:00	20.92	7.9	2351	101.3	8.82
9/21/10 20:00	20.89	7.88	2352	96.8	8.43
9/21/10 21:00	20.62	7.86	2355	93.7	8.21
9/21/10 22:00	20.27	7.85	2359	91.7	8.09
9/21/10 23:00	19.88	7.84	2361	90.5	8.04
9/22/10 0:00	19.42	7.84	2365	89.8	8.06
9/22/10 1:00	18.96	7.84	2369	89.5	8.1
9/22/10 2:00	18.58	7.84	2372	89.4	8.16
9/22/10 3:00	18.3	7.84	2371	89.4	8.2
9/22/10 4:00	18.08	7.84	2374	89.5	8.25
9/22/10 5:00	17.88	7.84	2374	89.5	8.28
9/22/10 6:00	17.69	7.84	2374	89.4	8.31
9/22/10 7:00	17.49	7.84	2377	89.7	8.36
9/22/10 8:00	17.33	7.85	2378	90.8	8.5
9/22/10 9:00	17.39	7.87	2375	94.8	8.86
9/22/10 10:00	17.68	7.88	2377	97.8	9.09
9/22/10 11:00	18.2	7.91	2377	104.9	9.64
9/22/10 12:00	19.17	7.94	2379	111.9	10.09
9/22/10 13:00	20.11	7.95	2380	116.4	10.29
9/22/10 14:00	20.94	7.95	2382	119.7	10.41
9/22/10 15:00	21.44	7.94	2381	118.1	10.18
9/22/10 16:00	21.46	7.92	2378	111.6	9.61
9/22/10 17:00	21.71	7.93	2375	112.2	9.62
9/22/10 18:00	21.84	7.9	2375	106.9	9.14
9/22/10 19:00	21.77	7.88	2375	100.8	8.63
9/22/10 20:00	21.64	7.86	2374	96.1	8.25
9/22/10 21:00	21.45	7.84	2377	93.1	8.03
9/22/10 22:00	21.19	7.83	2379	91.3	7.91
9/22/10 23:00	20.94	7.82	2382	90	7.83
9/23/10 0:00	20.67	7.82	2387	89.3	7.81
9/23/10 1:00	20.33	7.82	2389	89.1	7.85
9/23/10 2:00	20.01	7.82	2392	88.8	7.87
9/23/10 3:00	19.76	7.81	2394	88.9	7.91
9/23/10 4:00	19.54	7.82	2395	88.8	7.95
9/23/10 5:00	19.4	7.82	2395	89	7.98
9/23/10 6:00	19.31	7.82	2394	89.2	8.02
9/23/10 7:00	19.13	7.82	2394	89.2	8.05
9/23/10 8:00	19.02	7.82	2393	90.2	8.15
9/23/10 9:00	19.05	7.84	2391	93.2	8.42
9/23/10 10:00	19.29	7.86	2390	97.6	8.77
9/23/10 11:00	19.95	7.89	2391	104.6	9.28
9/23/10 12:00	20.83	7.91	2393	110.5	9.64
9/23/10 13:00	21.87	7.92	2394	116.4	9.94

Appendix Table A4 Continued.

Wheeling Ck @ CR 10 (Barton -Blaine Rd)					
River Mile: 9.40 Storet: 203459					
Date/Time	Temp.	pH	Spec.Cond	D.O	D.O.
M/DD/YEAR TIME	°C	SU	mS/cm	% Sat.	mg/l
8/10/10 13:00	26.08	8.15	2107	164.2	12.97
8/10/10 14:00	27.14	8.21	2104	174.3	13.51
8/10/10 15:00	27.72	8.18	2104	166.9	12.8
8/10/10 16:00	28.09	8.16	2093	161.4	12.3
8/10/10 17:00	28.31	8.14	2088	155.3	11.79
8/10/10 18:00	28.22	8.11	2092	141.4	10.75
8/10/10 19:00	28.03	8.05	2094	124.9	9.52
8/10/10 20:00	27.69	7.99	2098	106	8.13
8/10/10 21:00	27.29	7.93	2103	92.4	7.14
8/10/10 22:00	26.89	7.91	2108	86.4	6.73
8/10/10 23:00	26.5	7.89	2104	84.4	6.62
8/11/10 0:00	26.1	7.88	2103	83.4	6.58
8/11/10 1:00	25.7	7.89	2112	83.7	6.65
8/11/10 2:00	25.33	7.89	2115	84.6	6.77
8/11/10 3:00	24.97	7.9	2113	85.2	6.86
8/11/10 4:00	24.63	7.9	2088	85.6	6.95
8/11/10 5:00	24.34	7.89	2064	86	7.02
8/11/10 6:00	24.05	7.91	2050	86.3	7.08
8/11/10 7:00	23.79	7.9	1978	87.3	7.19
8/11/10 8:00	23.68	7.94	1959	93.2	7.7
8/11/10 9:00	23.79	7.99	1926	106.3	8.76
8/11/10 10:00	24.14	8.08	1911	123.1	10.08
8/11/10 11:00	24.65	8.11	1896	138.2	11.21
8/11/10 12:00	25.22	8.17	1887	148.3	11.91
8/11/10 13:00	26.13	8.21	1882	163.2	12.89
8/11/10 14:00	26.63	8.2	1875	164.8	12.9
8/11/10 15:00	27.01	8.18	1867	161	12.52
8/11/10 16:00	27.13	8.14	2086	141.8	10.99
8/11/10 17:00	27.13	8.11	2084	137.2	10.63
8/11/10 18:00	27.27	8.08	2089	132	10.21
8/11/10 19:00	27.25	8.02	2097	118.1	9.13
8/11/10 20:00	27.06	7.96	2096	102.6	7.96
8/11/10 21:00	26.77	7.92	2104	90.5	7.06
8/11/10 22:00	26.51	7.89	2115	85.9	6.73
8/11/10 23:00	26.3	7.87	2119	83.9	6.6
8/12/10 0:00	26.04	7.88	2119	84.2	6.66
8/12/10 1:00	25.73	7.89	2122	84.4	6.71
8/12/10 2:00	25.41	7.89	2127	84.5	6.75
8/12/10 3:00	25.1	7.9	2130	85.2	6.85
8/12/10 4:00	24.85	7.9	2135	85.8	6.93
8/12/10 5:00	24.61	7.91	2137	86	6.98
8/12/10 6:00	24.42	7.89	2138	86.2	7.02
8/12/10 7:00	24.27	7.92	2140	86.8	7.09
8/12/10 8:00	24.18	7.93	2147	89	7.28
8/12/10 9:00	24.18	7.96	2145	94.8	7.75
8/12/10 10:00	24.23	8	2146	101.6	8.31
8/12/10 11:00	24.3	8.04	2148	108.5	8.85

Wheeling Ck @ CR 10 (Barton -Blaine Rd)					
River Mile: 9.40 Storet: 203459					
Date/Time	Temp.	pH	Spec.Cond	D.O	D.O.
M/DD/YEAR TIME	°C	SU	mS/cm	% Sat.	mg/l
9/21/10 16:00	20.63	8.15	2299	134.8	11.85
9/21/10 17:00	20.94	8.13	2303	127.2	11.11
9/21/10 18:00	21.02	8.1	2288	119.5	10.42
9/21/10 19:00	20.71	8.05	2283	107.6	9.44
9/21/10 20:00	20.25	7.98	2288	95.3	8.44
9/21/10 21:00	19.83	7.93	2294	88.9	7.94
9/21/10 22:00	19.45	7.9	2296	85.2	7.67
9/21/10 23:00	19.18	7.88	2297	84.1	7.61
9/22/10 0:00	19	7.87	2296	83.7	7.6
9/22/10 1:00	18.85	7.87	2299	83.8	7.63
9/22/10 2:00	18.7	7.88	2304	84.4	7.71
9/22/10 3:00	18.52	7.88	2312	84.8	7.78
9/22/10 4:00	18.31	7.88	2308	84.9	7.82
9/22/10 5:00	18.06	7.88	2307	85.4	7.9
9/22/10 6:00	17.81	7.88	2299	85.4	7.94
9/22/10 7:00	17.53	7.89	2293	85.8	8.03
9/22/10 8:00	17.32	7.91	2291	88.4	8.31
9/22/10 9:00	17.38	7.97	2293	99.3	9.32
9/22/10 10:00	17.68	8.03	2293	110	10.25
9/22/10 11:00	18.25	8.11	2296	126.2	11.63
9/22/10 12:00	19.2	8.17	2294	142.4	12.87
9/22/10 13:00	19.99	8.22	2293	153	13.62
9/22/10 14:00	20.92	8.23	2284	157.7	13.79
9/22/10 15:00	21.64	8.23	2285	152.9	13.18
9/22/10 16:00	21.88	8.16	2288	139.7	11.98
9/22/10 17:00	21.97	8.14	2290	134.4	11.51
9/22/10 18:00	21.86	8.1	2281	123.2	10.57
9/22/10 19:00	21.63	8.02	2270	108.8	9.38
9/22/10 20:00	21.31	7.95	2268	95.8	8.31
9/22/10 21:00	21.06	7.91	2268	88.5	7.71
9/22/10 22:00	20.76	7.87	2269	84.7	7.42
9/22/10 23:00	20.56	7.85	2267	83.4	7.34
9/23/10 0:00	20.44	7.85	2266	83.1	7.33
9/23/10 1:00	20.28	7.85	2263	83.1	7.36
9/23/10 2:00	20.09	7.84	2263	83	7.38
9/23/10 3:00	19.9	7.85	2262	83.4	7.44
9/23/10 4:00	19.7	7.85	2258	83.8	7.5
9/23/10 5:00	19.53	7.85	2254	84	7.55
9/23/10 6:00	19.37	7.86	2250	84.4	7.61
9/23/10 7:00	19.11	7.86	2244	84.6	7.67
9/23/10 8:00	18.93	7.88	2244	86.9	7.9
9/23/10 9:00	18.93	7.94	2247	96.5	8.78
9/23/10 10:00	19.31	8.02	2250	114.7	10.35
9/23/10 11:00	19.93	8.07	2248	129.4	11.54
9/23/10 12:00	20.61	8.13	2245	141.5	12.45

Appendix Table A4. Continued.

Site Location: Wheeling Ck @ Blain (Pease Rd)					
River Mile: 5.05 Storet: C03S18					
Date/Time	Temp.	pH	Spec.Cond	D.O	D.O.
M/DD/YEAR TIME	°C	SU	mS/cm	% Sat.	mg/l
8/10/10 14:00	26.19	8.09	2087	119.9	9.45
8/10/10 15:00	27.08	8.11	2084	119	9.23
8/10/10 16:00	27.83	8.12	2082	118.6	9.08
8/10/10 17:00	28.42	8.11	2080	118.8	9
8/10/10 18:00	28.66	8.1	2078	114.1	8.61
8/10/10 19:00	28.77	8.08	2077	109.6	8.25
8/10/10 20:00	28.48	8.04	2077	101.5	7.68
8/10/10 21:00	28.08	8.01	2074	94.9	7.23
8/10/10 22:00	27.68	7.98	2074	91.3	7.01
8/10/10 23:00	27.26	7.96	2073	89.9	6.95
8/11/10 0:00	26.8	7.95	2075	89.4	6.97
8/11/10 1:00	26.36	7.94	2078	89.2	7.01
8/11/10 2:00	26	7.93	2076	89.2	7.06
8/11/10 3:00	25.64	7.93	2079	89.3	7.11
8/11/10 4:00	25.3	7.93	2080	89.6	7.17
8/11/10 5:00	25	7.93	2087	89.7	7.22
8/11/10 6:00	24.69	7.93	2090	89.7	7.27
8/11/10 7:00	24.4	7.93	2094	90.3	7.36
8/11/10 8:00	24.25	7.95	2097	92.1	7.52
8/11/10 9:00	24.28	7.98	2098	97.1	7.93
8/11/10 10:00	24.51	8.02	2100	103.1	8.38
8/11/10 11:00	24.94	8.05	2102	109.8	8.85
8/11/10 12:00	25.49	8.08	2106	113.9	9.1
8/11/10 13:00	25.99	8.1	2108	118.4	9.37
8/11/10 14:00	26.52	8.1	2107	118.2	9.26
8/11/10 15:00	26.91	8.1	2105	117.4	9.13
8/11/10 16:00	27.26	8.1	2103	115.9	8.96
8/11/10 17:00	27.4	8.1	2099	112.7	8.69
8/11/10 18:00	27.58	8.08	2098	110.5	8.49
8/11/10 19:00	27.52	8.06	2095	104.1	8.01
8/11/10 20:00	27.39	8.03	2094	98.1	7.57
8/11/10 21:00	27.21	7.99	2096	93.8	7.26
8/11/10 22:00	26.98	7.97	2098	91.2	7.09
8/11/10 23:00	26.78	7.95	2099	89.9	7.01
8/12/10 0:00	26.53	7.94	2099	89.4	7
8/12/10 1:00	26.23	7.94	2097	89.1	7.02
8/12/10 2:00	25.92	7.94	2090	89.1	7.06
8/12/10 3:00	25.61	7.94	2090	89.1	7.1
8/12/10 4:00	25.35	7.93	2090	89.2	7.14
8/12/10 5:00	25.12	7.93	2092	89.3	7.18
8/12/10 6:00	24.9	7.94	2097	89.4	7.22
8/12/10 7:00	24.74	7.94	2100	89.8	7.27
8/12/10 8:00	24.62	7.95	2106	91	7.38
8/12/10 9:00	24.58	7.97	2110	94	7.63
8/12/10 10:00	24.65	8	2111	98.3	7.97
8/12/10 11:00	24.65	8.01	2113	99.6	8.08

Site Location: Wheeling Ck @ Blain (Pease Rd)					
River Mile: 5.05 Storet: C03S18					
Date/Time	Temp.	pH	Spec.Cond	D.O	D.O.
M/DD/YEAR TIME	°C	SU	mS/cm	% Sat.	mg/l
9/21/10 13:00	17.4	7.97	2229	110.7	10.35
9/21/10 14:00	18.09	8.04	2234	113	10.42
9/21/10 15:00	19.01	8.09	2236	114.7	10.38
9/21/10 16:00	20.27	8.12	2240	116	10.24
9/21/10 17:00	21.32	8.12	2244	113.9	9.84
9/21/10 18:00	21.82	8.11	2245	109.4	9.36
9/21/10 19:00	21.82	8.08	2241	103.4	8.85
9/21/10 20:00	21.57	8.04	2245	98.2	8.45
9/21/10 21:00	21.24	8.01	2247	95	8.22
9/21/10 22:00	20.84	7.98	2248	92.9	8.1
9/21/10 23:00	20.43	7.96	2251	91.7	8.06
9/22/10 0:00	20.05	7.94	2252	91	8.07
9/22/10 1:00	19.7	7.93	2253	90.9	8.11
9/22/10 2:00	19.39	7.93	2256	90.8	8.15
9/22/10 3:00	19.1	7.92	2256	90.8	8.2
9/22/10 4:00	18.85	7.91	2260	90.9	8.25
9/22/10 5:00	18.62	7.91	2262	91	8.3
9/22/10 6:00	18.41	7.91	2263	91.1	8.34
9/22/10 7:00	18.2	7.91	2266	91.1	8.37
9/22/10 8:00	18.02	7.92	2264	92.3	8.52
9/22/10 9:00	18.04	7.95	2263	96.9	8.94
9/22/10 10:00	18.29	7.98	2264	101.9	9.35
9/22/10 11:00	18.66	8.03	2268	107.6	9.8
9/22/10 12:00	19.21	8.05	2269	112.6	10.14
9/22/10 13:00	20	8.09	2272	117.8	10.45
9/22/10 14:00	20.72	8.11	2273	120.8	10.57
9/22/10 15:00	21.18	8.11	2270	118.9	10.3
9/22/10 16:00	21.77	8.11	2271	114.7	9.82
9/22/10 17:00	22.38	8.12	2268	115.5	9.78
9/22/10 18:00	22.46	8.1	2267	110.6	9.35
9/22/10 19:00	22.23	8.06	2267	104.6	8.88
9/22/10 20:00	22.02	8.03	2267	98.4	8.39
9/22/10 21:00	21.85	7.99	2268	95.2	8.14
9/22/10 22:00	21.6	7.97	2268	92.9	7.98
9/22/10 23:00	21.37	7.94	2269	91.7	7.91
9/23/10 0:00	21.15	7.93	2273	91.1	7.89
9/23/10 1:00	20.92	7.91	2275	90.8	7.91
9/23/10 2:00	20.67	7.9	2278	90.7	7.94
9/23/10 3:00	20.45	7.9	2282	90.5	7.96
9/23/10 4:00	20.21	7.89	2285	90.5	7.99
9/23/10 5:00	20.05	7.89	2288	90.8	8.05
9/23/10 6:00	19.9	7.89	2293	90.8	8.07
9/23/10 7:00	19.67	7.89	2294	90.8	8.1
9/23/10 8:00	19.46	7.89	2293	91.8	8.23
9/23/10 9:00	19.45	7.92	2292	95.9	8.6
9/23/10 10:00	19.64	7.96	2289	101	9.02
9/23/10 11:00	20.09	8	2292	106.6	9.44
9/23/10 12:00	20.62	8.02	2293	111.3	9.75

Appendix Table A4. Continued.

Site Location: Crabapple Ck @ CR 10 (Crabapple Rd)					
River Mile: 0.16 Storet: C03L05					
Date/Time	Temp.	pH	Spec.Cond	D.O	D.O.
M/DD/YEAR TIME	°C	SU	mS/cm	% Sat.	mg/l
8/10/10 11:00	23.89	7.68	2487	107.3	8.82
8/10/10 12:00	24.98	7.69	2488	113.6	9.14
8/10/10 13:00	26.25	7.7	2488	119.2	9.37
8/10/10 14:00	27.25	7.73	2485	121.1	9.36
8/10/10 15:00	27.84	7.74	2482	119	9.09
8/10/10 16:00	28.36	7.74	2474	117	8.86
8/10/10 17:00	28.63	7.74	2477	114.3	8.62
8/10/10 18:00	28.53	7.73	2479	108.8	8.21
8/10/10 19:00	28.32	7.71	2486	104	7.88
8/10/10 20:00	27.88	7.69	2487	98.3	7.51
8/10/10 21:00	27.37	7.67	2486	95.3	7.34
8/10/10 22:00	26.83	7.66	2488	94.3	7.33
8/10/10 23:00	26.38	7.65	2486	93.8	7.36
8/11/10 0:00	25.92	7.65	2487	93.7	7.41
8/11/10 1:00	25.49	7.64	2486	93.7	7.47
8/11/10 2:00	25.18	7.64	2487	93.8	7.52
8/11/10 3:00	24.91	7.63	2484	93.6	7.54
8/11/10 4:00	24.68	7.63	2477	93.7	7.58
8/11/10 5:00	24.47	7.63	2474	93.7	7.62
8/11/10 6:00	24.22	7.62	2478	93.4	7.62
8/11/10 7:00	23.97	7.62	2478	93.9	7.7
8/11/10 8:00	23.87	7.63	2478	95.6	7.86
8/11/10 9:00	24.03	7.64	2484	100	8.19
8/11/10 10:00	24.39	7.66	2486	104.5	8.5
8/11/10 11:00	24.78	7.68	2492	108.4	8.76
8/11/10 12:00	25.32	7.7	2494	112.9	9.03
8/11/10 13:00	26.08	7.7	2492	118.6	9.36
8/11/10 14:00	26.79	7.72	2491	119.6	9.32
8/11/10 15:00	27.09	7.71	2497	116.4	9.02
8/11/10 16:00	27.17	7.7	2504	114	8.81
8/11/10 17:00	27.29	7.7	2503	111.6	8.62
8/11/10 18:00	27.32	7.68	2505	108.2	8.35
8/11/10 19:00	27.19	7.67	2506	102.6	7.93
8/11/10 20:00	26.98	7.65	2507	98.2	7.62
8/11/10 21:00	26.66	7.64	2509	94.9	7.41
8/11/10 22:00	26.3	7.62	2516	93.5	7.35
8/11/10 23:00	25.98	7.62	2522	93.4	7.38
8/12/10 0:00	25.72	7.62	2521	93.4	7.41
8/12/10 1:00	25.45	7.62	2523	93.3	7.44
8/12/10 2:00	25.16	7.63	2521	93.3	7.48
8/12/10 3:00	24.89	7.61	2520	93.2	7.51
8/12/10 4:00	24.66	7.61	2523	93.4	7.56
8/12/10 5:00	24.44	7.6	2522	93.3	7.59
8/12/10 6:00	24.28	7.6	2526	93.5	7.62
8/12/10 7:00	24.14	7.6	2531	93.7	7.66
8/12/10 8:00	24.06	7.6	2536	94.4	7.73
8/12/10 9:00	24.06	7.61	2536	96.2	7.88

Site Location: Crabapple Ck @ CR 10 (Crabapple Rd)					
River Mile: 0.16 Storet: C03L05					
Date/Time	Temp.	pH	Spec.Cond	D.O	D.O.
M/DD/YEAR TIME	°C	SU	mS/cm	% Sat.	mg/l
9/21/10 12:00	18.21	7.94	2750	106.8	9.8
9/21/10 13:00	19.68	7.98	2758	111.3	9.92
9/21/10 14:00	21.08	8.02	2764	115.6	10.02
9/21/10 15:00	21.86	8.03	2762	114.4	9.76
9/21/10 16:00	22.04	8.01	2758	111.5	9.49
9/21/10 17:00	21.93	8.01	2757	105.5	8.99
9/21/10 18:00	21.5	7.98	2751	100	8.6
9/21/10 19:00	21.08	7.96	2749	95.7	8.3
9/21/10 20:00	20.65	7.95	2749	93.2	8.15
9/21/10 21:00	20.15	7.94	2748	92.6	8.17
9/21/10 22:00	19.67	7.91	2748	92.2	8.22
9/21/10 23:00	19.34	7.92	2752	92.1	8.26
9/22/10 0:00	19.12	7.93	2751	92	8.29
9/22/10 1:00	18.92	7.93	2748	91.9	8.32
9/22/10 2:00	18.73	7.93	2749	92	8.35
9/22/10 3:00	18.55	7.93	2749	91.9	8.38
9/22/10 4:00	18.39	7.92	2744	91.9	8.4
9/22/10 5:00	18.27	7.93	2743	91.9	8.43
9/22/10 6:00	18.16	7.88	2743	91.8	8.44
9/22/10 7:00	18.06	7.92	2743	91.7	8.44
9/22/10 8:00	18.04	7.93	2746	92.6	8.53
9/22/10 9:00	18.26	7.95	2750	96.9	8.88
9/22/10 10:00	18.59	7.96	2747	99.3	9.05
9/22/10 11:00	19.17	7.98	2752	104.9	9.44
9/22/10 12:00	20.24	8	2755	112	9.87
9/22/10 13:00	21.36	8.01	2760	117.9	10.17
9/22/10 14:00	22.58	8.03	2762	119.5	10.07
9/22/10 15:00	22.85	8.01	2757	115.3	9.66
9/22/10 16:00	22.55	7.95	2743	104.1	8.77
9/22/10 17:00	22.45	7.98	2752	106.3	8.97
9/22/10 18:00	22.06	7.94	2752	101.5	8.63
9/22/10 19:00	21.72	7.93	2753	96	8.22
9/22/10 20:00	21.5	7.91	2749	93	7.99
9/22/10 21:00	21.27	7.88	2744	92	7.94
9/22/10 22:00	21.06	7.87	2741	91.8	7.96
9/22/10 23:00	20.88	7.9	2753	91.8	7.99
9/23/10 0:00	20.74	7.89	2756	91.8	8.01
9/23/10 1:00	20.57	7.89	2750	91.7	8.03
9/23/10 2:00	20.38	7.89	2755	91.6	8.05
9/23/10 3:00	20.12	7.88	2755	91.7	8.1
9/23/10 4:00	19.9	7.9	2750	91.7	8.13
9/23/10 5:00	19.75	7.9	2731	91.7	8.16
9/23/10 6:00	19.66	7.91	2728	91.2	8.13
9/23/10 7:00	19.45	7.9	2727	91.7	8.21
9/23/10 8:00	19.26	7.89	2732	92.1	8.27
9/23/10 9:00	19.13	7.89	2741	93.8	8.45
9/23/10 10:00	19.37	7.92	2751	97.9	8.77
9/23/10 11:00	20.06	7.96	2765	104.2	9.22
9/23/10 12:00	21.11	7.98	2783	112.3	9.73
9/23/10 13:00	22.37	8	2788	122.6	10.36
9/23/10 14:00	23.57	8	2791	123.2	10.18

Appendix Table A4. Continued.

Town Run @ TR 434 (Hells Kitchen Rd)					
River Mile: 0.28 Storet: C03S01					
Date/Time	Temp.	pH	Spec.Cond	D.O	D.O.
M/DD/YEAR TIME	°C	SU	mS/cm	% Sat.	mg/l
8/10/10 13:00	25.77	8.5	891	137	10.92
8/10/10 14:00	26.26	8.59	884	140.6	11.11
8/10/10 15:00	26.29	8.58	881	135.8	10.73
8/10/10 16:00	26.13	8.56	877	133.2	10.55
8/10/10 17:00	26.01	8.58	867	128.3	10.19
8/10/10 18:00	25.54	8.44	868	118.2	9.47
8/10/10 19:00	25.15	8.27	868	106.1	8.55
8/10/10 20:00	24.55	8	873	93.6	7.63
8/10/10 21:00	24.04	7.81	878	87.8	7.22
8/10/10 22:00	23.63	7.73	886	85.6	7.1
8/10/10 23:00	23.27	7.69	890	85.6	7.15
8/11/10 0:00	22.97	7.68	892	85.6	7.19
8/11/10 1:00	22.69	7.66	894	85.7	7.24
8/11/10 2:00	22.53	7.66	894	86	7.28
8/11/10 3:00	22.35	7.66	895	85.8	7.29
8/11/10 4:00	22.2	7.64	898	85.4	7.28
8/11/10 5:00	22.11	7.61	902	85	7.25
8/11/10 6:00	21.91	7.58	905	84.3	7.23
8/11/10 7:00	21.73	7.56	908	85.5	7.35
8/11/10 8:00	21.81	7.61	910	95	8.16
8/11/10 9:00	22.16	7.75	907	112.3	9.57
8/11/10 10:00	22.82	7.95	902	125.9	10.61
8/11/10 11:00	23.69	8.22	895	146.2	12.11
8/11/10 12:00	24.4	8.43	884	146.9	12.01
8/11/10 13:00	25.05	8.63	861	159.4	12.88
8/11/10 14:00	25.49	8.72	841	140.7	11.28
8/11/10 15:00	25.22	8.65	839	134.5	10.83
8/11/10 16:00	25	8.48	831	109.2	8.83
8/11/10 17:00	25.06	8.46	841	123.3	9.96
8/11/10 18:00	25.08	8.47	837	121	9.77
8/11/10 19:00	24.75	8.16	845	106.1	8.62
8/11/10 20:00	24.49	7.94	852	92.9	7.58
8/11/10 21:00	24.14	7.75	859	84.7	6.96
8/11/10 22:00	23.85	7.68	863	84	6.94
8/11/10 23:00	23.69	7.64	866	83.5	6.92
8/12/10 0:00	23.54	7.65	868	83.1	6.9
8/12/10 1:00	23.29	7.64	871	82.3	6.87
8/12/10 2:00	23.05	7.64	873	81.4	6.83
8/12/10 3:00	22.85	7.63	875	82	6.9
8/12/10 4:00	22.71	7.61	877	80.9	6.83
8/12/10 5:00	22.6	7.6	880	80.9	6.84
8/12/10 6:00	22.54	7.59	882	78.6	6.66
8/12/10 7:00	22.53	7.55	887	78.4	6.64
8/12/10 8:00	22.55	7.56	890	85.7	7.25
8/12/10 9:00	22.68	7.61	889	102	8.61
8/12/10 10:00	22.85	7.68	887	108.5	9.13

Town Run @ TR 434 (Hells Kitchen Rd)					
River Mile: 0.28 Storet: C03S01					
Date/Time	Temp.	pH	Spec.Cond	D.O	D.O.
M/DD/YEAR TIME	°C	SU	mS/cm	% Sat.	mg/l
9/21/10 15:00	19.71	8.26	941	118	10.57
9/21/10 16:00	19.87	8.3	947	118.1	10.54
9/21/10 17:00	19.58	8.23	951	112.8	10.13
9/21/10 18:00	18.88	8.03	957	102.9	9.37
9/21/10 19:00	18.23	7.82	961	94.3	8.7
9/21/10 20:00	17.84	7.72	963	90.3	8.4
9/21/10 21:00	17.57	7.66	967	89.1	8.34
9/21/10 22:00	17.33	7.62	971	88.5	8.32
9/21/10 23:00	17.1	7.62	971	88.7	8.37
9/22/10 0:00	16.91	7.61	971	88.9	8.43
9/22/10 1:00	16.74	7.63	969	89.4	8.51
9/22/10 2:00	16.59	7.63	969	89.7	8.56
9/22/10 3:00	16.47	7.63	971	89.5	8.57
9/22/10 4:00	16.32	7.61	975	89.2	8.56
9/22/10 5:00	16.18	7.59	977	89	8.57
9/22/10 6:00	16.06	7.57	980	88.5	8.55
9/22/10 7:00	15.9	7.53	983	88.1	8.53
9/22/10 8:00	15.82	7.54	986	91.4	8.87
9/22/10 9:00	16.11	7.61	986	101.6	9.8
9/22/10 10:00	16.77	7.69	985	106.1	10.09
9/22/10 11:00	17.54	7.86	984	115.2	10.79
9/22/10 12:00	18.85	8.07	981	123	11.21
9/22/10 13:00	20.23	8.25	980	130.3	11.55
9/22/10 14:00	20.95	8.51	956	125.8	10.99
9/22/10 15:00	21.03	8.43	954	118.9	10.37
9/22/10 16:00	20.48	8.26	960	106.4	9.38
9/22/10 17:00	20.62	8.35	961	118.2	10.4
9/22/10 18:00	20.18	8.18	968	106.9	9.49
9/22/10 19:00	19.65	7.91	974	94.6	8.48
9/22/10 20:00	19.29	7.73	979	89.3	8.07
9/22/10 21:00	19.05	7.67	981	88.4	8.02
9/22/10 22:00	18.83	7.63	984	87.9	8.01
9/22/10 23:00	18.74	7.62	985	88.1	8.04
9/23/10 0:00	18.65	7.62	986	88.3	8.08
9/23/10 1:00	18.42	7.61	987	88.3	8.12
9/23/10 2:00	18.2	7.63	986	89	8.22
9/23/10 3:00	18.02	7.63	989	88.8	8.23
9/23/10 4:00	17.85	7.62	994	88.6	8.24
9/23/10 5:00	17.85	7.59	1000	88.1	8.19
9/23/10 6:00	17.83	7.56	1004	87.6	8.15
9/23/10 7:00	17.55	7.54	1007	87.3	8.17
9/23/10 8:00	17.34	7.55	1009	90.8	8.53
9/23/10 9:00	17.38	7.6	1011	96.8	9.09
9/23/10 10:00	17.71	7.65	1011	101.5	9.47
9/23/10 11:00	18.71	7.81	1010	111.5	10.19
9/23/10 12:00	20.07	8.07	1007	122.3	10.87
9/23/10 13:00	21.43	8.33	1003	132.3	11.45

Appendix Table A5. Surface water bacteriological (*E. coli*) results from the Wheeling Creek watershed 2010-2011. All values are expressed in colony forming units (cfu) per 100 ml of water.

2010 Recreation season														
Station Name	River Mile	Station #	5/25	6/14	6/24	7/8	7/22	7/28	8/10	9/14	9/28	9/30	10/12	10/19
Wheeling Creek UST. Crabapple Creek @ Lee Rd	22.72	300817	110	400	3200	190	160	160	240	150	2800	740		5800
Wheeling Creek at Crescent DST Fall Run	12.27	C03L04											210	
Wheeling Creek near Barton UST. Town Run	10.99	C03W15			3000	110		260	250	120				200
Wheeling Creek at CR 4 in Barton	10.5	301197											190	320
Wheeling Creek at Blain @ Pease Rd (USGS Gage Station)	9.36	C03S18	80	380	1800	100	120	100	250	100	520	180		190
Crabapple Creek SW of Fairport at CR 10	0.16	C03L05	90	300	220	520	90	230	180	80	390	440		330
Steep Run at CR 10 in Barton	0.1	301196											300	3900
Steep Run near mouth in Barton Dst CR 10	0.05	301081											190	6500
2011 Recreation season														
Station Name	River Mile	Station #	9/1	9/6	9/12	9/21	9/27							
Wheeling Creek at Crescent DST Fall Run	12.27	C03L04	200	2000	90	290	8800							
Wheeling Creek at CR 4 in Barton	10.5	301197	220	1100	130	280	8000							
Steep Run N. of Barton adj Colerain-Barton Rd.	0.98	C03L02	120	2400	190	250	1000							
Steep Run at CR 10 in Barton	0.1	301196	730	3400	190	20000	1100							
Steep Run near mouth in Barton Dst CR 10	0.05	301081	2300	2400	230	7600	900							

Appendix Table A6. Wheeling Creek watershed sediment chemical sampling results, 2010.

Parameter	Units	Wheeling Creek UST Crabapple Creek	Wheeling Creek at USGS Gage Pease Rd at Blaine	Campbell Run at mouth	Crabapple Creek at CR 10	Steep Run at mouth in Barton	Fall Run near mouth
		8/3/2010	8/4/2010	8/3/2010	8/3/2010	8/3/2010	8/3/2010
Aluminum	mg/kg	13000	13500	10900	10800	45400	10900
Ammonia	mg/kg	77	110	120	110	200	21
Arsenic	mg/kg	13.6	14.4	17.2	20.1	28.6	18.3
Barium	mg/kg	168	147	109	126	148	129
Cadmium	mg/kg	0.769	1.03	0.744	0.822	1.89	0.696
Calcium	mg/kg	46900	54300	67400	122000	41800	84800
Chromium	mg/kg	15.5	17.4	12.8	14.3	10.7	13.4
Copper	mg/kg	26.2	34.2	19.1	24.2	51.8	23.2
Iron	mg/kg	34300	40700	94200	78400	300000	46200
Lead	mg/kg	23.2	30.2	13.1	24.6	14.5	39.7
Magnesium	mg/kg	6760	6940	3330	6530	< 4370	19500
Manganese	mg/kg	1940	1120	2340	3530	4080	1500
Nickel	mg/kg	28.4	36	42.2	41.8	252	25.3
Phosphorus	mg/kg	1460	956	522	670	1910	788
Potassium	mg/kg	2520	2230	< 1950	< 2480	< 8740	2000
Selenium	mg/kg	< 2.0	< 1.0	< 1.0	< 2.0	< 8.0	< 1.0
Sodium	mg/kg	< 5700.0	< 4730	< 4870	< 6210	< 21900	< 3580
Strontium	mg/kg	284	323	537	815	556	409
Zinc	mg/kg	141	162	171	182	975	89.4
% Solids	%	32.5	40.7	38	30.4	8.8	51.7
Substrate - clay	%	2.6	4.9	1.6	5.2	7.6	3.4
Substrate - clay, medium	%	2.6	4.9	1.6	1.7	3.8	1.7
Substrate - claypan soil	%	2.6	4.9	1.6	3.5	0	3.4
Substrate - sand, coarse	%	61	0	71	60	77	61
Substrate - silt, coarse	%	2.6	48	4.8	5.2	3.8	5.1
Substrate - silt, fine	%	7.7	20	4.8	6.9	0	6.7
Substrate - silt, medium	%	15	9.8	13	12	3.8	13
Substrate - silt, very fine	%	5.2	8.2	1.6	5.2	3.8	5.1

Appendix Table 7. Qualitative Habitat Evaluation Index scores and attributes

River Mile	QHEI	Gradient (ft/mile)	WWH Attributes							MWH Attributes										Total M.L. MWH Attributes	(MWH+1)/(MWH+1) Ratio	(MWH+1)/(MWH+1) Ratio		
			No Channelization or Recovered Boulder/Cobble/Gavel Substrates	Silt Free Substrates	Good/Excellent Substrates	Moderate/Fair/Unsatisfactory	Extensive/Modest/None	Fast Current/Eddies	Low/Normal/Overall Embedment	Max Depth > 40 cm	Low/Normal/High Embedment	High Influence					Moderate Influence							
												Total WWH Attributes	Channelized or No Recovery Silt/Muck Substrates	No Sinuosity	Sparse/No Cover	Max Depth < 40 cm (WD, HW)	Total H.I. MWH Attributes	Recovering Channel	Heavy/Moderate Silt Cover				Sand Substrates (Boat)	Hardpan Substrate Origin
(06-800) Wheeling Creek																								
Year: 2010																								
27.8	60.3	27.40	# #	# #	# #	# #	# #	# #	7		◆		1	●	●	●	●	4	0.25	0.75				
26.0	65.5	16.67	# #	# #	# #	# #	# #	# #	6		◆		1	●	●	●	●	4	0.29	0.86				
22.7	81.3	17.24	# #	# #	# #	# #	# #	# #	7				0	●	●	●	●	4	0.13	0.63				
17.3	88.3	10.53	# #	# #	# #	# #	# #	# #	7				0	●	●	●	●	3	0.13	0.50				
11.0	78.5	13.99	# #	# #	# #	# #	# #	# #	9				0	●	●	●	●	2	0.10	0.30				
9.4	70.5	13.33	# #	# #	# #	# #	# #	# #	7				0	●	●	●	●	4	0.13	0.63				
5.0	84.0	12.20	# #	# #	# #	# #	# #	# #	8				0	●	●	●	●	3	0.11	0.44				
1.9	67.0	19.32	# #	# #	# #	# #	# #	# #	7				0	●	●	●	●	3	0.13	0.50				
(06-805) Steep Run																								
Year: 2010																								
0.1	30.5	31.25	#						1	◆	◆	◆	◆	4	●	●	●	●	6	2.50	5.50			
(06-806) Town Run																								
Year: 2010																								
0.3	58.8	100.0	# #	# #	# #	# #	# #	# #	6		◆	◆	2	●	●	●	●	3	0.43	0.86				
(06-807) Fall Run																								
Year: 2010																								
0.1	65.3	21.28	# #	# #	# #	# #	# #	# #	5		◆	◆	2	●	●	●	●	3	0.50	1.00				
(06-810) Cox Run																								
Year: 2010																								
0.1	61.5	19.42	# #	# #	# #	# #	# #	# #	5		◆	◆	2	●	●	●	●	5	0.50	1.33				
(06-812) Pogue Run																								
Year: 2010																								
0.1	81.0	27.78	# #	# #	# #	# #	# #	# #	8		◆		1	●	●	●	●	1	0.22	0.33				
(06-814) McCracken Run																								
Year: 2010																								
0.2	54.0	40.82	#	# #	# #	# #	# #	# #	5				0	●	●	●	●	5	0.17	1.00				
(06-815) Crabapple Creek																								
Year: 2010																								
2.9	59.5	28.57	#	#	#	#	#	#	2	◆	◆	◆	3	●	●	●	●	5	1.33	3.00				
0.2	67.8	17.54	# #	# #	# #	# #	# #	# #	6		◆	◆	2	●	●	●	●	4	0.43	1.00				
(06-816) Campbell Creek																								
Year: 2010																								

Key
QHEI
Components

River Mile	QHEI	Gradient (ft/mile)	WQH Attributes							MWH Attributes																						
			No Channelization or Recovered Boulder/Cobble/Gravel Substrates	Silt Free Substrates	Good/Excellent Substrates	Moderate/Fair Sinuosity	Extensive Moderate Cover	Fast Current/Eddies	Low/Normal Overall Embeddiness	Max Depth > 40 cm	Low/Normal Riffle Embeddiness	Total WQH Attributes	Channelized or No Recovery Silt/Muck Substrates	No Sinuosity	Sparse/No Cover	Max Depth < 40 cm (WD, HW)	Total H.I. MWH Attributes	Recovering Channel	Heavy/Moderate Silt Cover	Sand Substrates (Boat)	Hardpan Substrate Origin	Fair/Poor Development	Low Sinuosity	Only 1-2 Cover Types	Intermittent and Poor Pools	No Fast Current	High/Mod. Overall Embeddiness	High/Mod. Riffle Embeddiness	No Riffle	Total M.L. MWH Attributes	(WQH H.I. - 1) / (WQH + 1) Ratio	(MWH M.L. + 1) / (MWH + 1) Ratio
0.1	70.8	32.79	#	#	#	#	#	#	#	7			◆		1	●														3	0.25	0.63

Key
QHEI
Components

(06-816) Campbell Creek
Year: 2010

Appendix Table 8. Fish species and abundance for each sampling location

Species List

River Code: 06-800 River Mile: 27.80 Time Fished: 2550 sec Dist Fished: 0.20 km	Stream: Wheeling Creek Location: Mt. Hope Rd. Drainage: 4.4 sq mi Basin: Central Ohio River Tribs No of Passes: 1	Sample Date: 2010 Date Range: 08/31/2010 Sampler Type: E
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Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	32	48.00	7.51			
Western Blacknose Dace	N	G	S	T	17	25.50	3.99			
Creek Chub	N	G	N	T	110	165.00	25.82			
Central Stoneroller	N	H	N		174	261.00	40.85			
Largemouth Bass	F	C	C		1	1.50	0.23			
Green Sunfish	S	I	C	T	7	10.50	1.64			
Bluegill Sunfish	S	I	C	P	10	15.00	2.35			
Johnny Darter	D	I	C		58	87.00	13.62			
Fantail Darter	D	I	C		17	25.50	3.99			
<i>Mile Total</i>					426	639.00				
<i>Number of Species</i>					9					
<i>Number of Hybrids</i>					0					

Species List

River Code: 06-800 River Mile: 26.00 Time Fished: 3161 sec Dist Fished: 0.20 km	Stream: Wheeling Creek Location: Co. Rd. 78 Drainage: 13.0 sq mi Basin: Central Ohio River Tribs No of Passes: 1	Sample Date: 2010 Date Range: 08/31/2010 Sampler Type: E
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Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	46	69.00	13.37			
Western Blacknose Dace	N	G	S	T	1	1.50	0.29			
Creek Chub	N	G	N	T	51	76.50	14.83			
Silverjaw Minnow	N	I	M		1	1.50	0.29			
Central Stoneroller	N	H	N		150	225.00	43.60			
Yellow Bullhead		I	C	T	1	1.50	0.29			
Largemouth Bass	F	C	C		6	9.00	1.74			
Green Sunfish	S	I	C	T	40	60.00	11.63			
Bluegill Sunfish	S	I	C	P	16	24.00	4.65			
Johnny Darter	D	I	C		15	22.50	4.36			
Fantail Darter	D	I	C		17	25.50	4.94			
<i>Mile Total</i>					344	516.00				
<i>Number of Species</i>					11					
<i>Number of Hybrids</i>					0					

Species List

River Code: 06-800 River Mile: 22.70 Time Fished: 3605 sec Dist Fished: 0.20 km	Stream: Wheeling Creek Location: Lee Rd. Drainage: 24.2 sq mi Basin: Central Ohio River Tribs No of Passes: 1	Sample Date: 2010 Date Range: 08/31/2010 Sampler Type: E
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Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	44	66.00	6.89	3.30	25.52	50.00
Western Blacknose Dace	N	G	S	T	10	15.00	1.56	0.06	0.43	3.75
Creek Chub	N	G	N	T	260	390.00	40.69	6.17	47.69	15.81
Central Stoneroller	N	H	N		233	349.50	36.46	2.78	21.49	7.95
Largemouth Bass	F	C	C		1	1.50	0.16	0.01	0.09	8.00
Green Sunfish	S	I	C	T	7	10.50	1.10	0.32	2.51	30.86
Bluegill Sunfish	S	I	C	P	1	1.50	0.16	0.01	0.09	8.00
Green Sf X Bluegill Sf					4	6.00	0.63	0.07	0.56	12.00
Logperch	D	I	S	M	70	105.00	10.95	0.15	1.13	1.39
Fantail Darter	D	I	C		9	13.50	1.41	0.06	0.49	4.67
<i>Mile Total</i>					639	958.50		12.93		
<i>Number of Species</i>					9					
<i>Number of Hybrids</i>					1					

Species List

River Code: 06-800 River Mile: 17.30 Time Fished: 5700 sec Dist Fished: 0.40 km	Stream: Wheeling Creek Location: Co. Rd. 10 Drainage: 59.6 sq mi Basin: Central Ohio River Tribs No of Passes: 2	Sample Date: 2010 Date Range: 08/10/2010 Thru: 09/13/2010 Sampler Type: D
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Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Northern Hog Sucker	R	I	S	M	136	102.00	10.97	6.59	40.62	64.63
White Sucker	W	O	S	T	112	84.00	9.03	3.48	21.47	41.47
Creek Chub	N	G	N	T	77	57.75	6.21	1.20	7.39	20.77
Silver Shiner	N	I	S	I	6	4.50	0.48	0.05	0.29	10.33
Rosyface Shiner	N	I	S	I	8	6.00	0.65	0.02	0.14	3.75
Sand Shiner	N	I	M	M	15	11.25	1.21	0.04	0.27	3.89
Silverjaw Minnow	N	I	M		1	0.75	0.08	0.01	0.05	10.00
Bluntnose Minnow	N	O	C	T	1	0.75	0.08	0.00	0.02	3.00
Central Stoneroller	N	H	N		313	234.75	25.24	2.99	18.44	12.75
Yellow Bullhead		I	C	T	3	2.25	0.24	0.08	0.51	36.67
Rock Bass	S	C	C		1	0.75	0.08	0.12	0.72	155.00
Smallmouth Bass	F	C	C	M	3	2.25	0.24	0.35	2.17	156.67
Largemouth Bass	F	C	C		3	2.25	0.24	0.05	0.28	20.00
Green Sunfish	S	I	C	T	11	8.25	0.89	0.28	1.73	34.09
Bluegill Sunfish	S	I	C	P	8	6.00	0.65	0.21	1.32	35.63
Johnny Darter	D	I	C		73	54.75	5.89	0.06	0.37	1.10
Greenside Darter	D	I	S	M	272	204.00	21.94	0.50	3.05	2.43
Rainbow Darter	D	I	S	M	197	147.75	15.89	0.19	1.19	1.30
<i>Mile Total</i>					1,240	930.00		16.23		
<i>Number of Species</i>					18					
<i>Number of Hybrids</i>					0					

Species List

River Code: 06-800	Stream: Wheeling Creek	Sample Date: 2010
River Mile: 11.00	Location: just upst. Town Run	Date Range: 08/10/2010
Time Fished: 5400 sec	Drainage: 82.0 sq mi	Thru: 09/13/2010
Dist Fished: 0.40 km	Basin: Central Ohio River Tribs No of Passes: 2	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Northern Hog Sucker	R	I	S	M	171	128.25	10.07	3.70	21.42	28.83
White Sucker	W	O	S	T	199	149.25	11.72	3.28	19.01	21.98
Goldfish	G	O	M	T	1	0.75	0.06	0.02	0.09	20.00
Western Blacknose Dace	N	G	S	T	4	3.00	0.24	0.01	0.07	3.75
Creek Chub	N	G	N	T	175	131.25	10.31	5.57	32.29	42.47
Silver Shiner	N	I	S	I	12	9.00	0.71	0.05	0.28	5.42
Rosyface Shiner	N	I	S	I	6	4.50	0.35	0.02	0.13	5.00
Sand Shiner	N	I	M	M	1	0.75	0.06	0.00	0.01	3.00
Silverjaw Minnow	N	I	M		11	8.25	0.65	0.04	0.22	4.64
Central Stoneroller	N	H	N		728	546.00	42.87	3.77	21.82	6.90
Rock Bass	S	C	C		1	0.75	0.06	0.01	0.04	10.00
Largemouth Bass	F	C	C		5	3.75	0.29	0.07	0.39	18.00
Green Sunfish	S	I	C	T	3	2.25	0.18	0.11	0.61	46.67
Bluegill Sunfish	S	I	C	P	12	9.00	0.71	0.11	0.63	12.08
Johnny Darter	D	I	C		7	5.25	0.41	0.01	0.06	1.71
Greenside Darter	D	I	S	M	168	126.00	9.89	0.32	1.85	2.53
Rainbow Darter	D	I	S	M	192	144.00	11.31	0.18	1.06	1.27
Fantail Darter	D	I	C		2	1.50	0.12	0.01	0.04	4.00
<i>Mile Total</i>					1,698	1,273.50		17.26		
<i>Number of Species</i>					18					
<i>Number of Hybrids</i>					0					

Species List

River Code: 06-800	Stream: Wheeling Creek	Sample Date: 2010
River Mile: 9.40	Location: first bridge S of Barton	Date Range: 08/11/2010
Time Fished: 5100 sec	Drainage: 86.0 sq mi	Thru: 09/14/2010
Dist Fished: 0.40 km	Basin: Central Ohio River Tribs No of Passes: 2	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Northern Hog Sucker	R	I	S	M	135	101.25	7.34	4.60	36.83	45.45
White Sucker	W	O	S	T	102	76.50	5.54	1.27	10.14	16.57
Western Blacknose Dace	N	G	S	T	5	3.75	0.27	0.01	0.09	3.00
Creek Chub	N	G	N	T	29	21.75	1.58	0.49	3.90	22.41
Silver Shiner	N	I	S	I	18	13.50	0.98	0.06	0.45	4.17
Rosyface Shiner	N	I	S	I	8	6.00	0.43	0.02	0.15	3.13
Sand Shiner	N	I	M	M	12	9.00	0.65	0.05	0.36	5.00
Silverjaw Minnow	N	I	M		2	1.50	0.11	0.01	0.06	5.00
Central Stoneroller	N	H	N		735	551.25	39.95	4.81	38.48	8.72
Rock Bass	S	C	C		1	0.75	0.05	0.00	0.02	4.00
Smallmouth Bass	F	C	C	M	1	0.75	0.05	0.06	0.51	85.00
Johnny Darter	D	I	C		24	18.00	1.30	0.05	0.39	2.71
Greenside Darter	D	I	S	M	377	282.75	20.49	0.68	5.41	2.39
Rainbow Darter	D	I	S	M	391	293.25	21.25	0.40	3.21	1.37
<i>Mile Total</i>					1,840	1,380.00		12.49		
<i>Number of Species</i>					14					
<i>Number of Hybrids</i>					0					

Species List

River Code: 06-800	Stream: Wheeling Creek	Sample Date: 2010
River Mile: 5.00	Location: Pease Rd.	Date Range: 08/11/2010
Time Fished: 5400 sec	Drainage: 96.0 sq mi	Thru: 09/14/2010
Dist Fished: 0.40 km	Basin: Central Ohio River Tribs No of Passes: 2	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Golden Redhorse	R	I	S	M	12	9.00	1.55	2.25	10.94	250.00
Northern Hog Sucker	R	I	S	M	134	100.50	17.36	2.04	9.91	20.29
White Sucker	W	O	S	T	145	108.75	18.78	8.09	39.34	74.41
River Chub	N	I	N	I	1	0.75	0.13	0.01	0.04	10.00
Creek Chub	N	G	N	T	2	1.50	0.26	0.13	0.62	85.00
Silver Shiner	N	I	S	I	11	8.25	1.42	0.05	0.24	5.91
Rosyface Shiner	N	I	S	I	12	9.00	1.55	0.04	0.20	4.58
Sand Shiner	N	I	M	M	24	18.00	3.11	0.06	0.31	3.54
Silverjaw Minnow	N	I	M		38	28.50	4.92	0.10	0.49	3.55
Central Stoneroller	N	H	N		129	96.75	16.71	0.58	2.83	6.01
Rock Bass	S	C	C		2	1.50	0.26	0.24	1.19	162.50
Smallmouth Bass	F	C	C	M	20	15.00	2.59	6.16	29.93	410.50
Largemouth Bass	F	C	C		5	3.75	0.65	0.11	0.51	28.00
Bluegill Sunfish	S	I	C	P	11	8.25	1.42	0.38	1.86	46.36
Johnny Darter	D	I	C		14	10.50	1.81	0.02	0.11	2.21
Greenside Darter	D	I	S	M	102	76.50	13.21	0.20	0.98	2.64
Rainbow Darter	D	I	S	M	110	82.50	14.25	0.11	0.51	1.27
<i>Mile Total</i>					772	579.00		20.57		
<i>Number of Species</i>					17					
<i>Number of Hybrids</i>					0					

Species List

Page 8

River Code: 06-800	Stream: Wheeling Creek	Sample Date: 2010
River Mile: 1.90	Location: upst. Co. Rd. 24	Date Range: 08/11/2010
Time Fished: 5700 sec	Drainage: 104.0 sq mi	Thru: 09/14/2010
Dist Fished: 0.40 km	Basin: Central Ohio River Tribs No of Passes: 2	Sampler Type: D

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M	1,327	995.25	52.18	4.08	12.27	4.10
Northern Hog Sucker	R	I	S M	55	41.25	2.16	1.20	3.60	29.03
White Sucker	W	O	S T	5	3.75	0.20	0.03	0.10	9.00
River Chub	N	I	N I	4	3.00	0.16	0.01	0.03	3.25
Western Blacknose Dace	N	G	S T	1	0.75	0.04	0.00	0.00	2.00
Emerald Shiner	N	I	M	58	43.50	2.28	0.11	0.32	2.41
Silver Shiner	N	I	S I	14	10.50	0.55	0.06	0.18	5.71
Rosyface Shiner	N	I	S I	85	63.75	3.34	0.09	0.28	1.45
Spotfin Shiner	N	I	M	55	41.25	2.16	0.08	0.24	1.91
Sand Shiner	N	I	M M	40	30.00	1.57	0.05	0.15	1.68
Mimic Shiner	N	I	M I	3	2.25	0.12	0.00	0.01	2.00
Bluntnose Minnow	N	O	C T	30	22.50	1.18	0.05	0.16	2.33
Central Stoneroller	N	H	N	42	31.50	1.65	0.26	0.79	8.33
Channel Catfish	F		C	18	13.50	0.71	12.69	38.16	939.72
Flathead Catfish	F	P	C	2	1.50	0.08	1.31	3.95	875.00
Rock Bass	S	C	C	8	6.00	0.31	0.31	0.94	52.03
Smallmouth Bass	F	C	C M	17	12.75	0.67	1.71	5.16	134.41
Bluegill Sunfish	S	I	C P	13	9.75	0.51	0.07	0.21	7.03
Longear Sunfish	S	I	C M	7	5.25	0.28	0.04	0.11	7.14
Logperch	D	I	S M	4	3.00	0.16	0.05	0.15	16.25
Greenside Darter	D	I	S M	234	175.50	9.20	0.38	1.16	2.19
Banded Darter	D	I	S I	166	124.50	6.53	0.17	0.50	1.33
Bluebreast Darter [T]	D	I	S R	6	4.50	0.24	0.01	0.04	2.67
Tippecanoe Darter [T]	D	I	S R	4	3.00	0.16	0.01	0.02	2.00
Rainbow Darter	D	I	S M	335	251.25	13.17	0.26	0.79	1.04
Freshwater Drum			M P	10	7.50	0.39	10.21	30.70	1,360.80
<i>Mile Total</i>				2,543	1,907.25		33.24		
<i>Number of Species</i>				26					
<i>Number of Hybrids</i>				0					

Species List

River Code: 06-805	Stream: Steep Run	Sample Date: 2010
River Mile: 0.10	Location: at mouth	Date Range: 08/03/2010
Time Fished: 1057 sec	Drainage: 2.3 sq mi	
Dist Fished: 0.12 km	Basin: Central Ohio River Tribs No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	2	5.00	4.88			
Western Blacknose Dace	N	G	S	T	31	77.50	75.61			
Creek Chub	N	G	N	T	8	20.00	19.51			
<i>Mile Total</i>					41	102.50				
<i>Number of Species</i>					3					
<i>Number of Hybrids</i>					0					

Species List

River Code: 06-806	Stream: Town Run	Sample Date: 2010
River Mile: 0.30	Location: Hells Kitchen Rd.	Date Range: 09/02/2010
Time Fished: 2775 sec	Drainage: 2.4 sq mi	
Dist Fished: 0.20 km	Basin: Central Ohio River Tribs No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Northern Hog Sucker	R	I	S	M	2	3.00	0.33			
White Sucker	W	O	S	T	42	63.00	6.99			
Western Blacknose Dace	N	G	S	T	191	286.50	31.78			
Creek Chub	N	G	N	T	177	265.50	29.45			
Bluntnose Minnow	N	O	C	T	1	1.50	0.17			
Central Stoneroller	N	H	N		79	118.50	13.14			
Smallmouth Bass	F	C	C	M	1	1.50	0.17			
Bluegill Sunfish	S	I	C	P	6	9.00	1.00			
Johnny Darter	D	I	C		7	10.50	1.16			
Greenside Darter	D	I	S	M	5	7.50	0.83			
Rainbow Darter	D	I	S	M	90	135.00	14.98			
<i>Mile Total</i>					601	901.50				
<i>Number of Species</i>					11					
<i>Number of Hybrids</i>					0					

Species List

River Code: 06-807	Stream: Fall Run	Sample Date: 2010
River Mile: 0.10	Location: upst. Co. Rd. 5 and Grays Ridge Run	Date Range: 08/03/2010
Time Fished: 3007 sec	Drainage: 3.4 sq mi	
Dist Fished: 0.20 km	Basin: Central Ohio River Tribs No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Northern Hog Sucker	R	I	S	M	12	18.00	2.51			
White Sucker	W	O	S	T	64	96.00	13.36			
Western Blacknose Dace	N	G	S	T	109	163.50	22.76			
Creek Chub	N	G	N	T	134	201.00	27.97			
Central Stoneroller	N	H	N		62	93.00	12.94			
Bluegill Sunfish	S	I	C	P	4	6.00	0.84			
Johnny Darter	D	I	C		7	10.50	1.46			
Greenside Darter	D	I	S	M	6	9.00	1.25			
Rainbow Darter	D	I	S	M	81	121.50	16.91			
<i>Mile Total</i>					479	718.50				
<i>Number of Species</i>					9					
<i>Number of Hybrids</i>					0					

Species List

River Code: 06-810	Stream: Cox Run	Sample Date: 2010
River Mile: 0.10	Location: at mouth	Date Range: 09/30/2010
Time Fished: 3818 sec	Drainage: 7.3 sq mi	
Dist Fished: 0.15 km	Basin: Central Ohio River Tribs No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Northern Hog Sucker	R	I	S	M	2	4.00	0.35			
White Sucker	W	O	S	T	125	250.00	21.89			
Western Blacknose Dace	N	G	S	T	42	84.00	7.36			
Creek Chub	N	G	N	T	42	84.00	7.36			
Central Stoneroller	N	H	N		21	42.00	3.68			
Smallmouth Bass	F	C	C	M	3	6.00	0.53			
Largemouth Bass	F	C	C		1	2.00	0.18			
Pumpkinseed Sunfish	S	I	C	P	1	2.00	0.18			
Johnny Darter	D	I	C		25	50.00	4.38			
Greenside Darter	D	I	S	M	30	60.00	5.25			
Rainbow Darter	D	I	S	M	269	538.00	47.11			
Fantail Darter	D	I	C		10	20.00	1.75			
<i>Mile Total</i>					571	1,142.00				
<i>Number of Species</i>					12					
<i>Number of Hybrids</i>					0					

River Code: 06-812	Stream: Pogue Run	Sample Date: 2010
River Mile: 0.10	Location: at mouth	Date Range: 09/30/2010
Time Fished: 3730 sec	Drainage: 5.3 sq mi	
Dist Fished: 0.15 km	Basin: Central Ohio River Tribs No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	61	122.00	7.52			
Goldfish	G	O	M	T	1	2.00	0.12			
Western Blacknose Dace	N	G	S	T	61	122.00	7.52			
Creek Chub	N	G	N	T	174	348.00	21.45			
Bluntnose Minnow	N	O	C	T	3	6.00	0.37			
Central Stoneroller	N	H	N		392	784.00	48.34			
Largemouth Bass	F	C	C		1	2.00	0.12			
Green Sunfish	S	I	C	T	5	10.00	0.62			
Bluegill Sunfish	S	I	C	P	12	24.00	1.48			
Johnny Darter	D	I	C		17	34.00	2.10			
Rainbow Darter	D	I	S	M	51	102.00	6.29			
Fantail Darter	D	I	C		33	66.00	4.07			
<i>Mile Total</i>					811	1,622.00				
<i>Number of Species</i>					12					
<i>Number of Hybrids</i>					0					

Species List

River Code: 06-814 River Mile: 0.20 Time Fished: 3000 sec Dist Fished: 0.20 km	Stream: McCracken Run Location: Drainage: 4.7 sq mi Basin: Central Ohio River Tribs No of Passes: 1	Sample Date: 2010 Date Range: 08/19/2010 Sampler Type: E
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Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	30	45.00	6.49			
Western Blacknose Dace	N	G	S	T	82	123.00	17.75			
Creek Chub	N	G	N	T	152	228.00	32.90			
South. Redbelly Dace	N	H	S		1	1.50	0.22			
Central Stoneroller	N	H	N		130	195.00	28.14			
Yellow Bullhead		I	C	T	1	1.50	0.22			
Western Mosquitofish	E	I	N		1	1.50	0.22			
Largemouth Bass	F	C	C		1	1.50	0.22			
Green Sunfish	S	I	C	T	2	3.00	0.43			
Johnny Darter	D	I	C		29	43.50	6.28			
Greenside Darter	D	I	S	M	19	28.50	4.11			
Rainbow Darter	D	I	S	M	14	21.00	3.03			
<i>Mile Total</i>					462	693.00				
<i>Number of Species</i>					12					
<i>Number of Hybrids</i>					0					

Species List

River Code: 06-815 River Mile: 2.90 Time Fished: 3727 sec Dist Fished: 0.15 km	Stream: Crabapple Creek Location: Co. Rd. 66 Drainage: 10.2 sq mi Basin: Central Ohio River Tribs No of Passes: 1	Sample Date: 2010 Date Range: 09/29/2010 Sampler Type: E
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Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Northern Hog Sucker	R	I	S	M	9	18.00	5.73			
White Sucker	W	O	S	T	1	2.00	0.64			
Common Carp	G	O	M	T	1	2.00	0.64			
Creek Chub	N	G	N	T	1	2.00	0.64			
Central Stoneroller	N	H	N		21	42.00	13.38			
Yellow Bullhead		I	C	T	4	8.00	2.55			
White Crappie	S	I	C		1	2.00	0.64			
Green Sunfish	S	I	C	T	58	116.00	36.94			
Bluegill Sunfish	S	I	C	P	4	8.00	2.55			
Johnny Darter	D	I	C		6	12.00	3.82			
Greenside Darter	D	I	S	M	31	62.00	19.75			
Rainbow Darter	D	I	S	M	15	30.00	9.55			
Fantail Darter	D	I	C		5	10.00	3.18			
<i>Mile Total</i>					157	314.00				
<i>Number of Species</i>					13					
<i>Number of Hybrids</i>					0					

Species List

River Code: 06-815	Stream: Crabapple Creek	Sample Date: 2010
River Mile: 0.20	Location: Co. Rd. 10	Date Range: 08/31/2010
Time Fished: 3144 sec	Drainage: 19.6 sq mi	
Dist Fished: 0.20 km	Basin: Central Ohio River Tribs No of Passes: 1	Sampler Type: E

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Northern Hog Sucker	R	I	S	M	39	58.50	10.54			
White Sucker	W	O	S	T	14	21.00	3.78			
Western Blacknose Dace	N	G	S	T	3	4.50	0.81			
Creek Chub	N	G	N	T	52	78.00	14.05			
Silver Shiner	N	I	S	I	1	1.50	0.27			
Rosyface Shiner	N	I	S	I	2	3.00	0.54			
Central Stoneroller	N	H	N		212	318.00	57.30			
Yellow Bullhead		I	C	T	1	1.50	0.27			
Smallmouth Bass	F	C	C	M	1	1.50	0.27			
Largemouth Bass	F	C	C		1	1.50	0.27			
Green Sunfish	S	I	C	T	3	4.50	0.81			
Johnny Darter	D	I	C		8	12.00	2.16			
Greenside Darter	D	I	S	M	16	24.00	4.32			
Rainbow Darter	D	I	S	M	13	19.50	3.51			
Fantail Darter	D	I	C		4	6.00	1.08			
<i>Mile Total</i>					370	555.00				
<i>Number of Species</i>					15					
<i>Number of Hybrids</i>					0					

Species List

River Code: 06-816 River Mile: 0.10 Time Fished: 3613 sec Dist Fished: 0.15 km	Stream: Campbell Creek Location: at mouth Drainage: 7.3 sq mi Basin: Central Ohio River Tribs No of Passes: 1	Sample Date: 2010 Date Range: 08/04/2010 Sampler Type: E
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Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
White Sucker	W	O	S	T	7	14.00	6.93			
Western Blacknose Dace	N	G	S	T	7	14.00	6.93			
Creek Chub	N	G	N	T	40	80.00	39.60			
Central Stoneroller	N	H	N		39	78.00	38.61			
Green Sunfish	S	I	C	T	1	2.00	0.99			
Bluegill Sunfish	S	I	C	P	1	2.00	0.99			
Greenside Darter	D	I	S	M	5	10.00	4.95			
Rainbow Darter	D	I	S	M	1	2.00	0.99			
<i>Mile Total</i>					101	202.00				
<i>Number of Species</i>					8					
<i>Number of Hybrids</i>					0					

Appendix Table 9. Fish Index of Biological Integrity (IBI) scores and metrics

A9 Fish IBI scores for Wheeling Creek, 2010.

River Mile	Type	Date	Drainage area (sq mi)	Number of						Percent of Individuals					Rel.No. minus tolerants /(0.3km)	IBI	
				Total species	Minnow species	Headwater species	Sensitive species	Darter & Sculpin species	Simple Lithophils	Tolerant fishes	Omni-vores	Pioneering fishes	Insect-ivores	DELT anomalies			
<i>Wheeling Creek - (06-800)</i>																	
Year: 2010																	
27.80	E	08/31/2010	4.4	9(3)	3(3)	2(3)	0(1)	2(3)	2(1)	39(3)	8(5)	41(3)	22(3)	0.0(5)	390(5)	38	
26.00	E	08/31/2010	13.0	11(3)	4(3)	2(3)	0(1)	2(1)	2(1)	40(3)	13(5)	31(3)	26(3)	0.0(5)	308(3)	34	
<i>Steep Run - (06-805)</i>																	
Year: 2010																	
0.10	E	08/03/2010	2.3	3(1)	2(1)	1(1)	0(1)	0(1)	2(3)	100(1)	5(5)	20(5)	0(1)	0.0(5)	0(1) *	26	
<i>Town Run - (06-806)</i>																	
Year: 2010																	
0.30	E	09/02/2010	2.4	11(5)	4(3)	1(1)	4(5)	3(5)	5(5)	68(1)	7(5)	31(3)	18(3)	0.0(5)	285(5)	46	
<i>Fall Run - (06-807)</i>																	
Year: 2010																	
0.10	E	08/03/2010	3.8	9(3)	3(3)	1(1)	3(3)	3(5)	5(5)	64(1)	13(3)	29(5)	23(3)	0.0(5)	258(3)	40	
<i>Cox Run - (06-810)</i>																	
Year: 2010																	
0.10	E	09/30/2010	7.3	12(3)	3(3)	2(3)	4(3)	4(5)	5(3)	37(3)	22(3)	12(5)	59(5)	0.0(5)	724(5)	46	
<i>Pogue Run - (06-812)</i>																	
Year: 2010																	
0.10	E	09/30/2010	5.3	11(3)	4(3)	2(3)	1(1)	3(3)	3(3)	38(3)	8(5)	25(5)	15(1)	0.0(5)	1012(5)	40	
<i>McCracken Run - (06-814)</i>																	
Year: 2010																	
0.20	E	08/19/2010	4.7	11(3)	4(3)	2(3)	2(3)	3(3)	5(5)	58(1)	7(5)	40(3)	14(1)	0.0(5)	293(3)	38	
<i>Crabapple Creek - (06-815)</i>																	
Year: 2010																	
2.90	E	09/29/2010	10.2	12(3)	2(1)	1(1)	3(3)	4(5)	4(3)	41(3)	1(5)	41(3)	85(5)	0.0(5)	184(1)	38	
0.20	E	08/31/2010	19.6	15(3)	5(3)	2(3)	6(3)	4(3)	7(3)	20(5)	4(5)	17(5)	24(1)	0.0(5)	446(3)	42	
<i>Campbell Run - (06-816)</i>																	
Year: 2010																	
0.10	E	08/04/2010	7.3	8(3)	3(3)	1(1)	2(1)	2(3)	4(3)	54(3)	7(5)	41(3)	8(1)	0.0(5)	92(1)	32	

◆ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

River Mile	Type	Date	Drainage area (sq mi)	Number of					Percent of Individuals					Rel.No. minus tolerants /(0.3km)	IBI	Modified Iwb	
				Total species	Sunfish species	Sucker species	Intolerant species	Darter species	Simple Lithophils	Tolerant fishes	Omni- vores	Top carnivores	Insect- ivores				DELT anomalies
Wheeling Creek - (06800)																	
Year: 2010																	
22.70	E	08/31/2010	24	9(3)	2(3)	1(1)	0(1)	2(3)	19(3)	50(3)	7(5)	0.2(1)	14(1)	0.0(5)	477(3)	32	6.2
17.30	D	08/10/2010	59	16(3)	3(3)	2(3)	2(1)	3(3)	69(5)	16(5)	8(5)	0.6(1)	70(5)	0.0(5)	684(3)	42	8.1
17.30	D	09/13/2010	59	17(3)	2(3)	2(3)	2(1)	3(3)	52(5)	17(5)	10(5)	0.6(1)	50(3)	0.0(5)	870(5)	42	8.2
11.00	D	08/10/2010	80	14(3)	1(1)	2(3)	2(1)	4(3)	49(5)	26(3)	14(5)	0.0(1)	36(3)	0.0(5)	740(3)	36	7.7
11.00	D	09/13/2010	80	15(3)	3(3)	2(3)	2(1)	4(3)	41(5)	21(5)	11(5)	0.6(1)	33(3)	0.0(5)	1235(5)	42	8.0
9.40	D	08/11/2010	86	13(3)	0(1)	2(3)	2(1)	3(3)	63(5)	7(5)	6(5)	0.1(1)	59(5)	0.0(5)	1097(5)	42	7.7
9.40	D	09/14/2010	86	12(3)	1(1)	2(3)	2(1)	3(3)	51(5)	7(5)	6(5)	0.1(1)	48(3)	0.0(5)	1460(5)	40	7.9
5.00	D	08/11/2010	96	17(3)	2(3)	3(3)	3(3)	3(3)	61(5)	23(3)	23(3)	2.4(3)	53(3)	0.0(5)	485(3)	40	8.0
5.00	D	09/14/2010	96	15(3)	2(3)	3(3)	2(1)	3(3)	77(5)	14(5)	14(5)	4.9(3)	70(5)	0.0(5)	453(3)	44	8.1
1.90	D	08/11/2010	104	25(5)	2(3)	2(1)	7(5)	6(5)	35(3)	1(5)	56(1)	0.7(1)	40(3)	0.0(5)	1638(5)	42	8.6
1.90	D	09/14/2010	104	25(5)	3(3)	2(1)	7(5)	6(5)	37(5)	2(5)	51(1)	1.3(3)	45(3)	0.0(5)	2123(5)	46	9.3

na - Qualitative data, Modified Iwb not applicable.

◆ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

Appendix Table 10. Macroinvertebrates collection results

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Wheeling Creek
Mt. Hope Rd.

Collection Date: 08/03/2010 River Code: 06-800 RM: 27.80

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	+			
03360	<i>Plumatella sp</i>	+			
03600	<i>Oligochaeta</i>	+			
08230	<i>Orconectes (Crockerinus) obscurus</i>	+			
11200	<i>Callibaetis sp</i>	+			
21200	<i>Calopteryx sp</i>	+			
22001	<i>Coenagrionidae</i>	+			
22300	<i>Argia sp</i>	+			
23804	<i>Basiaeschna janata</i>	+			
23909	<i>Boyeria vinosa</i>	+			
47600	<i>Sialis sp</i>	+			
50301	<i>Chimarra aterrima</i>	+			
50315	<i>Chimarra obscura</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
52430	<i>Ceratopsyche morosa group</i>	+			
52440	<i>Ceratopsyche slossonae</i>	+			
52530	<i>Hydropsyche depravata group</i>	+			
57900	<i>Pycnopsyche sp</i>	+			
63300	<i>Hydroporini</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
68901	<i>Macronychus glabratus</i>	+			
69400	<i>Stenelmis sp</i>	+			
70700	<i>Dicranota sp</i>	+			
71100	<i>Hexatoma sp</i>	+			
72700	<i>Anopheles sp</i>	+			
77355	<i>Clinotanytus pinguis</i>	+			
77500	<i>Conchapelopia sp</i>	+			
78655	<i>Procladius (Holotanytus) sp</i>	+			
80410	<i>Cricotopus (C.) sp</i>	+			
82730	<i>Chironomus (C.) decorus group</i>	+			
82820	<i>Cryptochironomus sp</i>	+			
82885	<i>Cryptotendipes pseudotener</i>	+			
84470	<i>Polypedilum (P.) illinoense</i>	+			
85500	<i>Paratanytarsus sp</i>	+			
95100	<i>Physella sp</i>	+			

No. Quantitative Taxa: 0 Total Taxa: 35
 No. Qualitative Taxa: 35 ICI:
 Number of Organisms: 0 Qual EPT: 8

Ohio EPA/DSW Ecological Assessment Section
 Macroinvertebrate Collection

Site: Wheeling Creek
 dst. Co. Rd. 78

Collection Date: 08/03/2010 River Code: 06-800 RM: 25.90

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
03360	<i>Plumatella sp</i>	+	87540	<i>Hemerodromia sp</i>	+
03600	<i>Oligochaeta</i>	+	95100	<i>Physella sp</i>	+
04664	<i>Helobdella stagnalis</i>	+	98600	<i>Sphaerium sp</i>	+
06201	<i>Hyalella azteca</i>	+			
07820	<i>Cambarus (Cambarus) sp A</i>	+	No. Quantitative Taxa: 0		Total Taxa: 47
08230	<i>Orconectes (Crockerinus) obscurus</i>	+	No. Qualitative Taxa: 47		ICI:
11200	<i>Callibaetis sp</i>	+	Number of Organisms: 0		Qual EPT: 9
13400	<i>Stenacron sp</i>	+			
17200	<i>Caenis sp</i>	+			
21200	<i>Calopteryx sp</i>	+			
22001	<i>Coenagrionidae</i>	+			
22300	<i>Argia sp</i>	+			
47600	<i>Sialis sp</i>	+			
50315	<i>Chimarra obscura</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
52430	<i>Ceratopsyche morosa group</i>	+			
52440	<i>Ceratopsyche slossonae</i>	+			
52530	<i>Hydropsyche depravata group</i>	+			
57900	<i>Pycnopsyche sp</i>	+			
60900	<i>Peltodytes sp</i>	+			
63300	<i>Hydroporini</i>	+			
64050	<i>Liodessus sp</i>	+			
67700	<i>Paracymus sp</i>	+			
68702	<i>Dubiraphia bivittata</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
68901	<i>Macronychus glabratus</i>	+			
69400	<i>Stenelmis sp</i>	+			
71100	<i>Hexatoma sp</i>	+			
72700	<i>Anopheles sp</i>	+			
77500	<i>Conchapelopia sp</i>	+			
77750	<i>Hayesomyia senata or Thienemannimyia norena</i>	+			
78140	<i>Labrundinia pilosella</i>	+			
78401	<i>Natarsia species A (sensu Roback, 1978)</i>	+			
80430	<i>Cricotopus (C.) tremulus group</i>	+			
81650	<i>Parametriocnemus sp</i>	+			
82730	<i>Chironomus (C.) decorus group</i>	+			
84470	<i>Polypedilum (P.) illinoense</i>	+			
84750	<i>Stictochironomus sp</i>	+			
85230	<i>Cladotanytarsus mancus group</i>	+			
85500	<i>Paratanytarsus sp</i>	+			
85625	<i>Rheotanytarsus sp</i>	+			
85800	<i>Tanytarsus sp</i>	+			
85840	<i>Tanytarsus sepp</i>	+			
86100	<i>Chrysops sp</i>	+			

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Wheeling Creek
dst. Twp. Rd. 337

Collection Date: 08/16/2010 River Code: 06-800 RM: 22.50

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	+	80430	<i>Cricotopus (C.) tremulus group</i>	612 +
03360	<i>Plumatella sp</i>	1	82102	<i>Thienemanniella boltoni</i>	8
03600	<i>Oligochaeta</i>	24 +	82121	<i>Thienemanniella lobapodema</i>	8
04664	<i>Helobdella stagnalis</i>	+	82141	<i>Thienemanniella xena</i>	24
06201	<i>Hyaella azteca</i>	+	82730	<i>Chironomus (C.) decorus group</i>	+
08230	<i>Orconectes (Crockerinus) obscurus</i>	+	83040	<i>Dicrotendipes neomodestus</i>	+
08601	<i>Hydrachnidia</i>	8	83820	<i>Microtendipes "caelum" (sensu Simpson & Bode, 1980)</i>	+
11200	<i>Callibaetis sp</i>	+	83840	<i>Microtendipes pedellus group</i>	+
13400	<i>Stenacron sp</i>	74 +	84210	<i>Paratendipes albimanus or P. duplicatus</i>	+
16700	<i>Tricorythodes sp</i>	3	84450	<i>Polypedilum (Uresipedilum) flavum</i>	489 +
17200	<i>Caenis sp</i>	16 +	84460	<i>Polypedilum (P.) fallax group</i>	31
21200	<i>Calopteryx sp</i>	+	84470	<i>Polypedilum (P.) illinoense</i>	+
21300	<i>Hetaerina sp</i>	+	84750	<i>Stictochironomus sp</i>	+
22001	<i>Coenagrionidae</i>	+	85230	<i>Cladotanytarsus mancus group</i>	+
22300	<i>Argia sp</i>	+	85500	<i>Paratanytarsus sp</i>	31 +
23804	<i>Basiaeschna janata</i>	+	85625	<i>Rheotanytarsus sp</i>	795 +
44501	<i>Corixidae</i>	+	85800	<i>Tanytarsus sp</i>	184
47600	<i>Sialis sp</i>	+	85821	<i>Tanytarsus glabrescens group sp 7</i>	275 +
50315	<i>Chimarra obscura</i>	+	86100	<i>Chrysops sp</i>	+
52200	<i>Cheumatopsyche sp</i>	469 +	86401	<i>Atherix lantha</i>	+
52430	<i>Ceratopsyche morosa group</i>	670 +	87540	<i>Hemerodromia sp</i>	19
52440	<i>Ceratopsyche slossonae</i>	8 +	98600	<i>Sphaerium sp</i>	+
52530	<i>Hydropsyche depravata group</i>	1			
53800	<i>Hydroptila sp</i>	62			
64800	<i>Uvarus sp</i>	+	No. Quantitative Taxa: 29		Total Taxa: 66
65800	<i>Berosus sp</i>	+	No. Qualitative Taxa: 53		ICI: 42
66500	<i>Enochrus sp</i>	+	Number of Organisms: 4235		Qual EPT: 7
67800	<i>Tropisternus sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68130	<i>Helichus sp</i>	+			
68201	<i>Scirtidae</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
68901	<i>Macronychus glabratus</i>	5 +			
69400	<i>Stenelmis sp</i>	2 +			
71100	<i>Hexatoma sp</i>	+			
71900	<i>Tipula sp</i>	+			
72700	<i>Anopheles sp</i>	+			
74100	<i>Simulium sp</i>	1			
77120	<i>Ablabesmyia mallochi</i>	+			
77500	<i>Conchapelopia sp</i>	61 +			
78655	<i>Procladius (Holotanypus) sp</i>	+			
80370	<i>Corynoneura lobata</i>	48			
80410	<i>Cricotopus (C.) sp</i>	122 +			
80420	<i>Cricotopus (C.) bicinctus</i>	184 +			

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Wheeling Creek

Collection Date: 08/16/2010 River Code: 06-800 RM: 17.30

Co. Rd. 10

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01900	<i>Nemertea</i>	16	86401	<i>Atherix lantha</i>	+
03360	<i>Plumatella sp</i>	+	87400	<i>Stratiomys sp</i>	+
03600	<i>Oligochaeta</i>	8 +	87540	<i>Hemerodromia sp</i>	76
06201	<i>Hyalella azteca</i>	+	95100	<i>Physella sp</i>	+
08230	<i>Orconectes (Crockerinus) obscurus</i>	2 +			
08601	<i>Hydrachnidia</i>	24	No. Quantitative Taxa: 23		Total Taxa: 48
13400	<i>Stenacron sp</i>	1 +	No. Qualitative Taxa: 37		ICI: 38
17200	<i>Caenis sp</i>	8 +	Number of Organisms: 3478		Qual EPT: 6
21200	<i>Calopteryx sp</i>	+			
22001	<i>Coenagrionidae</i>	+			
22300	<i>Argia sp</i>	+			
24501	<i>Gomphidae</i>	+			
47600	<i>Sialis sp</i>	+			
50301	<i>Chimarra aterrima</i>	+			
50315	<i>Chimarra obscura</i>	24 +			
52200	<i>Cheumatopsyche sp</i>	297 +			
52430	<i>Ceratopsyche morosa group</i>	452 +			
52540	<i>Hydropsyche dicantha</i>	4			
60900	<i>Peltodytes sp</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
68901	<i>Macronychus glabratus</i>	54 +			
71700	<i>Pilaria sp</i>	+			
72700	<i>Anopheles sp</i>	+			
77120	<i>Ablabesmyia mallochi</i>	+			
78450	<i>Nilotanyus fimbriatus</i>	27			
80410	<i>Cricotopus (C.) sp</i>	53 +			
80420	<i>Cricotopus (C.) bicinctus</i>	53 +			
80430	<i>Cricotopus (C.) tremulus group</i>	53 +			
80440	<i>Cricotopus (C.) trifascia</i>	+			
82141	<i>Thienemanniella xena</i>	16			
82200	<i>Tvetenia bavarica group</i>	26			
82730	<i>Chironomus (C.) decorus group</i>	+			
82820	<i>Cryptochironomus sp</i>	+			
82885	<i>Cryptotendipes pseudotener</i>	+			
84450	<i>Polypedilum (Uresipedilum) flavum</i>	27			
84460	<i>Polypedilum (P.) fallax group</i>	106			
84470	<i>Polypedilum (P.) illinoense</i>	+			
84700	<i>Stenochironomus sp</i>	+			
84750	<i>Stictochironomus sp</i>	+			
85500	<i>Paratanytarsus sp</i>	53			
85625	<i>Rheotanytarsus sp</i>	956 +			
85800	<i>Tanytarsus sp</i>	+			
85821	<i>Tanytarsus glabrescens group sp 7</i>	1142			
86100	<i>Chrysops sp</i>	+			

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Wheeling Creek

Collection Date: 08/16/2010 River Code: 06-800 RM: 11.55

Co. Rd. 10

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
03600	<i>Oligochaeta</i>	+			
06201	<i>Hyalella azteca</i>	+	No. Quantitative Taxa: 20		Total Taxa: 43
06810	<i>Gammarus fasciatus</i>	+	No. Qualitative Taxa: 34		ICI: 38
08230	<i>Orconectes (Crockerinus) obscurus</i>	+	Number of Organisms: 6166		Qual EPT: 8
08601	<i>Hydrachnidia</i>	32			
13000	<i>Leucrocuta sp</i>	1			
13400	<i>Stenacron sp</i>	33 +			
17200	<i>Caenis sp</i>	16 +			
21200	<i>Calopteryx sp</i>	+			
21300	<i>Hetaerina sp</i>	+			
22300	<i>Argia sp</i>	+			
23909	<i>Boyeria vinosa</i>	+			
47600	<i>Sialis sp</i>	+			
50315	<i>Chimarra obscura</i>	17 +			
52200	<i>Cheumatopsyche sp</i>	281 +			
52430	<i>Ceratopsyche morosa group</i>	640 +			
52440	<i>Ceratopsyche slossonae</i>	+			
52530	<i>Hydropsyche depravata group</i>	1			
52540	<i>Hydropsyche dicantha</i>	3 +			
53800	<i>Hydroptila sp</i>	+			
68075	<i>Psephenus herricki</i>	+			
68707	<i>Dubiraphia quadrinotata</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
68901	<i>Macronychus glabratus</i>	1 +			
69400	<i>Stenelmis sp</i>	+			
72700	<i>Anopheles sp</i>	+			
77120	<i>Ablabesmyia mallochii</i>	+			
77500	<i>Conchapelopia sp</i>	54 +			
80420	<i>Cricotopus (C.) bicinctus</i>	108			
80430	<i>Cricotopus (C.) tremulus group</i>	54			
81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	54			
82730	<i>Chironomus (C.) decorus group</i>	+			
84210	<i>Paratendipes albimanus or P. duplicatus</i>	+			
84450	<i>Polypedilum (Uresipedilum) flavum</i>	108			
84460	<i>Polypedilum (P.) fallax group</i>	54			
84470	<i>Polypedilum (P.) illinoense</i>	+			
85625	<i>Rheotanytarsus sp</i>	3893 +			
85800	<i>Tanytarsus sp</i>	+			
85821	<i>Tanytarsus glabrescens group sp 7</i>	811			
86401	<i>Atherix lantha</i>	4 +			
87540	<i>Hemerodromia sp</i>	1 +			
95100	<i>Physella sp</i>	+			
98200	<i>Pisidium sp</i>	+			

Ohio EPA/DSW Ecological Assessment Section
 Macroinvertebrate Collection

Site: Wheeling Creek
 first bridge S of Barton

Collection Date: 08/17/2010 River Code: 06-800 RM: 9.40

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	+	84520	<i>Polypedilum (Tripodura) halterale group</i>	+
01900	<i>Nemertea</i>	17	85625	<i>Rheotanytarsus sp</i>	1492
03600	<i>Oligochaeta</i>	18 +	85800	<i>Tanytarsus sp</i>	+
06201	<i>Hyalella azteca</i>	+	85821	<i>Tanytarsus glabrescens group sp 7</i>	232 +
08230	<i>Orconectes (Crockerinus) obscurus</i>	+	87540	<i>Hemerodromia sp</i>	28 +
08601	<i>Hydrachnidia</i>	64 +	95100	<i>Physella sp</i>	+
11200	<i>Callibaetis sp</i>	+			
11670	<i>Procloeon viridoculare</i>	+	No. Quantitative Taxa: 25		Total Taxa: 50
13400	<i>Stenacron sp</i>	1 +	No. Qualitative Taxa: 37		ICI: 40
16700	<i>Tricorythodes sp</i>	17	Number of Organisms: 2890		Qual EPT: 7
17200	<i>Caenis sp</i>	+			
21200	<i>Calopteryx sp</i>	+			
22001	<i>Coenagrionidae</i>	+			
22300	<i>Argia sp</i>	1 +			
43300	<i>Ranatra sp</i>	+			
50315	<i>Chimarra obscura</i>	2 +			
52200	<i>Cheumatopsyche sp</i>	289 +			
52430	<i>Ceratopsyche morosa group</i>	338 +			
52540	<i>Hydropsyche dicantha</i>	35			
60300	<i>Dineutus sp</i>	+			
60900	<i>Peltodytes sp</i>	+			
63300	<i>Hydroporini</i>	+			
63900	<i>Laccophilus sp</i>	+			
65800	<i>Berosus sp</i>	+			
67800	<i>Tropisternus sp</i>	+			
68601	<i>Ancyronyx variegata</i>	8			
68708	<i>Dubiraphia vittata group</i>	+			
68901	<i>Macronychus glabratus</i>	+			
69400	<i>Stenelmis sp</i>	16			
72700	<i>Anopheles sp</i>	+			
74501	<i>Ceratopogonidae</i>	8 +			
77120	<i>Ablabesmyia mallochi</i>	51 +			
77500	<i>Conchapelopia sp</i>	26			
77750	<i>Hayesomyia senata or Thienemannimyia norena</i>	51			
78655	<i>Procladius (Holotanypus) sp</i>	+			
80370	<i>Corynoneura lobata</i>	8			
80420	<i>Cricotopus (C.) bicinctus</i>	77			
80430	<i>Cricotopus (C.) tremulus group</i>	51 +			
81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	26			
82141	<i>Thienemanniella xena</i>	8			
82730	<i>Chironomus (C.) decorus group</i>	+			
83040	<i>Dicrotendipes neomodestus</i>	26			
84210	<i>Paratendipes albimanus or P. duplicatus</i>	+			
84470	<i>Polypedilum (P.) illinoense</i>	+			

Ohio EPA/DSW Ecological Assessment Section
 Macroinvertebrate Collection

Site: Wheeling Creek
 at Blain

Collection Date: 08/17/2010 River Code: 06-800 RM: 6.00

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	1			
01900	<i>Nemertea</i>	14 +	No. Quantitative Taxa: 31		Total Taxa: 44
03360	<i>Plumatella sp</i>	1	No. Qualitative Taxa: 29		ICI: 30
03600	<i>Oligochaeta</i>	4 +	Number of Organisms: 367		Qual EPT: 7
06201	<i>Hyaella azteca</i>	+			
08230	<i>Orconectes (Crockerinus) obscurus</i>	+			
11200	<i>Callibaetis sp</i>	+			
13400	<i>Stenacron sp</i>	+			
17200	<i>Caenis sp</i>	4 +			
21200	<i>Calopteryx sp</i>	2 +			
22001	<i>Coenagrionidae</i>	+			
22300	<i>Argia sp</i>	2 +			
28001	<i>Libellulidae</i>	+			
48620	<i>Nigronia serricornis</i>	+			
50315	<i>Chimarra obscura</i>	+			
52200	<i>Cheumatopsyche sp</i>	3 +			
52430	<i>Ceratopsyche morosa group</i>	1 +			
52540	<i>Hydropsyche dicantha</i>	2 +			
68130	<i>Helichus sp</i>	+			
68601	<i>Ancyronyx variegata</i>	+			
68708	<i>Dubiraphia vittata group</i>	11 +			
68901	<i>Macronychus glabratus</i>	4			
69400	<i>Stenelmis sp</i>	2 +			
77120	<i>Ablabesmyia mallochi</i>	19			
77500	<i>Conchapelopia sp</i>	3			
77750	<i>Hayesomyia senata or Thienemannimyia norena</i>	3			
78655	<i>Procladius (Holotanypus) sp</i>	3 +			
80410	<i>Cricotopus (C.) sp</i>	3 +			
80440	<i>Cricotopus (C.) trifascia</i>	+			
81240	<i>Nanocladius (N.) distinctus</i>	16			
81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	3 +			
82730	<i>Chironomus (C.) decorus group</i>	3 +			
82820	<i>Cryptochironomus sp</i>	3 +			
82885	<i>Cryptotendipes pseudotener</i>	+			
83040	<i>Dicrotendipes neomodestus</i>	6			
84060	<i>Parachironomus pectinatellae</i>	3			
84210	<i>Paratendipes albimanus or P. duplicatus</i>	3 +			
84300	<i>Phaenopsectra obediens group</i>	9			
84460	<i>Polypedilum (P.) fallax group</i>	25			
84540	<i>Polypedilum (Tripodura) scalaenum group</i>	16			
84750	<i>Stictochironomus sp</i>	+			
85230	<i>Cladotanytarsus mancus group</i>	3			
85800	<i>Tanytarsus sp</i>	34			
85821	<i>Tanytarsus glabrescens group sp 7</i>	161			

Ohio EPA/DSW Ecological Assessment Section
 Macroinvertebrate Collection

Site: Wheeling Creek
 Co. Rd. 24

Collection Date: 09/30/2010 River Code: 06-800 RM: 1.64

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01900	<i>Nemertea</i>	9	94400	<i>Fossaria sp</i>	+
03600	<i>Oligochaeta</i>	262 +	98001	<i>Pisidiidae</i>	4
04666	<i>Helobdella papillata</i>	+			
05800	<i>Caecidotea sp</i>	+	No. Quantitative Taxa: 26		Total Taxa: 45
08230	<i>Orconectes (Crockerinus) obscurus</i>	+	No. Qualitative Taxa: 27		ICI: 26
08601	<i>Hydrachnidia</i>	12	Number of Organisms: 1469		Qual EPT: 6
13400	<i>Stenacron sp</i>	+			
16700	<i>Tricorythodes sp</i>	18			
17200	<i>Caenis sp</i>	+			
21200	<i>Calopteryx sp</i>	+			
22001	<i>Coenagrionidae</i>	+			
22300	<i>Argia sp</i>	+			
26700	<i>Macromia sp</i>	+			
47600	<i>Sialis sp</i>	+			
50315	<i>Chimarra obscura</i>	3 +			
51300	<i>Neureclipsis sp</i>	8			
52200	<i>Cheumatopsyche sp</i>	315 +			
52430	<i>Ceratopsyche morosa group</i>	97 +			
52540	<i>Hydropsyche dicantha</i>	3 +			
53800	<i>Hydroptila sp</i>	13			
60900	<i>Peltodytes sp</i>	+			
63900	<i>Laccophilus sp</i>	+			
68130	<i>Helichus sp</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
68901	<i>Macronychus glabratus</i>	+			
69400	<i>Stenelmis sp</i>	1			
71900	<i>Tipula sp</i>	2			
77750	<i>Hayesomyia senata or Thienemannimyia norena</i>	17			
78450	<i>Nilotanytus fimbriatus</i>	8			
78655	<i>Procladius (Holotanytus) sp</i>	+			
80370	<i>Corynoneura lobata</i>	4			
80410	<i>Cricotopus (C.) sp</i>	388 +			
80420	<i>Cricotopus (C.) bicinctus</i>	34			
80430	<i>Cricotopus (C.) tremulus group</i>	101 +			
81231	<i>Nanocladius (N.) crassicornus or N. (N.) "rectinervis"</i>	25			
81632	<i>Parakiefferiella n.sp 2</i>	8			
81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	25 +			
82141	<i>Thienemanniella xena</i>	20			
82730	<i>Chironomus (C.) decorus group</i>	+			
83040	<i>Dicrotendipes neomodestus</i>	25			
84540	<i>Polypedilum (Tripodura) scalaenum group</i>	8			
85800	<i>Tanytarsus sp</i>	+			
85821	<i>Tanytarsus glabrescens group sp 7</i>	59			

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Steep Run
at mouth

Collection Date: 08/04/2010 River Code: 06-805 RM: 0.03

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
06830	<i>Gammarus minus</i>	+			
08601	<i>Hydrachnidia</i>	+			
21200	<i>Calopteryx sp</i>	+			
33100	<i>Leuctra sp</i>	+			
47600	<i>Sialis sp</i>	+			
51600	<i>Polycentropus sp</i>	+			
57900	<i>Pycnopsyche sp</i>	+			
67800	<i>Tropisternus sp</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
69400	<i>Stenelmis sp</i>	+			
80430	<i>Cricotopus (C.) tremulus group</i>	+			
82730	<i>Chironomus (C.) decorus group</i>	+			
95100	<i>Physella sp</i>	+			

No. Quantitative Taxa: 0	Total Taxa: 13
No. Qualitative Taxa: 13	ICI:
Number of Organisms: 0	Qual EPT: 3

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Town Run
Hells Kitchen Rd.

Collection Date: 08/04/2010 River Code: 06-806 RM: 0.28

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	+			
03600	<i>Oligochaeta</i>	+			
06830	<i>Gammarus minus</i>	+			
11120	<i>Baetis flavistriga</i>	+			
21200	<i>Calopteryx sp</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
53800	<i>Hydroptila sp</i>	+			
63300	<i>Hydroporini</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
71900	<i>Tipula sp</i>	+			
74100	<i>Simulium sp</i>	+			
74650	<i>Atrichopogon sp</i>	+			
77500	<i>Conchapelopia sp</i>	+			
78350	<i>Meropelopia sp</i>	+			
80310	<i>Cardiocladius obscurus</i>	+			
80420	<i>Cricotopus (C.) bicinctus</i>	+			
80430	<i>Cricotopus (C.) tremulus group</i>	+			
80440	<i>Cricotopus (C.) trifascia</i>	+			
80740	<i>Eukiefferiella claripennis group</i>	+			
82820	<i>Cryptochironomus sp</i>	+			
84450	<i>Polypedilum (Uresipedilum) flavum</i>	+			
84470	<i>Polypedilum (P.) illinoense</i>	+			
85821	<i>Tanytarsus glabrescens group sp 7</i>	+			
89704	<i>Limnophora aequifrons</i>	+			
94400	<i>Fossaria sp</i>	+			

No. Quantitative Taxa: 0	Total Taxa: 25
No. Qualitative Taxa: 25	ICI:
Number of Organisms: 0	Qual EPT: 3

Ohio EPA/DW Ecological Assessment Section
Macroinvertebrate Collection

Site: Fall Run

Collection Date: 08/16/2010 River Code: 06-807 RM: 0.10

upst. Co. Rd. 5 and Grays Ridge Run

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	1		<i>Bode, 1980)</i>	
01900	<i>Nemertea</i>	18	83840	<i>Microtendipes pedellus group</i>	7 +
06830	<i>Gammarus minus</i>	1 +	84210	<i>Paratendipes albimanus or P. duplicatus</i>	20 +
08230	<i>Orconectes (Crockerinus) obscurus</i>	1 +	84300	<i>Phaenopsectra obediens group</i>	7
08601	<i>Hydrachnidia</i>	+	84450	<i>Polypedilum (Uresipedilum) flavum</i>	3
11250	<i>Centroptilum sp (w/o hindwing pads)</i>	+	84460	<i>Polypedilum (P.) fallax group</i>	90
17200	<i>Caenis sp</i>	+	84540	<i>Polypedilum (Tripodura) scalaenum group</i>	3
21200	<i>Calopteryx sp</i>	1 +	84750	<i>Stictochironomus sp</i>	+
22001	<i>Coenagrionidae</i>	+	85500	<i>Paratanytarsus sp</i>	3
33100	<i>Leuctra sp</i>	+	85615	<i>Rheotanytarsus pellucidus</i>	3 +
44501	<i>Corixidae</i>	+	85625	<i>Rheotanytarsus sp</i>	23 +
47600	<i>Sialis sp</i>	1 +	85800	<i>Tanytarsus sp</i>	3 +
50301	<i>Chimarra aterrima</i>	+	85821	<i>Tanytarsus glabrescens group sp 7</i>	50
51600	<i>Polycentropus sp</i>	3	85840	<i>Tanytarsus sepp</i>	20
52200	<i>Cheumatopsyche sp</i>	3 +	87400	<i>Stratiomys sp</i>	+
52430	<i>Ceratopsyche morosa group</i>	+	87540	<i>Hemerodromia sp</i>	+
52440	<i>Ceratopsyche slossonae</i>	+	89001	<i>Sciomyzidae</i>	+
52530	<i>Hydropsyche depravata group</i>	+	95100	<i>Physella sp</i>	26
53800	<i>Hydroptila sp</i>	2	98200	<i>Pisidium sp</i>	+
60900	<i>Peltodytes sp</i>	+			
63300	<i>Hydroporini</i>	+	No. Quantitative Taxa: 37		Total Taxa: 62
67500	<i>Laccobius sp</i>	+	No. Qualitative Taxa: 42		ICI: 32
68708	<i>Dubiraphia vittata group</i>	+	Number of Organisms: 460		Qual EPT: 8
69400	<i>Stenelmis sp</i>	9 +			
70700	<i>Dicranota sp</i>	+			
71100	<i>Hexatoma sp</i>	+			
71900	<i>Tipula sp</i>	+			
72700	<i>Anopheles sp</i>	+			
77120	<i>Ablabesmyia mallochi</i>	13 +			
77500	<i>Conchapelopia sp</i>	15 +			
77750	<i>Hayesomyia senata or Thienemannimyia norena</i>	3			
77800	<i>Helopelopia sp</i>	51			
78450	<i>Nilotanytus fimbriatus</i>	5			
78655	<i>Procladius (Holotanytus) sp</i>	+			
80370	<i>Corynoneura lobata</i>	5			
80410	<i>Cricotopus (C.) sp</i>	3 +			
80420	<i>Cricotopus (C.) bicinctus</i>	10			
81650	<i>Parametriocnemus sp</i>	37 +			
81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	+			
82141	<i>Thienemanniella xena</i>	1			
82730	<i>Chironomus (C.) decorus group</i>	3 +			
82820	<i>Cryptochironomus sp</i>	10 +			
82885	<i>Cryptotendipes pseudotener</i>	3			
83820	<i>Microtendipes "caelum" (sensu Simpson &</i>	3			

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Cox Run

Collection Date: 08/04/2010 River Code: 06-810 RM: 0.50

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
03600	<i>Oligochaeta</i>	+			
06830	<i>Gammarus minus</i>	+			
07810	<i>Cambarus (Cambarus) carinirostris</i>	+			
44501	<i>Corixidae</i>	+			
47600	<i>Sialis sp</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
52430	<i>Ceratopsyche morosa group</i>	+			
52440	<i>Ceratopsyche slossonae</i>	+			
52530	<i>Hydropsyche depravata group</i>	+			
53800	<i>Hydroptila sp</i>	+			
63300	<i>Hydroporini</i>	+			
66500	<i>Enochrus sp</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
70700	<i>Dicranota sp</i>	+			
71100	<i>Hexatoma sp</i>	+			
72700	<i>Anopheles sp</i>	+			
74100	<i>Simulium sp</i>	+			
74501	<i>Ceratopogonidae</i>	+			
77500	<i>Conchapelopia sp</i>	+			
80420	<i>Cricotopus (C.) bicinctus</i>	+			
80430	<i>Cricotopus (C.) tremulus group</i>	+			
80440	<i>Cricotopus (C.) trifascia</i>	+			
82820	<i>Cryptochironomus sp</i>	+			
84750	<i>Stictochironomus sp</i>	+			
85800	<i>Tanytarsus sp</i>	+			
95100	<i>Physella sp</i>	+			

No. Quantitative Taxa: 0	Total Taxa: 26
No. Qualitative Taxa: 26	ICI:
Number of Organisms: 0	Qual EPT: 5

Ohio EPA/DSW Ecological Assessment Section
 Macroinvertebrate Collection

Site: Pogue Run
 at mouth

Collection Date: 08/03/2010 River Code: 06-812 RM: 0.11

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	+	84700	<i>Stenochironomus sp</i>	+
06830	<i>Gammarus minus</i>	+	85625	<i>Rheotanytarsus sp</i>	+
08230	<i>Orconectes (Crockerinus) obscurus</i>	+	86401	<i>Atherix lantha</i>	+
11130	<i>Baetis intercalaris</i>	+	95100	<i>Physella sp</i>	+
11245	<i>Centroptilum sp</i>	+			
11650	<i>Procloeon sp (w/ hindwing pads)</i>	+	No. Quantitative Taxa: 0		Total Taxa: 48
11670	<i>Procloeon viridoculare</i>	+	No. Qualitative Taxa: 48		ICI:
13400	<i>Stenacron sp</i>	+	Number of Organisms: 0		Qual EPT: 14
17200	<i>Caenis sp</i>	+			
21200	<i>Calopteryx sp</i>	+			
22300	<i>Argia sp</i>	+			
23600	<i>Aeshna sp</i>	+			
24900	<i>Gomphus sp</i>	+			
25510	<i>Stylogomphus albistylus</i>	+			
34130	<i>Acroneuria frisoni</i>	+			
47600	<i>Sialis sp</i>	+			
50301	<i>Chimarra aterrima</i>	+			
51600	<i>Polycentropus sp</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
52430	<i>Ceratopsyche morosa group</i>	+			
52440	<i>Ceratopsyche slossonae</i>	+			
52530	<i>Hydropsyche depravata group</i>	+			
58505	<i>Helicopsyche borealis</i>	+			
63300	<i>Hydroporini</i>	+			
68130	<i>Helichus sp</i>	+			
68707	<i>Dubiraphia quadrinotata</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
68901	<i>Macronychus glabratus</i>	+			
69400	<i>Stenelmis sp</i>	+			
71100	<i>Hexatoma sp</i>	+			
71900	<i>Tipula sp</i>	+			
72700	<i>Anopheles sp</i>	+			
77120	<i>Ablabesmyia mallochi</i>	+			
77500	<i>Conchapelopia sp</i>	+			
78140	<i>Labrundinia pilosella</i>	+			
78450	<i>Nilotanytus fimbriatus</i>	+			
80430	<i>Cricotopus (C.) tremulus group</i>	+			
81650	<i>Parametriocnemus sp</i>	+			
82141	<i>Thienemanniella xena</i>	+			
82730	<i>Chironomus (C.) decorus group</i>	+			
82820	<i>Cryptochironomus sp</i>	+			
83840	<i>Microtendipes pedellus group</i>	+			
84210	<i>Paratendipes albimanus or P. duplicatus</i>	+			
84460	<i>Polypedilum (P.) fallax group</i>	+			

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Crabapple Creek
Co. Rd. 66

Collection Date: 07/01/2010 River Code: 06-815 RM: 2.88

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
03360	<i>Plumatella sp</i>	+			
08230	<i>Orconectes (Crockerinus) obscurus</i>	+			
11200	<i>Callibaetis sp</i>	+			
17200	<i>Caenis sp</i>	+			
22001	<i>Coenagrionidae</i>	+			
22300	<i>Argia sp</i>	+			
47600	<i>Sialis sp</i>	+			
50301	<i>Chimarra aterrima</i>	+			
50315	<i>Chimarra obscura</i>	+			
52200	<i>Cheumatopsyche sp</i>	+			
52440	<i>Ceratopsyche slossonae</i>	+			
52530	<i>Hydropsyche depravata group</i>	+			
68708	<i>Dubiraphia vittata group</i>	+			
71900	<i>Tipula sp</i>	+			
74100	<i>Simulium sp</i>	+			
74501	<i>Ceratopogonidae</i>	+			
78655	<i>Procladius (Holotanypus) sp</i>	+			
80420	<i>Cricotopus (C.) bicinctus</i>	+			
80510	<i>Cricotopus (Isocladius) sylvestris group</i>	+			
82730	<i>Chironomus (C.) decorus group</i>	+			
82820	<i>Cryptochironomus sp</i>	+			
84039	<i>Parachironomus frequens group</i>	+			
84470	<i>Polypedilum (P.) illinoense</i>	+			
85500	<i>Paratanytarsus sp</i>	+			
85625	<i>Rheotanytarsus sp</i>	+			
85800	<i>Tanytarsus sp</i>	+			
87501	<i>Empididae</i>	+			
95100	<i>Physella sp</i>	+			
98600	<i>Sphaerium sp</i>	+			

No. Quantitative Taxa: 0	Total Taxa: 29
No. Qualitative Taxa: 29	ICI:
Number of Organisms: 0	Qual EPT: 7

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Crabapple Creek
Co. Rd. 10

Collection Date: 08/16/2010 River Code: 06-815 RM: 0.16

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01900	<i>Nemertea</i>	64			
03600	<i>Oligochaeta</i>	8 +			
06201	<i>Hyalella azteca</i>	+			
08230	<i>Orconectes (Crockerinus) obscurus</i>	1 +			
08601	<i>Hydrachnidia</i>	16			
17200	<i>Caenis sp</i>	1 +			
21200	<i>Calopteryx sp</i>	4 +			
22300	<i>Argia sp</i>	+			
47600	<i>Sialis sp</i>	3 +			
50315	<i>Chimarra obscura</i>	58 +			
52200	<i>Cheumatopsyche sp</i>	82 +			
52430	<i>Ceratopsyche morosa group</i>	47 +			
52530	<i>Hydropsyche depravata group</i>	1			
52570	<i>Hydropsyche simulans</i>	1			
54100	<i>Neotrichia sp</i>	8 +			
68130	<i>Helichus sp</i>	+			
68901	<i>Macronychus glabratus</i>	+			
69400	<i>Stenelmis sp</i>	+			
72700	<i>Anopheles sp</i>	+			
74100	<i>Simulium sp</i>	1 +			
74501	<i>Ceratopogonidae</i>	3			
78655	<i>Procladius (Holotanypus) sp</i>	+			
80410	<i>Cricotopus (C.) sp</i>	97 +			
80420	<i>Cricotopus (C.) bicinctus</i>	49 +			
80430	<i>Cricotopus (C.) tremulus group</i>	76			
81240	<i>Nanocladius (N.) distinctus</i>	14			
81632	<i>Parakiefferiella n.sp 2</i>	14			
84315	<i>Phaenopsectra flavipes</i>	7			
84470	<i>Polypedilum (P.) illinoense</i>	7 +			
85625	<i>Rheotanytarsus sp</i>	28			
85800	<i>Tanytarsus sp</i>	35			
85821	<i>Tanytarsus glabrescens group sp 7</i>	278			
87540	<i>Hemerodromia sp</i>	60			
94400	<i>Fossaria sp</i>	+			
95100	<i>Physella sp</i>	+			
96120	<i>Menetus (Micromenetus) dilatatus</i>	1			

No. Quantitative Taxa: 27 Total Taxa: 36
 No. Qualitative Taxa: 22 ICI: **36**
 Number of Organisms: 964 Qual EPT: 5

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Campbell Creek
at mouth

Collection Date: 08/03/2010 River Code: 06-816 RM: 0.03

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
08230	<i>Orconectes (Crockerinus) obscurus</i>	+			
21200	<i>Calopteryx sp</i>	+			
22300	<i>Argia sp</i>	+			
52430	<i>Ceratopsyche morosa group</i>	+			
68901	<i>Macronychus glabratus</i>	+			
74501	<i>Ceratopogonidae</i>	+			
78655	<i>Procladius (Holotanypus) sp</i>	+			

No. Quantitative Taxa: 0 Total Taxa: 7
No. Qualitative Taxa: 7 ICI:
Number of Organisms: 0 Qual EPT: 1

Appendix Table 11. Macroinvertebrate Invertebrate Community Index (ICI) scores and metrics

A11-ICI scores for Wheeling Creek watershed, 2010.

River Mile	Drainage Area (sq mi)	Number of				Percent:					Qual. EPT	Eco-region	ICI
		Total Taxa	Mayfly Taxa	Caddisfly Taxa	Dipteran Taxa	Mayflies	Caddisflies	Tanytarsini	Other Dipt/NI	Tolerant Organisms			
Wheeling Creek (06-800)													
Year: 2010													
22.50	24.4	29(4)	3(2)	5(6)	16(4)	2.2(2)	28.6(6)	30.3(6)	38.7(4)	5.6(6)	7(2)	4	42
17.30	59.6	23(2)	2(0)	4(6)	12(2)	0.3(2)	22.3(6)	61.8(6)	14.0(6)	4.8(6)	6(2)	4	38
11.55	81.8	20(2)	3(2)	5(6)	10(2)	0.8(2)	15.3(4)	76.3(6)	7.6(6)	2.6(6)	8(2)	4	38
9.40	86.0	25(4)	2(0)	4(6)	13(2)	0.6(2)	23.0(6)	59.7(6)	15.9(6)	3.3(6)	7(2)	4	40
6.00	96.4	31(4)	1(0)	3(4)	18(4)	1.1(2)	1.6(2)	54.0(6)	37.6(4)	13.1(2)	7(2)	4	30
1.64	104.0	26(4)	1(0)	6(6)	14(4)	1.2(2)	29.9(6)	4.0(2)	64.8(0)	20.2(0)	6(2)	4	26
Fall Run (06-807)													
Year: 2010													
0.10	3.4	37(4)	0(0)	3(6)	26(6)	0.0(0)	1.7(6)	22.2(6)	73.7(0)	28.0(0)	8(4)	4	32
Crabapple Creek (06-815)													
Year: 2010													
0.16	19.6	27(4)	1(0)	6(6)	13(2)	0.1(2)	20.4(6)	35.4(6)	43.4(4)	8.1(4)	5(2)	4	36