Biological and Water Quality Study
Ohio River - New Boston Area

Southern Ohio Port Authority

2001

Scioto County, Ohio

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State of Ohio Environmental Protection Agency
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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 1987), 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.

Ohio Environmental Protection Agency. 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.

Ohio Environmental Protection Agency. 1989b. Addendum to Biological criteria for the protection of aquatic life: Volume II. Users manual for biological field assessment of Ohio surface waters. Div. Water Qual. Plan. & Assess., Ecological Assessment Section, Columbus, Ohio.

Ohio Environmental Protection Agency. 1989c. 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.

Ohio Environmental Protection Agency. 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.D. 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.

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. and E.T. Rankin. 1995. 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. 1995. 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. 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. 1995. 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.

These documents and this report may be obtained by writing to:

Ohio EPA, Division of Surface Water
Monitoring and Assessment Section
4675 Homer Ohio Lane
Groveport, Ohio 43125
(614) 836-8777

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 Ohio EPA conducts biosurveys in 6-10 different study areas with an aggregate total of 350-400 sampling sites.

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 Ohio EPA (*e.g.*, NPDES permits, Director's Orders, the Ohio Water Quality Standards [OAC 3745-1]), and are eventually incorporated into Water Quality Permit Support Documents (WQPSDs), State Water Quality Management Plans, the Ohio Nonpoint Source Assessment, and the Ohio Water Resource Inventory (305[b] report).

Hierarchy of Indicators

A carefully conceived ambient monitoring approach, using cost-effective indicators comprised 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 is outlined in Figure 1 and includes a hierarchical continuum from administrative to true environmental indicators. 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,

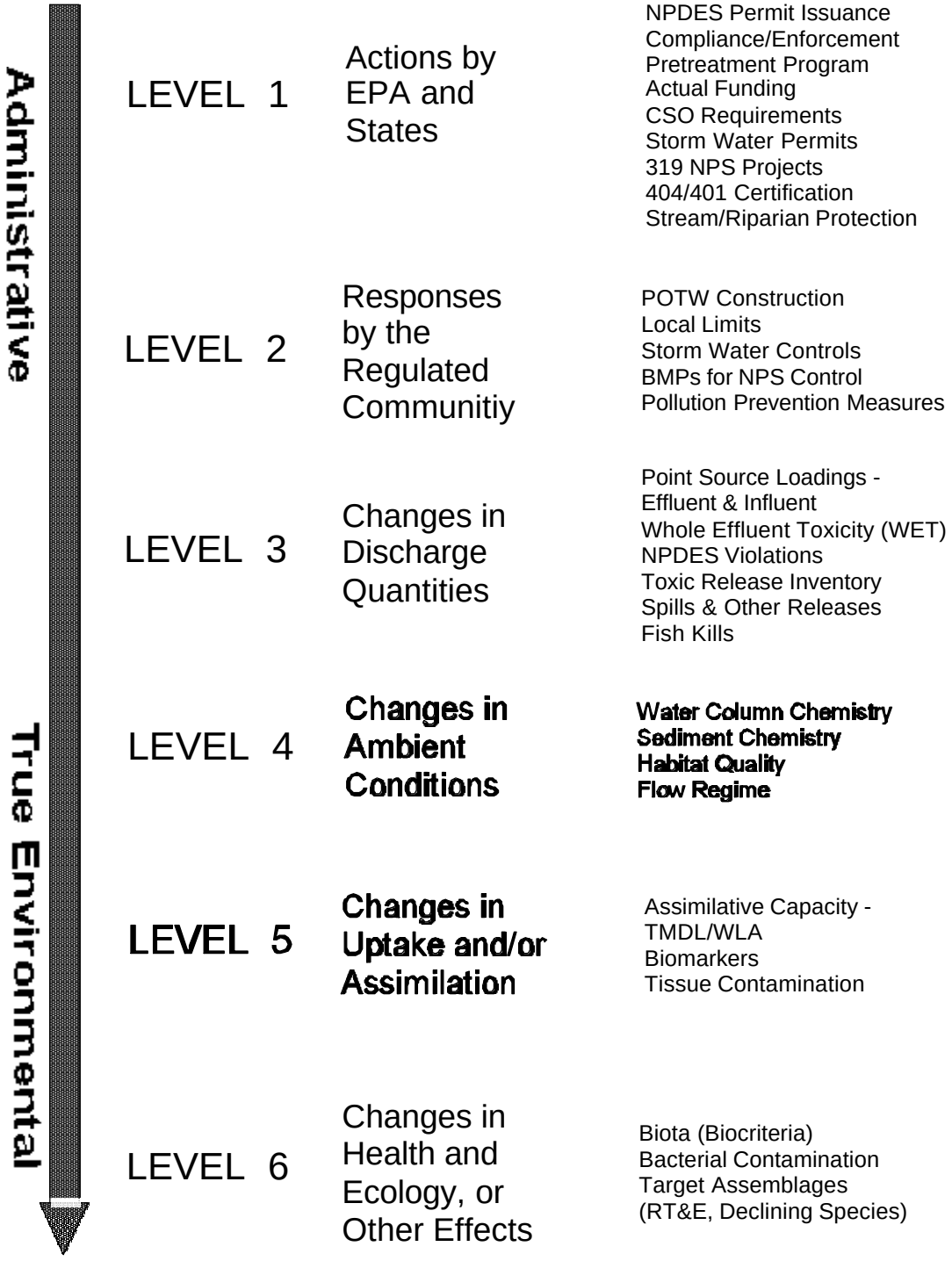

Figure 1. Hierarchy of administrative and environmental indicators which can be used for water quality management activities such as monitoring and assessment, reporting, and the evaluation of overall program effectiveness. This is patterned after a model developed by U.S. EPA (1995).

ecology, or other effects (ecological condition, pathogens). In this process 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 scale is a biological and water quality report. These reports then provide the foundation for aggregated assessments such as the Ohio Water Resource Inventory (305[b] report), the Ohio Nonpoint Source Assessment, and other technical bulletins.

Ohio Water Quality Standards: Designated Aquatic Life Uses

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 cold water 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 and permitted 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 mi.^{2} 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 water quality 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 is simply having a water depth of at least one meter over an area of at least 100 square feet or where canoeing is a feasible activity. If a water body is too small and shallow to meet either criterion the SCR use applies. The attainment status of PCR and SCR is determined using bacterial indicators (*e.g.*, fecal coliforms, *E. coli)* and the criteria for each are specified in the Ohio WQS.

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 and are detailed in other documents.

ACKNOWLEDGMENTS

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Surface Water - Mike Gray
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INTRODUCTION

The Southern Ohio Port Authority (SOPA) was awarded a Brownfield Redevelopment Initiative grant from U.S. EPA for the investigation and potential redevelopment of brownfield properties in the Scioto County region. One of the properties currently being investigated is the former Empire-Detroit steel mill in New Boston, Ohio. The former steel mill property is located adjacent to the Ohio River and west of the currently operating New Boston Coke plant.

As part of this project, the Division of Surface Water evaluated surface water, sediment, and biological conditions in a 3.1 mile section of the Ohio River to assess the contribution of potential contaminants from parcel two of the former steel mill, currently owned by SOPA (See Munn Run report, dated January 31, 2002 for a discussion of the New Boston Coke permitted discharge to Munn Run).

Specific objectives of this evaluation were to:

1) Establish biological conditions in the Ohio River in the vicinity of the Southern Ohio Port Authority property (SOPA) by evaluating fish and macroinvertebrate communities,

2) Evaluate surface water and sediment chemical quality in the Ohio River, and

3) Determine the aquatic life attainment status of the Ohio River with regard to the Warmwater Habitat (WWH) aquatic life use designation.

SUMMARY

A total of 3.1 miles of the Ohio River was assessed by Ohio EPA in 2001. Based on the performance of the biological communities, 2.7 miles were in full attainment of the Warmwater Habitat aquatic life use and 0.4 miles were in non-attainment (Table 1). Although Ohio biocriteria do not apply to the Ohio River, for comparison purposes and to establish relative attainment conditions, biocriteria results were assessed using narrative evaluations.

Results from previous Ohio EPA sampling of the Ohio River were analyzed and compared to results from this study to develop the macroinvertebrate narrative evaluation. Based on this evaluation, a substantial impairment in the macroinvertebrate community of the Ohio River was observed downstream from Munn Run. The decline from the upstream site appeared to be the result of the thermal discharge from New Boston Coke, via Munn Run.

There were no exceedences of Ohio surface water quality criteria associated with the SOPA property. Five PAH compounds were detected in sediments adjacent to the SOPA property; however, all were at low levels. Surface water, sediment, and biological results indicate that SOPA parcel two is not impairing the Ohio River.

Table 1. Attainment status of the Warmwater Habitat aquatic life use for the Ohio River based on biological sampling conducted during August and October, 2001. Attainment status based on a narrative evaluation of the Ohio River results.

RIVER MILE Fish/Invert.	IBI	MIwb	ICI	QHEI	Attainment Status	Site Location
Ohio River	*Western Allegheny Plateau (WAP) - WWH Use Designation*					
351.1 / 351.1	43 (G)	8.6 (G)	28 (G)	49.5	Full	Upstream SOPA property
- / 351.95	-	-	18 (P)	-	(Non)	Dst. Munn Run
351.8 / 351.64	42 (G)	8.2 (MG)	26 (MG)	43.5	Full	Adjacent SOPA property
352.3 / 352.3	44 (VG)	8.9 (G)	24 (MG)	52.0	Full	Downstream SOPA property
353.7 / 353.7	45 (VG)	8.8 (G)	30 (G)	47.5	Full	Downstream SOPA property

Narrative evaluations: E - exceptional, VG - very good, G - good, MG - marginally good, F -fair, P - poor, VP - very poor

METHODS

All physical, chemical, and biological field, laboratory, data processing, and data analysis methodologies and procedures adhere to those specified in the Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices (Ohio Environmental Protection Agency 1989a) and Biological Criteria for the Protection of Aquatic Life, Volumes I-III (Ohio Environmental Protection Agency 1987a, 1987b, 1989b, 1989c), and The Qualitative Habitat Evaluation Index (QHEI): Rationale, Methods, and Application (Rankin 1989, 1995) for aquatic habitat assessment.

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 7-16). 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 Index of Biotic Integrity (IBI) and modified Index of Well-Being (MIwb), indices measuring the response of the fish community, and the Invertebrate Community Index (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

Table 2. Sampling locations in the Ohio River, 2001. Type of sampling included fish community (F), macroinvertebrate community (M), sediment (S) and surface water (W).

Stream/ River Mile	Type of Sampling	Latitude	Longitude	Landmark
350.80A	S	38.75171	82.91973	Ust. SOPA and Munn Run - 3 feet from bank
350.80B	S	38.75166	82.91967	Ust. SOPA and Munn Run - 20 feet from bank
351.1	F,M,W	38.75056	82.92325	Ust. SOPA and Munn Run
351.64A	S,M,W	38.74708	82.93438	Ust. end of SOPA parcel 2 - sed. 3 feet from bank
351.64B	S	38.74695	82.93429	Ust. end of SOPA parcel 2 - 20 feet from bank
351.8	F	38.74567	82.93748	Adjacent SOPA parcel 2
351.93A	S	38.74502	82.93940	Lower end of SOPA parcel 2 - 12 feet from bank
351.93B	S	38.74487	82.93929	Lower end of SOPA parcel 2 - 40 feet from bank
351.95	M,W	38.74456	82.94038	Lower end of SOPA parcel 2
352.30	F,M,S,W	38.74206	82.94550	Near field to SOPA - sed. 4 feet from bank
352.41	S	38.74111	82.94726	Near field to SOPA - sed. 20 feet from bank
353.7	F,M	38.73105	82.96707	Far field to SOPA
353.76	S	38.73067	82.96797	Far field to SOPA - sed. 8 feet from bank
353.85	S,W	38.73008	82.96909	Far field to SOPA - sed. 20 feet from bank

performance. An aquatic life use attainment table (Table 1) 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 Qualitative Habitat Evaluation Index (QHEI) developed by the Ohio EPA for streams and rivers in Ohio (Rankin 1989, 1995). 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 typify 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 or stainless steel ekman dredges. The work plan recommended transect sediment samples consisting of three grabs per sampling location, for a total of 15 sediment samples. However, due to the scarcity of fine-grained material in sediments greater than 40 feet from shore, the furthest out transect sample was deleted from each location. Decontamination of sediment sampling equipment followed the procedures outlined in the Ohio EPA sediment sampling guidance manual (Ohio EPA 1996). 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^{o}C) in a cooler, and shipped to an Ohio EPA contract lab. Sediment data is reported on a dry weight basis. Surface water samples were collected directly into appropriate containers, preserved and delivered to an Ohio EPA contract lab. 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 Ecotox Thresholds (USEPA 1996), Ontario Ministry of the Environment (Persaud*et al.* 1993), and New York Department of Environmental Conservation (1999).

Macroinvertebrate Community Assessment

Macroinvertebrates were collected using artificial substrate samples at five Ohio River sites. The artificial substrate collection provided quantitative data and consisted of a composite sample of 5 modified Hester-Dendy multiple-plate samplers colonized for six weeks.

Fish Community Assessment

Fish were sampled twice at each site using pulsed DC night electrofishing methods, with sampling distances at each site 500 meters in length. Fish were processed in the field (some fish were taken back to the lab for verification), and included identifying each individual to species, weighing each species individually or in mass, 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).

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

framework, has been extensively discussed elsewhere (Karr *et al.* 1986; Karr 1991; Ohio EPA 1987a,b; 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 1995). 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.

RESULTS

Surface Water Quality

Chemical analyses were conducted on surface water samples collected during 2001 from five locations in the Ohio River. Surface water samples were analyzed for metals, pesticides, PCB parameters, volatile organic compounds, and semivolatile compounds. Temperature was measured in conjunction with the fish community assessment sampling. Parameters which were in exceedence of Ohio water quality criteria are reported in Table 3.

The only chemical parameter which exceeded Ohio water quality criteria was PCB-1260 collected at river mile 352.3. There were no exceedences of Ohio water quality criteria adjacent to the SOPA property.

The exceedence of the outside Mixing Zone Average criteria for temperature at river mile 351.1 appeared to be caused by the Munn Run discharge. Temperature was measured in the Ohio River just upstream from the mouth of Munn Run but within an area impacted by the discharge plume. Elevated temperatures (above background) were observed downstream at RM 351.8 (Appendix Table 7), approximately one-half mile downstream from where Munn Run enters the Ohio River (RM 351.20).

Sediment Chemistry

Sediment samples were collected at ten locations in the Ohio River by the Ohio EPA on September 10 and 11, 2001. All sampling locations are indicated by river mile in Figure 2. Samples were analyzed for volatile and semivolatile organic compounds, pesticides, PCBs, total analyte list inorganics, diesel range organics, gasoline range organics, particle size, and total organic carbon. Specific chemical parameters tested and results are listed in Appendix Table 1. Where feasible, two grab sediment samples were collected at the same river mile location, with one near the shoreline and the other perpendicularly 20 to 40 feet out from the shoreline. This occurred at the three most upstream locations (RMs 350.80 to 351.93). This perpendicular transect sampling was not feasible at the lower two sites due to a scarcity of fine-grained material in the area 20-40 feet from shore.

Table 3. Exceedences of Ohio Water Quality Standards criteria (OAC 37445-1) for chemical/physical parameters from the Ohio River (SOPA) study area during 2001 (units are ug/l for metals and organics).

River Mile	Parameter (value)
351.1	Temperature °C.(30)*
351.64	None
351.95	None
352.3	PCB-1260 (7.84)*
353.85	None

* Exceedence of Outside Mixing Zone Average criteria (OMZA).

Sediment data was evaluated using guidelines established in Ecotox Thresholds (USEPA 1996), the Ontario Ministry of the Environment (Persaud *et al.* 1993), and criteria prescribed by New York State's Department of Environmental Conservation (1999). The ecotox thresholds are based on comparison to either *Effects Range Low* (ERL) values or USEPA sediment quality criteria. The Ontario guidelines define two levels of ecotoxic effects and are based on the chronic, long-term effects of contaminants on benthic organisms. A *Lowest Effect Level* (LEL) is a level of sediment contamination that can be tolerated by the majority of benthic organisms, and a *Severe Effect Level* (SEL) indicates a level at which pronounced disturbance of the sediment-dwelling community can be expected. New York State's sediment evaluation process establishes sediment screening criteria for identifying areas of sediment contamination, and providing an initial assessment of potential adverse impacts. Non-polar organic contaminant criteria are derived using the equilibrium partitioning approach, while the metals analyses are for the most part based on Persaud *et al.* (1993). This tiered approach to evaluating sediment is consistent with rule 3745-300-09.

Sediment collected from the most upstream location in the Ohio River (RM 350.80 A & B - upstream from the SOPA property) exhibited a number of chemical parameters exceeding LEL and/or ERL guidelines (Table 4). Of the tested parameters, copper, iron, manganese, nickel, and zinc were considered slightly elevated. Volatile organics, PAHs, chlorinated organic pesticides, and PCBs were not detected.

Sediment collected adjacent to the SOPA property (RMs 351.64A&B and 351.93A&B) documented metals levels comparable to the upstream samples. As noted upstream, copper, iron, manganese,

nickel, and zinc were slightly elevated. One sample had chromium exceeding the LEL guideline. Five PAH compounds were detected in sediments adjacent to the SOPA property; however, all were at low levels. Volatile organics, chlorinated organic pesticides, and PCBs were not detected.

The two sample locations downstream from the SOPA property (RMs 352.30 to 353.85, 4 separate grab samples) were comparable to the sites adjacent to SOPA, with similar levels of metals and PAH compounds. Volatile organics, chlorinated organic pesticides, and PCBs were not detected.

Gasoline range organics and diesel range organics were tested in each sediment sample. Results revealed gasoline range organics at or below lab detection limits for all samples. Diesel range organics were detected in 8 of the 10 sediment samples, with detected values ranging from 5.03 to 10.9 mg/kg. The highest concentration was observed upstream from the SOPA property.

Physical Habitat For Aquatic Life

Physical habitat was evaluated in the Ohio River at each fish sampling location. Qualitative Habitat Evaluation Index (QHEI) scores are detailed in Table 5. Although developed for smaller inland Ohio streams, the QHEI was completed for each site to quantify habitat quality. Gravel and sand predominated the bottom substrates in the study area, with lesser amounts of cobble, muck and artificial riprap. Instream channel development was poor, largely related to the impounded nature of the Ohio River and the resulting lack of riffle and run areas. Instream cover was sparse throughout the study area. Moderate silt conditions and moderate embeddedness of the substrates was evident at all biological sampling locations. QHEI scores for the Ohio River ranged between 43.5 and 52.0. These scores are indicative of fair river habitat.

Fish Community Assessment

Fish communities were assessed at four Ohio River sites on August 20 and 21 and October 10, 2001 (Figure 2). One site was located upstream from SOPA and Munn Run (RM 351.1), adjacent to SOPA parcel two (RM 351.8), near-field downstream from SOPA (RM 352.3), and far-field downstream from SOPA (RM 353.7).

Marginally good to very good fish communities were documented at the four fish sampling locations in the Ohio River (Table 6). IBI scores ranged from 42 at RM 351.8 to 45 at RM 353.7, and MIwb scores ranged from 8.2 at RM 351.8 to 8.9 at RM 352.3. For comparison purposes, the IBI and MIwb scores were compared to narrative ranges for sites in the Western Allegheny Plateau ecoregion (biocriteria identified in the Ohio Water Quality Standards do not apply to the Ohio River). Based on this comparison, the Ohio River fish sites fully achieved the Warmwater Habitat use designation.

Based on the results of sampling in the Ohio River, SOPA parcel two is not impacting fish communities in the Ohio River.

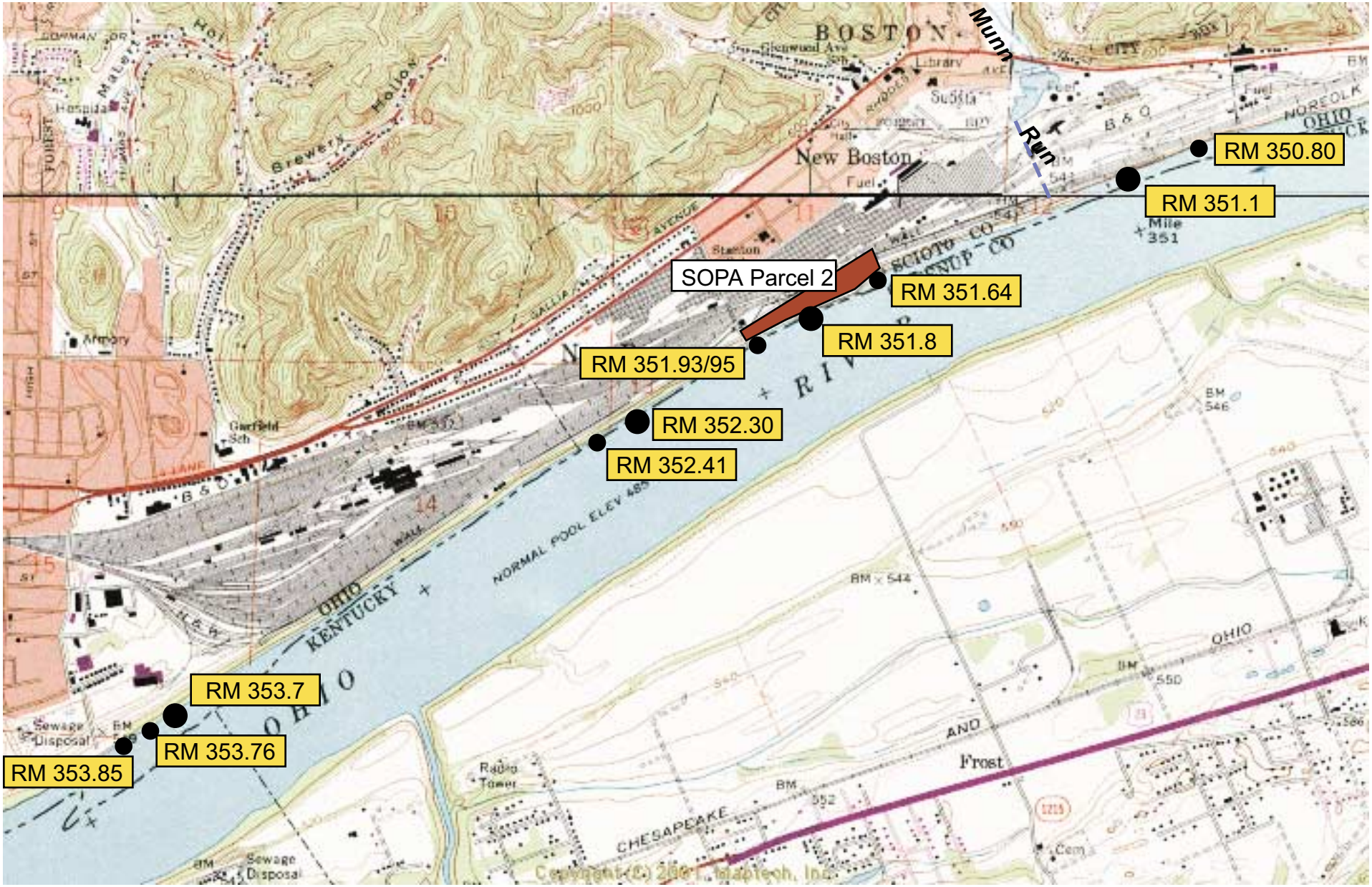

Figure 2. Map of the Ohio River showing sampling locations, 2001.

Table 4. Select detected chemical parameters measured in sediment samples collected by Ohio EPA from the Ohio River, September, 2001. Contamination levels were determined for a number of parameters using either Ecotox Thresholds (USEPA 1996), Persaud et al.(1993) or New York States' contaminated sediments screening guidance (1999). Parameters in italics do not have sediment evaluation guidelines established.

	Ohio River				
	RM 350.80A	RM 350.80B	RM 351.64A	RM 351.64B	RM 351.93A
Volatile Organics (ug/kg)	None detected at or above the reporting limit				
Pesticides/PCBs (ug/kg)	None detected at or above the reporting limit				
Semivolatile Organics (ug/kg)					
Benzo(a)pyrene	nd	nd	nd	nd	584[ERL,LEL]
Benzo(b)fluoranthene	nd	nd	nd	1100	1170
Chrysene	nd	nd	nd	nd	569[LEL]
Fluoranthene	nd	nd	nd	698[ERL]	980[ERL,LEL]
Naphthalene	nd	nd	nd	nd	nd
Phenanthene	nd	nd	nd	nd	616[ERL,LEL]
Pyrene	nd	nd	nd	571[LEL]	810[ERL,LEL]
Total PAHs	nd	nd	nd	2369	4729[LEL]
Gasoline Range Organics (mg/kg)	nd	nd	nd	nd	0.4
Diesel Range Organics (mg/kg)	nd	10.9	8.59	8.69	8.89
Inorganics (mg/kg)					
Chromium	21	18.6	47.6[LEL]	19.3	21.2
Copper	28.3[LEL]	25.8[LEL]	13.4	20.8[LEL]	25.3[LEL]
Iron	24,500[LEL]	23,800[LEL]	18,300	22,300[LEL]	26,200[LEL]
Mercury	nd	nd	nd	nd	nd
Manganese	1770[LEL,SEL]	980[LEL]	949[LEL]	814[LEL]	825[LEL]
Nickel	30.9[ERL,LEL]	30.5[ERL,LEL]	16.6[LEL]	24.7[ERL,LEL]	30.3[ERL,LEL]
Zinc	130[LEL]	126[LEL]	79	109	142[LEL]

[LEL] Value exceeds the Lowest Effect Level in Persuad et al. 1993.
[SEL] Value exceeds the Severe Effect Level in Persuad et al. 1993.
[ERL] Value exceeds the Effects Range-Low in Ecotox Thresholds (USEPA 1996).

Table 4. Continued.

	Ohio River				
	RM 351.93B	RM 352.30	RM 352.41	RM 353.76	RM 353.85
Volatile Organics (ug/kg)	None detected at or above the reporting limit				
Pesticides/PCBs (ug/kg)	None detected at or above the reporting limit				
Semivolatile Organics (ug/kg)					
Benzo(a)pyrene	nd	nd	nd	nd	nd
Benzo(b)fluoranthene	751	691	880	684	913
Chrysene	nd	nd	nd	nd	nd
Fluoranthene	645[ERL]	nd	627[ERL]	517	638[ERL]
Naphthalene	926[ERL]	nd	nd	nd	801[ERL]
Phenanthene	nd	nd	nd	nd	nd
Pyrene	nd	nd	nd	nd	nd
Total PAHs	2322	691	1507	1201	2352
Gasoline Range Organics (mg/kg)	nd	0.4	nd	nd	nd
Diesel Range Organics (mg/kg)	5.03	7.09	7.11	9.9	nd
Inorganics (mg/kg)					
Chromium	20	20.4	17.9	17.4	18.2
Copper	23.9[LEL]	25.4[LEL]	23.1[LEL]	28.6[LEL]	34.5[ERL,LEL]
Iron	24,400[LEL]	25,800[LEL]	22,900[LEL]	22,900[LEL]	21,100[LEL]
Mercury	nd	0.391[ERL,LEL]	nd	nd	nd
Manganese	789[LEL]	721[LEL]	667[LEL]	918[LEL]	798[LEL]
Nickel	28.9[ERL,LEL]	29.6[ERL,LEL]	27[ERL,LEL]	25.5[ERL,LEL]	27.5[ERL,LEL]
Zinc	120[LEL]	134[LEL]	119	122[LEL]	125[LEL]

[LEL] Value exceeds the Lowest Effect Level in Persuad et al. 1993.
[SEL] Value exceeds the Severe Effect Level in Persuad et al. 1993.
[ERL] Value exceeds the Effects Range-Low in Ecotox Thresholds (USEPA 1996).
nd Not detected at or above the reporting limit.

Table 5. Qualitative Habitat Evaluation Index (QHEI) matrix showing modified and warwater attributes for the Ohio River, 2001.

			WWH Attributes										MWH Attributes																									
													High Influence				*Moderate Influence*																							
Key QHEI Components			No Channelization or Recovered	Boulder/Cobble/Gravel Substrates	Silt Free Substrates	Good/Excellent Substrates	Moderate/High Sinuosity	Extensive/Moderate Cover	Fast Current/Eddies	Low-Normal Overall Embeddedness	Max Depth > 40 cm	Low-Normal Riffle Embeddedness	**Total WWH Attributes**	Channelized or No Recovery	Silt/Muck Substrates	No Sinuosity	Sparse/No Cover	Max Depth < 40 cm (WD, HW)	**Total HL 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 Embeddedness	High/Mod. Riffle Embeddedness	No Riffle	**Total ML MWH Attributes**	**(MWH HL+1)/(WWH+1) Ratio**	**(MWH ML+1)/(WWH+1) Ratio**
River Mile	QHEI	Gradient (ft/mile)																																				
(90-001) Ohio River																																						
Year: 2001																																						
353.7	**47.5**	0.10	■	■							■		3			◆			1	■		■	■	■		■	■		■		7	0.50	2.25
352.3	**52.0**	0.10	■	■				■			■		4			◆			1	■		■	■			■	■		■		6	0.40	1.60
351.8	**43.5**	0.10	■	■							■		3	◆		◆			2	■		■	■	■		■	■		■		7	0.75	2.50
351.1	**49.5**	0.10	■	■							■		3			◆			1	■		■	■	■		■	■		■		7	0.50	2.25

Table 6. Fish community summaries based on pulsed DC night electrofishing sampling conducted by Ohio EPA at four Ohio River sites collected in August and October, 2001. Relative numbers are per 1.0 km.

Stream / River Mile	Mean Number of Species	Total Number Species	Mean Relative Number	Mean Relative Weight (kg)	QHEI	Mean Modified Index of Well Being	Mean Index of Biotic Integrity	Narrative Evaluation
Ohio River (2001)								
351.1	19.5	27	370	46.90	49.5	8.6	43	Good
351.8	20.0	26	475	42.11	43.5	8.2	42	Marg.Good/Good
352.3	18.0	23	721	57.46	52.0	8.9	44	Good/Very Good
353.7	20.0	25	525	90.35	47.5	8.8	45	Good/Very Good

Macroinvertebrate Community Assessment

The macroinvertebrate communities in the Ohio River were sampled at five locations using quantitative artificial substrate samples in 2001. Results are summarized in Table 7. Raw data and ICI metrics and scores are attached as Appendix Tables 5 and 6. Qualitative samples were not collected at all sites so the ICI scores for all sites were calculated using the quantitative sample number of EPT taxa. Biological criteria for inland streams found in Table 7-16 of the Ohio Administrative Code rule 3745-1-07 do not apply to the Ohio River. ORSANCO is in the process of developing ICI metrics specific to the Ohio River. For this discussion existing ICI metrics and scoring used by Ohio EPA were the basis for comparison of the five samples from this study. Results from previous Ohio EPA sampling from the Ohio River were analyzed and compared to results from this study to develop a narrative evaluation.

The upstream sample collected at RM 351.1 had an ICI score of 28 with a narrative evaluation of good relative to other Ohio River sites. The sample consisted of 6 % tolerant organisms, 9 quantitative EPT taxa and 33 total taxa.

The sample downstream from Munn Run at RM 351.64 had an ICI score of 18 with a narrative evaluation of poor. The sample had 43% tolerant organisms, 4 quantitative EPT taxa, and 26 total taxa. The decline in the macroinvertebrate community from the upstream site appeared to be the result of the thermal discharge from New Boston Coke via Munn Run.

The sample collected at RM 351.95 had an ICI score of 26 and a narrative evaluation of marginally good. The sample had 31% tolerant organisms and 8 EPT taxa. There was a total of 29 macroinvertebrate taxa in the quantitative sample. The results indicate some recovery of the

macroinvertebrate community from impacts observed at the RM 351.64 site.

At RM 352.3 the sample had an ICI score of 24 with a narrative evaluation of marginally good. Tolerant organisms comprised 18% of the sample. The quantitative sample had 9 EPT taxa and 29 total taxa.

The most downstream sample collected at RM 353.7 had an ICI score of 30 and a narrative evaluation of good. The sample had 15% tolerant organisms and 10 EPT taxa. A total of 40 macroinvertebrate taxa were collected from the sample. Results based on ICI scores indicate that this site is somewhat better than the most upstream site.

Table 7. Summary of macroinvertebrate data collected from artificial substrates (quantitative sampling) in the Ohio River during 2001.

River Mile	Density Number/ft^2	Total Taxa	% EPT[a] Composition	Quantitative EPT Taxa	ICI	Evaluation[b]
351.1	605	33	8.1	9	28	Good
351.64	446	26	5.0	4	18	Poor
351.95	191	29	24.1	8	26	Marginally Good
352.3	624	29	11.5	9	24	Marginally Good
353.7	662	40	13.0	10	30	Good

[a] EPT= total Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) taxa richness, a measure of pollution sensitive organisms.

[b] Narrative evaluation based on a comparison to all Ohio River sites in the Ohio EPA database. Western Allegheny Plateau (WAP) inland stream biocriteria are not applicable to the Ohio River biocriteria. ORSANCO is in the process of developing ICI metrics and scoring for attainment levels specifically for the Ohio River.

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APPENDICES

Appendix Table 1. Results of sediment samples collected by Ohio EPA from the Ohio River, September 10, 2001.

	Ohio River				
Sampling Location/River Mile :	RM 350.80A	RM 350.80B	RM 351.64A	RM 351.64B	RM 351.93A
Date Sampled :	10-Sep-2001	10-Sep-2001	10-Sep-2001	10-Sep-2001	10-Sep-2001
Time Sampled:	12:45 PM	01:15 PM	02:35 PM	02:50 PM	03:35 PM
VOLATILE ORGANIC COMPOUNDS (ug/kg)					
Dichlorodifluoromethane	<15.5	<12.4	<13.3	<13.9	<12.8
Chloromethane	<15.5	<12.4	<13.3	<13.9	<12.8
Vinyl chloride	<15.5	<12.4	<13.3	<13.9	<12.8
Bromomethane	<15.5J	<12.4J	<13.3J	<13.9J	<12.8J
Chloroethane	<15.5	<12.4	<13.3	<13.9	<12.8
Trichlorofluoromethane	<7.8	<6.2	<6.7	<6.9	<6.4
Acrolein	<155	<124	<133	<139	<128
Acetone	<155J	<124J	<133J	<139J	<128J
1,1-Dichloroethene	<7.8	<6.2	<6.7	<6.9	<6.4
Methylene chloride	<7.8	<6.2	<6.7	<6.9	<6.4
Carbon disulfide	<155	<124	<133	<139	<128
Acrylonitrile	<155	<124	<133	<139	<128
n-Hexane	<7.8	<6.2	<6.7	<6.9	<6.4
trans-1,2-Dichloroethene	<7.8	<6.2	<6.7	<6.9	<6.4
1,1-Dichloroethane	<7.8	<6.2	<6.7	<6.9	<6.4
Vinyl acetate	<77.6	<62.0	<66.6	<69.3	<64.0
Methyl ethyl ketone	<155	<124	<133	<139	<128
2,2-Dichloropropane	<7.8	<6.2	<6.7	<6.9	<6.4
cis-1,2-Dichloroethene	<7.8	<6.2	<6.7	<6.9	<6.4
Bromochloromethane	<7.8	<6.2	<6.7	<6.9	<6.4
Chloroform	<7.8	<6.2	<6.7	<6.9	<6.4
1,1,1-Trichloroethane	<7.8	<6.2	<6.7	<6.9	<6.4
1,1-Dichloropropene	<7.8	<6.2	<6.7	<6.9	<6.4
Carbon tetrachloride	<7.8	<6.2	<6.7	<6.9	<6.4
Benzene	<7.8	<6.2	<6.7	<6.9	<6.4
1,2-Dichloroethane	<7.8	<6.2	<6.7	<6.9	<6.4
Trichloroethene	<7.8	<6.2	<6.7	<6.9	<6.4
1,2-Dichloropropane	<7.8	<6.2	<6.7	<6.9	<6.4
Bromodichloromethane	<7.8	<6.2	<6.7	<6.9	<6.4
Dibromomethane	<7.8	<6.2	<6.7	<6.9	<6.4
2-Chloroethyl vinyl ether	<15.5	<12.4	<13.3	<13.9	<12.8
4-Methyl-2-pentanone	<77.6	<62.0	<66.6	<69.3	<64.0
cis-1,3-Dichloropropene	<7.8	<6.2	<6.7	<6.9	<6.4
Toluene	<7.8	<6.2	<6.7	<6.9	<6.4
Ethyl methacrylate	<7.8	<6.2	<6.7	<6.9	<6.4
trans-1,3-Dichloropropene	<7.8	<6.2	<6.7	<6.9	<6.4
1,1,2-Trichloroethane	<7.8	<6.2	<6.7	<6.9	<6.4
2-Hexanone	<77.6	<62.0	<66.6	<69.3	<64.0
1,3-Dichloropropane	<7.8	<6.2	<6.7	<6.9	<6.4
Tetrachloroethene	<7.8	<6.2	<6.7	<6.9	<6.4
Chlorodibromomethane	<7.8	<6.2	<6.7	<6.9	<6.4
Ethylene dibromide	<7.8	<6.2	<6.7	<6.9	<6.4
Chlorobenzene	<7.8	<6.2	<6.7	<6.9	<6.4
Ethylbenzene	<7.8	<6.2	<6.7	<6.9	<6.4
1,1,1,2-Tetrachlorethane	<7.8	<6.2	<6.7	<6.9	<6.4
p,m-Xylene	<7.8	<6.2	<6.7	<6.9	<6.4
o-Xylene	<7.8	<6.2	<6.7	<6.9	<6.4
Styrene	<7.8	<6.2	<6.7	<6.9	<6.4
Isopropylbenzene	<7.8	<6.2	<6.7	<6.9	<6.4
Bromoform	<7.8	<6.2	<6.7	<6.9	<6.4
1,1,2,2-Tetrachloroethane	<7.8	<6.2	<6.7	<6.9	<6.4

Appendix Table 1. Continued.

	Ohio River				
Sampling Location/River Mile :	RM 350.80A	RM 350.80B	RM 351.64A	RM 351.64B	RM 351.93A
Date Sampled :	10-Sep-2001	10-Sep-2001	10-Sep-2001	10-Sep-2001	10-Sep-2001
Time Sampled:	12:45 PM	01:15 PM	02:35 PM	02:50 PM	03:35 PM
VOLATILE ORGANIC COMPOUNDS (ug/kg)					
1,2,3-Trichloropropane	<7.8	<6.2	<6.7	<6.9	<6.4
n-Propylbenzene	<15.5	<12.4	<13.3	<13.9	<12.8
Bromobenzene	<15.5	<12.4	<13.3	<13.9	<12.8
2-Chlorotoluene	<15.5	<12.4	<13.3	<13.9	<12.8
1,3,5-Trimethylbenzene	<15.5	<12.4	<13.3	<13.9	<12.8
4-Chlorotoluene	<15.5	<12.4	<13.3	<13.9	<12.8
tert-Butylbenzene	<15.5	<12.4	<13.3	<13.9	<12.8
1,2,4-Trimethylbenzene	<15.5	<12.4	<13.3	<13.9	<12.8
sec-Butylbenzene	<15.5	<12.4	<13.3	<13.9	<12.8
p-Isopropyltoluene	<15.5	<12.4	<13.3	<13.9	<12.8
1,3-Dichlorobenzene	<15.5	<12.4	<13.3	<13.9	<12.8
1,4-Dichlorobenzene	<15.5	<12.4	<13.3	<13.9	<12.8
n-Butylbenzene	<15.5	<12.4	<13.3	<13.9	<12.8
1,2-Dichlorobenzene	<15.5	<12.4	<13.3	<13.9	<12.8
1,2-Dibromo-3-chloropropane	<15.5	<12.4	<13.3	<13.9	<12.8
1,2,4-Trichlorobenzene	<15.5	<12.4	<13.3	<13.9	<12.8
Hexachlorobutadiene	<15.5J	<12.4J	<13.3J	<13.9J	<12.8J
Naphthalene	<15.5	<12.4	<13.3	<13.9	<12.8
1,2,3-Trichlorobenzene	<15.5	<12.4	<13.3	<13.9	<12.8
SEMIVOLATILE ORGANIC COMPOUNDS (ug/kg)					
Azobenzene	<637	<536	<454	<538	<547
Benzo(b)fluoranthene	<637	<536	<454	1100	1170
Benzo(k)fluoranthene	<637	<536	<454	<538	<547
Bis(2-ethylhexyl)phthalate	<637	<536	<454	<538	<547
N-Nitrosodimethylamine	<3280	<2760	<2340	<2770	<2820
Bis(2-chloroethly)ether	<637	<536	<454	<538	<547
2-Chlorophenol	<637	<536	<454	<538	<547
Phenol	<637	<536	<454	<538	<547
1,3-Dichlorobenzene	<637	<536	<454	<538	<547
1,4-Dichlorobenzene	<637	<536	<454	<538	<547
1,2-Dichlorobenzene	<637	<536	<454	<538	<547
Bis(2-chloroisopropyl)ether	<637	<536	<454	<538	<547
Hexachloroethane	<637	<536	<454	<538	<547
N-Nitroso-di-n-propylamine	<637	<536	<454	<538	<547
Nitrobenzene	<637	<536	<454	<538	<547
Isophorone	<637	<536	<454	<538	<547
2-Nitrophenol	<637	<536	<454	<538	<547
2,4-Dimethylphenol	<637	<536	<454	<538	<547
Bis(2-chloroethoxy)methane	<637	<536	<454	<538	<547
2,4-Dichlorophenol	<637	<536	<454	<538	<547
1,2,4-Trichlorobenzene	<637	<536	<454	<538	<547
Naphthalene	<637	<536	<454	<538	<547
Hexachlorobutadiene	<637	<536	<454	<538	<547
4-Chloro-3-methylphenol	<1270	<1070	<909	<1080	<1090
Hexachlorocyclopentadiene	<1270	<1070	<909	<1080	<1090
2,4,6-Trichlorophenol	<637	<536	<454	<538	<547
2-Chloronaphthalene	<637	<536	<454	<538	<547
Acenaphthylene	<637	<536	<454	<538	<547

Appendix Table 1. Continued.

	Ohio River				
Sampling Location/River Mile :	RM 350.80A	RM 350.80B	RM 351.64A	RM 351.64B	RM 351.93A
Date Sampled :	10-Sep-2001	10-Sep-2001	10-Sep-2001	10-Sep-2001	10-Sep-2001
Time Sampled:	12:45 PM	01:15 PM	02:35 PM	02:50 PM	03:35 PM
SEMIVOLATILE ORGANIC COMPOUNDS (ug/kg)					
Dimethylphthalate	<637	<536	<454	<538	<547
2,6-Dinitrotoluene	<637	<536	<454	<538	<547
Acenaphthene	<637	<536	<454	<538	<547
2,4-Dinitrophenol	<3280	<2760	<2340	<2770	<2820
2,4-Dinitrotoluene	<637	<536	<454	<538	<547
4-Nitrophenol	<3280	<2760	<2340	<2770	<2820
Fluorene	<637	<536	<454	<538	<547
4-Chlorophenyl phenyl ether	<637	<536	<454	<538	<547
Diethylphthalate	<637	<536	<454	<538	<547
N-Nitrosodiphenylamine	<1270J	<1070J	<909J	<1080J	<1090J
4,6-Dinitro-2-methylphenol	<3280	<2760	<2340	<2770	<2820
4-Bromophenyl phenyl ether	<637	<536	<454	<538	<547
Hexachlorobenzene	<637	<536	<454	<538	<547
Pentachlorophenol	<3280	<2760	<2340	<2770	<2820
Phenanthrene	<637	<536	<454	<538	616
Anthracene	<637	<536	<454	<538	<547
Di-n-butylphthalate	<637	<536	<454	<538	<547
Fluoranthene	<637	<536	<454	698	980
Pyrene	<637	<536	<454	571	810
Butylbenzylphthalate	<637	<536	<454	<538	<547
Benzo(a)anthracene	<637	<536	<454	<538	<547
Chrysene	<637	<536	<454	<538	569
3,3'-Dichlorobenzidine	<1270	<1070	<909	<1080	<1090
Di-n-octylphthalate	<637	<536	<454	<538	<547
Benzo(a)pyrene	<637	<536	<454	<538	584
Dibenzo(a,h)anthracene	<637	<536	<454	<538	<547
Indeno(1,2,3-cd)pyrene	<637	<536	<454	<538	<547
Benzo(g,h,i)perylene	<637	<536	<454	<538	<547
PESTICIDES (ug/kg)					
Aldrin	<20.0	<20.0	<20.0	<20.0	<20.0
alpha-BHC	<20.0	<20.0	<20.0	<20.0	<20.0
beta-BHC	<20.0	<20.0	<20.0	<20.0	<20.0
delta-BHC	<20.0	<20.0	<20.0	<20.0	<20.0
gamma-BHC (Lindane)	<20.0	<20.0	<20.0	<20.0	<20.0
Chlordane (tech)	<100	<100	<100	<100	<100
4,4'-DDD	<20.0	<20.0	<20.0	<20.0	<20.0
4,4'-DDE	<30.0	<30.0	<30.0	<30.0	<30.0
4,4'-DDT	<30.0	<30.0	<30.0	<30.0	<30.0
Dieldrin	<20.0	<20.0	<20.0	<20.0	<20.0
Endosulfan I	<30.0	<30.0	<30.0	<30.0	<30.0
Endosulfan II	<30.0	<30.0	<30.0	<30.0	<30.0
Endosulfan sulfate	<30.0	<30.0	<30.0	<30.0	<30.0
Endrin	<50.0	<50.0	<50.0	<50.0	<50.0
Endrin aldehyde	<50.0	<50.0	<50.0	<50.0	<50.0
Heptachlor	<30.0	<30.0	<30.0	<30.0	<30.0
Heptachlor epoxide	<30.0	<30.0	<30.0	<30.0	<30.0
Methoxychlor	<30.0	<30.0	<30.0	<30.0	<30.0
Toxaphene	<100	<100	<100	<100	<100
Endrin ketone	<20.0	<20.0	<20.0	<20.0	<20.0

Appendix Table 1. Continued.

	Ohio River				
Sampling Location/River Mile :	RM 350.80A	RM 350.80B	RM 351.64A	RM 351.64B	RM 351.93A
Date Sampled :	10-Sep-2001	10-Sep-2001	10-Sep-2001	10-Sep-2001	10-Sep-2001
Time Sampled:	12:45 PM	01:15 PM	02:35 PM	02:50 PM	03:35 PM
PCBs (ug/kg)					
PCB-1016	<100	<100	<100	<100	<100
PCB-1221	<100	<100	<100	<100	<100
PCB-1232	<100	<100	<100	<100	<100
PCB-1242	<100	<100	<100	<100	<100
PCB-1248	<100	<100	<100	<100	<100
PCB-1254	<100	<100	<100	<100	<100
PCB-1260	<100	<100	<100	<100	<100
INORGANICS (mg/kg)					
Silver	<4.90	<4.12	<3.42	<3.98	<4.05
Aluminum	9100	6720	3940	5960	6790
Arsenic	3.36	2.05	1.45	2.2	3.01
Barium	125	98.1	66	87.8	114
Beryllium	<4.90	<4.12	<3.42	<3.98	<4.05
Calcium	3230	4570	2840	2900	2360
Cadmium	<0.98	<0.824	<0.671	<0.788	<0.813
Cobalt	18.6	17.1	9.74	15	18.2
Chromium	21	18.6	47.6	19.3	21.2
Copper	28.3	25.8	13.4	20.8	25.3
Iron	24500	23800	18300	22300	26200
Mercury	<0.161	<0.119	<0.105	<0.126	<0.126
Potassium	943	560	363	538	613
Magnesium	2570	2230	1740	2010	2130
Manganese	1770	980	949	814	825
Sodium	<245	<206	<171	<199	<202
Nickel	30.9	30.5	16.6	24.7	30.3
Lead	21.1	14.6	22	19.5	25.9
Antimony	<24.5	<20.6	<17.1	<19.9	<20.2
Selenium	<0.980	<0.824	<0.671	<0.788	<0.813
Thallium	<0.980	<0.824	<0.671	<0.788	<0.813
Vanadium	19.9	16	15.3	16.3	17
Zinc	130	126	79	109	142
Extractable Petroleum Hydrocarbons (mg/kg) - DRO					
Diesel	<1.00	10.9	8.59	8.69	8.89
TVPH (mg/kg) - GRO					
Gasoline	<0.5	<0.5	<0.5	<0.4	0.4
OTHER					
Total Organic Carbon (mg/kg)	18300	12900	6510	13000	14500
Solids (%)	51	61	72	61	60
Particle Size:					
Gravel (%)	0	0.1	0.5	0.2	0
Sand (%)	15.5	46.6	57.7	46.8	59.9
Silt (%)	66.2	42.5	34.7	42.7	33.4
Clay (%)	18.3	10.8	7.1	10.3	6.7

Appendix Table 1. Continued.

	Ohio River				
Sampling Location/River Mile :	RM 351.93B	RM 352.30	RM 352.41	RM 353.76	RM 353.85
Date Sampled :	10-Sep-2001	10-Sep-2001	10-Sep-2001	10-Sep-2001	10-Sep-2001
Time Sampled:	03:55 PM	04:25 PM	05:10 PM	05:40 PM	06:15 PM
VOLATILE ORGANIC COMPOUNDS (ug/kg)					
Dichlorodifluoromethane	<10.7	<8.3	<10.4	<10.4	<14.6
Chloromethane	<10.7	<8.3	<10.4	<10.4	<14.6
Vinyl chloride	<10.7	<8.3	<10.4	<10.4	<14.6
Bromomethane	<10.7J	<8.3J	<10.4J	<10.4J	<14.6J
Chloroethane	<10.7	<8.3	<10.4	<10.4	<14.6
Trichlorofluoromethane	<5.3	<4.1	<5.2	<5.2	<7.3
Acrolein	<107	<82.8	<104	<104	<146
Acetone	<107J	<82.8J	<104J	<104J	<146J
1,1-Dichloroethene	<5.3	<4.1	<5.2	<5.2	<7.3
Methylene chloride	<5.3	<4.1	<5.2	<5.2	<7.3
Carbon disulfide	<107	<82.8	<104	<104	<146
Acrylonitrile	<107	<82.8	<104	<104	<146
n-Hexane	<5.3	<4.1	<5.2	<5.2	<7.3
trans-1,2-Dichloroethene	<5.3	<4.1	<5.2	<5.2	<7.3
1,1-Dichloroethane	<5.3	<4.1	<5.2	<5.2	<7.3
Vinyl acetate	<53.3	<41.4	<51.9	<52.2	<73.1
Methyl ethyl ketone	<107	<82.8	<104	<104	<146
2,2-Dichloropropane	<5.3	<4.1	<5.2	<5.2	<7.3
cis-1,2-Dichloroethene	<5.3	<4.1	<5.2	<5.2	<7.3
Bromochloromethane	<5.3	<4.1	<5.2	<5.2	<7.3
Chloroform	<5.3	<4.1	<5.2	<5.2	<7.3
1,1,1-Trichloroethane	<5.3	<4.1	<5.2	<5.2	<7.3
1,1-Dichloropropene	<5.3	<4.1	<5.2	<5.2	<7.3
Carbon tetrachloride	<5.3	<4.1	<5.2	<5.2	<7.3
Benzene	<5.3	<4.1	<5.2	<5.2	<7.3
1,2-Dichloroethane	<5.3	<4.1	<5.2	<5.2	<7.3
Trichloroethene	<5.3	<4.1	<5.2	<5.2	<7.3
1,2-Dichloropropane	<5.3	<4.1	<5.2	<5.2	<7.3
Bromodichloromethane	<5.3	<4.1	<5.2	<5.2	<7.3
Dibromomethane	<5.3	<4.1	<5.2	<5.2	<7.3
2-Chloroethyl vinyl ether	<10.7	<8.3	<10.4	<10.4	<14.6
4-Methyl-2-pentanone	<53.3	<41.4	<51.9	<52.2	<73.1
cis-1,3-Dichloropropene	<5.3	<4.1	<5.2	<5.2	<7.3
Toluene	<5.3	<4.1	<5.2	<5.2	<7.3
Ethyl methacrylate	<5.3	<4.1	<5.2	<5.2	<7.3
trans-1,3-Dichloropropene	<5.3	<4.1	<5.2	<5.2	<7.3
1,1,2-Trichloroethane	<5.3	<4.1	<5.2	<5.2	<7.3
2-Hexanone	<53.3	<41.4	<51.9	<52.2	<73.1
1,3-Dichloropropane	<5.3	<4.1	<5.2	<5.2	<7.3
Tetrachloroethene	<5.3	<4.1	<5.2	<5.2	<7.3
Chlorodibromomethane	<5.3	<4.1	<5.2	<5.2	<7.3
Ethylene dibromide	<5.3	<4.1	<5.2	<5.2	<7.3
Chlorobenzene	<5.3	<4.1	<5.2	<5.2	<7.3
Ethylbenzene	<5.3	<4.1	<5.2	<5.2	<7.3
1,1,1,2-Tetrachlorethane	<5.3	<4.1	<5.2	<5.2	<7.3
p,m-Xylene	<5.3	<4.1	<5.2	<5.2	<7.3
o-Xylene	<5.3	<4.1	<5.2	<5.2	<7.3
Styrene	<5.3	<4.1	<5.2	<5.2	<7.3
Isopropylbenzene	<5.3	<4.1	<5.2	<5.2	<7.3
Bromoform	<5.3	<4.1	<5.2	<5.2	<7.3
1,1,2,2-Tetrachloroethane	<5.3	<4.1	<5.2	<5.2	<7.3

Appendix Table 1. Continued.

	Ohio River				
Sampling Location/River Mile :	RM 351.93B	RM 352.30	RM 352.41	RM 353.76	RM 353.85
Date Sampled :	10-Sep-2001	10-Sep-2001	10-Sep-2001	10-Sep-2001	10-Sep-2001
Time Sampled:	03:55 PM	04:25 PM	05:10 PM	05:40 PM	06:15 PM
VOLATILE ORGANIC COMPOUNDS (ug/kg)					
1,2,3-Trichloropropane	<5.3	<4.1	<5.2	<5.2	<7.3
n-Propylbenzene	<10.7	<8.3	<10.4	<10.4	<14.6
Bromobenzene	<10.7	<8.3	<10.4	<10.4	<14.6
2-Chlorotoluene	<10.7	<8.3	<10.4	<10.4	<14.6
1,3,5-Trimethylbenzene	<10.7	<8.3	<10.4	<10.4	<14.6
4-Chlorotoluene	<10.7	<8.3	<10.4	<10.4	<14.6
tert-Butylbenzene	<10.7	<8.3	<10.4	<10.4	<14.6
1,2,4-Trimethylbenzene	<10.7	<8.3	<10.4	<10.4	<14.6
sec-Butylbenzene	<10.7	<8.3	<10.4	<10.4	<14.6
p-Isopropyltoluene	<10.7	<8.3	<10.4	<10.4	<14.6
1,3-Dichlorobenzene	<10.7	<8.3	<10.4	<10.4	<14.6
1,4-Dichlorobenzene	<10.7	<8.3	<10.4	<10.4	<14.6
n-Butylbenzene	<10.7	<8.3	<10.4	<10.4	<14.6
1,2-Dichlorobenzene	<10.7	<8.3	<10.4	<10.4	<14.6
1,2-Dibromo-3-chloropropane	<10.7	<8.3	<10.4	<10.4	<14.6
1,2,4-Trichlorobenzene	<10.7	<8.3	<10.4	<10.4	<14.6
Hexachlorobutadiene	<10.7J	<8.3J	<10.4	<10.4	<14.6
Naphthalene	<10.7	<8.3	<10.4	<10.4	<14.6
1,2,3-Trichlorobenzene	<10.7	<8.3	<10.4	<10.4	<14.6
SEMIVOLATILE ORGANIC COMPOUNDS (ug/kg)					
Azobenzene	<565	<516	<500	<478	<585
Benzo(b)fluoranthene	751	691	880	684	913
Benzo(k)fluoranthene	<565	<516	<500	<478	<585
Bis(2-ethylhexyl)phthalate	<565	<516	<500	<478	<585
N-Nitrosodimethylamine	<2910	<2660	<2580	<2460	<3020
Bis(2-chloroethly)ether	<565	<516	<500	<478	<585
2-Chlorophenol	<565	<516	<500	<478	<585
Phenol	<565	<516	<500	<478	<585
1,3-Dichlorobenzene	<565	<516	<500	<478	<585
1,4-Dichlorobenzene	<565	<516	<500	<478	<585
1,2-Dichlorobenzene	<565	<516	<500	<478	<585
Bis(2-chloroisopropyl)ether	<565	<516	<500	<478	<585
Hexachloroethane	<565	<516	<500	<478	<585
N-Nitroso-di-n-propylamine	<565	<516	<500	<478	<585
Nitrobenzene	<565	<516	<500	<478	<585
Isophorone	<565	<516	<500	<478	<585
2-Nitrophenol	<565	<516	<500	<478	<585
2,4-Dimethylphenol	<565	<516	<500	<478	<585
Bis(2-chloroethoxy)methane	<565	<516	<500	<478	<585
2,4-Dichlorophenol	<565	<516	<500	<478	<585
1,2,4-Trichlorobenzene	<565	<516	<500	<478	<585
Naphthalene	926	<516	<500	<478	801
Hexachlorobutadiene	<565	<516	<500	<478	<585
4-Chloro-3-methylphenol	<1130	<1030	<1000	<957	<1170
Hexachlorocyclopentadiene	<1130	<1030	<1000	<957	<1170
2,4,6-Trichlorophenol	<565	<516	<500	<478	<585
2-Chloronaphthalene	<565	<516	<500	<478	<585
Acenaphthylene	<565	<516	<500	<478	<585

Appendix Table 1. Continued.

	Ohio River				
Sampling Location/River Mile :	RM 351.93B	RM 352.30	RM 352.41	RM 353.76	RM 353.85
Date Sampled :	10-Sep-2001	10-Sep-2001	10-Sep-2001	10-Sep-2001	10-Sep-2001
Time Sampled:	03:55 PM	04:25 PM	05:10 PM	05:40 PM	06:15 PM
SEMIVOLATILE ORGANIC COMPOUNDS (ug/kg)					
Dimethylphthalate	<565	<516	<500	<478	<585
2,6-Dinitrotoluene	<565	<516	<500	<478	<585
Acenaphthene	<565	<516	<500	<478	<585
2,4-Dinitrophenol	<2910	<2660	<2580	<2460	<3020
2,4-Dinitrotoluene	<565	<516	<500	<478	<585
4-Nitrophenol	<2910	<2660	<2580	<2460	<3020
Fluorene	<565	<516	<500	<478	<585
4-Chlorophenyl phenyl ether	<565	<516	<500	<478	<585
Diethylphthalate	<565	<516	<500	<478	<585
N-Nitrosodiphenylamine	<1130J	<1030J	<1000J	<957J	<1170J
4,6-Dinitro-2-methylphenol	<2910	<2660	<2580	<2460	<3020
4-Bromophenyl phenyl ether	<565	<516	<500	<478	<585
Hexachlorobenzene	<565	<516	<500	<478	<585
Pentachlorophenol	<2910	<2660	<2580	<2460	<3020
Phenanthrene	<565	<516	<500	<478	<585
Anthracene	<565	<516	<500	<478	<585
Di-n-butylphthalate	<565	<516	<500	<478	<585
Fluoranthene	645	<516	627	517	638
Pyrene	<565	<516	<500	<478	<585
Butylbenzylphthalate	<565	<516	<500	<478	<585
Benzo(a)anthracene	<565	<516	<500	<478	<585
Chrysene	<565	<516	<500	<478	<585
3,3'-Dichlorobenzidine	<1130	<1030	<1000	<957	<1170
Di-n-octylphthalate	<565	<516	<500	<478	<585
Benzo(a)pyrene	<565	<516	<500	<478	<585
Dibenzo(a,h)anthracene	<565	<516	<500	<478	<585
Indeno(1,2,3-cd)pyrene	<565	<516	<500	<478	<585
Benzo(g,h,i)perylene	<565	<516	<500	<478	<585
PESTICIDES (ug/kg)					
Aldrin	<20.0	<100	<100	<100	<100
alpha-BHC	<20.0	<100	<100	<100	<100
beta-BHC	<20.0	<100	<100	<100	<100
delta-BHC	<20.0	<100	<100	<100	<100
gamma-BHC (Lindane)	<20.0	<100	<100	<100	<100
Chlordane (tech)	<100	<500	<500	<500	<500
4,4'-DDD	<20.0	<100	<100	<100	<100
4,4'-DDE	<30.0	<150	<150	<150	<150
4,4'-DDT	<30.0	<150	<150	<150	<150
Dieldrin	<20.0	<100	<100	<100	<100
Endosulfan I	<30.0	<150	<150	<150	<150
Endosulfan II	<30.0	<150	<150	<150	<150
Endosulfan sulfate	<30.0	<150	<150	<150	<150
Endrin	<50.0	<250	<250	<250	<250
Endrin aldehyde	<50.0	<250	<250	<250	<250
Heptachlor	<30.0	<150	<150	<150	<150
Heptachlor epoxide	<30.0	<150	<150	<150	<150
Methoxychlor	<30.0	<150	<150	<150	<150
Toxaphene	<100	<500	<500	<500	<500
Endrin ketone	<20.0	<100	<100	<100	<100

Appendix Table 1. Continued.

	Ohio River				
Sampling Location/River Mile :	RM 351.93B	RM 352.30	RM 352.41	RM 353.76	RM 353.85
Date Sampled :	10-Sep-2001	10-Sep-2001	10-Sep-2001	10-Sep-2001	10-Sep-2001
Time Sampled:	03:55 PM	04:25 PM	05:10 PM	05:40 PM	06:15 PM
PCBs (ug/kg)					
PCB-1016	<100	<100	<100	<100	<100
PCB-1221	<100	<100	<100	<100	<100
PCB-1232	<100	<100	<100	<100	<100
PCB-1242	<100	<100	<100	<100	<100
PCB-1248	<100	<100	<100	<100	<100
PCB-1254	<100	<100	<100	<100	<100
PCB-1260	<100	<100	<100	<100	<100
INORGANICS (mg/kg)					
Silver	<4.12	<3.74	<3.83	<3.61	<4.27
Aluminum	6290	6490	5350	5380	5720
Arsenic	2.77	2.22	2.29	2.46	2.39
Barium	102	108	90.8	95.8	95.6
Beryllium	<4.12	<3.74	<3.83	<3.61	<4.27
Calcium	2280	3170	1910	1790	2370
Cadmium	<0.825	<0.762	<0.754	<0.714	<0.893
Cobalt	15.5	16.8	14.4	15.3	16
Chromium	20	20.4	17.9	17.4	18.2
Copper	23.9	25.4	23.1	28.6	34.5
Iron	24400	25800	22900	22900	21100
Mercury	<0.141	0.391	<0.111	<0.113	<0.149
Potassium	590	605	504	479	510
Magnesium	2040	2010	1730	1640	1950
Manganese	789	721	667	918	798
Sodium	<206	<187	<191	<180	<214
Nickel	28.9	29.6	27	25.5	27.5
Lead	23.1	24.4	17.8	28.8	23.2
Antimony	<20.6	<18.7	<19.1	<18.0	<21.4
Selenium	<0.825	<0.762	<0.754	<0.714	<0.893
Thallium	<0.825	<0.762	<0.754	<0.714	<0.893
Vanadium	15.8	17.1	14.2	13.9	14.1
Zinc	120	134	119	122	125
Extractable Petroleum Hydrocarbons (mg/kg) - DRO					
Diesel	5.03	7.09	7.11	9.9	<5.0
TVPH (mg/kg) - GRO					
Gasoline	<0.5	0.4	<0.4	<0.4	<0.4
OTHER					
Total Organic Carbon (mg/kg)	87400	60400	14600	12300	23700
Solids (%)	58	64	65	69	56
Particle Size:					
Gravel (%)	0.7	5.3	1.7	0.7	0.1
Sand (%)	33.8	60.2	52.3	65.3	43.8
Silt (%)	56.2	30	39.7	28.4	47.3
Clay (%)	9.3	4.5	6.3	5.6	8.8

Appendix Table 2. Results of surface water samples collected by Ohio EPA from the Ohio River, August 20 and September 11, 2001.

	Ohio River					
Sampling Location/River Mile :	RM 351.10	RM 351.64	RM 351.95	RM 351.95	RM 352.30	RM 353.85
Date Sampled :	20-Aug-2001	20-Aug-2001	20-Aug-2001	20-Aug-2001	20-Aug-2001	20-Aug-2001
Time Sampled:	07:25 PM	07:50 PM	08:10 PM	08:10 PM	06:40 PM	05:50 PM
				Duplicate		
INORGANICS (ug/l)						
Silver	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0
Aluminum	527	743	379	556	621	449
Arsenic	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Barium	54.3	56.9	53.5	55.7	53.9	54.7
Beryllium	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Calcium	33100	32900	33300	34200	32200	33800
Cadmium	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cobalt	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Chromium	<15.0	<15.0	<15.0	<15.0	<15.0	<15.0
Copper	<15.0	<15.0	<15.0	<15.0	<15.0	<15.0
Iron	502	1070	540	581	569	534
Mercury	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Potassium	2780	2810	2680	2800	2710	2780
Magnesium	10300	10300	10400	10600	10000	10500
Manganese	42	71.8	43.8	48.3	42	45.4
Sodium	25500	24900	25400	25800	25100	26100
Nickel	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0
Lead	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Antimony	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Selenium	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Thallium	<1.50	<1.50	<1.50	<1.50	<1.50	<1.50
Vanadium	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0
Zinc	<100	<100	<100	<100	<100	<100
PESTICIDES (ug/l)						
alpha-BHC	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
gamma-BHC (Lindane)	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
beta-BHC	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Heptachlor	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
delta-BHC	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Aldrin	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Heptachlor epoxide	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Endosulfan I	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
4,4'-DDE	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Dieldrin	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Endrin	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
4,4'-DDD	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Endosulfan II	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
4,4'-DDT	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Endrin aldehyde	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Endosulfan sulfate	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Methoxychlor	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Endrin ketone	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
Chlordane (tech)	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Toxaphene	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100

Appendix Table 2. Continued.

	Ohio River					
Sampling Location/River Mile :	RM 351.10	RM 351.64	RM 351.95	RM 351.95	RM 352.30	RM 353.85
Date Sampled :	20-Aug-2001	20-Aug-2001	20-Aug-2001	20-Aug-2001	20-Aug-2001	20-Aug-2001
Time Sampled:	07:25 PM	07:50 PM	08:10 PM	08:10 PM	06:40 PM	05:50 PM
				Duplicate		
PCBs (ug/l)						
PCB-1016	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
PCB-1221	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
PCB-1232	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
PCB-1242	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
PCB-1248	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
PCB-1254	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
PCB-1260	<1.00	<1.00	<1.00	<1.00	7.84	<1.00
VOLATILE ORGANIC COMPOUNDS (ug/l)						
Dichlorodifluoromethane	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chloromethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Acrolein	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0
Acetone	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0
1,1-Dichloroethene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon disulfide	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Acrylonitrile	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0
n-Hexane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
trans-1,2-Dichloroethene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl acetate	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methyl ethyl ketone	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0
2,2-Dichloropropane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromochloromethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloropropene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dibromomethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethyl vinyl ether	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
4-Methyl-2-pentanone	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0
cis-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	1.4	1	<1.0	<1.0
Ethyl methacrylate	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Hexanone	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0
1,3-Dichloropropane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Appendix Table 2. Continued.

	Ohio River					
Sampling Location/River Mile :	RM 351.10	RM 351.64	RM 351.95	RM 351.95	RM 352.30	RM 353.85
Date Sampled :	20-Aug-2001	20-Aug-2001	20-Aug-2001	20-Aug-2001	20-Aug-2001	20-Aug-2001
Time Sampled:	07:25 PM	07:50 PM	08:10 PM	08:10 PM	06:40 PM	05:50 PM
				Duplicate		
VOLATILE ORGANIC COMPOUNDS (ug/l)						
Tetrachloroethene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylene dibromide	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1,2-Tetrachlorethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
p,m-Xylene	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
o-Xylene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Styrene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Isopropylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2,3-Trichloropropane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
n-Propylbenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromobenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Chlorotoluene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,3,5-Trimethylbenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
4-Chlorotoluene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
tert-Butylbenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2,4-Trimethylbenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
sec-Butylbenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
p-Isopropyltoluene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,3-Dichlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,4-Dichlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
n-Butylbenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dibromo-3-chloropropane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2,4-Trichlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hexachlorobutadiene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Naphthalene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2,3-Trichlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
SEMIVOLATILE ORGANIC COMPOUNDS (ug/l)						
N-Nitrosodiphenylamine	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0
Bis(2-chloroethly)ether	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
2-Chlorophenol	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Phenol	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
1,3-Dichlorobenzene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
1,4-Dichlorobenzene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
1,2-Dichlorobenzene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Bis(2-chloroisopropyl)ether	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Hexachloroethane	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
N-Nitroso-di-n-propylamine	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Nitrobenzene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Isophorone	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
2-Nitrophenol	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
2,4-Dimethylphenol	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Bis(2-chloroethoxy)methane	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
2,4-Dichlorophenol	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
1,2,4-Trichlorobenzene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0

Appendix Table 2. Continued.

	Ohio River					
Sampling Location/River Mile :	RM 351.10	RM 351.64	RM 351.95	RM 351.95	RM 352.30	RM 353.85
Date Sampled :	20-Aug-2001	20-Aug-2001	20-Aug-2001	20-Aug-2001	20-Aug-2001	20-Aug-2001
Time Sampled:	07:25 PM	07:50 PM	08:10 PM	08:10 PM	06:40 PM	05:50 PM
				Duplicate		
SEMIVOLATILE ORGANIC COMPOUNDS (ug/l)						
Naphthalene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Hexachlorobutadiene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
4-Chloro-3-methylphenol	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0
Hexachlorocyclopentadiene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
2,4,6-Trichlorophenol	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
2-Chloronaphthalene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Acenaphthylene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Dimethylphthalate	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
2,6-Dinitrotoluene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Acenaphthene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
2,4-Dinitrophenol	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0
2,4-Dinitrotoluene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
4-Nitrophenol	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0
Fluorene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
4-Chlorophenyl phenyl ether	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Diethylphthalate	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
N-Nitrosodimethylamine	<10.0J	<10.0J	<10.0J	<10.0J	<10.0J	<10.0J
Azobenzene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
4,6-Dinitro-2-methylphenol	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0
4-Bromophenyl phenyl ether	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Hexachlorobenzene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Pentachlorophenol	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0
Phenanthrene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Anthracene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Di-n-butylphthalate	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Fluoranthene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Pyrene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Butylbenzylphthalate	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Benzo(a)anthracene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Chrysene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
3,3'-Dichlorobenzidine	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0
Bis(2-ethylhexyl)phthalate	<10.0	<10.0	112	<10.0	<10.0	<10.0
Di-n-octylphthalate	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Benzo(b)fluoranthene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Benzo(k)fluoranthene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Benzo(a)pyrene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Dibenzo(a,h)anthracene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Indeno(1,2,3-cd)pyrene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Benzo(g,h,i)perylene	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0

Appendix Table 2. Continued.

	Ohio River				
Sampling Location/River Mile :	RM 351.10	RM 351.64	RM 351.95	RM 352.30	RM 353.85
Date Sampled :	11-Sep-2001	11-Sep-2001	11-Sep-2001	11-Sep-2001	11-Sep-2001
Time Sampled:	08:25 AM	08:40 AM	08:50 AM	09:05 AM	09:20 AM
INORGANICS (ug/l)					
Silver	<20.0	<20.0	<20.0	<20.0	<20.0
Aluminum	<200	<200	<200	<200	<200
Arsenic	<5.0	<5.0	<5.0	<5.0	<5.0
Barium	58.4	59.1	59.5	58	58
Beryllium	<2.00	<2.00	<2.00	<2.00	<2.00
Calcium	38100	38000	38200	37800	38200
Cadmium	<5.00	<5.00	<5.00	<5.00	<5.00
Cobalt	<10.0	<10.0	<10.0	<10.0	<10.0
Chromium	<15.0	<15.0	<15.0	<15.0	<15.0
Copper	<15.0	<15.0	<15.0	<15.0	<15.0
Iron	163	265	131	154	129
Mercury	<0.200	<0.200	<0.200	<0.200	<0.200
Potassium	2960	3220	3190	3000	3220
Magnesium	12100	12500	12400	12300	12200
Manganese	42.8	49.8	44.8	37.7	41.5
Sodium	31600	32700	32400	32100	31900
Nickel	<20.0	<20.0	<20.0	<20.0	<20.0
Lead	5.56	<5.0	<5.0	<5.0	6
Antimony	<5.0	<5.0	<5.0	<5.0	<5.0
Selenium	<5.0	<5.0	<5.0	<5.0	<5.0
Thallium	<1.50	<1.50	<1.50	<1.50	<1.50
Vanadium	<50.0	<50.0	<50.0	<50.0	<50.0
Zinc	<150	<150	<150	<150	<150
PESTICIDES (ug/l)					
alpha-BHC	<0.020	<0.020	<0.020	<0.020	<0.020
gamma-BHC (Lindane)	<0.020	<0.020	<0.020	<0.020	<0.020
beta-BHC	<0.020	<0.020	<0.020	<0.020	<0.020
Heptachlor	<0.030	<0.030	<0.030	<0.030	<0.030
delta-BHC	<0.020	<0.020	<0.020	<0.020	<0.020
Aldrin	<0.020	<0.020	<0.020	<0.020	<0.020
Heptachlor epoxide	<0.030	<0.030	<0.030	<0.030	<0.030
Endosulfan I	<0.030	<0.030	<0.030	<0.030	<0.030
4,4'-DDE	<0.030	<0.030	<0.030	<0.030	<0.030
Dieldrin	<0.020	<0.020	<0.020	<0.020	<0.020
Endrin	<0.050	<0.050	<0.050	<0.050	<0.050
4,4'-DDD	<0.020	<0.020	<0.020	<0.020	<0.020
Endosulfan II	<0.030	<0.030	<0.030	<0.030	<0.030
4,4'-DDT	<0.030	<0.030	<0.030	<0.030	<0.030
Endrin aldehyde	<0.050	<0.050	<0.050	<0.050	<0.050
Endosulfan sulfate	<0.030	<0.030	<0.030	<0.030	<0.030
Methoxychlor	<0.030	<0.030	<0.030	<0.030	<0.030
Endrin ketone	<0.040	<0.040	<0.040	<0.040	<0.040
Chlordane (tech)	<0.100	<0.100	<0.100	<0.100	<0.100
Toxaphene	<0.100	<0.100	<0.100	<0.100	<0.100

Appendix Table 2. Continued.

	Ohio River				
Sampling Location/River Mile :	RM 351.10	RM 351.64	RM 351.95	RM 352.30	RM 353.85
Date Sampled :	11-Sep-2001	11-Sep-2001	11-Sep-2001	11-Sep-2001	11-Sep-2001
Time Sampled:	08:25 AM	08:40 AM	08:50 AM	09:05 AM	09:20 AM
PCBs (ug/l)					
PCB-1016	<1.00	<1.00	<1.00	<1.00	<1.00
PCB-1221	<1.00	<1.00	<1.00	<1.00	<1.00
PCB-1232	<1.00	<1.00	<1.00	<1.00	<1.00
PCB-1242	<1.00	<1.00	<1.00	<1.00	<1.00
PCB-1248	<1.00	<1.00	<1.00	<1.00	<1.00
PCB-1254	<1.00	<1.00	<1.00	<1.00	<1.00
PCB-1260	<1.00	<1.00	<1.00	<1.00	<1.00
VOLATILE ORGANIC COMPOUNDS (ug/l)					
Dichlorodifluoromethane	<2.0J	<2.0J	<2.0J	<2.0J	<2.0J
Chloromethane	<1.0	1.6	<1.0	<1.0	<1.0
Vinyl chloride	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	<1.0J	<1.0J	<1.0J	<1.0J	<1.0J
Trichlorofluoromethane	<1.0J	<1.0J	<1.0J	<1.0J	<1.0J
Acrolein	<25.0	<25.0	<25.0	<25.0	<25.0
Acetone	<25.0	<25.0	<25.0	<25.0	<25.0
1,1-Dichloroethene	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon disulfide	<1.0	<1.0	<1.0	<1.0	<1.0
Acrylonitrile	<25.0	<25.0	<25.0	<25.0	<25.0
n-Hexane	<5.0	<5.0	<5.0	<5.0	<5.0
trans-1,2-Dichloroethene	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl acetate	<1.0	<1.0	<1.0	<1.0	<1.0
Methyl ethyl ketone	<25.0	<25.0	<25.0	<25.0	<25.0
2,2-Dichloropropane	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	<1.0	<1.0	<1.0	<1.0	<1.0
Bromochloromethane	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloropropene	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	<1.0	<1.0	<1.0	<1.0	<1.0
Dibromomethane	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethyl vinyl ether	<10.0	<10.0	<10.0	<10.0	<10.0
4-Methyl-2-pentanone	<25.0	<25.0	<25.0	<25.0	<25.0
cis-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl methacrylate	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0
2-Hexanone	<25.0	<25.0	<25.0	<25.0	<25.0
1,3-Dichloropropane	<1.0	<1.0	<1.0	<1.0	<1.0

Appendix Table 2. Continued.

	Ohio River				
Sampling Location/River Mile :	RM 351.10	RM 351.64	RM 351.95	RM 352.30	RM 353.85
Date Sampled :	11-Sep-2001	11-Sep-2001	11-Sep-2001	11-Sep-2001	11-Sep-2001
Time Sampled:	08:25 AM	08:40 AM	08:50 AM	09:05 AM	09:20 AM
VOLATILE ORGANIC COMPOUNDS (ug/l)					
Tetrachloroethene	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylene dibromide	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1,2-Tetrachlorethane	<1.0	<1.0	<1.0	<1.0	<1.0
p,m-Xylene	<2.0	<2.0	<2.0	<2.0	<2.0
o-Xylene	<1.0	<1.0	<1.0	<1.0	<1.0
Styrene	<1.0	<1.0	<1.0	<1.0	<1.0
Isopropylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	<1.0	<1.0	<1.0	<1.0	<1.0
1,2,3-Trichloropropane	<1.0	<1.0	<1.0	<1.0	<1.0
n-Propylbenzene	<5.0	<5.0	<5.0	<5.0	<5.0
Bromobenzene	<5.0	<5.0	<5.0	<5.0	<5.0
2-Chlorotoluene	<5.0	<5.0	<5.0	<5.0	<5.0
1,3,5-Trimethylbenzene	<5.0	<5.0	<5.0	<5.0	<5.0
4-Chlorotoluene	<5.0	<5.0	<5.0	<5.0	<5.0
tert-Butylbenzene	<5.0	<5.0	<5.0	<5.0	<5.0
1,2,4-Trimethylbenzene	<5.0	<5.0	<5.0	<5.0	<5.0
sec-Butylbenzene	<5.0	<5.0	<5.0	<5.0	<5.0
p-Isopropyltoluene	<5.0	<5.0	<5.0	<5.0	<5.0
1,3-Dichlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0
1,4-Dichlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0
n-Butylbenzene	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dibromo-3-chloropropane	<5.0	<5.0	<5.0	<5.0	<5.0
1,2,4-Trichlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0
Hexachlorobutadiene	<5.0	<5.0	<5.0	<5.0	<5.0
Naphthalene	<5.0	<5.0	<5.0	<5.0	<5.0
1,2,3-Trichlorobenzene	<5.0	<5.0	<5.0	<5.0	<5.0
SEMIVOLATILE ORGANIC COMPOUNDS (ug/l)					
N-Nitrosodiphenylamine	<50.0	<50.0	<50.0	<50.0	<50.0
Bis(2-chloroethly)ether	<10.0	<10.0	<10.0	<10.0	<10.0
2-Chlorophenol	<10.0	<10.0	<10.0	<10.0	<10.0
Phenol	<10.0	<10.0	<10.0	<10.0	<10.0
1,3-Dichlorobenzene	<10.0	<10.0	<10.0	<10.0	<10.0
1,4-Dichlorobenzene	<10.0	<10.0	<10.0	<10.0	<10.0
1,2-Dichlorobenzene	<10.0	<10.0	<10.0	<10.0	<10.0
Bis(2-chloroisopropyl)ether	<10.0	<10.0	<10.0	<10.0	<10.0
Hexachloroethane	<10.0	<10.0	<10.0	<10.0	<10.0
N-Nitroso-di-n-propylamine	<10.0	<10.0	<10.0	<10.0	<10.0
Nitrobenzene	<10.0	<10.0	<10.0	<10.0	<10.0
Isophorone	<10.0	<10.0	<10.0	<10.0	<10.0
2-Nitrophenol	<10.0	<10.0	<10.0	<10.0	<10.0
2,4-Dimethylphenol	<10.0	<10.0	<10.0	<10.0	<10.0
Bis(2-chloroethoxy)methane	<10.0	<10.0	<10.0	<10.0	<10.0
2,4-Dichlorophenol	<10.0	<10.0	<10.0	<10.0	<10.0
1,2,4-Trichlorobenzene	<10.0	<10.0	<10.0	<10.0	<10.0

Appendix Table 2. Continued.

	Ohio River				
Sampling Location/River Mile :	RM 351.10	RM 351.64	RM 351.95	RM 352.30	RM 353.85
Date Sampled :	11-Sep-2001	11-Sep-2001	11-Sep-2001	11-Sep-2001	11-Sep-2001
Time Sampled:	08:25 AM	08:40 AM	08:50 AM	09:05 AM	09:20 AM
SEMIVOLATILE ORGANIC COMPOUNDS (ug/l)					
Naphthalene	<10.0	<10.0	<10.0	<10.0	<10.0
Hexachlorobutadiene	<10.0	<10.0	<10.0	<10.0	<10.0
4-Chloro-3-methylphenol	<20.0	<20.0	<20.0	<20.0	<20.0
Hexachlorocyclopentadiene	<10.0	<10.0	<10.0	<10.0	<10.0
2,4,6-Trichlorophenol	<10.0	<10.0	<10.0	<10.0	<10.0
2-Chloronaphthalene	<10.0	<10.0	<10.0	<10.0	<10.0
Acenaphthylene	<10.0	<10.0	<10.0	<10.0	<10.0
Dimethylphthalate	<10.0	<10.0	<10.0	<10.0	<10.0
2,6-Dinitrotoluene	<10.0	<10.0	<10.0	<10.0	<10.0
Acenaphthene	<10.0	<10.0	<10.0	<10.0	<10.0
2,4-Dinitrophenol	<50.0	<50.0	<50.0	<50.0	<50.0
2,4-Dinitrotoluene	<10.0	<10.0	<10.0	<10.0	<10.0
4-Nitrophenol	<50.0	<50.0	<50.0	<50.0	<50.0
Fluorene	<10.0	<10.0	<10.0	<10.0	<10.0
4-Chlorophenyl phenyl ether	<10.0	<10.0	<10.0	<10.0	<10.0
Diethylphthalate	<10.0	<10.0	<10.0	<10.0	<10.0
N-Nitrosodimethylamine	<10.0	<10.0	<10.0	<10.0	<10.0
Azobenzene	<10.0	<10.0	<10.0	<10.0	<10.0
4,6-Dinitro-2-methylphenol	<50.0	<50.0	<50.0	<50.0	<50.0
4-Bromophenyl phenyl ether	<10.0	<10.0	<10.0	<10.0	<10.0
Hexachlorobenzene	<10.0	<10.0	<10.0	<10.0	<10.0
Pentachlorophenol	<50.0	<50.0	<50.0	<50.0	<50.0
Phenanthrene	<10.0	<10.0	<10.0	<10.0	<10.0
Anthracene	<10.0	<10.0	<10.0	<10.0	<10.0
Di-n-butylphthalate	<10.0	<10.0	<10.0	<10.0	<10.0
Fluoranthene	<10.0	<10.0	<10.0	<10.0	<10.0
Pyrene	<10.0	<10.0	<10.0	<10.0	<10.0
Butylbenzylphthalate	<10.0	<10.0	<10.0	<10.0	<10.0
Benzo(a)anthracene	<10.0	<10.0	<10.0	<10.0	<10.0
Chrysene	<10.0	<10.0	<10.0	<10.0	<10.0
3,3'-Dichlorobenzidine	<20.0	<20.0	<20.0	<20.0	<20.0
Bis(2-ethylhexyl)phthalate	<10.0	<10.0	<10.0	<10.0	<10.0
Di-n-octylphthalate	<10.0	<10.0	<10.0	<10.0	<10.0
Benzo(b)fluoranthene	<10.0	<10.0	<10.0	<10.0	<10.0
Benzo(k)fluoranthene	<10.0	<10.0	<10.0	<10.0	<10.0
Benzo(a)pyrene	<10.0	<10.0	<10.0	<10.0	<10.0
Dibenzo(a,h)anthracene	<10.0	<10.0	<10.0	<10.0	<10.0
Indeno(1,2,3-cd)pyrene	<10.0	<10.0	<10.0	<10.0	<10.0
Benzo(g,h,i)perylene	<10.0	<10.0	<10.0	<10.0	<10.0

River Code: **90-001**	Stream: **Ohio River**	Sample Date: **2001**
River Mile: **353.70**	Location:	Date Range: 08/21/2001
Time Fished: 4145 sec	Drainage: 60700.0 sq mi	Thru: 10/10/2001
Dist Fished: 1.00 km	Basin: Ohio River No of Passes: 2	Sampler Type: P

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Longnose Gar		P	M		1	1.00	0.19	1.00	1.11	1,000.00
Gizzard Shad		O	M		21	21.00	4.00	1.80	1.99	85.72
Smallmouth Buffalo	C	I	M		26	26.00	4.95	44.16	48.88	1,698.56
Quillback Carpsucker	C	O	M		1	1.00	0.19	0.85	0.94	850.00
Silver Redhorse	R	I	S	M	7	7.00	1.33	5.85	6.47	835.71
Golden Redhorse	R	I	S	M	18	18.00	3.43	5.93	6.57	329.56
Shorthead Redhorse	R	I	S	M	41	41.00	7.81	11.38	12.60	277.66
River Redhorse [S]	R	I	S	I	4	4.00	0.76	2.66	2.95	666.00
Silver Chub	N	I	M		18	18.00	3.43	0.33	0.36	18.11
Suckermouth Minnow	N	I	S		1	1.00	0.19	0.01	0.01	6.00
Emerald Shiner	N	I	S		14	14.00	2.67	0.04	0.05	3.07
River Shiner	N	I	S		2	2.00	0.38	0.01	0.01	6.00
Channel Shiner	N	I	M	I	234	234.00	44.57	0.36	0.40	1.54
Channel Catfish	F		C		15	15.00	2.86	10.09	11.17	672.67
Flathead Catfish	F	P	C		1	1.00	0.19	0.90	1.00	900.00
White Bass	F	P	M		7	7.00	1.33	0.35	0.39	50.57
Striped Bass	E	P	M		6	6.00	1.14	0.29	0.32	48.33
Str. Bass X Wh. Bass	E				1	1.00	0.19	0.05	0.06	54.00
Smallmouth Bass	F	C	C	M	2	2.00	0.38	0.97	1.07	485.00
Spotted Bass	F	C	C		2	2.00	0.38	0.01	0.01	3.50
Green Sunfish	S	I	C	T	1	1.00	0.19	0.00	0.00	2.00
Sauger	F	P	S		33	33.00	6.29	2.35	2.60	71.21
River Darter [T]	D	I	S		1	1.00	0.19	0.00	0.00	2.00
Logperch	D	I	S	M	2	2.00	0.38	0.01	0.01	6.50
Johnny Darter	D	I	C		1	1.00	0.19	0.00	0.00	1.00
Freshwater Drum			M	P	65	65.00	12.38	0.93	1.02	14.25
Mile Total					525	525.00		90.35		
Number of Species					25					
Number of Hybrids					1					

River Code: **90-001**	Stream: **Ohio River**	Sample Date: **2001**
River Mile: **352.30**	Location:	Date Range: 08/21/2001
Time Fished: 4200 sec	Drainage: 60700.0 sq mi	Thru: 10/10/2001
Dist Fished: 1.00 km	Basin: Ohio River No of Passes: 2	Sampler Type: P

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Longnose Gar		P	M		2	2.00	0.28	0.45	0.78	225.00
Mooneye		I	M	R	2	2.00	0.28	0.04	0.08	22.00
Gizzard Shad		O	M		38	38.00	5.27	1.05	1.82	27.58
Smallmouth Buffalo	C	I	M		12	12.00	1.66	16.95	29.50	1,412.50
Quillback Carpsucker	C	O	M		8	8.00	1.11	2.74	4.77	342.63
River Carpsucker	C	O	M		3	3.00	0.42	2.90	5.05	966.67
Silver Redhorse	R	I	S	M	5	5.00	0.69	3.55	6.18	710.40
Golden Redhorse	R	I	S	M	8	8.00	1.11	2.64	4.59	329.50
Shorthead Redhorse	R	I	S	M	19	19.00	2.64	6.81	11.85	358.42
River Redhorse [S]	R	I	S	I	6	6.00	0.83	4.62	8.05	770.67
Silver Chub	N	I	M		6	6.00	0.83	0.11	0.19	18.17
Suckermouth Minnow	N	I	S		1	1.00	0.14	0.01	0.01	5.00
Emerald Shiner	N	I	S		57	57.00	7.91	0.17	0.29	2.89
Channel Shiner	N	I	M	I	426	426.00	59.08	0.68	1.17	1.59
Channel Catfish	F		C		12	12.00	1.66	6.90	12.01	575.08
Brook Silverside		I	M	M	1	1.00	0.14	0.00	0.00	2.00
White Bass	F	P	M		7	7.00	0.97	0.58	1.01	82.57
Str. Bass X Wh. Bass	E				13	13.00	1.80	1.23	2.14	94.46
Spotted Bass	F	C	C		6	6.00	0.83	1.23	2.13	204.17
Largemouth Bass	F	C	C		1	1.00	0.14	1.20	2.09	1,200.00
Sauger	F	P	S		27	27.00	3.74	2.21	3.85	82.00
River Darter [T]	D	I	S		1	1.00	0.14	0.00	0.00	2.00
Logperch	D	I	S	M	1	1.00	0.14	0.01	0.01	6.00
Freshwater Drum			M	P	59	59.00	8.18	1.40	2.43	23.64
Mile Total					721	721.00		57.46		
Number of Species					23					
Number of Hybrids					1					

River Code: **90-001**	Stream: **Ohio River**	Sample Date: **2001**
River Mile: **351.80**	Location:	Date Range: 08/20/2001
Time Fished: 4121 sec	Drainage: 60700.0 sq mi	Thru: 10/10/2001
Dist Fished: 1.00 km	Basin: Ohio River No of Passes: 2	Sampler Type: P

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		20	20.00	4.21	0.54	1.28	26.95
Smallmouth Buffalo	C	I	M		8	8.00	1.68	15.00	35.62	1,875.00
Quillback Carpsucker	C	O	M		2	2.00	0.42	0.26	0.62	131.00
Silver Redhorse	R	I	S	M	4	4.00	0.84	2.21	5.26	553.50
Golden Redhorse	R	I	S	M	6	6.00	1.26	2.47	5.87	411.67
Shorthead Redhorse	R	I	S	M	11	11.00	2.32	2.41	5.72	219.09
River Redhorse [S]	R	I	S	I	1	1.00	0.21	0.29	0.69	290.00
Northern Hog Sucker	R	I	S	M	2	2.00	0.42	0.01	0.02	5.00
Silver Chub	N	I	M		1	1.00	0.21	0.02	0.05	20.00
Emerald Shiner	N	I	S		26	26.00	5.47	0.05	0.12	2.00
River Shiner	N	I	S		1	1.00	0.21	0.00	0.01	4.00
Bullhead Minnow	N	O	C		1	1.00	0.21	0.00	0.00	2.00
Channel Shiner	N	I	M	I	257	257.00	54.11	0.09	0.22	0.37
Channel Catfish	F		C		14	14.00	2.95	13.46	31.95	961.14
Flathead Catfish	F	P	C		5	5.00	1.05	1.24	2.94	247.40
White Bass	F	P	M		2	2.00	0.42	0.24	0.57	120.00
Black Crappie	S	I	C		2	2.00	0.42	0.67	1.60	337.00
Smallmouth Bass	F	C	C	M	1	1.00	0.21	0.16	0.38	162.00
Spotted Bass	F	C	C		8	8.00	1.68	0.38	0.90	47.25
Longear Sunfish	S	I	C	M	1	1.00	0.21	0.01	0.02	8.00
Sauger	F	P	S		18	18.00	3.79	1.67	3.96	92.61
River Darter [T]	D	I	S		1	1.00	0.21	0.00	0.00	2.00
Channel Darter [T]	D	I	S	S	1	1.00	0.21	0.00	0.00	1.00
Logperch	D	I	S	M	8	8.00	1.68	0.04	0.10	5.38
Greenside Darter	D	I	S	M	4	4.00	0.84	0.01	0.03	3.00
Freshwater Drum			M	P	70	70.00	14.74	0.87	2.05	12.36
	Mile Total				475	475.00		42.11		
	Number of Species				26					
	Number of Hybrids				0					

River Code: **90-001**	Stream: **Ohio River**	Sample Date: **2001**
River Mile: **351.10**	Location:	Date Range: 08/20/2001
Time Fished: 4920 sec	Drainage: 60700.0 sq mi	Thru: 10/10/2001
Dist Fished: 1.00 km	Basin: Ohio River No of Passes: 2	Sampler Type: P

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Longnose Gar		P	M		7	7.00	1.89	3.70	7.89	528.57
Gizzard Shad		O	M		31	31.00	8.38	0.55	1.18	17.81
Smallmouth Buffalo	C	I	M		14	14.00	3.78	19.80	42.22	1,414.29
Quillback Carpsucker	C	O	M		1	1.00	0.27	0.71	1.51	708.00
Highfin Carpsucker	C	O	M		1	1.00	0.27	0.25	0.53	250.00
Silver Redhorse	R	I	S	M	2	2.00	0.54	0.63	1.35	316.00
Golden Redhorse	R	I	S	M	5	5.00	1.35	3.70	7.89	740.00
Shorthead Redhorse	R	I	S	M	3	3.00	0.81	0.98	2.08	325.00
Common Carp	G	O	M	T	1	1.00	0.27	1.25	2.67	1,250.00
Silver Chub	N	I	M		1	1.00	0.27	0.02	0.04	20.00
Emerald Shiner	N	I	S		16	16.00	4.32	0.03	0.07	2.06
Channel Shiner	N	I	M	I	135	135.00	36.49	0.22	0.47	1.62
Channel Catfish	F		C		15	15.00	4.05	7.34	15.65	489.27
Flathead Catfish	F	P	C		2	2.00	0.54	0.68	1.45	339.00
White Bass	F	P	M		5	5.00	1.35	0.57	1.21	113.60
White Crappie	S	I	C		1	1.00	0.27	0.16	0.34	160.00
Smallmouth Bass	F	C	C	M	2	2.00	0.54	0.35	0.74	173.50
Spotted Bass	F	C	C		26	26.00	7.03	0.86	1.84	33.15
Largemouth Bass	F	C	C		3	3.00	0.81	1.10	2.35	366.67
Green Sunfish	S	I	C	T	1	1.00	0.27	0.00	0.01	4.00
Bluegill Sunfish	S	I	C	P	2	2.00	0.54	0.04	0.09	20.50
Longear Sunfish	S	I	C	M	1	1.00	0.27	0.08	0.17	80.00
Sauger	F	P	S		21	21.00	5.68	2.85	6.09	135.90
River Darter [T]	D	I	S		1	1.00	0.27	0.00	0.00	2.00
Logperch	D	I	S	M	8	8.00	2.16	0.06	0.13	7.38
Greenside Darter	D	I	S	M	1	1.00	0.27	0.00	0.00	2.00
Freshwater Drum			M	P	64	64.00	17.30	0.97	2.06	15.11
	Mile Total				370	370.00		46.90		
	Number of Species				27					
	Number of Hybrids				0					

Appendix T. 4 Index of Biotic Integrity (IBI) scores and metrics for sites sampled by Ohio EPA in the Ohio River, 2001.

River Mile	Type	Date	Drainage area (sq mi)	Number of: Total species	Number of: Sunfish species	Number of: Sucker species	Number of: Intolerant species	Percent of Individuals: Rnd-bodied suckers	Percent of Individuals: Simple Lithophils	Percent of Individuals: Tolerant fishes	Percent of Individuals: Omni-vores	Percent of Individuals: Top carnivores	Percent of Individuals: Insect-ivores	DELT anomalies	Rel.No. minus tolerants /(1.0 km)	IBI	Modified Iwb
Ohio River - (90-001)																	
Year: 2001																	
353.70	P	10/10/2001	60700	18(3)	0(1)	6(5)	2(3)	9(1)	22(5)	0(5)	11(5)	13(5)	37(3)	0.0(5)	342(3)	44	8.7
353.70	P	08/21/2001	60700	21(5)	1(1)	5(3)	2(3)	16(1)	24(5)	0(5)	1(5)	8(3)	87(5)	0.0(5)	706(5)	46	8.9
352.30	P	10/10/2001	60700	19(3)	0(1)	7(5)	3(3)	5(1)	24(5)	0(5)	10(5)	8(3)	54(5)	0.3(5)	574(5)	46	9.6
352.30	P	08/21/2001	60700	17(3)	0(1)	5(3)	2(3)	5(1)	13(5)	0(5)	5(5)	4(1)	90(5)	0.2(5)	868(5)	42	8.2
351.80	P	10/10/2001	60700	19(3)	2(3)	4(3)	3(3)	4(1)	19(5)	0(5)	7(5)	8(3)	52(3)	0.5(5)	412(3)	42	8.4
351.80	P	08/20/2001	60700	21(5)	1(1)	5(3)	1(1)	6(1)	16(5)	0(5)	3(5)	6(3)	84(5)	0.7(3)	538(5)	42	8.1
351.10	P	10/10/2001	60700	24(5)	3(3)	6(5)	1(1)	5(1)	22(5)	1(5)	5(5)	22(5)	37(3)	0.0(5)	376(3)	46	9.5
351.10	P	08/20/2001	60700	14(3)	1(1)	1(1)	1(1)	1(1)	9(5)	0(5)	14(5)	13(5)	67(5)	0.0(5)	360(3)	40	7.7

▲ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 10/10/2001 River Code: 90-001 RM: 353.70 R Site: Ohio River

Taxa Code	Taxa	Quant/Qual
01200	*Cordylophora lacustris*	6
01320	*Hydra sp*	1842
01801	*Turbellaria*	64
03360	*Plumatella sp*	2
03600	*Oligochaeta*	17
06810	*Gammarus fasciatus*	83
13400	*Stenacron sp*	231
13550	*Stenonema mexicanum integrum*	20
13561	*Stenonema pulchellum*	1
16700	*Tricorythodes sp*	27
17200	*Caenis sp*	1
22300	*Argia sp*	2
51206	*Cyrnellus fraternus*	79
52200	*Cheumatopsyche sp*	57
53800	*Hydroptila sp*	8
59407	*Nectopsyche candida*	4
59520	*Oecetis cinerascens*	1
77115	*Ablabesmyia janta*	2
77120	*Ablabesmyia mallochi*	2
77750	*Hayesomyia senata or Thienemannimyia norena*	17
80410	*Cricotopus (C.) sp*	6
81240	*Nanocladius (N.) distinctus*	17
82700	*Chironomus sp*	2
83040	*Dicrotendipes neomodestus*	21
83050	*Dicrotendipes lucifer*	24
83300	*Glyptotendipes (G.) sp*	15
84040	*Parachironomus frequens*	2
84470	*Polypedilum (P.) illinoense*	6
84700	*Stenochironomus sp*	2
84790	*Tribelos fuscicorne*	39
85800	*Tanytarsus sp*	9
87540	*Hemerodromia sp*	20
93200	*Hydrobiidae*	110
94060	*Lithasia verrucosa*	2
94603	*Pseudosuccinea columella*	56
95100	*Physella sp*	435
96120	*Menetus (Micromenetus) dilatatus*	41
96900	*Ferrissia sp*	29
97601	*Corbicula fluminea*	4
97710	*Dreissena polymorpha*	6
99998	*NO QUALITATIVE SAMPLE COLLECTED*	+

Taxa Code	Taxa	Quant/Qual

No. Quantitative Taxa: 40 Total Taxa: 41

No. Qualitative Taxa: 1

Number of Organisms: 3312

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 10/10/2001 River Code: 90-001 RM: 352.30 R Site: Ohio River

Taxa Code	Taxa	Quant/Qual
01200	*Cordylophora lacustris*	1
01320	*Hydra sp*	1685
01801	*Turbellaria*	11
03600	*Oligochaeta*	80
06810	*Gammarus fasciatus*	65
13400	*Stenacron sp*	24
13550	*Stenonema mexicanum integrum*	8
13561	*Stenonema pulchellum*	1
16700	*Tricorythodes sp*	21
27404	*Neurocordulia molesta*	1
51206	*Cyrnellus fraternus*	68
52200	*Cheumatopsyche sp*	113
52560	*Hydropsyche orris*	5
53800	*Hydroptila sp*	117
59407	*Nectopsyche candida*	3
77120	*Ablabesmyia mallochi*	5
77750	*Hayesomyia senata or Thienemannimyia norena*	22
80410	*Cricotopus (C.) sp*	5
83002	*Dicrotendipes modestus*	43
83040	*Dicrotendipes neomodestus*	279
83050	*Dicrotendipes lucifer*	32
84470	*Polypedilum (P.) illinoense*	27
84700	*Stenochironomus sp*	5
84960	*Pseudochironomus sp*	22
87540	*Hemerodromia sp*	8
93200	*Hydrobiidae*	18
95100	*Physella sp*	363
96900	*Ferrissia sp*	85
97710	*Dreissena polymorpha*	3
99998	*NO QUALITATIVE SAMPLE COLLECTED*	+

Taxa Code	Taxa	Quant/Qual

No. Quantitative Taxa: 29 Total Taxa: 30

No. Qualitative Taxa: 1

Number of Organisms: 3120

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 10/10/2001 River Code: 90-001 RM: 351.95 R Site: Ohio River

Taxa Code	Taxa	Quant/Qual		Taxa Code	Taxa	Quant/Qual
01200	*Cordylophora lacustris*	1				
01320	*Hydra sp*	94				
01801	*Turbellaria*	17	+			
03360	*Plumatella sp*		+			
03600	*Oligochaeta*	143	+			
04750	*Myzobdella lugubris*		+			
05800	*Caecidotea sp*		+			
06810	*Gammarus fasciatus*	96	+			
08250	*Orconectes (Procericambarus) rusticus*		+			
13400	*Stenacron sp*	11	+			
13550	*Stenonema mexicanum integrum*	9				
16700	*Tricorythodes sp*	9	+			
17200	*Caenis sp*	4				
22300	*Argia sp*		+			
51206	*Cyrnellus fraternus*	20				
52200	*Cheumatopsyche sp*	9				
53800	*Hydroptila sp*	168	+			
59407	*Nectopsyche candida*	1	+			
68130	*Helichus sp*		+			
77120	*Ablabesmyia mallochi*	18	+			
80410	*Cricotopus (C.) sp*	9				
81240	*Nanocladius (N.) distinctus*	3				
81631	*Parakiefferiella n.sp 1*	3				
82820	*Cryptochironomus sp*		+			
83002	*Dicrotendipes modestus*	27				
83040	*Dicrotendipes neomodestus*	86	+			
83050	*Dicrotendipes lucifer*	18				
84470	*Polypedilum (P.) illinoense*	27	+			
84540	*Polypedilum (Tripodura) scalaenum group*	3				
84790	*Tribelos fuscicorne*	6				
84960	*Pseudochironomus sp*	18				
85800	*Tanytarsus sp*	6				
87540	*Hemerodromia sp*	8				
93200	*Hydrobiidae*	20	+			
93900	*Elimia sp*		+			
95100	*Physella sp*		+			
96900	*Ferrissia sp*	121				
97601	*Corbicula fluminea*		+			
97710	*Dreissena polymorpha*	2	+			

No. Quantitative Taxa: 29 Total Taxa: 39

No. Qualitative Taxa: 22

Number of Organisms: 957

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 10/10/2001 River Code: 90-001 RM: 351.75 R Site: Ohio River

Taxa Code	Taxa	Quant/Qual
01320	*Hydra sp*	267
01801	*Turbellaria*	14
03600	*Oligochaeta*	567
06810	*Gammarus fasciatus*	172
13550	*Stenonema mexicanum integrum*	19
16700	*Tricorythodes sp*	14
51206	*Cyrnellus fraternus*	23
53800	*Hydroptila sp*	54
71300	*Limonia sp*	1
77120	*Ablabesmyia mallochi*	5
77750	*Hayesomyia senata or Thienemannimyia norena*	5
80350	*Corynoneura sp*	2
80410	*Cricotopus (C.) sp*	11
80420	*Cricotopus (C.) bicinctus*	22
81240	*Nanocladius (N.) distinctus*	11
83002	*Dicrotendipes modestus*	49
83040	*Dicrotendipes neomodestus*	383
83050	*Dicrotendipes lucifer*	38
83300	*Glyptotendipes (G.) sp*	5
84470	*Polypedilum (P.) illinoense*	92
84960	*Pseudochironomus sp*	38
85800	*Tanytarsus sp*	5
87540	*Hemerodromia sp*	1
95100	*Physella sp*	265
96120	*Menetus (Micromenetus) dilatatus*	163
97710	*Dreissena polymorpha*	3
99998	*NO QUALITATIVE SAMPLE COLLECTED*	+

Taxa Code	Taxa	Quant/Qual

No. Quantitative Taxa: 26 Total Taxa: 27

No. Qualitative Taxa: 1

Number of Organisms: 2229

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 10/10/2001 River Code: 90-001 RM: 351.10 R Site: Ohio River

Taxa Code	Taxa	Quant/Qual		Taxa Code	Taxa	Quant/Qual
01200	*Cordylophora lacustris*	3				
01320	*Hydra sp*	2149				
01801	*Turbellaria*	9	+			
03360	*Plumatella sp*	1	+			
03600	*Oligochaeta*	57	+			
06810	*Gammarus fasciatus*	60	+			
08250	*Orconectes (Procericambarus) rusticus*		+			
13400	*Stenacron sp*	54	+			
13550	*Stenonema mexicanum integrum*	11	+			
16700	*Tricorythodes sp*	7				
17200	*Caenis sp*	9				
18750	*Hexagenia limbata*		+			
22300	*Argia sp*		+			
27404	*Neurocordulia molesta*	1				
51206	*Cyrnellus fraternus*	63				
52200	*Cheumatopsyche sp*	87				
52801	*Potamyia flava*	4				
53800	*Hydroptila sp*	5	+			
59407	*Nectopsyche candida*	3				
68901	*Macronychus glabratus*	4				
77120	*Ablabesmyia mallochi*	12				
77750	*Hayesomyia senata or Thienemannimyia norena*	24				
81240	*Nanocladius (N.) distinctus*	95				
81631	*Parakiefferiella n.sp 1*	18				
82820	*Cryptochironomus sp*		+			
83002	*Dicrotendipes modestus*	130				
83040	*Dicrotendipes neomodestus*	107	+			
83050	*Dicrotendipes lucifer*	30				
84470	*Polypedilum (P.) illinoense*	6	+			
84790	*Tribelos fuscicorne*	18				
84960	*Pseudochironomus sp*	18				
85800	*Tanytarsus sp*	6				
87540	*Hemerodromia sp*	4				
93200	*Hydrobiidae*	4	+			
96900	*Ferrissia sp*	16				
97601	*Corbicula fluminea*	2	+			
97710	*Dreissena polymorpha*	7	+			

No. Quantitative Taxa: 33 Total Taxa: 37

No. Qualitative Taxa: 16

Number of Organisms: 3024

Appendix Table 6. Invertebrate Community Index (ICI) metrics and scores for sampling sites in the Ohio River SOPA study area, 2001.

River Mile	Drainage Area (Sq mi)	Number of: Total Taxa	Mayfly Taxa	Caddisfly Taxa	Dipteran Taxa	Percent: Mayflies	Caddis-Flies	Tany-tarsini	Other Dipt/NI	Tolerant Organisms	Quant EPT	Eco-Region	ICI
Ohio River (90-001)													
Year: 2001													
353.70 R	60700	40(6)	5(4)	5(4)	15(6)	8.5(4)	4.5(0)	0.3(2)	86.7(0)	15.2(0)	10(4)	4	30
352.30 R	60700	29(4)	4(2)	5(4)	10(6)	1.7(2)	9.8(2)	0.0(0)	88.4(0)	17.8(0)	9(4)	4	24
351.95 R	8000	29(4)	4(2)	4(4)	13(6)	3.4(2)	20.7(2)	0.6(2)	75.2(0)	30.7(0)	8(4)	4	26
351.75 R	8000	26(4)	2(0)	2(2)	15(6)	1.5(2)	3.5(0)	0.2(2)	94.8(0)	42.9(0)	4(2)	4	18
351.10 R	60700	33(6)	4(2)	5(4)	12(6)	2.7(2)	5.4(2)	0.2(2)	91.6(0)	5.8(0)	9(4)	4	28

Appendix Table 7. Ohio River water temperature data from Ohio EPA fish community assessment sampling during 2001.

Date	River Mile	Temperature °C.
08/28/01	351.1	30
08/28/01	351.8	28
08/28/01	352.3	27
08/28/01	353.7	–
10/10/01	351.1	23
10/10/01	351.8	20
10/10/01	352.3	19.5
10/10/01	353.7	20