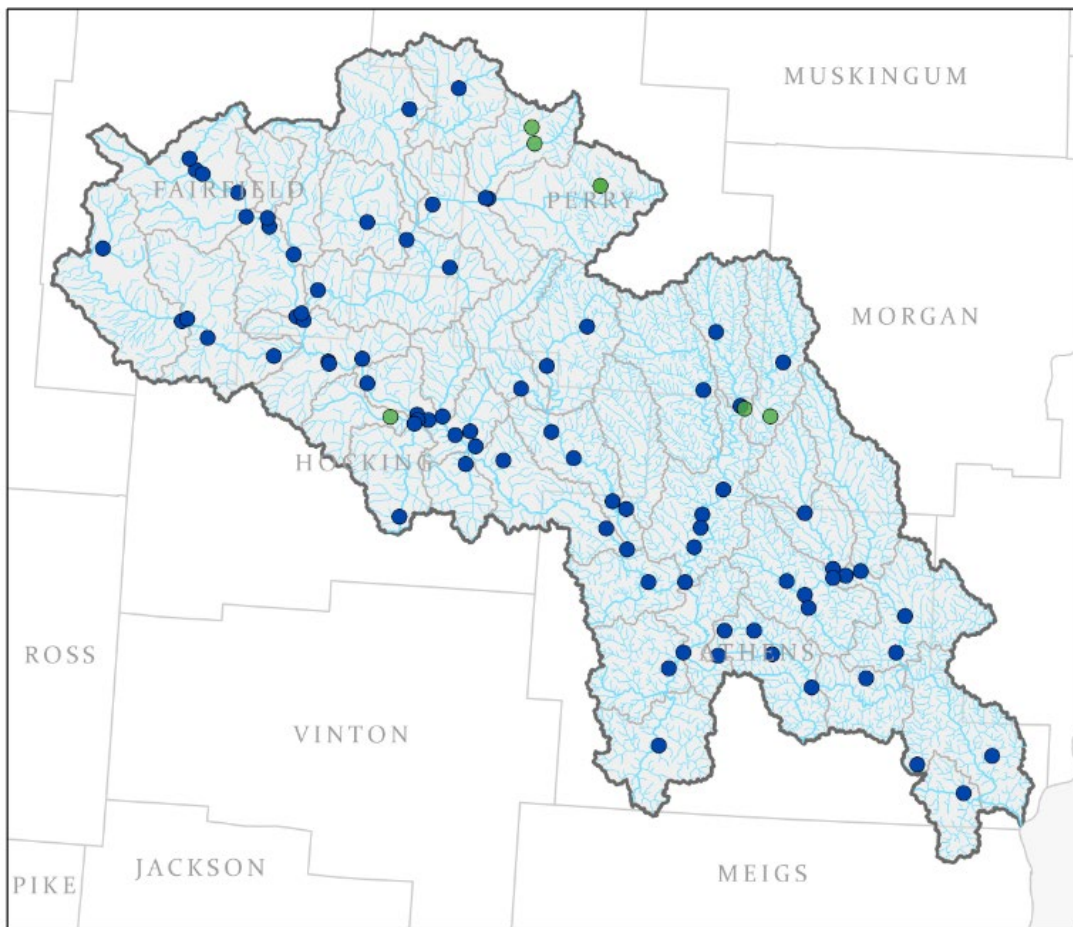




Quality Assurance Project Plan (QAPP) for the Biological and Water Quality Study of the Hocking River Watershed, 2022



Ohio EPA Technical Report AMS/2022-HOCKI-1
Division of Surface Water
July 2022

Quality Assurance Project Plan (QAPP)
for the Biological and Water Quality Study of the Hocking River
Watershed, 2022

Fairfield, Perry, Morgan, Washington, Athens, Meigs and Hocking Counties

Version 1.0

July 2022

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Section A

A1. Title and Approval

Quality Assurance Project Plan for the Biological and Water Quality Study of the Hocking River, 2022

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Date: 8/9/2020

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Rachel Taulbee

Rachel Taulbee, SEDO District Water Quality Supervisor

Date: 7/22/2022

List of Acronyms - (Glossary of Terms can be found [here](#))

2C	Priority Pollutant Analyte List Form
AMD	Acid Mine Drainage
AMDAT	Acid Mine Drainage Abatement and Treatment
ALU	Aquatic Life Use
BLM	Biotic Ligand Model
Ca	Calcium
Cl	Chlorine
CWA	Clean Water Act
DES	Division of Environmental Services
DQO	Data Quality Objective
DOC	Dissolved Organic Carbon
EA3	Ecological Assessment and Analysis Application
EPA	Environmental Protection Agency
FEG	Fish Evaluation Group
GFO	Groveport Field Office
GC/MS	Gas Chromatograph/ Mass Spectrometer
HUC	Hydrological Unit Code
IBI	Index of Biotic Integrity
ICI	Invertebrate Community Index
ID	Identification
IR	Integrated Report
ITS	Information Technology Services
K	Potassium
Mg	Magnesium
Na	Sodium
MIwb	Modified Index of Well-being
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
OAC	Ohio Administrative Code
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QHEI	Qualitative Habitat Evaluation Index
pH	Potential Hydrogen
RL	Reporting Limit
S-VOCs	Semi-volatile Organic Chemicals
SOP	Standard Operating Procedure
SO₄	Sulfate
SOCC	State of Ohio Computer Center
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
TSD	Technical Support Document
WAU	Watershed Assessment Unit
WQ	Water Quality
WQS	Water Quality Standards
WWTP	Wastewater Treatment Plant

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A3. Distribution List

This QAPP will be distributed to the following division management and staff, saved on the DSW collaboration site and posted on the DSW Biological and Water Quality Monitoring and Assessment webpage.

Table 1 — Distribution List

Name/Title	Contact Email/Phone	
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DSW Southeast District Office		
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DSW Central District Office		
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Chloe Welch, Environmental Specialist 2	chloe.welch@epa.ohio.gov	(614) 728-3852
DDAGW Central Office		
Ruth Briland, Environmental Specialist 2	ruth.briland@epa.ohio.gov	(614) 369-4045
DES		
Jennifer Kraft, Environmental Manager	jennifer.kraft@epa.ohio.gov	(614) 644-3020
Steve Roberts, Environmental Supervisor	steven.roberts@epa.ohio.gov	(614) 644-4225
Kristin Sowards, Sample Receiving Coordinator	kristin.sowards@epa.ohio.gov	(614) 644-4243

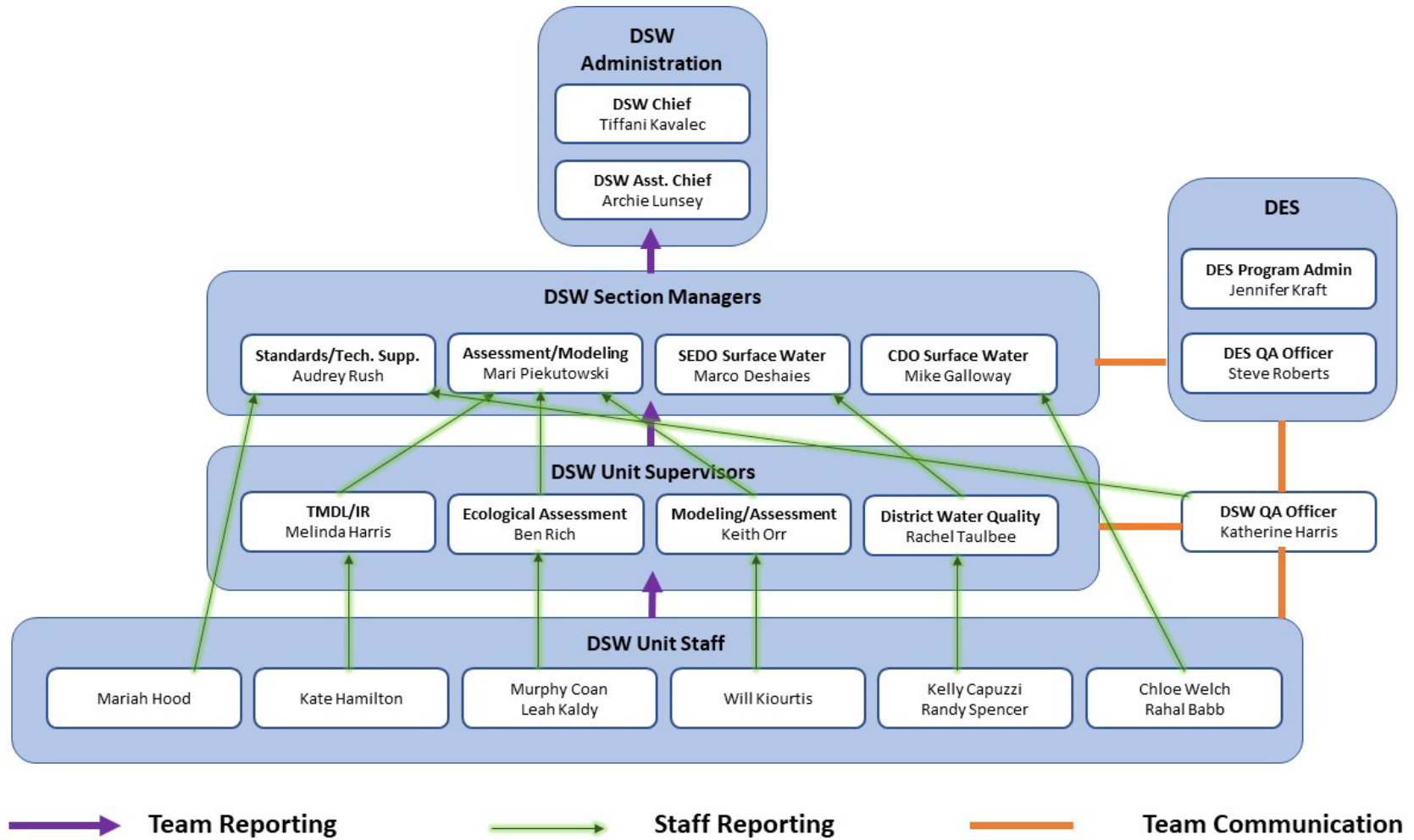
A4. Project Organization and Communication

Table 2 — Roles and Responsibilities.

Individual(s) Assigned:	Responsible for:	Authorized to:
Division of Surface Water		
Tiffani Kavalec/Archie Lunsey DSW Chief/Assistant Chief	Overall administration of division.	Confirm project existence; approve staff and capital resources; approve plans; edit reports.
Mari Piekutowski Assessment & Modeling Section Manager	Overall management of monitoring section.	Assign staff; approve plans; edit reports.
Melinda Harris TMDL and IR Unit Supervisor	Coordination of biennial Integrated Report update; TMDL program development.	Assign and support staff; edit reports.
Kathryn Hamilton TMDL Staff	Leading TMDL projects.	Write assigned TMDL sections.
Keith Orr Modeling & Assessment Unit Supervisor	Supporting modeling field crews with supplies, equipment and training.	Obtain approvals and signatures; develop budgets; conduct field audits; edit reports.
Will Kiourtsis Modeling & Assessment Unit Staff	Dissolved oxygen surveys, stream flow measurements and chemistry sampling.	Help plan study. Schedule and complete assigned field activities. Tabulate data and write discussion for technical report.
Audrey Rush Standards and Tech Support Section Manager	Quality management (QAPPs, SOPs); staff training; water quality standard rules.	Approve plans and edit reports.
Bob Miltner Standards and Tech Support Lead Worker	Water quality standard criteria development and rule updates.	Help plan study. Review project actions and documents in relation to listed responsibilities.
Katherine Harris Standards and Tech Support QA Officer	DSWs quality management program.	Develop and implement field QA/QC guidelines. Track field QA/QC and staff training.
Mariah Hood Standards and Tech Support Lead Worker	Water quality standard criteria development and rule updates.	Help plan study. Make recommended beneficial use changes.
VACANT Standards and Tech Support Staff	Representing agency in fish and wildlife consumption and contact advisory matters.	Help plan study. Make waterbody specific consumption and contact advisory recommendations.
Ben Rich Ecological Assessment Unit Supervisor	Supporting biological field crews with supplies, equipment, and training.	Obtain approvals and signatures; develop budgets; conduct field audits; edit reports.
Heidi Babos Ecological Assessment Unit Lead Worker	Assist with property access, track project progress, managing data and compiling information for Integrated Report.	Provide landowner information for access consent. Upload fish, bug and chemistry data into EA3. Review and comment on reports. Write assigned Integrated Report sections.
Murphy Coan Ecological Assessment Unit Fish Crew Leader	Fish population and stream habitat assessments.	Help plan study. Schedule and complete assigned field activities. Tabulate data and write discussion for technical report.

Individual(s) Assigned:	Responsible for:	Authorized to:
Leah Kaldy Ecological Assessment Unit Bug Crew Leader	Macroinvertebrate population assessments.	Help plan study. Schedule and complete assigned field activities. Tabulate data and write discussion for technical report.
Marco Deshaies District Surface Water Section Manager	Implementing division goals at the district level.	Review documents and reports; suggest changes and edits; obtain approvals and signatures.
Jack Knapp Brandon Atwood Permits & Enforcement Lead Worker	NPDES permit related issues.	Obtain wastewater and storm water permit information needed for planning and reporting.
Rachel Taulbee District Water Quality Unit Supervisor	Supporting water quality field crews with supplies, equipment, and training.	Obtain approvals and signatures; develop budgets; conduct field audits; edit reports.
Kelly Capuzzi Randy Spencer District Water Quality Unit	Water and sediment data collection, validation, and management.	Help plan study. Schedule and complete assigned field activities. Tabulate data and write discussion for technical report.
Michael Gallaway District Surface Water Section Manager	Implementing division goals at the district level. Supporting water quality field crews with supplies, equipment, and training.	Review documents and reports; suggest changes and edits; obtain approvals and signatures; develop budgets; conduct field audits
Carla Whisner District Permits & Enforcement	NPDES permit related issues.	Obtain wastewater and storm water permit information needed for planning and reporting.
Chloe Welch District Water Quality Unit	Water and sediment data collection, validation, and management.	Help plan study. Schedule and complete assigned field activities. Tabulate data and write discussion for technical report.
Division of Environmental Services		
Jennifer Kraft Program Administrator	Overall administration of laboratory activities.	Help solve laboratory information management system problems. Develop analytical methods and SOPs.
Steve Roberts QA Officer	DES quality management program.	Oversee data completeness, validation, and delivery.
Kristin Sowards Sample Receiving Coord.	Intake of laboratory samples, coordination with field staff	Help solve daily sample scheduling and sample submission issues.
Division of Drinking and Ground Waters		
Ruth Briland (CO)	Harmful Algae Bloom program implementation.	Coordinate with DSW on drinking water intake and inland lake monitoring.

Figure 1 — Organization Chart



A5. Problem Definition & Background

As part of Ohio's statewide monitoring strategy, biological and water quality assessments will be done during the 2022 field season in the Hocking River watershed.

Sunday and Monday Creeks in the Hocking River watershed was last studied by Ohio EPA in 2001 and the rest of the Hocking River watershed was sampled in 2004. Ambient biology, macro-habitat, and water quality data were collected and evaluated. Results showed that both aquatic life and recreation beneficial uses were impaired at a significant number of locations. It was found that the watershed was impacted by acid mine drainage, metals deposition, urban/stormwater runoff and agricultural nonpoint sources.

Following the stream study, a Total Maximum Daily Load (TMDL) report was prepared. TMDL reports identify and evaluate water quality problems in impaired water bodies and propose solutions to bring those waters into attainment with water quality standards. Local watershed groups also completed Acid Mine Drainage Abatement and Treatment (AMDAT) reports for Rush Creek, Monday Creek, Sunday Creek and Federal Creek to identify projects needed to restore these watersheds impacted by mine drainage.

The Hocking River Watershed TMDL report, which encompasses the Hocking River watershed with the exception of the Monday and Sunday Creek watersheds, was approved by U.S. EPA in 2009. The Monday and Sunday Creek Watershed TMDL reports were approved by U.S. EPA in 2005 and 2006, respectively. TMDLs were calculated for total phosphorus, fecal coliform bacteria, habitat and sedimentation. TMDL recommendations included new effluent limits for total phosphorus for wastewater treatment plants, reducing home sewage treatment system failures, improving manure management at livestock operations, managing storm water quantity and quality in suburban areas, and improving erosion and sediment controls in all areas.

More information on previous studies done in the Hocking River watershed can be found at Ohio EPA's TMDL page published at: <https://epa.ohio.gov/divisions-and-offices/surface-water/reports-data/hocking-river-watershed>. The AMDAT reports and AMD project reports can be found at <https://watersheddata.com/>.

Organizations that have done restoration work or land preservation in this watershed include: Ohio Department of Natural Resources (ODNR), US Forest Service, Ohio University, Friends of the Hocking River, Hocking River Commission, Federal Valley Watershed Group, Upper Hocking Action Group, Rural Action, Monday Creek Restoration Project, Sunday Creek Watershed Group, Athens Conservancy, Hocking College, Fairfield County Park District, Appalachian Ohio Alliance, Arc of Appalachia, City of Logan, City of Athens, City of Lancaster and Franklin County Metroparks. True Pigments, LLC is a Rural Action social enterprise that is working to restore seven miles of Sunday Creek affected by acid mine drainage from the Truetown Seep. A new watershed group in Rush Creek has recently formed and is working with Rural Action, ODNR and Ohio University to address historic abandoned minelands in the watershed.

As part of Ohio’s statewide monitoring strategy, the study planned for the 2022 field season will evaluate the effectiveness of the TMDLs and practices implemented. Information collected as part of this survey will support the Data Quality Objectives listed in Section A7.

A6. Project Description

The Hocking River is over 102 miles long and its watershed spans from central Ohio to southeastern Ohio. It drains 1,197 square miles. The watershed encompasses seven counties (Fairfield, Perry, Hocking, Athens, and parts of Morgan, Meigs and Washington). It spans one 8-digit hydrologic unit code (HUC) and is composed of 41 12-digit watershed assessment units (WAUs). The HUCs and their description are listed in Table 3. See Figure 2 for a map of the watershed with sampling location information. Larger municipalities in the watershed include Lancaster, Logan, Nelsonville, and Athens.

The following tasks will be completed at sampling locations. Fish and macroinvertebrate populations will be sampled to generate biological index scores. These scores will be used to determine aquatic life use attainment status. Habitat, surface water, wastewater and sediment data will be gathered to help determine potential causes and sources of biological impairment. Habitat and biological index scores will also be used to validate or assign aquatic life uses where needed. Diurnal dissolved oxygen flux will be measured using automatic data loggers. This along with data collected to measure primary productivity will be used to evaluate the impact on biological communities specifically from nutrients using the stream nutrient assessment protocol (SNAP). Primary productivity is measured using a combination of benthic and sestonic chlorophyll-a data. Stream flow data will be collected at select locations to help calculate pollutant loads and results will be evaluated against water quality standards using load duration curves. Recreation use status will be evaluated using *Escherichia coli* as an indicator organism.

A routine field season can run from May 1 to October 31. The index period for biological sampling and nutrient sampling is from June 15 to October 15. Bacteria sampling to evaluate recreation use will be conducted within a 90-day period during the recreation season, May 1 to October 31.

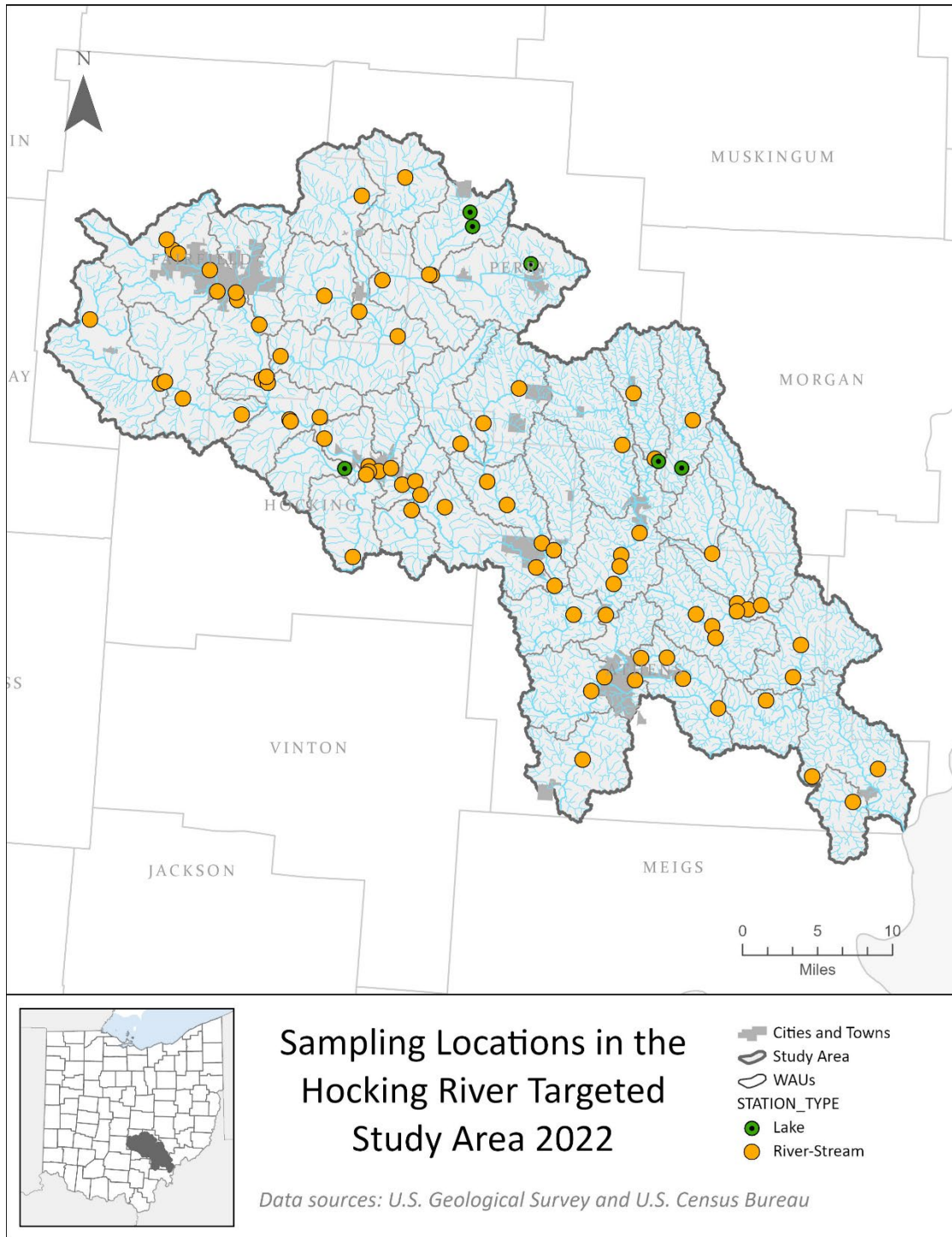
Table 3 – List of Watershed Assessment Units (WAU) in Study Area

HUC8	HUC10	HUC12	
05030204	Watershed		
	0503020410	Enter HUC12	
		050302041001	Willow Creek – Hocking River
		050302041002	Piper Run – Hocking River
		050302041003	Fourmile Creek
		050302041004	Frost Run – Hocking River
	0503020409		
		050302040901	Miners and Hyde Forks
		050302040902	McDougall Branch
		050302040903	Kasler Creek – Federal Creek
		050302040904	Sharps Fork
		050302040905	Big Run – Federal Creek

HUC8	HUC10	HUC12	
	0503020408		
		050302040801	Hamley Run – Hocking River
		050302040802	Headwaters Margaret Creek
		050302040803	Factory Creek – Margaret Creek
		050302040804	Coates Run – Hocking River
	0503020407		
		050302040701	East Branch Sunday Creek
		050302040702	Dotson Creek – Sunday Creek
		050302040703	West Branch Sunday Creek
		050302040704	Greens Run – Sunday Creek
	0503020406		
		050302040601	Clear Fork
		050302040602	Scott Creek
		050302040603	Oldtown Creek
		050302040604	Fivemile Creek
		050302040605	Harper Run – Hocking River
		050302040606	Dorr Run – Hocking River
	0503020405		
		050302040501	Little Monday Creek
		050302040502	Lost Run – Monday Creek
		050302040503	Snow Fork
		050302040504	Kitchen Run – Monday Creek
	0503020404		
		050302040401	Headwaters Hocking River
		050302040402	Baldwin Run
		050302040403	Pleasant Run
		050302040404	Tarhe Run – Hocking River
		050302040405	Buck Run – Hocking River
	0503020403		
		050302040301	Headwaters Clear Creek
		050302040302	Mouth Clear Creek
	0503020402		
		050302040201	Headwaters Little Rush Creek
		050302040202	Indian Creek – Little Rush Creek
		050302040203	Raccoon Run
		050302040204	Turkey Run – Rush Creek
	0503020401		
		050302040101	Center Branch
		050302040102	Headwaters Rush Creek

HUC8	HUC10	HUC12	
		050302040103	Clark Run – Rush Creek

Figure 2 - Sampling Locations Map – (does not include locations of potential supplemental sampling locations)



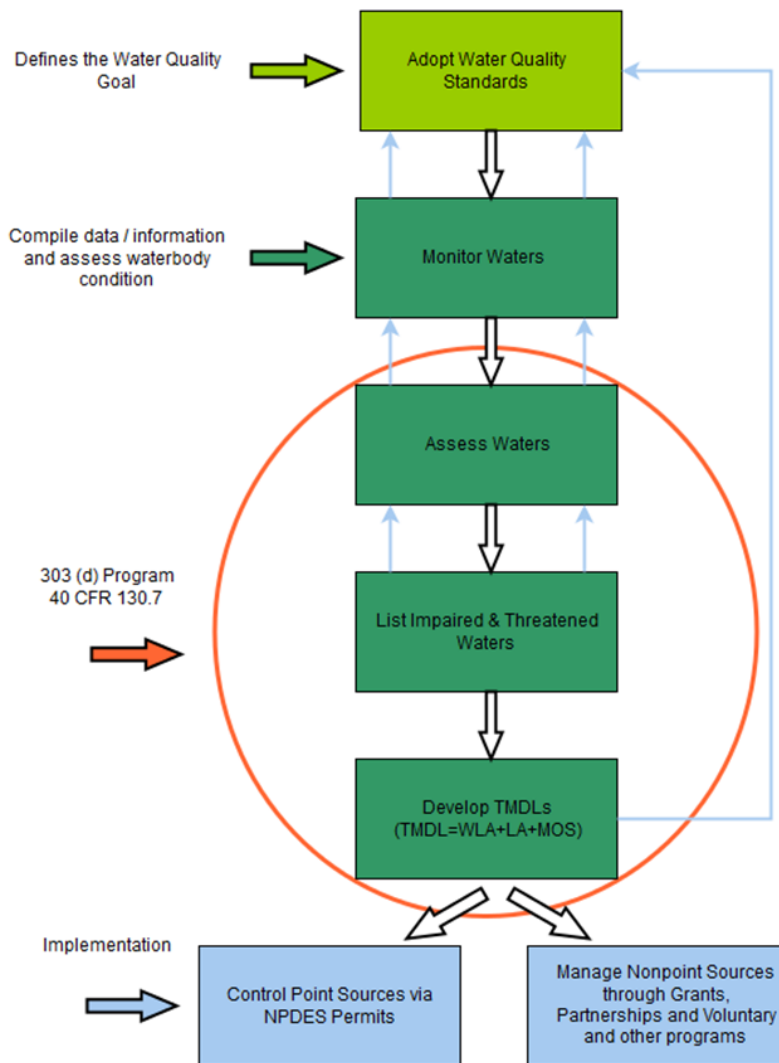
A7. Data Quality Objectives

The data collected during this watershed survey fulfills multiple objectives:

- Assess and report on the status of WAUs as required by sections 305(b) and 303(d) of the Clean Water Act (CWA)
- Assess causes and sources of impairment
- Support water quality standards development
- Provide data for the Ohio Fish Tissue Consumption Monitoring Program
- Support the National Permit Discharge Elimination System (NPDES) permitting
- Total Maximum Daily Load (TMDL) development and implementation

Figure 3 - Water Quality-Based Approach of the Clean Water Act.

Water Quality-Based Approach of the Clean Water Act



Source: <https://www.epa.gov/tmdl/overview-identifying-and-restoring-impaired-waters-under-section-303d-cwa>

Monitor and Assess Ohio's Waters

Under Section 305(b) of the CWA, Ohio EPA is required to assess and report on the quality of Ohio's waters. Ohio EPA determines attainment/non-attainment status of water quality standards in three main ways:

- Biological assessments determine attainment/non-attainment of aquatic life uses (ALU) as codified in OAC 3745-1-07, Table 7-1. Numerical biological criteria are based on multi-metric 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. Performance expectations for the basic aquatic life uses (Warmwater Habitat [WWH], Exceptional Warmwater Habitat [EWH], and Modified Warmwater Habitat [MWH]) were developed using the regional reference site approach (Hughes et al. 1986, Omernik 1987).
- *E. coli* is used as an indicator to determine attainment/non-attainment of recreational uses as codified in OAC 3745-1-07. Water quality must meet a 90-day geometric mean and a statistical threshold not to be exceeded more than 10 percent of the time. Each WAU will have at least one site sampled. Most effort will focus on streams with public access that are more highly used for recreation.
- Chemical concentrations in fish tissue are used to determine attainment/non-attainment of non-drinking water human health water quality standards and for the development of fish consumption advisories.

Under Section 303(d) of the CWA Ohio EPA is federally obligated to list impaired and threatened waters by determining attainment/non-attainment status of water quality standards. To support this objective, the following data will be collected: fish and macroinvertebrate community assemblages, physical stream habitat evaluation (Qualitative Habitat Evaluation Index, or QHEI), organic and inorganic water column chemistry (parameters in Appendix 4), continuous sonde measurements, continuous temperature measurements, *E. coli* bacteria, and fish tissue chemical concentrations.

Assess Causes and Sources of Impairment

Chemical and physical monitoring is a direct measure of the CWA goal and can be used to determine the factors that limit biologic attainment. Specific objectives for each planned measurement are included below:

- **Physical Habitat Assessments:** The Qualitative Habitat Evaluation Index (QHEI) (Rankin 1989, 1995, and Ohio EPA 2006) is a method that evaluates microhabitat necessary to support biological assemblages consistent with Ohio's tiered ALU designations. Channel morphology, lithography, gradient, and riparian conditions are fundamental components of riverine habitat, affecting the diversity, structure, organization, and viability of aquatic communities. Because the QHEI explicitly measures the presence, absence, or relative function of these key attributes, it serves as an important and cost-efficient monitoring tool to describe and rank macrohabitat

quality, evaluate habitat effects in surface water assessments, and aid in establishing ALU potential for underperforming waters.

- **Inorganic Surface Water Chemistry:** A standard suite of inorganic surface water chemical parameters will be collected at every site listed in Appendix 2. Impairment due to chemical contaminants in the water column can be assessed by comparing water column chemical concentrations to numeric criteria in Ohio EPA's rules: aquatic life (Table 35-1), wildlife (Table 35-12), recreation/aesthetics (Table 37-1), water supply (Table 33-1) and human health (Table 34-1).
- **Nutrient Enrichment:** Water quality parameter sondes will be deployed to capture a minimum of 48 continuous hours of diel dissolved oxygen flux, pH, temperature, and specific conductance measurements. Benthic and/or sestonic chlorophyll *a* samples will be collected during every sonde deployment if site conditions are appropriate. Continuous measurements will be evaluated against water quality criteria and, along with chlorophyll *a* results, will be used to provide lines of evidence for causes of biological impairment such as nutrient or organic enrichment.
- **Organic Surface Water Chemistry:** Water column samples will be analyzed for organic constituents (see Appendix 4 for parameters) at a subset of sites. Sites were selected based on local knowledge of dischargers or legacy issues. Semi-volatile organic carbons (s-VOCs) (USEPA Method 625) testing will generally be focused on municipal areas with categorical users of these constituents and/or historic reference locations. Once one SVOC pass is conducted district WQ staff may evaluate the data to determine whether more passes are necessary. This evaluation should be based on parameters with results above method detection. Herbicide (USEPA Methods 515.1 and 525.2) testing will be focused in agricultural areas and used as an indicator of potential overall agrichemical impact to biology. Organochlorine insecticides (USEPA Method 608/8081) mostly are compounds that are no longer used and are typically not water soluble. For that reason, these constituents will generally only be sampled if there is evidence of legacy pollution or knowledge of current site conditions warrant an investigation. Each site where pesticides will be collected will be sampled a minimum of two times. The objective of two passes is to screen whether select organic constituents are present in the water column; a statistic evaluation or geometric mean does not need to be calculated for each site. Samples for agricultural chemicals such as herbicides will be collected early in the sampling season to coincide with typical timing of applications.
- **Sediment:** Chemical and physical analysis of sediments can be used as a tool for the monitoring of pollutant discharges to a river and assigning causes and sources of impairment. Sediment samples may help to locate nonpoint, historical, or intermittent discharges that may not be readily apparent using samples collected from the water column. However, sediment will not be collected during the 2022 field season. If during the 2022 field season site conditions or impairments are observed that indicate sediment samples would be useful for determining causes and/or sources of biological impairment, follow-up sediment samples will be collected the following year.

Support Water Quality Standards Development

- **Beneficial Use Designations:** The collection of biological, habitat, chemical and bacteria data is necessary to verify current designated uses and allows for updated recommendations as appropriate. Current beneficial use designations for the Hocking River drainage basin can be found in the Ohio Water Quality Standards Chapter 3745-1-08. <https://epa.ohio.gov/static/Portals/35/rules/01-08.pdf>. Streams that have a plus (+) symbol have been field verified and streams with an asterisk (*) symbol have not been field verified. Many smaller streams in the watershed are not listed in the water quality standards. While it would be difficult to sample all of these drainages, unverified and streams not listed in the water quality standards for the Hocking River Watershed have been identified in Appendix 6. These streams will be sampled as time allows.
- **Antidegradation:** The collection of biological, chemical and habitat data will be used to determine if existing uses are being protected and to also support updates to the State's list of special high-quality waters. Streams in the Hocking River watershed listed as Superior High Quality Water include Clear Creek, Federal Creek, Spring Run, Arney Run, Big Run, Nellis Run, Marietta Run, Brill Run, Joe's Run and Wildcat Run. Several of these streams are not being targeted in this survey but they are also included in Appendix 6 and will be sampled as time allows. The Antidegradation rule can be found in the Ohio Water Quality Standards Chapter 3745-1-05: <https://epa.ohio.gov/static/Portals/35/rules/01-05.pdf>.

Provide Data for the Ohio Fish Tissue Consumption Monitoring Program

Fish tissue samples will be collected from 5 locations as part of the Ohio Fish Tissue Consumption Monitoring Program. Sampling locations may vary based on the availability of sport fish collected at each location. Fillet samples of edible-size sport fish will be tested for organochlorinated pesticides, PCBs, mercury, lead, cadmium, arsenic, and selenium. Results will be used in the Ohio Sport Fish Consumption Advisory Program and used to determine attainment status of non-drinking water human health criteria in the Integrated Report.

Support NPDES Permitting

A list of NPDES permitted dischargers in the survey area is presented in Appendix 3. Survey data will be collected to provide the NPDES program with necessary biological and/or chemical sampling data. Stream water and effluent chemistry samples will be collected to specifically assess eight wastewater treatment plant (WWTP) that discharge directly to the Hocking River mainstem including the Lancaster Water Pollution Control Facility (WPCF), Upper Hocking WPCF, Logan WWTP, Haydenville WWTP, Nelsonville WWTP, The Plains WWTP, Athens WWTP, and Coolville WWTP. Several facilities that discharge to tributaries to the Hocking River will also be evaluated including the Amesville WWTP and Chauncey WWTP. Additional NPDES facilities may be sampled if impairment is found.

TMDL Implementation

The TMDL program, established under Section 303(d) of the CWA focuses on identifying and restoring polluted rivers, streams, lakes, and other surface water bodies. TMDLs are prepared for waters identified as impaired on the 303(d) list in the Integrated Water Quality Monitoring and Assessment Report (Integrated Report or IR). A TMDL is a written, quantitative assessment of water quality problems in a water body and contributing sources of pollution. It specifies the amount a pollutant needs to be reduced to meet Water Quality Standards (WQS), allocates pollutant load reductions, and provides the

basis for taking actions needed to restore a water body. The objectives of the TMDL process are to estimate pollutant loads from the various sources within the basin, define or characterize allowable loads to support the various beneficial uses, and to allocate pollutant loads among different pollutant sources through appropriate controls (e.g., NPDES permitting, storm water management, 319 proposals, NPS controls or other abatement strategies). The components of the TMDL process supported by this survey are primarily the identification of impaired waters, verification (and re-designation if necessary) of beneficial use designations, gathering ambient information that will factor into the wasteload allocation, and ascribing causes and sources of use impairment. These data are necessary precursors to the development of effective control or abatement strategies.

A8. Special Training/Certification

All staff who conduct surface water sampling, whether from streams or lakes, receive initial training by someone experienced in the proper techniques required, usually a supervisor or veteran employee. Mandatory refresher training is done on an annual basis for all Agency surface water samplers. Annual boating safety refresher training is required by internal safety policy SP 10-12. Employees who operate watercraft must also demonstrate proficiency in boat operation to their supervisor on an annual basis. All trainings are documented using a Microsoft® Access database. Supervisors should also conduct an annual field audit to verify standard operating procedures are followed.

A9. Documents and Records

Microsoft® SharePoint is used as a document library. Access is through Ohio EPA's Intranet collaboration site.

Examples of documents posted to this location include

Pre-sampling documents:

- Preliminary information sheets
- Property access forms
- Draft and final QAPP versions

Project documents:

- All data files
- Draft report sections
- Changes to sites, staff, parameters, etc. should be filed in the project folder by the study team leader
- Project photos will be moved to and stored in the Lynx Photo System. All files and original data sheets will be initially retained by Ohio EPA in accordance with established retention schedules.

Changes in project leadership or major actions which might affect the DQOs require an updated QAPP and signoff sheet. The study team leader shall retain copies of all management reports, memoranda, and all correspondence between team members.

For analytical samples the original chain of custody form is delivered to DES along with the samples and retained by the Laboratory. A copy of the form may be kept in a binder by the sample collector as well. After water samples are analyzed and the results are approved by the DES QA Officer the data will be

released to Sample Master® and subsequently uploaded to DSW's Ecological Assessment and Analysis Application (EA3). The sample collector reviews laboratory sheets for completeness and accuracy, validates field QC, adds comments and completes edits if necessary and approves the sheet. All data approved in EA3 is sent to U.S. EPA's Water Quality Exchange.

Datalogger temperature data files will be created for each stream location. The district study team will download the data files from the dataloggers and transmit them to the Assessment and Modeling Section staff for data reduction and analysis.

Original fish and QHEI data sheets will be retained at the Groveport Field Office. Data from the field sheet is manually entered into the EA3 database using the appropriate data entry screen. The sheets are double entered to minimize mistakes.

Section B. Data Generation and Acquisition

B1. Sampling Process and Design

The site selection process for aquatic life beneficial uses is designed to systematically sample principal streams in the targeted study area with enough locations to ensure alignment with the Data Quality Objectives (DQO)s listed in Section A7. Principal streams are roughly defined as those that drain a surface area >8 mi², though smaller drainages may be sampled as deemed necessary. Each WAU (HUC 12) is independently evaluated to determine its existing, relevant characteristics that contribute to the fulfillment of study objectives. These characteristics include, but are not limited to historical biological impairment, active watershed TMDLs, known and suspected point and nonpoint discharges, land use changes (e.g. agriculture to urban, forest to agriculture, etc.), historical reference sites, unlisted/undesigned streams in the WQS, known restoration activities, and other miscellaneous local impacts that may contribute to beneficial use impairment. Larger, longer streams that flow across multiple WAUs are additionally evaluated holistically to ensure adequate longitudinal sampling coverage. Available USGS gage sites are selected to obtain accurate stream flow data for load calculation purposes. The site selection process for recreation beneficial use is designed to obtain a representative picture of conditions in an assessment unit. A minimum of 1 site per assessment unit is desired.

A summary of the planned sampling effort is shown in Appendix 1. A detailed list of sampling sites and the type of sampling at each is shown in Appendix 2. A list of facilities regulated by individual NPDES permit is shown in Appendix 3. Monday Creek, Sunday Creek and Rush Creek watersheds will have additional monitoring locations that will be collected by level III Qualified Data Collectors for fish, habitat and chemistry by Rural Action, Ohio DNR and Ohio University. Since the previous survey in 2001, many restoration projects have been implemented in both Monday Creek and Sunday Creek. Ohio EPA will collect additional data at these locations for qualitative macroinvertebrates and chemistry as needed or requested to document improvements.

B2. Sampling Methods

The version 8.0 of the Surface Water Field Sampling Manual (2021) can be found at:

<https://epa.ohio.gov/static/Portals/35/bioassess/2021-DSW-FieldSamplingManual-Main.pdf>

Stream Habitat Evaluation

Physical habitat is evaluated based on methods described in Qualitative Habitat Evaluation Index (QHEI); Rationale, Methods, and Application (Rankin 1989, 1995, and Ohio EPA 2006). Various attributes of the available habitat are scored based on their overall importance to the establishment of viable, diverse aquatic faunas. Habitat attributes scored include the type and quality of substrate, amount of instream cover, channel morphology, extent of riparian canopy, pool and riffle development and quality and gradient are among the metrics used to evaluate the characteristics of a stream segment, not just the characteristics of a single sampling site.

Biological Community Assessment

Fish and macroinvertebrate sampling protocols are detailed in Ohio EPA 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 2015b).

A combination of quantitative and qualitative methods will be employed to monitor benthic macroinvertebrate communities. Quantitative collections are made using modified Hester-Dendy multiple plate artificial substrate samplers, deployed at all biomonitoring sites draining more than 20 mi², or at reference sites regardless of size. Once deployed, artificial substrates are left to colonize, in-stream, for a six-week period. Qualitative sampling will be conducted at all biomonitoring stations. This sampling method consists of a basic inventory of macroinvertebrate taxa from natural substrates, noting dominant taxa among major habitat types (for example, riffle, run, pool and margin).

Fish will be sampled at each sampling location using pulsed DC headwater, wading or boat electrofishing methods depending on watershed size at each sampling zone. Sites with drainage areas greater than 20 mi² or at reference site locations will be sampled twice during the sampling index period. The number of passes may be adjusted as necessary based on best professional judgment of the fish crew leader. Reasons for a single pass monitoring at sites otherwise identified as needing multiple passes may include extremely difficult and time-consuming access, work delays related to weather, or the emergence of alterations (natural or otherwise) at points of access or sampling reach, rendering replication of the initial effort hazardous or costly, or both. Fish are processed in the field, which includes identifying each specimen to species level, counting individuals at all sites, weighing individuals at wading and boat sites, and recording external abnormalities.

Surface Water

When feasible, surface water physical and chemical testing will be done to coincide with biological monitoring. Ideally these samples will be collected across a variety of flow conditions. A minimum of five sets of samples will be collected. If this is not feasible, sites where $n < 3$ will be noted in the report to question the validity of any arithmetic or geometric mean calculated.

Inorganic surface water chemical parameters will be collected at every site listed in Appendix 2. Physical water quality measurements will be taken with a multimeter probe each time a grab sample is collected. Analytical methods and laboratory reporting levels for chemical and physical parameters for different media samples collected within the study are listed in Appendix 4.

Surface water grab samples will be collected and preserved using appropriate methods as outlined in the Surface Water Field Sampling Manual for water column chemistry, bacteria, and flows (Ohio EPA 2021). This document is hereafter referred to as the Surface Water Field Sampling Manual. Samples are delivered to Ohio EPA's Division of Environmental Services (DES) for analyses. Field measurements of dissolved oxygen (DO), percent DO saturation, pH, temperature, and conductivity will be made using YSI 556, Professional Plus or ProDSS meters.

Laboratory reporting limits are adequate to evaluate most pollutants. Potential exceptions include nitrate-nitrite and ammonia. It is common for nitrogen to become depleted during the summer in aquatic environments. In instances where a value is needed to calculate a mean concentration and the result is below reporting limit (RL), the reported "value" will be used in the calculation.

Water Quality Sonde Deployments

Continuous multi-parameter measurement sondes will be deployed at 29 locations. Sonde surveys should be done during stable, baseflow conditions. Ideally, each site targeted will have 2 surveys done. Water quality sondes will be placed at select locations (indicated in Appendix 2) to evaluate diel measurements of dissolved oxygen, pH, temperature, and conductivity. The sonde deployment goal is to capture a minimum of 48 continuous hours. Sestonic and benthic chlorophyll-a samples are to be collected during each sonde deployment as site conditions allow. All sampling, analysis and procedures adhere to those specified in the Surface Water Field Sampling Manual – Appendix II for water quality parameters and flows (Ohio EPA 2021). Section F of Appendix II outlines equipment preparation, deployment, equipment retrieval, data management, quality control testing, and maintenance.

Bacteria

Attainment/non-attainment of recreational uses will be determined using *E. coli* criteria codified in OAC 3745-1-37, Table 37-2. Each WAU will have at least 1 site sampled. Water quality must meet a 90-day geometric mean and a statistical threshold not to be exceeded more than 10 percent of the time. Bacteria sampling to evaluate recreation use will be done within a 90-day period that falls from May 1st to October 31st. Each site will have at least 5 sets of *E. coli* samples tested. Water samples will be collected into appropriate containers, cooled to 4°C, and transported to a contract laboratory and/or Ohio EPA's DES within six hours of sample collection. All samples will be analyzed for *E. coli* bacteria using U.S. EPA-approved methods.

Temperature

Continuous temperature measurements will be recorded at 17-20 locations using Onset HOBO Water Temperature Pro v2 Data Loggers. The sampling will be conducted in accordance with procedures outlined in the Surface Water Field Sampling Manual Section G, Standard Operating Procedure for Continuous Temperature Data Logger Deployments. The loggers are accurate to approximately 0.2°C with an expected drift of approximately 0.1°C per year. Accuracy of the logger will be tested against a calibrated thermometer prior to deployment, ensuring the readings are within the accuracy range provided by the manufacturer. A stream temperature datapoint will be collected every 30 minutes from July 1 through August 31 to determine the temperature regime for the streams during this time.

Chlorophyll

Benthic and sestonic chlorophyll *a* will be collected and preserved using appropriate methods, as outlined in Appendix II of the Surface Water Field Sampling Manual (Ohio EPA 2021) and delivered to Ohio EPA-DES for analyses.

Sediment

Sediment sampling may be conducted in Year 2 if evaluation of biological, chemical and/or physical data indicate the need for sediment investigation. Fine-grained, multi-incremental sediment samples will be collected in the upper four inches of bottom material using either decontaminated stainless steel scoops or dredges. Potential sediment sampling parameters are listed in Table 4. Collected sediment will be placed into appropriate containers, placed on ice (to maintain 4°C) and shipped to Ohio EPA-DES for analysis. Sampling and decontamination protocols will follow those listed in Appendix III of the Surface Water Field Sampling Manual.

Fish Tissue

Tissue fillet samples will be collected from fish of edible size and species preferred for analysis may include spotted bass, largemouth bass, smallmouth bass, flathead catfish, walleye, saugeye, white bass, common carp, freshwater drum, buffalo and channel catfish. When possible, composite samples (by species) should include a minimum of three fish, yielding at least 150 grams of tissue. At each fish tissue sampling location, an attempt will be made to collect five fish species for analysis. Fish will be collected using standard electrofishing methods (Ohio EPA 2015b). Sampling locations are listed in Table 2 and the parameters to be analyzed are listed in Table 4. Fish used for tissue analysis will be filleted in the field using decontaminated stainless-steel fillet knives. Samples will be wrapped in aluminum foil, placed in a sealed plastic bag, along with necessary site documentation. Temporary storage in the field may take one of two forms. Samples may be stored on wet ice for a period not exceeding 48 hours. For longer periods of field storage, samples must be placed on dry ice. Collection, decontamination, and field processing of tissue samples will follow protocols listed in the Ohio EPA Fish Tissue Collection Guidance Manual (Ohio EPA 2012). From the field, fish tissue samples will be stored and inventoried in chest freezers at the Ohio EPA Groveport Field Office prior to delivery to DES.

Lake Sampling

Lake sampling will be done once per month May through September for a total of five (5) sampling events. Grab samples of lake water will be collected at 0.5m below the surface and 0.5m above the bottom from the deepest portion of the lake and analyzed for the list of the parameters in Appendix 4. Algal biomass, algal toxin and atrazine testing will only be done in the surface sample. Three sets of surface samples (spring, summer, fall) will also be submitted for species level phytoplankton cell counts and bio-volume estimates. Other pollutants outside the standard assessment (i.e. glyphosate, carbamates) will be done if historical data indicates a problem. A water column field reading profile (temperature, DO, percent DO saturation, pH and conductivity) will be done at the chemistry station starting at 0.5m below the surface and continuing at either 0.5m or 1.0m intervals, thereafter, being sure to include the depth of the bottom sample. A sediment sample will be collected if none has been done within the last 10 years. Fish tissue specimens will be collected only in lakes selected by a multiagency committee with a priority given to those commonly used for sport fishing. All field practices

will follow guidelines in the Appendix I of the Surface Water Field Sampling Manual (Ohio EPA 2019e). This document is also known as the Inland Lakes Sampling Procedure Manual. Data will be used to assess use designations previewed in the Ohio 2012 Integrated Water Quality Monitoring and Assessment Report. The uses, criteria and assessment methods described are considered draft until they are adopted into the Ohio Water Quality Standards. The strategy generally focuses on water quality conditions in the epilimnion of lakes, although the entire water column is examined when the lake is unstratified.

B3. Sample Handling and Custody

Sample Master[®] software is used by DES to manage laboratory information. A guidance manual for use of the software is in Appendix IV of the Surface Water Field Manual (2019d). The sample collector logs into the system and places an order by selecting the appropriate project, stations to be sampled, and test group(s) to be analyzed. The program creates a chain of custody form and container labels for each site.

B4. Analytical Methods

The analytical methods to be used in this study are provided in Appendix 4 along with the preservatives, holding times, and reporting limits. SOPs for the analytical methods are available upon request.

B5. Quality Control

Stream Habitat Evaluation

To ensure technical proficiency and promote standardized observations between and among all Ohio EPA field staff tasked with macrohabitat assessment, participation in annual QHEI refresher training is required. The training pre-dates the onset of sampling activities by several weeks, is field-based, and typically organized and lead by a senior Fish Evaluation Group (FEG) biologist. Participants are asked to independently generate a QHEI from one or several target stream segments; this followed by a group discussion, on-site, where each component of each of the five metrics that comprise the QHEI are reviewed in detail. In this way, all investigators are obliged to revisit guidance material and reaffirm the various definitions, categories, and related classifications that underpin this key assessment tool. The annual refresher has proved an efficient method to discipline observations made by front-line field staff and as such has served as a practical check on investigator drift.

Water Quality Sonde Deployments

Sondes will be calibrated according to manufacturer specification prior to deployment. A calibration record is kept for all sondes. After each deployment, sondes undergo a precision quality control check, for more details see section F and Appendix II of the Surface Water Field Sampling Manual. All field quality control requirements and data validation methods are detailed in the Surface Water Field Sampling Manual.

Temperature Data

Battery-life and quality assurance of the loggers will be tested prior to deployment and upon retrieval. QA of the loggers will be tested by a method called herd calibration. This is done by placing groupings of the loggers into a homogenized water bath and recording the temperature every minute for

approximately 15 – 20 minutes. The deviation of each individual logger should be within 0.5°C from the group average. Loggers that fail the QA test during the pre-deployment test will not be deployed.

Upon receipt of temperature data, the data will go through an initial review process to flag/remove anomalous data. Anomalous data could be a result of a malfunction of the probe or an indication that the probe was not reading accurate information which could occur if the probe was not continuously submerged underwater, became buried under fine sediment, etc. Methods employed will take advantage of the ContDataQC R package developed by Tetra Tech, Inc (<https://github.com/leppott/ContDataQC>). Data will be evaluated in a manner consistent with Ohio EPA's Standard Operating Procedure for the Analysis of Continuous Temperature Data for Determining Coldwater Habitats. See Appendix II, Section G of the Surface Water Field Manual for guidelines

Surface Water Chemistry

Ten percent of the total number of water samples will be submitted to the laboratory as field quality control samples. About five percent will be duplicates, including replicates if natural variability is a concern, and about five percent will be blanks, including field blanks and equipment blanks. Matrix spike duplicates will be collected for organic water samples at a minimum of five percent. Data will be validated based on the results of the field quality control samples as outlined in Appendix IV in the Surface Water Field Sampling Manual (Ohio EPA 2021d). The laboratory will validate data according to the requirements defined in the applicable analytical method (see Appendix 4). Field instruments will be calibrated according to manufacturer guidelines. Field instruments utilizing electrochemical sensors must be calibrated daily.

Chlorophyll

Ten percent of the total number of chlorophyll samples collected will be quality control samples. Approximately five percent will be equipment blanks and five percent will be duplicates. Equipment blanks for benthic and sestonic samples are collected following two separate procedures that are each outlined in Appendix II of the Surface Water Field Sampling Manual (Ohio EPA 2021b). Duplicates are collected as two aliquots pulled from the same sample, designed to measure the variability in sample processing (not sample collection). Chlorophyll data will be validated based on the results of the equipment blanks and duplicates as outlined in Appendix IV in the Surface Water Field Sampling Manual (Ohio EPA 2021d).

Sediment

Ten percent of the number of sediment samples should be collected as quality control samples, approximately 5 percent should be duplicates and 5 percent equipment blanks. Field duplicate samples are collected to determine laboratory analytical variability and/or field compositing techniques and of sediment heterogeneity within a single collected sample. Quality control sampling protocols will follow those listed in Appendix III of the Surface Water Field Sampling Manual. Sediment data will be validated based on the results of the equipment blanks and duplicates as procedures outlined in Appendix IV in the Surface Water Field Sampling Manual (Ohio EPA 2021d).

B6. Instrument/Equipment Testing, Inspection and Maintenance

All instruments/equipment will be inspected prior to each use. All field meters are service annually by the manufacturer to verify that they are operating within specifications. Parts are repaired or replaced at this time if necessary.

B7. Instrument Calibration and Frequency

The appropriate calibration procedure, as specified in the instrument's user manual, must be followed. All calibration solutions used will be checked for expiration dates before utilized. All equipment is assigned a logbook that will detail the equipment's calibration and maintenance history. For more details see Section D and Appendix II of the Surface Water Field Sampling Manual. Other equipment used will follow specifications provided in the biological and habitat methods cited.

B8. Inspection/Acceptance of Supplies

Supplies and consumables will be inspected upon receipt by the field sampling teams. Nearly all supplies utilized for this project are maintained and used during Ohio EPA's normal business operations. The field team leaders will be responsible for ensuring that all sample containers and all needed supplies and consumables are available in advance of all field work. It will be their responsibility to maintain and replenish stock when needed. Consumable supplies include, but are not limited to sample containers, acid preservatives, Lugol's iodine solution, ethyl alcohol, buffers, filters and miscellaneous supplies such as distilled water, disposable gloves, and towels. Field personnel will confirm that all reagents are within applicable shelf life.

B9. Data Acquisition Requirements for Non-Direct Measurements

Data collected for this project and other data previously collected by Ohio EPA will be used to develop data summaries for each waterbody.

B10. Data Management

The data management process is shared by the Division of Surface Water (DSW) and Division of Environmental Services (DES). DES uses Sample Master[®] software to manage laboratory information and DSW uses the Ecological Assessment and Analysis Application (EA3) to manage data. These programs are linked together to allow the transfer of information between the two systems. EA3 software is used to assign a permanent six-digit station ID number to each sampling location and to create a project name to associate locations so data can subsequently be exported and assessed in groups.

Field measurements are collected instantaneously using a multi-parameter meter and saved in an internal file storage system. These files are downloaded to the manufacturer's software, exported to Microsoft Excel[®] and then uploaded to Sample Master[®] so field data can be associated with chemistry data in the database.

Field and chemistry data tabulated in Sample Master[®] are eventually uploaded into EA3. Then, in EA3, the sample collector will review each data sheet for accuracy, validate field QC, add comments and complete edits, if necessary, before approving the sheet. This data is then available for use in IR reports. All agency files are ultimately backed up and housed in the State of Ohio Computer Center (SOCC).

The project leader will maintain the project file in a dedicated folder on SharePoint. The goal or objective is to have a complete record of all decisions about modifications of data collection, validation, or interpretation between the QAPP signoff and project report completion. To achieve this, the project leader will need to be included on emails or otherwise receive summaries of all actions that meet the above description. Project photos should all be filed in the Lynx photo management system.

Section C. Assessment and Oversight of Data Collection

C1. Assessment and Response Actions

Assessments

Periodic assessment of field sites, field equipment, and laboratory equipment is necessary to ensure that data obtained meets project needs. This is an ongoing process that continues every day during project implementation, as well as on larger scale assessments that take place less frequently (*e.g.*, annually). The assessments generally focus on readiness and consistency of implementation but also are looking for continual improvement opportunities.

Daily assessments (for each day of project activities, as applicable) include assessment of field equipment and supplies, laboratory equipment and supplies, completeness of the day's samples and associated field notes, future needs, etc.

Response Actions

Despite best preparations, assessments may find situations requiring corrective actions. Small day-to-day level assessment findings are often addressed by the individual doing the assessment in the field or in the laboratory and are common enough to the process to not necessitate a formal response.

- Laboratory personnel are aware that response may be necessary. Many of these will result in changes to the analytical reporting via data qualifiers and comments, for more information see Appendix IV of the field manual if:
- QC data are outside the warning or acceptable windows for precision and accuracy
- Blanks contain target analytes above acceptable levels
- Undesirable trends are detected in spike recoveries or relative percent difference (RPD) between duplicates
- There are unusual changes in detection limits
- Deficiencies are detected by the laboratory and or project QA officers during any internal or external audits or from the results of performance evaluation samples
- Inquiries concerning data quality are received

Corrective action implementation will be determined by the likelihood that the situation may affect the quality of the data. Field corrective actions will be brought to the attention of the study team for consideration as to their impact on the data, their potential interest to other sampling teams/subcontractors, any future considerations for process improvement, and for their potential

inclusion to the quarterly reports. Laboratory corrective actions will follow regular laboratory procedures and SOPs. Any laboratory corrective action with the potential to affect data quality will be conveyed to the study team leader by the laboratory.

The datalogger installations will be visited periodically over the summer to make sure the logger remains in place within the stream. The dataloggers will be checked as soon as possible after large storm events which may dislodge or bury a logger. It is critical to reset the logger as soon as possible to prevent the loss of no more than several days of the entire data record. Weather and stream conditions will also be monitored if streams are at risk of going dry. Loggers may need to be relocated to deeper pools in the same area.

Reporting and Resolution of Issues

Any audits or other assessments that reveal findings of practice or procedure that do not conform to the written QAPP will be corrected as soon as possible. The study team and QA coordinator will be notified regarding deviations.

Data Completeness

Success of the project will be judged by the resulting data fulfilling the needs outlined in the data objectives. Potential data gaps will be monitored as the project progresses and the project schedule will be revised to fill these gaps where they are determined to be significant or to potentially impact the fulfillment of project objectives.

Reports to Management

The project leader or district supervisor will receive regular updates from field staff throughout the sampling season and will report to division management during Senior Management Team meetings. Any problems that jeopardize completion of the project will lead to memorandum and consultation with program management and quality assurance staff.

The final TSD will report all study results and findings. Aquatic life use attainment will be determined by biological criteria. Causes and sources of aquatic life use impairment will be identified and supported by water chemistry, sediment chemistry, and stream habitat evaluations. Public water supply use will be determined on surface water chemistry and recreational use will be determined on bacteriological results.

Section D. Data Validation and Usability

D1. Data Review, Validation and Verification Requirements

Data verification will be conducted by the study team with assistance from other DSW staff. This process will confirm that sample results received are congruent with samples submitted and parameters requested from the laboratory. The process will also result in summaries of any differences between initial sampling and methods planned in the QAPP and results reported and available. Differences may result from samples not being collected (due to weather, scheduling, etc.), samples not being submitted (due to accidents like broken containers, or delays resulting in being past holding times, etc.), problems at the laboratory (methods changing, containers or equipment breaking), or other reasons. It is also

possible that additional sampling would take place because of field observations/conditions. Documenting deviations from the QAPP is the responsibility of the project leader.

The DES laboratory does the initial validation on all data and may qualify data based on laboratory QA/QC alone or with feedback from the sampler (regarding specific sampling procedures, variable sampling matrix, conditions, blank contamination, duplicate agreement, matrix spike recovery, etc.). The data user can evaluate the data given their knowledge of sampling conditions, expected variability given location and matrix, data uses, etc.

All fish, macroinvertebrate, and habitat data are hand-entered into the EA3 database using a double data entry method. This helps to minimize data entry errors. Final approval of data involves a reconciliation between the paper forms and the electronic data which is completed by the data collector or a database administrator in the Ecological Assessment Unit.

Upon approval in EA3, field and laboratory data cannot be revised without intervention from database administrators in the Agency's Office of Information Technology Services (ITS).

D2. Validation and Verification Methods

Biological and habitat field sampling results will be verified and validated based on field staff experience and qualifications and adherence to training and QA/QC procedures for current and new field staff available in Subsection 1, Part A (macroinvertebrates) and Subsection 2, Part A (Fish and Habitat) in Biological Criteria for the Protection of Aquatic Life: Volume III. Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities.

In addition to verifying data completeness, the study team will oversee data validation for the project that will include confirmation of sample holding times, proper preservatives, sample containers, analysis methods, QA/QC results (including assessment of results for blanks, spikes, and duplicates), etc. This will be an ongoing effort, concluding in a data validation summary to be included in the final report.

The study team will make final decisions regarding validity and usability and will evaluate the sample collection, analysis, and data reporting processes to determine if the data is of sufficient quality to meet the project objectives. Data validation involves all procedures used to accept or reject data after collection and prior to use. These include screening, editing, verifying, and reviewing. Data validation procedures ensure that objectives for data precision and bias will be met, that data will be generated in accordance with the QAPP and SOPs, and that data are traceable and defensible. The process is both qualitative and quantitative and is used to evaluate the project.

The laboratory QA staff will conduct a systematic review of the analytical data for compliance with the established QC criteria using batch and sample QA/QC information including spike, duplicate, and blank results. All technical holding times will be reviewed, the laboratory analytical instrument performance will be evaluated, and results of initial and continuing calibration will be reviewed and evaluated.

Field QC sample results will be evaluated using recently clarified DSW procedures available in Section I of the Surface Water Field Sampling Manual. Much of this work is facilitated by a centralized automated QC data evaluation Excel file. Use of this file is explained in the document “QC Tracking and Data Qualification” available in SharePoint in DSW Quality Management/Documents/DSW Procedures.

For most DSW chemical water quality data, data validation is generally confined to evaluation of blank results, duplicate/replicate results, paired parameter results (defined below) and confirming that samples were properly preserved/prepared (including filtration, *etc.* - if indicated by the method). Standards for evaluation of analytical results of those QC sample types and general field samples are described in Appendix IV, Section A of the Surface Water Field Sampling Manual.

D3. Reconciliation with Data Quality Objectives

Issues related to biological and habitat data uncertainty, including any patterns of analytical or field QC uncertainties, will be assessed by field staff and their management. For most situations, issues can be addressed with acknowledgement of factors captured in the sample metadata which can confirm, explain, and document the data quality concern. Significant, persistent, or unresolved issues will be brought to the attention of the project study team, division QC personnel, and Ecological Assessment Unit and/or DSW management for further evaluation. This combination of personnel will assess how to best label affected data for storage in the EA3 database and how to eliminate or limit any similar problems going forward. Consideration will also be given on how best to memorialize data limitations or anomalies as the data is transferred to other databases, including the WQ Portal, so that future users of the sampling data are aware of any data quality issues or limitations.

Appendix 1. Summary of Sampling Effort*

Type of Sample	# of sites	# of passes	Total #
Biology			
Fish < 20 mi ² (1 pass)	32	1	32
Fish > 20 mi ² (2 pass)	31	2	62
Macroinvertebrate (Quantitative)	34	1	35
Macroinvertebrate (Qualitative)	38	1	39
Fish Tissue			
Fish Tissue	5	1	5
Water Quality			
Inorganic Samples	65	5	325
Nutrient (sonde deployment & Chlorophyll-a)	29	2	58
Semi-volatile Organic Samples (BNA)	15	1	15
Herbicides/Insecticides	4	2	8
Temperature Dataloggers	17-20	1	17-20
Sediment Quality			
Metals	-	1	-
Pesticides/PCB's and Semi-volatile Organics	-	1	-
Bacteria			
<i>E. coli</i> Cultures	45	5	225

* numbers do not include the sampling at potential supplemental sampling locations. Including the supplemental sampling locations in the survey will be dependent on the availability of field staff resources

Appendix 2. Streams, Sampling Locations, and Sampling Types.

Station	Site Name	Ecoregion/ALU *	Drain			Lat.	Lon.	(refer to key in footnote) Sampling
			River Mile	Area (mi ²)	County			
Hocking River Mainstem (01-001-000)								
J01S14	Hocking River Near Hooker @ Campground Rd.	ECBP/WWH	94.9	10.8	Fairfield	39.7475	-82.665	F, Mq, C, N, B
J01K25	Hocking River Near Hooker @ Collins Rd.	ECBP/MWH	94.3	11	Fairfield	39.7441	-82.6578	F, Mq, C, N, O1, B
J01P29 M	Hocking River At Lancaster @ Pierce Ave.	EOLHP/MWH	91.9	32	Fairfield	39.7281	-82.6181	F2, MQ, C, O1, B
J01P05	Hocking River Dst. Lancaster WWTP @ Sugar Grove Rd.	EOLHP/WWH	88.5	65	Fairfield	39.6992	-82.5833	F2, MQ, C, N, FT, O1
J01W30	Hocking River Near Sugar Grove @ Sugar Grove Rd.	EOLHP/WWH	81.9	98.5	Fairfield	39.6222	-82.5531	F2, MQ, C, B
J01S10	Hocking River Dst. Sugar Grove, Adj. Buckeye Rd. Dst. Rush Creek	WAP/WWH	81.3	336	Fairfield	39.6189	-82.5453	F2, MQ, C, N
J01S09	Hocking River at Rockbridge CR 118	WAP/WWH	77.3	450	Hocking	39.583694	-82.518207	B
601530	Hocking River Near Enterprise @ Co. Rd. 31	WAP/WWH	73.3	459	Hocking	39.565	-82.4747	F2, MQ, C, N, FT, O1, B
J02W07	Hocking River DST SR 664 at Mingo Park	WAP/WWH	69.3	469	Hocking	39.53827	-82.4196	B
J02W01	Hocking River at SR 93 Kachelmacher Park	WAP/WWH	68.3	510	Hocking	39.53356	-82.4068	B
J02P09	Hocking River Dst. Logan @ St. Rt. 328	WAP/WWH	66.3	525	Hocking	39.5206	-82.3775	F2, MQ, C, N, FT, O1
J02P11	Hocking River Dst. Nelsonville @ St. Rt. 691	WAP/WWH	51.4	579	Athens	39.44	-82.2106	F2, MQ, C, N
J02K02	Hocking River At Athens, Upst. Margaret Creek, Adj. T.R.404	WAP/WWH	36.7	877	Athens	39.3339	-82.1258	F2, MQ, C

Station	Site Name	Ecoregion/ALU *	Drain			Lat.	Lon.	(refer to key in footnote) Sampling
			River Mile	Area (mi ²)	County			
J02S15	Hocking River At Athens @ Stimson Ave	WAP/WWH	33.0 3	942	Athens	39.3308	-82.0875	C, N
201642	Hocking River 3.0 Mi. Dst. Athens WWTP, 0.6 Mt. Upst. Strouds Run	WAP/WWH	29.5	948	Athens	39.3319	-82.0278	F2, MQ, C, N, O1
Trib. To Hocking R. (RM 62.18) (01-001-005)								
201654	Trib. To Hocking R. (RM 62.18) N. of Haydenville @ St. Rt. 595	WAP/WWH	1.1	4.2	Hocking	39.4986	-82.3242	F, Mq, C, B, T
Trib. To Hocking R. (RM 74.82) (01-001-007)								
201656	Trib. To Hocking R. (RM 74.82) N. of Enterprise @ Twp. Rd. 2	WAP/WWH	0.4	5	Hocking	39.5858	-82.4803	F, Mq, C, T
Claypool Run (01-001-014)								
201662	Claypool Run NW. of Lancaster @ Mouth, Dst. WWTP	ECBP/WWH	0.1	5	Fairfield	39.7575	-82.6725	F, Mq, C
Skunk Run (01-004-000)								
201664	Skunk Run @ Ireland Rd	WAP/WWH	1.5	3.8	Athens	39.243435	-81.785664	B
Jordan Run (01-006-000)								
304312	Jordan Run adj Deep Hollow Rd at Desonier SNP	WAP/WWH	4.48	0.9	Athens	39.23674	-81.868136	F, Mq, T
Fourmile Creek (01-010-000)								
201667	Fourmile Creek Just Upst. U.S. Rt. 50/S.R. 7 Interchange	WAP/WWH	1.73	7.6	Athens	39.2117	-81.8175	F, Mq, C, B
Miller Run (01-015-000)								
201669	Miller Run adj. CR 48	WAP/WWH	1.7	0.9	Athens	39.3106	-81.9244	B
Willow Creek (01-020-000)								
201672	Willow Creek At Stringtown @ Twp. Rd. 129	WAP/WWH	0.2	12.8	Athens	39.3033	-81.9844	F, Mq, C, N, B

Station	Site Name	Ecoregion/ALU *	Drain			Lat.	Lon.	(refer to key in footnote) Sampling
			River Mile	Area (mi ²)	County			
Strouds Run (01-023-000)								
304311	Strouds Run upstream Dow Lake	WAP/WWH	2.5	2.9	Athens	39.352218	-82.047836	F, Mq, C
Margaret Creek (01-024-000)								
J02K09	Margaret Creek E. of Hebbardsville @ Twp. Rd. 55	WAP/WWH	8.6	16.7	Athens	39.2542	-82.1533	F, Mq, C, N, B
J02S01	Margaret Creek W. of Athens @ Mouth	WAP/WWH	1.51	46	Athens	39.3203	-82.1422	F2, MQ, C, N, B
Sugar Creek (01-028-000)								
201688	Sugar Creek at CR 26	WAP/WWH	2.2	5.1	Athens	39.3778	-82.0847	F, Mq, C, B
Hamley Run (01-030-000)								
J02S03	Hamley Run 1.4 Mi. W. of Chauncey @ Mouth	WAP/WWH	0.1	8.2	Athens	39.3942	-82.1639	F, Mq, C, N, B
Fivemile Creek (01-033-000)								
J02S06	Fivemile Creek SE. of Logan @ St. Rt. 328	WAP/WWH	1	13.7	Hocking	39.4958	-82.3658	F, Mq, C, T
Threemile Creek (01-034-000)								
201694	Threemile Creek E. of Logan @ Smith Chapel Rd.	WAP/WWH	1.9	7.9	Hocking	39.5236	-82.3611	F, Mq, C
201693	Threemile Creek E. of Logan @ Old U.S. Rt. 33	WAP/WWH	0.7	8.9	Hocking	39.5108	-82.3547	F, Mq, C, B, T
Oldtown Creek (01-036-000)								
601580	Oldtown Creek At Logan @ Front St.	WAP/WWH	0.62	13.2	Hocking	39.5364	-82.3914	F, Mq, C, B, T
Scott Creek (01-037-000)								
J02W08 R	Scott Creek Adj. St. Rt. 93, Upst. Horse Farm, S. of Ewing	WAP/WWH	8.72	1.6	Hocking	39.4506	-82.4392	F, MQ, C, O1, T
J02S07	Scott Creek At Logan @ Mouth	WAP/WWH	0.01	39.8	Hocking	39.5333	-82.4189	F2, MQ, C, N, B
Clear Fork (01-038-000)								
J02K12	Clear Fork W. of Logan @ Mouth	WAP/WWH	0.1	16.1	Hocking	39.5303	-82.4225	F, Mq, C, B
Buck Run (01-042-000)								

Station	Site Name	Ecoregion/ALU *	Drain			Lat.	Lon.	(refer to key in footnote) Sampling
			River Mile	Area (mi ²)	County			
J01S31	Buck Run At Rockbridge @ Mouth	WAP/WWH	0.01	10.9	Hocking	39.5817	-82.5169	F, Mq, C
Pleasant Run (01-045-000)								
J01S32	Pleasant Run S. of Lancaster @ Co. Rd. 50	EOLHP/WWH	0.76	17.2	Fairfield	39.6753	-82.5561	F, Mq, C, N, B, T
Baldwin Run (01-046-000)								
J01W03	Baldwin Run At Lancaster @ Mouth	EOLHP/WWH	0.01	12.9	Fairfield	39.7064	-82.5856	F, Mq, C, N, B
Hunters Run (01-048-000)								
J01S33	Hunters Run At Lancaster @ Mouth	EOLHP/WWH	0.01	11.1	Fairfield	39.70747	-82.609013	F, Mq, C
Federal Creek (01-100-000)								
J03S08 ALP	Federal Creek at Amesville at SR-550	WAP/EWH	11.8	32.1	Athens	39.4045	-81.9599	F2, MQ, C, B, T
J03P01	Federal Creek Dst. Amesville @ co. rd. 38	WAP/EWH	10.4 6	70	Athens	39.3986	-81.9461	F2, MQ, C, N
J03G05	Federal Creek At Broadwell, Adj. S.R. 329, Near Sand Rock Rd.	WAP/EWH	4.8	120	Athens	39.3639	-81.8808	F2, MQ, C, FT
J03S01 R	Federal Creek N of Stewart, Upst. Twp. Rd. 231, Adj. St. Rt. 329	WAP/EWH	1.4	138	Athens	39.3328	-81.8908	F2, MQ, C, N, FT, O1, B
Sharps Fork (01-160-000)								
J03S09	Sharps Fork E. of Amesville @ St. Rt. 329	WAP/WWH	0.03	35.7	Athens	39.4025	-81.9297	F2, MQ, C, B
McDougall Branch (01-170-000)								
J03K15	McDougall Branch W. of Amesville, Dst. Bryson Branch, Adj. SR. 550	WAP/WWH	4.5	12.4	Athens	39.3942	-82.0114	F, Mq, C
J03K14 R	McDougall Branch SW. of Amesville, 0.2 Mi. Dst. St. Rt. 690	WAP/WWH	2.9	27.3	Athens	39.3825	-81.9911	F2, MQ, C, O1
J03K13	McDougall Branch Near Amesville, Near Mouth	WAP/WWH	0.3	37.6	Athens	39.396987	-81.96013	F2, MQ, C, N, B
Mush Run (01-172-000)								

Station	Site Name	Ecoregion/ALU *	Drain			Lat.	Lon.	(refer to key in footnote) Sampling
			River Mile	Area (mi ²)	County			
201728	Mush Run SW. of Amesville @ Dutch Run Rd.	WAP/WWH	1	12.7	Athens	39.3714	-81.9872	F, Mq, C
Miners Fork (01-192-000)								
J03P07	Miners Fork NNW Amesville @ St. Rt. 329	WAP/WWH	0.05	9.9	Athens	39.4528	-81.9906	F, Mq, C, B
Sunday Creek (01-200-000)								
J02H20	Sunday Creek On N. Edge of Corning @ First Bridge Upst. St. Rt. 155	WAP/WWH	24	8.5	Perry	39.6083	-82.0881	F, Mq, C, B
J02H05	Sunday Creek Upst. Confl E. Br. Sunday Creek	WAP/WWH	18.2	24	Athens	39.5447	-82.0617	Mq, C
J02G86	Sunday Creek At Jacksonville @ Co. Rd. 27	WAP/WWH	10.2	110	Athens	39.4731	-82.0811	Mq, C
J02G75	Sunday Creek Upst. Truetown Seep, Adj. St. Rt. 685	WAP/WWH	7.3	120	Athens	39.4517	-82.1044	Mq, C
J02G73	Sunday Creek Dst. Truetown Seep, Adj St. Rt. 685	WAP/WWH	6.6	122	Athens	39.4408	-82.1064	Mq, C
J02G71	Sunday Creek SW of Millfield @ Private Drive Off St. Rt. 13	WAP/WWH	3.6	128	Athens	39.4239	-82.1136	F2, MQ, C, B
601640	Sunday Creek Near Chauncey @ St. Rt. 13	WAP/WWH	0.23	138	Athens	39.3939	-82.1236	Mq, C
W. Br. Sunday Creek (01-240-000)								
J02G96	W. Br. Sunday Creek N. of McLeish @ Cornstill Rd.	WAP/WWH	6.2	22	Athens	39.5583	-82.1025	F2, MQ, C, N, B
E. Br. Sunday Creek (01-250-000)								
J02H01	E. Br. Sunday Creek Upst. Burr Oak Reservoir @ Co. Rd. 58	WAP/WWH	8.3	17	Morgan	39.5819	-82.0139	F, Mq, C, N, B
Monday Creek (01-300-000)								
J02G58	Monday Creek W of Shawnee @ St. Rt. 93	WAP/WWH	24.2	7.3	Perry	39.6133	-82.2311	F, Mq, C, B
J02G38	Monday Creek At Monday Creek Junction, dst. Dans Run	WAP/WWH	19.7	29	Hocking	39.5797	-82.2758	Mq, C
J02G31	Monday Creek Dst. L. Monday Creek @ Dawley Rd.	WAP/WWH	14.3	62	Hocking	39.5233	-82.2711	Mq, C

Station	Site Name	Ecoregion/ALU *	Drain			Lat.	Lon.	(refer to key in footnote) Sampling
			River Mile	Area (mi ²)	County			
J02P06	Monday Creek Upst. Monkey Hollow @ St. Rt. 278	WAP/WWH	10.3 5	77	Hocking	39.5006	-82.2467	F2, MQ, C, N, B
J02G05	Monday Creek W Of Bessemer @ Loop Rd., Dst. Mcknight Seep	WAP/WWH	4.3	84	Athens	39.4636	-82.2033	Mq, C
J02P07	Monday Creek S Of Doanville @ Elm Rock Rd.	WAP/WWH	0.64	116	Athens	39.4222	-82.1875	Mq, C
Snow Fork (01-310-000)								
J02G07	Snow Fork @ Buchtel dst Whitmore Hollow	WAP/LRW	1.0	26.9	Athens	39.4569	-82.1883	B
L. Monday Creek (01-340-000)								
J02G42	L. Monday Creek SW of Gore @ Price Rd.	WAP/WWH	3.3	22.1	Hocking	39.56	-82.3044	F2, MQ, C, B
Clear Creek (01-400-000)								
201757	Clear Creek NW. of Amanda, Dst. Muddy Prairie Creek	ECBP/WWH	19.6	12.4	Fairfield	39.68	-82.7683	F, Mq, C
J01S02	Clear Creek S. of Amanda @ Clearport Rd.	EOLHP/WWH	9.46	47	Fairfield	39.6181	-82.6806	F2, MQ, C, N, O2, B, T
J01W12	Clear Creek At Revenge @ Revenge Rd.	WAP/WWH	6.99	72	Fairfield	39.6039	-82.6517	F2, MQ, C, N
J01S01 R	Clear Creek At USGS Gauge @ Camp Wyandot Bridge	WAP/WWH	2.03	89	Hocking	39.5883	-82.5783	F2, MQ, C, N, O2, B, T
Muddy Prairie Run (01-420-000)								
J01S06 R	Muddy Prairie Run Near Clearport @ Clearcreek Rd.	ECBP/WWH	0.48	10.2	Fairfield	39.62	-82.6744	F, MQ, C, O1, T
Rush Creek (01-500-000)								
J01K07	Rush Creek W. of Junction City, Upst. Center Branch	WAP/LRW	21	45.6	Perry	39.7231	-82.3403	F2, MQ, C, O2, B
J01P02	Rush Creek Upst. Bremen @ Jerusalem Rd.	EOLHP/LRW	17.4	95	Perry	39.7183	-82.4022	F2, MQ, C, N, B
J01S17	Rush Creek Upst. Sugar Grove @ Hansley Rd.	EOLHP/WWH	2.05	234	Fairfield	39.6447	-82.5294	F2, MQ, C, N, O2, B
601610	Rush Creek at CR 65 Maple Street in Sugar Grove	WAP/WWH	0.22	235	Fairfield	39.6249	-82.5475	B
Turkey Run (01-520-000)								

Station	Site Name	Ecoregion/ALU *	Drain			Lat.	Lon.	(refer to key in footnote) Sampling
			River Mile	Area (mi ²)	County			
J01K10 R	Turkey Run SE. of Bremen @ Bethel Rd.	WAP/WWH	1.12	8	Fairfield	39.6639	-82.3831	F, MQ, C, O1, T
Raccoon Run (01-530-000)								
J01K11	Raccoon Run W. of Bremen @ Lane off Bremen Rd.	EOLHP/WWH	3.3	13.8	Fairfield	39.7031	-82.4747	F, Mq, C
J01P15	Raccoon Run S. of Bremen @ St. Rt. 312	EOLHP/WWH	0.39	27.4	Fairfield	39.6878	-82.4311	F2, MQ, C, N, B, T
Little Rush Creek (01-540-000)								
J01G43	Little Rush Creek NW. of New Reading @ Rush Creek Rd.	EOLHP/WWH	17.3	15.9	Perry	39.8175	-82.3731	F, Mq, C, B, T
J01G44	Little Rush Creek Dst. Rush Creek Lake @ St. Rt. 664	EOLHP/WWH	9.20	30	Fairfield	39.7997	-82.4278	F2, MQ, C, N, B
304313	Little Rush Creek at Gun Barrel Rd	ECBP/WWH	8.05	32.7	Fairfield	39.797529	-82.443953	F2, MQ, C, N, B
Center Branch Rush Creek (01-550-000)								
J01P13	Center Branch Rush Creek W. of Junction City @ St. Rt. 37	WAP/WWH	0.01	24.9	Perry	39.7236	-82.3433	F2, MQ, C, B, T
State Park Lakes								
201742	Burr Oak Reservoir, L-1	WAP/EWH	--	--	Athens	39.5422	-82.0572	IL
300793	Burr Oak Reservoir, L-2	WAP/EWH	--	--	Morgan	39.5357	-82.0282	IL
201700	Lake Logan L-1	WAP/EWH	--	--	Hocking	39.5361	-82.4494	IL
Drinking Water Reservoirs								
201780	New Lexington Reservoir #1, L-1	WAP/EWH	--	--	Perry	39.7336	-82.2158	IL
204590	New Lexington Reservoir #2, L-1	WAP/EWH	--	--	Perry	39.7339	-82.2158	IL
204601	Somerset Reservoir, L-1	EOLHP/EWH	--	--	Perry	39.7839	-82.2919	IL
201796	Lake St. Joseph, L-1	WAP/EWH	--	--	Perry	39.7700	-82.2889	IL

TBD – to be determined

* -- Potential supplemental sampling locations. Sampling and the level of assessment at these stations is dependent on the availability of field staff resources

M – modified reference site. R – reference site.

Code Sample Type

Code Sample Type

F	Fish – 1 Pass	O1	Organics -- SVOCs (semi-volatile organic compounds)
F2	Fish – 2 Pass	O2	Organics -- herbicides and Pesticides
FT	Fish Tissue	B	<i>E. coli</i> bacteria
MQ	Macroinvertebrate - Quantitative (HD)	S	Sediment
Mq	Macroinvertebrate – Qualitative	N	Nutrient site
C	Chemistry	T	Temperature datalogger
IL	Inland Lake		

Appendix 3. NPDES Permitted Facilities

Nested Sub-watershed	Ohio Permit Number	Facility Name	Design Flow ¹ (MGD)	Average Flow ² (MGD)	Type of Waste ³	Stream and River Mile at Discharge	County
05030204-							
01-01	0IM00011	Premier Scaffold Solutions	0.00157	0.000075	Industrial	UNT Center Branch Rush Creek (2.09) at RM 1.4	Perry
01-01	0PB00040	Somerset WWTP	0.25	0.1602	Public	Somerset Creek at RM 2.83	Perry
01-02	0IN00055	Ludowici Roof Tile Inc	0.01	---	Industrial	UNT Rush Creek (27.09) at RM 0.25	Perry
01-02	0IN00228	RVM Realty Inc New Lexington Bulk Plant	0.0005	0.000065	Industrial	UNT Rush Creek (28.65) at RM 0.15	Perry
01-02	0IN00251	Tunnell Hill Reclamation LLC	N/A	0.41	Industrial	Rush Creek at RM 32.34	Perry
01-02	0PA00074	Junction City WWTP	0.1	0.038	Public	Rush Creek at RM 23.15	Perry
01-02	0PC00008	New Lexington WWTP	0.87	0.655	Public	Rush Creek at RM 27.4	Perry
02-02	4PR00002	Rushville Lagoons	0.029	0.291	Public	Little Rush Creek	Fairfield
02-02	4PT00008	Country Lane Gardens HC	0.030	0.0122	Public	UNT to Little Rush Creek	Fairfield
02-04	4PA00001	Sugar Grove WWTP	0.070	0.046	Public	Rush Creek	Fairfield
02-04	4PB00002	Bremen WWTP	0.336	0.188	Public	Rush Creek at RM 14.88	Fairfield
02-04	0PR00162	Camp Akita	0.02	0.0005235	Public	UNT Rush Creek (6.11) at RM 0.3	Hocking
03-01	4IN00160	Republic Services Pine Grove Regional Facility**	0.010	0.0239	Public	UNT to Clear Creek	Fairfield
03-01	4PB00021	Amanda WWTP	0.1269	0.2995	Public	Clear Creek	Fairfield
03-02	4PP00011	Southeastern Correctional Institute	0.400	0.1902	Public	UNT to Arney Run (4.20) at RM 0.97	Fairfield
03-02	0PR00156	Camp Wyandot-Lodge	0.0187	0.0033685	Public	Clear Creek at RM 1.8	Hocking
04-01	4IN00169	Blackhorse Energy-Lancaster Bulk	0.000093	0.0432	Industrial	Hocking River	Fairfield
04-01	4IN00179	Lancaster Stonewall Cemetery Road Landfill	0.176	0.002471	Industrial	UNT to Hunter's Run	Fairfield
04-01	4PD00102	Upper Hocking WPCF	2.000	1.4117	Public	Hocking River at RM 94.54	Fairfield
04-02	4PD00001	Lancaster WPCF	10.000	6.0	Public	Hocking River at RM 89.05	Fairfield
04-03	4PG00028	Lakeside Estates Water Reclamation Facility	0.030	0.012	Public	UNT to Pleasant Run	Fairfield
04-03	4PG00030	Pleasant Lea Water Reclamation Facility	0.040	0.012	Public	UNT to Pleasant Run	Fairfield
04-03	4PX00014	South Central Power	0.0035	0.00072	Public	UNT to Pleasant Run	Fairfield
04-04	4PR00094	Geneva Hills Center WWTP	0.007	0.00175	Public	UNT to Hocking River	Fairfield

Nested Sub-watershed	Ohio Permit Number	Facility Name	Design Flow ¹ (MGD)	Average Flow ² (MGD)	Type of Waste ³	Stream and River Mile at Discharge	County
04-04	4PV00121	Brookdale MHP	0.0081	0.00327	Public	UNT to Hocking River	Fairfield
04-04	4PV00122	Restover MHP	0.0015	0.0007	Public	Hocking River	Fairfield
04-04	4PV00123	Yogi's MHP	0.0015	0.00054	Public	Hocking River	Fairfield
04-04	4PW00009	Pine Lakes Estate No 1	0.0125	0.0061	Public	UNT to Hocking River	Fairfield
04-04	4PY00002	Rustic Ridge MHP	0.030	0.018	Public	UNT to Hocking River	Fairfield
04-04	4PY00004	Colony Village	0.0141	0.008	Public	Pleasant Run	Fairfield
04-05	OPH00014	Rockbridge WWTP	0.028	0.21	Public	Hocking River at RM 77.7	Hocking
05-02	OPA00017	Shawnee WWTP	0.093	0.0255	Public	Monday Creek at RM 24.4	Perry
05-02	OPA00068	New Straitsville WWTP	0.095	0.0571	Public	UNT Monday Creek (20.03) at RM 2.4	Perry
06-01	OPG00007	Lake Moor Estates Subdivision	0.03	0.016	Public	Lake Logan (Clear Fork) at RM 3.0	Hocking
06-02	OPX00005	Property Owners Assoc Inc Lost Hollow Campgrounds	0.06	0.016	Public	UNT Dry Run (6.48) at RM 2.9	Hocking
06-03	OIN00005	Savant Technologies LLC - Logan Glass Plant	0.04	---	Industrial	Oldtown Creek at RM 2.0	Hocking
06-03	OIN00123	Carborundum Grinding Wheel Resnoid Products Plant	0.0028	0.0026	Industrial	Oldtown Creek at RM 0.45	Hocking
06-03	OPD00009	Logan WWTP	1.6	1.1275	Public	Hocking River at RM 67.58	Hocking
06-04	OPT00013	Union Furnace Elem School WWTP	0.003	0.00254	Public	UNT Fivemile Creek (0.68) at RM 0.1	Hocking
06-05	OIJ00052	Mar-Zane Materials Inc	N/A	---	Industrial	Hocking River at RM 73.1	Hocking
06-05	OIZ00030	Logan WTP	0.625	0.0495	Industrial	Hocking River at RM 68.4	Hocking
06-05	OPT00028	Enterprise Elem School	0.003	0.000094	Public	UNT Hocking River (73.29) at RM 0.4	Hocking
06-06	OIN00056	Athens-Hocking Landfill	N/A	0.009	Industrial	UNT Hocking River (56.05) at RM 0.85	Athens
06-06	OPC00006	Nelsonville WWTP	0.55	0.557	Public	Hocking River at RM 52.08	Athens
06-06	OPG00062	Haydenville WWTP	0.0225	0.027	Public	Hocking River at RM 60.88	Hocking
06-06	OPT00038	Hocking Co Board of Developmental Disabilities	0.0025	0.00025	Public	UNT Hocking River (62.19) at RM 0.65	Hocking
07-01	OPP00002	ODNR Burr Oak State Park Lodge & Cabins	0.035	---	Public	Burr Oak Reservoir - East Branch Sunday Creek at RM 3.15	Morgan
07-02	OIV00010	Burr Oak Regional WTP**	0.0327	---	Industrial	UNT Sunday Creek (18.2)	Athens

Nested Sub-watershed	Ohio Permit Number	Facility Name	Design Flow ¹ (MGD)	Average Flow ² (MGD)	Type of Waste ³	Stream and River Mile at Discharge	County
07-02	OIL00144	Buckingham Mine Complex**	0.016	---	Industrial	UNT Dotson Cr (0.12) at RM 14	Perry
07-02	OPA00100	Corning WWTP	0.06	0.024	Public	Sunday Creek at RM 22.75	Perry
07-03	OIN00270	ODOT Hollister Outpost	N/A	---	Industrial	Muddy Fork at RM 2.4	Athens
07-03	OIL00168	CCU Coal & Construction LLC - Johnston Run Mine	0.9	---	Industrial	Johnston Run at RM 0.12	Athens
07-03	OPT00033	Southern Local School District	0.01	0.0027	Public	West Branch Sunday Creek at RM 11.72	Perry
07-04	OIL00139	CCU Coal & Construction LLC D-1163**	0.0327	0.0144	Industrial	UNT Sunday Creek (14.73) at RM 0.45	
07-04	OPB00086	Trimble Township WWTP	0.283	0.24995	Public	Sunday Creek at RM 9.15	Athens
08-01	OIN00231	Athens County 691 Landfill	N/A	0.0153425	Industrial	UNT Hocking River (48.7) at RM 0.5	Athens
08-01	OIZ00023	Le-Ax Water District	N/A	0.04	Industrial	Hocking River at RM 49.19	Athens
08-01	OPB00006	Chauncey WWTP	0.345	0.1879	Public	Hocking River at RM 43.2	Athens
08-02	OPB00087	Albany WWTP	0.13	0.111	Public	UNT Margaret Creek (11.36) at RM 0.58	Athens
08-02	OPR00165	Hocking College - Lake Snowden	0.012	0.0004	Public	UNT North Branch Margaret Creek (0.75) at RM 0.9	
08-02	OPV00007	Village at Rolling Hills	0.025	0.0022	Public	Margaret Creek at RM 5.3	Athens
08-02	OPW00018	Capstone Village Apartments**	0.0075	0.00252	Public	UNT Margaret Creek (5.14) at RM 0.3	Athens
08-02	OPX00008	Health Recovery Services**	0.0025	0.00135	Public	UNT Margaret Creek (5.14) at RM 1.51	Athens
08-03	OPR00062	Athens Golf & Country Club	0.018	0.00233	Public	UNT Margaret Creek (3.83) at RM 1.01	Athens
08-03	OPV00001	Spreading Oaks MHP WWTP	0.03	0.019	Public	UNT Dirty Creek (0.19) at RM 1.3	Athens
08-03	OPV00531	Happy Valley Estates MHP	0.014	0.0079	Public	West Branch Margaret Creek at RM 0.68	Athens
08-03	OPW00029	Ron Campbell Apartments	0.00042	0.0005	Public	Ditch to Little Factory Creek (1.42) at RM 0.02	
08-04	OIZ00000	Athens WTP	0.05	0.16	Industrial	Hocking River RM 36.03	Athens
08-04	OPJ00005	The Plains SD No 1 Buchtel	0.6	0.169	Public	Hocking River at RM 40.3	Athens
09-03	OPA00101	Amesville WWTP**	0.0182	0.005	Public	Federal Creek at RM 11.45	Athens

Nested Sub-watershed	Ohio Permit Number	Facility Name	Design Flow ¹ (MGD)	Average Flow ² (MGD)	Type of Waste ³	Stream and River Mile at Discharge	County
10-01	OIN00225	RVM Realty South Inc - Moore's Athens Bulk Plant	0.000375	0.000001	Industrial	Storm Sewer to Hocking River at RM 32.93	Athens
10-01	OPD00000	Athens WWTP	4.8	2.1375	Public	Hocking River at RM 32.52	Athens
10-02	OPV00036	Mansfield Trailer Park	0.0005	0.000325	Public	UNT Hocking River (21.64) at RM 0.2	
10-04	OPA00106	Village of Coolville WWT Facility**	0.549	0.014	Public	UNT Hocking River (4.97) at RM 0.35	Athens
10-04	OPP00087	ODOT Torch Rest Area WWTP	0.01	0.001888	Public	UNT Skunk Run (2.31) at RM 0.9	Athens
10-04	OPR00109	Bobo RV Campground	0.0125	---	Public	UNT Hocking River (1.6) at RM 0.2	Athens
10-04	OPR00158	Blue Heron Campground	0.00769	0.000613	Public	Ross Run at RM 0.15	Athens
10-04	OPT00047	Federal Hocking Middle & Sr HS	0.0009	0.002323	Public	UNT Hocking River (14.47) at RM 0.24	Athens

1 Design flows that are greater than 1.0 million gallons per day (MGD) classify a facility as a major discharger.
 2 Average flows are displayed for January 2017 through February 2022 (last five years) unless otherwise noted.
 3 Storm water indicates that this facility is only designed to treat storm water associated with an industrial activity and therefore does not have a design flow rate.
 ** Indicates a facility where more than one outfall is present. In these cases, only the primary (001) outfall flow data is listed here.

Appendix 4. List of Physical/Chemical Parameters and Reporting Limits

Parameter	Method	Water (RL)	Sediment (RL)	Fish Tissue
Oxygen Demand				
BOD, 5 day	SM 5210B	2 mg/L		
cBOD, 20 day	OEPA 310.2	2 mg/L		
COD	SM 5220D	20 mg/L		
Physical Properties				
Alkalinity	USEPA 310.1	5 mg/L		
Hardness	USEPA 200.7	10 mg/L		
Dissolved Oxygen (mg/l and % saturation)	Field Meter/Sonde	0 mg/L 0% sat		
pH	Field Meter/Sonde	0 s.u.		
pH		0 s.u.	0 s.u.	
Specific Conductance	SM 2510B	1 µS/cm		
Specific Conductance	Field Meter/Sonde	1 µS/cm		
Temperature	Field Meter/Sonde	0 °C		
Total Dissolved Solids	SM 2540C	10 mg/L		
Total Suspended Solids	SM 2540D	5 mg/L		
% Solids	SM 2540G		0%	
% Lipids	OEPA 581.5			0%
Nutrients				
Ammonia-N	USEPA 350.1	0.05 mg/L	7 mg/kg	
Nitrate-Nitrite	USEPA 350.1	0.5 mg/L		
Nitrite	USEPA 353.2	0.02 mg/L		
Total Kjeldahl Nitrogen	USEPA 351.2	0.2 mg/L		
Total Phosphorus	USEPA 365.4	0.01 mg/L	50 mg/kg	
Orthophosphate (as P)	USEPA 365.4	0.01 mg/L		
Total Organic Carbon	SM 5310B	2 mg/L	0.1%	
Dissolved Organic Carbon	SM 5310C	2 mg/L		
Anions				
Carbonate/Bicarbonate	SM 2320B			
Chloride	USEPA 325.1	5 mg/L		
Sulfate	USEPA 375.2	10 mg/L		
Cations				
Aluminum	USEPA 200.7	200 µg/L	200 µg/L	

Parameter	Method	Water (RL)	Sediment (RL)	Fish Tissue
Barium	USEPA 200.7	15 µg/L	15 µg/L	
Calcium	USEPA 200.7	2 mg/L	2 µg/L	
Iron	USEPA 200.7	50 µg/L	50 µg/L	
Magnesium	USEPA 200.7	1 mg/L	1 µg/L	
Manganese	USEPA 200.7	10 µg/L	10 µg/L	
Potassium	USEPA 200.7	2 mg/L	2 µg/L	
Sodium	USEPA 200.7	5 mg/L	5 µg/L	
Strontium	USEPA 200.7	30 µg/L	30 µg/L	
Metals				
Zinc	USEPA 200.7	10 µg/L	8 mg/kg	
Arsenic	USEPA 200.8/SM 3113B	2 µg/L	0.8 mg/kg	0.05mg/kg
Beryllium	USEPA 200.8		20 µg/L	
Cadmium	USEPA 200.8/SM 3113B	0.2 µg/L	0.08 mg/kg	.004 mg/kg
Chromium	USEPA 200.8	2 µg/L	0.8 mg/kg	
Cobalt	USEPA 200.8		2 µg/L	
Copper	USEPA 200.8	2 µg/L	0.8 mg/kg	
Lead	USEPA 200.8/SM 3113B	2 µg/L	0.8 mg/kg	0.04 mg/kg
Nickel	USEPA 200.8	2 µg/L	0.8 mg/kg	
Selenium	USEPA 200.8/SM 3113B	2 µg/L	0.8 mg/kg	0.05 mg/kg
Silver	USEPA 200.8		0.08 mg/kg	
Titanium	USEPA 200.7		50 µg/L	
Vanadium	USEPA 200.7		50 µg/L	
Mercury	USEPA 245.1/SM 3113B		0.02 mg/kg	0.02 mg/kg
Bacteria				
Escherichia coliform	USEPA 1603	2 CFU		
Algal Biomass				
Chlorophyll a	USEPA 445.0	2 µg/L		
Microcystins	OEPA 701.0	(0.3 µg/L) ^α		
Saxitoxin	OEPA 702.0	(0.022 µg/L) ^α		
Cylindrospermopsin	OEPA 703.0	(0.05 µg/L) ^α		
Anatoxin-a	OEPA 706.0	(0.4 µg/L) ^α		
Organic Compounds				
Atrazine	OEPA 704.0	0.3 µg/L		
Chlorinated Herbicides	USEPA 515.1	40 µg/L		
Acid Herbicides	USEPA 525.2	200 µg/L		
Semi-volatile organics	USEPA 625	2-20 µg/L		

Parameter	Method	Water (RL)	Sediment (RL)	Fish Tissue
Semi-volatile organics	USEPA 8270C	2 – 10 mg/l	0.4-2 mg/kg	
Organochlorine Pesticides	USEPA 8082A/OEPA 590.1	1-10 µg/L	4 µg/kg	10 µg/kg
PCBs	USEPA 8082A/OEPA 590.1		20 µg/kg	50 µg/kg

^a Lake value provided in parenthesis if different or if parameter only applies to lake samples.

Appendix 5. Safety Contacts and Hospital Locations

Safety:	
County Wildlife Officers:	County Sheriff:
Athens County – Ryan Donnelly, (740) 541-8266 Fairfield County – Tony Zerkle, (614) 902-4210 Hocking County – Chris Dodge, (614) 257-7792 Morgan County – (614) 563-5338 Perry County – Mark Basinger, (614) 565-0137	Athens County – Rodney Smith, (740) 593-6633 Fairfield County – Alex Lape, (740) 652-7252 Hocking County – Lanny E. North, (740) 385-2131 Morgan County – Douglas J. McGrath, (740) 962-1366 Perry County – William R. Barker, (740) 342-4123 Ext. 1803
OEMA:	State Highway Patrol:
Athens County – (614) 296-4724 Fairfield County – (614) 296-4364 Hocking County – (614) 296-4724 Morgan County – (614) 296-4724 Perry County – (614) 296-4724	Athens/Hocking County – (740) 593-6611 Fairfield/Perry County – (740) 654-1523 Morgan County – (740) 374-6616
Hospitals:	
Fairfield Medical Center 401 N Ewing St. Lancaster, OH 43130 (740) 687-8000	Genesis Perry County Medical Center 301 Dr Mike Clouse Dr Suite 2 Somerset, OH 43783 (740) 743-3800
Hocking Valley Community Hospital 601 OH-664 N Logan, OH 43138 (740) 380-8000	OhioHealth O’Bleness Hospital 55 Hospital Dr Athens, OH 45701 (740) 593-5551

Appendix 6. Additional Unverified and SHQW Streams

Unverified in <i>OAC 3745-01-08</i>				
McGill Run	Tar Creek	Rowell Run	Miller Run	Butts Run
Ross Run	Jordan Run Tribs	Twomile Run	Tiger Run	Rocky Run
Wolfpen Creek	Lead Run	Piper Run	Green Run	Lick Run
Canaanville Run	Little Factory Creek	Mill Creek	Car Bailey Run	Bloody Run
Shawnee Creek	Monkey Run	Black Run	Toby Creek	Muddy Run
Somerset Cr. Trib	Fetters Run	Sugar Run	Linscott Run	Ewing Run
Hyde Branch				
SHQW of the Hocking River in <i>OAC 3745-1-05</i>				
Spring Run	Big Run	Nellis Run	Marietta Run	Brill Run
Joe's Run	Wildcat Run			

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