Quality Assurance Project Plan (QAPP) for the Biological and Water Quality Study of the Mad River Watershed, 2023

Ohio EPA Technical Report AMS/2023-MADRV-1
Division of Surface Water
June 2023

TMDL DEVELOPMENT | ●○○○○

Quality Assurance Project Plan (QAPP) for the Biological and Water Quality Study of the Mad River Basin Watershed, 2023

Champaign, Clark, Greene, Logan, Miami, and Montgomery Counties, Ohio

Version 1.0

June 2023

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Section A

A1. Title and Approval

Quality Assurance Project Plan for the Biological and Water Quality Study of the Mad River Basin watershed, 2023

Archie L. Lunsey II — Date: 6/27/23
Archie Lunsey, Division Assistant Chief

Date: 6/8/2023
Marianne Piekutowski, Assessment, Modeling & TMDL Section Manager

Melinda Harris — Date: 6/12/2023
Melinda Harris, Standards and Technical Support Section Manager

BenjaminARich — Date: 6/8/2023
Ben Rich, Ecological Assessment Unit Supervisor

Katherine K. Harris — Date: 6/21/2023
Katherine Harris, DSW Quality Assurance Coordinator

Joe Miller — Date: 6/22/2023
Joseph Miller, SWDO DSW Environmental Manager

Leah R. Kaldy — Date: June 8, 2023
Leah Kaldy, Study Coordinator

List of Acronyms - (Glossary of Terms can be found *here*)

2C	Priority Pollutant Analyte List Form
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
Mlwb	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
SO_4	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

A2. Table of Contents

List of Appendices

List of Figures

List of Tables

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	
DSW Central Office		
Tiffani Kavalec, Environmental Administrator	Vacant	(614) 644-3538
Archie Lunsey, Asst. Environmental Administrator	*archie.lunsey@epa.ohio.gov*	(614) 644-2033
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Melinda Harris, Environmental Manager	*melinda.harris@epa.ohio.gov*	(614) 728-1357
Bob Miltner, Environmental Specialist 3	*robert.miltner@epa.ohio.gov*	(614) 836-8796
Katherine Harris (QA/QC Officer)	*katherine.harris@epa.ohio.gov*	(614) 644-2014
John Estenik, Environmental Specialist 3	*john.estenik@epa.ohio.gov*	(614)-644-2866
Mariah Hood, Environmental Specialist 3	*mariah.hood@epa.ohio.gov*	(614) 644-2865
Rich Budnik, Environmental Specialist 2	*richard.budnik@epa.ohio.gov*	(614) 664-4200
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Walter Ariss, Environmental Manager	*walter.ariss@epa.ohio.gov*	(614) 644-3075
Kathryn Hamilton, Environmental Specialist 2	*kathryn.hamilton@epa.ohio.gov*	(614) 644-4132
Emily Keil-Loudner, Environmental Specialist 2	*emily.keil-loudner@epa.ohio.gov*	(614) 728-2384
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Leah Kaldy, Environmental Specialist 2	*leah.kaldy@epa.ohio.gov*	(614) 836-8784
Brian Alsdorf, Environmental Specialist 2	*Brian.Alsdorf@epa.ohio.gov*	(614) 836-8770
DSW Southwest District Office		
Joseph Miller, Environmental Manager	*joby.jackson@epa.ohio.gov*	(937) 285-6029
Michelle Waller, Environmental Specialist 2	*michelle.waller@epa.ohio.gov*	(937) 285-6028
Matt Walbridge, Environmental Specialist 2	*matt.walbridge@epa.ohio.gov*	(937) 285-6095
Rob Zimmer, Environmental Specialist 2	*robert.zimmer2@epa.ohio.gov*	(937) 285-6444
Jacob Taylor, Environmental Specialist 2	*jacob.taylor@epa.ohio.gov*	(937) 285-6096
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
DDAGW Central Office		
Allison Reed, Environmental Manager	*allison.reed@epa.ohio.gov*	(937) 285-6447
Callie Nauman, Environmental Specialist 2	*callie.nauman@epa.ohio.gov*	(614) 644-2752

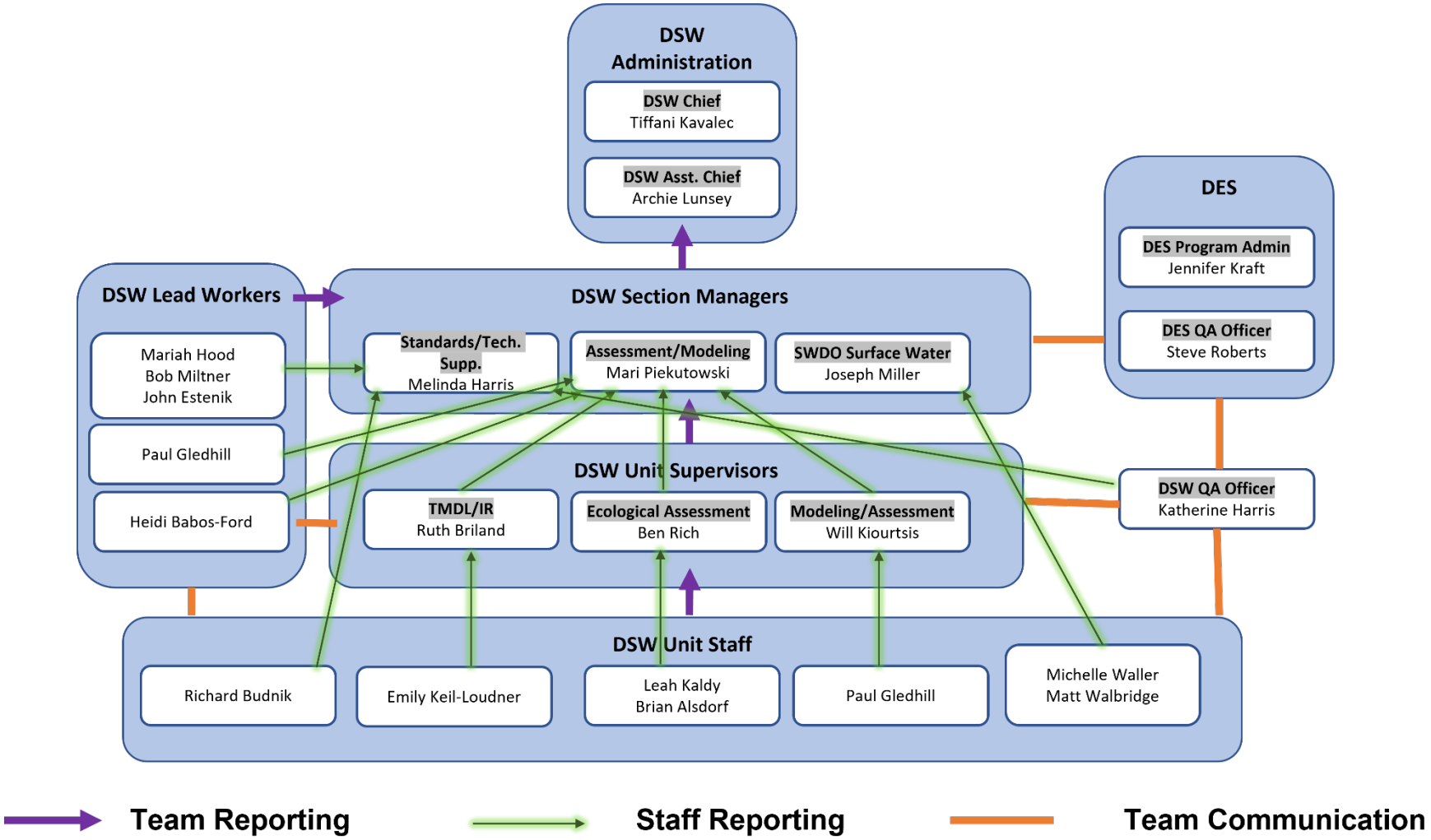
A4. Project Organization and Communication

Table 2 — Roles and Responsibilities.

Individual(s) Assigned:	Responsible for:	Authorized to:
Division of Surface Water		
Vacant 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 & TMDL Section Manager	Overall management of monitoring section.	Assign staff; approve plans; edit reports.
Ruth Briland TMDL and IR Unit Supervisor	Coordination of biennial Integrated Report update; TMDL program development.	Assign and support staff; edit reports.
Emily Keil-Loudner TMDL and IR Unit Staff	Leading TMDL projects.	Write assigned TMDL sections.
Will Kiourtsis Modeling & Assessment Unit Supervisor	Supporting modeling field crews with supplies, equipment and training.	Obtain approvals and signatures; develop budgets; conduct field audits; edit reports.
Paul Gledhill Modeling & Assessment Unit Lead Worker	Modeling and assessment technical guidance and review. 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.
Melinda Harris 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.
John Estenik Standards and Tech Support Lead Worker	Implement DSW's quality management program.	Provide quality support.
Rich Budnik 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-Ford 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.

Individual(s) Assigned:	Responsible for:	Authorized to:
Brian Alsdorf 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.
Leah Kaldy Ecological Assessment Unit Bug Crew Leader	Macroinvertebrate population assessments and overall study coordination.	Plan and coordinate study. Schedule and complete assigned field activities. Tabulate data and write discussion for technical report.
Joseph Miller District Surface Water Section Manager	Implementing division goals at the district level.	Review documents and reports; suggest changes and edits; obtain approvals and signatures.
Rob Zimmer & Jacob Taylor SWDO District Permits & Enforcement	NPDES permit related issues.	Obtain wastewater and storm water permit information needed for planning and reporting.
Michelle Waller & Matt Walbridge SWDO 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		
Allison Reed Source Water Characterization and Protection Manager	Management of source water characterization and protection section.	Assign staff, approve plans, and edit reports.
Callie Nauman Central Office Emerging Contaminants	Harmful Algal Bloom program implementation	Coordinate with DSW on drinking water intake and inland lake monitoring.

Figure 1 — Organization Chart. (editable version *HERE*)



A5. Problem Definition & Background

Watershed Monitoring and Assessment History

As part of Ohio's statewide monitoring strategy, biological, and water quality assessments will be done during the 2023 field season in the Mad River watershed. The study area encompasses Champaign, Clark, Greene, Logan, Miami, and Montgomery counties. The Mad River watershed spans one 8-digit hydrologic unit code (HUC) and is composed of twenty-seven 12-digit watershed assessment units (WAUs). The HUCs and their description are listed in Table 3 and Figure 2 is a map of the watershed with station IDs. Information collected as part of this survey will support the Data Quality Objectives listed in A7.

The Mad River watershed was last studied by Ohio EPA in 2003. Ambient biological, macro-habitat and water quality data were collected and evaluated. Ohio EPA determined that 22 of the 107 sites sampled in the Mad River watershed did not support their designated or recommended aquatic life uses, or the Primary Contact Recreational use. The Mad River and some of its tributaries were found to be impaired by fecal coliform bacteria. Other historical causes of impairment include nutrient and organic enrichment resulting from agricultural activities, urban runoff, or wastewater treatment plants. Habitat alterations as a result of channelization has also been a contributing factor to the degradation of several stream segments in the past.

Following the 2003 basin survey, a Total Maximum Daily Load (TMDL) report was prepared for the Mad River watershed and approved by the United States Environmental Protection Agency (U.S. EPA) in 2010. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. 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.

TMDLs were developed for fecal coliform to address impairment of recreational uses and also for nitrate, habitat and bedload sediment to address impairment of aquatic life uses in the Mad River watershed. Recommendations for fecal coliform reduction included eliminating cattle access to streams, addressing home sewage treatment systems by connecting unsewered residences to centralized treatment systems, and using agricultural best management practices (BMPs) to filter nutrients and bacteria from surface runoff. Reductions in nitrate loading to streams via surface runoff and groundwater infiltration were also recommended. Stream restoration and bio-engineering techniques were recommendations made in the TMDL report to improve habitat and water quality in channelized streams.

Multiple organizations have been active in the Mad River watershed, including the Mad Men (Trout Unlimited), B-W Greenway Community Land Trust, the Lower Mad River Watershed Protection Group (includes Champaign Soil and Water Conservation District (SWCD) and Clark SWCD), Five Rivers MetroParks, and the Miami Conservancy District. The Mad River Steering Committee was historically a joint effort that included representatives from all the organizations and agencies involved with the watershed, including Champaign SWCD, Logan SWCD, Ohio State University (OSU) Extension, Ohio Department of Natural Resources (ODNR), and Ohio EPA.

More information on previous studies done in the Mad River watershed can be found on Ohio EPAs TMDL page published at: ***https://epa.ohio.gov/divisions-and-offices/surface-water/reports-data/total-maximum-daily-load-tmdl-program***

As part of Ohio's statewide monitoring strategy, the study planned for the 2023 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 Mad River watershed is located in west-central Ohio and drains approximately 657 mi^2 into the Great Miami River in Dayton. Urban areas in the watershed include Dayton, Fairborn, Springfield, Urbana and West Liberty. The study area includes over 61 miles of the Mad River beginning in the headwaters and extending to near the confluence with the Great Miami River. Subwatersheds within the study area include Nettle Creek, Buck Creek, Donnels Creek and Mud Run. The HUCs and their description are listed in Table 3 and Figure 2 is a map of the watershed with sampling location information.

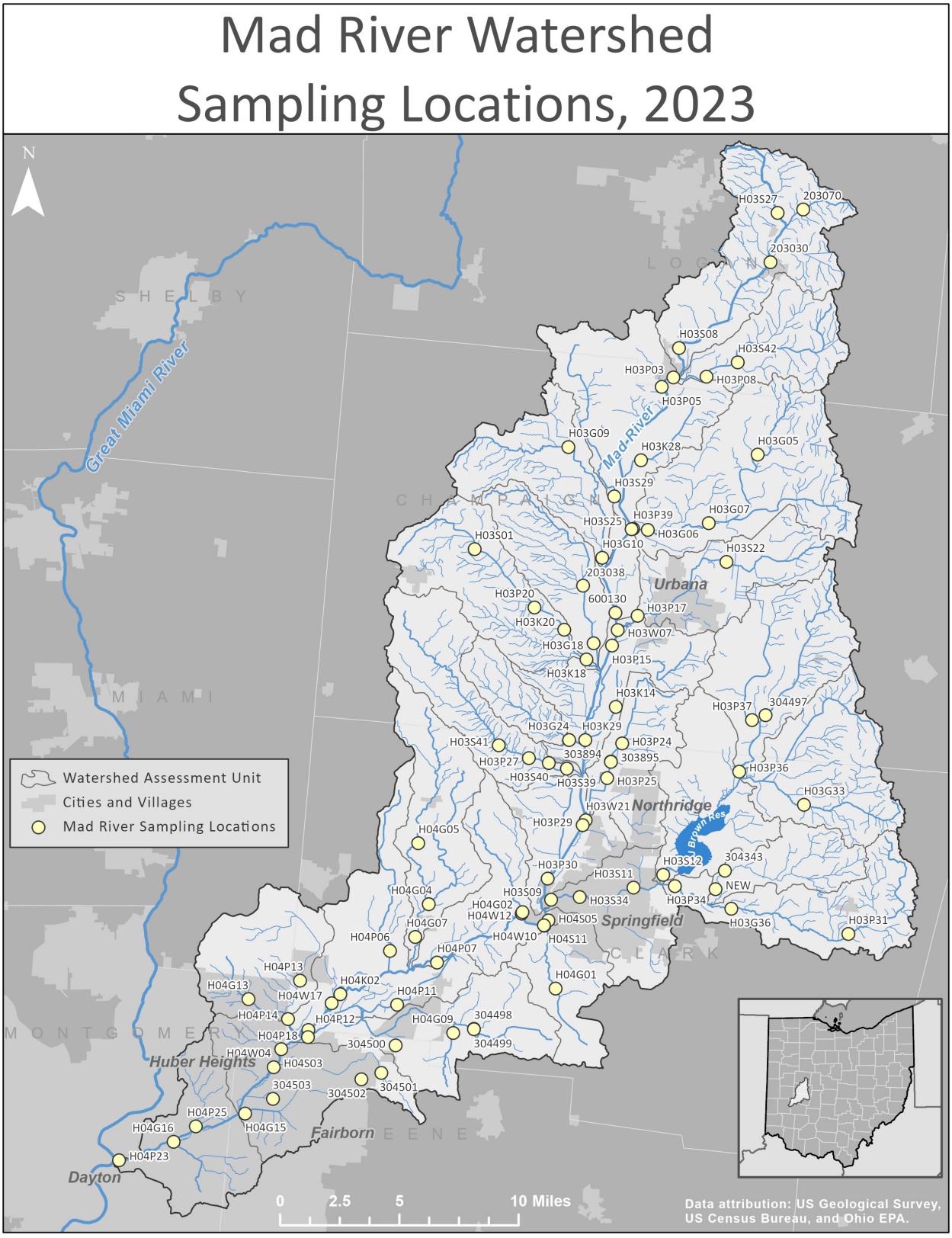
The following tasks will be completed at sampling locations. Fish and macroinvertebrate populations will be sampled to generate biological index scores. These scores will be used to determine aquatic life use attainment status. Habitat, surface water, wastewater and sediment data will be gathered to 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* (*E. coli*) as an indicator organism.

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

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

HUC8	HUC10	HUC12	
05080001	Mad River Watershed within 8-digit HUC: Upper Great Miami, Indiana, Ohio		
	05080001 15	Headwaters Mad River	
		05080001 15 01	Macochee Creek
		05080001 15 02	Headwaters Mad River
		05080001 15 03	Kings Creek
		05080001 15 04	Glady Creek-Mad River
	05080001 16	Nettle Creek-Mad River	
		05080001 16 01	Muddy Creek
		05080001 16 02	Dugan Run
		05080001 16 03	Nettle Creek
		05080001 16 04	Anderson Creek
		05080001 16 05	Storms Creek
		05080001 16 06	Chapman Creek
		05080001 16 07	Bogles Run-Mad River
	05080001 17	Buck Creek	
		05080001 17 01	East Fork Buck Creek
		05080001 17 02	Headwaters Buck Creek
		05080001 17 03	Sinking Creek
		05080001 17 04	Beaver Creek
		05080001 17 05	Clarence J Brown Lake-Buck Creek
		05080001 17 06	City of Springfield-Buck Creek
	05080001 18	Donnels Creek-Mad River	
		05080001 18 01	Moore Run
		05080001 18 02	Pondy Creek-Mad River
		05080001 18 03	Mill Creek
		05080001 18 04	Donnels Creek
		05080001 18 05	Rock Run-Mad River
		05080001 18 06	Jackson Creek-Mad River
	05080001 19	Mud Run-Mad River	
		05080001 19 01	Mud Creek
		05080001 19 02	Mud Run
		05080001 19 03	Huffman Dam-Mad River
		05080001 19 04	City of Dayton-Mad River
	Large River Assessment Unit (LRAU)		
		05080001 90 03	Mad River Mainstem (Donnels Creek to mouth)

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

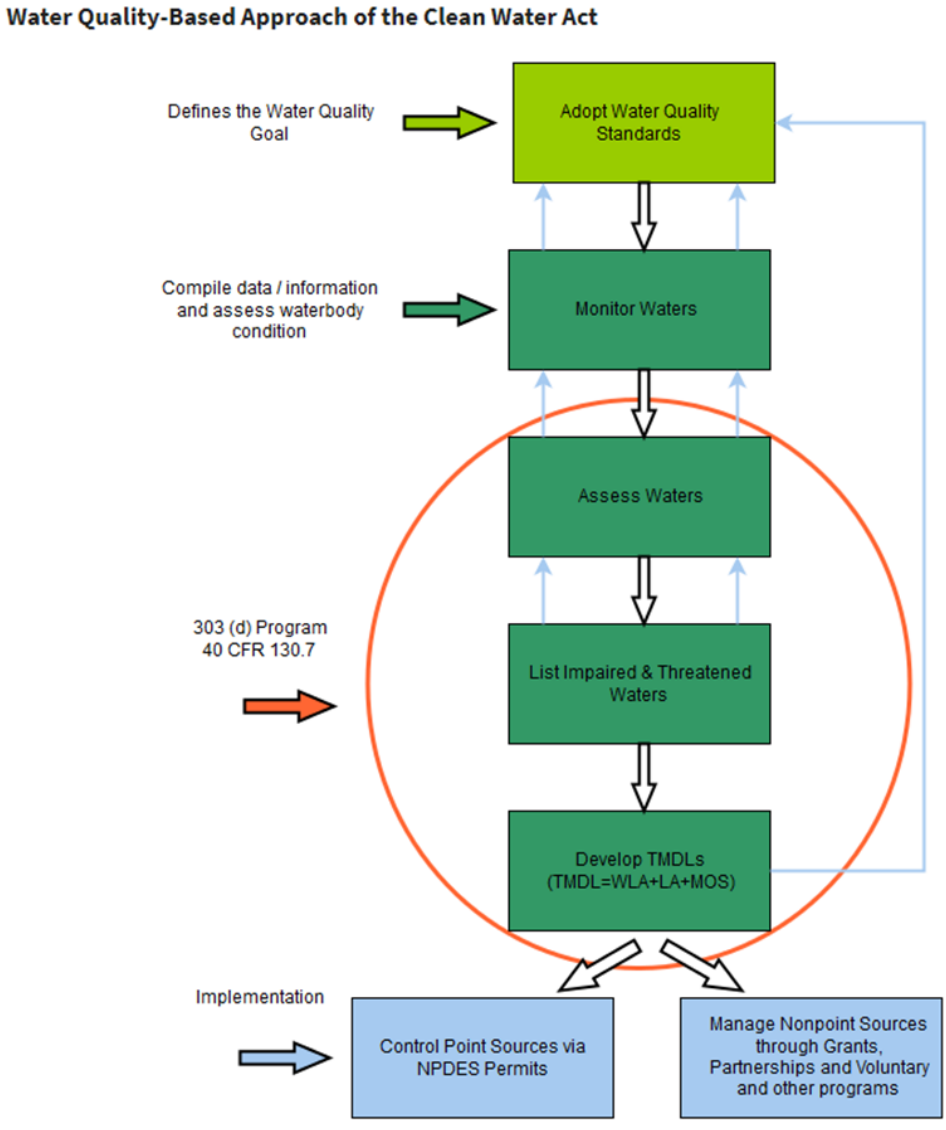


A7. Data Quality Objectives

The data collected during this watershed survey fulfills multiple objectives:

- Assess and report on the status of Watershed Assessment Units (WAUs) as required by the Clean Water Act (CWA) 305(b) and 303(d)
- 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
- Determine and evaluate water quality trends at watershed, stream, and site level scales.

Figure 3- 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 Clean Water Act (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:

- Three aquatic community indices serve as the principal arbiters of Aquatic Life Use (ALU) attainment or condition status of Ohio's lotic waters: Index of Biotic integrity (IBI), Modified Index of well-being (MIwb) and the Invertebrate Community Index (ICI). Where quantitative macrobenthos data are unavailable, corresponding narrative equivalents derived from qualitative sampling are used in lieu of ICI scores. Further explanations of Ohio EPA's biocriteria can be found in Ohio Administrative Code (OAC) Chapter 3745-1-07 and additionally at ***https://epa.ohio.gov/divisions-and-offices/surface-water/reports-data/biological-criteria-for-the-protection-of-aquatic-life***.
- *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 is planned to 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:** The water quality parameter sondes will be deployed to capture about 48 continuous hours of hourly diel dissolved oxygen flux, pH, temperature, and specific conductance measurements. Benthic and/or sestonic chlorophyll *a* samples are to 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 (SVOCs) (USEPA Method 625) testing will generally be focused on industrial facilities, 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**: Sediment sampling is an important component of a pollution monitoring program. The analytical results serve as valuable lines of evidence for identifying impacted areas, determining the magnitude and extent of contamination, and elucidating probable causes and sources of beneficial use impairment that may not be detected in water column sampling alone. Sediment contaminant data can be used to locate historical, intermittent, point and nonpoint contaminant sources, or contaminant concentrations of concern, which include direct discharge, groundwater infiltration, soil erosion, aerial deposition, and sediment translocation and redeposition. Year 1 sediment sampling will occur at sites with historical documented impairment due to contaminated sediments. Otherwise, sediment sampling will be conducted in Year 2 on a follow-up basis if sediment contamination is suspected to contribute to biological impairment.

Support Water Quality Standards Development

- **Use Designations**: All data collected as part of this survey will form the basis of UAAs for unassessed waters, verify or reaffirm existing beneficial uses, or readjust the current aquatic life use designations as appropriate for updates to the WQS.
- **Antidegradation**: The collection of biological and habitat data will support updates to the State's list of special high-quality waters.

Provide Data for the Ohio Fish Tissue Consumption Monitoring Program

Fish tissue samples will be collected from 11 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 regulation-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 NDPES program with necessary biological and/or chemical sampling data. Stream water and effluent chemistry samples will be collected to specifically assess four wastewater treatment plant (WWTP) discharges at Urbana, Springfield, Clark County Southwest Regional and Fairborn, along with the discharge from Navistar.

TMDL Implementation

The Total Maximum Daily Load (TMDL) program, established under Section 303(d) of the Clean Water Act, 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 Report. 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.

Following the 2003 Mad River basin survey, a TMDL report was prepared for the Mad River watershed and approved by U.S. EPA in 2010. A brief summary of the TMDLs developed for the Mad River watershed is located in Section A5. For additional detail, the Mad River TMDL report is published at: ***https://epa.ohio.gov/static/Portals/35/tmdl/MadRiverTMDL_final_dec09.pdf***.

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. 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 at the Groveport Field Office while the survey report is being finalized in accordance with established retention schedules.
- Long term survey information and data storage will take place at the State's Storage Facility in accordance with established retention schedules.

Changes in project leadership or major actions which might affect the data quality objectives (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 DQOs listed in Section A7. Principal streams are roughly defined as those that drain a surface area >8 mi^2, 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/undesignated streams in the WQS, known restoration activities, and other miscellaneous local impacts that may contribute to beneficial use impairment.

For WAUs with monotonous character (consistent land use, few/no known water quality issues, lack of development, etc.), one sampling location will be placed at or near the HUC outlet, preferably where biological sampling has been historically conducted. 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 as well as to evaluate areas of significant stream recreation. A minimum of one site per WAU is desired, though more sites may be included as recreation uses deem necessary.

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.

B2. Sampling Methods

The most recent 2021 version of the *Surface Water Field Sampling Manual* 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). Published at: ***https://www.epa.state.oh.us/Portals/35/documents/BioCrit15_Vol3.pdf***

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 mi^2, or at reference sites regardless of size. If flows are adequate, HDs may also be deployed to smaller drainages in order to replicate historical quantitative sampling efforts or to evaluate complex permit issues. 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 (e.g., riffle, run, pool and margin).

Fish will be sampled at each designated location using pulsed DC headwater, wading, backpack, or boat electrofishing methods depending on stream size at each sampling zone. Sites may be sampled once, twice, or more through the summer sampling season. Reasons why sites may be sampled twice (or even more) during the sampling index period could include: sites downstream from permitted dischargers, reference site locations, sites that did not meet goals during the first sampling pass, or areas that are prone to greater fluctuations or system instability. At least three to four weeks should elapse between multiple electrofishing passes at a given site. The number of passes may be adjusted as necessary based on best professional judgment of the Ohio EPA field staff. Reasons for a single pass monitoring at sites may include extremely difficult or 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. At least 10 percent of fish sampling locations will receive a second electrofishing sampling event. 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. Some specimens are preserved for further identification in the laboratory (if necessary) or to document new or noteworthy species records.

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. Five sets of samples are planned to be collected during the survey period.

Inorganic surface water chemical parameters will be collected at the sites 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. This document is hereafter referred to as the Surface Water Field Sampling Manual. Samples are delivered via overnight courier to Ohio EPA's Division of Environmental Services (DES) for analyses. Field measurements of dissolved oxygen, pH, temperature and conductivity will be made using YSI 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/Nutrient Site Evaluation

A subset of the stream assessment sites are designated as nutrient sites. Continuous multi-parameter measurement sondes will be deployed during stable, baseflow conditions for this assessment. Ideally, two sonde surveys will be carried out at each nutrient assessment site. Water quality sondes will be placed at select locations indicated as a nutrient site on Appendix 2 to evaluate diel measurements of dissolved oxygen, pH, temperature, and conductivity. The goal of each sonde deployment is to capture about 48 continuous hours of hourly measurements. 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*. 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 1 to October 31. Each site will have at least five sets of E. coli samples tested. Water samples will be collected into appropriate containers, cooled to less than 6°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 two locations (see Appendix 2) 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* and delivered to Ohio EPA- DES for analyses.

Sediment

In Year 1, sediment sampling will be conducted at two locations in areas of historical sediment contamination. Additional 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 Appendix 4. Collected sediment will be placed into appropriate containers, placed on ice (to maintain <6°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 regulation 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 Appendix 4. Fish used for tissue

analysis will either be filleted in the field or at the Ohio EPA Groveport Field Office 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 2021). 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.

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 led 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 at the Groveport Field Office (GFO). 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 water temperature 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*. 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 prior to use.

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*. 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*.

Sediment

Ten percent of the number of sediment samples should be collected as quality control samples, approximately five percent should be duplicates and five 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*.

B6. Instrument/Equipment Testing, Inspection and Maintenance

All instruments/equipment will be inspected prior to each use. All field meters are to be serviced prior to the start of the survey by the manufacturer or qualified service provider to verify they are operating within specifications.

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 use. 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)	46	1	46
Fish > 20 mi^2 (1-2 passes)	36	1-2	36+
Macroinvertebrate (Quantitative)*	41	1	41
Macroinvertebrate (Qualitative)	41	1	41
Fish Tissue			
Fish Tissue	11	1	11
Water Quality			
Inorganic Samples	87	5	435
Nutrient (sonde deployment & chlorophyll *a*)	48	≥ 1	48 - 96
Semi-volatile Organic Samples (BNA) (O1)	3	2	6
Herbicides/Insecticides (O2)	3	1	3
Temperature Dataloggers	0	1	0
Sediment Quality			
Metals	2	1	2
Pesticides/PCB's and Semi-volatile Organics	2	1	2
Bacteria			
E. coli Cultures	27	5	135

*HDs will be deployed at all biomonitoring sites >20 mi^2 and at all reference locations, regardless of drainage area

Appendix 2. Streams, Sampling Locations, and Sampling Types. Sites in Red are Effluent Only.

Station	Site Name	River Mile	Area (mi²)	HUC12	County	Lat.	Long.	Sampling (refer to key in footnote)
Mad River (14-100-000)								
H03S27R	MAD R. UPST. ZANESFIELD @ CO. RD. 5	61.23	7.30	050800011502	Logan	40.350000	-83.674700	MQ, F, C
H03S08R	MAD R. UPST. WEST LIBERTY @ TWP. RD. 173	53.21	35.30	050800011502	Logan	40.267200	-83.751400	MQ, F, C, B, N
H03P03	MAD R. NEAR WEST LIBERTY @ U.S. RT. 68	51.68	55.70	050800011504	Logan	40.249200	-83.755600	MQ, F, C, N
H03P05	MAD R. DST. WEST LIBERTY @ PIMTOWN RD.	50.98	59.70	050800011504	Champaign	40.243300	-83.764700	MQ, F, C, N, FT
H03S25	MAD R. NW OF URBANA, JUST UPST. CONFL KINGS CREEK	43.83	91.00	050800011504	Champaign	40.156700	-83.787200	MQ, F, C, B
600130	MAD R. W OF URBANA NEAR U.S. RT. 36 (dst. low-head dam)	39.8	162.5	050800011607	Champaign	40.105776	-83.799032	MQ, F, C, N, FT
H03W07	Urbana WWTP 001 Outfall to Mad R.	39.0	186	050800011607	Champaign	40.095307	-83.797115	C
H03P15	MAD R. SW OF URBANA @ OLD TROY PIKE	38.35	188.00	050800011607	Champaign	40.085800	-83.801400	MQ, F, C, N, O1
H03K29	MAD R. NE OF TREMONT CITY @ COUNTY LINE RD.	34.2	252	050800011607	Clark	40.028169	-83.821284	MQ, F, C, B
H03P29	MAD R. NEAR EAGLE CITY @ EAGLE CITY RD.	30.50	307.0	050800011802	Clark	39.9764	-83.8225	MQ, F, C, N
H03P30	MAD R. NEAR SPRINGFIELD @ ST. RT. 41	27.81	321	050800011802	Clark	39.9436	-83.8494	MQ, F, C, B, N
H04S05	MAD R. UPST. SPRINGFIELD WWTP	25.60	464.00	050800011805	Clark	39.918300	-83.848300	MQ, F, C, N
H04W10	SPRINGFIELD WWTP 001 OUTFALL TO MAD R.	25.35	464.00	050800011805	Clark	39.915300	-83.851700	C

Station	Site Name	River Mile	Area (mi^2)	HUC12	County	Lat.	Long.	Sampling (refer to key in footnote)
H04W12	MAD R. W OF SPRINGFIELD @ LOWER VALLEY PIKE	24.13	490.00	050800011805	Clark	39.922200	-83.869400	MQ, F, C, B, N, O1, FT
H04P07	MAD R. NEAR ENON @ ENON RD.	19.65	497.0	050800011805	Clark	39.891700	-83.935600	MQ, F, C
H04K02	MAD R. UPST. CLARK CO. REGIONAL WWTP	13.90	549.0	050800011806	Clark	39.871400	-84.011700	MQ, F, C, N
H04W17	CLARK CO. REGIONAL WWTP 001 OUTFALL TO MAD R.	13.20	551.0	050800011806	Clark	39.865800	-84.018300	C
H04P12	MAD R. NEAR FAIRBORN @ MEDWAY RD.	11.44	556.0	050800011806	Clark	39.849400	-84.036400	MQ, F, C, B, N, FT
H04W04	FAIRBORN WWTP 001 OUTFALL TO MAD R.	9.62	615.0	050800011903	Greene	39.837500	-84.057600	C
H04S03	MAD R. DST. FAIRBORN WWTP	8.70	616.0	050800011903	Greene	39.826400	-84.063300	MQ, F, C, N, FT
H04P25	MAD R. AT DAYTON @ HARSHMAN RD.	3.97	642.0	050800011904	Montgomery	39.789700	-84.123900	MQ, F, C, N, FT
H04P23	MAD R. AT DAYTON @ WEBSTER ST.	0.28	657.0	050800011904	Montgomery	39.768300	-84.183600	MQ, F, C, B, N
Sugar Creek (14-100-011)								
203070	SUGAR CREEK NE OF ZANESFIELD @ PRIVATE ROAD OFF CO. RD. 2	1.00	3.40	050800011502	Logan	40.352200	-83.654400	Mq, F, C
Peters Ditch (14-100-010)								
203030	PETERS DITCH S OF ZANESFIELD @ MOUTH	0.10	5.20	050800011502	Logan	40.320000	-83.680000	Mq, F, C, N
Macochee Creek (14-139-000)								
H03S42R	MACOCHEE CREEK E OF WEST LIBERTY @ ST. RT. 287	2.95	14.60	050800011501	Logan	40.258900	-83.704700	MQ, F, C, B, N
H03P08	MACOCHEE CREEK NEAR WEST LIBERTY @ TWP. RD. 47	1.41	16.30	050800011501	Logan	40.250000	-83.729400	MQ, F, C, N
Macochee Ditch (14-138-000)								

Station	Site Name	River Mile	Area (mi^2)	HUC12	County	Lat.	Long.	Sampling (refer to key in footnote)
H03K28	MACOCHEE DITCH S OF WEST @ UPPER VALLEY PIKE	1.27	7.00	050800011504	Champaign	40.1986	-83.7803	Mq, F, C
Glady Creek (14-137-000)								
H03S29	GLADY CREEK NEAR MOUTH @ FARM	0.45	12.60	050800011504	Champaign	40.176400	-83.801100	Mq, F, C, O2
Kings Creek (14-136-000)								
H03G07	KINGS CREEK AT KINGSCREEK @ KENNARD-KINGS CREEK RD.	3.90	27.90	050800011503	Champaign	40.161000	-83.726000	MQ, F, C
H03P39	KINGS CREEK NEAR MOUTH @ UPPER VALLEY PIKE	0.09	43.60	050800011503	Champaign	40.156900	-83.785800	MQ, F, C, B, N, O2, FT
Trib. to Kings Creek (14-136-001)								
H03G06	TRIB. TO KINGS CREEK (0.46) @ FARM LANE	0.40	8.70	050800011503	Champaign	40.156400	-83.774400	Mq, F, C
Trib. to Kings Creek (14-136-003)								
H03G05	TRIB. TO KINGS CREEK (4.99/3.18) @ KENNARD NORTH RD.	1.06	10.60	050800011503	Champaign	40.203000	-83.688000	Mq, F, C
Muddy Creek (14-129-000)								
H03G09	MUDDY CREEK NW OF NORTHVILLE @ CHURCH RD.	6.23	12.00	050800011601	Champaign	40.206000	-83.838000	Mq, F, C
H03G10	MUDDY CREEK NW OF URBANA @ GRAVEL ROAD NEAR MOUTH	0.45	22.70	050800011601	Champaign	40.139000	-83.810000	MQ, F, C, B, N, O2
Dugan Run (14-128-000)								
H03S22	DUGAN RUN UPST. URBANA @ DUGAN RD.	6.50	11.60	050800011602	Champaign	40.137500	-83.711700	Mq, F, C
H03P17	DUGAN RUN NEAR URBANA @ MUZZY RD.	0.95	23.20	050800011602	Champaign	40.104200	-83.781400	MQ, F, C, B, N, S
Nettle Creek (14-130-000)								

Station	Site Name	River Mile	Area (mi^2)	HUC12	County	Lat.	Long.	Sampling (refer to key in footnote)
H03S01R	NETTLE CREEK SE OF MILLERSTOWN, ADJ. NETTLE CREEK RD.	8.23	9.00	050800011603	Champaign	40.143100	-83.911100	MQ, F, C, B, N
H03P20R	NETTLE CREEK NEAR WESTVILLE @ RUNKLE RD.	4.49	17.80	050800011603	Champaign	40.108300	-83.863100	MQ, F, C, B
H03K20	NETTLE CREEK S OF WESTVILLE @ NETTLE CREEK RD.	2.78	19.80	050800011603	Champaign	40.095000	-83.839200	MQ, F, C
H03K18	NETTLE CREEK SE OF WESTVILLE @ BAIR RD.	0.91	27.70	050800011603	Champaign	40.077200	-83.821400	MQ, F, C, N
Anderson Creek (14-131-000)								
203038	ANDERSON CREEK UPST. RUSSELL CREEK @ STICKLEY RD.	3.72	7.30	050800011604	Champaign	40.122000	-83.825000	Mq, F, C
H03G18	ANDERSON CREEK SW OF URBANA @ OLD TROY PIKE	1.03	16.90	050800011604	Champaign	40.087000	-83.816000	Mq, F, C, B, N
Cedar Run (14-118-000)								
H03K14	CEDAR RUN NE OF TREMONT CITY @ DALLAS RD.	1.95	1.00	050800011607	Champaign	40.048640	-83.797510	Mq, F, C, N
Storms Creek (14-119-000)								
H03G24	STORMS CREEK N OF TREMONT CITY @ UPPER VALLEY PIKE	0.70	9.10	050800011605	Clark	40.028000	-83.834000	Mq, F, C, B
Chapman Creek (14-120-000)								
H03S41R	CHAPMAN CREEK SE OF THACKERY @ SNYDER-DOMER RD.	4.00	18.40	050800011606	Clark	40.024200	-83.889700	MQ, F, C, N, FT
H03P27	CHAPMAN CREEK W OF TREMONT CITY @ WILLOWDALE RD.	2.56	21.50	050800011606	Clark	40.016700	-83.865800	MQ, F, C
H03S40	CHAPMAN CREEK W OF TREMONT CITY @ FARM LANE	1.69	22.30	050800011606	Clark	40.013900	-83.850000	MQ, F, C
H03S39	CHAPMAN CREEK AT TREMONT CITY @ UPPER VALLEY PIKE	0.77	24.20	050800011606	Clark	40.010600	-83.835600	MQ, F, C, B, N, FT

Station	Site Name	River Mile	Area (mi^2)	HUC12	County	Lat.	Long.	Sampling (refer to key in footnote)
Buck Creek (14-110-000)								
304497	BUCK CREEK @ EVERETT ROAD	16.35	12.80	050800011702	Champaign	40.04475	-83.679116	Mq, F, C
H03P36	BUCK CREEK NE OF NEW MOOREFIELD @ ST. RT. 4	13.13	30.50	050800011702	Clark	40.010300	-83.699400	MQ, F, C, B, N
H03S12	BUCK CREEK AT SPRINGFIELD, ADJ. OLD REID PARK	6.50	82.50	050800011705	Clark	39.946900	-83.758300	MQ, F, C, B, N, FT
H03S11	BUCK CREEK AT SPRINGFIELD, ADJ. LAGONDA FIELD	4.80	127.00	050800011706	Clark	39.938900	-83.781700	MQ, F, C, N
H03S34	BUCK CREEK AT SPRINGFIELD, DST. RR NEAR CEMETERY	1.88	139.00	050800011706	Clark	39.932800	-83.823900	MQ, F, C, N, FT
H03S09	BUCK CREEK AT SPRINGFIELD, ADJ. SNYDER PARK	0.60	141.00	050800011706	Clark	39.930800	-83.846400	MQ, F, C, B, N
Dugan Ditch (14-110-001)								
H03P37	DUGAN DITCH AT POWHATTAN @ ST. RT. 54	0.36	13.90	050800011702	Champaign	40.041700	-83.689700	Mq, F, C
Beaver Creek (14-111-000)								
H03P31	BEAVER CREEK NEAR SOUTH VIENNA @ ST. RT. 54	10.16	10.80	050800011704	Clark	39.912500	-83.611400	Mq, F, C
H03G36	BEAVER CREEK E OF SPRINGFIELD @ LANE BET. RODMAN RD/RT. 40	4.50	22.70	050800011704	Clark	39.927000	-83.704000	MQ, F, C
H03P34R	BEAVER CREEK NEAR SPRINGFIELD @ CROFT RD.	0.67	39.20	050800011704	Clark	39.940300	-83.748900	MQ, F, C, B, N
Sinking Creek (14-112-000)								
304343	SINKING CREEK AT GRANT RD.	2.67	11.8	050800011703	Clark	39.949981	-83.709586	Mq, F, C, B, N
NEW (potential)	GALLAGHER FEN DRAINAGE	TBD	TBD	050800011703	Clark	39.938645	-83.716716	Mq, F, C, N

Station	Site Name	River Mile	Area (mi^2)	HUC12	County	Lat.	Long.	Sampling (refer to key in footnote)
Trib. to East Fork Buck Creek (14-113-001)								
H03G33	TRIB. TO E. FK. BUCK CREEK (1.00) @ VERNON ASBURY RD.	2.30	10.40	050800011701	Clark	39.990600	-83.647800	Mq, F, C
Moore Run (14-117-000)								
H03P24	MOORE RUN NE OF TREMONT CITY @ COUNTY LINE RD.	4.10	7.40	050800011801	Champaign	40.026400	-83.792200	Mq, F, C, N
303895	MOORE RUN JUST UPST. NAVISTAR OUTFALL 021	3.31	7.70	050800011801	Clark	40.015389	-83.800750	Mq, F, C, N
303894	NAVISTAR 021 OUTFALL TO MOORE RUN	3.30	7.70	050800011801	Clark	40.015236	-83.800739	C
H03P25	MOORE RUN N OF SPRINGFIELD @ TREMONT CITY RD.	2.46	11.30	050800011801	Clark	40.005271	-83.803545	Mq, F, C, N, O1, S
H03W21	MOORE RUN N OF SPRINGFIELD @ MOUTH	0.01	18.30	050800011801	Clark	39.979495	-83.819973	Mq, F, C, B, N
Mill Creek (14-114-000)								
H04G01	MILL CREEK NEAR SPRINGFIELD @ YELLOW SPRINGS RD.	3.24	7.60	050800011803	Clark	39.877000	-83.842000	Mq, F, C
H04S11	MILL CREEK AT SPRINGFIELD @ MOUTH	0.01	15.50	050800011803	Clark	39.915000	-83.851400	Mq, F, C, B, N
Rock Run (14-108-000)								
H04G02	ROCK RUN JUST W OF SPRINGFIELD @ MOUTH	0.01	9.10	050800011805	Clark	39.923000	-83.869000	Mq, F, C
Donnels Creek (14-106-000)								
H04G05	DONNELS CREEK @ DETRICK-JORDON PIKE	7.49	9.40	050800011804	Clark	39.964000	-83.952000	Mq, F, C
H04G07	DONNELS CREEK S OF DONNELSVILLE @ HAMPTON RD.	1.87	25.70	050800011804	Clark	39.907000	-83.953400	MQ, F, C, B, N

Station	Site Name	River Mile	Area (mi^2)	HUC12	County	Lat.	Long.	Sampling (refer to key in footnote)
East Fork Donnels Creek (14-107-000)								
H04G04	E. FK. DONNELS CREEK N OF DONNELSVILLE @ MOUTH	0.01	9.10	050800011804	Clark	39.927000	-83.943000	Mq, F, C
Jackson Creek (14-105-000)								
H04P06	JACKSON CREEK SE OF DONNELSVILLE @ LOWER VALLEY PIKE	0.90	9.20	050800011806	Clark	39.898300	-83.973100	Mq, F, C
Mud Creek (14-100-005)								
H04P13	MUD CREEK NEAR MEDWAY @ GERLAUGH RD.	2.51	9.40	050800011901	Clark	39.879200	-84.043600	Mq, F, C
H04P14	MUD CREEK NEAR FAIRBORN @ LOWER VALLEY PIKE	0.56	22.80	050800011901	Clark	39.855800	-84.052500	MQ, F, C, B, N
Mud Run (14-101-000)								
304498	MUD RUN JUST UPST. CONFL. WITH COYOTE RUN	9.82	3.5	050800011902	Clark	39.851681	-83.905732	Mq, F, C, N
H04P18	MUD RUN NEAR FAIRBORN @ MEDWAY RD.	0.80	27.30	050800011902	Greene	39.845000	-84.036700	MQ, F, C, B, N
304500	TRIB. TO MUD RUN (4.99/0.40) DST. ARMSTRONG RD.	1.20	0.4	050800011902	Greene	39.840853	-83.967447	Mq, F, C, N
Coyote Run (14-101-003)								
304499	COYOTE RUN @ MOUTH FROM LANE OFF HAGEN RD.	0.05	6.20	050800011902	Clark	39.85141	-83.905819	Mq, F, C
Warden Ditch (14-101-002)								
H04P11	WARDEN DITCH NEAR ENON @ SNIDER RD.	2.27	4.00	050800011806	Clark	39.865600	-83.966700	Mq, F, C
Clear Creek (14-102-000)								
H04G09	CLEAR CREEK SE OF ENON @ FAIRFIELD PIKE	0.45	5.20	050800011902	Clark	39.849000	-83.922000	Mq, F, C

Station	Site Name	River Mile	Area (mi^2)	HUC12	County	Lat.	Long.	Sampling (refer to key in footnote)
Dry Lick Run (14-100-006)								
H04G13	DRY LICK RUN NEAR HUBER HEIGHTS @ BELLEFONTAINE RD.	1.70	5.20	050800011901	Montgomery	39.867500	-84.083900	Mq, F, C
Hebble Creek (14-100-002)								
H04G15	HEBBLE CREEK AT WPAFB @ HEBBLE CREEK RD.	0.26	15.50	050800011903	Greene	39.798000	-84.085000	Mq, F, C, B, N
304501	TRIB. TO HEBBLE CR. (8.13) ADJ. YELLOW SPRINGS FAIRFIELD RD.	0.01	0.1	050800011903	Greene	39.823949	-83.9782597	Mq, F, C, N
304502	REDBANK DITCH AT THE END OF RAPIDS DRIVE	2.5	0.5	050800011903	Greene	39.81995	-83.99392	Mq, F, C, N
304503	TRIB. TO MAD R. (6.88) AT MARL RD.	1.2	3.6	050800011903	Greene	39.80717	-84.063424	Mq, F, C, N
Lilly Creek (14-100-001)								
H04G16	LILLY CREEK AT DAYTON, NEAR MOUTH @ EASTWOOD PARK	0.10	7.10	50800011904	Montgomery	39.780000	-84.141000	Mq, F, C

TBD – to be determined

*** -- Any station designated as "NEW" will receive a station code once the access process has concluded and the actual sampling river mile determined.**

M – modified reference site. **R** – reference site.

Code	Sample Type
F	Fish – 1 or 2 passes
PWS	Public Water Supply
FT	Fish Tissue
MQ	Macroinvertebrate - Quantitative (HD)
Mq	Macroinvertebrate – Qualitative
C	Chemistry

Code	Sample Type
O1	Organics -- SVOCs (semi-volatile organic compounds)
O2	Organics -- herbicides and insecticides
B	*E. coli* bacteria
S	Sediment
N	Nutrient site
T	Temperature datalogger

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
05080001-							
15-01		No Individual NPDES permitted dischargers					
15-02	1PR00101	A and E Campground LLC	0.0075	0.0016	Public	Unnamed trib. to Mad R. (RM 63.0) RM 0.9	Logan
15-02	1PZ00109	Kamp-A-Lott Campground	0.012	0.0108	Public	Unnamed trib. to Mad R. (RM 61.4) at RM 0.2	Logan
15-02	1PZ00069	Kirkmont Center	0.01	0.00204	Public	Unnamed trib. to Mad R. (58.82)	Logan
15-02	1PV00129	4000 Alpine Pkwy Zanesfield OH 43360 LLC	0.015	0.0138	Public	Unnamed trib. to Mad R. (58.05) at RM 0.24	Logan
15-03		No Individual NPDES permitted dischargers					
15-04	1PC00012	West Liberty STP	0.5	**0.968**	Public	West Liberty trib. at RM 0.2	Logan
15-04	1PT00066	West Liberty Salem School	0.021	0.0035	Public	Macochee Ditch (RM 3.2)	Champaign
16-01		No Individual NPDES permitted dischargers					
16-02	1IH00020	J Rettenmaier USA LP	NA	1.4985	Industrial	Drainage ditch to Dugan Run (RM 1.85)	Champaign
16-02	1IS00000	Johnson Welded Products Inc	NA	NA	Industrial	Unnamed trib. to Dugan Run (RM ~2.0) at RM 0.2	Champaign
16-03	1PB00029	Saint Paris WWTP	0.5	0.2695	Public	Unnamed trib. to Nettle Cr. (RM 8.8) at RM 2.9	Champaign
16-03	1PT00088	Graham High School	0.009	0.0039	Public	Unnamed trib. to Nettle Cr. (RM 6.7) at RM 1.1	Champaign
16-04		No Individual NPDES permitted dischargers					
16-05	1IQ00017	IPL Dayton Inc	0.004 (001); 0.006 (002)	0.0017 (001); 0.0032 (002)	Industrial	Storms Creek RM 0.2	Clark
16-06		No Individual NPDES permitted dischargers					
16-07	1IY00300	Urbana WTP	NA	0.07176	Industrial	Mad River RM ~43.3	Champaign
16-07	1IJ00142	Urbana Materials	NA	0.41948	Industrial	Mad River RM ~39.15	Champaign
16-07	**1PD00011**	**Urbana WPCF**	**4.5**	**1.55**	**Public**	**Mad River RM 39.05**	**Champaign**
16-07	1PY00002	Valley View MHP	0.015	0.002648	Public	Bogles Run RM ~5.85	Champaign
17-01	1PA00020	Catawba SD	Not listed[4]	0.5	Public	UT of E. Fk. Buck Cr. (RM 1.0) at RM 2.73	Clark
17-02		No Individual NPDES permitted dischargers					
17-03	1PV00097	Brookside Village MHP	0.051	0.042648	Public	Sinking Creek RM 4.6	Clark
17-03	1PT00033	Northeastern HS	0.015	0.00225	Public	Sinking Creek RM 4.5	Clark
17-04	1PZ00092	Ports Petroleum	NA	NA	Stormwater	UT of Beaver Cr. (RM 9.4)	Clark

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
17-04	1PA00021	South Vienna Village WWTP	0.0772	0.05684	Public	Beaver Cr. RM ~8.55	Clark
17-04	1PV00112	Bridgewood MHP	0.0075	0.0008	Public	UT of Beaver Cr. (@ RM 6.1)	Clark
17-04	1PV00007	Harmony Estates MHP	0.05	0.02208	Public	UT of Beaver Cr. (RM 6.15)	Clark
17-04	1PX00043	Tomorrows Stars RV Park	0.0184	0.00405	Public	Beaver Cr. RM ~5.6	Clark
17-05		No Individual NPDES permitted dischargers					
17-06	1IN00256	Blackhorse Energy LLC - Springfield Bulk Plant	NA	NA	Stormwater	Drainage swale of Buck Cr.	Clark
18-01	1PV00118	A&R Reck Sunset Terrace MHP	0.01	0.0067	Public	UT of Moore Run (RM ~6.1) at RM 0.2	Champaign
18-01	1PV00047	Rolling Hills MHP STP	0.046	0.018	Public	UT of Moore Run (RM 4.32) at RM ~0.6	Champaign
18-01	1PV00082	Harvest Square MHP	0.03	0.009	Public	Moore Run RM 4.45	Champaign
18-01	1IN00022	Navistar Inc	0.245	0.1415	Industrial	Moore Run RM 3.3	Clark
18-01	1PZ00003	KTK Industrial Park WWTP	0.017	0.0032	Public	Moore Run RM 2.15	Clark
18-02		No Individual NPDES permitted dischargers					
18-03		No Individual NPDES permitted dischargers					
18-04		No Individual NPDES permitted dischargers					
18-05	1PW00037	Greenlawn Village Condominiums	0.04	0.0445	Public	Miller Creek RM ~1.42	Clark
18-05	1PV00058	Rolling Terrace MHP	0.0249	0.0066	Public	Miller Creek RM ~0.8	Clark
18-05	1PT00118	Exponential Genomics Inc (Xenomics)	0.006	0.0003	Public	UT of Rock Cr. (RM ~0.3)	Clark
18-05	**1PE00007**	**Springfield WWTP**	**25**	**17.056**	**Public**	**Mad R. RM 25.34**	**Clark**
18-05	1PX00056	C & S Tree Recycling Service	NA	NA	Stormwater	UT of Mad R. (RM ~25.05)	Clark
18-05	1PV00100	SSA Edgewood MHP	0.01	0.0079	Public	UT of Mad R. (RM ~25.05)	Clark
18-05	1PV00106	Enon Heights MHP	0.0135	0.0064	Public	UT of Mad R. (RM ~22.2)	Clark
18-06	1PW00052	Evans Family Ranch LLC Apartment Housing	0.0036	0.0015 (11-1-20 to 1-1-23)	Public	Package plant appears to discharge to irrigation ponds that don't appear to have an outlet.	Clark
18-06	1PV00105	Pleasant Valley Est MHP	0.052	0.0198	Public	UT to Mad @ RM 20.4	Clark
18-06	1IX00032	Enon WTP	NA	0.0258	Industrial	Mad R. RM 19.6	Clark
18-06	**1PK00013**	**Southwest Regional WWTP**	**4**	**1.3813**	**Public**	**Mad R. RM 13.25**	**Clark**
18-06	1IJ00026	Martin Marietta Materials Inc - Fairborn	NA	28.537	Industrial	Mad R. RM 11.1	Clark
19-01		No Individual NPDES permitted dischargers					
19-02	1PT00014	Greenon HS	0.016	0.002	Public	UT (RM ~1.7) of Mud Run (RM 9.2)	Clark
19-03	**1PD00002**	**Fairborn Water Reclamation Center**	**6**	**3.946**	**Public**	**Mad R. RM 9.62**	**Greene**

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
19-03	1IN90011	Wright-Patterson AFB**	NA	0.001 (March-April 2022)	Industrial	Branch of Mad R. RM 8.26	Greene
19-03	1IN00156	Wright Patterson AFB	1.152	0.7985	Industrial	Mad R. RM 6.68	Greene
19-03	1PV00088	Huber MHP	0.0235	0.0217	Public	UT (RM ~0.6) of Mad R (RM 7.4)	Greene
19-04	1IO00001	Wright-Patterson AFB***	NA	0.0676	Industrial	Mad R. between ~RMs 5.8 and 3.7	Greene
19-04	1IB00022	Dayton Power & Light - MacGregor Park Office Bldg	NA	0.4435	Industrial	UT Lilly Creek RM ~2.5	Montgomery
19-04	1IN00133	Home City Ice Co	NA	0.81923	Industrial	Mad R. RM 1.7	Montgomery
19-04	1GW00001	City of Dayton WTP Lime Reclamation Facility (outfall 001) and Lime Settling Lagoon (outfall 002)	NA	Outfall 001: 0.75825 Outfall 002: 0.12109	Industrial	Outfall 001 - Mad R. RM 1.0 Outfall 002 - Mad R. RM 1.6	Montgomery
19-04	1GN00059	Dayton Children's Hospital	NA	NA	Industrial	Mad R. RM 1.2	Montgomery
19-04	1IN00310	Water Street Commercial Bldg	NA	0.1	Industrial	Mad R. RM 0.1	Montgomery

1 For most facilities, design flows that are greater than 1.0 million gallons per day (MGD) classify a facility as a major discharger and are bolded in this table
2 Average flows are displayed for 2020 – 2022 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.
4 Controlled discharge
** There is a discharge authorization for two PFAS treatment systems that are not yet operational.
*** Nine permitted outfalls are located throughout the facility. Only outfall 003 includes non-stormwater discharge (non-contact cooling water) to Mad R. Reported flow is for outfall 003 only.

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	0.02 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	
Barium	USEPA 200.7	15 µg/L	15 µg/L	
Calcium	USEPA 200.7	2 mg/L	2 µg/L	

Parameter	Method	Water (RL)	Sediment (RL)	Fish Tissue
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		
Organic Compounds				
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		
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

Appendix 5 – Safety Contacts and Hospital Locations

Safety:	
County Wildlife Officers:	**County Sheriff:**
Champaign County – (614) 902-4209 Clark County – (937)206-9321 Greene County – (937) 545-6327 Logan County – (614) 902-4215 Miami County – (937) 470-1917 Montgomery County – (937) 545-6768	Champaign County – (937) 652-1311 Clark County – (937) 521-2050 Greene County – (937) 562-4800 Logan County – (937) 599-3333 Miami County – (937) 440-6085 Montgomery County - (937) 225-4357
OEMA:	**State Highway Patrol:**
Champaign County – (937) 484-1642 Clark County – (937) 521-2175 Greene County – (937) 562-5994 Logan County – (937) 593-5743 Miami County – (937) 440-5460 Montgomery County – (937) 224-8934	Champaign/Clark County – (937) 323-9781 Greene County – (937) 372-7671 Logan County – (937) 644-8811 Miami County – (937) 773-1131 Montgomery County - (937) 832-4794
Hospitals:	
Champaign County: Mercy Health – Urbana Hospital 904 Scioto Street Urbana, OH 43078 (937) 653-5231	Clark County: Mercy Health –Springfield Regional Medical Center 100 Medical Center Drive Springfield, OH 45504 (937) 523-1000
Greene County: Kettering Health Greene Memorial 1141 N. Monroe Drive Xenia, OH 45385 (937) 352-2000	Logan County: Mary Rutan Hospital 205 E. Palmer Road Bellefontaine, OH 43311 (937) 592-4015
Miami/Montgomery Counties: Miami Valley Hospital 1 Wyoming Street Dayton, OH 45409 (937) 208-8000	

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