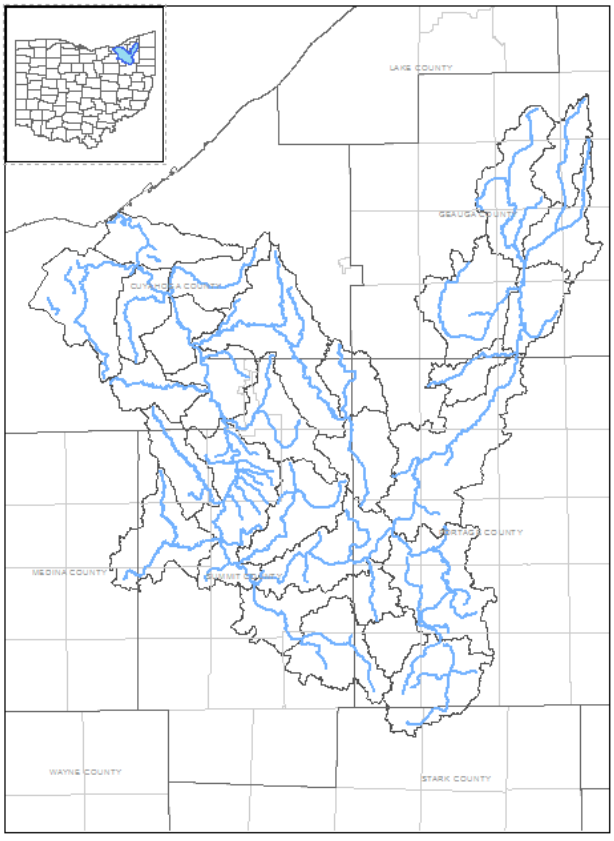
Quality Assurance Project Plan (QAPP) for the Biological and Water Quality Study of Cuyahoga Tributaries and Ship Channel 2018

Cuyahoga, Portage, Summit, and Geauga Counties



Division of Surface Water

May 29, 2018

Quality Assurance Project Plan (QAPP) for the Biological and Water Quality Study of Cuyahoga Tributaries and Ship Channel, 2018

Cuyahoga, Portage, Summit, and Geauga Counties

May 29, 2018

Prepared by
State of Ohio Environmental Protection Agency

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SECTION A – PROJECT MANAGEMENT

A1 - Quality Assurance Project Plan for the Biological and Water Quality Study of the Cuyahoga River Tributaries and Ship Channel, 2018.

Brian W Hall
_____ Date: 6/11/2018
Brian Hall, Assistant Chief

_____ Date: 6/11/2018
Marianne Piekutowski, Modeling and Assessment Manager

Jeffrey W. Reynolds
_____ Date: 6/11/2018
Jeff Reynolds, Ohio EPA Quality Assurance Coordinator

William J Zawiski
_ _____ Date: 6-11-18
Bill Zawiski, Study Team Leader

A2 - Table of Contents

A3 - Distribution List

A3.1 - Table 1. Ohio EPA Central Office Staff

Name/Title	Contact E-mail/Phone	
Marianne Piekutowski, Assessment and Modeling Manager	marianne.piekutowski@epa.ohio.gov	614-644-2876
Melinda Harris, TMDL and IR Supervisor	melinda.harris@epa.ohio.gov	614-728-1357
Rahel Babb, TMDL Coordinator	rahel.babb@epa.ohio.gov	614-728-2384
Keith Orr, Assessment and Modeling Supervisor	keith.orr@epa.ohio.gov	614-644-2885
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Audrey Rush, STS Manager	audrey.rush@epa.ohio.gov	614-644-2035
Jeff Reynolds, Quality Assurance Coordinator	jeffrey.reynolds@epa.ohio.gov	614-705-1011

A3.2 - Table 2. Ohio EPA District Office Staff

Name/Title	Contact Phone/E-mail	
Bill Zawiski, Study Team Leader	william.zawiski@epa.ohio.gov	330-963-1134
Mandy Razzano, District Water Quality	mandy.razzano@epa.ohio.gov	330-963-1269
Greg Orr, District Water Quality	gregory.orr@epa.ohio.gov	330-963-1189
Jennifer Carlson, District Water Quality	jennifer.carlson@epa.ohio.gov	330-963-1228

A4 – Project/Task Organization and Communication

A4.1 - Table 4. Roles and Responsibilities

Individual(s) Assigned:	Responsible for:	Authorized to:
Mari Piekutowski, Assessment and Modeling Manager **Jeff Bohne**, Ecological Assessment Supervisor **Melinda Harris**, TMDL and IR Supervisor **Keith Orr**, Assessment and Modeling Supervisor	Staff assignment, signatures, payments, and reporting.	Review documents and reports; suggest changes and edits; obtain approvals and signatures.
Audrey Rush, WQS Manager **Jeff Reynolds** Quality Assurance Coordinator	QA/QC input to document development. Prepare documents and reports.	Review documents and reports. Review documents and reports; suggest changes and edits.
Rich Blasick, DSW District Manager	Staff assignment, signatures, payments, and reporting.	Review documents and reports; suggest changes and edits; obtain approvals and signatures.
Bill Zawiski*, District Water Quality Supervisor	Staff assignment, signatures, payments, and reporting. Coordinating the distribution of this QAPP and all QAPP updates.	Review documents and reports; suggest changes and edits; obtain approvals and signatures.
STUDY TEAM		
Sarah Becker, Modeler **Josh Griffin**, Modeler	Scheduling and coordination of field activities. Complete field activities and quality control; field sampling and analysis, data collection, review, analysis, verification, database population and transmission. Assist with project planning.	Prepare documents and reports. Arrange for external training. Schedule field activities.
Andrew Phillips, Fish Biologist **Edward Moore**, Macroinvertebrate Biologist	Scheduling and coordination of field activities. Complete field activities and quality control; field sampling and analysis, data collection, review, analysis, verification, database population and transmission. Assist with project planning.	Prepare documents and reports. Arrange for external training. Schedule field activities.
Mandy Razzano*, District Water Quality	Complete field activities and quality control; field sampling and analysis, data collection,	Prepare documents and reports. Arrange for external training.

Individual(s) Assigned:	Responsible for:	Authorized to:
	review, analysis, verification, database population and transmission. Assist with project planning.	Schedule field activities.

*Study Team Leader

A5 – Problem Definition/Background

As part of the Total Maximum Daily Load (TMDL) process and in support of the basin approach for NPDES permitting, an intensive ambient assessment will be conducted during the 2018 field sampling season within selected tributaries to the Cuyahoga River and the ship channel. The Cuyahoga River basin has three TMDL reports approved by US EPA. Cuyahoga River TMDLs were calculated for the upper, middle, and lower river sections, including their associated tributaries. The upper section was approved in September 2004, the middle section was approved in March 2000, and the lower section was approved September 2003. Copies of these reports can be found on the Ohio EPA web page at: http://epa.ohio.gov/dsw/tmdl/CuyahogaRiver.aspx

A5.1 – Beneficial Use Designations

Ohio Water Quality Standards (WQS; Ohio Administrative Code 3745-1) consist of designated uses and chemical, physical, and biological criteria designed to represent measurable properties of the environment that are consistent with the goals specified by each use designation. The beneficial use designations evaluated as part of this survey are aquatic life, water supply, and recreation. Beneficial use designations have been verified for 89 of 94 water bodies or water body segments within this study area. Four water bodies or water body segments have beneficial use designations that have not been verified using standardized field collection methods. An additional 15 water bodies to be sampled during the current survey are not listed in OAC 3745-1-26; appropriate beneficial use designation will be recommended for these streams based on sampling results. Beneficial use designations pertinent for water bodies in the study area are detailed in OAC 3745-1-26.

A5.2 - Total Maximum Daily Load (TMDL)

Section 303(d) of the Clean Water Act and Chapter 40 of the Code of Federal Regulations Part 130 require states to develop TMDLs for waters not meeting designated uses under technology-based controls for pollution. The TMDL process quantitatively assesses the impairment factors and establishes water-quality based controls to reduce pollution from both point and nonpoint sources and to restore and protect the quality of their water resources.

A5.3 - NPDES Permits

There are 109 individual NPDES permitted facilities within the survey area. Selected major and minor NPDES permitted facilities will be evaluated as part of this study. These include both publicly owned treatment works and private entities. A list of all permitted facilities within the study area are listed in Appendix 3.

The Northeast Ohio Regional Sewer District (NEORSD) and the City of Akron have undertaken major infrastructure projects to eliminate combined sewer overflow (CSO) events within the Cuyahoga River watershed. The water quality impact of CSO releases has been historically documented. This survey will

evaluate the water quality effects of the current reduction in CSO discharges and the existing impacts of these CSOs.

A5.4 - Nonpoint Sources

The Cuyahoga River watershed is a highly developed, urbanized watershed. Urbanization results in an increase in impervious surfaces, which leads to increased storm water runoff containing non-point source pollutants and increased stream flashiness. Through municipal, industrial, and construction storm water permitting, best management practices (BMPs) have been implemented to control the quality and quantity of storm runoff from developed land.

A5.5 – Nutrients

Nutrient enrichment has been identified as a cause of impairment in all three Cuyahoga River watershed TMDL reports. The nutrient weight of evidence approach adopted by Ohio EPA provides an objective and robust characterization of the sources and effects of nutrients on water quality.

A5.6 - Area of Concern (AOC)

The Cuyahoga River AOC includes 18 of the 28 HUC 12 watershed assessment units within the Cuyahoga River watershed. Data collected during the survey will assist the Cuyahoga River AOC to accurately determine the status of beneficial use impairments (BUI) within the AOC area. The BUIs have been set by the Great Lakes Water Quality Agreement (GLWQA) and the restoration target levels to delist impairment are set by Ohio EPA.

A5.7– Cuyahoga Ship Channel

Specific use designations for the ship channel, defined as the lowest 5.6 river miles of the Cuyahoga River, are presented in OAC 3745-1-26, section E. The chemical criteria and aquatic life designations outlined in the rule will be reviewed, and revised as appropriate, using a comparable water quality model to the original rule making. Data collected in the ship channel and its tributaries during the survey will be used to develop that model.

A6 – Project/Task Description

The Cuyahoga River watershed is in northeastern Ohio in Cuyahoga, Summit, Geauga, and Portage Counties and drains 813 square miles of the Erie/Ontario Lake Plain (EOLP) ecoregion into Lake Erie. The Cuyahoga River watershed is characterized by a complex glacial history that can have a significant local relief. Many glacial features characteristic of the EOLP ecoregion are found in the Cuyahoga River basin. The river generally follows the course of the buried valleys but does traverse a ridge of erosion-resistant sandstone. The headwaters originate in northeastern Geauga County and flow southwest to Akron. The river turns sharply to the northwest at the confluence with the Little Cuyahoga River in north Akron, then winds through outwash terraces, till plains, and till ridges before reaching the flat lake plain of the Cleveland area.

The typical duration of an intensive watershed survey encompassing the objectives listed below can extend multiple years, depending on complexity of issues within a given study area. The full suite of biological and chemical information detailed in Appendix A are typically collected during the first summer of the project. Additional data will be collected in subsequent years, if required, to clarify causes and sources of impairment, investigate other issues noted during the survey (e.g., fish kill events), or support the calculation of TMDLs. Throughout the process there are multiple opportunities for stakeholder input. This QAPP will result in a finished study to include data needed for beneficial use assessment, a technical support document (TSD), and TMDL reports.

A6.1 Project Objectives

The study area is composed 28 HUC 12 watershed assessment units. A total of 108 sampling locations are allocated to this effort. Ambient biology, macrohabitat quality, and water column chemistry will be collected concurrently from most of these sites. Bacteria, continuous water quality (dissolved oxygen, pH, specific conductivity, and temperature), sediment chemistry (metals, organics, and particle size), and chlorophyll-*a* (benthic and sestonic) will be evaluated at selected sampling locations. See Appendix 2, for specific details on stream sampling locations and sampling types.

The general objectives of the study are to:

Systematically sample and assess the tributaries of the Cuyahoga River and ship channel in support of the TMDL process;

Identify impairments to aquatic life and other beneficial use designations, and develop or reassess previous TMDLs to address those impairments;

Gather ambient environmental information (biological, chemical, and physical) from undesignated water bodies to recommend an appropriate suite of beneficial uses (e.g., aquatic life, recreational, water supply);

Verify the appropriateness of current beneficial use designations;

Establish and evaluate baseline ambient biological conditions at selected reference stations to evaluate the effectiveness of past, on-going, and future pollution abatement efforts;

Document any changes in the biological, chemical, and physical conditions of the study area where historical information exists, thus expanding Ohio EPA's database for statewide trends analysis (e.g., 305[b]);

Evaluate beneficial use impairment status for the Cuyahoga River AOC; and

Reevaluate the appropriateness of water quality criteria for the Cuyahoga River ship channel;

Conduct biological and habitat benchmark sampling with Northeast Ohio Regional Sewer District (NEORSD) as part of the Credible Data Program's QA oversight of Qualified Data Collectors (QDC).

Collect pesticide water samples for USEPA study. Standard Operating Procedure (SOP) for sample collection will be developed by USEPA and is attached as Appendix 6.

A6.2 – Beneficial Use Designations

The beneficial use designations evaluated as part of this survey are the aquatic life, water supply, and recreation uses. Attainment of the aquatic life beneficial use is determined using results from biological sampling as described on page 8-7 in Biocriteria for Aquatic Life User's Manual (Ohio EPA, 1987). Attainment of non-aquatic life uses, such as water supply and recreation use, are determined by screening water column chemistry data for water supply and bacteriological data against relevant recreation standards criteria.

A6.3 - Total Maximum Daily Load (TMDL)
Data generated from this survey will determine the efficacy of previous TMDLs. Where new impairments are identified, Ohio EPA will develop a load analysis plan to outline the next steps in addressing the impairments. This load analysis plan will be released for public comment before the Agency moves to the next step of the TMDL process.

A6.4 - NPDES Permits
Selected sampling locations are designed to bracket major NPDES dischargers and CSO areas of concern. The data generated from this survey will establish background water quality data to assist NPDES permit writers during the waste load allocation process and evaluate water quality effects of CSO releases.

A6.5 - Nonpoint Sources
Sample results will evaluate cumulative water quality improvements from various BMPs implemented within the watershed and baseline and/or post construction water quality related to nonpoint source pollution controls or habitat restorations.

A6.6 – Nutrients
Data to support the nutrient weight of evidence analysis will be collected at designated sites. This analysis will use a suite of parameters, including water column nutrients, continuous dissolved oxygen, and chlorophyll-*a*, to determine designated use impairments caused by nutrient enrichment.

A6.7 - Area of Concern (AOC)
Data collected within the 18 HUC 12s of the AOC will be utilized to delist the following BUIs: 1a Fish Consumption, 3 Fish population, 4 Fish Tumors/Deformities, 6 Benthos, 8 Eutrophication or Algae, 14a Fish Habitat.

A6.8 – Cuyahoga Ship Channel
Data collected at the ship channel study sites will be used to develop and calibrate a water quality model of the ship channel. This model will evaluate the appropriateness of the current ALU designation and its specific water quality criteria for ammonia, CBOD, and dissolved oxygen.

A6.9 Credible Data Benchmarking
Fish and habitat benchmark sampling will be conducted with Northeast Ohio Regional Sewer District (NEORSD) as part of the Credible Data Program's QA oversight of Qualified Data Collectors (QDC). OEPA field staff will assess NEORSD's QDCs Qualitative Habitat Evaluation Index (QHEI) scores and fish collections at headwater and wadable streams to ensure the data being generated is equivalent to OEPA. OEPA will conduct the first pass at the five selected fish sites, followed by NEORSD QDCs performing the second pass at those same five sites. Upon the completion of both passes, the data will be compared. The five sampling locations to be evaluated are identified in Appendix 2.

A7 – Quality Objectives and Criteria

A7.1 - QC Performance criteria for water chemistry
Blanks and duplicate QC samples will be collected at rates consistent with the Surface Water Field Sampling Manual (2018) for water quality parameters and flows herein referred to as Field Manual. Target rates are 5 percent for the sum of field and equipment blanks and 5 percent for the sum of duplicates and replicates. The results of these will be evaluated using techniques and thresholds also described in section A of Appendix IV to the Field Manual (2018), which describes assessment methodology and acceptable thresholds for blanks, duplicates, and paired parameter agreement. The project coordinators will plan

sampling to ensure collection of an appropriate number of QC samples. The division will also do an annual review of QC sampling rates, rates of blank detects, and duplicate sample qualifications by parameter.

A7.2 - QC Performance criteria for biological and habitat data
Ambient environmental information (biological and physical habitat) has been collected from selected streams is utilized to assess aquatic life use attainment and to recommend an appropriate ALU using procedures described in the Biocriteria for Aquatic Life User's Manual (Ohio EPA 1987) and OAC 3745-1-07).

A8 – Special Training/Certification

Ohio EPA's Division of Surface Water (DSW) has developed an Access database called "TrainTrack" to document initial and refresher trainings. All staff involved in collecting any type of environmental sample must complete training associated with that sampling method. The first line supervisors shall ensure staff have the necessary safety and skill set training (initial and refresher training) prior to sampling. Annual chemical sampling refresher training covers a rotating sequence of difference methods, instruments, and other issues pertinent to field sampling. Biological trainings and quality assurance refresher activities are described in the Biological Criteria Manual Volume 3 (Ohio EPA 2015b). Initial training or refresher trainings are conducted annually for Ohio EPA staff (both full time and intermittent) that will be collecting biological and/or habitat sampling.

A9 – Documents and Records

The study plan team leader will be provided a copy of the final QAPP to the appropriate project personnel by email as detailed in the distribution list. As the plan is updated, each person on the distribution list will be sent an email with the most current document. The most current date of revision will be included in the document name and in the header of the document.

The Qualitative Habitat Evaluation Index (QHEI) habitat forms, chain of custody forms, sample submission forms, and field logs will be maintained in their original form and information from those forms will be included in Agency databases. The databases are backed up on secure servers.

Field measurements taken with a handheld multi-parameter water quality sonde (herein referred to as handheld meter) will be recorded electronically. If a handheld meter is used that does not have datalogging capabilities, a field sheet will be completed, and the data will be input manually into the database for storage and dissemination. The results from samples sent to the Ohio EPA Division of Environmental Services (DES) for analysis will follow the protocol typical to Ohio EPA standard practice. The data will be placed directly into Agency databases that have secure backup and ease of retrieval.

The format for all data recording will be consistent with the requirements and procedures used for data validation and assessment described in this QAPP. Files generated according to applicable and attached standard operating procedures (such as raw data, results of QC checks, problems encountered, etc.) will be documented and reported to the study team.

All communications regarding study plan changes or refinements, such as changes to sites, staff, parameters, etc., will be filed in the Sharepoint project file by the study team leader. Other major actions which might affect the DQOs, project leader changes, etc., will require an updated QAPP with a new signoff sheet.

A9.1 - Document/record control

The recording media for the project will be a combination of paper and electronic means to document site conditions. Data gathered using paper will be recorded using indelible ink, and changes to such data records will be made by drawing a single line through the error with an initial by the responsible person. Similar methods will be used for electronic data recording.

The study team leader will retain the most recent version of the QAPP and be responsible for distribution of the current version of the QAPP to the project team. Agency management and the Quality Assurance Crew (QAC) will approve updates to the QAPP as needed. The study leader will retain copies of all management reports, memoranda, and all correspondence between team members identified in Section A. Retention of records should emphasize any deviations from the signed QAPP, including the rationale for those changes.

A9.2 - Document storage

A Sharepoint project file will act as a central repository for all documents collected or generated relevant to this project. All project documents will be scanned in and stored electronically on the project Sharepoint file and hardcopies will be stored at an Ohio EPA office. Project photos will be moved to and stored in the Lynx Photo System. All files will be retained by Ohio EPA in accordance with its records retention policy.

All communications regarding study plan changes or refinements, such as changes to sites, staff, parameters, etc., will be filed in the Sharepoint project file by the study team leader. Other major actions which might affect the DQOs, project leader changes, etc., will require an updated QAPP with a new signoff sheet.

SECTION B – DATA GENERATION AND ACQUISITION

B1 – Sampling Process Design

Biological, chemical, and physical stream data will be collected during the 2018 field sampling season within the Cuyahoga River tributaries and ship channel study area. As part of the TMDL process, this study is designed to identify impairments to beneficial uses and evaluate the appropriateness of existing beneficial uses, including aquatic life, recreation, and water supply. Biological data collected will characterize any potential aquatic life use impairment. Habitat and water chemistry provide additional information which further inform the biological findings, adding to the weight of evidence approach to help diagnose the cause of aquatic life or other beneficial use impairments.

B1.1 Sample Location Selection

Sampling site locations included in this survey are listed in Appendix 2. The sampling regime is designed to assess the study area with a sufficient number of sampling locations, ensuring a credible evaluation of environmental impacts. Site locations are selected based on spatial representativeness, known or expected point and non-point sources, historical biological data availability, and stream flow data for load analysis. Reference sampling locations are included in the selection. Reference sampling locations reflect the reasonably attainable biological conditions and water quality within an ecoregion given the local background conditions. A complete discussion of all aspects of the reference site approach is discussed within Biological Criteria for the Protection of Aquatic Life: Volume II (Ohio EPA 1987).

B1.2 Sampling Type and Frequency

Surface water chemistry samples, fish and macroinvertebrate assemblages, stream habitat evaluations, and stream sediments will be collected during the 2018 survey. A summary of sampling types and frequencies are listed in Table 1, with a more extensive list located in Appendix 1 and 2.

B1.2- Table 1. Sampling Type and Count

Sample Type	Count
Fish	103
Macro	103
Chemistry	107
Chemistry w/ nutrients	47
Organics	23
Sediment	26
Bacteria	33

B2 – Sampling Methods

All biological, chemical, data processing, and data analysis methods and procedures adhere to those specified in the Surface Water Field Sampling Manual for Water Quality Parameters and Flow (Ohio EPA 2018), Biological Criteria for the Protection of Aquatic Life, Volumes II - III (Ohio EPA 1987, 1989a, 2015b), 2015 Updates to the Biological Criteria for the Protection of Aquatic Life, Volume II (Ohio EPA 2015a), and The Qualitative Habitat Evaluation Index (QHEI): Rationale, Methods, and Application (Ohio EPA 1989b, 2006) for habitat assessment.

B2.1 - Stream Habitat Evaluation

Physical habitat is evaluated using the QHEI (Ohio EPA 1989b, 2006). The QHEI is a rapid, visual assessment of instream physical habitat quality and is designed to provide a measure of habitat features that generally correspond to those physical factors that affect fish communities, and which are generally important to other aquatic life. Evaluations of substrate type and quality, amount of in-stream cover, channel morphology, extent of riparian canopy, pool and riffle development and quality, and stream gradient are among the metrics used to evaluate the habitat of a stream segment.

B2.2 - Biological Community Assessment

Macroinvertebrates will be collected from artificial substrates (quantitative) and from the natural habitats (qualitative). Attempts to collect quantitative macroinvertebrate samples will be made at all reference locations, locations with drainage areas greater than 20 mi^2, and select locations under 20 mi^2. Conditions encountered while sampling (i.e. insufficient streamflow) may preclude collection of quantitative samples. The artificial substrate collection provides quantitative data and consists of a composite sample of five modified Hester-Dendy (HD) multiple-plate samplers colonized for six weeks. At the time of the artificial substrate collection, a qualitative multihabitat composite sample is also collected. Qualitative sampling will be conducted at all sampling locations. The qualitative sampling effort consists of an inventory of all observed macroinvertebrate taxa from the natural habitats at each site with no attempt to quantify populations other than notations on the predominance of specific taxa or taxa groups within major macrohabitat types (e.g., riffle, run, pool, and margin). A complete summary of macroinvertebrate sampling procedures is described in Biological Criteria for the Protection of Aquatic Life: Volume III (Ohio EPA 2015b).

Fish communities will be assessed at each location noted in Appendix 2. Fish community samples will be collected by pulsed DC electrofishing using methodology developed by Ohio EPA (Ohio EPA 1987, 1989a, 2015bc). Typically, two sampling events will be conducted at sites larger than 20 mi² and at reference sites, although anywhere from one to three passes may occur at a given location regardless of stream size based on need for additional information to further elucidate conditions observed while sampling. Biological sampling protocols and methodology are detailed in the Ohio EPA manual Biological Criteria for the Protection of Aquatic Life, Volume III (Ohio EPA 2015b).

B2.3 – Sediment

Fine grained multi-incremental sediment samples will be collected in the upper four inches of bottom material using either decontaminated stainless-steel scoops or Ekman dredges. Samples will subsequently be placed into appropriate containers, placed on ice (to maintain ≤6°C), and shipped to Ohio EPA's Division of Environmental Services (DES). Sampling and decontamination protocols will follow those listed in Ohio EPA's Sediment Sampling Guide and Methodologies, found in Appendix III of the Surface Water Field Sampling Manual for Water Quality Parameters and Flow (Ohio EPA 2018).

B2.4- Surface Water

Surface water grab samples will be collected from the upper 12 inches of river water into appropriate containers. Collected water will be preserved using appropriate methods, as outlined in Surface Water Field Sampling Manual for Water Quality Parameters and Flow (Ohio EPA 2018), placed on ice (to maintain ≤6°C) and delivered to DES for analysis. Instantaneous measurements of dissolved oxygen, pH, temperature, and specific conductivity will be made using handheld meters along with all grab samples for surface water chemistry.

B2.5 –Nutrient and Water Quality Sonde

To evaluate water quality impacts from nutrient enrichment, benthic and sestonic chlorophyll-*a* samples will be collected and preserved using appropriate methods, as outlined in Surface Water Field Sampling Manual for Water Quality Parameters and Flow (Ohio EPA 2018). Multi-parameter water quality sondes will be deployed at nutrient sites to collect continuous measurements of dissolved oxygen, pH, temperature, and specific conductivity. Typically, each deployment will last 48 hours, with an attempt to cover each site twice during the summer sampling period.

B2.6- Bacteria

Samples will be collected directly into a sterilized glass or polypropylene (or other autoclavable plastic) bottle. All bacteria samples will be collected and stored in coolers with ice sufficient to maintain the samples at ≤6º C until deliver at the bacteria analyzing lab within required holding time. All bacteria sampling is required to occur in a 90-day period between May 1st and Oct. 31st. Sample collection methods are outlined in Surface Water Field Sampling Manual for Water Quality Parameters and Flow (Ohio EPA 2018)

B2.7– Fish Tissue Sampling

A complete discussion of fish tissue efforts to be conducted in 2018, including methodology and QA/QC procedures, are contained within the Cuyahoga Fish Tissue QAPP.

B3 – Sample Handling and Custody

DSW will use Sample Master® to enter information for sample labels and parameters needed for analysis and to print necessary documentation. Written standard operating procedures (SOPs) for all sample

handling is available in Section 8 of the Surface Water Field Sampling Manual for Water Quality Parameters and Flow (Ohio EPA 2018). This document formally details procedures to possess, transfer, and handle samples for the duration of time samples are within a sampler's custody.

B4 – Analytical Methods

The analytical methods to be used in this study are provided in Appendix 4 along with the containers, preservatives, holding times, and reporting limits. SOPs for the analytical methods are available on the DES intranet site.

B5 – Quality Control (QC)

Duplicate and replicate QC samples are to be collected and submitted at a combined minimum frequency of 5% of the total number of field samples. Field blank and equipment blanks are also to be collected and submitted at a combined minimum frequency of 5% of the total number of field samples. This results in a minimum of 10% QC samples. Matrix spike duplicates will be collected for organic water samples at a minimum of 5 percent. All QC procedures are outlined in subsection E5 of Surface Water Field Sampling Manual for Water Quality Parameters and Flow (Ohio EPA 2018).

B6 – Instrument/Equipment Testing and Calibration, Inspection, and Maintenance

All instruments/equipment will be inspected and calibrated prior to use. All calibration solutions used will be checked for expiration dates before utilized. The appropriate calibration procedure, as specified in the instruments user manual, must be followed. All equipment is assigned a log book 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 for Water Quality Parameters and Flow (Ohio EPA 2018). Other equipment used will follow specifications provided in the biological and habitat methods cited.

B7 – Inspection/Acceptance of Supplies and Consumables

Supplies and consumables will be inspected upon receipt. Nearly all supplies utilized for this project are maintained and used during Ohio EPA's normal business operations. Field personnel will be responsible to ensure 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. Consumable supplies include sample containers, preservatives, Lugol's iodine solution, sugared formaldehyde, filters and miscellaneous supplies such as distilled water, disposable gloves, and towels. Field personnel will confirm that all reagents are within applicable shelf life.

B8 – Data Management

B8.1 – Chemistry Samples

DSW and DES share the data management process. DSW uses a specially designed program called Ecological Assessment and Analysis Application (EA3) and DES uses a Lab Information Management System (LIMS) called Sample Master® for this purpose. These programs are linked together to allow information transfer from Sample Master® to EA3. 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. See Field Manual, Appendix IV, Section B.

Sample Master® is used to schedule and administer the samples that are submitted to DES for analysis. 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.

Field measurements are collected instantaneously using a handheld meter following the methods described in the Field Manual. The handheld meters have an internal file storage system that allows for data to be saved in the field by selecting the correct station from a site list created within the instrument's menu system. Alternatively, parameters can be recorded manually on a paper form. Electronic files are downloaded to an Ohio EPA PC using software supplied by the manufacturer. These files can then be exported to Microsoft Excel and saved on a local or shared network. All agency files are ultimately backed up and housed in the State of Ohio Computer Center (SOCC).

Data files saved in Excel need to be transferred to a table in Sample Master® by the sample collector or delegated data manager. Field data recorded on paper can also be manually entered into this table. Once entered, the sample collector or data manager validates and approves the results in Sample Master®. Field and lab chemistry data from a site are paired together based on the sample ID number assigned during the sample order process. Lab chemistry data are reviewed and approved by DES before being released and uploaded into EA3. Then, in EA3, the sample collector reviews each data sheet for accuracy, validates field QC, and adds comments, qualifiers, and edits, if necessary, before approving the sheet. This data is then available for use in water quality reports such as the TSD.

B8.2 Biological and Habitat Data Sheets

All original fish, macroinvertebrate, and QHEI data sheets are filed at Ohio EPA with the Ecological Assessment Unit. Data from the field sheets are manually entered into the EA3 database system. Field data sheets are double-entered to reduce entry error rates. Each respective collector is responsible for final proofing, editing, and confirming correctness of all information before the data is approved in the EA3 database. Respective data collectors are also typically responsible for final approvals of data sheets in the EA3 database.

B8.3 Data management Summary

The project leader maintains 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 is included on emails or otherwise receives 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

C1 – During Sampling Assessments/Analysis and Response Actions

C1.1 – 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.

C1.2 - 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 lab and are common enough to the process, so as 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) 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. Lab corrective actions will follow regular laboratory procedures and SOPs. Any lab corrective action with the potential to affect data quality will be conveyed to the study team leader by the laboratory.

C1.3 - 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.

C1.4 - 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.

C2 – Reports to Management

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 result.

C2.1 – Aquatic Life Use Attainment
Attainment status of aquatic life uses will be determined by using biological criteria 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), which measure the response of the

fish community, and the Invertebrate Community Index (ICI), which indicates the response of the macroinvertebrate community.

Performance expectations for the tiered aquatic life uses included in OAC 3745-1-07 were developed using the regional reference site approach (Hughes et al. 1986; Omernik 1987). This fits the practical definition of biological integrity as the biological performance of the natural habitats within a region (Karr and Dudley 1981). Attainment of an aquatic life use is FULL when all applicable biological indices meet the applicable biocriteria, PARTIAL if at least one of the applicable indices did not attain, and NON if all the measured biological scores either fail to attain the applicable biocriteria or any index indicates poor or very poor performance.

C2.2 – Stream Habitat Evaluation

Various attributes of the available habitat are scored based on their overall importance to the establishment of viable, diverse aquatic faunas. Evaluations of substrate type and quality, amount of in-stream cover, channel morphology, extent of riparian canopy, pool and riffle development and quality, and stream gradient are among the metrics used to evaluate the habitat characteristics of a stream. In most cases, an aggregation of habitat scores throughout a stream reach are used to fully characterize the habitat quality and, thus, the potential for a stream reach to support a certain level of biological performance. Habitat quality at an individual site may be sub-optimal due to a localized disturbance yet still support aquatic communities closely resembling those sampled at adjacent sites with better habitat, provided water quality conditions are similar.

C2.3 – Recreational Use Attainment (Bacteria)

Recreational use attainment will be determined using Escherichia coli (*E. coli*) bacteria. *E. coli* is the indicator organism used to detect the potential presence of pathogens in surface water resulting from the presence of untreated human and/or animal wastes and is the basis for recreational use water quality criteria in OAC 3745-1-37. *E. coli* results are compared against the applicable *E. coli* criteria in Table 37-2 to determine recreational use attainment status.

C2.4 – Surface Water Quality

Surface water quality (chemistry) data will be reviewed for any exceedances of the water quality criteria and screened as possible causes of impairment. Nutrient enrichment is evaluated as a potential cause of impairment using a weight of evidence approach, which involves diel dissolved oxygen, benthic and sestonic chlorophyll-*a*, and water column nutrient data.

C2.5 – Sediment Evaluation

Sediment data will primarily be used as a resource to help determine causes and sources of aquatic life impairment. More detailed follow-up studies may be recommended in some instances. To determine the potential for sediment contaminants to exert adverse effects the data will first be compared to Ohio sediment reference values and consensus-based sediment quality guidelines. This constitutes a Tier I assessment as described in *Guidance on Evaluating Sediment Contaminant Results* (Ohio EPA, 2010). No further assessment is needed if the sediment passes the screening. If not, it is considered above levels of concern and further evaluation is needed using the Tier II process. This process estimates bioavailability using total organic carbon to normalize pollutant concentrations.

SECTION D: DATA VALIDATION AND USABILITY

D1 – Data Review, Verification, and Validation

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 lab. The process will also result in summaries of any differences between initial sampling and methods planned in the QAPP and final 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 lab (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 data review 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.

D2 – Verification and Validation 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 (June 2015).

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 as a whole.

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 Field Manual (Ohio, 2018). 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.

D2.1 - Data Validation Guidelines for QC and Field Samples

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 D of the Field Manual, Data Management, for guidance on data validation guidelines for QC and field samples.

D3 – Reconciliation with User Requirements

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.

APPENDICES

Appendix 1 – Table 1. Summary of Sampling Effort

Type of sample	# Sites	# Passes	Total #
	Biological Communities		
Fish (Boat)	1	1	1
Fish (Wading)	39	2	76
Fish (Headwater)	58	1	58
Macroinvertebrate (HD)	39	1	39
Macroinvertebrate (Qualitative)	57	1	57
	Water Chemistry		
Conventional (Inorganic Samples)	107	5	535
Chlorophyll-*a*	47	2	94
Organic Samples	23	1 (2 if needed)	23
Nutrient (Sonde deployment)	47	2	94
Ship Channel	5	50	250
	Sediment		
Metals (Selected)	26	1	26
PCB's and Semivolatiles (BNA)	26	1	26
	Bacteria		
E. coli cultures	33	5	165

Appendix 2- Streams, Sampling Locations, and Sampling Type. NEORSD benchmarking sites are indicated with an *.

STORET	Site Name	River Mile	Area (mi^2)	HUC12	River Code	Sample Types	Latitude	Longitude
F01G05	W. BR. CUYAHOGA R. @ TAYLOR-WELLS RD.	12.3	7.2	41100020102	19-036-000	F,Mq,C,N	41.5599	-81.1564
F01G44	W. BR. CUYAHOGA R. @ AQUILLA RD. NEAR FISHER RD.	5.6	25.4	41100020102	19-036-000	F2,MQ,C	41.4878	-81.1743
F01W76	W. BR. CUYAHOGA R.@ RAPIDS RD.	0.87	35.4	41100020102	19-036-000	F2,MQ,C,N,B,Sd,O	41.4506	-81.1589
F01G07	BUTTERNUT CREEK @ AQUILLA RD.	0.8	4.2	41100020102	19-037-000	F,Mq,C,N	41.5321	-81.18
F01G08	HOPSONS CREEK @ ST. RT. 87	0.6	4.9	41100020102	19-036-001	F,Mq,C,N	41.4708	-81.1636
F01A55	TARE CREEK N OF MIDDLEFIELD @ ST. RT. 608	1.59	6.1	41100020103	19-038-000	F,Mq,C,Sd	41.4858	-81.0825
F01P51	E. BR. CUYAHOGA R. NEAR MIDDLEFIELD @ ST. RT. 608	90.86	18.6	41100020103	19-001-000	F2,MQ,C,N	41.5025	-81.09763
F01W74	BRIDGE CREEK @ TAYLOR MAY RD.	8.46	15	41100020104	19-035-000	F,Mq,C,B	41.3775	-81.2642
F01W75	BRIDGE CREEK DST. LADUE RESERVOIR @ STAFFORD RD.	1.32	31	41100020104	19-035-000	F2,MQ,C,N,B	41.4137	-81.17526
New_01	TRIB. TO BRIDGE CK. (8.85) @ AUBURN RD.	1.4	3.1	41100020104	19-035-002	F,Mq,C	41.3912	-81.24631
F01G10	TRIB TO BRIDGE CK. (0.52) NEAR RAPIDS RD.	0.1	8.2	41100020104	19-035-001	F,Mq,C	41.419	-81.1673
F01W72	BLACK BROOK @ FOX RD.	1.78	11.7	41100020105	19-033-000	F,Mq,C,B	41.3506	-81.1961
F01G12	SAWYER BROOK @ TILDEN RD.	0.3	2.5	41100020106	19-034-000	F,Mq,C,N	41.3736	-81.152
F01T02	FEEDER CANAL (CONGRESS LAKE OUTLET) @ WATERLOO RD.	12.42	24.6	41100020201	19-028-004	F2,MQ,C,B	41.0330	-81.25724
F01W71	POTTER CREEK @ TRARES RD.	1.47	3.2	41100020201	19-028-005	F2,MQ,C,Sd (Ref.)	41.0428	-81.2958
F01A31	BREAKNECK CREEK UPST. PORTAGE LANDFILL	14.6	42.3	41100020202	19-028-000	F2,MQ,C,Sd (Ref.)	41.0892	-81.2914
F01S03	BREAKNECK CREEK SW OF RAVENNA @ SUMMIT RD.	7	56.2	41100020202	19-028-000	F2,MQ,C,Sd, (Ref.)	41.1394	-81.2708
F01S51	BREAKNECK CREEK @ POWDER MILL RD.	3.08	60.7	41100020202	19-028-000	F2,MQ,C,N,B	41.1444	-81.3081
F01W83	BREAKNECK CREEK NEAR MOUTH	0.05	78.7	41100020202	19-028-000	F2,MQ,C,N,Sd,O	41.1694	-81.3378
F01A19	FEEDER CANAL (CONGRESS LAKE OUTLET) SW OF RAVENNA @ TALMADGE RD.	5.63	43.69	41100020202	19-028-004	F2,MQ,C,B	41.1000	-81.30057
New_02	TRIB TO CONGRESS LAKE OUTLET (9.77) @ JOHNNYCAKE RD.	0.3	4.22	41100020202	19-028-008	F,Mq,C	41.0587	-81.26846

F01S53	WAHOO DITCH AT RAVENNA @ MAIN ST.	1.22	3.9	41100020202	19-028-002	F,Mq,C,N	41.1583	-81.2683
F01P32	WAHOO DITCH NEAR RAVENNA @ LAKEWOOD RD.	0.39	5.5	41100020202	19-028-002	F,Mq,C,N,Sd,O	41.1514	-81.2797
200113	BRIMFIELD DITCH NEAR KENT, NEAR MOUTH	0.1	11.7	41100020202	19-028-001	F,Mq,C,N,B	41.155	-81.3183
F01G13	TRIB. TO CUYAHOGA R. (69.43) @ CANADA RD.	0.2	3.8	41100020203	19-001-024	F,Mq,C	41.2753	-81.2215
F01G15	HARPER DITCH @ BECK RD.	0.2	4.7	41100020203	19-001-020	F,Mq,C	41.2549	-81.2569
F01P53	TRIB. TO CUYAHOGA R. (65.19) NEAR COIT RD	0.3	3	41100020203	19-001-023	F,Mq,C	41.2531	-81.2706
200064	TRIB. TO CUYAHOGA R. (63.82) @ ST. RT. 303	0.1	3.7	41100020203	19-001-041	F,Mq,C	41.2437	-81.2956
F01G16	TRIB. TO CUYAHOGA R. (63.43) @ ST. RT. 303	0.1	2.5	41100020203	19-001-022	F,Mq,C	41.2409	-81.3010
F01G19	ECKERT DITCH @ DAWLEY RD.	1.09	8	41100020203	19-001-018	C Only	41.1912	-81.2907
303950	MORROW DITCH	1.5	0.43	41100020302	19-030-009	C,B	41.0826	-81.3196
F01G23	PLUM CREEK @ TALLMADGE RD.	3.7	4.2	41100020303	19-027-000	F,Mq,C	41.1002	-81.3698
F01P34	PLUM CREEK DST. KENT WTP @ CHERRY ST	0.32	13	41100020303	19-027-000	F,Mq,C,N,B,Sd,O	41.1406	-81.3728
New_03	TRIB. TO PLUM CK. (2.77) @ SUNNYBROOK RD.	0.35	4.2	41100020303	19-027-001	F,Mq,C	41.11146	-81.3715
F01S88	L CUYAHOGA R UPST WINGFOOT LAKE OUTLET, DST UNIVERSAL MATRLS	11.2	17.4	41100020303	19-030-000	F2,MQ,C,N	41.0581	-81.4322
F01S84	L. CUYAHOGA R. AT AKRON @ MASSILLON RD.	7.15	31	41100020303	19-030-000	F2,MQ,C,B	41.0603	-81.4628
F01S97	TRIB. TO L. CUYAHOGA R. (11.59) DST. SE AVE. & UNION OIL	0.5	2.7	41100020303	19-030-006	C Only	41.0686	-81.3969
F01S94	WINGFOOT LAKE OUTLET @ UNNAMED ROAD AT MOUTH	0.05	7.2	41100020303	19-032-000	F,Mq,C	41.0548	-81.3985
F01S92	SPRINGFIELD LAKE OUTLET @ MOUTH	0.01	12.5	41100020303	19-031-000	F,Mq,C	41.0594	-81.4636
302337	ADAMS RUN AT AKRON @ ESSEX ST.	0.2	1.9	41100020303	19-031-001	C,Sd,O	41.0478	-81.4658
F01S82	L. CUYAHOGA R. AT AKRON @ BANK ST.	5.11	47	41100020304	19-030-000	F2,MQ,C,N,Sd,O	41.0733	-81.4847
F01S99	L. CUYAHOGA R. AT AKRON @ CUYAHOGA ST.	2.14	54	41100020304	19-030-000	F2,MQ,C	41.0925	-81.5169
502180	L. CUYAHOGA R. AT AKRON, NEAR MOUTH	0.3	61.7	41100020304	19-030-000	F2,MQ,C,N,B,Sd,O	41.1147	-81.5275
F01S90	CHESSIE TRIB. (4.11) (CAMP BROOK) AT AKRON @ EASTWOOD AVE.	0.05	5.2	41100020304	19-030-004	C Only	41.0861	-81.4869
F01A01	OHIO CANAL AT AKRON @ NORTH ST.	0.18	50	41100020304	19-030-001	F2,MQ,C,N	41.0911	-81.5178
F01W37	FISH CREEK AT KENT @ N. RIVER RD.	0.38	11.4	41100020305	19-026-000	F,Mq,C,N,B,Sd,O	41.1458	-81.3972
F01P25	MUD BROOK AT STOW @ SEASONS RD.	8.34	14.9	41100020401	19-024-000	F,Mq,C,N,B	41.2028	-81.4733

F01P24	MUD BROOK N OF AKRON @ AKRON-PENINSULA RD.	0.18	29.3	41100020401	19-024-000	F2,MQ,C,N,Sd,B,O	41.1389	-81.5481
F01S46	POWERS BROOK DST. HUDSON #6 WWTP @ SOD FARM RD.	0.3	9.3	41100020401	19-025-000	F,Mq,C,B	41.2139	-81.4661
F01G46	YELLOW CREEK @ GRANGER RD. (FIRST CROSSING UPST. NORTH FORK)	5.3	10.6	41100020402	09-021-000	F,Mq,C,N	41.1606	-81.649
F01P16	YELLOW CREEK DST. GHENT @ YELLOW CREEK RD.	4.08	22	41100020402	19-021-000	F2,MQ,C,N	41.1572	-81.6306
F01P15	YELLOW CREEK NEAR BOTZUM @ RIVERVIEW RD.	0.14	31	41100020402	19-021-000	F2,MQ,C,N,B,Sd,O	41.1633	-81.5761
F01P21	N. FK. YELLOW CREEK AT GHENT, UPST. YELLOW CREEK RD.	0.1	9.8	41100020402	19-022-000	F,Mq,C,N	41.1592	-81.6383
300088*	FURNACE RUN DST. CONFLUENCE WITH ROCK CREEK	7.25	5.6	41100020403	19-020-000	F,Mq,C	41.26	-81.6371
F01P14	FURNACE RUN NEAR EVERETT @ RIVERVIEW RD.	0.27	20.3	41100020403	19-020-000	F2,MQ,C,N,B,Sd,O	41.2014	-81.5736
200102	TRIB. TO FURNACE RUN (7.90) N OF RICHFIELD, NEAR MOUTH	0.2	0.7	41100020403	19-020-001	F,Mq,C	41.2669	-81.6417
300085	ROCK CREEK UPST. ELM GROVE BRIDGE	0.1	1.92	41100020403	19-020-002	F,Mq,C	41.2683	-81.6382
New_03	RIDING RUN (1.98) @ WHEATLEY RD.	0.1	1.3	41100020403	09-020-003	F,Mq,C	41.2161	-81.5924
New_04	TRIB. TO FURNACE RUN (1.20) @ EVERETT RD.	0.1	1.93	41100020403	19-020-004	F,Mq,C	41.2052	-81.5877
F01W11	BRANDYWINE CREEK NEAR HUDSON @ HINES HILL RD.	7.02	8.7	41100020404	19-010-000	F,Mq,C,Sd	41.2602	-81.4891
F01P35	BRANDYWINE CREEK NEAR NORTHFIELD CENTER @ ST. RT. 8, upst Indian Ck.	4.27	15.9	41100020404	19-010-000	F,Mq,C,N	41.2942	-81.5231
F01S49*	BRANDYWINE CREEK NEAR MOUTH, UPST. TECUMSEH DRIVE	0.26	27.2	41100020404	19-010-000	F2,MQ,C,N,B,Sd,O	41.2859	-81.5615
F01W15	INDIAN CREEK AT MACEDONIA @ MOUTH	0.01	6.5	41100020404	19-010-001	F,Mq,C	41.294	-81.5195
F01P23	SAND RUN @ RIVERVIEW RD N OF AKRON	0.13	3.1	41100020405	19-001-014	F,Mq,C	41.1389	-81.5617
F01G26	WOODWARD CREEK @ AKRON-PENINSULA RD.	0.6	2.9	41100020405	19-023-000	F,Mq,C,Sd	41.1594	-81.5649
F01G27	ROBINSON RUN @ AKRON-PENINSULA RD.	0.1	0.9	41100020405	19-019-000	F,Mq,C	41.2085	-81.5603
F01G29	DICKERSON RUN @ AKRON-PENINSULA RD.	0.6	2.5	41100020405	19-017-000	F,Mq,C	41.2184	-81.552
F01G30	SALT RUN @ AKRON-PENINSULA RD.	0.3	2.8	41100020405	19-016-000	F,Mq,C	41.2261	-81.5473
F01G32	BOSTON RUN (28.98) @ DUGWAY HILL RD.	0.22	2.7	41100020405	19-013-000	F,Mq,C	41.2448	-81.5458

F01G33	SLIPPER RUN (28.78) @ RIVERVIEW RD.	0.16	1.4	41100020405	19-012-000	F,Mq,C	41.2424	-81.5557
200061	SPRING CREEK (26.19) SE OF BOSTON, ADJ. BOSTON MILLS RD.	1.3	0.6	41100020405	19-001-012	F,Mq,C	41.2556	-81.5786
F01G34	STANFORD RUN (25.75) @ HINES HILL RD.	0.9	1.9	41100020405	19-011-000	F,Mq,C	41.2704	-81.5508
New_05	TRIB TO CUYAHOGA RIVER (25.41) @ RIVERVIEW RD.	0.15	2.03	41100020405	19-001-043	F,Mq,C	41.2756	-81.5680
F01W64	CUYAHOGA R. 0.55 MI. DST. L. CUYAHOGA R. @ GOLF COURSE	41.71	402	41100020405	19-001-000	F2,MQ,C	41.1242	-81.5311
502010	CUYAHOGA R. DST. AKRON WWTP @ BOLANZ RD.	33.2	480	41100020405	19-001-000	F,MQ,C,N	41.2019	-81.5686
F01S32	TINKERS CREEK @ HUDSON-AURORA RD.	25.05	19	41100020499	19-007-000	F2,MQ,C,N,B	41.2619	-81.3942
F01W28	POND BROOK JUST DST. OF TRIB.	2.39	10.9	41100020501	19-008-000	F,Mq,C,N	41.3186	-81.4004
F01S40	POND BROOK NEAR AURORA @ ST. RT. 82	1.41	15.7	41100020501	19-008-000	F,Mq,C,N,B	41.305	-81.3997
F99Q10	TINKERS CREEK @ SEASONS RD.	28.3	3.8	41100020502	19-007-000	F2,MQ,C,N (Ref.)	41.2161	-81.3731
F01P13*	CHIPPEWA CREEK AT BRECKSVILLE @ RIVERVIEW RD.	0.36	17.6	41100020503	19-009-000	F,Mq,C,N,B,Sd	41.3169	-81.5922
F01S59	CHIPPEWA CREEK UPST. BROADVIEW HEIGHTS LANDFILL	6.03	6.3	41100020503	19-009-000	F,Mq,C	41.3244	-81.6722
302647	TRIB. TO CHIPPEWA CREEK (0.80) NEAR BRECKSVILLE, NEAR MOUTH	0.1	1.2	41100020503	19-009-003	F,Mq,C	41.31564	-81.6020
200081	TINKERS CREEK NEAR TWINSBURG, 0.36 MI. UPST. RTS. 82 & 14	18	48	41100020504	19-007-000	F2,MQ,C,N	41.3072	-81.4367
F01S29	TINKERS CREEK DST. TWINSBURG WWTP @ E. IDLEWOOD DR.	13.8	55	41100020504	19-007-000	F2,MQ,C,N,B,Sd,O	41.3331	-81.4578
502090	TINKERS CREEK AT GLEN WILLOW, DST. RICHMOND RD.	8.65	69	41100020504	19-007-000	F2,MQ,C,N	41.3767	-81.49
502220	TINKERS CREEK AT BEDFORD @ ST. RT. 14	6.32	84	41100020504	19-007-000	F2,MQ,C,N	41.3844	-81.5275
F01S25*	TINKERS CREEK UPST. WOOD CREEK, ADJ. BUTTON RD.	2.5	91	41100020504	19-007-000	F2,MQ,C,N,B	41.3744	-81.5734
F01S24*	TINKERS CREEK AT MOUTH @ CANAL RD.	0.1	96	41100020504	19-007-000	F2,MQ,C,N,B,Sd,O	41.3647	-81.6092
F01P44	BEAVER MEADOW RUN DST. SOLON WWTP @ COCHRAN RD.	0.11	6.1	41100020504	19-007-010	F,Mq,C,N	41.3611	-81.47
F01W57	HAWTHORN CREEK @ RICHMOND RD.	0.75	6.5	41100020504	19-007-008	F,Mq,C	41.3836	-81.4889
F01G22	BEAR CREEK W OF I-271 @ SOLON RD.	0.2	4.5	41100020504	19-007-007	F,Mq,C	41.3863	-81.5163

F01S36	WOOD CREEK DST. BEDFORD WWTP, NEAR MOUTH	0.15	3.2	41100020504	19-007-001	C,B	41.3775	-81.575
303949	TRIB. TO CUYAHOGA R. (21.40) @ RIVERVIEW RD.	0.4	0.75	41100020505	19-001-043	C,B	41.31	-81.589
F01G38	SAGAMORE CREEK @ CANAL RD.	0.2	6.2	41100020505	19-001-011	F,Mq,C,B,Sd,O	41.3514	-81.5923
F01G37	SAGAMORE CREEK UPST. SAGAMORE RD.	2.92	3.3	41100020505	19-001-011	F,Mq,C	41.3507	-81.5545
F01P09	MILL CREEK @ BROADWAY RD.	4.2	11.7	41100020601	19-006-001	F2,MQ,C,N,B,Sd,O	41.4336	-81.6058
502110	MILL CREEK AT GARFIELD HEIGHTS @ CANAL RD.	0.12	18.5	41100020601	19-006-000	F2,MQ,C,N,Sh,Sd,O	41.4178	-81.6383
F01G41	TRIB. TO CUYAHOGA R. (14.33) @ STONE RD.	0.1	3.31	41100020602	19-001-008	C,B	41.381	-81.624
502020	CUYAHOGA R. AT INDEPENDENCE @ OLD ROCKSIDE RD.	13.18	707	41100020602	19-000-000	Sh	41.3953	-81.63
F01S21	BIG CREEK @ BIG CREEK PARKWAY	7.8	10.9	41100020603	19-005-000	F,Mq,C,N,B,O	41.4089	-81.755
301193	BIG CREEK AT BROOKLYN, UPST. FORD BRANCH	4.4	20.8	41100020603	19-005-000	F2,MQ,C,N,O	41.446	-81.754
F01S20	BIG CREEK @ USGS GAGE	2.4	34.9	41100020603	19-005-000	F2,MQ,C,N,O	41.4506	-81.7214
502120	BIG CREEK @ JENNINGS AVE.	0.23	37.1	41100020603	19-005-000	F2,MQ,C,N,Sh,B,O	41.4467	-81.6883
F01G43	WEST CREEK AT PARMA @ BROADVIEW RD.	3.7	6.3	41100020604	19-001-004	F2,MQ,C,Sd,O	41.4112	-81.6928
F01P10	WEST CREEK NEAR BROOKLYN HEIGHTS @ ST. RT. 17 (GRANGER RD.)	0.19	13.2	41100020604	19-001-004	F2,MQ,C,N,Sh,B,Sd,O	41.4147	-81.6478
F01S09	CUYAHOGA R. DST SOUTHERLY WWTP @ CONRAIL RR	9.7	744	41100020604	19-000-000	Sh	41.4269	-81.6658
F01W43	CUYAHOGA R. @ LTV FOOTBRIDGE	5.9	788	41100020605	19-000-000	Sh	41.4633	-81.6806
200005	CUYAHOGA R. @ SCRANTON RD HABITAT RESTORATION	2.7	806	41100020605	19-000-000	Sh	41.4881	-81.6933

Appendix 3 –NPDES Permitted Facilities in the Cuyahoga River Tributaries.

Ohio EPA Permit Number	Facility Name	Design Discharge (MGD)[1]	Wastewater Type, Treatment System, Cont. or Batch Discharge	Stream Discharge	RM	County

Ohio EPA Permit Number	Facility Name	Design Discharge (MGD)[1]	Wastewater Type, Treatment System, Cont. or Batch Discharge	Stream Discharge	RM	County
3GB00006*BG	Arc Terminals Holdings LLC - Cleveland		Petroleum Bulk Storage Facilities	Cuyahoga River Ship Channel	3.5	Cuyahoga
3PD00006*PD	Bedford Hts WWTP	3.6	Municipality - 1.0 to 10 MGD	Hawthorne Creek	0.05	Cuyahoga
3PD00005*ID	Bedford WWTP	3.2	Municipality - 1.0 to 10 MGD	Wood Creek	1.1	Cuyahoga
3PD00019*PD	City of Solon Water Reclamation Facility	5.8	Municipality - 1.0 to 10 MGD	Beaver Meadow	0.95	Cuyahoga
3GH00025*BG	Marathon Petroleum Company LP		Hydrostatic Test Water	Cuyahoga River Ship Channel	3.8	Cuyahoga
3IG00038*HD	MPLX Terminals LLC - Brecksville Terminal	Storm	Refinery: Oil Producer	UT of Furnace Run	0.7	Cuyahoga
3GN00022*EG	Nook Industries Inc		Non-Contact Cooling Water	Ohio Erie Canal	NA	Cuyahoga
3IK00005*CD	Thistledown Racetrack	Storm, CAFO	Tannery: Rendering Plant?	Mill Creek	9.0	Cuyahoga
3IE00014*KD	Zircoa Inc	001-0.190, Storm, NCCW-003	Inorganic Chemical Plant	Beaver Meadow	2.8	Cuyahoga
3IE00005*KD	Zaclon LLC	NCCW	Inorganic Chemical Plan	Cuyahoga River Ship Channel	4.3	
3PG00100*GD	Aquilla Village WWTP	0.07	County - Under 0.1 MGD	UT of West Branch Cuyahoga River	0.2 (10.6)	Geauga

Ohio EPA Permit Number	Facility Name	Design Discharge (MGD)[1]	Wastewater Type, Treatment System, Cont. or Batch Discharge	Stream Discharge	RM	County
3PG00154*ED	Auburn Corners WWTP	0.07	County - Under 0.1 MGD	UT of LaDue Resevoir	4.03	Geauga
3PR00518*BD	Blossom Hill Care Center	0.01425	Semi-Public - Under 0.05 MGD	UT of East Branch Reservior	0.5 (92.6)	Geauga
3PG00011*HD	Broadwood Hills WWTP	0.0275	County - Under 0.1 MGD	UT to Hopsons Creek	0.3 (0.7)	Geauga
3PG00102*GD	Burton Lakes WWTP	0.05	County - Under 0.1 MGD	UT to Bridge Creek	1.3 (0.50)	Geauga
3PB00066*GD	Burton WWTP	0.27	Municipality - 0.1 to 0.5 MGD	UT East Branch Cuyahoga River	0.2 (86.4)	Geauga
3PR00513*BD	Cabana Island Restaurant	0.00263	Semi-Public - Under 0.05 MGD	Butternut Creek	0.9	Geauga
3PR00267*CD	Camp Anisfield	0.005	Semi-Public - Under 0.05 MGD	UT of West Branch Cuyahoga	0.2 (7.2)	Geauga
3PR00233*DD	Camp Burton	0.009	Semi-Public - Under 0.05 MGD	Hopsons Creek (Dierich CK)	4.0	Geauga
3PR00446*DD	Church of Saint Helens Parish School	0.0035	Semi-Public - Under 0.05 MGD	Silver Lake	NA	Geauga
3PR00525*BD	Circle K #5685	0.002	Semi-Public - Under 0.05 MGD	Butternut Creek	2.2	Geauga
3PR00295*CD	Claridon Plaza	0.0041	Semi-Public - Under 0.05 MGD	Butternut Creek	0.8	Geauga
3PT00105*CD	Claridon Properties	0.004	Schools and Hospitals	Ut of East Branch of Cuyahoga River	0.5 (93.0)	Geauga
3PR00516*BD	Debord Plumbing	0.01	Semi-Public - Under 0.05 MGD	UT of Butternut Creek	2.2	Geauga
3PV00132*AD	Deer Lake MHP	0.01	Mobile Home Park	UT of West Branch Cuyahoga River	0.5 (4.0)	Geauga
3PT00060*CD	Hambden Elem Sch	0.008	Schools and Hospitals	Ut to West Branch Cuyahoga River	2.1 (13.8)	Geauga

Ohio EPA Permit Number	Facility Name	Design Discharge (MGD)[1]	Wastewater Type, Treatment System, Cont. or Batch Discharge	Stream Discharge	RM	County
3IF00010*ID	Johnsonite	Storm, NCCW	Organic Chemical Plant	UT of Bridge Creek	0.9 (10.6)	Geauga
3PR00614*AD	KKR Inc - The Patio Lounge	0.003	Semi-Public - Under 0.05 MGD	Bridge Creek	9.0	Geauga
3PR00248*DD	Kozent LLC dba OME	0.0007	Semi-Public - Under 0.05 MGD	Pond Brook	2.0	Geauga
3PV00079*ED	Leaders Properties LLC	0.05	Mobile Home Park	Ut to West Branch Cuyahoga River	1.1 (12.15)	Geauga
3IN00376*AD	Mar-Bal Inc	0.006185	Miscellaneous	UT of Bridge Creek	0.6 (10.6)	Geauga
3IN00291*DD	Melzerland of Middlefield-(Middlefield Bulk Plant)	Storm	Miscellaneous	UT to Tare Creek	2.8 (0.5)	Geauga
3IR00037*KD	Middlefield Warehouse	004-0.0576, Storm	Rubber Fabrication, 004 - GW Pump and Treat	UT to Tare Creek	3.7 (0.5)	Geauga
3PB00034*JD	Middlefield WWTP	1.0	Municipality - 0.1 to 0.5 MGD	UT to Tare Creek	1.8 (0.5)	Geauga
3PT00140*BD	Munson Elementary School	0.007	Schools and Hospitals	Butternut Creek	2.4	Geauga
3PR00416*CD	Munson Sun Mart	0.0005	Semi-Public - Under 0.05 MGD	Butternut Creek	1.45	Geauga
3PT00124*CD	New Hope Christian Fellowship	0.0085	Schools and Hospitals	Bridge Creek	7.0	Geauga
3PR00297*CD	Newbury Industrial Park	0.01	Semi-Public - Under 0.05 MGD	West Branch of Cuyahoga River	3.55	Geauga

Ohio EPA Permit Number	Facility Name	Design Discharge (MGD)[1]	Wastewater Type, Treatment System, Cont. or Batch Discharge	Stream Discharge	RM	County
3PP00009*FD	Punderson State Park Campground Plant	0.0602	State Facility	UT of Bridge Creek	3.8 (0.50)	Geauga
3PR00665*AD	Rosewood Diesel Shop	0.0005	Semi-Public - Under 0.05 MGD	Butternut Creek	2.1	Geauga
3IH00025*GD	Rothenbuhler Cheesemakers, Inc	0.240	Food Processor	Tare Creek	1.0	Geauga
3PG00079*ID	Troy Oaks WWTP	0.06	County - Under 0.1 MGD	LaDue Reservoir (Bridge Creek)	4.2	Geauga
3IY00164*BD	Troyer Water System	0.00145	Water Treatment - Iron, Manganese Removal	Tare Creek	1.6	Geauga
3PR00316*DD	Welshfield Inn	0.00525	Semi-Public - Under 0.05 MGD	Sawyer Brook	2.5	Geauga
3GB00007*BG	Western Reserve Farm Cooperative Inc		Petroleum Bulk Storage Facilities	Hopsons Creek (Dierich Ck)	1.3	Geauga
3PW00014*FD	Granger Lake Condominiums No 1 Assn Inc	0.06	Subdivisions and Apartment Complexes	UT of Yellow Creek	1.5 (7.0)	Medina
3PD00046*FD	Aurora Westerly WWTP	1.4	Municipality - 1.0 to 10 MGD	UT of Pond Brook	0.6 (1.57)	Portage
3PW00023*CD	Benttree Condominium Assoc	0.0125	Subdivisions and Apartment Complexes	Ut to Cuyahoga River	0.3 (70.3)	Portage
3IY00153*DD	Brimfield WTP	0.027	Water Treatment - Iron, Manganese Removal	UT to Plum Creek	0.5 (4.0)	Portage
3IR00032*ED	Colonial Rubber Co	0.002	Rubber Fabrication	Wahoo Ditch	2.6	Portage
3PR00492*BD	DA Potter-Special Residence	0.00045	Semi-Public - Under 0.05 MGD	Black Brook Ditch	5.2	Portage

Ohio EPA Permit Number	Facility Name	Design Discharge (MGD)[1]	Wastewater Type, Treatment System, Cont. or Batch Discharge	Stream Discharge	RM	County
3PV00078*ED	Evergreen Village MHP	0.02	Mobile Home Park	UT to Harper Ditch	1.18 (0.61)	Portage
3PG00096*ID	Fairlane WWTP	0.03	County - Under 0.1 MGD	UT Potters Creek	0.4 (2.5)	Portage
3PK00015*HD	Franklin Hills WWTP	1.5	County - 1.0 to 10 MGD	Breakneck Creek	2.52	Portage
3IC00022*JD	Goodyear Tire & Rubber Airship Operations	0.002	Sewage Treatment	Wingfoot Lake	4.2	Portage
3IG00033*ID	Guttman Realty dba Bulk Terminal Storage	Storm	Refinery: Oil Producer	UT to Tinkers Creek	3.3 (26.80)	Portage
3PR00146*GD	Hattie Larlham Center for Children w/ Disabilities	0.03	Semi-Public - Under 0.05 MGD	UT to Cuyahoga River	0.8 (65.1)	Portage
3PR00161*DD	JL Excavating Services LLC	0.00525	Semi-Public - Under 0.05 MGD	Mogadore Reservoir	15	Portage
3PV00102*ED	M & M MHP	0.011	Mobile Home Park	Eckerts Ditch	1.3	Portage
3PV00000*ED	Mantua MHP	0.028	Mobile Home Park	Harper Ditch	0.90	Portage
3PT00107*CD	Mantua Twp Trustees	0.004	Schools and Hospitals	Black Brook Ditch	6.0	Portage
3GU00242*DG	Marathon Gas & Beverage		Petroleum-Related Corrective Action	Black Brook Ditch	5.2	Portage
3PR00241*CD	ODNR - Wingfoot Lake State Park	0.005	Semi-Public - Under 0.05 MGD	Wingfoot Lake	3.9	Portage
3IF00029*HD	Omnova Solutions Inc	NCCW	Organic Chemical Plant	Wingfoot Lake Outlet	0.8	Portage
3PR00496*BD	Paradise Lake Golf & Banquet Center	0.0029	Semi-Public - Under 0.05 MGD	UT to Mogadore Resevior	1.0 (16.3)	Portage

Ohio EPA Permit Number	Facility Name	Design Discharge (MGD)[1]	Wastewater Type, Treatment System, Cont. or Batch Discharge	Stream Discharge	RM	County
3IQ00057*DD	Parker Hannifin Corp Brass Products Div	NCCW	Plastic Fabrication	Plum Creek	0.2	Portage
3PH00059*CD	Randolph WWTP	0.3	County - 0.1 to 0.5 MGD	Congress Lake Outlet	11.5	Portage
3PD00018*OD	Ravenna WWTP	2.8	Municipality - 1.0 to 10 MGD	Hommon Ditch	0.85	Portage
3PG00127*ID	Rivermoor Estates WWTP	0.0425	County - Under 0.1 MGD	Wingfoot Lake Outlet	2.3	Portage
3IY00151*ED	Shalerville WTP	0.2135	Water Treatment - Iron, Manganese Removal	UT to Cuyahoga River	0.2 (66.1)	Portage
3PR00263*DD	St Joseph Parish WWTP	0.015	Semi-Public - Under 0.05 MGD	Cranberry Creek	2.0	Portage
3PT00090*DD	St Nicholas Orthodox Church	0.005	Schools and Hospitals	UT to Wingfoot Lake Outlet	1.8	Portage
3PK00014*HD	Streetsboro Hudson Regional WWTP	4.0	County - 1.0 to 10 MGD	Tinkers Creek	26.1	Portage
3PH00038*KD	Twin Lakes WWTP	0.456	County - 0.1 to 0.5 MGD	UT to Cuyahoga	0.6 (57.7)	Portage
3PR00385*DD	Congress Lake Clubhouse	0.015	Semi-Public - Under 0.05 MGD	Congress Lake Outlet	19.4	Stark
3PV00129*AD	Alexanders MHP	0.0075	Mobile Home Park	UT to Springfield Lake	0.2 (4.2)	Summit
3PG00030*JD	Aurora Shores WWTP No 29	0.5	County - Under 0.1 MGD	Pond Brook	3.8	Summit
3PR00481*BD	Boston Mills - Brandywine Ski Resort	0.016	Semi-Public - Under 0.05 MGD	Brandywine Creek	0.9	Summit
3PR00625*AD	BP Gas Station #36248	0.0015	Semi-Public - Under 0.05 MGD	Boston Run	3.5	Summit

Ohio EPA Permit Number	Facility Name	Design Discharge (MGD)[1]	Wastewater Type, Treatment System, Cont. or Batch Discharge	Stream Discharge	RM	County
3PR00085*FD	Budget Inn Hudson	0.0035	Semi-Public - Under 0.05 MGD	Boston Run	3.5	Summit
3PR00532*BD	Camp Christopher	0.015	Semi-Public - Under 0.05 MGD	Yellow Creek	2.8	Summit
3IG00026*JD	CITGO Petroleum Corp	Storm	Refinery: Oil Producer	UT to Little Cuyahoga	0.6 (11.60)	Summit
3PD00039*LD	City of Twinsburg WWTP	5.8	Municipality - 1.0 to 10 MGD	Tinker's Creek	15.5	Summit
3PR00360*CD	Clearview Inn Steak and Chop House	0.003	Semi-Public - Under 0.05 MGD	UT of North Fork into Yellow Creek	1.2 (2.3)	Summit
3PR00306*CD	D'Agnes Bistro & Bar	0.0025	Semi-Public - Under 0.05 MGD	UT of Yellow Creek	0.4 (2.1)	Summit
3PR00507*BD	Don-El Motel	0.002	Semi-Public - Under 0.05 MGD	UT to Mud Brook	1.3 (8.9)	Summit
3PR00355*CD	Ghent Square Ltd	0.0025	Semi-Public - Under 0.05 MGD	Yellow Creek	4.4	Summit
3PR00345*FD	Girl Scouts of Northeast Ohio - Camp Ledgewood	0.013	Semi-Public - Under 0.05 MGD	Boston Run	1.8	Summit
3PR00188*DD	Gregg Apts	0.00175	Semi-Public - Under 0.05 MGD	Tinkers Creek	23.7	Summit
3PY00003*FD	Hudson Estates	0.04	Mobile Home Park	UT of Mud Brook	1.2 (8.9)	Summit
3PV00095*DD	Indian Springs Trailer Park	0.0225	Mobile Home Park	Ohio Canal to Cuyahoga River	1.6 (33.5)	Summit
3PR00504*BD	Jadlyn Management LLC (DBA Todays Bride Magazine)	0.0015	Semi-Public - Under 0.05 MGD	UT of North Fork Yellow Creek	0.5 (2.1)	

Ohio EPA Permit Number	Facility Name	Design Discharge (MGD)[1]	Wastewater Type, Treatment System, Cont. or Batch Discharge	Stream Discharge	RM	County
Summit3PR00286*CD	Ken Stewarts Lodge	0.0079	Semi-Public - Under 0.05 MGD	UT of North Fork Yellow Creek	0.7 (1.67)	Summit
3GN00028*EG	Ken-Tool		Non-Contact Cooling Water	Little Cuyahoga River	3.9	Summit
3PR00565*BD	Mac's Convenience Store LLC DBA Circle K #5592	0.00035	Semi-Public - Under 0.05 MGD	UT to North Fork Yellow Creek	0.8 (1.67)	Summit
3IT00013*HD	Norfolk Southern-Bedford Yard	Storm	Railroad Facilities	UT of Tinkers Creek	2.0 (3.75)	Summit
3IN00314*DD	Northfield Park Assoc LLC	Storm, CAFO	Miscellaneous	UT of Tinkers Creek	2.1 (3.75)	Summit
3PR00651*AD	Oak Knoll Condominiums	0.015	Semi-Public - Under 0.05 MGD	UT of Yellow Creek	0.3 (1.7)	Summit
3PR00159*CD	Ohio Motel	0.004	Semi-Public - Under 0.05 MGD	UT of North Fork Yellow Creek	0.8 (2.5)	Summit
3PT00091*FD	Old Trail School	0.005	Schools and Hospitals	Ohio Canal to Cuyahoga River	2.5 (33.5)	Summit
3IR00030*HD	RCA Rubber Co	Cooling Water, Filter backwash, Storm	Rubber Fabrication	Little Cuyahoga River	7.4	Summit
3PH00003*HD	Richfield Hills WWTP	0.13	County - 0.1 to 0.5 MGD	Furnace Run	4.8	Summit
3IQ00014*GD	Saint-Gobain Performance Plastics Akron	NCCW, 601 – 0.375	Plastic Fabrication	Little Cuyahoga River	9.0	Summit
3IG00086*DD	Sunoco Pipeline LP Hudson Pump Station	Storm	Refinery: Oil Producer	Little Cuyahoga River	4.0	Summit

Ohio EPA Permit Number	Facility Name	Design Discharge (MGD)[1]	Wastewater Type, Treatment System, Cont. or Batch Discharge	Stream Discharge	RM	County
3IN00319*CD	Tri-County Concrete Co Inc	Storm, Truck Rinse	Miscellaneous	Tinkers Creek	16.5	Summit
3PR00530*BD	Wayside Farm Nursing Home & Rehab Center	0.0075	Semi-Public - Under 0.05 MGD	UT to Dickerson Run	0.6 (3.2)	Summit

Appendix 4 –List of chemical/physical water quality parameters to be analyzed/ measured in surface water and sediment from the Cuyahoga River Tributaries and Ship Channel, 2018.

Parameters	Test Method	Holding Time	Water (RL)	Sediment (RL)
Alkalinity	USEPA 310.1	14 days	X	
Carbonaceous BOD, 20-day	OEPA 310.2	48 hours	X	
Turbidity	OEPA 180.1	48 hours		
Solids, Dissolved (TDS)	SM 2540C	7 days	X	
Solids, Suspended (TSS)	SM 2540D	7 days	X	
Ammonia-N	USEPA 350.1	28 days	X	

Parameters	Test Method	Holding Time	Water (RL)	Sediment (RL)
Total Kjeldahl Nitrogen (TKN)	USEPA 351.2	28 days	X	
Nitrate-Nitrite	USEPA 350.1	28 days	X	
Nitrite	USEPA 353.2	48 hours	X	
Chloride	USEPA 325.1	28 days	X	
Chemical Oxygen Demand (COD)	USEPA 410.4	28 days	X	
Sulfate	USEPA 375.2	28 days	X	
Total Phosphorus	USEPA 365.4	28 days	X	X
Orthophosphate (as P)	USEPA 365.1	28 hours	X	
ICP 1 (Al,Ba,Ca,Fe, Mg, Mn, Na, K, Sr, Zn, Hardness)	USEPA 200.7	6 months	X	
ICP 3 (Al,Ba,Ca,Fe,Mg,Mn,Na,K,S,Zn)	USEPA 200.7	6 months		X
ICPMS 1 (As,Cd,Cr,Cu, Ni,Pb,Se)	USEPA 200.8	6 months	X	
ICPMS 5 (As,Be,Cd,Co,Cr,Cu,Ni,Pb,Se)	USEPA 6020A	6 months		X
BNA Organics (SVOCs)	USEPA 625	7 days(water) 14 days (sed)	X	X (USEPA 8270)
Herbicides (including Atrazine)	USEPA 525.2	14 days	X	
pH	Field Meter	n/a	X	
Specific conductivity	Field Meter	n/a	X	
Dissolved Oxygen (mg/L and % saturation)	Field Meter	n/a	X	
Temperature	Field Meter	n/a	X	
E. coli	USEPA 1603	8 hours	X	
Chlorophyll a	USEPA 445.0	25 days	X	
Percent Solids	SM 2540G	7 days		X
Total Organic Carbon	OEPA 335.4	28 days		X
Dissolved Organic Carbon (DOC)	SM 5310B	7 days	X	
Mercury	USEPA 245.1	1 year		X (USEPA 7471A)
PCBs	USEPA 508 (Water)	7 days (water) 14 days (sed)	X	X (USEPA 8082)
Pesticides	USEPA 505 (water)	7 days (water) 14 days (sed)	X	X (USEPA 8081)

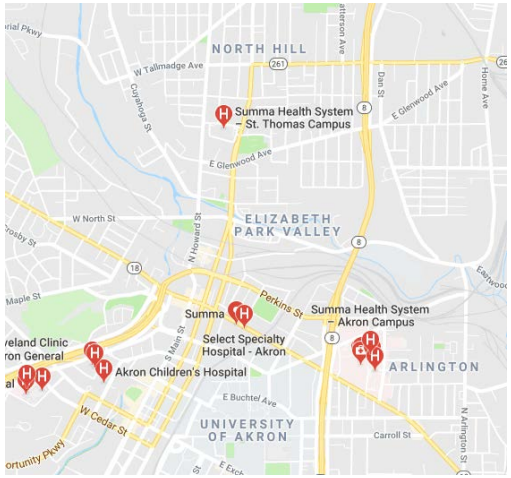
Appendix 5 –Safety Contacts and Hospital Locations

Safety:		
ODNR Wildlife Officers:	**County Sheriff Offices:**	**Cleveland Metropark Rangers**
Cuyahoga County – VACANT Summit County – Daniel Shroyer (330) 245-3042 Portage County – Marino Pellegrini (330) 245-3040 Geauga County - Scott Denamen (330) 245-3035	Cuyahoga County – (216) 443-6000 Summit County – (330) 643-2181 Portage County – (330) 296-5100 Geauga County – (440) 286-1234	440-331-5530
Hospitals:		
Cuyahoga County:	**Summit County:**	
MetroHealth Medical Center 2500 Metrohealth Dr Cleveland, OH 44109 (216) 778-7800	Summa Health System 444 Main St Akron, OH 44310 (330) 375-3000	
Portage County:	**Geauga County:**	
University Hospitals Portage Medical Center 6693 N Chestnut St Ravenna, OH 44266 (216) 844-8447	University Hospitals Geauga Medical Center 13207 Ravenna Rd Chardon, OH 44024 (440) 285-6000	

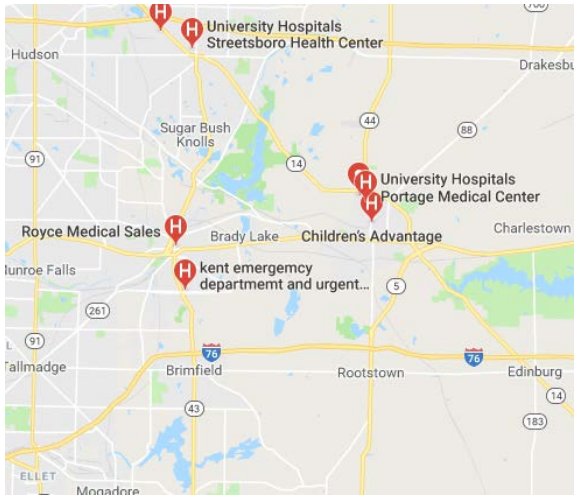
Cuyahoga County

Geauga County

Summit County



Portage County



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