Ohio Environmental Protection Agency

Quality Assurance Project Plan for Grand Lake St. Marys Monitoring

Division of Surface Water
Northwest District Offices

April 2018

Quality Assurance Project Plan for Grand Lake St. Marys Monitoring

Mercer and Auglaize Counties

April 2018

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Section A – Project Management

A1 – Title of Plan and Approval — Quality Assurance Project Plan for Grand Lake St. Marys Monitoring

Brian W Hall — Date: 6/4/2018
Brian Hall, DSW Assistant Chief

Audrey Rush — Date: 6/4/18
Audrey Rush, DSW Standards and Technical Support Manager

Jeffrey W. Reynolds — Date: 6/4/18
Jeff Reynolds, Ohio EPA Quality Assurance Coordinator

Daniel J. Glomski — Date: 6/5/18
Dan Glomski, NWDO Water Quality Supervisor

Date:
Brent Kuenzli, NWDO Water Quality ES II

Date: 6/6/18

This Quality Assurance Project Plan (QAPP) contains elements of the overall project management, data generation and acquisition, information management, assessment and oversight and data validation and usability for the Ohio EPA Grand Lake St. Marys monitoring program. The complete QAPP includes this document and its associated study plan as well as references to other manuals, which together comprise the integrated set of QAPP documents. All project cooperators should follow these guidelines. Mention of trade names or commercial products in this document does not constitute endorsement or recommendation for use.

A2 – Table of Contents

A3 – Distribution List

This QAPP will be distributed to the following division management and staff and saved on the DSW Inland Lakes collaboration site and webpage.

Table 1 — Distribution List.

Name/Title	Contact e-mail/Phone	
DSW Central Office		
Brian Hall, Asst. Environmental Administrator	***brian.hall@epa.ohio.gov***	(614) 644-2033
Cathy Alexander, Environmental Manager	***cathy.alexander@epa.ohio.gov***	(614) 644-2021
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DSW Northwest District Office		
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DES		
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Steve Roberts, Environmental Supervisor	***steven.roberts@epa.ohio.gov***	(614) 644-4225

A4 – Project/Task Organization and Communication

Table 2 — Roles and Responsibilities.

Individual(s) Assigned:	Responsible for:	Authorized to:
Division of Surface Water		
Brian Hall Assistant Chief	Assist with overall coordination and administration of division.	Approve project, approve resources, resolve disputes, suggest changes and edits.
Cathy Alexander TMDL & IR Manager		Review budgets and project proposals.
Melinda Harris TMDL & IR Supervisor		Post QAPPs on webpage; Review documents and reports; suggest changes and edits.
Marianne Piekutowski Assessment Manager		
Jeff Bohne Ecological Assessment Supervisor	Schedule meetings and training. Ensure consistency of methods.	Coordinate inland lakes monitoring program.
Audrey Rush STS Manager	Ensure QAPPs and SOPs are reviewed and establish training programs.	Review documents and reports; suggest changes and edits.
Jeff Reynolds QA Officer	Implement DSWs quality management program. Track training.	Review documents and reports; suggest changes and edits.
Elizabeth Wick District Manager	Ensure division programs are implemented at the district.	Review documents and reports; suggest changes and edits; obtain approvals and signatures.
Dan Glomski Water Quality Supervisor	Ensure district techs are properly trained, supplied and equipped.	Review reports, suggest changes and edits, obtain approvals and signatures and develop budgets.
Brent Kuenzli Water Quality ESII	Data collection, validation and management and report writing.	Schedule and complete field activities. Procure supplies, equipment and maintenance.
Rahel Babb TMDL & IR ESII		
Division of Environmental Services		
Jennifer Kraft Program Administrator	Oversee sample analysis. Direct method development.	Technical assistance. Coordinate information management system.
Steve Roberts QA Officer	Oversee data validation and delivery.	Review documents and reports; suggest changes and edits.
Kristin Sowards Lab Coordinator	Sample scheduling and receiving.	Log samples. Send lab supplies when needed.

KEY

TMDL - Total Maximum Daily Load; IR - Integrated Report; STS - Standards and Technical Support

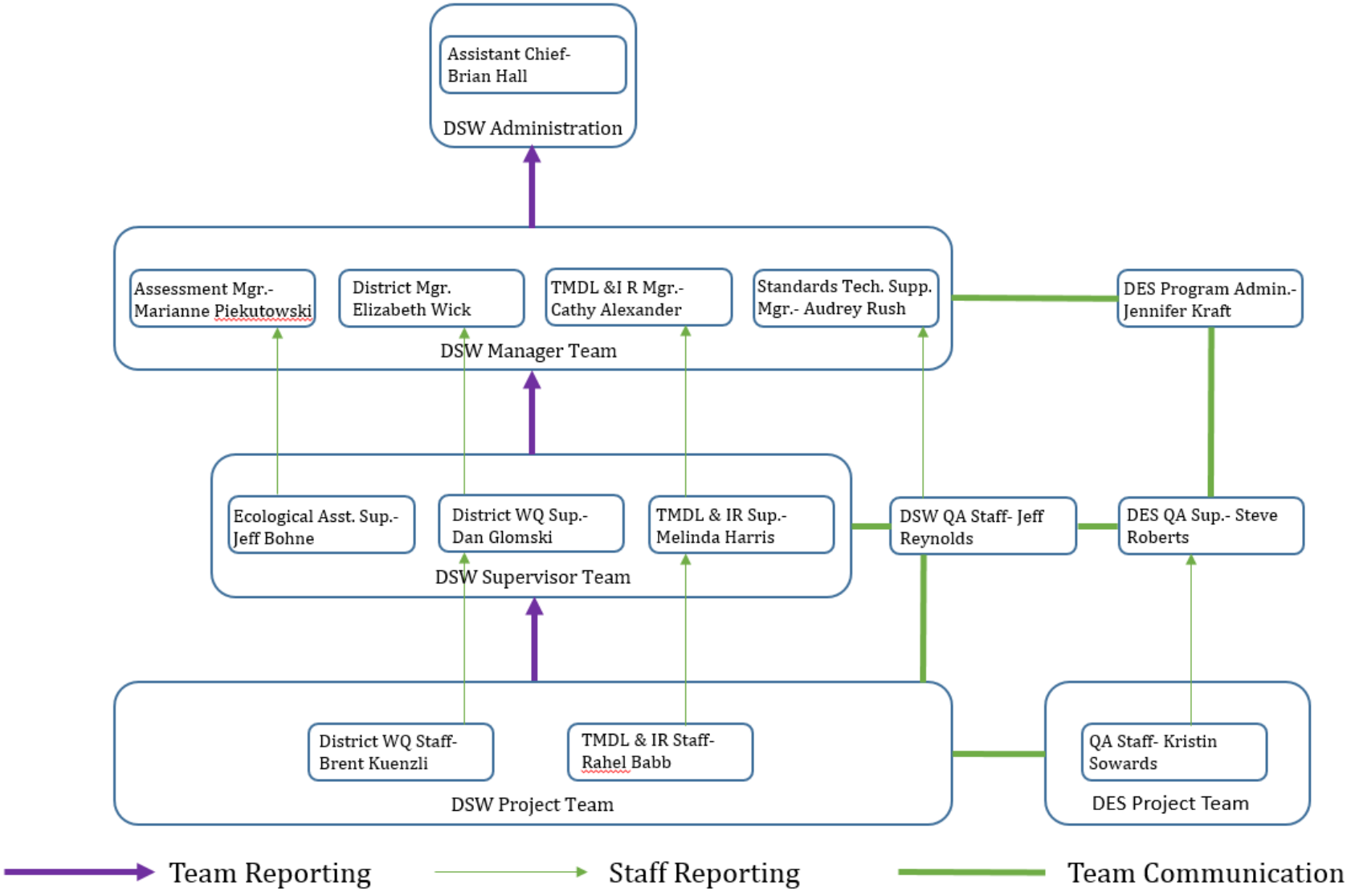

Figure 1 — Organization Chart

A5 – Problem Definition/Background

Grand Lake St. Marys, herein referred to as Grand Lake, was constructed in 1845 to store water for the Miami-Erie canal system. The lake covers a surface area of 20 mi^2 and drains a watershed of 112 mi^2. Along with an average depth of about 6 ft. this small ratio of water to land makes the lake susceptible to land use practices and external nutrient loading from tributaries. In addition, the eventual buildup of nutrients in sediment and biota cause internal nutrient cycling to be a factor. The first modern limnological study of the lake was done by US EPA in 1973 as part of the National Eutrophication Survey. Based on those results the lake was classified as eutrophic. The lake was assessed again in the 1990s by Ohio EPA and those studies showed conditions had advanced to a hypereutrophic state. In 2007 Grand Lake was selected for assessment under the US EPA led National Lake Survey. This survey revealed for the first time that a significant human health problem existed in the lake with respect to Microcystin toxin produced by cyanobacteria. This led to more routine monitoring and the issuance of recreation advisories. Parts of the lake were treated with alum in June 2011 and April 2012 to neutralize some of the biologically available phosphorus and reduce algal productivity. Other projects have also been implemented to reduce both internal and external nutrients, including treatment trains on tributary streams, dredging and rough fish removal.

A6 – Project/Task Description

Annual water quality monitoring has been done at Grand Lake since the cyanotoxin issue was realized in 2010. The purpose is to keep track of nutrient levels and algal productivity in the lake. Low scale monitoring consisting of 3-4 sampling events has been done the last 5 years. More robust monitoring consisting of 10 sampling events is planned for 2018. This aligns with the newly adopted methodology for all inland lake assessments. Single sampling events will be done in April, May, September and October, while two will be done in each of June, July and August. Water quality samples will be collected by the Division of Surface Water (DSW) and submitted to the Division of Environmental Services for analysis. Samples for phytoplankton identification and count will be done by a contract lab.

A7 – Quality Objectives and Criteria

Field QC samples (duplicates and blanks) will be collected at a rate of about five percent for the sum of field and equipment blanks and five percent for the sum of duplicates and replicates. Field QC sample types and collection frequency are defined in Subsection E5 of the *Surface Water Field Sampling Manual for water quality parameters and flows* (Ohio EPA, 2018), herein referred to as Surface Water Field Manual. Methods for data validation, including acceptable thresholds for blanks, duplicates and paired parameters, are found in Appendix IV, Section A of the Surface Water Field Manual. The district water quality staff will plan each sampling trip to allow for collection of an appropriate number of QC samples. The DSW quality assurance officer will do an annual review of QC sampling rates, rates of blank detections and duplicate sample qualification by parameter.

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. Inland lakes team members generally participate in 1-2 conference calls or webinars per year to discuss important issues and do group on-water training exercises roughly every 2-3 years. 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. An access database called TrainTrack is used by the division to keep track of this information.

A9 – Documents and Records

Microsoft® SharePoint will be used as a library for quality documents. Access to the site is through Ohio EPA's intranet collaboration site. A Microsoft® Excel spreadsheet stored on the Quality Management page summarizes field QC results. The Inland Lake Program webpage will also be used to share documents and records, including a final signed version of this QAPP. Access to the site is through Ohio EPA's publicly available internet. The DES keeps an archive of all original sample chain of custody forms and photo copies are kept in a binder by the district office sample collector.

Section B – Data Generation and Acquisition

B1 – Sampling Process Design

The fixed monitoring stations used by Ohio EPA to evaluate water quality in Grand Lake have been established since the 1990's. Design follows the guidelines described in Appendix I of the Surface Water Field Manual, also known as the Inland Lakes Sampling Procedure Manual (Ohio EPA, 2016) and herein referred to as the Lakes Manual. The lake is roughly 9 miles long and 3 miles wide, so three stations are evenly spaced across the middle of the lake to get an accurate representation of conditions. Since the lake is shallow and well mixed all field measurements, water quality and phytoplankton samples are collected from 0.5m below the surface. No bottom samples or profile measurements are taken. The station names, IDs and locations are shown below.

Name	ID#	N. Lat.	W. Lon.
L-2	203758	40.5261	-84.5558
L-1	203761	40.5239	-84.4878
L-3	203764	40.5300	-84.4317

B2 – Sampling Methods

Sampling methods follow guidelines described in the Lakes Manual. Secchi depth is measured using a commercially available disk. The other field readings shown in Table 3 are measured using a YSI® Pro Plus hand held meter by lowering the probe/cable assembly to 0.5m below the surface. Time is allowed for the meter to indicate that the readings are stable before they are logged. Water quality samples are collected using a Wildlife Supply Company® beta-bottle that is horizontally oriented. A metered section of rope is attached to the bottle so it can be lowered to 0.5m below the surface. The ends of the bottle are then closed with a messenger device. Contents from the bottle are placed in a churn splitter to facilitate mixing and filling of containers. All samples are analyzed for the parameters shown in Table 4, except microcystins and are only done at L-1. Phytoplankton enumeration samples will be collected at L-1 during May, July and September sampling events.

Table 3 — List of field readings to be measured at Grand Lake sampling stations.

Parameter	PCS#	RL	Units
Water Depth	NA	0.1	m
Secchi Depth	00077	0.01	m
Temperature	00010	0.01	C
Dissolved Oxygen	00300	0.01	mg/L
Dissolved Oxygen	00301	0.01	%
Conductivity	00094	0.01	µS/cm
Specific Conductance	00095	0.01	µS/cm
pH	00400	0.1	SU

Table 4 — List of parameters to analyze in Grand Lake water quality samples.

Parameter	PCS#	Method	RL	Units	Container	Preservative	Hold
Alkalinity	00410	USEPA 310.1	5	mg/L	1L LDPE	cool ≤6˚C	14d
Bicarbonate	00440	SM 2320 B	5	mg/L			28d
Carbonate	00445	SM 2320 B	5	mg/L			28d
Chloride	00940	USEPA 325.1	5	mg/L			28d
Sulfate	00945	USEPA 375.2	10	mg/L			28d
Dissolved Solids	70300	SM 2540 C	10	mg/L			7d
Suspended Solids	00530	SM 2540 D	5	mg/L			7d
Nitrite	00615	USEPA 353.2	0.02	mg/L			48 hr.
Turbidity	82079	USEPA 180.1	0.05	NTU			48 hr.
Ammonia	00610	USEPA 350.1	0.05	mg/L	1L LDPE	2 ml H_2SO_4 to pH<2 cool ≤6˚C	28d
Nitrate-Nitrite	00630	USEPA 350.1	0.5	mg/L			28d
Kjeldahl Nitrogen	00625	USEPA 351.2	0.2	mg/L			28d
T-Phosphorus	00665	USEPA 365.4	0.01	mg/L			28d
T-Organic Carbon	00680	SM 5310 B	2	mg/L			28d
Orthophosphate	00671	US EPA 365.1	1	µg/L	1L LDPE	filter, cool ≤6˚C	48 hr.
Chlorophyll a	32230	USEPA 445.0	1	µg/L	GF/C	freeze	25d
Microcystins	NA	Ohio EPA 701.0	0.3	µg/L	250 ml PET-G	cool ≤6˚C	36 hr.

B3 – Sample Handling and Custody

All sample containers except those for phytoplankton enumeration are shipped to the DES via overnight courier. SampleMaster® software is used by DES to manage lab information. A guidance manual for use of the software is in Appendix IV of the Surface Water Field Manual. 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. Samples for analysis of cyanotoxins are submitted using a separate test group to expedite release of the results so they can be posted on Ohio EPA's Harmful Algae Bloom webpage in a timely manner.

B4 – Analytical Methods

The analytical methods to be used in this study are provided in Table 4 along with the containers, preservatives, holding times and reporting limits. Analytical SOPs for individual parameters are available on Ohio EPAs unity client.

B5 – Quality Control

All water quality sample collection and preservation methods will follow guidelines established in the Surface Water Field Manual. A Microsoft® Excel Data Validation Tool developed by Ohio EPA will be used to determine if data needs to be rejected or qualified as estimated. Duplicate results are evaluated based on relative percent difference (RPD). Acceptable RPD is parameter specific and depends on the method reporting limit and how close the concentration is to that limit.

B6 – Instrument/Equipment Testing, Inspection and Maintenance

Sample collectors will inspect equipment prior to and during sampling to ensure that all equipment remains in working condition. Sample collectors will coordinate with supervisors to purchase new equipment when necessary. YSI® Pro Plus hand held field meters are serviced annually by the manufacturer to ensure they are operating within specifications. Any probes out of specification are replaced at this time.

B7 – Instrument/Equipment Calibration and Frequency

YSI® Pro Plus hand held field meters are calibrated daily according to the manufacturer and results are recorded in a bound log book with numbered pages.

B8 – Inspection/Acceptance of Supplies and Consumables

Most lake sampling supplies and consumables are used as part of normal program operations and are routinely inspected upon receipt. The sample collector will be responsible for ensuring that needed supplies and consumables are available in advance of sampling events and for replenishing them if necessary. Included are sample containers, acid preservatives, Lugol's iodine solution, buffers, filters and miscellaneous supplies such as reagent 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

Only Ohio EPA results will be used in data summaries. All data generated is Level 3 Credible in accordance with state law.

B10 – Data Management

Sampling projects and their associated station IDs are created in the Ecological Assessment and Analysis Application (EA3) and samples submitted to DES for analysis are scheduled and administered using SampleMaster® software. Guidelines are in Appendix IV, Section B of the Surface Water Field Manual. The sample collector logs into the system and places a lab order by selecting the appropriate project, stations to be sampled and test group to be analyzed. The program creates a chain of custody and container labels for each site.

After sample analysis is completed chemistry and associated field data is tabulated in SampleMaster® and uploaded into EA3. Results for each sample are summarized on a sheet. The sample collector reviews each sheet for completeness, validates field QC, adds comments and completes edits if necessary and approves the sheet. The data is then available for use in the IR or other reports.

Section C — Assessment and Oversight of Data Collection

C1 – Sampling Assessments/Analysis and Response Actions

Periodic assessment of field sites, field equipment and laboratory equipment are necessary to ensure that sampling goes smooth and data obtained meets project needs. This is an ongoing process that continues every day on which the project is implemented as well as larger scale assessments that take place less frequently (annually). The assessments generally will focus on readiness and consistency of implementation but also seek continual improvement opportunities.

Daily assessments (for each day of project activities, as applicable) will include assessment of field equipment and supplies, laboratory equipment and supplies, completeness of the day's samples and associated field notes, future needs, etc. The district supervisor will conduct an annual field audit to ensure consistency in sampling protocol. This will enable the auditor to: check for proper use and maintenance of equipment; check for adherence to calibration processes; assess supplies; and evaluate how samples were collected as compared to standard operating methods.

Annual assessments will include: reviews of data validation and verification; sample completeness and QA/QC review results; quality system targets and processes; and status of project resources. These assessments will be completed and reported to division management.

Despite best preparations, assessments may find situations requiring corrective actions (CAs). Small day-to-day level assessment findings are often addressed by the individual(s) doing the assessment in the field or in the lab and are common enough to the process to not necessitate a formal response. More significant problems will be brought to the attention of the district supervisor lakes for discussion and resolution.

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 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; or
- 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 and future considerations for process improvement.

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 sample collector. The district supervisor will evaluate if data requires any additional qualifiers and/or if it is usable for its originally intended purpose. Before delivery to field crews, DES examines the quality of its reagent water to ensure it is sufficient to use for field blanks and to rinse sample jars or other equipment. Any blank analytes detected above the reporting limit will be documented by the lab via email to the sample collector, MAS-TMDL manager, MAS supervisor and STS QA staff.

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 Officer will be notified regarding deviations.

It is expected that adherence to SOPs will generate useable data. 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 district supervisor will receive regular updates from district technicians 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 disposition of technical reports is to be determined.

Section D — Data Validation and Usability

D1 – Data Review, Verification and Validation

Data verification will be conducted by the sample collector with assistance from other staff when appropriate. This process will confirm that sample results received match up 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 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 or conditions. Documenting deviations from the QAPP is the responsibility of the sample collector.

The DES does the initial data review on all data. DES 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.). DES points out potential QA/QC issues but leaves much of the final data qualification to the sampler (supposing that data may be useable for some purposes and not for others). The data user can evaluate the data given their knowledge of sampling conditions, expected variability given location and matrix, data uses, etc.

D2 – Verification and Validation Methods

In addition to verifying data completeness, the sample collector will oversee data validation for the project which will include confirmation of sample holding times, proper preservatives, sample containers, analysis methods and QA/QC results (including assessment of results for blanks and duplicates). This will be an ongoing effort.

The Study Team will make final decisions regarding the validity and usability of the data 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 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 procedures in Appendix D, Data Management, of the Surface Water Field 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.

Data qualifiers will be added by samplers to EA3 as part of their data review process. This will ensure the qualifier remains with the sample result. We want to be sure that valid conclusions can be made using our data for any current and future data uses.

D3 – Reconciliation with User Requirements

Pending connection issues, it is intended that water chemistry will be uploaded to the national STORET data warehouse. Data approved in the EA3 database will then be available for query via the Water Quality Portal under the organization ID 21OHIO_WQX. Data qualifiers applied to sample results by DES at the lab and by samplers in the EA3 system will remain with the analytical results when the data is transferred to U.S. EPA. This will reflect limitations of analytical results for current and future users of sampling data. Other anomalies will be recorded in the EA3 comments and/or field notes to be retained by DSW.

Issues related to data uncertainty, including any patterns of analytical or field QC uncertainties, will be assessed by samplers, other internal data users (DDAGW) and their management. Significant or persistent issues will be brought to the attention of the EA3 team, division QC personnel and DES for further evaluation. This combination of personnel will assess how to best label affected data for storage in the database and how to eliminate or limit any similar problems going forward.