

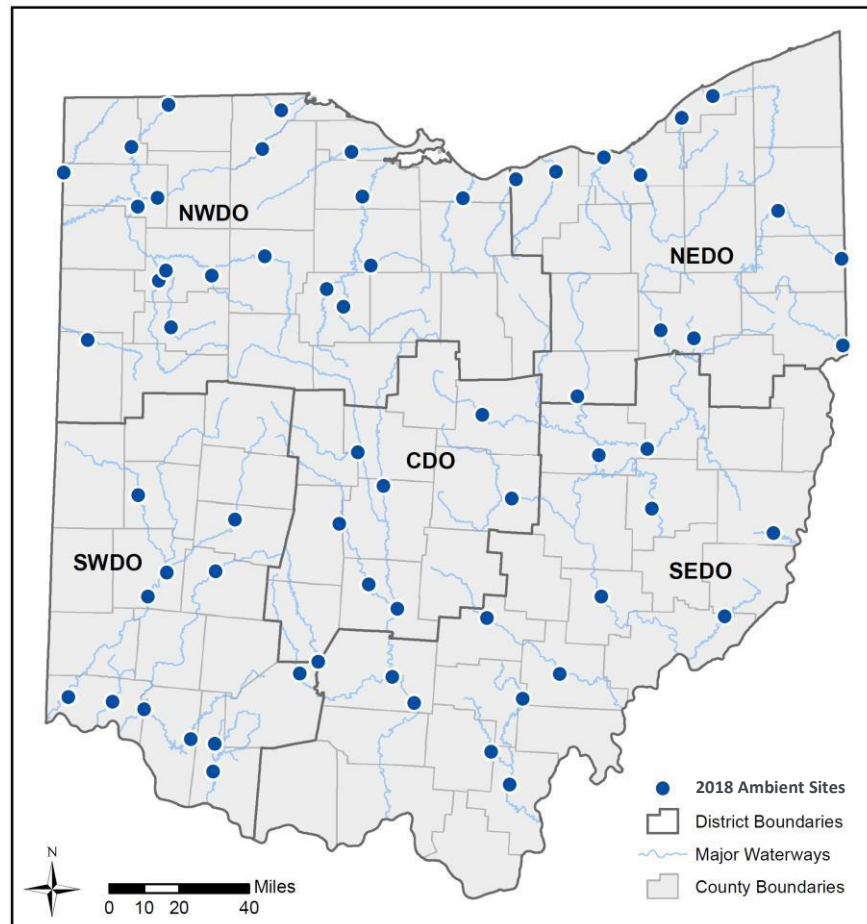


Statewide Ambient Water Quality Monitoring Guidance

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Ohio Environmental Protection Agency
Division of Surface Water

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State Wide Ambient Water Quality Monitoring Guidance

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This monitoring guidance contains elements of the overall project management, data generation and acquisition, information management, assessment and oversight, and data validation and usability of the *Surface Water Field Sampling Manual* (Ohio EPA, March 2018). 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.

Introduction

Ohio EPA has a long history of monitoring water quality in streams across the state where US Geological Survey (USGS) streamflow gages are located. The program started as part of a National Ambient Water Quality Monitoring Network and eventually was incorporated into the Division of Surface Water's (DSW) basic monitoring framework. In addition to annual macroinvertebrate community sampling, chemical water quality sampling was typically done monthly until about 2008 when a quarterly approach was implemented. Quarterly sampling for water quality should be continued at a minimum and should be collected on the first part of March, June, September and December. Collecting at these regular intervals over time will help to ensure sampling at varying points across the hydrograph. If unique data objectives exist more frequent sampling is an option. Sampling during winter months (December-February) will only be done if the stations are ice free and weather permits safe travel and working conditions. Macroinvertebrate and fish sampling will be conducted on a 5-year rotation and will include sampling at a 4-5 site subset of the ambient site list.

Physical, chemical, and biological data from these "ambient" stations has historically been used to track long term water quality trends. In 2000, Ohio EPA embarked on a systematic assessment of watersheds for Total Maximum Daily Load (TMDL) development and data from ambient stations has proved useful for water quality modeling and trend assessment purposes. This data may also help identify sources of nutrients that contribute to harmful algae blooms in Western Lake Erie and the Gulf of Mexico via the Ohio River and be used to evaluate the effectiveness of management actions.

Objective

The objectives of the ambient sampling sites are for them to be sources of long term data which span the hydrograph (low, medium and high flows), for use in the determination of background concentrations regarding the calculation of loads used in waste load allocations (WLAs) for permits, for long term biological and chemical trend analysis, for quantifying nutrient loading to Lake Erie and the Ohio River, and possibly Water Quality Standard (WQS) development. The theory is that by doing the sampling the same approximate time at the beginning of each season (see below in the Data Collection section) and by not having samplers pick a sampling day based on favorable weather or flow conditions that samples will be taken over a wide range of conditions and flows. This, however, needs to be confirmed through a flow vs sample date analysis by the DSW CO staff every fifth year beginning 2020.

Criteria

The criteria for the determination of where to locate ambient stations are that they must be located at or in conjunction with a USGS station, have flow year-round, be safely accessible, be non-duplicative, be at a logical site to achieve the objective of an ambient site, and they should reflect locally normal background water quality chemistry (not skewed by a nearby upstream influence such as a point source discharge or other abnormal or unnatural influence).

Data Collection

Stations that will be sampled are listed in Table 1. An effort will be made to collect water quality samples under a variety of streamflow conditions. This will be done during sampling days by keeping track of real time streamflow data for Ohio published by USGS on the World Wide Web at <http://waterdata.usgs.gov/oh/nwis/rt>. The web page categorizes streamflow from low to high using a color-coded map. Quarterly sampling should be continued at a minimum and should be collected on the first part of March, June, September and December. Collection frequency is shown in Tables 1, 2 and 3 as either Q for quarterly or M for monthly. Samples will be collected in accordance to Ohio EPA's Division of Surface Water's Field Sampling Manual, Ohio EPA, 2018.

Five priority sites in the NW Ohio Lake Erie drainage will continue to be visited monthly to meet minimum sample needs for useful data collection as per Betanzo, et. Al., Water Data to Answer Urgent Water Policy Questions. These are priority pour points that are not presently being sampled by any other entity. That they are to be sampled monthly is indicated in Table 1 with an "M" in the frequency column.

Table 1. List of all ambient water quality and biological stations (bolded) sorted by district.

District	Samp Freq	Description	RM	USGS gage number	Storret No./EA3 ID	DA (sq mi)	huc8 or 12	N. Lat	W. Long
CDO	Q	BIG DARBY CK @ SR 316 AT DARBYVILLE	13.36	3230500	601300	534	05060001	39.7008	-83.1097
CDO	Q	Little Darby at West Jefferson @ Middle Pike	7.35	3230310	V06G28	162.0	05060001-20-06	39.9512	-83.2694
CDO	Q	KOKOSING R @ TILDEN AVE GAGE AT MT VERNON	28.61	3136500	R12P02	202	05040003	40.4056	-82.4997
CDO	Q	LICKING R @ SR 16 (STADDEN BRIDGE) NR NEWARK	26.75	3146500	601770	537	05040006	40.0592	-82.3397
CDO	Q	Mill C. near Bellpoint	1.57	3220000	601260	178	05060001	40.2481	-83.1736
CDO	Q	OLENTANGY R @ I-270 NR WORTHINGTON (bio only @ Hyatts Rd., RM 19.6)	11.5	3226800	601290	497	05060001	40.1103	-83.0319
CDO	Q	PAINT CK @ SR 753 UPST GREENFIELD	52.54	3232000	V10S30	249	05060003	39.3794	-83.3756
CDO	Q	Scioto R. @ US 22	99.82	3230700	600960	3217	05060001	39.6015	-82.9551
NEDO	Q	BLACK R @ FORD RD DST ELYRIA	9.8	4200500	501510	412	04110001	41.4117	-82.0958
NEDO	Q	CHAGRIN R @ RIDGE RD (SR 84) AT WILLOUGHBY	4.95	4209000	502400	246	04110003	41.63	-81.4003
NEDO	Q	Cuyahoga River at Independence, OH	13.1	4208000	502020	707	04110002-06-02	41.3964	-81.6294
NEDO	Q	GRAND R @ SR 84 AT PAINESVILLE	8.45	4212100	502530	685	04110004	41.7192	-81.2281
NEDO	Q	KILLBUCK CK @ US 62 DST KILLBUCK WWTP	23.91	3139000	R04S03	464	05040003	40.4814	-81.9861
NEDO	Q	L BEAVER CK @ GRIMMS BRIDGE RD NR E LIVERPOOL	4.5	3109500	602000	496	05030101	40.6758	-80.5408
NEDO	Q	MAHONING R @ FIRST ST AT LOWELLVILLE	10.79	3099500	602300	1074	05030103	41.0361	-80.5361
NEDO	Q	MAHONING R @ LEAVITT RD AT LEAVITTSBURG	43.78	3094000	602280	575	05030103	41.2392	-80.8808
NEDO	Q	NIMISHILLEN CK @ HOWENSTINE RD DST N. INDUSTRY	6.72	3118500	601940	177	05040001	40.7342	-81.3522
NEDO	Q	ROCKY R @ PARK BLVD AT LAKEWOOD	3	No gage (use Berea gage for Qs)	501790	291	04110001	41.4694	-81.8317
NEDO	Q	TUSCARAWAS R @ WARMINGTON ST AT MASSILLON	87.37	3117000	601930	520	05040001	40.7522	-81.5292

Table 1 continued. List of all ambient water quality and biological (bolded) stations sorted by district.

District	Samp Freq	Description	RM	USGS gage number	Storet No./EA3 ID	DA (sq mi)	Huc8 or 12	N. Lat	W. Long
NWDO	Q	Auglaize River near Defiance @ Harding Rd.	4.14	4191500	500290	2318	04100007-12-09	41.2375	-84.3991
NWDO	Q	Auglaize River near Ft. Jennings @ US Rt. 224	39.57	4186500	P03S03	327	04100007-09-04	40.9489	-84.2661
NWDO	M	Bean Creek at Powers @ Fulton CR 20	6.00	4184500	500330	206	04100006-02-02	41.6775	-84.2322
NWDO	Q	Blanchard River near Findlay @ Hancock CR 140	55.26	4189000	500040	345	04100008-03-04	41.0562	-83.6885
NWDO	Q	Honey Creek at Melmore @ St. Rt. 67/100	12.30	4197100	U03S02	149	04100011-08-06	41.0222	-83.1097
NWDO	Q	Huron River at Milan @ downstream US Rt. 250	12.30	4199000	501030	371	04100012-06-06	41.3017	-82.6069
NWDO	Q	Maumee River at Waterville @ St. Rt. 64	20.68	4193500	500080	6330	04100009-09-03	41.5000	-83.7128
NWDO	Q	Maumee River near Defiance @ Independence Dam	60.00	4192500	P09W19	5544	04100009-02-03	41.2914	-84.2819
NWDO	Q	Ottawa River downstream Allentown Dam (bio only)	28.83	4187500	P04W12	160	04100007-04-02	40.7554	-84.1950
NWDO	M	Ottawa River at Univ. of Toledo @ Stadium Drive	11.15	4177000	P11S74	155	04100001-03-08	41.6614	-83.6097
NWDO	Q	Ottawa River near Kalida @ Putnam CR 19	0.96	4188100	500150	351	04100007-05-03	40.99	-84.2267
NWDO	Q	Portage River at Elmore @ St. Rt. 590 (bio only @ US20 @ Woodville, RM 27.3)	17.03	4195820	S02P08	495	04100010-05-02	41.4911	-83.2281
NWDO	M	Riley Creek near Pandora @ Putnam CR 6	4.36	4189174	500480	70	04100008-04-05	40.973	-83.9767
NWDO	Q	Sandusky River near Fremont @ Rice Rd.	20.25	4198000	500820	1251	04100011-13-02	41.3078	-83.1589
NWDO	M	Sandusky River near Up Sandusky @ Wyandot CR 121	78.09	4196500	500860	298	04100011-07-02	40.8506	-83.2564
NWDO	Q	St. Joseph R. near Ohio/Indiana State Line @ St. Rt. 249	42.34	4178000	510220	609	04100003-05-05	41.3856	-84.8017
NWDO	Q	St. Mary's River at Rockford @ St. Rt. 118	57.82	4180988	P01W08	295	04100004-03-03	40.6954	-84.6464
NWDO	Q	Tiffin River at Stryker @ Williams CR F/Curtis St.	33.95	4185000	300020	412	04100006-05-03	41.5	-84.4301
NWDO	M	Tymochtee Creek at Crawford @ St. Rt. 199	8.06	4196800	500850	229	04100011-06-05	40.9228	-83.3489
NWDO	Q	Vermilion River near Vermilion @ Mill Hollow/North Ridge Rd.	6.32	4199500	501260	262	04100012-02-04	41.3819	-82.3169

Table 1 continued. List of all ambient water quality and biological (bolded) stations sorted by district.

District	Samp Freq	Description	RM	USGS gage number	Storet No./EA3 ID	DA (sq mi)	huc8 or 12	N. Lat	W. Long
SEDO	Q	HOCKING R @ CR 31 NR ENTERPRISE	73.37	3157500	601530	459	05030204	39.565	-82.475
SEDO	Q	HOCKING R @ STIMSON AVE AT ATHENS	33.03	3159500	J02S15	942	05030204	39.3308	-82.0875
SEDO	Q	LITTLE RACCOON CREEK @ KEYSTONE ROAD	12.71	3201980	W03S06	99	05090101	39.0106	-82.4522
SEDO	Q	PAINT CK @ SR 772 AT CHILLICOTHE	3.8	3234300	V10P06	1138	05060003	39.32	-82.9789
SEDO	Q	RACCOON CK @ US RT 35 AT ADAMSVILLE	29.2	3202000	601400	586	05090101	38.8736	-82.3561
SEDO	Q	RACCOON CK AT BOLIN MILLS	80.6	3201902	W03G50	200	05090101	39.2308	-82.286
SEDO	Q	SCIOTO R DST CHILLICOTHE @ HIGBY BRIDGE	56.17	3234500	600770	5131	05060002	39.2122	-82.8647
SEDO	Q	Captina Creek at Armstrong Mills @ New Gage off SR 148	16.1	03113990	300828	127	05030106-09-05	39.9052	-80.9339
SEDO	Q	Muskingum River at McConnellsville @ SR 37/78	49.83	03150000	601860	7420	05040004-08-06	39.6525	81.8620
SEDO	Q	Muskingum River downstream Coshocton @ SR 83	108.28	03140500	611740	4861	05040004-03-01	40.2361	-81.8717
SEDO	Q	Little Muskingum River @ Bloomfield @ SR 260	30.13	03115400	609380	210	05030201-07-03	39.5631	-81.2039
SEDO	Q	Tuscarawas River @ Newcomerstown @ River St.	21.17	03129000	611790	2443	05040001-18-04	40.2611	-81.6097
SEDO	Q	Wills Creek at Cambridge @ Campbell Ave Gage	64.1	03142000	R17W13	406	05040005-05-04	40.0145	-81.5871

Table 1 continued. List of all ambient water quality and biological (bolded) stations sorted by district.

District	Samp Freq	Description	RM	USGS gage number	Storet No./EA3 ID	DA (sq mi)	huc8 or 12	N. Lat	W. Long
SWDO	Q	E Fork Little Miami River at Williamsburg @ Main Street	34.91	3246500	M04S08	237	05090202-11-02	39.0525	-84.05
SWDO	Q	Great Miami River at Dayton @ Stewart Street (bio previously @ Needmore Rd, presently @ Troy Pike, RM 85.9)	78.85	3270500 & 3271000	H09W02	2587	05080002-01-05	39.74	-84.1933
SWDO	Q	Great Miami River at Miamisburg @ Linden Avenue	66.9	3271500	H09S13	2711	05080002-04-04	39.6406	-84.2922
SWDO	Q	Great Miami River at Miamitown @ Harrison Road (stage only)	15.49	3274615	H11W20	3838	05080002-09-06	39.2161	-84.7035
SWDO	Q	Little Miami River at Milford @ Wooster Pike	13.07	3245500	M05P11	1203	05090202-14-03	39.1717	-84.2986
SWDO	Q	Little Miami River near Oldtown @ US 68	80.63	3240000	600570	129	05090202-01-04	39.7483	-83.9314
SWDO	Q	Mad River at Eagle City @ St. Paris Pike	29.52	3267900	610040	310	05080001-18-02	39.9642	-83.8317
SWDO	Q	Mill Creek at Cincinnati @ Anthony Wayne Avenue	10.5	3259000	600410	115	05090203-01-04	39.2015	-84.4708
SWDO	Q	Rattlesnake Creek at Centerfield @ Centerfield Road (stage only)	7.55	3232300	300049	209	05060003-04-07	39.3293	-83.4741
SWDO	Q	Sterling Run at Mt. Orab WTP @ WTP access drive	6.47	-----	X02K14	19.7	05090201-10-01	39.0344	-83.9203
SWDO	Q	Stillwater River at Pleasant Hill @ Lauer Road	27.86	3265000	H06P03	503	05080001-13-03	40.0578	-84.3558
SWDO	Q	White Oak Creek above Georgetown @ White Oak Valley Road	15.2	3238495	X02K08	199	05090201-10-02	38.9195	-83.9283

*Gage discontinued

Q & M mean quarterly and monthly sampling

Some of Ohio EPA's ambient sites are also sampled by other agencies, for instance Table 2 show sites sampled daily by the National Center for Water Quality Research (NCWQR). This negates the need for Ohio EPA to sample them monthly, however, since they have been sampled historically by OhioEPA quarterly data is needed to maintain data for trend analyses for parameters not analyzed by the NCWQR. OhioEPA's list of parameters includes metals and other parameters not included in NCWQR's sampling parameter list. Table 3 are sites that are sampled by both Ohio EPA and USGS.

Table 2. Ohio EPA and NCWQR common sampling sites.

District	Samp Freq	Description	RM	USGS gage number	Storet No./EA3 ID	DA (sq mi)	huc8 or 12	N. Lat	W. Long
NWDO	Q	Blanchard River near Findlay @ Hancock CR 140	55.26	4189000	500040	345	04100008-03-04	41.0562	-83.6885
NWDO	Q	Honey Creek at Melmore @ St. Rt. 67/100	12.30	4197100	U03502	149	04100011-08-06	41.0222	-83.1097
NWDO	Q	Huron River at Milan @ downstream US Rt. 250	12.30	4199000	501030	371	04100012-06-06	41.3017	-82.6069
NWDO	Q	Maumee River at Waterville @ St. Rt. 64	20.68	4193500	500080	6330	04100009-09-03	41.5000	-83.7128
NWDO	Q	Sandusky River near Fremont @ Rice Rd.	20.25	4198000	500820	1251	04100011-13-02	41.3078	-83.1589
NWDO	Q	Tiffin River at Stryker @ Williams CR F/Curtis St.	33.95	4185000	300020	412	04100006-05-03	41.5	-84.4301

Q means quarterly sampling

Table 3. Ohio EPA and USGS common sampling sites.

District	Samp Freq	Description	RM	USGS gage number	Storet No./EA3 ID	DA (sq mi)	Huc8 or 12	N. Lat	W. Long
NEDO	Q	GRAND R @ SR 84 AT PAINESVILLE	8.45	4212100	502530	685	04110004	41.7192	-81.2281
NWDO	Q	Huron River at Milan @ downstream US Rt. 250	12.30	4199000	501030	371	04100012-06-06	41.3017	-82.6069
NWDO	Q	Vermilion River near Vermilion @ Mill Hollow/North Ridge Rd.	6.32	4199500	501260	262	04100012-02-04	41.3819	-82.3169
NWDO	Q	Auglaize River near Defiance @ Harding Rd. ^A	4.14	4191500	500290	2318	04100007-12-09	41.2375	-84.3991
NWDO	Q	Auglaize River near Ft. Jennings @ US Rt. 224 ^A	39.57	4186500	P03S03	327	04100007-09-04	40.9489	-84.2661
NWDO	Q	Maumee River at Waterville @ St. Rt. 64	20.68	4193500	500080	6330	04100009-09-03	41.5000	-83.7128
NWDO	Q	Maumee River near Defiance @ Independence Dam ^A	60.00	4192500	P09W19	5544	04100009-02-03	41.2914	-84.2819
NWDO	Q	Ottawa River near Kalida @ Putnam CR 19 ^A	0.96	4188100	500150	351	04100007-05-03	40.99	-84.2267
NWDO	Q	St. Joseph R. near Ohio/Indiana State Line @ St. Rt. 249 ^{B D}	42.34	4178000	510220	609	04100003-05-05	41.3856	-84.8017
NWDO	Q	St. Mary's River at Rockford @ St. Rt. 118 ^{CD}	57.82	4180988	P01W08	295	04100004-03-03	40.6954	-84.6464

Q means quarterly sampling

^A Indicates USGS started monitoring in 3/2014.

^B Indicates USGS started monitoring in 3/2017.

^C USGS gage water quality monitoring will be downstream at Willshire. (near OH/IN state line).

^D Indicates that the USGS site is not at the exact location of Ohio EPA's ambient station but that they are near enough to each other that it may be adequate for modeling or load analysis efforts.

Stations will have “at point” chemical conditions measured in the field with a properly calibrated water quality sonde such as a YSI® Pro Series meter or equivalent. The field data will be logged electronically and recorded in writing on a lab sample submission form. The sample time will also be written on the lab form. A summary of the field measurements is listed in Table 4. Macroinvertebrate and fish community assessment at the selected subset of sites, indicated in Table 1 with bolded font, will be collected and analyzed using standardized procedures available at <http://epa.ohio.gov/dsw/bioassess/BioCriteriaProtAqLife.aspx> .

Ambient sites differ from stream nutrient sites in that there are no continuous multiparameter sonde (D.O.) or chlorophyll_a data collected unless they are part of an assessment survey. Therefore, the data necessary to make stream nutrient calculations will not typically exist at these ambient sites.

Table 4. List of field measurements that will be recorded at ambient stations sampled by Ohio EPA.

Parameter	PCS#	RL	Units
Temperature	00010	0.01	C
Dissolved Oxygen	00300	0.01	mg/L
Dissolved Oxygen	00301	0.01	%
Specific Conductivity	00095	0.01	µS/cm
pH	00400	0.1	SU

Data Analysis

All water samples submitted for lab analysis will be tested for the parameters listed in Table 5 which are taken from the Ohio EPA’s Division of Environmental Services (DES) Stream

Survey Nutrient Schedule (as noted in the Data Collection Chapter above - Ambient sites differ from Nutrient sites as there are no continuous multiparameter meter data associated with the chemical data). The parameters listed in Table 6 are details about the metals samples from the bottom of Table 5. Samples will be collected either by wading and directly filling the containers or by using a clean intermediate container such as a bucket lowered from a bridge.

Upon return to the office, the sample collector(s) will access the USGS streamflow web page and record gage height and discharge readings closest to the actual sample collection time and add it to the sample metadata upon uploading into database.

Data Management

Knowledge of DSW’s Sample Master and Ecological Assessment and Analysis Application (EA3) programs is needed to manage data. The station ID numbers that are assigned to each sampling location are created using EA3. Ambient stations already have stations created, so this step isn’t needed in most instances. Sampling trips are organized using the Sample Master program. To facilitate future data assessment the sample collector first selects a common project to group the samples together. Project No. 1385 (Monthly Ambient) should be selected from the dropdown box. The sampling stations can then be selected to create a run. The software assigns an external ID number and bar code specific to each sample and prints the laboratory sample submission forms and container labels. Samples delivered

to DES are logged with a scanner that reads the external ID bar code printed on the label. The samples are then assigned a lab ID number used to track them through the system.

Field data is collected in conjunction with the chemistry samples and is ultimately attached to the chemistry sample results. The YSI® Pro Series is a commonly used instrument for collecting the field data and has an internal file storage system. A site list based on station ID # is first created using YSI® Pro Series Data Manager V1.1.8 software installed on a desktop PC. The field meter is then connected to the PC via a USB port so the site list can be uploaded to the meter. Data is saved in the field by selecting the correct station from the menu. Field data is next transferred to a Lab Information Management System called Sample Master®. *For the SOP on how to transfer field data to Sample Master, and how to view, validate and approve data in Sample Master go to the Field Data SOP folder in SharePoint.* Field data is lastly uploaded into the DSWs Ecological Assessment and Analysis Application database along with the chemistry data it is associated with.

Instruments other than the YSI® ProSeries have other methods of data downloading and manual data entry can be used for data from any instrument.

After water samples are analyzed and the results are approved by the lab QA Officer, the data is loaded into the Laboratory Information Management System (LIMS). Individual lab sheets are also posted on a web based server accessible by DSW staff. Once the lab data is available in LIMS it can be imported into EA3. Before the chemistry data is imported it's important to verify that field data has been uploaded since the system uses the external ID number tag to merge the two datasets. Once the sheets are imported the sample collector reviews them for accuracy, completes edits if necessary, validates field QC and approves the sheet. All data approved in EA3 is sent to the U.S. EPA Water Quality Exchange.

Quality Assurance

All water quality sample collection and preservation methods will follow guidelines established in the *Surface Water Field Sampling Manual* (Ohio EPA, March 2018). Field QC requirements for duplicates and blanks are summarized in Table E-1 of the manual. An Excel Data Validation Tool will be used to determine if data needs to be rejected or qualified as estimated 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.

Table 5. List of parameters that will be analyzed at least quarterly in ambient samples collected by Ohio EPA – included in DES’s Stream Survey Nutrient Schedule.

Parameter	PCS#	Method	RL	Units	Container	Preservative	Hold
Alkalinity, Total (as CaCO ₃)	410	USEPA 310.1	5	mg/L	1L LDPE	cool ≤6°C	14d
Chloride, Total (as Cl)	940	USEPA 325.1	5	mg/L			28d
Nitrite, Total (as N)	615	USEPA 353.2	0.02	mg/L			48 hr.
Solids, Total Dissolved	70300	SM 2540 C	10	mg/L			7d
Solids, Total Suspended	530	SM 2540 D	5	mg/L			7d
Sulfate, Total (as SO ₄)	945	USEPA 375.2	10	mg/L			28d
Conductivity	95	SM 2510 B	2	umhos/cm			28d
Ammonia, Total (as N)	610	USEPA 350.1	0.05	mg/L	1L LDPE	2 ml H ₂ SO ₄ to pH<2, cool ≤6°C	28d
Chemical Oxygen Demand	340	SM 5220 D	20	mg/L			28d
Kjeldahl, Total (as N)	625	USEPA 351.2	0.2	mg/L			28d
Nitrate-Nitrite, Total (as N)	630	USEPA 350.1	0.5	mg/L			28d
Phosphorus, Total (as P)	665	USEPA 365.4	1	mg/L			28d
Orthophosphate, Dissolved (as P)	671	US EPA 365.1	1	mg/L	1L LDPE - 120 ml min.	filter, cool ≤6°C	48 hr.
Dissolved Organic Carbon <i>(not on test schedule as yet so needs to be manually added in Sample Master)</i>	681	SM 5310 D	2	mg/L			7d
ICP_1 (Al,Ba,Ca,Fe,Mg,Mn,Na,K,Sr, Zn,Hardness)	see details below in Table 6						
ICPMS_1 ICPMS 1 (As,Cd,Cr,Cu,Ni,Pb,Se)	see details below in Table 6						

Table 6. List of metals that will be analyzed at least quarterly in ambient samples collected by Ohio EPA – included in DES’s Stream Survey Nutrient Template.

Parameter	PCS#	Method	RL	Units	Container	Preservative	Hold
Aluminum, Total (as Al)	01105	USEPA 200.7	200	µg/L	1L LDPE	5 ml HNO ₃ to pH<2, cool ≤6°C	6 mo.
Barium, Total (as Ba)	01007		15	µg/L			
Calcium, Total (as Ca)	00916		2	mg/L			
Iron, Total (as Fe)	01045		50	µg/L			
Magnesium, Total (as Mg)	00927		1	mg/L			
Manganese, Total (as Mn)	01055		10	µg/L			
Potassium, Total (as K)	00937		2	mg/L			
Sodium, Total (as Na)	00929		5	mg/L			
Strontium, Total (as Sr)	01082		30	µg/L			
Zinc, Total (as Zn)	01092		10	µg/L			
Arsenic, Total (as As)	01002	USEPA 200.8	2.0	µg/L			
Cadmium, Total (as Cd)	01027		0.2	µg/L			
Chromium, Total (as Cr)	01034		2.0	µg/L			
Copper, Total (as Cu)	01042		2.0	µg/L			
Lead, Total (as Pb)	01051		2.0	µg/L			
Nickel, Total (as Ni)	01067		2.0	µg/L			
Selenium, Total (as Se)	01147		2.0	µg/L			

Reporting

As mentioned in the objectives chapter above, data from the Ambient Stations are to be used for various needs of the DSW such as WQ standards and permit writing support, long term chemical and biological trends, and nutrient loading analyses. Exactly how these objectives will be met will be determined in a future (to this writing, July 2018) LEAN event. Details for each ambient station like data collection frequency and how the data will be used will be determined and put into a Quality Assurance Action Plan (QAPP) which will then replace this document.

References

Betanzo, E.A., Choquette, A.F., Reckhow, K.H., Hayes, L., Hagen, E.R., Argue, D.M., and Cangelosi, A.A., 2015, Water data to answer urgent water policy questions: Monitoring design, available data and filling data gaps for determining the effectiveness of agricultural management practices for reducing tributary nutrient loads to Lake Erie, Northeast-Midwest Institute Report, 169 p., <http://www.nemw.org> DOI: 10.13140/RG.2.1.1102.5684

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