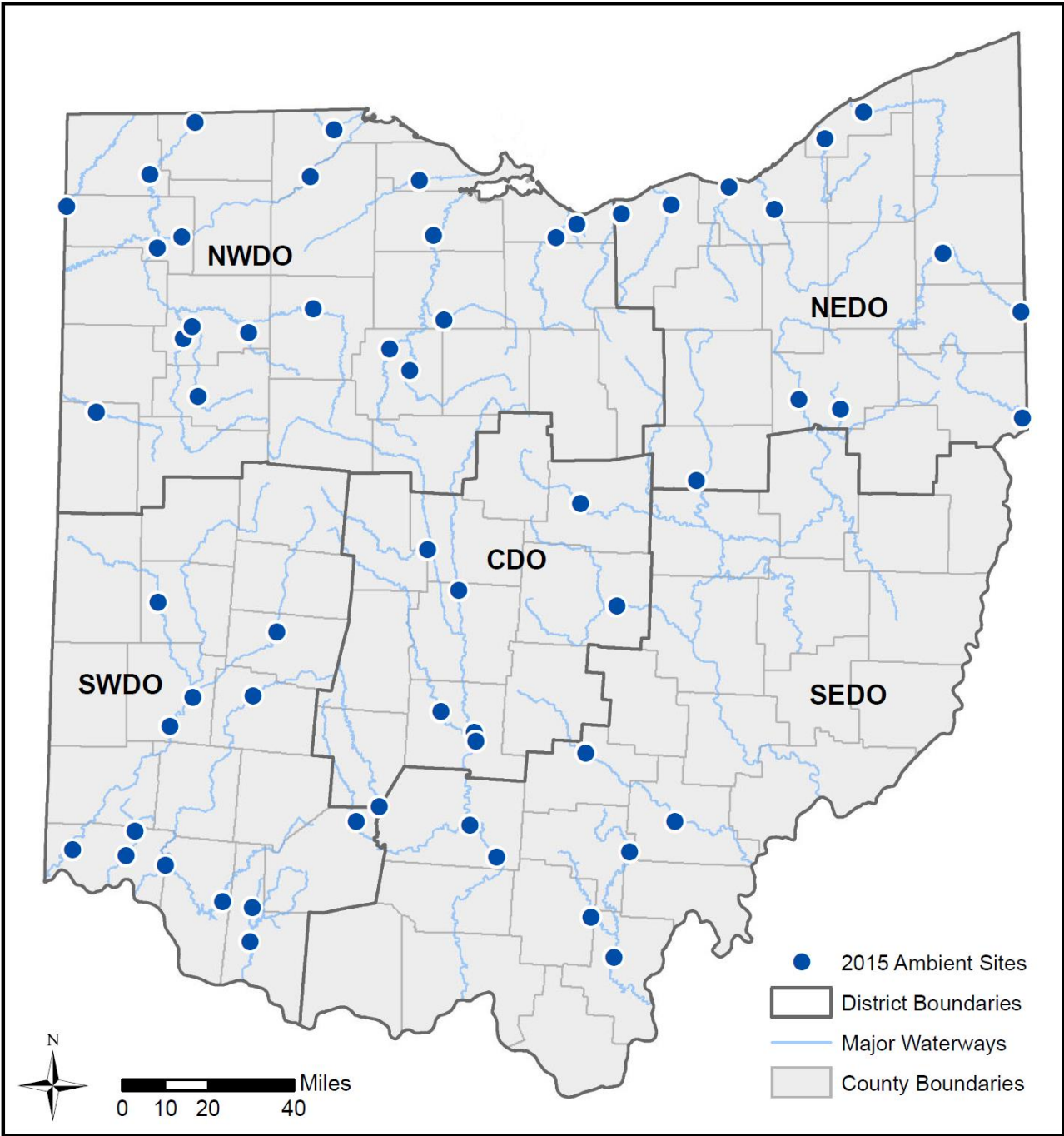


State Wide Ambient Water Quality Monitoring Study Plan

April 15, 2015





Ambient Water Quality Monitoring Guidance

V 1.0

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Ohio Environmental Protection Agency
Division of Surface Water

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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 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 spans 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.

Criteria

The criteria for the determination of where to locate ambient stations is that they must be located at or in conjunction with a USGS station, have flow year round, be safely accessible, be non-duplicative, and be at a logical site to achieve the objective of an ambient site, that is 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 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.

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 also 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 2. Macroinvertebrate and fish community assessment at the selected subset of sites will be collected and analyzed using standardized procedures available at <http://epa.ohio.gov/dsw/bioassess/BioCriteriaProtAqLife.aspx>.

Ambient sites differ from the proposed Stream Nutrient Assessment Procedure (SNAP) 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 SNAP calculations will not typically exist at these ambient sites.

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

District	Description	RM	USGS gage number	Storet No./EA3 ID	DA (sq mi)	huc8 or 12	N. Lat	W. Long
CDO	BIG DARBY CK @ SR 316 AT DARBYVILLE	13.36	3230500	601300	534	05060001	39.7008	-83.1097
CDO	KOKOSING R @ TILDEN AVE GAGE AT MT VERNON	28.61	3136500	R12P02	202	05040003	40.4056	-82.4997
CDO	LICKING R @ SR 16 (STADDEN BRIDGE) NR NEWARK	26.75	3146500	601770	537	05040006	40.0592	-82.3397
CDO	Mill C. near Bellpoint	1.57	3220000	601260	178	05060001	40.2481	-83.1736
CDO	OLENTANGY R @ I-270 NR WORTHINGTON (bio only @ Hyatts Rd., RM 19.6)	11.5	3226800	601290	497	05060001	40.1103	-83.0319
CDO	PAINT CK @ SR 753 UPST GREENFIELD	52.54	3232000	V10S30	249	05060003	39.3794	-83.3756
CDO	Scioto River near Commercial Point, OH (bio only @ Hyatts Rd., RM 19.6)	102.	3229610	601340	2272	05060001-23-06	39.6306	-82.9617
CDO	Scioto R. @ US 22	99.82	3230700	600960	3217	05060001	39.6015	-82.9551
NEDO	BLACK R @ FORD RD DST ELYRIA	9.8		501510	412	04110001	41.4117	-82.0958
NEDO	CHAGRIN R @ RIDGE RD (SR 84) AT WILLOUGHBY	4.95		502400	246	04110003	41.63	-81.4003
NEDO	Cuyahoga River at Independence, OH	13.1	04208000	502020	707	04110002-06-02	41.3964	-81.6294
NEDO	GRAND R @ SR 84 AT PAINESVILLE	8.45		502530	685	04110004	41.7192	-81.2281
NEDO	KILLBUCK CK @ US 62 DST KILLBUCK WWTP	23.91		R04S03	464	05040003	40.4814	-81.9861
NEDO	L BEAVER CK @ GRIMMS BRIDGE RD NR E LIVERPOOL	4.5		602000	496	05030101	40.6758	-80.5408
NEDO	MAHONING R @ FIRST ST AT LOWELLVILLE	10.79		602300	1074	05030103	41.0361	-80.5361
NEDO	MAHONING R @ LEAVITT RD AT LEAVITTSBURG	43.78		602280	575	05030103	41.2392	-80.8808
NEDO	NIMISHILLEN CK @ HOWENSTINE RD DST N. INDUSTRY	6.72		601940	177	05040001	40.7342	-81.3522
NEDO	ROCKY R @ PARK BLVD AT LAKEWOOD	3		501790	291	04110001	41.4694	-81.8317
NEDO	TUSCARAWAS R @ WARMINGTON ST AT MASSILLON	87.37		601930	520	05040001	40.7522	-81.5292

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

District	Description	RM	USGS gage number	Storet No./EA3 ID	DA (sq mi)	huc8 or 12	N. Lat	W. Long
NWDO	Auglaize River near Defiance @ Harding Rd.	4.14	4191500	500290	2318	04100007-12-09	41.2375	-84.3991
NWDO	Auglaize River near Ft. Jennings @ US Rt. 224	39.57	4186500	P03S03	327	04100007-09-04	40.9489	-84.2661
NWDO	Bean Creek at Powers @ Fulton CR 20	6.00	4184500	500330	206	04100006-02-02	41.6775	-84.2322
NWDO	Blanchard River near Findlay @ Hancock CR 140	55.26	4189000	500040	345	04100008-03-04	41.0562	-83.6885
NWDO	Honey Creek at Melmore @ St. Rt. 67/100	12.30	4197100	U03S02	149	04100011-08-06	41.0222	-83.1097
NWDO	Huron River at Milan @ downstream US Rt. 250	12.30	4199000	501030	371	04100012-06-06	41.3017	-82.6069
NWDO	Maumee River at Waterville @ St. Rt. 64	20.68	4193500	500080	6330	04100009-09-03	41.5000	-83.7128
NWDO	Maumee River near Defiance @ Independence Dam	60.00	4192500	P09W19	5544	04100009-02-03	41.2914	-84.2819
NWDO	Old Woman Creek near Huron @ Berlin Rd.	3.69	4199155	K01G31	21.6	04100012-03-04	41.3485	-82.5139
NWDO	OTTAWA R. AT ALLENTOWN, DST. ALLENTOWN DAM (bio only)	28.83	04187100	P04W12	160.	04100007-04-02	40.7552	-84.1953
NWDO	Ottawa River at Univ. of Toledo @ Stadium Drive	11.15	4177000	P11S74	155	04100001-03-08	41.6614	-83.6097
NWDO	Ottawa River near Kalida @ Putnam CR 19	0.96	4188100	500150	351	04100007-05-03	40.99	-84.2267
NWDO	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	Riley Creek near Pandora @ Putnam CR 6	4.36	4189174	500480	70	04100008-04-05	40.973	-83.9767
NWDO	Sandusky River near Fremont @ Rice Rd.	20.25	4198000	500820	1251	04100011-13-02	41.3078	-83.1589
NWDO	Sandusky River near Up Sandusky @ Wyandot CR 121	78.09	4196500	500860	298	04100011-07-02	40.8506	-83.2564
NWDO	St. Joseph R. near Ohio/Indiana State Line @ St. Rt. 249	42.34	4178000	510220	609	04100003-05-05	41.3856	-84.8017
NWDO	St. Mary's River at Rockford @ St. Rt. 118	57.82	4180988	P01W08	295	04100004-03-03	40.6954	-84.6464
NWDO	Tiffin River at Stryker @ Williams CR F/Curtis St.	33.95	4185000	300020	412	04100006-05-03	41.5	-84.4301
NWDO	Tymochtee Creek at Crawford @ St. Rt. 199	8.06	4196800	500850	229	04100011-06-05	40.9228	-83.3489
NWDO	Vermilion River near Vermilion @ Mill Hollow/North Ridge Rd.	6.32	4199500	501260	262	04100012-02-04	41.3819	-82.3169
SEDO	HOCKING R @ CR 31 NR ENTERPRISE	73.37	3157500	601530	459	05030204	39.565	-82.475
SEDO	HOCKING R @ STIMSON AVE AT ATHENS	33.03	3159500	J02S15	942	05030204	39.3308	-82.0875
SEDO	LITTLE RACCOON CREEK @ KEYSTONE ROAD	12.71	3201980	W03S06	99	05090101	39.0106	-82.4522
SEDO	PAINT CK @ SR 772 AT CHILLICOTHE	3.8	3234300	V10P06	1138	05060003	39.32	-82.9789
SEDO	RACCOON CK @ US RT 35 AT ADAMSVILLE	29.2	3202000	601400	586	05090101	38.8736	-82.3561
SEDO	RACCOON CK AT BOLIN MILLS	80.6	3201902	W03G50	200	05090101	39.2308	-82.286
SEDO	SCIOTO R DST CHILLICOTHE @ HIGBY BRIDGE	56.17	3234500	600770	5131	05060002	39.2122	-82.8647

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

District	Description	RM	USGS gage number	Storet No./EA3 ID	DA (sq mi)	huc8 or 12	N. Lat	W. Long
SWDO	E Fork Little Miami River at Williamsburg @ Main Street	34.91	3246500	M04S08	237	05090202-11-02	39.0525	-84.05
SWDO	Great Miami River at Dayton @ Stewart Street (bio previously @ Needmore Rd, presently @ Troy Pike, RM 85.9)	78.85	03270500 & 03271000	H09W02	2587	05080002-01-05	39.74	-84.1933
SWDO	Great Miami River at Miamisburg @ Linden Avenue	66.9	3271510	H09S13	2711	05080002-04-04	39.6406	-84.2922
SWDO	Great Miami River at Miamitown @ Harrison Road	15.49	3274615	H11W20	3838	05080002-09-06	39.2161	-84.7035
SWDO	Little Miami River at Milford @ Wooster Pike	13.07	3245500	M05P11	1203	05090202-14-03	39.1717	-84.2986
SWDO	Little Miami River near Oldtown @ US 68	80.63	3240000	600570	129	05090202-01-04	39.7483	-83.9314
SWDO	Mad River at Eagle City @ St. Paris Pike	29.52	3267900	610040	310	05080001-18-02	39.9642	-83.8317
SWDO	Mill Creek at Cincinnati @ Anthony Wayne Avenue	10.5	3259000	600410	115	05090203-01-04	39.201583	-84.4708
SWDO	Mill Creek NE of Glendale @ Kemper Road	17.61	3255300	Q01S17	44.8	05090203-01-03	39.2844	-84.4331
SWDO	Rattlesnake Creek at Centerfield @ Centerfield Road	7.55	3232300	300049	209	05060003-04-07	39.329	-83.4741
SWDO	Sterling Run at Mt. Orab WTP @ WTP access drive	6.47	-----	X02K14	19.7	05090201-10-01	39.0344	-83.9203
SWDO	Stillwater River at Pleasant Hill @ Lauver Road	27.86	3265000	H06P03	503	05080001-13-03	40.0578	-84.3558
SWDO	White Oak Creek above Gerogetown @ White Oak Valley Road	15.2	3238495	X02K08	199	05090201-10-02	38.9195	-83.9283

Table 2. 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 3 which are taken from the Ohio EPA's Division of Environmental Services (DES) Test Schedule for Stream Surveys. The

parameters listed in Table 4 are details about the metals samples from Table 3. 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 on the sample submission form.

Data Management

Knowledge of DSW's Cyberintern and Ecological Assessment and Analysis Application (EA3) programs are needed to manage data. The station ID numbers that are assigned to each sampling location are created using EA3. Most ambient stations already have stations created, so this step isn't needed in

most instances. Sampling trips are organized using the Cyberintern 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 drop down 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. After sampling is completed the files are downloaded to the Data Manager software. They are then exported as an Excel file to the DSW's Water Quality Data Acquisition Manager and uploaded to the Ohio EPA SQL server database. Streamflow data is manually coded to the spreadsheet before it gets uploaded. 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 the DSW. 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, 2013b). 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 3. List of parameters that will be analyzed at least quarterly in ambient samples collected by Ohio EPA – included in DES’s Stream Survey Template unless otherwise noted.

Parameter	PCS#	Method	RL	Units	Container	Preservative	Hold
Alkalinity, Total (as CaCO ₃)	00410	USEPA 310.1	5	mg/L	1L LDPE	cool ≤6°C	14d
Ammonia, Total (as N)	00610	USEPA 350.1	0.05	mg/L	1L LDPE	2 ml H ₂ SO ₄ to pH<2, cool ≤6°C	28d
Chloride, Total (as Cl)	00940	USEPA 325.1	5	mg/L	1L LDPE	cool ≤6°C	28d
Chemical Oxygen Demand	00340	SM 5220 D	20	mg/L	1L LDPE	2 ml H ₂ SO ₄ to pH<2, cool ≤6°C	28d
Conductivity		SM 2510 B		umhos /cm	1L LDPE		28d
ICP_1 (Al,Ba,Ca,Fe,Mg,Mn,Na,K,Sr,Zn,Hardness)	see details below in Table 4						
ICPMS_1 ICPMS 1 (As,Cd,Cr,Cu,Ni,Pb,Se)	see details below in Table 4						
Nitrite, Total (as N)	00615	USEPA 353.2	0.02	mg/L	1L LDPE	cool ≤6°C	48 hr.
Nitrate-Nitrite, Total (as N)	00630	USEPA 350.1	0.5	mg/L	1L LDPE	2 ml H ₂ SO ₄ to pH<2, cool ≤6°C	28d
Kjeldahl, Total (as N)	00625	USEPA 351.2	0.2	mg/L	1L LDPE	2 ml H ₂ SO ₄ to pH<2, cool ≤6°C	28d
Solids, Total Dissolved	70300	SM 2540 C	10	mg/L	1L LDPE	cool ≤6°C	7d
Solids, Total Suspended	00530	SM 2540 D	5	mg/L	1L LDPE	cool ≤6°C	7d
Sulfate, Total (as SO ₄)	00945	USEPA 375.2	10	mg/L	1L LDPE	cool ≤6°C	28d
Phosphorus, Total (as P)	00665	USEPA 365.4	0.01	mg/L	1L LDPE	2 ml H ₂ SO ₄ to pH<2, cool ≤6°C	28d
Orthophosphate, Dissolved (as P) (not on template – must add to lab sheet)	00671	US EPA 365.1	0.01	mg/L	1L LDPE	filter, cool ≤6°C	48 hr.

Table 4. List of metals that will be analyzed at least quarterly in ambient samples collected by Ohio EPA – included in DES's Stream Survey 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	USEPA 200.7	15	µg/L	1L LDPE	5 ml HNO ₃ to pH<2, cool ≤6°C	6 mo.
Calcium, Total (as Ca)	00916	USEPA 200.7	2	mg/L	1L LDPE	5 ml HNO ₃ to pH<2, cool ≤6°C	6 mo.
Iron, Total (as Fe)	01045	USEPA 200.7	50	µg/L	1L LDPE	5 ml HNO ₃ to pH<2, cool ≤6°C	6 mo.
Magnesium, Total (as Mg)	00927	USEPA 200.7	1	mg/L	1L LDPE	5 ml HNO ₃ to pH<2, cool ≤6°C	6 mo.
Manganese, Total (as Mn)	01055	USEPA 200.7	10	µg/L	1L LDPE	5 ml HNO ₃ to pH<2, cool ≤6°C	6 mo.
Potassium, Total (as K)	00937	USEPA 200.7	2	mg/L	1L LDPE	5 ml HNO ₃ to pH<2, cool ≤6°C	6 mo.
Sodium, Total (as Na)	00929	USEPA 200.7	5	mg/L	1L LDPE	5 ml HNO ₃ to pH<2, cool ≤6°C	6 mo.
Strontium, Total (as Sr)	01082	USEPA 200.7	30	µg/L	1L LDPE	5 ml HNO ₃ to pH<2, cool ≤6°C	6 mo.
Zinc, Total (as Zn)	01092	USEPA 200.7	10	µg/L	1L LDPE	5 ml HNO ₃ to pH<2, cool ≤6°C	6 mo.
Arsenic, Total (a As)	01002	USEPA 200.8	2.0	µg/L	1L LDPE	5 ml HNO ₃ to pH<2, cool ≤6°C	6 mo.
Cadmium, Total (as Cd)	01027	USEPA 200.8	0.2	µg/L	1L LDPE	5 ml HNO ₃ to pH<2, cool ≤6°C	6 mo.
Chromium, Total (as Cr)	01034	USEPA 200.8	2.0	µg/L	1L LDPE	5 ml HNO ₃ to pH<2, cool ≤6°C	6 mo.
Copper, Total (as Cu)	01042	USEPA 200.8	2.0	µg/L	1L LDPE	5 ml HNO ₃ to pH<2, cool ≤6°C	6 mo.
Lead, Total (as Pb)	01051	USEPA 200.8	2.0	µg/L	1L LDPE	5 ml HNO ₃ to pH<2, cool ≤6°C	6 mo.
Nickel, Total (as Ni)	01067	USEPA 200.8	2.0	µg/L	1L LDPE	5 ml HNO ₃ to pH<2, cool ≤6°C	6 mo.
Selenium, Total (as Se)	01147	USEPA 200.8	2.0	µg/L	1L LDPE	5 ml HNO ₃ to pH<2, cool ≤6°C	6 mo.