

Statewide Toxics Monitoring Trending Network – Water

Sampling and Analysis Plan



State of Oregon
Department of
Environmental
Quality

**Laboratory and
Environmental
Assessment Division**

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Project Approvals

Approved by: _____ **Date:** _____
Michael Mulvey, Project Coordinator

Approved by: _____ **Date:** _____
Aaron Borisenko, Water Quality Section Manager

Approved by: _____ **Date:** _____
Sara Krepps, Quality Assurance Officer

Section A. Project Management

A1. Distribution List

The following personnel will be emailed regarding all pertinent aspects of this Sampling and Analysis Plan (SAP). Deviations from this SAP must be communicated in writing (e-mail is acceptable) to all pertinent individuals identified in Table 1. Final data reports are available from the DEQ Laboratory. Final data results are publically accessible in DEQ's online AWQMS database.

Table 1. Distribution List

Name	Phone	Email
Michael Mulvey, Project Coordinator	503-693-5732	mulvey.michael@deq.state.or.us
Sara Krepps, Quality Assurance Officer	503-693-5704	krepps.sara@deq.state.or.us
Gary Crosby, Sample Coordinator	503-693-5780	crosby.gary@deq.state.or.us
Zach Mander, Inorganic Section Manager	503-693-5757	mandera.zach@deq.state.or.us
Ned Fairchild, Organic Section Manager	503-693-5749	fairchild.ned@deq.state.or.us
Aaron Borisenko, Water Quality Monitoring Manager	503-693-5723	borisenko.aaron@deq.state.or.us

A2. Problem Definition/Background

As part of the on-going Statewide Toxics Monitoring Program, DEQ is collecting water samples from around the state to monitor and evaluate for the presence of toxic pollutants, and to establish a trend network starting in 2019. The trend network will track changes in the presence or amount of toxic compounds through time similar to the Ambient Water Quality Monitoring Program's monitoring network for 'traditional' water quality indicators. In addition, as new analytical methods are developed and laboratory analytical capacity grows, the network may incorporate new analyses and additional sites. DEQ staff selected the initial monitoring locations for the Toxics Monitoring network based on previous sampling data, spatial coverage of the state, 303(d) listed waters, assessment unit clustering, land use, and best professional judgement. In this way, the original list of over 300 monitoring locations was narrowed to the 60 sites listed in Table 2. DEQ laboratory staff believe that the 60 site network represents a work load that we can accomplish with our existing analytical and monitoring resources. The sampling conducted under this SAP represents the current Toxics Monitoring Program's water sampling effort. We will address Toxics Monitoring Program sediment and fish sampling in separate SAPs.

Sample collection and data analysis procedures are outlined in the overall Statewide Toxics Monitoring Program QAPP, [DEQ09-LAB-0029-QAPP](#). To track time and expenses spent on this project DEQ personnel must use the **Q-time number: 45558**.

A3. Project/Task Description

Sampling Organization: Oregon DEQ Laboratory and Environmental Assessment Division
7202 NE Evergreen Parkway, Suite 150
Hillsboro, Oregon 97124
Ph: 503-693-5700
Contact: Michael Mulvey

Analytical Organization: Oregon DEQ Laboratory and Environmental Assessment Division
7202 NE Evergreen Parkway, Suite 150
Hillsboro, Oregon 97124
Ph: 503-693-5700
Contact: Sara Krepps

A4. Quality Objectives and Criteria

Samples will be analyzed and reported following standard DEQ Laboratory and Environmental Assessment Division (LEAD) procedures. If circumstances require analyses to be conducted by a third party laboratory, the laboratory will meet the DEQ laboratory's Limit of Quantitation (LOQ) and quality control requirements.

A5. Documentation and Records

Samples collected from the field will be returned to the DEQ laboratory using the current controlled version of the DEQ Chain of Custody ([DEQ06-LAB-0054-FORM](#)). Policies and procedures for the maintenance of LEAD analytical records are described in the LEAD Quality Manual ([DEQ91-LAB-0006-LQM](#)). Final analytical reports generated by the DEQ Laboratory will follow standard laboratory practices. Electronic versions of the reports will be e-mailed to the project coordinator in a Portable Document Format (PDF). An original hard copy of the report with the supporting Quality Control (QC) documentation will be kept on file at the DEQ Laboratory. Copies of the report will be available upon request.

Section B. Data Generation and Acquisition

B1. Sampling

Sampling design, collection, methods, and handling will be managed by the Water Quality Monitoring section of DEQ LEAD. These trained personnel will ensure that all samples will be collected in the appropriate sample containers, preserved as identified in the appropriate reference methods, and transported to the analytical organization within the appropriate sample holding times, with the appropriate documentation, and under the appropriate sample transport conditions.

Field sampling will follow standard DEQ protocols described in the DEQ Laboratory Mode of Operations Manual (MOMs) ([DEQ03-LAB-0036-SOP_V3](#)) and the Field Sampling Reference Guide ([DEQ86-LAB-0002-QAG](#)) for general sampling. Trace metal sampling of surface waters will be conducted as described in the Surface Water Sampling for Trace Metal Analysis SOP ([DEQ11-LAB-0017-SOP](#)). There are no anticipated deviations from these sampling protocols, however, if there is a deviation from these protocols in the field, this will be documented on the Field Sheet. Any effect on data quality based on this deviation will be determined by the project coordinator.

The locations to be sampled are summarized in Table 2. Figure 1 shows the locations of the sampling locations.

Table 2: Summary of the sampling locations

Sample Location ID	Name
Deschutes	
36776	Trout Creek downstream of Mud Springs Creek
37821	Deschutes R at RM 222 DS of Wickiup Reservoir
Grande Ronde	
11521	Grande Ronde River at Peach Lane (Island City)
11647	Grande Ronde River at Lower Cove Rd (Markert Rd)
Hood	
13148	Indian Creek at Union Avenue near PPL power station
11972	Lenz Creek at mouth

Sample Location ID	Name
28574	Mill Creek at 2 nd Street, The Dalles
25204	Threemile Creek at Hwy 197
John Day	
38510	North Fork John Day River at Hwy 359 bridge river mile 61
31990	John Day River Clyde Holliday State Park
31987	Canyon Creek, John Day City Park
37720	John Day R at Cathedral Rock & Hwy 19
Klamath	
11597	Klamath River at Miller Island Boat Ramp
10763	Klamath Strait at USBR Pump Station F
10759	Lost River at Hwy 39 (Merrill)
Malheur	
10407	Malheur River at Hwy 201 (Ontario)
10728	Willow Creek @ RR Crossing (Vale)
Mid Coast	
13336	Yaquina River at Marker #47
29900	Cummins Creek
28989	Siuslaw River at RM 0.1, at North Fork confluence OR2002-0051
37400	Siuslaw River at Siuslaw Falls Park
North Coast	
10812	Skipanon River at Hwy 101
24299	Nehalem River at Hwy 47 bridge, US of Vernonia
13308	Tillamook Bat at Hobsonville Point
Oregon Closed Lakes	
33929	Silvies River at West Loop Road
37616	Donner und Blitzen River at RM
36778	Thomas Creek at Stock Drive Road
10748	Antelope Creek at Hwy 140 (Lakeview)
Owyhee	
10729	Owyhee River at Hwy 201 Bridge (Owyhee)
10730	Owyhee River at Rome (Hwy 95)
Powder and Burnt	
33829	Burnt River, 150 feet upstream of Huntington WWTP outfall

Sample Location ID	Name
11857	Powder R at Snake R Rd (Richland)
Rogue	
10418	Rogue River at Robertson Bridge (Merlin)
37826	Rogue River at RM 7.4
10422	Rogue River upstream of Raygold Dam
11051	Bear Creek at Kirtland Road (Central Point)
Sandy	
34102	Beaver Creek at RM 0.9 north of Otto Park (Sandy)
37091	Kelly Creek at Kane Rd Gresham upstream of Mt Hood Community College Pond
South Coast	
13388	Isthmus Slough at Eastside Bridge
13400	Joe Ney Slough at east end of dock
30670	Chetco River below Jack Creek
Umatilla and Walla Walla	
10711	Walla Walla at Hwy 11 (Milton-Freewater)
33084	Little Walla Walla R. West Branch/Crocket
32010	West Prong Little WW south of State Line Rd
12090	Umatilla River upstream of Three Mile Dam
Umpqua	
37818	Umpqua R at RM 21.4
10996	Calapooya Creek at mouth
30163	S Umpqua R above mouth
25950	Deer Creek at Fowler Bridge, Roseburg
Willamette	
10821	Willamette River at St. John's Bridge
31545	Willamette River at Hebb Park boat ramp
10344	Willamette River at Wheatland Ferry
10555	Willamette River at Marion Street (Salem)
10350	Willamette River at Albany (eastbound Hwy 20 bridge)
29044	Willamette River at Greenway bike bridge, Eugene
10916	Tualatin River at bridge upstream of mouth
10355	Willamette River at Hwy 99E (Harrisburg)
10456	Tualatin River at Boones Ferry Road

Sample Location ID	Name
10363	Yamhill R at Dayton
27986	MF Willamette, u/s Hills Cr Reservoir at USGS gage

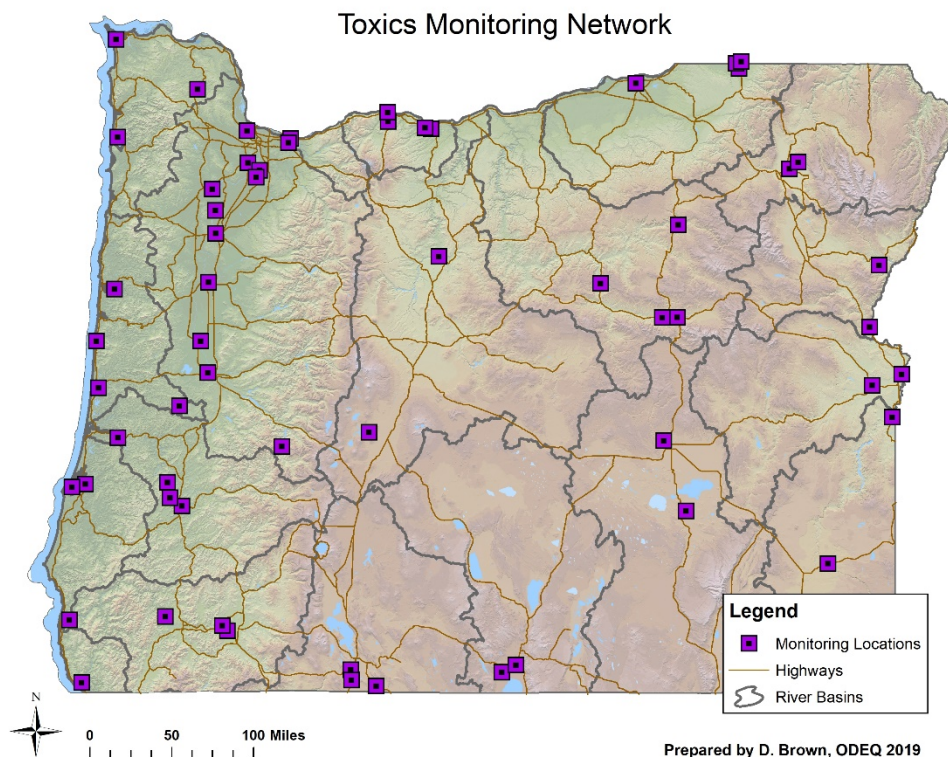


Figure 1: Sampling locations for the Toxics Monitoring Program’s trend network

B2. Sampling Containers and Sample Handling

A summary of the sampling containers, preservation requirements, and holding times is presented in Table 3.

At each sampling location, sampling containers for alkalinity, nutrients and field parameters are filled directly from the water body. All other sampling containers are filled from a Van Dorn bottle, which is washed in a dilute nitric acid, rinsed with DI water, and stored in a plastic bag between field weeks. If filtration is necessary, then the filter is flushed with approximately 100 mL of deionized water before filtering the sample. At sampling locations where the water body is inaccessible, such as a bridge, then metal buckets and the Van Dorn bottle are lowered into the water to collect the appropriate amount of water to complete the sample collection. After collection, the samples are stored on ice until delivered to the DEQ laboratory.

Table 3: Summary of sampling parameters

Parameter Group	Container Type	Preservation	Holding Time
Field: Temperature, specific conductivity, turbidity, pH, dissolved oxygen concentration, dissolved oxygen saturation.	In-stream / stainless steel bucket	None	Immediate
Nutrients: Ammonia, nitrate + nitrite, total phosphorus, total nitrogen	500 mL poly	H ₂ SO ₄ to pH < 2	28 days
Alkalinity	500 mL poly	Ice < 4 °C	14 days
Sulfate, chloride	250 mL poly	Filter in field (0.45 µm filter), ice < 4°C	28 days
Total recoverable metals and cations	250 mL fluorinated poly	HNO ₃ to pH < 2	6 months
Total mercury			28 days
Dissolved metals and cations	250 mL poly	HNO ₃ to pH < 2	6 months
Total organic carbon	125 mL amber glass	H ₂ SO ₄ to pH < 2	28 days
Dissolved organic carbon	125 mL amber glass	H ₂ SO ₄ to pH < 2	28 days

B3. Analytical Parameters, Methods, and Quality Control

A summary of the requested analytical parameters and methods is provided in Table 4. Standard DEQ Laboratory operating procedures will be followed during the analyses of the samples, including analytical Quality Control measures and equipment inspection/maintenance. Individual analytes associated with each Parameter Group are included in Appendix A. The LOQs for specific analytes will be based on current laboratory capabilities and may be affected by matrix interferences and other factors. In order to evaluate these data in relation to the water quality criterion of 0.012 ug/L, total mercury, the analytical results for EPA Method 245.1 (Total Mercury) will be reported to the minimum detection limit.

Table 4: Summary of parameter groups and reference methods

Parameter Group	Reference Method (s)
Field methods: Temperature, specific conductivity, turbidity, dissolved oxygen concentration, dissolved oxygen saturation, pH.	Multiple, See Appendix A
Nutrients: Total phosphorus, total nitrogen, nitrate + nitrite, ammonia	Multiple, See Appendix A
Alkalinity by SM2320B	SM 2320B
Chloride by 300.0	EPA 300.0
Sulfate by 300.0	EPA 300.0
Metals, Cations + Hardness by 200.8, Total Recoverable	EPA 200.8
Metals, Cations + Hardness by 200.8, Dissolved	EPA 200.8
Total Mercury by 245.1	EPA 245.1
TOC by Combustion SM5310B	SM 5310 B
DOC by Combustion SM5310B	SM 5310 B

B4. Data Management

Analytical data generated by the laboratory will be stored as an electronic PDF report. The DEQ Laboratory will maintain hard copies of the analytical reports, including all analytical QC measurements. Data generated by the DEQ Laboratory will be moved to an external web accessible data repository database following release of the final analytical report. Data in this repository is publicly available through the DEQ website (<https://www.oregon.gov/deq/wq/Pages/WQdata.aspx>).

Section C. Assessment and Oversight

Overall project assessment and oversight, including field activities, will be the responsibility of the project coordinator. Laboratory assessment and oversight will be provided by DEQ LEAD management and Quality Assurance Officers (QAO) as defined in the Laboratory's Quality Manual or for cause. Any analytical anomalies or delays encountered during laboratory operations will be communicated to the project manager in writing (e-mail is acceptable). The project coordinator will also be notified in writing of any data quality limitations that may be the result of laboratory operations.

Section D. Data Validation and Usability

The DEQ Laboratory will provide standard data review, verification, and validation on all analytical data generated by this project. Data review, verification, and validation is performed by the project data coordinator. If any data appear to be inaccurate or misleading, the DEQ QAO will be consulted. If any data fail the project specific data quality objectives due to field or sampling activities, the data coordinator will consult the project coordinator. This data will be appropriately qualified in the final report and transferred to the data repository. Data quality levels (DQLs) will be assigned in accordance with the overriding Quality Assurance Project Plan for this project, [DEQ09-LAB-0029-QAPP](#) and the revised DEQ Guidance: Data Validation and Qualification [DEQ09-LAB-0006-QAG](#). Generally, only DQLs of A or B will be acceptable for this project unless the basis for the data acceptability is approved and documented by the project coordinator.

Section E. Document History

Date	Version	Description	Editor
9/3/19	1.0	New document	Dan Brown
10/25/19	1.1	Minor revisions	Dan Brown

Appendix A – Analytical methods and parameters

Field Parameters

Parameter Name	Method Reference
Field Temperature	EPA 170.1
Field pH	EPA 150.1
Field Dissolved Oxygen	LDO or SM 4500-O H
Field Conductivity	EPA 120.1
Field Turbidity	EPA 180.1

Physical Parameters

Alkalinity by SM2320 B in Water :: LAB (SM 2320 B)

Preservation: Cool 4°C

Container: Poly 500 mL

Amount Required: 1000 Hold Time: 14 days

Analyte	MDL	Reporting Limit	Surrogate % Rec	Duplicate RPD	Matrix Spike %Rec	RPD	Blank Spike/LCS %Rec	RPD
Alkalinity, Total as CaCO ₃	0.350	1.00 mg/L		10			80-120	

Nutrients

Ammonia by ASTM D6919-09 in Water :: LAB (ASTM 6919-09)

Preservation: pH<2, H₂SO₄, Cool 4°C

Container: Poly 500 mL

Amount Required: 100 Hold Time: 28 days

Analyte	MDL	Reporting Limit	Surrogate % Rec	Duplicate RPD	Matrix Spike %Rec	RPD	Blank Spike/LCS %Rec	RPD
Ammonia as N	0.00500	0.0100 mg/L		20	80-120		90-110	

Nitrate+Nitrite by SM4500-NO₃ F in Water :: LAB (SM 4500-NO₃ F)

Preservation: pH<2, H₂SO₄, Cool 4°C

Container: Poly 500 mL, H₂SO₄

Amount Required: 150 Hold Time: 28 days

Analyte	MDL	Reporting Limit	Surrogate % Rec	Duplicate RPD	Matrix Spike %Rec	RPD	Blank Spike/LCS %Rec	RPD
Nitrate/Nitrite as N	0.00190	0.00500 mg/L		10	80-120		90-110	

Nitrogen, Total by SM4500-N C in Water :: LAB (SM 4500-N C)

Preservation: pH<2, H₂SO₄, Cool 4°C

Container: Poly 500 mL, H₂SO₄

Amount Required: 100 Hold Time: 28 days

Analyte	MDL	Reporting Limit	Surrogate % Rec	Duplicate RPD	Matrix Spike %Rec	RPD	Blank Spike/LCS %Rec	RPD
Nitrogen, Total	0.0200	0.0500 mg/L			80-120	20	90-110	20

Phosphate, Total by SM4500-P E in Water :: LAB (SM 4500-P E)

Preservation: pH<2, H2SO4, Cool 4°C

Container: Poly 500 mL, H2SO4

Amount Required: 100 Hold Time: 28 days

Analyte	MDL	Reporting Limit	Surrogate % Rec	Duplicate RPD	Matrix Spike %Rec	RPD	Blank Spike/LCS %Rec	RPD
Phosphate, Total as P	0.00300	0.0100 mg/L		10	80-120		90-110	

Anions

Chloride by 300.0 in Water :: LAB (EPA 300.0)

Preservation: None

Container: Poly 250 mL, Filtered

Amount Required: 250 Hold Time: 28 days

Analyte	MDL	Reporting Limit	Surrogate % Rec	Duplicate RPD	Matrix Spike %Rec	RPD	Blank Spike/LCS %Rec	RPD
Chloride	0.100	0.500 mg/L		20	80-120	20	90-110	10

Sulfate by 300.0 in Water :: LAB (EPA 300.0)

Preservation: Cool 4°C

Container: Poly 250 mL, Filtered

Amount Required: 250 Hold Time: 28 days

Analyte	MDL	Reporting Limit	Surrogate % Rec	Duplicate RPD	Matrix Spike %Rec	RPD	Blank Spike/LCS %Rec	RPD
Sulfate	0.0400	0.200 mg/L		20	80-120		90-110	

Metals

Mercury by 245.1, Total in Water :: LAB (EPA 245.1)

Preservation: pH<2, HNO3

Container: Poly Fluorinated 250 mL, HNO3

Amount Required: 500 Hold Time: 28 days

Analyte	MDL	Reporting Limit	Surrogate % Rec	Duplicate RPD	Matrix Spike %Rec	RPD	Blank Spike/LCS %Rec	RPD
Mercury, Total recoverable	0.00650	0.0200 mg/L			70-130	20	85-115	

Metals Cations + Hardness by 200.8, Dissolved in Water :: LAB (EPA 200.8)

Preservation: pH<2, HNO3

Container: Poly 250 mL, HNO3, Filtered

Amount Required: 250 Hold Time: 180 days

Analyte	MDL	Reporting Limit	Surrogate % Rec	Duplicate RPD	Matrix Spike %Rec	RPD	Blank Spike/LCS %Rec	RPD
Sodium, Dissolved	0.0100	0.100 mg/L			70-130	20	85-115	
Magnesium, Dissolved	0.0100	0.0500 mg/L			70-130	20	85-115	
Potassium, Dissolved	0.0200	0.200 mg/L			70-130	20	85-115	
Calcium, Dissolved	0.0300	0.200 mg/L			70-130	20	85-115	
Hardness as CaCO3, Dissolved	0.0800	0.750 mg/L						

Metals WQ Toxics by 200.8 CCT, Dissolved in Water :: LAB (EPA 200.8)

Preservation: pH<2, HNO3

Container: Poly 250 mL, HNO3, Filtered

Amount Required: 250

Hold Time: 180 days

Analyte	MDL	Reporting Limit	Surrogate % Rec	Duplicate RPD	Matrix Spike %Rec	Spike RPD	Blank Spike/LCS %Rec	RPD
Beryllium, Dissolved	0.0500	0.100 µg/L			70-130	20	85-115	
Aluminum, Dissolved	6.00	20.0 µg/L			70-130	20	85-115	
Chromium, Dissolved	0.200	1.00 µg/L			70-130	20	85-115	
Manganese, Dissolved	0.150	2.00 µg/L			70-130	20	85-115	
Iron, Dissolved	15.0	50.0 µg/L			70-130	20	85-115	
Nickel, Dissolved	0.200	1.00 µg/L			70-130	20	85-115	
Copper, Dissolved	0.150	1.50 µg/L			70-130	20	85-115	
Zinc, Dissolved	0.600	5.00 µg/L			70-130	20	85-115	
Arsenic, Dissolved	0.0500	0.250 µg/L			70-130	20	85-115	
Selenium, Dissolved	0.500	2.00 µg/L			70-130	20	85-115	
Silver, Dissolved	0.0350	0.100 µg/L			70-130	20	85-115	
Cadmium, Dissolved	0.0500	0.100 µg/L			70-130	20	85-115	
Antimony, Dissolved	0.150	0.500 µg/L			70-130	20	85-115	
Barium, Dissolved	0.200	2.00 µg/L			70-130	20	85-115	
Thallium, Dissolved	0.0100	0.0400 µg/L			70-130	20	85-115	
Lead, Dissolved	0.0200	0.200 µg/L			70-130	20	85-115	

Metals Cations + Hardness by 200.8, Total Recoverable in Water :: LAB (EPA 200.8)

Preservation: pH<2, HNO3

Container: Poly 250 mL, HNO3

Amount Required: 250

Hold Time: 180 days

Analyte	MDL	Reporting Limit	Surrogate % Rec	Duplicate RPD	Matrix Spike %Rec	Spike RPD	Blank Spike/LCS %Rec	RPD
Sodium, Total recoverable	0.0100	0.100 mg/L			70-130	20	85-115	
Magnesium, Total recoverable	0.0100	0.0500 mg/L			70-130	20	85-115	
Potassium, Total recoverable	0.0200	0.200 mg/L			70-130	20	85-115	
Calcium, Total recoverable	0.0300	0.200 mg/L			70-130	20	85-115	
Hardness as CaCO3, Total recoverable	0.0800	0.750 mg/L						

Metals WQ Toxics by 200.8 CCT, Total Recoverable in Water :: LAB (EPA 200.8)

Preservation: pH<2, HNO3

Container: Poly 250 mL, HNO3, Filtered

Amount Required: 250

Hold Time: 180 days

Analyte	MDL	Reporting Limit	Surrogate % Rec	Duplicate RPD	Matrix Spike		Blank Spike/LCS	
					%Rec	RPD	%Rec	RPD
Beryllium, Total recoverable	0.0500	0.100 µg/L			70-130	20	85-115	
Aluminum, Total recoverable	6.00	20.0 µg/L			70-130	20	85-115	
Chromium, Total recoverable	0.200	1.00 µg/L			70-130	20	85-115	
Manganese, Total recoverable	0.150	2.00 µg/L			70-130	20	85-115	
Iron, Total recoverable	15.0	50.0 µg/L			70-130	20	85-115	
Nickel, Total recoverable	0.200	1.00 µg/L			70-130	20	85-115	
Copper, Total recoverable	0.150	1.50 µg/L			70-130	20	85-115	
Zinc, Total recoverable	0.600	5.00 µg/L			70-130	20	85-115	
Arsenic, Total recoverable	0.0500	0.250 µg/L			70-130	20	85-115	
Selenium, Total recoverable	0.500	2.00 µg/L			70-130	20	85-115	
Silver, Total recoverable	0.0350	0.100 µg/L			70-130	20	85-115	
Cadmium, Total recoverable	0.0500	0.100 µg/L			70-130	20	85-115	
Antimony, Total recoverable	0.150	0.500 µg/L			70-130	20	85-115	
Barium, Total recoverable	0.200	2.00 µg/L			70-130	20	85-115	
Thallium, Total recoverable	0.0100	0.0400 µg/L			70-130	20	85-115	
Lead, Total recoverable	0.0200	0.200 µg/L			70-130	20	85-115	

Organic Carbon

DOC by Combustion SM 5310B in Water :: LAB (SM 5310B)

Preservation: pH<2, HNO3, Cool 4°C

Container: AG, 125 mL, H2SO4, Filtered

Amount Required: 125

Hold Time: 28 days

Analyte	MDL	Reporting Limit	Surrogate % Rec	Duplicate RPD	Matrix Spike		Blank Spike/LCS	
					%Rec	RPD	%Rec	RPD
Dissolved Organic Carbon	0.250	1.00 mg/L		20	75-125		85-115	

TOC by Combustion SM 5310B in Water :: LAB (SM 5310B)

Preservation: pH<2, HNO3, Cool 4°C

Container: AG, 125 mL, H2SO4

Amount Required: 125

Hold Time: 28 days

Analyte	MDL	Reporting Limit	Surrogate % Rec	Duplicate RPD	Matrix Spike		Blank Spike/LCS	
					%Rec	RPD	%Rec	RPD
Total Organic Carbon	0.250	1.00 mg/L		20	86-121		90-113	