AMBIENT WATER QUALITY MONITORING QUALITY ASSURANCE PROJECT PLAN

Revision 2.6.2
Effective Date: April 1, 2019

Organization: Metropolitan Water Reclamation District
of Greater Chicago
Monitoring and Research Department

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GROUP A: PROJECT MANAGEMENT

A1: Approval Sheet

Date 4/8/19

Jennifer Wasik
Project Manager
Principal Environmental Scientist
Environmental Monitoring and Research Division

P. Grunwald

Date 4/8/19

Pawel Grunwald
Quality Assurance Officer
Supervising Environmental Chemist
Analytical Laboratories Division

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A3: Distribution List

A copy of this Quality Assurance Project Plan (QAPP) will be distributed to each person signing the approval sheet and each person involved with project tasking identified in Section A4. A copy of this QAPP shall be available on request to any person participating in the project from any of the personnel listed in Section A4. Persons not employed by the Metropolitan Water Reclamation District of Greater Chicago (District) may obtain a copy of this QAPP from the Director of the Monitoring and Research (M&R) Department.

As this document will be updated periodically, the reader is advised to check with the Project Manager for the latest revision if his copy is more than one year old. Revision 2.6 has been prepared following the United States Environmental Protection Agency (USEPA) guidance document EPA QA/R-5 titled “EPA Requirements for Quality Assurance Project Plans,” March 2001.

A4: Project/Task Organization

The responsible persons for Project Management are:

Project Director:
Edward W. Podczerwinski, P.E.
Director of Monitoring and Research

Project Manager:
Thomas Minarik
Principal Environmental Scientist
Environmental Monitoring and Research Division

Quality Assurance Coordinator:
Ashley Jesernik
Supervising Environmental Chemist

Environmental Monitoring Manager:
Nicholas Kollias
Aquatic Biologist

Stickney Analytical Laboratory Manager:
Pawel Grunwald
Supervising Environmental Chemist

Calumet Analytical Laboratory Manager:
John McNamara
Supervising Environmental Chemist

Industrial Waste Analytical Laboratory Manager:
Tiffany Poole
Supervising Environmental Chemist

Egan Analytical Laboratory Manager:
Victor Olchowka
Supervising Environmental Chemist

Microbiology Laboratory Manager:
Kamlesh Patel
Principal Environmental Scientist

Organic Compounds Analytical Laboratory Manager:
Anna Liao
Supervising Instrumentation Chemist

Laboratory Information Management System (LIMS) Manager:
Spandana Pappu
Senior Environmental Chemist

SAS® Database Manager:
Zainul Abedin
Biostatistician

IEPA Project Manager:
Gregg Good
Surface Water Section Manager

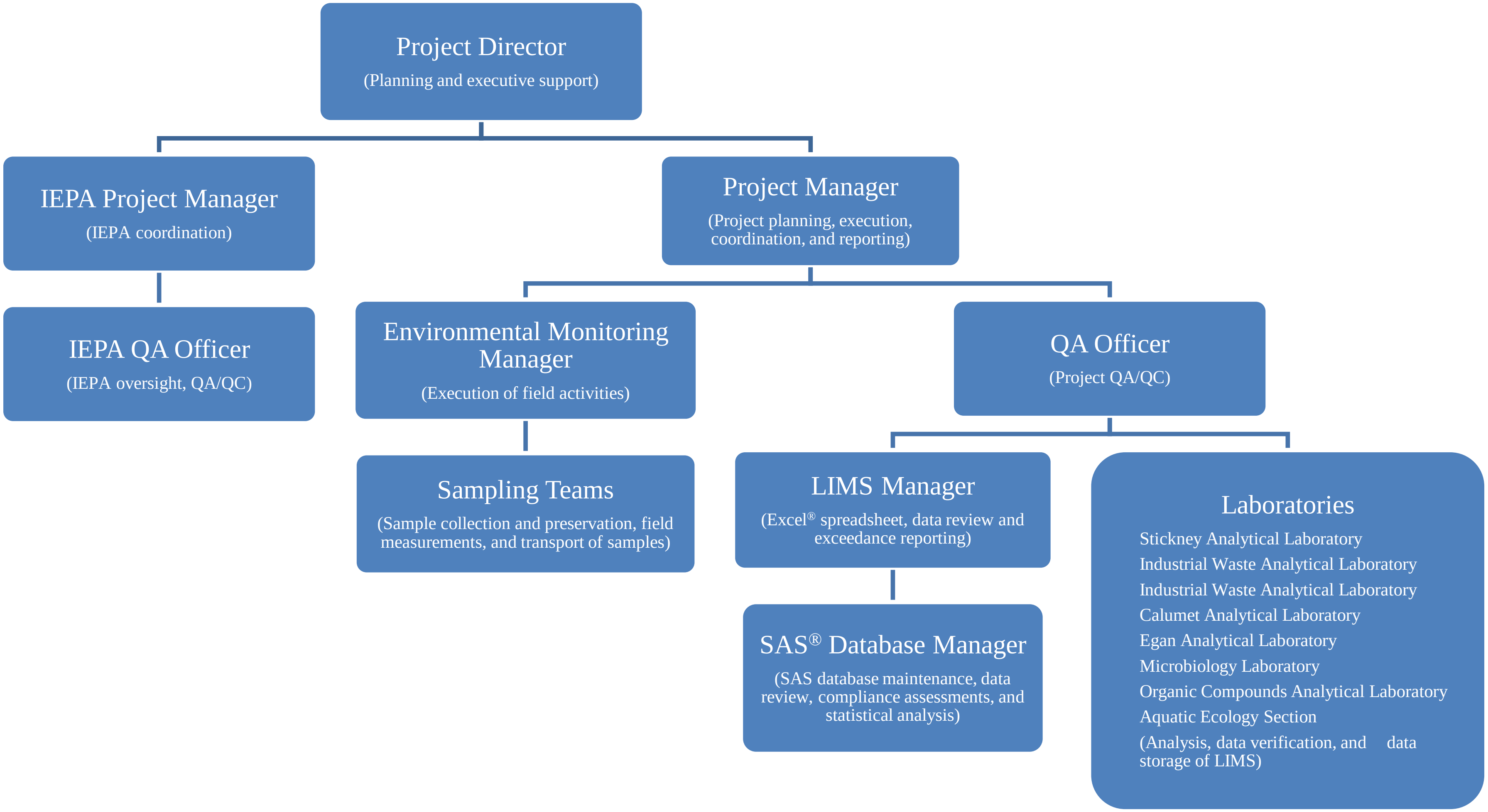
Illinois Environmental Protection Agency Quality Assurance Officer:
Michelle Rousey
Quality Assurance Officer, Bureau of Water

Figure 1 is the organization chart for the project. Primary lines of communication are shown as dashed lines. However, within the District, communication between any of the project participants may occur and is, in fact, encouraged as questions or issues arise.

The Project Director is responsible for executive oversight of the entire project and ensuring funding and resources are available to execute the project. The Project Manager plans and revises the scope of the project to ensure that it meets regulatory requirements and other objectives, evaluates and communicates the resources required to execute the project, reviews data submittals and reports, coordinates project activities, and completes QAPP revisions. The Quality Assurance (QA) Officer is responsible for oversight of quality control for the project.

The Illinois Environmental Protection Agency (IEPA) Project Manager coordinates the efforts of both agencies to ensure that project data will be usable by the IEPA for assessment of

FIGURE 1: AMBIENT WATER QUALITY MONITORING PROJECT ORGANIZATION CHART



water quality. He is assisted by the IEPA QA Officer, who oversees project activities and project quality control.

The Environmental Monitoring Manager is responsible for the execution of field activities and laboratory information management system (LIMS) set-up and maintenance for the project. He also assists with data analysis and QAPP revisions. The sampling teams collect and preserve samples, make field measurements, and transport the samples to the District laboratories. Several District laboratories analyze project samples. Participant laboratories include the Stickney Analytical Laboratory (SAL), the Egan Analytical Laboratory (EAL) the Industrial Waste Analytical Laboratory (IWAL), the Calumet Analytical Laboratory (CAL), the Microbiology Laboratory (AML), the Organic Compounds Analytical Laboratory (OCAL), and the Aquatic Ecology and Water Quality Section (AEWQ).

The LIMS Manager is responsible for collection of project test results and data verifications for SAL, IWAL, EAL, and CAL data. The Statistical Analysis Software (SAS®) Database Manager maintains the project database in SAS® and assists Project Manager with data analysis and reporting.

A5: Background

The District routinely collects and analyzes water samples from the District service area waterways. "Waterways" as used in this document will mean natural and modified rivers or streams, and man-made canals. This monitoring has been undertaken by the District to determine water quality on an ongoing basis and establish a historical record. A historical water quality database exists back to project inception in 1970.

The Illinois Pollution Control Board (IPCB) designates District service area waterways based on their recreational and aquatic life use potential. Recreational use designations in these waterways include: General Use, Primary Contact, Incidental Contact, Non-Contact, Non-Recreational, and Secondary Contact. Aquatic Life Uses are General Use, Chicago Area Waterway System (CAWS) Aquatic Life Use A, CAWS Aquatic Life Use B, and Indigenous Aquatic Life Use.

The IPCB has established separate water quality standards to support the designated uses for each waterway. Comprehensive assessments of the Ambient Water Quality Monitoring (AWQM) data from this project are made annually using all applicable water quality standards established by the IPCB.

The AWQM data collected from this project have been used, often in conjunction with data from other monitoring studies, to evaluate the impact of District operations and projects, including the water reclamation plants (WRPs), the pretreatment program, the flood and pollution control Tunnel and Reservoir Plan, the Sidestream Elevated Pool Aeration Stations, and the Instream Aeration Stations.

The AWQM data provide a broad surveillance of significant discharges to the waterways. The data also may have potential use for evaluation of other factors affecting water quality, including intermittent stormwater releases and release of pollutants from bottom sediment in the waterways.

Another goal of this project is to coordinate the waterway monitoring performed by the District with the waterway monitoring performed by the IEPA's Bureau of Water. The District will review key aspects of its program, including sampling locations, sampling frequency, sampling methods, parameters analyzed, and analytical capability, to determine how to best provide water quality data usable by both agencies.

This QAPP will address how to conduct the monitoring of the waterways in a manner that will efficiently utilize available resources and produce water quality data that will meet or exceed the measurement quality objectives for all intended uses of the data.

A6: Project/Task Description

Monitoring is conducted on 14 waterbodies at 30 sampling stations. The total number of river miles monitored is approximately 225. The following rivers, creeks, man-made channels, and a canal are monitored for water quality.

Des Plaines River System:

- Weller Creek.
- Higgins Creek.
- Salt Creek.
- Des Plaines River.
- West Branch DuPage River.

Chicago River System:

- North Branch Chicago River.
- North Shore Channel.
- Chicago River.
- South Branch Chicago River.
- South Fork South Branch Chicago River.
- Chicago Sanitary and Ship Canal.

Calumet River System:

- Grand Calumet River.
- Little Calumet River.
- Calumet-Sag Channel.

Figure 2 is a map showing the waterways in the Chicago metropolitan area and the current sampling locations.

A description of the 30 monitoring stations is provided in Tables 1, 2, and 3. Table 1 lists all current and discontinued sampling locations with their station identification number and IPCB use classifications. Table 2 shows the latitude and longitude of each sampling station. Table 3 shows the United States Geological Survey quadrant, township, range, section, and quarter section of each sampling station.

All locations are sampled monthly, except Lockport Powerhouse and Lock (92) which is sampled weekly. Grab samples taken at the surface are collected at each sample location for the analysis of most measured analytes. These water samples are analyzed for a wide range of parameters, including alkalinity, solids, ammonia, nitrate, phosphorus, total or dissolved metals, cyanide, phenol, fecal coliform, and organic priority pollutants. A special sampling device is used to collect samples at a depth of 3 feet for bacterial analysis. Water temperature, pH, and dissolved oxygen are measured onsite at each sampling location.

Following collection, the samples are transported to the Lue-Hing Research and Development (R&D) Complex at the Stickney WRP and the OCAL at the John E. Egan WRP for login. After login, fluoride, chloride, alkalinity, and sulfate samples are transported to EAL, total and low level mercury samples are transported to CAL, and the rest of the samples are analyzed at SAL. All project data are maintained in the District LIMS database.

A7: Quality Objectives and Criteria for Measurement Data

Many analytes measured for this project are present in low concentrations throughout the waterway systems. Analyte concentrations will vary as discharged effluents and stormwater runoff are introduced into the waterways. All analytes are subject to chemical, biological, and physical processes that will alter their presence in the waterway. It is the intent of this project to employ methods of measurement that will detect and quantify all analytes of interest wherever possible.

Although there are several intended and potential uses of the data, minimum measurement criteria will be established at the lowest analyte concentration required for actual uses of the measurement data. Where no minimum measurement criteria can be identified, the water samples will be analyzed to the lowest concentration readily achievable by District laboratories.

FIGURE 2: AMBIENT WATER QUALITY MONITORING PROGRAM WATERWAY SAMPLE STATIONS

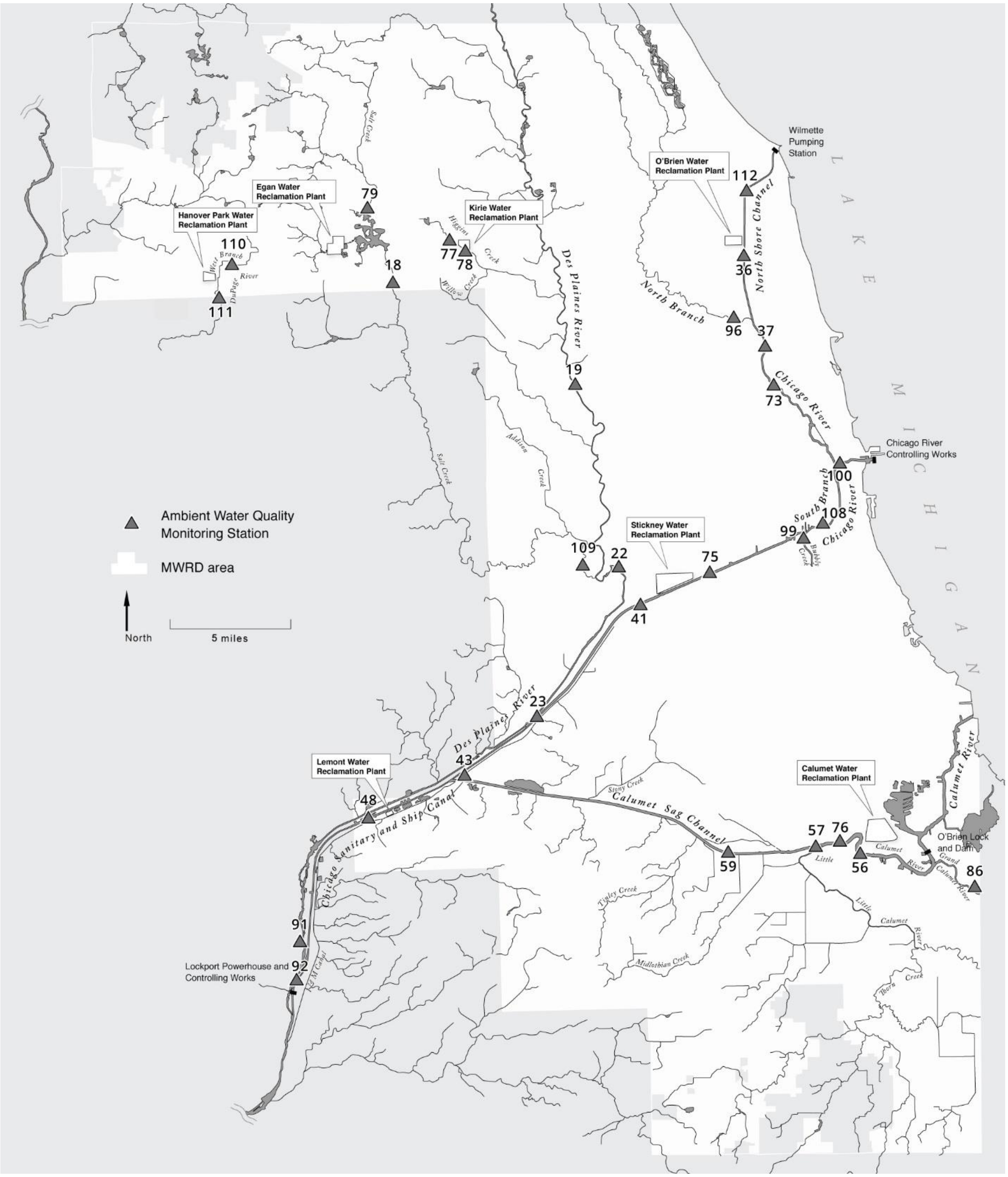


TABLE 1: SAMPLING LOCATIONS

Station	Location	IEPA Classification
	Chicago River System	
106	Dundee Road, West Fork North Branch of Chicago River	General Use
103	Golf Road, West Fork North Branch of Chicago River	General Use
31	Lake-Cook Road, Middle Fork North Branch of Chicago River	General Use
104	Glenview Road, Middle Fork North Branch of Chicago River	General Use
32	Lake-Cook Road, Skokie River	General Use
105	Frontage Road, Skokie River	General Use
34	Dempster Street, North Branch of Chicago River	General Use
96	Albany Avenue, North Branch of Chicago River*	General Use
35	Central Street, North Shore Channel	CAWS A/ICR
112	Dempster Street, North Shore Channel*	CAWS A/ICR
102	Oakton Street, North Shore Channel	CAWS A/ICR
36	Touhy Avenue, North Shore Channel*	CAWS A/PC
101	Foster Avenue, North Shore Channel	CAWS A/PC
37	Wilson Avenue, North Branch of Chicago River*	CAWS A/PC
73	Diversey Parkway, North Branch of Chicago River*	CAWS A/PC
46	Grand Avenue, North Branch of Chicago River	CAWS A/PC
74	Lake Shore Drive, Chicago River	General Use
100	Wells Street, Chicago River*	General Use
39	Madison Street, South Branch of Chicago River	CAWS A/PC
108	Loomis Street, South Branch of Chicago River*	CAWS A/PC
99	Archer Avenue, South Fork South Branch of Chicago River*	IAL/SC
40	Damen Avenue, Chicago Sanitary and Ship Canal	CAWS B/ICR
75	Cicero Avenue, Chicago Sanitary and Ship Canal*	CAWS B/ICR
41	Harlem Avenue, Chicago Sanitary and Ship Canal*	CAWS B/ICR
42	Route 83, Chicago Sanitary and Ship Canal	CAWS B/ICR
48	Stephen Street, Chicago Sanitary and Ship Canal*	CAWS B/NR
92	Lockport Powerhouse Forebay*	CAWS B/NR
	Calumet River System	
49	Ewing Avenue, Calumet River	CAWS A/NCR
50	Wolf Lake, Burnham Avenue	General Use
55	130th Street, Calumet River	CAWS A/ICR
86	Burnham Avenue, Grand Calumet River*	CAWS A/ICR

TABLE 1: SAMPLING LOCATIONS

Station	Location	IEPA Classification
	Calumet River System (Continued)	
56	Indiana Avenue, Little Calumet River*	CAWS A/PC
76	Halsted Street, Little Calumet River*	CAWS A/PC
52	Wentworth Avenue, Little Calumet River	General Use
54	Joe Orr Road, Thorn Creek	General Use
97	170th Street, Thorn Creek	General Use
57	Ashland, Little Calumet River*	General Use
58	Ashland Avenue, Calumet-Sag Channel	CAWS A/PC
59	Cicero Avenue, Calumet-Sag Channel*	CAWS A/PC
43	Route 83, Calumet-Sag Channel*	CAWS A/PC
	Des Plaines River System	
12	Lake-Cook Road, Buffalo Creek	General Use
13	Lake-Cook Road, Des Plaines River	General Use
17	Oakton Street, Des Plaines River	General Use
19	Belmont Avenue, Des Plaines River*	General Use
20	Roosevelt Road, Des Plaines River	General Use
22	Ogden Avenue, Des Plaines River*	General Use
23	Willow Springs Road, Des Plaines River*	General Use
29	Stephen Street, Des Plaines River	General Use
91	Material Service Road, Des Plaines River*	General Use
110	Springinsguth Road, West Branch of DuPage River*	General Use
89	Walnut Lane, West Branch of DuPage River	General Use
111	Arlington Drive, West Branch of DuPage River*	General Use
79	Higgins Road, Salt Creek*	General Use
80	Arlington Heights Road, Salt Creek	General Use
18	Devon Avenue, Salt Creek*	General Use
24	Wolf Road, Salt Creek	General Use
109	Brookfield Avenue, Salt Creek*	General Use
77	Elmhurst Road, Higgins Creek*	General Use
78	Wille Road, Higgins Creek*	General Use

TABLE 1: SAMPLING LOCATIONS

Station	Location	IEPA Classification
	Fox River	
90	Route 19, Poplar Creek	General Use
127	Lincoln Street, Weller Creek	General Use

*Current sampling location as of April 2019.
PC = Primary Contact.
ICR = Incidental Contact Recreation.
NCR = Non-Contact Recreation.
NR = Non-Recreational.
SC = Secondary Contact.
IAL = Indigenous Aquatic Life.

TABLE 2: LATITUDE AND LONGITUDE OF CURRENT SAMPLING LOCATIONS

Station	Description	North Latitude	West Longitude
96	North Branch Chicago River @ Albany Ave.	41° 58.475'	87° 42.375'
112	North Shore Channel @ Dempster St.	42° 02.460'	87° 42.583'
36	North Shore Channel @ Touhy Ave.	42° 00.690'	87° 42.600'
37	North Branch Chicago River @ Wilson Ave.	41° 57.891'	87° 41.834'
73	North Branch Chicago River @ Diversey Ave.	41° 55.920'	87° 40.940'
100	Chicago River Main Stem @ Wells St.	41° 53.259'	87° 38.045'
108	South Branch Chicago River @ Loomis St.	41° 50.752'	87° 39.642'
99	South Fork, South Branch Chicago River @ Archer Ave.	41° 50.331'	87° 39.849'
75	Chicago Sanitary & Ship Canal @ Cicero Ave.	41° 49.169'	87° 44.616'
41	Chicago Sanitary & Ship Canal @ Harlem Ave.	41° 48.263'	87° 48.104'
48	Chicago Sanitary & Ship Canal @ Stephen St.	41° 40.750'	88° 00.683'
92	Chicago Sanitary & Ship Canal @ Lockport Powerhouse Forebay	41° 34.256'	88° 04.704'
86	Grand Calumet River @ Burnham Ave.	41° 37.870'	87° 32.352'
56	Little Calumet River @ Indiana Ave.	41° 39.136'	87° 35.828'
76	Little Calumet River @ Halsted St.	41° 39.440'	87° 38.476'
57	Little Calumet River @ Ashland Ave.	41° 39.099'	87° 39.633'
59	Calumet-Sag Channel @ Cicero Ave.	41° 39.282'	87° 44.284'
43	Calumet-Sag Channel @ Route 83	41° 41.790'	87° 56.480'
19	Des Plaines @ Belmont Ave.	41° 56.236'	87° 50.975'
22	Des Plaines River @ Ogden Ave.	41° 49.256'	87° 48.654'
23	Des Plaines River @ Willow Springs Rd.	41° 44.135'	87° 52.901'
91	Des Plaines River @ Material Service Rd.	41° 35.794'	88° 04.112'
110	West Branch DuPage River @ Springinsguth Rd.	42° 00.495'	88° 07.142'
111	West Branch DuPage River @ Arlington Drive	41° 58.500'	88° 08.316'
79	Salt Creek @ Higgins Rd.	42° 01.880'	88° 00.679'
18	Salt Creek @ Devon Ave.	41° 59.546'	87° 59.924'
109	Salt Creek @ Brookfield Ave.	41° 49.370'	87° 50.494'
77	Higgins Creek @ Elmhurst Rd.	42° 01.287'	87° 56.436'
78	Higgins Creek @ Wille Rd.	42° 01.120'	87° 56.201'
127	Weller Creek @ Lincoln St.	42° 03.327'	87° 57.246'

TABLE 3: QUADRANT, TOWNSHIP, AND RANGE OF CURRENT SAMPLING LOCATIONS

Station	Description	Quadrant	TWP	Range	Sec.	¼ Sec.
96	North Branch Chicago River @ Albany Avenue	Chicago Loop	40N	13E	12	SW
112	North Shore Channel @ Dempster Street	Evanston	41N	13E	14	SE
36	North Shore Channel @ Touhy Avenue	Evanston	42N	13E	26	SE
37	North Branch Chicago River @ Wilson Avenue	Chicago Loop	40N	13E	13	NE
73	North Branch Chicago River @ Diversey Avenue	Chicago Loop	40N	14E	30	SW
100	Chicago River Main Stem @ Wells Street	Chicago Loop	39N	14E	9	SW
108	South Branch Chicago River @ Loomis Street	Englewood	39N	14E	28	NW
99	South Fork, South Branch Chicago River @ Archer Avenue	Englewood	39N	14E	29	SW
75	Chicago Sanitary & Ship Canal @ Cicero Avenue	Englewood	38N	13E	3	NW
41	Chicago Sanitary & Ship Canal @ Harlem Avenue	Berwyn	38N	12E	7	NW
48	Chicago Sanitary & Ship Canal @ Stephen Street	Romeoville	37N	11E	20	NW
92	Chicago Sanitary & Ship Canal @ Lockport Powerhouse	Joliet	36N	10E	27	SW
86	Grand Calumet River @ Burnham Avenue	Lake Calumet	36N	15E	5	SW
56	Little Calumet River @ Indiana Avenue	Lake Calumet	37N	14E	34	SW
76	Little Calumet River @ Halsted Street	Blue Island	37N	14E	33	NW
57	Little Calumet River @ Ashland Avenue	Blue Island	37N	14E	32	SW
59	Calumet-Sag Channel @ Cicero Avenue	Blue Island	37N	13E	34	NW
43	Calumet-Sag Channel @ Route 83	Calumet-Sag Bridge	37N	11E	14	SE
19	Des Plaines @ Belmont Avenue	River Forest	40N	12E	22	SE
22	Des Plaines River @ Ogden Avenue	Berwyn	38N	12E	1	NE
23	Des Plaines River @ Willow Springs Road	Calumet-Sag Bridge	38N	12E	33	SW
91	Des Plaines River @ Material Service Road	Joliet	36N	10E	22	SW
110	West Branch DuPage River @ Springinsguth Road	Streamwood	41N	10E	26	SW
111	West Branch DuPage River @ Arlington Drive	West Chicago	40N	10E	6	SE
79	Salt Creek @ Higgins Road	Palatine	41N	11E	20	NW
18	Salt Creek @ Devon Avenue	Elmhurst	41N	11E	33	SW
109	Salt Creek @ Brookfield Avenue	Berwyn	39N	12E	35	SW
77	Higgins Creek @ Elmhurst Road	Arlington Hts.	41N	11E	25	NW
78	Higgins Creek @ Wille Road	Arlington Hts.	41N	11E	25	NW
127	Weller Creek @ Lincoln Street	Arlington Hts.	41N	11E	11	NW

Currently, except for the IPCB water quality standards, there are no other specified minimum measurement criteria for waterways monitoring data. Therefore, this project will use the most restrictive water quality standard applicable to waterways within the District's service area to establish the minimum measurement criteria for each parameter. The minimum measurement criteria will apply for all samples irrespective of the IPCB waterway designation in order to maintain uniform measurement objectives for the project.

The monitored parameters and the established minimum measurement criteria are shown in columns 1 and 3 of Attachment A. Analytes not subject to an IPCB water quality standard will not have specified minimum measurement criteria. The minimum measurement criteria will be adjusted accordingly when IPCB water quality standards are changed or as dictated by other planned uses of the data.

Column 2 of Attachment A gives the Reporting Limits (RLs) for the project, which are established by ALD. RLs are mathematically derived from MDLs. For parameters where RLs are not applicable, such as pH, solids, temperature, and dissolved oxygen, the minimum measurement criteria shown in column 3 of Attachment A are the sensitivities, to be obtained by the measurement method. Sensitivity of a method shall be defined as the difference in concentration that can be distinguished by measurement.

A8: Special Training/Certification

1. Sample collection personnel shall be trained in proper sample collection methods by the Environmental Monitoring Manager.
2. Microbiological analyses are performed in the Illinois Department of Public Health (IDPH) certified Analytical Bacteriology Laboratory by analysts who have successfully completed the source water bacteria testing Demonstration of Capability.
3. Each section of ALD has successfully maintained accredited status as certified by the IEPA following The NELAC Institute (TNI) standard.

A9: Documents and Records

1. The District Project Manager and IEPA QA Officer shall retain copies of all updates and revisions of this QAPP.
2. The Analytical Laboratory Managers and QA Officer for the District shall retain copies of all analytical procedures used for analysis of project samples.
3. The Project Manager shall retain copies of all laboratory analytical reports and correspondence with the laboratories.

4. The Project Manager shall retain copies of all communications to and from outside agencies and other interested parties.

5. All the records and reports listed above will be retained for 10 years at the Lue-Hing R&D Complex located at the Stickney WRP.

GROUP B: DATA GENERATION AND ACQUISITION

B1: Sampling Process Design (Experimental Design)

Selection of Sampling Locations. The 30 sampling locations have been previously identified in Tables 1, 2, and 3. Criteria for selecting sampling locations include:

1. Downstream of the point at which major tributaries enter the District's service area.
2. Near the intake control structures where water is diverted into the waterways from Lake Michigan.
3. Upstream and downstream of District facilities, including WRPs, aeration stations, and pumping stations.
4. At the confluence of significant waterway branches.
5. At the Lockport control facility where most flow from the District service area leaves the waterways system.
6. Near the downstream end of a reach designated by the IEPA as a waterbody segment or assessment unit.

Sampling locations must be readily accessible and judged safe for all sampling activities. Bridges over the waterways have provided ideal sampling locations. For locations where bridge access or height will not allow for safe sampling, samples may be collected by boat. Occasionally, if a bridge is under construction or if the sampling schedule required it, water samples that are normally collected by bridge may also be sampled by boat, in accordance with the procedures described in Appendix 1.

The IEPA utilizes water quality data to prepare its biannual water quality report as required by Section 305(b) of the Clean Water Act. For this purpose, the IEPA assesses conditions for waterbody segments and has defined these segments for all waters in the state.

Sampling locations may be added or removed from the monitoring network based upon periodic assessments of monitoring needs and resources available.

Sampling Frequency. All 30 sampling locations are monitored monthly, except Lockport Powerhouse and Lock (92), which is sampled weekly. The sampling frequency for each parameter is shown in Attachment B. This schedule provides sampling through seasonal changes and a sufficient number of samples to adequately characterize water quality annually and to identify long-term trends over many years. Monthly sampling may also detect an abrupt degradation of water quality, allowing the opportunity for the District to respond appropriately.

Water quality samples are collected weekly at the Lockport Powerhouse and Lock because this facility controls the release of water from the Chicago Sanitary and Ship Canal, which contains, at that location, the combined flow from the Chicago and Calumet River Systems. The treated wastewater from four District WRPs covering most of the District's service area flows through the Lockport Powerhouse and Lock.

Sampling frequency may be modified temporarily if there is a specific need to acquire additional data.

Selection of Parameters for Monitoring. Parameters selected for analysis are those that have IPCB water quality standards, and other parameters that have been used to characterize instream water quality. Certain parameters may only be analyzed in waterways with a particular designated use category. These are identified in Attachment A. Periodically, the parameters monitored are reviewed. A parameter may be removed from monitoring if the parameter is found to be non-essential for the goals of the project. If parameters are needed for a monitoring purpose, they will be added to the project.

B2: Sampling Methods

Manual sampling from a bridge or boat is conducted on each Monday of the month. When a Monday is a District paid holiday the sampling will be performed on the following Tuesday. Two person teams, each comprised of Pollution Control Technicians or available trained AEWQ Section personnel, perform the sampling under the direction of the Environmental Monitoring Manager.

The twelve locations on the Des Plaines River System are sampled on the first Monday of each month. The five most northern sampling locations on the Chicago River System are sampled on the second Monday of each month. The remaining six locations on the Chicago River System are sampled on the third Monday of each month. The six sampling locations on the Calumet River System are sampled on the fourth Monday of each month. The Lockport sampling location on the powerhouse forebay catwalk is sampled weekly.

The surface water grab samples are collected using a stainless steel bucket. Before the samples are collected using the stainless steel bucket, a calibrated dissolved oxygen probe is lowered into the waterway to a depth of three feet on the upstream side of the bridge at the most central location of the waterway and a field measurement is taken and recorded on the sample collection sheet. The bucket is then lowered into the waterway at the same location as the dissolved oxygen probe. The sampling time is recorded on the sample collection sheet (Appendix II). The bucket is submerged, filled, and then raised to the top of the bridge. The water temperature and pH are measured immediately from the stainless steel bucket using a calibrated pH/temperature probe and recorded on the sample collection sheet. The contents of the bucket are then discarded and the bucket is lowered and refilled as necessary to acclimate the bucket and provide sample for the individual sample aliquots. The sterile sample container for bacterial analysis is filled separately using a special sampling device in the waterway to prevent contact of the sample with non-sterile surfaces.

There are exceptions to sampling from bridges. Stephen Street (48) is sampled from the District's Pollution Control Boat in the center of the waterway, since the bridge no longer exists. Water samples are also routinely collected from the boat for safety reasons at Cicero Avenue (75) and Harlem Avenue (41) on the Chicago Sanitary and Ship Canal, Route 83 on the Cal-Sag Channel (43), and Ashland Avenue on the Little Calumet River (57). Occasionally, other stations may also be sampled by boat for logistical reasons, including bridge construction or coordination with other special sampling activities.

The individual sample containers are filled in accordance with the sampling procedures described in Appendix I. The individual containers for sample collection are prepared by the laboratory performing the sample analysis. Chemical preservatives as necessary are placed in the containers by the laboratory of origin before sample collection. Specific information regarding sample containers and chemical preservatives is found in Table 4.

Preprinted adhesive sample labels with unique LIMS identification numbers are placed on each container prior to filling. The sampling team completes the sample collection sheet (Appendix II) in the field as each sample is collected.

B3: Sample Handling and Custody

All sample containers are chilled in an ice-filled cooler immediately after collection and kept in ice during transport to the laboratories except for low level mercury samples.

All water samples are transported to the SAL after collection accompanied by sample collection sheets. The laboratory physically receives the samples from the Industrial Waste Division transporter. An Environmental Chemist, or a Laboratory Technician under the direct supervision of an Environmental Chemist, "receives" the samples into the District's LIMS using a barcode scanner. Each sample is inspected against the laboratory's sample receiving checklist for proper container, proper labeling, sufficient volume, and general appearance. Any missing samples or aliquots are noted on the sample receiving checklist. Sample arrival temperatures are measured using an infrared thermometer calibrated against a NIST traceable certified thermometer ("NIST" is the National Institute of Standards and Technology, United States Department of Commerce), and recorded. Since the time between sampling and arrival at the laboratory is only a few hours, samples may not always reach the 0.1 to 6 degrees Celsius (°C) required for thermal preservation. Samples are acceptable if "evidence of chilling" has begun. Samples that require thermal preservation are refrigerated after sample acceptance in the laboratory. Samples for biological and metals analyses are then routed to the appropriate laboratories at the Lue-Hing R&D Complex. Samples for organics analysis are transported to the OCAL at the John E. Egan WRP. The remaining samples for inorganic analysis are received by the SAL. Following sample transfer in LIMS at the SAL, the samples for fluoride, chloride, alkalinity, and sulfate analyses are transported to the Egan Laboratory, and the aliquot for low level mercury analysis is transported to the CAL within 24 hours.

TABLE 4: SAMPLE CONTAINERS AND FIELD PRESERVATION

Parameter	Container and Field Preservation
1. Fecal coliform	125-mL square polypropylene bottle, sterilized and sealed with 0.45 mL of 15% disodium salt of EDTA adjusted to pH of 6.5, and 0.15 mL of 10% sodium thiosulfate. Chill sample with ice. See Appendix I page AI-4 and AI-5 for the correct procedure.
2. General chemistry[1] (see footnote for parameters)	1-gallon polyethylene bottle. Chill sample with ice.
3. Metals, total	250-mL polyethylene bottle with 2.5 mL conc. HNO_3 to adjust pH < 2.
4. Metals, dissolved	900-mL certified clean polyethylene bottle. Chill sample with ice. (Sample filtered in laboratory with 0.45 μm membrane filter into a 250-mL certified clean polyethylene bottle and acidified with 2.5 mL of conc. HNO_3.)
5. Chromium, hexavalent	900-mL certified clean polyethylene bottle. Chill sample with ice.
6. Mercury (low level)	Four 40-mL vials, each with 200 μL BrCl. Do not put sample on ice.
7. Cyanide, total and chlorine amenable	½-gallon plastic bottle with 5 mL 50% NaOH to adjust pH > 12. Chill sample with ice.
8. Phenol	1-quart glass bottle with 2 mL of conc. H_2SO_4 to adjust pH < 2. Chill sample with ice.
9. n-Hexane extractable materials	Two 1-quart glass bottles. Chill sample with ice.
10. Alkalinity	250-mL polyethylene bottle. Chill sample with ice.
11. Sulfate, chloride, and fluoride	250-mL polyethylene bottle. Chill sample with ice.
12. Total phosphorus, total Kjeldahl nitrogen	250-mL polyethylene bottle with 0.5 mL of concentrated 50% sulfuric acid to acidify sample. Chill sample with ice.

TABLE 4 (Continued): SAMPLE CONTAINERS AND FIELD PRESERVATION

Parameter	Container and Field Preservation
13. Ammonia, NO_2+NO_3	250-mL polyethylene bottle, preserved with 0.5 mL of concentrated 50% sulfuric acid upon collection.
14. Carbon, total organic	250-mL polyethylene bottle with 1 mL HCl to adjust pH < 2. Chill sample with ice.
15. Chlorophyll *a*	1-liter HDPE Nalgene amber, wide-mouth bottle with 1 mg powdered $MgCO_3$. Chill sample with ice.
16. Volatile organics, BETX (benzene, ethyl benzene, toluene, and xylenes)	Three 40-mL vials with Teflon-lined septum screw caps, each with 25 mg ascorbic acid, filled to top with minimal overflow and no air bubbles. Chill sample with ice.
17. Base/neutral and acid extractable compounds, pesticides, PCBs, OPPs	1-gallon glass with 0.7 mL of 50% sodium thiosulfate solution. Chill sample with ice.

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[1] General chemistry parameters include total dissolved solids, total suspended solids.

Each laboratory receives the samples by logging them into the laboratory logbook and/or laboratory LIMS. Maximum holding times before analysis, as stated in applicable laboratory method standard operating procedures (SOPs), are adhered to. Parameters of particular concern, because of short maximum holding times, include: bacterial analysis (six hours) and hexavalent chromium (must be preserved within 24 hours).

Copies of the sample collection sheets, along with the sample receiving checklist, are retained by the SAL. The pH, temperature, and dissolved oxygen for each field sample are entered into the LIMS by AEWQ Section personnel.

The original sample collection sheets are returned to Environmental Monitoring Manager for review. The Environmental Monitoring Manager is responsible for the execution of field operations and corrective actions for field related quality control problems or other nonconformance issues.

B4: Analytical Methods

The analytical methods shown in Table 5 have been selected to meet the minimum measurement criteria presented in Attachment A. Column 1 of Table 5 gives the analytes to be measured, column 2 shows the method to be used by the laboratory, and column 3 the method reference. Except for chlorophyll *a*, all methods used by the District are USEPA approved methods listed in 40 CFR Parts 136, 141, and 145. Approved USEPA methods are not available for the determination of chlorophyll *a*.

Table 6 shows laboratory preservation and maximum holding time from the time of sampling for each analyzed parameter. Column 2 of Table 6 gives the laboratory preservation requirements. The maximum holding time for each parameter is given in column 3 of Table 6. Refrigeration of samples that require thermal preservation is maintained at 4°C, but temperatures in the range of 0.1 to 6°C are considered acceptable. Preservation and maximum holding times are in accord with those given in 40 CFR Part 136.

The laboratory where each analysis will be performed is identified in column 2 of Table 7. Column 3 of Table 7 identifies the laboratory method SOP. The analytical method SOPs are incorporated into this QAPP by reference in column 3 of Table 7. SOPs for analytical methods are available from the responsible Laboratory Manager identified in Section A4.

Attachment A compares the minimum measurement criteria against the RL achieved by the designated District laboratory. All analytes meet the minimum measurement criteria.

All data collected for this project will be reported to the analyte RL. Test results less than the RL will be reported as either zero or as less than the numerical value of the RL.

TABLE 5: ANALYTICAL METHODS

Parameter	Method	Method Reference
Dissolved oxygen	Electrode	SM 4500-O H
Temperature	Electrode	SM 2550 B
pH	Electrode	SM 4500-H^+ B
Ammonia nitrogen	Colorimetric	EPA 350.1R.2.0
Ammonia nitrogen, un-ionized[1]	Calculation	
Nitrate and nitrite nitrogen	Colorimetric	EPA 353.2 R.2.0
Kjeldahl nitrogen	Colorimetric	EPA 351.2 R.2.0
Phosphorus, total	Colorimetric	EPA 365.4
Sulfate	Ion Chromatography	EPA 300.0
Total dissolved solids	Gravimetric	SM 2540 C
Suspended solids	Gravimetric	SM 2540 D
Volatile suspended solids	Gravimetric	SM 2540 E
Alkalinity	Titration	SM 2320 B
Chloride	Ion Chromatography	EPA 300.0
Fluoride	Ion Chromatography	EPA 300.0
Organic carbon, total	UV-Oxidation	SM 5310 C
Phenol	Colorimetric	EPA 420.2
Cyanide, total	Colorimetric	EPA Kelada-01
Cyanide, chlorine amenable	Colorimetric	SM 4500-CN G
Barium, total	ICP-MS	EPA 200.8
Boron, total	ICP-MS	EPA 200.8
Calcium, total	ICP-OES	EPA 200.7
Chromium, trivalent[2]	ICP-MS	EPA 200.8
Chromium, hexavalent	Colorimetric	EPA 218.6
Magnesium, total	ICP-OES	EPA 200.7
Manganese, total	ICP-MS	EPA 200.8
Mercury, low-level, total; General Use	Cold vapor AFS	EPA 1631 E
Selenium, total	ICP-MS	EPA 200.8
Silver, total	ICP-MS	EPA 200.8
Arsenic, dissolved	ICP-MS	EPA 200.8
Cadmium, dissolved	ICP-MS	EPA 200.8
Chromium, dissolved	ICP-MS	EPA 200.8
Copper, dissolved	ICP-MS	EPA 200.8
Iron, dissolved	ICP-MS	EPA 200.8
Lead, dissolved	ICP-MS	EPA 200.8
Nickel, dissolved	ICP-MS	EPA 200.8
Silver, dissolved	ICP-MS	EPA 200.8
Zinc, dissolved	ICP-MS	EPA 200.8
Fecal coliform	Membrane	SM 9222 D

TABLE 5 (Continued): ANALYTICAL METHODS

Parameter	Method	Method Reference
n-Hexane extractable materials	Gravimetric	EPA 1664, Rev. A
Chlorophyll *a*	Colorimetric	SM 10200 H
BETX (benzene, ethyl benzene, toluene, xylenes)	Purge and trap GC/MS	EPA 624
Organic Priority Pollutants		
Volatile organic compounds	Purge and trap GC/MS	EPA 624
Base/neutral and acid-extractable compounds	GC/MS	EPA 625
Pesticides	GC/ECD	EPA 608
PCBs	GC/ECD	EPA 608

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[1] Calculated from pH, temperature, and ammonia nitrogen.
[2] Trivalent chromium measured as total chromium.

TABLE 6: LABORATORY PRESERVATION AND MAXIMUM HOLDING TIME

Parameter	Laboratory Preservation[1,2]	Maximum Holding Time
Dissolved oxygen	NA	NA[3]
Temperature	NA	0.25 hours
pH	NA	0.25 hours
Ammonia nitrogen	(a) Refrigerate, (b) with H_2SO_4 to pH < 2	24 hours, 28 days
Ammonia nitrogen, un-ionized[4]	NA	NA
Nitrate and nitrite nitrogen	(a) Refrigerate, (b) with H_2SO_4 to pH < 2	24 hours, 28 days
Kjeldahl nitrogen	(a) Refrigerate, (b) with H_2SO_4 to pH < 2	24 hours, 28 days
Phosphorus, total	(a) Refrigerate, (b) with H_2SO_4 to pH < 2	24 hours, 28 days
Sulfate	Refrigerate	28 days
Total dissolved solids	Refrigerate	7 days
Suspended solids	Refrigerate	7 days
Volatile suspended solids	Refrigerate	7 days
Alkalinity	Refrigerate	14 days
Chloride	None required	28 days
Fluoride	None required	28 days
Organic carbon, total	Refrigerate, HCl to pH < 2	28 days
Phenol	Refrigerate, H_2SO_4 to pH < 2	28 days
Cyanide, total	Refrigerate, NaOH to pH > 12	14 days
Cyanide, chlorine amenable	Refrigerate, NaOH to pH > 12	14 days
Chromium, hexavalent	(a) Refrigerate, (b) with $(NH_4)_2SO_4 + NH_4OH$ solution and NaOH to pH 9.3–9.7	24 hours, 28 days
Metals, total (excluding mercury)	HNO_3 to pH < 2	6 months
Mercury, low-level, total	BrCl	90 days
Metals, dissolved (excluding mercury)	Filter, HNO_3 to pH < 2	6 months
Fecal coliform	Refrigerate	6 hours
n-Hexane extractable materials	Refrigerate, H_2SO_4 to pH < 2	28 days
Chlorophyll *a*	Refrigerate	30 days

TABLE 6 (Continued): LABORATORY PRESERVATION AND MAXIMUM HOLDING TIME

Parameter	Laboratory Preservation[1,2]	Maximum Holding Time
BETX (Benzene, ethyl benzene, toluene, xylenes)	Refrigerate	7 days
Organic priority pollutants	Refrigerate	7 days

NA = Not applicable.

[1] All samples stored in ice after collection and in transport to laboratory except for low-level mercury.

[2] Refrigeration at 4°C.

[3] Dissolved oxygen measured in situ.

[4] Calculated from pH, temperature, and ammonia nitrogen.

TABLE 7: RESPONSIBLE LABORATORIES AND METHOD STANDARD OPERATING PROCEDURE IDENTIFICATION

Parameter	Laboratory	Method SOP ID
Dissolved oxygen	Field measurement	HQd Oper. Instr.
Temperature	Field measurement	YSI Pro10 Oper. Instr.
pH	Field measurement	YSI Pro10 Oper. Instr.
Ammonia nitrogen	SAL	ST-NH3
Ammonia nitrogen, un-ionized[1]	Calculation	NA
Nitrate and nitrite nitrogen	SAL	ST-NO3/NO2
Kjeldahl nitrogen	SAL	ST-TKN
Phosphorus, total	SAL	ST-TP
Sulfate	EAL	JE-ANIONS
Total dissolved solids	SAL	ST-TDS
Suspended solids	SAL	ST-TSS/VSS
Volatile suspended solids	SAL	ST-TSS/VSS
Alkalinity	SAL	ST-Alk-Visco
Chloride	EAL	JE-ANIONS
Fluoride	EAL	JE-ANIONS
Organic carbon, total	IWAL	IW-TOC
Phenol	IWAL	IW-PHENOL-A
Cyanide, total	IWAL	IW-CN-AUTO
Cyanide, chlorine amenable	IWAL	IW-CN-AMEN
Chromium, hexavalent	IWAL	IW-CR6
Metals, total and dissolved (except mercury)	SAL	ST-ICPMS
Mercury, Low-Level	CAL	CaLLHg
Fecal coliform	AML	
n-Hexane extractable materials	IWAL	IW-FOG-SPE
Chlorophyll *a*	AEWQ	
Benzene, ethyl benzene, toluene, xylenes	OCAL	SOPEPA624
Organic priority pollutants	OCAL	SOPEPA624[2] SOPEPA625[3] SOPEPA608[4]

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[1] Calculated from pH, temperature and ammonia nitrogen.
[2] Volatile organic compounds.
[3] Base/neutral and acid extractable compounds.
[4] Pesticides and PCBs.

B5: Quality Control

Field blanks will be used to evaluate the potential for contamination from a source not associated with the sample collected. Each sampling team will prepare field blanks for the appropriate parameters at a sampling location on the day of sampling. AEWQ will review the field blank test results. Whenever significant contamination (greater than twice the reporting limit of any constituent) is found, AEWQ will initiate an investigation and implement the necessary corrective actions.

The individuals responsible for verification that proper procedures are followed in matters concerning sampling methods, sample preservation, and sample custody to the delivery of samples to the SAL will be the Environmental Monitoring Manager and his/her supervisor. For more information please see sections B2: Sampling Methods, B3: Sample Handling and Custody, and C1: Assessment and Response Actions. For any quality control or other nonconformance issue, the Environmental Monitoring Manager will submit an investigation and corrective action report to the Project Manager, who will send copies to the persons listed on the approval page.

It shall be understood that all measurements, regardless of the sample concentration, must have known and satisfactory accuracy and precision. Because various analytical procedures will be employed for sample analysis, specific criteria for accuracy and precision will not be provided in this document. Rather, satisfactory accuracy and precision shall be considered to be that which is consistent with the USEPA approved methods used to analyze the samples. All measurements must be derived in an environment of an adequate quality control program including statistical process control wherever applicable. The laboratory Quality Assurance Manuals (QAMs) and laboratory SOPs should be referred to for specific information relating to quality control. The AML and each section of ALD have successfully maintained accredited status as certified by the IDPH and/or the IEPA following TNI standards.

The individuals responsible for verification that analytical methods and other laboratory procedures are being properly executed are the Laboratory Managers. The Laboratory Managers are also responsible for the reliability of project analytical data. For any quality control or other nonconformance issue that may have affected the reliability of project data, the responsible Laboratory Manager will submit an investigation and corrective action report to the Project Manager, who will send copies to the persons listed on the approval page.

B6: Instrument/Equipment Testing, Inspection, and Maintenance

All instrumentation and equipment used in the laboratory are maintained as required by the manufacturer’s manuals and the laboratory SOPs.

Each laboratory is responsible for maintaining an adequate supply of spare parts to perform normal maintenance procedures. The three regional WRPs, at which the participating laboratories are located, maintain storerooms where frequently used supplies and consumables are inventoried. Major laboratory instrumentation is covered by maintenance/service contracts with qualified service representatives. Each laboratory also has an account to purchase any needed parts or consumables not inventoried in the WRP storeroom or in an emergency or other unforeseen situation.

The YSI Model Pro10 handheld pH/temperature meters and HACH Model HQ30d handheld dissolved oxygen meters (or similar model) used for field measurements are maintained by the AEWQ Section and routine maintenance is performed as needed. These instruments are calibrated for pH and dissolved oxygen in the laboratory before use. Calibration records are kept by the AEWQ laboratory. Sample collection personnel sign out a calibrated instrument on the day of sampling and return it on the same day after sampling. The meter operation and calibration are checked when each instrument is returned to the laboratory. The temperature calibration is verified at least annually against a NIST traceable thermometer. The SAL is responsible for securing service from qualified service representatives as needed.

B7: Instrument Calibration and Frequency

All instrumentation used for testing shall be calibrated each day of use as directed by manufacturer's manuals and laboratory SOPs. General guidelines and requirements regarding calibration of laboratory equipment are contained in the laboratory SOPs. Laboratories that participate in an accreditation program also will comply with the requirements for calibration maintained by the accreditation program.

All instrumentation is uniquely identified by serial number or other means. Wherever possible, NIST traceable standards are used for calibration of instruments. Calibration records are kept each time laboratory instrumentation and equipment are calibrated, and the calibration records and quality control samples are unmistakably identified for each batch of test results.

B8: Inspection/Acceptance of Supplies and Consumables

Supplies and consumables shall be inspected by the laboratories and accepted in accordance with all laboratory procedures and specifications contained in laboratory QAMs or SOPs. The laboratory section supervisors are responsible for verifying that supplies and consumables meet the specifications contained in the method SOPs.

B9: Non-direct Measurements

Non-direct measurements are not required for this project.

B10: Data Management

The District maintains several networked servers. The network may be accessed by personal computers and workstations from any District facility. Computer software used for this project includes a fully networked LIMS and Excel® software and SAS® software on selected workstations. The Thermo LabSystems SMW (SampleManager for Windows) version 10.2.0.0 is customized to incorporate procedures employed at District laboratories. The District LIMS supports numerous features including: barcode usage, prelogging of samples by either the sample submitter or laboratory personnel, label generation, sample login, sample receiving of prelogged samples, sample batching, instrument interfacing, manual data entry, automated calculations, control limit checking for each laboratory control sample, control chart maintenance, National Pollutant Discharge Elimination System (NPDES) limit checking, industrial waste limit checking, facilitated data handling, and data reporting. The LIMS is utilized by all laboratories participating in this project.

Most Ambient Water Quality Monitoring (AWQM) analytical data have resided in the District LIMS since 1996. Historical data back to 1970 are stored in Excel® spreadsheet files and SAS® files.

As the waterways are sampled routinely, the samples are prelogged into the District's LIMS. The Environmental Monitoring Manager generates sample labels for sample containers before sample collection. The labels contain information including sample location, sample type, and unique sample ID with barcode. Each sample container has a unique sample ID comprised of the sample number and aliquot designation.

The AML, AEWQ, and the OCAL follow documented procedures for sample login, sample acceptance, analysis, and data verification. Test data from the AML and AEWQ are manually entered into LIMS, while OCAL data is automatically uploaded from instrument to LIMS.

While the SAL employs the most computerized system for sample tracking and data handling, all participating laboratories follow similar procedures. The analyst assigned to receive the samples in the SAL uses a barcode scanner to log as received the "general chemistry" samples. All samples are checked and any missing sample containers are noted in the sample log. The analyst checks to make certain that sample acceptance criteria, including appropriate sample containers and thermal preservation, are satisfactory.

After the laboratory receives the samples, sub-samples are poured as required. The samples are then distributed to the appropriate analytical sections for analysis. As analyses are completed, the test results are entered into the LIMS generally by data file upload from the laboratory instrument. Test results are reviewed and verified by each analytical section supervisor.

Retesting for analytes is only done for a confirmed Quality Assurance/Quality Control (QA/QC) problem in the execution of analysis. No retesting will be performed on the basis of exceeding regulatory limits without consulting first with the sample submitter for information about any unusual conditions that would corroborate the test results. When such information is not available and a retest is requested, the sample submitter's authorization to conduct the retest should be in writing for documentation purposes. In those instances where retesting is performed for reasons other than a QC failure, then the highest confirmed value is reported unless otherwise specified above.

As sample analyses in the AML and ALD Laboratories are completed, the approved test data are collected from the LIMS database and transferred into an Excel® spreadsheet on a monthly basis. The Excel® spreadsheet includes all parameters, except for organics data, which are compiled in separate spreadsheets. Generally, analytical data from any month is expected to be completed and available to data users within 30 days after the end of that month.

The quarterly spreadsheet from the AML and ALD laboratories is checked by the LIMS Manager for completeness and atypical test data. When atypical test data are found, they are reported to the Project Manager for further investigation.

Annually, following final approval of all project data from the previous year, an Excel® spreadsheet file is sent to the SAS® Database Manager who creates a SAS® file from the Excel® spreadsheet. SAS® is the statistical analysis software used to analyze the data.

The Project Manager will ensure that an Excel® spreadsheet containing all approved project data from the previous year will be posted on the District's website by April 1 of the following year. The IEPA Division of Water Pollution Control Permit Section Manager will be notified by letter when this data is available online.

Project data will also be submitted on a biannual basis to the IEPA Quality Assurance Officer for their 305b Integrated Water Quality Report analysis. The Project Manager will consult the IEPA's website in order to comply with the data submittal due date and format requirements.

GROUP C: ASSESSMENT AND OVERSIGHT

C1: Assessment and Response Actions

Random surveillance of a sampling team is conducted by the Environmental Monitoring Manager to verify that water samples are being collected properly and sampling procedures are followed. The results of each surveillance are documented by the Environmental Monitoring Manager. As stated in Section B5, the Environmental Monitoring Manager and his/her supervisor will submit investigation and corrective action reports for all quality control and other nonconformance problems dealing with field procedures to the Project Manager with copies to the persons listed on the approval page of this QAPP.

All laboratories maintain internal quality control programs that are described in their QAMs. The ALD Laboratories maintain statistical process control for most analytical procedures. Laboratory assessment activities require investigation and corrective actions for all quality control problems and other nonconformance issues. As stated in Section B5, when the reliability of project data may have been affected by a quality control problem or other nonconformance issue, the responsible Laboratory Manager will submit a copy of the investigation and corrective action report to the Project Manager with copies to the persons listed on the approval page of this QAPP.

Also, the responsible Laboratory Manager shall make certain that the project data associated with any quality control or other nonconformance issue is made available to data users with the appropriate data qualification. When data previously released to data users may have been affected by a quality control problem or other nonconformance issue, the Manager shall notify data users of the problem and put in the appropriate data qualifiers in databases used by the District for storage of project data.

The SAL, CAL, EAL, and IWAL participate in two proficiency-testing studies each year. These proficiency studies are the semi-annual Water Pollution Study where data from the first study is combined with the National Pollutant Discharge Elimination System (NPDES) Discharge Monitoring Report Quality Assurance (DMR-QA) Study. The AML participates in Water Supply (WS) performance test samples that are analyzed every 12 months for fecal coliform bacteria to maintain IDPH certification and as part of the NPDES permit required DMR-QA microbiology study. Systematic investigations are conducted for all unacceptable results. The investigation and corrective action reports prepared by the Laboratory Manager and his/her staff are reviewed by the Assistant Director of M&R, by the QA Coordinator, and often by the Director of M&R.

The Organic Compounds Analytical Laboratory participates in two proficiency-testing studies each year and conducts investigations for unacceptable results in a manner similar to that followed by the other ALD Laboratories.

The AML is certified by the IDPH and must successfully pass a biannual on-site audit conducted by the IDPH.

All ALD laboratories as a requirement of their accreditation are audited annually by their Quality Assurance Coordinator and biannually by the IEPA.

C2: Reports to Management

The Project Manager will receive all investigation and corrective action reports concerning quality control problems and other nonconformance issues from field personnel and participating laboratories.

Project-related systems audits or special data quality assessments are undertaken on a random basis.

GROUP D: DATA VALIDATION AND USABILITY

D1: Data Review, Verification, and Validation

The laboratory data are reviewed and verified as described in Section B10, Data Management. The SAS® Database Manager also reviews the data after it is transferred into the SAS® software. If errors are discovered, he reports them to the Project Manager for investigation and resolution.

D2: Verification and Validation Methods

Sample collection records can be verified by the Environmental Monitoring Manager identified in Section A4. Laboratory data shall be verified as necessary by the LIMS Manager identified in Section A4 and the Laboratory Manager of the laboratory that produced the data. All field and laboratory records will be kept for a minimum of five years. Laboratory records that are stored include calibration data, raw data, bench records, and data for quality control samples.

When verification of data results in a change to the project-related data, the Project Manager shall inform data users of the problem and make certain that all databases known to contain the affected data are corrected as necessary.

The person designated as the Project Manager (Section A4) has all calculations used for checking applicable IPCB water quality standards. She should be consulted regarding any questions pertaining to compliance with water quality standards and the reporting of data.

The Project Manager and the QA Officer shall be informed of all situations where data integrity has been found compromised by errors including storage of incorrect data or the corruption of stored data. All responsible persons identified in Section A4 and all known data users shall be informed of data problems when they are discovered and the corrective action taken. The QA Officer shall prepare the disclosure report for distribution.

D3: Reconciliation with User Requirements

The QAPP shall govern the operation of the project at all times. Each responsible person shall adhere to the procedural requirements of the QAPP and ensure that subordinate personnel do likewise.

This QAPP shall be reviewed annually by the Project Manager to ensure that the project will achieve all intended purposes. The annual review shall address every aspect of the program including:

1. The adequacy and location of sampling stations.
2. The adequacy of sampling frequency at each location.

3. Sampling procedures.
4. The appropriateness of parameters monitored.
5. Changes in data quality objectives and minimum measurement criteria.
6. Whether the data obtained met minimum measurement criteria.
7. Analytical procedures.
8. Annual data submittal to IEPA and posting on-line.
9. Corrective actions taken during the previous year for field and laboratory operations.
10. Coordination of the project with the IEPA.
11. Review of other user requirements and recommendations.

It is expected that from time to time, ongoing and perhaps unexpected changes will need to be made to the project. Significant changes or deviations in project operation shall not be made without authorization by the Project Director. The Project Manager should be consulted if an operational change is necessary. Data users and other interested persons may also suggest changes to the project to the Project Manager.

The Project Manager shall evaluate the need for the change, consult with other responsible persons as appropriate, and make a recommendation to the Project Director for approval of significant changes (such as changes in sampling locations or frequency). The Project Manager shall, in a timely manner, inform the appropriate project personnel of approved changes in project operation. The Project Manager shall be responsible for the implementation of changes to the project and shall document the effective date of all changes made.

Following Project Director approval, a memorandum documenting each authorized significant change shall be prepared by the Project Manager and distributed to those on the approval list, as well as the Assistant Directors of the M&R Department. Approved changes shall be considered an amendment to the QAPP and shall be incorporated into the QAPP when it is updated.

The Project Manager will prepare a QAPP update if major changes have taken place.

REFERENCES

Standard Methods for the Examination of Water and Wastewater. Prepared jointly by the American Public Health Association, the American Water Works Association, and the Water Environment Federation. Published online at https://smww.aphapublications.org/. Accessed October 26, 2018.

State of Illinois Rules and Regulations, Title 35: Environmental Protection, Subtitle C: Water Pollution, Chapter I: Pollution Control Board. Published online at https://pcb.illinois.gov /SLR/IPCBandIEPAEnvironmentalRegulationsTitle35. Accessed November 1, 2018.

AMBIENT WATER QUALITY MONITORING PROJECT QUALITY ASSURANCE PROJECT PLAN

APPENDIX I

SAMPLING PROCEDURES

WATERWAY SAMPLING

Bridge Sampling Procedures

1. Before sample collection day, scrub the stainless steel sampling bucket, stirrers, and DO sampling device with a solution of noninterfering residue-free critical cleaning liquid detergent and water. Rinse with de ionized water.

2. Samples should be collected from the upstream side of the bridge.

3. Before lowering any object such as a probe or bucket into the waterway, look both upstream and downstream to ensure there are no recreators, boats, or other obstructions below or approaching the bridge.

    a. When encountering recreators on the water, wait for them to pass. Allow them to clear the area with enough space so there is no risk of collision before attempting to take a sample.

    b. Give a warning blast with the provided air horn to alert possible recreators that you will be lowering an object into the waterway.

4. Samples may be collected from the District's Pollution Control (PC) boats if approved by the Environmental Monitoring Manager, when circumstances deem necessary. Boat sampling should not be performed in areas where sediment could be disturbed. When sampling from a District PC boat, the following steps should be followed:

    a. Ensure the PC boat is in the correct location and the engines/motors are in idle.

    b. Communicate with the Patrol Boat Operator to ensure it is safe to collect the sample.

    c. Collect the sample from the side of the PC boat, away from the propellers and exhaust.

5. Take the samples from a representative location at the center of the river at the deepest point. <u>DO NOT SAMPLE FROM THE BANK OF THE WATERWAY</u>.

6. If boat traffic is encountered when sampling from a navigable body of water, delay sampling until the unnatural turbulence caused by the vessel's wake subsides. Indicate in the "Remarks" section of the sample collection sheet that sampling was interrupted due to a passing vessel.

7. Upon arrival at each prescribed sampling location, the following steps should be followed:

    a. Collect samples routinely collected from pail. See Section A.

   b. Collect DO and bacterial samples with modified DO sampler. See Section B.
   c. When required, collect field blanks from pail. See Section C.
   d. When required, collect organics samples from pail. See Section D.

8. Complete the sample collection sheet as appropriate at each sampling location.
   a. Sample collection date.
   b. Sampler's name(s).
   c. Weather conditions during sampling (Example: Clear, Cloudy, Rain, Snow, Air Temperature, if possible).
   d. Type of aliquots obtained.
   e. Time aliquots were obtained.
   f. Sample dissolved oxygen as obtained with the handheld meter.
   g. Sample pH as obtained with the handheld meter.
   h. Sample temperature as obtained with the handheld meter.
   i. Sample storage temperature.
   j. In the "Remarks" column, describe visual observation of sample (Clear, Semi Clear, Lt. Sed., etc.), indicate if there was any passing boat traffic and any unusual observations of the waterway quality, such as oil, discoloration, or debris. Also provide the LIMS number.
   k. At the bottom of the collection sheet, a space is available for additional remarks.
9. Upon completion of the sampling assignment, immediately transport the samples to the laboratory for analysis.
10. Upon relinquishing the samples to the laboratory analyst, record the following pertinent information on the sample collection sheet to complete chain of custody requirements (Appendix II).
   a. Signature of transporter.
   b. Signature of the person who relinquished the sample.
   c. Signature of the laboratory analytical staff member who received the sample.

   d. Time sample relinquished.

Section A: Routine Samples Collected in Pail

1. Using the handheld dissolved oxygen meter, lower the probe into the river/stream. Allow the probe to acclimate for one minute before obtaining a dissolved oxygen reading.

2. Properly identify (label) each sample container and arrange in order specified on sample trays.

3. Lower the clean stainless steel bucket into the river/stream water. Retrieve the bucket and immediately obtain a pH and temperature reading with the handheld meter.

4. Empty the bucket, lower and retrieve it two more times rinsing thoroughly to acclimate it to the waterway.

5. When sampling during precipitation events (rain or snow), cover the sample bucket at all times with the lid provided, except when the bucket is being raised or lowered from the bridge.

6. Whenever the sampling bucket is being raised or lowered from the bridge, give special attention to insure there is no contact with the bridge structure. If there is contact, discard the sample and start over. Also, make sure that the rope does not come in contact with the ground. Place the rope into the gray, plastic container.

6. Only after acclimating the sampling bucket three times should the actual sample be obtained. After the sample is obtained, stir the sample with the stirring rod 5x in one direction and then 5x in the other direction. Pour it into the individual sample aliquot bottles filling the aliquot bottles half way from right to left. Then stir the sample water in the bucket with the same procedure as above to ensure a homogeneous distribution of suspended solids and finish filling the bottles from left to right.

7. Samples to be collected and order in trays:

   a. General chemistry sample: 1 gallon (wide mouth plastic) container.

   b. Alkalinity, chloride sample: plastic 250 mL container, fill to shoulder.

   c. Cyanide sample: fill the plastic half gallon container (containing 5 mL of 50% NaOH preservative) to shoulder.

   d. Phenol sample: fill the glass sample bottle to the shoulder; exercise <u>CAUTION</u> as bottle contains 2 mL of sulfuric acid as a preservative. Do not breathe the vapors that may be emitted by the sulfuric acid preservative.

   e. Dissolved metals sample: fill a 900 mL certified clean, plastic bottle.

f. Total organic carbon: fill a 250 mL plastic bottle.

g. Trace metals sample: fill 8 oz. plastic bottle. Leave approximately l/4 inch air space at top of bottle. NOTE: The bottle contains 2 mL of nitric acid. (Overfilling may cause a loss of preservative.)

h. Sulfate: fill a 250 mL square plastic bottle.

i. Total Phosphorus, Total Kjeldahl Nitrogen: fill a 250 mL plastic bottle to the shoulder; exercise CAUTION as bottle contains 0.5 mL sulfuric acid as a preservative. Do not breathe the vapors that may be emitted by the sulfuric acid preservative

j. Fluoride: fill a 250 mL plastic bottle to the shoulder.

k. Ammonia, NO2+NO3: fill a 250 mL polyethylene bottle to the shoulder; exercise CAUTION as bottle contains 0.5 mL sulfuric acid as a preservative. Do not breathe the vapors that may be emitted by the sulfuric acid preservative.

l. Chlorophyll *a*: fill an opaque, brown 1 liter bottle (obtained from Room LE213). Leave approximately 1/2 inch air space at top of bottle.

m. n-Hexane extractable materials sample: fill two glass quart jars.

8. After all the sample aliquots have been poured off, rinse the sample bucket and stirring rod with deionized water.

9. Place each sample aliquot into the 72-quart thermal ice chest filled from 1/3 to 1/2 full of ice cubes. Insure the sample bottles are surrounded in ice.

Section B: Bacterial Samples

The bacterial sample is collected using a specialized sampler that has been modified to hold the bacterial sample container. The bacterial sample is collected as follows:

1. The bacterial container is a sterilized 4 oz. plastic bottle with foil covered plastic screw cap.

2. Do not open bacterial bottle until sampling, and replace foil covered plastic cap as soon as possible.

3. Care should be taken not to touch the neck or the mouth of the bacterial bottle, or the inside of the plastic cap to prevent contamination of the sample.

4. Insert bacterial bottle into the compartment attached to the outside of the sampling device making sure not to allow the top of the bottle to touch any part of the sample can.

5. Slowly lower the sampling device with the bacterial bottle into the waterway to the depth of approximately 3 feet from the surface.

6. Raise the sampling device when all the air bubbles have stopped rising.

7. Remove the bacterial bottle from the sampling device.

8. Obtain a second bacterial bottle, label, and then remove the foil-covered cap without removing the foil from the cap.

9. Care should be taken not to touch the neck or the mouth of the bottle, or the inside of the plastic cap to prevent contamination of the sample.

10. Pour the aliquot obtained with the sampling device into the second bacterial bottle. Fill the bottle approximately 80 percent full. DO NOT OVERFILL.

11. Close the bottle with the foil-covered cap and place the sample into the cooler on ice

12. Return the bacterial bottle used to collect the sample to the Microbiology Laboratory.

13. Place the sample into the cooler on ice.

14. Complete appropriate entries on sample collection sheet.

Section C: Field Blanks

Field blank assessments will be conducted on a quarterly basis at sampling locations at the end of each sampling trip as determined by the Environmental Monitoring Manager. A minimum of one sample for each sampling trip will be collected. Field blanks are used to verify the proper decontamination of field sampling equipment between sampling locations. Field blanks will be analyzed, and any sample result that is greater than twice the reporting limit will be considered to have significant contamination. Following a result of significant contamination, an investigation to determine the source of the contamination will be conducted by the Environmental Monitoring Manager, and corrective action will be taken. Field blanks are prepared as follows:

1. Properly identify (label) each sample container and arrange in order specified on sample trays.

2. Fill the stainless steel bucket two-thirds full with reagent water obtained from the laboratory.

3. Proceed with the filling of the sample containers as is done in Section A, refilling the bucket as necessary to fill all sample containers.
4. Place samples into cooler on ice.
5. Complete sample collection sheet as appropriate.

Section D: Organics Samples

Organic priority pollutants (OPP) and BETX (benzene, ethylbenzene, and total xylenes) samples are collected as follows:

1. The amber-colored glass containers provided by the OCAL must be used for BETX and OPP samples. These containers contain a preservative and should not be rinsed prior to filling.
2. OPP samples require one (1) gallon bottle and three (3) vials per sampling location.
3. BETX samples require three (3) vials per sampling location.
4. Each sampling team will transport a clearly marked, “Trip Blank” sample, consisting of two (2) amber vials filled with Milli-Q de-ionized water, with the other organic samples collected during the sampling trip.
5. Obtain a water sample in the stainless steel pail and fill sample containers.
6. When filling the containers care should be taken to minimize air bubbles in the sample container. Gallons and vials are to be filled to the top with minimal overflow. A slight bulge of water at the neck of the container caused by surface tension should be evident at the time the cap is tightened to insure elimination of excess air.
7. Place samples into cooler on ice.
8. Complete sample collection sheet as appropriate.
9. After transport to the laboratory, store the samples in the laboratory cooler for later transportation to the Organic Compounds Analytical Laboratory by the afternoon transporter.

Section E: Low Level Mercury Samples

Low level Mercury (LLHg) samples and equipment blanks are collected as follows:

1. Obtain the labeled LLHg sampling kit provided by CAL. The sampling kit contains four pairs of clean gloves, four 40 mL sample vials, two empty 40 mL equipment blank vials, and three 40 mL equipment blank vials filled with reagent water.

2. Do not expose the sample to anything that may contain significant amounts of mercury. Potential contamination sources: Sampling equipment, bailers, sampling tubing (including peristaltic pump tubing), gloves, clothing, bottles, exhaled breath from mercury amalgam fillings, precipitation, dirt, dust and airborne vapor.

3. Collect LLHg samples according to the following procedure:

    a. Obtain a water sample in the stainless steel pail.

    b. Sampler #1: Put on clean gloves and sufficient protective clothing to ensure dust and debris is not transferred from the person to the sample.

    c. Sampler #2: Put on clean gloves and sufficient protective clothing to ensure dust and debris is not transferred from the person to the sample. Do not touch anything that may contaminate your gloves.

    d. Sampler #1: Set up sampling equipment, open cooler, remove double bagged bottle kit from cooler and its bubble pack bag, open outer bag and hold it open so sampler #2 can reach inside.

    e. Sampler #2: Do not touch the outer bag. Open the inner bag, remove one 40 mL vial from the bag, remove the cap and fill with water sample to the top, screw cap onto vial and return filled vial to the innermost bag. There is no need to rinse the bottle or add a preservative. Repeat until 4 vials have been filled from the same sampling point. Close the zip lock seal most of the way, squeeze the inner bag to expel most of the air, complete the seal, push the inner bag inside the outer bag.

    f. Sampler #1: Close the outer bag zip lock seal most of the way, squeeze the bag to expel most of the air, complete the seal. Place the double bagged bottle kit in the bubble pack bag, remove the adhesive strip cover and seal the bubble bag closed. Place the kit in the cooler. NOTE: LLHg samples should <u>not</u> be placed on ice.

4. Collect LLHg equipment blanks according to the following procedure:

    a. Sampler #1: Put on clean gloves and sufficient protective clothing to ensure dust and debris is not transferred from the person to the sample.

   b. Sampler #2: Put on clean gloves and sufficient protective clothing to ensure dust and debris is not transferred from the person to the sample. Do not touch anything that may contaminant your gloves.

   c. Sampler #1: Open cooler, remove double bagged kit labeled equipment blank bottle kit from cooler and its bubble pack bag, apply client label to the outer zip lock bag, open outer bag and hold it open so the clean hands person can reach inside.

   d. Sampler #2: Do not touch the outer bag. Open the inner bag, remove one full 40 mL vial from the bag, and one empty 40 mL vial, remove the caps and pour the reagent water from one vial into the other under the same conditions to which regular samples were exposed, screw caps onto vials and return filled vial to the innermost bag discard the empty vial. There is no need to rinse the bottle or add a preservative. Repeat until 2 vials have been filled. There is an extra filled reagent water vial in case a spill occurs, discard if not needed. Close the zip lock seal most of the way, squeeze the inner bag to expel most of the air, complete the seal, push the inner bag inside the outer bag.

   e. Sampler #1: Close the outer bag zip lock seal most of the way, squeeze the bag to expel most of the air, complete the seal. Place the double bagged bottle kit in the bubble pack bag, remove the adhesive strip cover and seal the bubble bag closed. Place the kit in the cooler. NOTE: LLHg equipment blanks should not be placed on ice.

5. Complete sample collection sheet as appropriate.

Materials Required for Sampling

1. Labels: generated adhesive-backed labels with identifying LIMS barcode.

2. Bottles (per station; note: a field blank will require an additional set of sample containers a through l).

   a. Gallon (polyethylene) – General chemistry.

   b. 250 mL rectangular (polyethylene) – Alkalinity, chloride.

   c. 1/2 Gallon (polyethylene) – Cyanide.

   d. Quart (glass) – Phenol.

   e. 900 mL (polyethylene – certified clean) – Dissolved metals.

f. 250 mL rectangular (polyethylene) – Total organic carbon.

g. 8 oz. (polyethylene) – Trace metals (total).

h. 250 mL rectangular (polyethylene) – Sulfate and Fluoride.

i. Two quarts (glass) – n Hexane extractable materials (2).

j. 250 mL rectangular (polyethylene) Total Phosphorus, Total Kjeldahl Nitrogen, Ammonia, NO2+NO3.

k. Mercury Kit (General Use waters only; see Appendix I, Section E).

l. 1 liter brown, opaque (plastic) – Chlorophyll *a*.

m. Two 4 oz. (polypropylene w/foil covered stopper) – Fecal coliform.

n. Three 40 mL vials (amber colored glass) – BETX.

o. Three 40 mL vials (amber colored glass); and 1 gallon (glass) – Organic priority pollutants.

3. Sampling Devices.

   a. 13-quart stainless steel bucket and lid.

   b. Stainless steel special sampling device. Attached to this device is a stainless steel holder for a bacti bottle.

   c. Portable handheld electronic dissolved oxygen meter.

   d. Portable handheld electronic pH and temperature meter.

   e. Sufficient length of 3/8 inch nylon rope (approximately 100 feet).

4. Miscellaneous.

   a. Waterway Field Collection Sheet, for locations to be sampled.

   b. 72 quart ice chests as needed.

   c. Ice.

   d. Gray plastic container for storage of sampling rope during sampling events.

   e. Wood tray to hold sample bottles with each compartment labeled with name of the sample bottle in the order the aliquot will be poured off.

   f. Stainless steel stirring rod.
   g. Two carboys of reagent water.

Safety

1. Always wear appropriate personal protective equipment while sampling such as:
   a. Gloves, eye protection, long pants, closed-toed shoes, personal flotation device, and high-visibility vest.
2. Use proper lifting technique to avoid injury. Take breaks when necessary and work as a team to distribute work evenly.
3. Be prepared for the weather conditions and dress appropriately.
   a. Drink plenty of water
   b. Apply sunscreen.
   c. Wear light clothes during hot weather and dress in warm layers during cold weather (District-issued uniform).
   d. Wear rain gear during wet weather.
4. Be aware of road conditions and take necessary precautions to avoid accidents.
5. When sampling during winter months, do not attempt to sample if the waterway is frozen. Do not walk on the ice. Indicate the circumstances on the sample collection sheet.
6. When sampling from a bridge, be aware of the following safety concerns:
   a. DO NOT park District vehicle on a bridge. Attempt off-road parking, if possible.
   b. Use rotating lights on the vehicle when stopped.
   c. When parking on the road, use safety cone markers.
7. When sampling from one of the District’s Patrol boats, be aware of the following safety concerns:
   a. Adhere to all the Section 126 rules regarding PC boat crew safety.
   b. Wear the issued personal floatation device.

   c. Be aware of deck conditions. Spray from the boat can cause the deck to become wet and slippery in during warm weather and icy during cold weather.

8. Sampling may be cancelled due to road/bridge closures or if weather conditions are determined to be dangerous such as: extreme heat, extreme cold, icy conditions, excessive fog, or any other conditions determined by the Environmental Monitoring Manager.

AMBIENT WATER QUALITY MONITORING PROJECT
QUALITY ASSURANCE PROJECT PLAN

APPENDIX II

SAMPLE COLLECTION SHEET

#1 WEEK 4

Calumet, Little Calumet, Cal-Sag Watershed

DATE COLLECTED:______________________ COLLECTED BY: ______________________ WEATHER: ____________________

WW Number	LOCATION	TIME	TEMPERATURE °C	GEN. CHEM. (gallon)	TDS (250mL rect.)	F.O.G. (glass quart x2)	ALK (250mL rect.)	CYN. (1/2 gallon)	PHEN. (glass quart)	T.M. (8oz cylinder preserved)	SOL. T.M. (900mL)	Cr+6 (900mL)	BAC'T (4oz w/ foil x2)	D.O. (HACH meter)	RAD. (quart)	TOC (250mL preserved rect.)	PRIORTIY POLL. (amber gallon O-NP, 40mL vials X3 BETX)	F, Cl, SO4 (250mL rectangular)	CHLOROPHYLL, a (1L opaque brown)	LACHAT (250mL rect. 250mL preserved rect.)	LOW LEVEL Hg (LLHg kit)	pH	REMARKS
43	Cal - Sag Channel at Route # 83 Bridge					▨ ▨							 ▨ MST		▨		▨ BETX ▨ OPP					6.5-9.0	 LIMS#
59	Cal - Sag Channel at Cicero Avenue (near 131st St)					▨ ▨							 ▨ MST		▨		▨ BETX ▨ OPP					6.5-9.0	 LIMS #
57	Little Calumet River at Ashland Avenue (near 135th St)					▨ ▨							 ▨ MST		▨		▨ BETX ▨ OPP					6.5-9.0	 LIMS#
76	Little Calumet River at Halsted St. Downstream Calumet WRP, Riverdale					▨ ▨							 ▨ MST		▨		▨ BETX ▨ OPP					6.5-9.0	 LIMS #
56	Little Calumet River at Indiana Ave. Upstream of Calumet WRP, Chicago					▨ ▨							 ▨ MST		▨		▨ BETX ▨ OPP					6.5-9.0	 LIMS#
	EQUIPMENT BLANK					▨							▨	▨	▨	▨	▨		▨		▨		LIMS#

Analysis (Preservative): FOG (sulfuric acid); Cyanide (sodium hydroxide); Phenol (sulfuric acid); Metals (nitric acid); Mercury (nitric acid); COD (sulfuric acid); Nutrients (sulfuric acid).

STORED AT 4°C YES __________ NO __________

IN CUSTODY OF ______________________

METER # ______________________

VEHICLE # ______________________

TRANSPORTED BY: ______________________

RELINQUISHED BY: ______________________

DATE: ____________ TIME: ____________

RECEIVED BY LABORATORY: ______________________

DATE: ____________ TIME: ____________

RELINQUISHED BY SAL LAB: ______________________

RECEIVED BY : ______________________

ATTACHMENT A: LABORATORY REPORTING LIMITS AND ILLINOIS POLLUTION CONTROL BOARD MINIMUM MEASUREMENT CRITERIA 2022

Parameter	Reporting Limit (RL)	Minimum Measurement Criteria
Dissolved oxygen	NA	0.1 mg/L[1]
Temperature	NA	0.1 degree C[1]
pH	NA	0.1 pH unit[1]
Ammonia nitrogen	0.3 mg/L	15.0 mg/L
Ammonia nitrogen, un-ionized[2]	NA	0.1 mg/L[3]
Nitrate and nitrite nitrogen	0.25 mg/L	No standard
Kjeldahl nitrogen	1 mg/L	No standard
Phosphorus, total	0.15 mg/L	No standard
Sulfate	1.0 mg/L	500 mg/L
Total dissolved solids	25 mg/L	No standard
Suspended solids	4 mg/L	No standard
Volatile suspended solids	NA	No standard
Alkalinity	20 mg/L	No standard
Chloride	0.50 mg/L	500 mg/L
Fluoride	0.1 mg/L	15 mg/L[4]
Organic carbon, total	5 mg/L	No standard
Phenol	0.005 mg/L	0.1 mg/L
Cyanide, total	0.005 mg/L	0.1 mg/L[3]
Cyanide, chlorine amenable	0.001 mg/L	0.022 mg/L
Arsenic, total	0.050 mg/L	0.36 mg/L[3]
Barium, total	0.020 mg/L	5.0 mg/L[3]
Boron, total	NA mg/L	40.1 mg/L[5]
Calcium, total	0.5 mg/L	No standard
Chromium, trivalent[6]	0.005 mg/L	1.0 mg/L[3]
Chromium, hexavalent	0.003 mg/L	0.016 mg/L
Magnesium, total	0.5 mg/L	No standard
Manganese, total	0.005 mg/L	1.0 mg/L[3]
Mercury, total	0.0002 mg/L	0.0005 mg/L[3]
Mercury, low level, total	0.0005 µg/L	0.012 µg/L[7]
Selenium, total	0.05 mg/L	1.0 mg/L
Silver, total	0.005 mg/L	0.005 mg/L

ATTACHMENT A (Continued): LABORATORY REPORTING LIMITS AND ILLINOIS POLLUTION CONTROL BOARD MINIMUM MEASUREMENT CRITERIA

Parameter	Reporting Limit (RL)	Minimum Measurement Criteria
Fecal coliform	10 cfu/100 mL	200 cfu/100 mL[5]
n-Hexane extractable materials SPE	5 mg/L	15 mg/L[3]
Chlorophyll *a*	1 µg/L	No standard
Benzene	2 µg/L	310 µg/L
Ethyl benzene	2 µg/L	150 µg/L
Toluene	2 µg/L	2,000 µg/L
Xylenes	3 µg/L	920 µg/L
Organic priority pollutants[10]	Variable[11]	No standards

NA = Not applicable.

[1] Required sensitivity.

[2] Calculated from pH, temperature, and ammonia nitrogen. Significant figures for pH,temperature, and ammonia nitrogen allow calculation to 0.01 mg/L.

[3] Indigenous Aquatic Life Use water quality standard only.

[4] Calculated standard based on a minimum water hardness of 200 mg/L as $CaCO_3$.

[5] General Use water quality standard only.

[6] Trivalent chromium measured as total chromium.[7] Human Health Standard.

[8] CAWS A and B Aquatic Life Use water quality standard only.

[9] RL varies with total solids concentration of the sample

[10] Organic priority pollutants are identified in 40 CFR Part 122, Appendix D, Table II as amended.

[11] The RLs will be provided in the data report.

ATTACHMENT B: SAMPLING FREQUENCY

Station	Description	General Sampling[1]	n-Hexane Extractable Materials	BETX[2]	OPPs
96	Albany Avenue, North Branch Chicago River	Monthly 2nd Mon.		Bimonthly	Semiannually
112	Dempster Street, North Shore Channel	Monthly 2nd Mon.		Bimonthly	Semiannually
36	Touhy Avenue, North Shore Channel	Monthly 2nd Mon.		Bimonthly	Semiannually
37	Wilson Avenue, North Branch Chicago River	Monthly 2nd Mon.		Bimonthly	Semiannually
73	Diversey Parkway, North Branch Chicago River	Monthly 2nd Mon.		Bimonthly	Semiannually
100	Wells Street, Chicago River	Monthly 3rd Mon.		Bimonthly	Semiannually
108	Loomis Street, South Branch Chicago River	Monthly 3rd Mon.		Bimonthly	Semiannually
99	Archer Avenue, South Fork South Branch Chicago River	Monthly 3rd Mon.	Monthly 3rd Mon.	Bimonthly	Semiannually
75	Cicero Avenue, Chicago Sanitary & Ship Canal	Monthly 3rd Mon.		Bimonthly	Semiannually
41	Harlem Avenue, Chicago Sanitary & Ship Canal	Monthly 3rd Mon.		Bimonthly	Semiannually
48	Stephen Street, Chicago Sanitary & Ship Canal	Monthly 3rd Mon.		Bimonthly	Semiannually
92	Lockport Powerhouse Chicago Sanitary & Ship Canal	Weekly Every Mon.		Bimonthly	Semiannually

ATTACHMENT B (Continued): SAMPLING FREQUENCY

Station	Description	General Sampling[1]	n-Hexane Extractable Materials	BETX[2]	OPPs
86	Burnham Avenue, Grand Calumet River	Monthly 4th Mon.		Bimonthly	Semiannually
56	Indiana Avenue, Little Calumet River	Monthly 4th Mon.		Bimonthly	Semiannually
76	Halsted Street, Little Calumet River	Monthly 4th Mon.		Bimonthly	Semiannually
57	Ashland Avenue, Little Calumet River	Monthly 4th Mon.		Bimonthly	Semiannually
59	Cicero Avenue, Calumet-Sag Channel	Monthly 4th Mon.		Bimonthly	Semiannually
43	Route 83, Calumet-Sag Channel	Monthly 4th Mon.		Bimonthly	Semiannually
19	Belmont Avenue, Des Plaines River	Monthly 1st Mon.		Bimonthly	Semiannually
22	Ogden Avenue, Des Plaines River	Monthly 1st Mon.		Bimonthly	Semiannually
23	Willow Springs Road, Des Plaines River	Monthly 1st Mon.		Bimonthly	Semiannually
91	Material Service Road, Des Plaines River	Monthly 1st Mon.		Bimonthly	Semiannually
110	Springinsguth Road, West Branch DuPage River	Monthly 1st Mon.		Bimonthly	Semiannually
111	Arlington Drive, West Branch DuPage River	Monthly 1st Mon.		Bimonthly	Semiannually

ATTACHMENT B (Continued): SAMPLING FREQUENCY

Station	Description	General Sampling[1]	n-Hexane Extractable Materials	BETX[2]	OPPs
79	Higgins Road, Salt Creek	Monthly 1st Mon.		Bimonthly	Semiannually
18	Devon Avenue, Salt Creek	Monthly 1st Mon.		Bimonthly	Semiannually
109	Brookfield Avenue, Salt Creek	Monthly 1st Mon.		Bimonthly	Semiannually
77	Elmhurst Road, Higgins Creek	Monthly 1st Mon.		Bimonthly	Semiannually
78	Wille Road, Higgins Creek	Monthly 1st Mon.		Bimonthly	Semiannually
127	Lincoln Street, Weller Creek	Monthly 1st Mon.		Bimonthly	Semiannually

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[1] The parameters included in the general sampling performed monthly include temperature, pH, dissolved oxygen, fecal coliform, total metals, soluble metals, hexavalent chromium, ammonia nitrogen, combined nitrate and nitrite nitrogen, Kjeldahl nitrogen, total phosphorus, total cyanide, cyanide amenable to chlorination, phenol, alkalinity, chloride, fluoride, turbidity, total dissolved solids, total suspended solids, total organic carbon, and chlorophyll *a*. General sampling excluded oil and grease, *E. coli*, BETX, and priority organics.

[2] BETX = benzene, ethyl benzene, toluene, and xylenes.