The following documentation is an electronically-submitted vendor response to an advertised solicitation from the *West Virginia Purchasing Bulletin* within the Vendor Self-Service portal at ***wvOASIS.gov***. As part of the State of West Virginia's procurement process, and to maintain the transparency of the bid-opening process, this documentation submitted online is publicly posted by the West Virginia Purchasing Division at ***WVPurchasing.gov*** with any other vendor responses to this solicitation submitted to the Purchasing Division in hard copy format.


wOASIS
Procurement
Budgeting
Accounts Receivable
Accounts Payable
General Information
Contact
Default Values
Discount
Document Information
Clarification Request
Procurement Folder:
Procurement Type: Central Master Agreement
Vendor ID:
Legal Name: 120 WATER AUDIT INC
Alias/DBA:
Total Bid:
Response Date:
Response Time:
Responded By User ID:
First Name: Paul
Last Name: Schuler
Email:
Phone:
SO Doc Code: CRFQ
SO Dept:
SO Doc ID:
Published Date:
Close Date:
Close Time:
Status: Closed
Solicitation Description: LEAD TESTING IN SCHOOL DRINKING WATER
Total of Header Attachments:
Total of All Attachments:

Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Solicitation Response

Proc Folder:	1486277
Solicitation Description:	LEAD TESTING IN SCHOOL DRINKING WATER
Proc Type:	Central Master Agreement

Solicitation Closes	Solicitation Response	Version
2025-04-08 13:30	SR 0506 ESR04072500000006036	1

VENDOR

VS0000036770
120 WATER AUDIT INC

Solicitation Number: CRFQ 0506 EHS2500000001

Total Bid: 523436 **Response Date:** 2025-04-08 **Response Time:** 13:04:40

Comments: Having worked with the West Virginia Department of Health for a number of years on their Lead Testing in Schools program, it is with great interest that we submit this response. We have thoughtfully considered our pricing and deliverables based upon this past experience working with schools and daycares within the state, but also working with the individuals within the department. We very much realize and expect that opportunities for meaningful efficiencies and thus savings will occur based upon familiarity with systems and processes from both parties. For instance, it is expected that a great amount of time (support hours) will not have to be spent on items such as data transfer from an existing database to integration of that data into a new database because this data still exists and the software can easily be re-engaged. Additionally and related, we would be re-training staff on a familiar software platform (not training staff on a net new platform) so learning curve (or re-learning curve!) should be steep.
All this to say, we hope that this proposal is received in the spirit of pricing fairness and enthusiasm to re-engage with the Department of Health for which it was intended.

FOR INFORMATION CONTACT THE BUYER
Crystal G Hustead
(304) 558-2402
crystal.g.hustead@wv.gov

Vendor Signature X **FEIN#** **DATE**

All offers subject to all terms and conditions contained in this solicitation

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
1	Cloud-based Software/Platform				12500.00

Comm Code	Manufacturer	Specification	Model #
81162000			

Commodity Line Comments: This is the proprietary 120Water LIF (Lead n Facilities) Software Platform. It is commercial off the shelf (COTS) software that is cloud based. This software has been in production since 2019 and is considered a mature product, having undergone many updates and quality control exercises over the course of 5-6 years usage in multipole state engagements.
Annual Fee is based upon the stated annual enrollment estimated to be around 80-100 new facilities per year. Fee includes software deployment, training, support, maintenance, bug and glitch fixes, hosting, and product updates.
It is anticipated that training of existing Department of Health (DOH) staff will be fairly simple as they should already be very familiar with the software.
Additionally, the need to import or populate historical data should not pose an expense in time or dollars as it should already be present in the software from previous year's utilization.

Extended Description:

Contractor to provide cloud-based software/platform

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
2	Managing Cloud-based Software/Platform				0.00

Comm Code	Manufacturer	Specification	Model #
81162000			

Commodity Line Comments: Separate software management fee will not be charged as it is included the annual software fee above (Line 1).

Extended Description:

Managing the cloud-based software/platform

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
3	Test Kits and Sample Analysis	2000.0000	KIT	27.000000	54000.00

Comm Code	Manufacturer	Specification	Model #
60104202			

Commodity Line Comments: Price is for 120Water single bottle (250ml) kit and includes the kit, logistics, and analysis (Microban Lab). Delivery days are based upon delivery per facility after plan has been submitted and approved

Extended Description:

Provide Test Kits and Sample Analysis

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
4	Training	300.00000	HOUR	75.000000	22500.00

Comm Code	Manufacturer	Specification	Model #
60104202			

Commodity Line Comments: Hourly rate. Program services details provided in attached response document.
Delivery days are based upon once a cohort is established, the time it would take to organize, schedule, and execute the training per cohort.

Extended Description:

Training

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
5	Consultation and Remediation Services	300.00000	HOUR	75.000000	22500.00

Comm Code	Manufacturer	Specification	Model #
60104202			

Commodity Line Comments: Hourly rate. Program services details provided in attached response document.
Delivery days are based upon the average time expected to consult with and provide plans to individual facilities (ie to deliver a remediation plan after realizing an exceedance)

Extended Description:

Provide consultation, and remediation services

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
6	Fixture Replacement Drinking Fountain	10.00000	EA	639.950000	6399.50

Comm Code	Manufacturer	Specification	Model #
60104202			

Commodity Line Comments: This is a single unit drinking fountain (model LZS8L) from Elkay.
Given that Elkay is the US market leader for commercial drinking fountains and fixtures (specifically in schools and educational settings), there are a number of models to choose from all in a similar price range. We are in a very strong partnership with them and their local distributors to be able to offer various options to make sure a school/childcare facility is remediated to their standards.
Free Shipping and Handling
Delivery days are based upon average time to evaluate, schedule, and deliver product for installation

Extended Description:

Fixture replacement on eligible facilities drinking fountain

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
7	Fixture Replacement Bottle Filling	10.00000	EA	1295.950000	12959.50

Comm Code	Manufacturer	Specification	Model #
60104202			

Commodity Line Comments: This is a single water filling station (model LZS8WSSSMC) from Elkay.
Given that Elkay is the US market leader for commercial drinking fountains and fixtures (specifically in schools and educational settings), there are a number of models to choose from all in a similar price range. We are in a very strong partnership with them and their local distributors to be able to offer various options to make sure a school/childcare facility is remediated to their standards.
Free Shipping and Handling.
Delivery days are based upon average time to evaluate, schedule, and deliver product for installation

Extended Description:

Fixture replacement on eligible facilities bottle filling

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
8	Cloud-based Software/Platform-Year 2				12500.00

Comm Code	Manufacturer	Specification	Model #
81162000			

Commodity Line Comments: Annual fee as described in Line 1

Extended Description:

Contractor to provide cloud-based software/platform-Year 2

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
9	Managing Cloud-based Software/Platform-Year 2				0.00

Comm Code	Manufacturer	Specification	Model #
81162000			

Commodity Line Comments: Separate software management fee will not be charged as it is included the annual software fee above (Line 1).

Extended Description:

Managing the cloud-based software/platform-Year 2

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
10	Test Kits and Sample Analysis-Year 2	2000.0000	KIT	27.000000	54000.00

Comm Code	Manufacturer	Specification	Model #
60104202			

Commodity Line Comments: Price is for 120Water single bottle (250ml) kit and includes the kit, logistics, and analysis (Microban Lab)
Delivery days are based upon delivery per facility after plan has been submitted and approved

Extended Description:

Provide Test Kits and Sample Analysis-Year 2

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
11	Training-Year 2	300.00000	HOUR	75.000000	22500.00

Comm Code	Manufacturer	Specification	Model #
60104202			

Commodity Line Comments: Hourly rate. Program services details provided in attached response document.
Delivery days are based upon once a cohort is established, the time it would take to organize, schedule, and execute the training per cohort.

Extended Description:

Provide training-Year 2

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
12	Consultation and Remediation Services-Year 2	300.00000	HOUR	75.000000	22500.00

Comm Code	Manufacturer	Specification	Model #
60104202			

Commodity Line Comments: Hourly rate. Program services details provided in attached response document.
Delivery days are based upon the average time expected to consult with and provide plans to individual facilities (ie to deliver a remediation plan after realizing an exceedance)

Extended Description:

Provide consultation, and remediation services-Year 2

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
13	Fixture Replacement Drinking Fountain-Year 2	10.00000	EA	639.950000	6399.50

Comm Code	Manufacturer	Specification	Model #
60104202			

Commodity Line Comments: This is a single unit drinking fountain (model LZS8L) from market leader Elkay
Free Shipping and Handling.
Delivery days are based upon average time to evaluate, schedule, and deliver product for installation

Extended Description:

Fixture replacement Drinking Fountain-Year 2

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
14	Fixture Replacement Bottle Filling-Year 2	10.00000	EA	1295.950000	12959.50

Comm Code	Manufacturer	Specification	Model #
60104202			

Commodity Line Comments: This is a single water filling station (model LZS8WSSSMC) from market leader Elkay.
Free Shipping and Handling.
Delivery days are based upon average time to evaluate, schedule, and deliver product for installation

Extended Description:

Fixture replacement Bottle Filling - Year 2

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
15	Cloud-based Software/Platform-Year 3				12500.00

Comm Code	Manufacturer	Specification	Model #
81162000			

Commodity Line Comments: Annual fee as described in Line 1

Extended Description:

Contractor to provide cloud-based software/platform-Year 3

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
16	Managing Cloud-based Software/Platform-Year 3				0.00

Comm Code	Manufacturer	Specification	Model #
81162000			

Commodity Line Comments: Separate software management fee will not be charged as it is included the annual software fee above (Line 1).

Extended Description:

Managing the cloud-based software/platform-Year 3

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
17	Test Kits and Sample Analysis-Year 3	2000.0000	KIT	27.000000	54000.00

Comm Code	Manufacturer	Specification	Model #
60104202			

Commodity Line Comments: Price is for 120Water single bottle (250ml) kit and includes the kit, logistics, and analysis (Microban Lab).
Delivery days are based upon delivery per facility after plan has been submitted and approved

Extended Description:

Provide Test Kits and Sample Analysis-Year 3

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
18	Training-Year 3	300.00000	HOUR	75.000000	22500.00

Comm Code	Manufacturer	Specification	Model #
60104202			

Commodity Line Comments: Hourly rate. Program services details provided in attached response document.
Delivery days are based upon once a cohort is established, the time it would take to organize, schedule, and execute the training per cohort.

Extended Description:

Provide training-Year 3

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
19	Consultation and Remediation Services-Year 3	300.00000	HOUR	75.000000	22500.00

Comm Code	Manufacturer	Specification	Model #
60104202			

Commodity Line Comments: Hourly rate. Program services details provided in attached response document.
Delivery days are based upon the average time expected to consult with and provide plans to individual facilities (ie to deliver a remediation plan after realizing an exceedance)

Extended Description:

Provide consultation and remediation services-Year 3

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
20	Fixture Replacement Drinking Fountain-Year 3	10.00000	EA	639.950000	6399.50

Comm Code	Manufacturer	Specification	Model #
60104202			

Commodity Line Comments: This is a single unit drinking fountain (model LZS8L) from market leader Elkay
Free Shipping and Handling
Delivery days are based upon average time to evaluate, schedule, and deliver product for installation

Extended Description:

Fixture replacement drinking fountain-Year 3

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
21	Fixture Replacement Bottle Filling - Year 3	10.00000	EA	1295.950000	12959.50

Comm Code	Manufacturer	Specification	Model #
60104202			

Commodity Line Comments: This is a single water filling station (model LZS8WSSSMC) from market leader Elkay.
Free Shipping and Handling.
Delivery days are based upon average time to evaluate, schedule, and deliver product for installation

Extended Description:

Fixture replacement bottle filling-Year 3

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
22	Cloud-based Software/Platform-Year 4				12500.00

Comm Code	Manufacturer	Specification	Model #
81162000			

Commodity Line Comments: Annual fee as described in Line 1

Extended Description:

Contractor to provide cloud-based software/platform-Year 4

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
23	Managing Cloud-based Software/Platform-Year 4				0.00

Comm Code	Manufacturer	Specification	Model #
81162000			

Commodity Line Comments: Separate software management fee will not be charged as it is included the annual software fee above (Line 1).

Extended Description:

Managing the cloud-based software/platform-Year 4

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
24	Test Kits and Sample Analysis-Year 4	2000.0000	KIT	27.000000	54000.00

Comm Code	Manufacturer	Specification	Model #
60104202			

Commodity Line Comments: Price is for 120Water single bottle (250ml) kit and includes the kit, logistics, and analysis (Microban Lab).
Delivery days are based upon delivery per facility after plan has been submitted and approved

Extended Description:

Provide Test Kits and Sample Analysis - Year 4

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
25	Training-Year 4	300.00000	HOUR	75.000000	22500.00

Comm Code	Manufacturer	Specification	Model #
60104202			

Commodity Line Comments: Hourly rate. Program services details provided in attached response document.
Delivery days are based upon once a cohort is established, the time it would take to organize, schedule, and execute the training per cohort.

Extended Description:

Provide training -Year 4

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
26	Consultation and Remediation Services-Year 4	300.00000	HOUR	75.000000	22500.00

Comm Code	Manufacturer	Specification	Model #
60104202			

Commodity Line Comments: Hourly rate. Program services details provided in attached response document.
Delivery days are based upon the average time expected to consult with and provide plans to individual facilities (ie to deliver a remediation plan after realizing an exceedance)

Extended Description:

Provide consultation and remediation services-Year 4

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
27	Fixture Replacement Drinking Fountain -Year 4	10.00000	EA	639.950000	6399.50

Comm Code	Manufacturer	Specification	Model #
60104202			

Commodity Line Comments: This is a single unit drinking fountain (model LZS8L) from market leader Elkay
Free Shipping and Handling.
Delivery days are based upon average time to evaluate, schedule, and deliver product for installation

Extended Description:

Fixture replacement Drinking Fountain -Year 4

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
28	Fixture Replacement Bottle Filling-Year 4	10.00000	EA	1295.950000	12959.50

Comm Code	Manufacturer	Specification	Model #
60104202			

Commodity Line Comments: This is a single water filling station (model LZS8WSSSMC) from market leader Elkay.
Free Shipping and Handling.
Delivery days are based upon average time to evaluate, schedule, and deliver product for installation

Extended Description:

Fixture replacement Bottle Filling-Year 4

Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Centralized Request for Quote
Public Safety

Proc Folder: 1486277			**Reason for Modification:**
Doc Description: LEAD TESTING IN SCHOOL DRINKING WATER			ADDENDUM 3 TO CORRECT COMMODITY LINE 4 EXTENDED DESCRIPTION
Proc Type: Central Master Agreement			
Date Issued	**Solicitation Closes**	**Solicitation No**	**Version**
2025-04-04	2025-04-08 13:30	CRFQ 0506 EHS2500000001	4

BID RECEIVING LOCATION

BID CLERK
DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
2019 WASHINGTON ST E
CHARLESTON WV 25305
US

VENDOR

Vendor Customer Code: VS0000036770
Vendor Name : 120Water, Inc.
Address : 250
Street : S. Elm Street
City : Zionsville
State : IN **Country :** United States **Zip :** 46077
Principal Contact : Paul Schuler
Vendor Contact Phone: 317.501.3188 **Extension:**

FOR INFORMATION CONTACT THE BUYER
Crystal G Hustead
(304) 558-2402
crystal.g.hustead@wv.gov

Vendor Signature X Craig Herman **FEIN#** 93-4964685 **DATE** 04/07/2025

All offers subject to all terms and conditions contained in this solicitation

ADDITIONAL INFORMATION
THE STATE OF WEST VIRGINIA PURCHASING DIVISION FOR THE AGENCY, WEST VIRGINIA DEPARTMENT OF HEALTH, IS SOLICITING BIDS TO ESTABLISH AN OPEN-END CONTRACT FOR TESTING AND REMEDIATION FOR LEAD CONTAMINATION IN DRINKING WATER AT SCHOOLS AND CHILDCARE PROGRAMS PER THE ATTACHED DOCUMENTS. ***QUESTIONS REGARDING THE SOLICITATION MUST BE SUBMITTED IN WRITING TO CRYSTAL.G.HUSTEAD@WV.GOV PRIOR TO THE QUESTION PERIOD DEADLINE CONTAINED IN THE INSTRUCTIONS TO VENDORS SUBMITTING BIDS***

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
1	Cloud-based Software/Platform				

Comm Code	Manufacturer	Specification	Model #
81162000			

Extended Description:
Contractor to provide cloud-based software/platform

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
2	Managing Cloud-based Software/Platform				

Comm Code	Manufacturer	Specification	Model #
81162000			

Extended Description:
Managing the cloud-based software/platform

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
3	Test Kits and Sample Analysis	2000.00000	KIT		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide Test Kits and Sample Analysis

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
4	Training	300.00000	HOUR		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Training

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
5	Consultation and Remediation Services	300.00000	HOUR		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide consultation, and remediation services

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
6	Fixture Replacement Drinking Fountain	10.00000	EA		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Fixture replacement on eligible facilities drinking fountain

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
7	Fixture Replacement Bottle Filling	10.00000	EA		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Fixture replacement on eligible facilities bottle filling

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
8	Cloud-based Software/Platform-Year 2				

Comm Code	Manufacturer	Specification	Model #
81162000			

Extended Description:
Contractor to provide cloud-based software/platform-Year 2

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
9	Managing Cloud-based Software/Platform-Year 2				

Comm Code	Manufacturer	Specification	Model #
81162000			

Extended Description:
Managing the cloud-based software/platform-Year 2

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
10	Test Kits and Sample Analysis-Year 2	2000.00000	KIT		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide Test Kits and Sample Analysis-Year 2

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
11	Training-Year 2	300.00000	HOUR		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide training-Year 2

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
12	Consultation and Remediation Services-Year 2	300.00000	HOUR		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide consultation, and remediation services-Year 2

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
13	Fixture Replacement Drinking Fountain-Year 2	10.00000	EA		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Fixture replacement Drinking Fountain-Year 2

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
14	Fixture Replacement Bottle Filling-Year 2	10.00000	EA		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Fixture replacement Bottle Filling - Year 2

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
15	Cloud-based Software/Platform-Year 3				

Comm Code	Manufacturer	Specification	Model #
81162000			

Extended Description:
Contractor to provide cloud-based software/platform-Year 3

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
16	Managing Cloud-based Software/Platform-Year 3				

Comm Code	Manufacturer	Specification	Model #
81162000			

Extended Description:
Managing the cloud-based software/platform-Year 3

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
17	Test Kits and Sample Analysis-Year 3	2000.00000	KIT		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide Test Kits and Sample Analysis-Year 3

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
18	Training-Year 3	300.00000	HOUR		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide training-Year 3

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
19	Consultation and Remediation Services-Year 3	300.00000	HOUR		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide consultation and remediation services-Year 3

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
20	Fixture Replacement Drinking Fountain-Year 3	10.00000	EA		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Fixture replacement drinking fountain-Year 3

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
21	Fixture Replacement Bottle Filling - Year 3	10.00000	EA		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Fixture replacement bottle filling-Year 3

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
22	Cloud-based Software/Platform-Year 4				

Comm Code	Manufacturer	Specification	Model #
81162000			

Extended Description:
Contractor to provide cloud-based software/platform-Year 4

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
23	Managing Cloud-based Software/Platform-Year 4				

Comm Code	Manufacturer	Specification	Model #
81162000			

Extended Description:
Managing the cloud-based software/platform-Year 4

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
24	Test Kits and Sample Analysis-Year 4	2000.00000	KIT		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide Test Kits and Sample Analysis - Year 4

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
25	Training-Year 4	300.00000	HOUR		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide training -Year 4

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
26	Consultation and Remediation Services-Year 4	300.00000	HOUR		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide consultation and remediation services-Year 4

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
27	Fixture Replacement Drinking Fountain -Year 4	10.00000	EA		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Fixture replacement Drinking Fountain -Year 4

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
28	Fixture Replacement Bottle Filling-Year 4	10.00000	EA		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Fixture replacement Bottle Filling-Year 4

SCHEDULE OF EVENTS

Line	Event	Event Date
1	VENDOR QUESTION DEADLINE	2025-03-17

SOLICITATION NUMBER: CRFQ EHS2500000001
Addendum Number: 3

The purpose of this addendum is to modify the solicitation to reflect the change(s) identified and described below.

Applicable Addendum Category:

[ ] Modify bid opening date and time

[ ] Modify specifications of product or service being sought

[ ] Attachment of vendor questions and responses

[ ] Attachment of pre-bid sign-in sheet

[X] Correction of error

[ ] Other

Description of Modification to Solicitation:

1. **To correct the extended description on Commodity Line 4**

   No other changes

Additional Documentation: Documentation related to this Addendum (if any) has been included herewith as Attachment A and is specifically incorporated herein by reference.

Terms and Conditions:

1. All provisions of the Solicitation and other addenda not modified herein shall remain in full force and effect.

2. Vendor should acknowledge receipt of all addenda issued for this Solicitation by completing an Addendum Acknowledgment, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.: CRFQ EHS2500000001

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:
(Check the box next to each addendum received)

[✓]	Addendum No. 1	[ ]	Addendum No. 6
[✓]	Addendum No. 2	[ ]	Addendum No. 7
[✓]	Addendum No. 3	[ ]	Addendum No. 8
[ ]	Addendum No. 4	[ ]	Addendum No. 9
[ ]	Addendum No. 5	[ ]	Addendum No. 10

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

120Water, Inc.

Company

Craig Herman

Authorized Signature

04/07/2025

Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 4/4/2025

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME: Paulina Lipinski
Alliant Insurance Services, Inc. 125 High St. Ste. 2205 Boston MA 02110	PHONE (A/C, No, Ext): FAX (A/C, No):
License#: 0C36861	E-MAIL ADDRESS: Paulina.Lipinski@alliant.com

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A : Homeland Insurance Company of	34452
INSURER B : Cincinnati Insurance Company	10677
INSURER C :	
INSURER D :	
INSURER E :	
INSURER F :	

INSURED
120 Water, Inc.
P.O. Box 604
Zionsville IN 46077-0604

COVERAGES **CERTIFICATE NUMBER:** 1578332690 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X **COMMERCIAL GENERAL LIABILITY** [ ] CLAIMS-MADE [X] OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: [ ] POLICY [X] PRO-JECT [ ] LOC [ ] OTHER:			793-01-34-30-0000	7/7/2024	6/7/2025	EACH OCCURRENCE	$ 1,000,000
							DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 100,000
							MED EXP (Any one person)	$ 10,000
							PERSONAL & ADV INJURY	$ 1,000,000
							GENERAL AGGREGATE	$ 2,000,000
							PRODUCTS - COMP/OP AGG	$ 2,000,000
								$
B	**AUTOMOBILE LIABILITY** [ ] ANY AUTO [ ] OWNED AUTOS ONLY [ ] SCHEDULED AUTOS [X] HIRED AUTOS ONLY [X] NON-OWNED AUTOS ONLY			EBA 049 99 15	6/7/2024	6/7/2025	COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
							BODILY INJURY (Per person)	$
							BODILY INJURY (Per accident)	$
							PROPERTY DAMAGE (Per accident)	$
								$
	[ ] **UMBRELLA LIAB** [ ] OCCUR [ ] **EXCESS LIAB** [ ] CLAIMS-MADE [ ] DED [ ] RETENTION $						EACH OCCURRENCE	$
							AGGREGATE	$
								$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y / N ANYPROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? [ ] **(Mandatory in NH)** If yes, describe under DESCRIPTION OF OPERATIONS below	N / A					[ ] PER STATUTE [ ] OTH-ER	
							E.L. EACH ACCIDENT	$
							E.L. DISEASE - EA EMPLOYEE	$
							E.L. DISEASE - POLICY LIMIT	$

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

CERTIFICATE HOLDER

Evidence of Insurance

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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Quality Assurance Project Plan
for
West Virginia DHHR Lead Sampling Program for Schools & Child Care Facilities

Water Infrastructure Improvements for the Nation Act Grant

Prepared by:

120Water
250 South Elm St.
Zionsville, IN 46077

Prepared for:

US EPA Region 3
1650 Arch St.
Philadelphia, PA 19103-2029

February 1, 2024

Approval Signatures:

_____ Date: _____
WV DHHR Project Sponsor

_____ Date: _____
WV DHHR Project Manager

Aija Putelis _____ Date: 2/1/2024
120Water Practice Lead

_____ Date: _____
EPA Project Manager/Officer

_____ Date: _____
EPA QA Manager/Representative

_____ Date: _____
Laboratory QA Manager

List of Abbreviations

3T's - 3Ts for Reducing Lead in Drinking Water in Schools Report
COC – Chain of Custody
DL – Detection limit
EDD – Electronic Data Delivery
EPA – United States Environmental Protection Agency
WV DHHS – West Virginia Department of Health and Human Resources
LSP - Lead Sampling Program for Schools and Child Care Facilities
ppb – Parts per billion
PPE – Personal Protection Equipment
QA – Quality Assurance
QAPP – Quality Assurance Project Plan
QC – Quality Control
QL – Quantification limit
S.U. – Standard Unit
WIIN - Water Infrastructure Improvements for the Nation Act
WRIPP – Water Resources and Infrastructure Planning Program

Table of Contents

4.0 PROJECT MANAGEMENT

This Quality Assurance Project Plan ("QAPP") has been prepared for West Virginia's Lead Sampling Program for Schools and Child Care Facilities ("LSP"). This sampling project adds to West Virginia's efforts to safeguard the health of its children by sampling for the presence of lead in drinking water at schools and child care facilities and schools ("Facilities"). This section of the QAPP describes how the project will be managed, organized, and implemented.

1.1 Title and Approval Page – See Page 1

1.2 Table of Contents- see Pages 3-6

1.3 Distribution List

The following is a list of organizations and persons who will receive copies of the approved QAPP and any subsequent revisions:

WV DHHR
350 Capitol St.
Charleston, WV 25301

Meredith Vance
Program Sponsor
meredith.j.vance@wv.gov

Dan Mace
Project Manager
Dan.J.Mace@wv.gov

Kimberly Bayne
Billing Contact/Project Support
Kimberly.A.Bayne@wv.gov

EPA Region 3
1650 Arch St.
Philadelphia, PA 19103-2029

Ruby Stanmyer
Drinking Water Project Officer
Stanmyer.Ruby@epa.gov

Linden Alexander
alexander.linden@epa.gov

Dennis O'Connor
oconnor.dennis@epa.gov

120Water
250 S Elm St
Zionsville, IN 46077

Aija Putelis
Practice Lead - Lead in Facilities Sampling
aija.putelis@120water.com

Brianna Devin
Program Consultant
brianna.devin@120water.com

Brianna Devin
Remediation Technician
brianna.devin@120water.com

Microbac – Marietta, OH
158 Starlite Dr.
Marietta, OH 45750

Robert Ramnarine
Quality Manager
Robert.Ramnarine@microbac.com

West Virginia Rural Water Association
100 Young Street
Scott Depot, WV 25560

Todd Grinstead
Executive Director
toddgrinstead@wvrwa.org

1.4 Project Organization

The West Virginia Department of Health and Human Resources ("WV DHHR") is West Virginia's designated administrator for the Lead Testing in School and Child Care Program Drinking Water Grant Program as authorized by Section 2107 of the Water Infrastructure Improvements for the Nation Act ("WIIN Act"). The participating agency is the U.S. Environmental Protection Agency, Region 3

("EPA"). 120Water is a technology company that will coordinate laboratory testing, provide technical assistance, and host sampling data in an online database.

The roles and responsibilities of those involved in this program are listed below.

1.4.1 WV DHHR Project Sponsor

The WV DHHR Project Sponsor will be responsible for implementation of the LSP. They will task contractors with the work required to complete the project. They will oversee the entire project and ensure completion.

1.4.1 WV DHHR Project Manager

The WV DHHR Project Manager will act as the DHHR's point of contact for the LSP. They will assist the Project Sponsor in tasking contractors with the work required to complete this project. They will be responsible for the day-to-day tasks needed to keep the project on schedule.

1.4.2 WV DHHR Project Support

The WV DHHR Project Support will assist the Project Sponsor and Project Manager in tasking contractors with the work required to complete this project.

1.4.3 120Water Practice Lead

The 120Water Practice Lead will have responsibility for assigning appropriate trained personnel to complete the tasks contracted to 120Water in this plan. They will ensure that responsible parties adhere to sampling and remediation assistance protocol. They will communicate with the Project Manager on work accomplished in this plan and any problems or deviations that need to be resolved within 120Water's work plan. They will be responsible for assigning appropriate laboratory staff to perform the analyses specified in this plan. The 120Water Practice Lead will also be responsible for maintaining the QAPP and distributing revisions to the aforementioned distribution list.

1.4.4 120Water Program Consultant

The 120Water Program Consultant will collaborate with Facility staff over the course of the program to manage and review Facility sample designs, samples received, and other Facility requests related to the program. The 120Water Program Consultant will also be responsible for training Facility staff on both sample plan creation, sample collection procedures, and utilization of the broader 120Water software platform.

1.4.5 120Water Remediation Technician

The 120Water Remediation Technician will have a background in engineering and water quality management. They will assess lab results and infrastructure data, make remediation recommendations, and support Facilities in selecting and implementing remediation strategies.

1.4.6 Facility Partner

The Facility Partner will be responsible for providing information and decision-making for the Facility during this program. They will enroll the Facility in the program, undergo lead sampling training, design a sampling plan and map, collect samples, determine and conduct remediation steps (if any), and communicate findings with stakeholders.

1.4.8 Laboratory Partner

The Laboratory Partner, Microbac – Marietta, OH, will provide sample analysis and internal Quality Assurance ("QA") and Quality Control ("QC") for all analytical data it generates. Microbac – Marietta, OH will designate a Laboratory QA Manager to ensure all samples are testing in accordance with this QAPP.

1.4.9 Field Services Partner

The Field Services Partner will be responsible for designing a sampling plan and map as well as collecting samples. These efforts will be accomplished in close coordination with Facility Partner and guidance from 120Water Program Consultant.

See Figure 1-1. Organization Chart

1.5 Background/Problem Definition

Lead is a toxic metal that can be harmful to human health when ingested. Young children under the age of six are particularly sensitive to the effects of lead because their bodies are still undergoing development. Lead can get into drinking water if it is present in the source water or by interaction of the water with plumbing materials containing lead (through corrosion). Common sources of lead in drinking water include solder, fluxes, pipes and pipefittings, fixtures, and sediments. It is possible that different drinking water fixtures in a given building could have dissimilar concentrations of lead.

With the funding appropriated under section 1464(d) of the Safe Drinking Water Act, amended by the Water Infrastructure Improvement for the Nation Act ("WIIN") section 2107, the WV DHHR plans to sample for the presence of lead in drinking water in school and child care facilities. This will include the prioritization of facilities serving young children (ages six and under), underserved and low-income communities, and facilities that are older and more likely to contain lead plumbing.

The WV DHHR is using EPA's 3Ts guidance[1] as a model to: (1) **Communicate** the results and important lead information to the public, parents, and teachers throughout the program; (2) **Train** Facility staff on the risks of lead in drinking water and testing for lead, as well as developing key partnerships to support the program; (3) **Test** using appropriate testing protocols and a certified laboratory; and (4) **Take Action**, including the development of a plan for responding to results of testing conducted and addressing potential elevated lead where necessary.

1.6 Project/Task Description and Schedule

The WV DHHR anticipates available funding will provide sampling at 80 Facilities per annum. The WV DHHR will prioritize Facilities if they: 1) serve children that have a higher percentage of free/reduced lunches and are under the age of 6; 2) are located in buildings that have known lead components; and 3) by the age of the facility.

Once a Facility has been accepted into the program, the Facility Partner will work with the Program Consultant to create a sampling plan. Facility Partners will receive a Testing Kit from 120Water containing all the materials they will need to implement their sampling plan.

The Facility Partner will collect drinking water samples from all drinking water sources, including: water fountains (chilled and non-chilled), food preparation fixtures (located in the cafeteria, kitchen, and home economics classrooms) and other fixtures where children might drink the water. Concession stands and outside water fountains (such as in playgrounds and athletic fields) shall also be sampled. Custodial sinks and outside spigots may be sampled if Facility Partners indicate they are used for drinking water. The Sampling Protocol (Appendix A-1) provides more detail on appropriate sampling locations.

The Facility Partner will collect initial draw samples at all fixtures. Following the collection of all initial draw samples the Facility Partner will collect 30-second flush samples at all fixtures. Microbac – Marietta, OH, which maintains a WV certification for the analysis of lead using EPA drinking water methods, will perform the analysis for lead. The Remediation Technician will review sample results and coordinate with the Facility Partner on appropriate lead remediation actions, if necessary.

For those Facility Partners who do not meet key project schedule milestones (i.e., sample plan submission), the Field Services Partner will be deployed to facilitate and accelerate the creation of sampling plans and collection of samples.

If exceedances are encountered, the Facility Partner will be eligible to leverage unspent funds to support remediation actions as provided in the remediation guidance. Following the complete execution of remediation actions, follow-up initial draw and 30-second flush samples will be recollected from each fixture that had an exceedance to determine the impact of the remediation action.

The LSP schedule is as follows:

Prior to Sample Collection:

July 28, 2022: Submit updated QAPP
August 10, 2022: Receive and review comments on updated QAPP from USEPA
August 12, 2022: Submit Final QAPP
August 24, 2022: Obtain QAPP approval

Program Implementation - Fall 2022 Cohort:
August 01 – 19, 2022: Program enrollment open
August 22 – 31, 2022: Review of applications and selection of facility participants
September 01 – October 14, 2022: Facility training/Creation and submission of sampling plans
October 17 – 28, 2022: Re-engage any facilities that have not yet submitted sampling plans
October 30 – December 16, 2022: For those facilities that still have not submitted sampling plans, deploy field services to facilitate and accelerate creation of sampling plans, sample collection, sample analysis, results distribution, and remediation guidance
October 15 – December 16, 2022: Sampling kit shipment, sample collection, sample analysis, results distribution, and remediation guidance (if applicable)
January 02 – February 03, 2023: Remediation of problem fixtures
February 06 – March 03, 2023: Resampling kit shipment, resample collection, resample analysis, results distribution, and remediation guidance (if applicable)

Program Implementation - Spring 2023 Cohort:
January 02 – 20, 2023: Program enrollment open
January 23 – 31, 2023: Review of applications and selection of facility participants
February 01 – March 17, 2023: Facility training/Creation and submission of sampling plans
March 20 – 31, 2023: Re-engage any facilities that have not yet submitted sampling plans
April 03 – May 26, 2023: For those facilities that still have not submitted sampling plans, deploy field services to facilitate and accelerate creation of sampling plans, sample collection, sample analysis, results distribution, and remediation guidance
March 20 – May 26, 2023: Sampling kit shipment, sample collection, sample analysis, results distribution, and remediation guidance
May 30 – August 30, 2023: Remediation of problem fixtures
September 01 - 29, 2023: Resampling kit shipment, resample collection, resample analysis, results distribution, and remediation guidance (if applicable)

Program Implementation - Spring 2024 Cohort:
January 02 – 20, 2024: Program enrollment open
January 23 – 31, 2024: Review of applications and selection of facility participants
February 01 – March 17, 2024: Facility training/Creation and submission of sampling plans
March 20 – 31, 2024: Re-engage any facilities that have not yet submitted sampling plans
April 03 – May 26, 2024: For those facilities that still have not submitted sampling plans, deploy field services to facilitate and accelerate creation of sampling plans, sample collection, sample analysis, results distribution, and remediation guidance
March 20 – May 26, 2024: Sampling kit shipment, sample collection, sample analysis, results distribution, and remediation guidance

May 30 – August 30, 2024: Remediation of problem fixtures
September 01 - 29, 2024: Resampling kit shipment, resample collection, resample analysis, results distribution, and remediation guidance (if applicable)

The current plan is to run the program through the end of 120Water & WV DHHR's extended contract term, which is September 30, 2024. The program will be re-evaluated in the spring of 2024 with the possibility of an additional term extension. In the event that this term extension is solidified, this QAPP will undergo an annual internal review and will be resubmitted to the EPA if material changes are made.

1.7 Quality Objectives and Criteria for Measurement Data

This section describes the overall objectives and criteria for measurement for the WV DHHR Lead Sampling Program.

1.7.1 Objectives and Project Decisions

The overall objectives for the WV DHHR Lead Sampling Program are twofold:

1. to determine the lead concentration at drinking water fixtures within enrolled West Virginia Facilities; and
2. remediate drinking water fixtures with elevated lead concentration.

Through participation in the WV DHHR Lead Sampling Program, Facility Partners will gain greater awareness of monitoring for the presence of lead in drinking water at their Facility as well as be able to take appropriate, corrective action(s) to remediate the lead concentration.

The LSP will use a drinking water action level of 15 parts per billion ("ppb"), which follows the EPA Lead and Copper Rule.

Decisions to be made with the data include:

- If a drinking water test returns a result for lead equal to or exceeds 15 ppb, then the Remediation Technician will direct the Facility Partner to isolate the source of drinking water by turning off the fixture or providing a barrier to the consumption of the water (i.e. tape and bag). The Remediation Technician will then work with the Facility Partner to suggest remediation activities.

- If a Facility Partner enrolls in the LSP and receives lead sampling data, then they will make the results available to their stakeholders (parents, staff, etc.).

- If a Facility Partner is unable to perform the creation of the sample plan and/or sample collection, then the Field Services Partner will be deployed to support forward progress through the LSP.

- If a drinking water test returns a result for lead equal to or exceeds 15 ppb, then the Facility Partner may be eligible to leverage unspent LSP funds to support realizing the suggested remediation activities.

1.7.2 Action Limits/Levels

This program will follow the action level set by the EPA Lead and Copper Rule of 15 ppb. Remediation actions will be suggested for all fixtures whose sample results–whether initial draw or 30–second flush–indicate a result of 15 ppb or greater.

Table 1-1 proves the parameter to be sampled (lead) and its associated Project Action Limit ("PAL"). This information demonstrates that the analytical methods selected for this project are capable of providing data with quantification limits ("QLs") which exceed the PAL. In addition, Table 1-1 provides analytical detection limits ("DLs"). Detection Limits are minimum concentrations that can be detected above instrumental background or baseline/signal noise, providing further assurance that the analytical methods are capable of meeting the data needs of the project in terms of sensitivity (see Section 1.7.3.6).

The QL listed is deemed acceptable to meet the project objectives.

1.7.3 Measurement Performance Criteria/Acceptance Criteria

Data generated in this project must be of known and acceptable quality. 120Water has identified Data Quality Indicators (DQIs) for lead sampling parameters. Each DQI has unique assessment criteria. The DQIs include: precision, accuracy/bias, representativeness, comparability, completeness, and sensitivity.

For quantitative assessment of laboratory methodology, Microbac – Marietta, OH's QA manual and analytical SOPs have been reviewed by the LSP project team and the associated laboratory QC (types and frequencies of QC samples and QC acceptance limits) have been determined to be adequate to meet the data quality needs of this project.

1.7.3.1 Precision

Precision is a measure of the ability to reproduce analytical results and is usually assessed by analyzing laboratory duplicates and calculating the relative percent difference of the sample results. The lower the relative percent difference the greater the precision of the laboratory procedures. A Quality Control Sample, which is typically required as an initial demonstration of capability and quarterly thereafter, is a check on laboratory and instrument performance. Duplicate Quality Control Samples must be analyzed within the analytical batch by the testing laboratory as a requirement of this QAPP. This is to access precision where the relative percent difference must be less than or equal to 20%.

1.7.3.2 Bias

Bias is a measure of a systematic or inherent error that can occur in the sample collection, sample handling and/or sample analysis processes. Bias which may occur during sample collection and handling includes brushing the sample bottle against the fixture or placing sample container lids on tables, countertops or other surfaces. Facility Partners will receive thorough training regarding appropriate protocols to reduce bias due to contamination of the water sample from lead sources present in the sampling environment. Microbac – Marietta, OH will use method blanks during sample analysis to quantify bias during the sample analysis process. These protocols emphasize reducing environmental contamination to the maximum extent possible.

1.7.3.3 Representativeness

Representativeness is the ability of a sample to represent the environmental conditions at the time of collection. This DQI will be met qualitatively, by verifying that documented sample collection and analytical methods (including sample handling and chain-of-custody procedures, sample preservation, and sample holding time protocols) were followed.

The procedures identified throughout this QAPP were chosen to optimize the potential for obtaining samples that reflect the true state of the Facility's water quality, within practical limits. In addition, efforts were made in developing the sampling design to ensure samples would be collected which assess the entirety of the facility's plumbing profile. Initial draw samples provide data regarding the presence of lead at a specific fixture. Flush samples provide information on the presence of lead in the plumbing beyond the fixture.

Additionally, sampling plans will be designed to identify all drinking water fixtures in a Facility. Possible sampling locations include: drinking water fountains (bubblers), water coolers, food preparation fixtures and other potential consumption fixtures, such as those in the medical office and teachers' lounge.

1.7.3.4 Comparability

Comparability is the degree to which data can be compared directly to similar studies. This is accomplished by maintaining uniformity with collection procedures, analyses and reporting.

The sampling plan described in this QAPP uses approved analytical methods for lead analysis in drinking water (see Table 2-3). Maintaining uniformity with this plan will allow for statewide comparisons between past and future samples.

Analytical results from the initial draw and follow-up flush samples at the same drinking water fixture will be compared to assist in determining the source of lead contamination. Upon receiving results, the Remediation Technician will suggest remediation measures, if needed, to the Facility Partner.

1.7.3.5 Completeness

In order to satisfy the objective of the project, samples will be collected from drinking water fixtures according to the Sampling Plans submitted by Facility Partners and approved by the Program Manager.

One hundred percent (100%) of collected, valid initial draw samples and flush samples will be analyzed and reported.

1.7.3.6 Sensitivity

Microbac – Marietta, OH must use a reporting limit (RL) less than or equal to 2 ppb for lead in drinking water samples. This RL is lower than the regulatory Practical Quantitation Level ("PQL") for lead of 0.005 mg/L (5 ppb) from 40 CFR141 Subpart I of the National Primary Drinking Water Contaminant Regulations. The reporting limit of 2 ppb, required in this QAPP, is achievable with the EPA approved method listed in Table 2-3 of this QAPP.

See Table 2-4. Quality Control Requirements for Analyses

1.8 Special Training Requirements/Certification

1.8.1 Facility Partners

Facility Partners will receive an online training by 120Water that encompasses:

1) Program Overview and Sample Planning,
2) Sample Collection, Results, Communication, and
3) Exceedance Management, Remediations, Communications & Reporting.

These trainings will adhere to EPA's 3Ts.

1.8.2 Laboratory Personnel

Laboratory personnel from Microbac – Marietta, OH that are analyzing drinking water samples will have successfully completed required demonstrations of capability for the methods used. Microbac – Marietta, OH is certified by West Virginia for the analysis of lead using EPA drinking water methods. These methods are listed in Table 2-3. Microbac's certificate can be found in Appendix B-5.

1.8.3 Field Service Partner

The Field Service Partner will receive an online training by 120Water that encompasses:

1) Program Overview and Sample Planning,
2) Sample Collection, Results, Communication, and

1.9 Documents and Records

This section details the type of records created during the LSP, as well as their delivery and storage.

1.9.1 QAPP Distribution

120Water will act as the point of contact for all QAPP distributions. 120Water will maintain an updated and accurate email contact list and will distribute the amended QAPP to the individuals listed in Section 1.3.

1.9.2 Field Documentation and Records

Records generated during this program include: sampling plans, photographs, sampling maps, and pre-printed forms (such as labels and chain-of-custody forms). All field activities must be conducted according to the SOPs explained in the Sampling Protocol (Appendix A-1). The Program Consultant is responsible for maintaining updated revisions to the SOPs at all times and to distribute updated SOPs to Facility Partners and other program contacts, as needed. All documentation generated by the sampling program will be kept on file by 120Water. Table 1-2 details which partner or partners will store originally created records.

1.9.2.1 Sampling Plans

Sampling plans will be used to determine the number and location of samples in order to guide sampling activities. Facility Partners will create sampling plans using a tool developed by 120Water. In the event that a Facility Partner cannot perform this action by the program milestone, the Field Services Partner will create sampling plans using a tool developed by 120Water in close coordination with the Facility Partner. This tool can be accessed online or through a paper copy provided to the Facility Partner or Field Services Partner. Virtual training will be available to guide the creation of sampling plans. At a minimum, the information to be recorded in a sampling plan for each Facility includes:

- Fixture location
- Fixture description
- Fixture type
- Sample type: initial draw, 30-second flush

1.9.2.2 Photographs

Facility Partners or Field Services Partners will have the option to add digital photographs to the Sampling Plan. These photographs provide an image of the fixture described in the sampling plan in order to assist the Program Consultant when approving the plan. Photographs will also aid Facility Partners during sample collection by clarifying potential sources for errors. Photographs will be stored in 120Water's online data platform.

For each photograph, the following information will be gathered:

- Time, date, and location
- Fixture ID number
- User ID of photographer

1.9.2.3 Sampling Maps

Sampling Maps will show the location of each fixture to be sampled. Facility Partners may create these from scratch or may adapt pre-existing maps (fire route/emergency map, etc.). The Program Consultant will approve and use these maps when evaluating sampling plans. Approved sampling maps will be stored on 120Water's data platform. These maps will contain the following information:

- Date created
- Facility name and ID
- Fixture locations
- Fixture type
- Fixture legend
- Sampling route

1.9.2.4 Sample Bottle Labels

A pre-filled label will be affixed to each sample bottle shipped from 120Water to the facility to be sampled. The sampling plan is the source for all information contained on the labels. The sample labels will have preassigned, identifiable, and unique numbers. At a minimum, each label will include:

- Facility Name
- Facility ID
- Sample ID
- Fixture ID
- Sample Draw Type
- Fixture Type
- Location ID
- Location Description

1.9.2.5 Chain-of-Custody Forms

Facility Partners or Field Services Partners will fill out Chain-of-Custody ("COC") forms during sampling. 120Water will make an electronic COC form available during sampling. A back-up paper copy will also be provided by 120Water in the Testing Kit.

All sample shipments will be accompanied by a COC form. The forms will be completed and sent with each shipment of samples to the laboratory. If multiple Testing Kits are sent to the laboratory on a single day, forms will be completed and sent with the samples for each kit. The

original form will be included with the samples and sent to the laboratory. Digital copies will be held by 120Water on the online data platform.

The COC form will identify the contents of each shipment and maintain the custodial integrity of the samples. Procedures for completion and distribution of the COC forms are detailed in the Sampling Protocol (Appendix A-1).

1.9.3 Laboratory Documentation and Records

Microbac – Marietta, OH will keep a sample receiving log and all completed COC forms submitted with the samples collected for this project. They will also keep records of all analyses performed, as well as associated QC information required by their QA/QC Manual (Appendix B-1):

The data generated by the laboratory for each sampling event will be compiled into individual electronic data delivery packages ("EDD"). EDDs will be sent to 120Water, who will then upload them to the online data platform. The EDD will include the following information:

- Analysis Date & Time
- Analyte Name
- Below Detection Limit Indicator
- Collected By
- Collected Date & Time
- Fixture ID
- Lab Detection Limit
- Lab ID
- Lead Result
- Analysis Method
- Sample ID
- Sample Type
- Unit of Measure

Project team members may request additional information from the laboratory regarding a discussion of problems or unusual events. This may include, but is not limited to, topics such as: receipt of samples in incorrect, broken, or leaking containers, with improperly or incompletely filled out COC forms, receipt and/or analysis of samples after the holding times have expired; summary of QC results exceeding acceptance criteria, etc.

Microbac – Marietta, OH's QC Manager will review all EDDs before delivery to 120Water to ensure the accurate documentation of any deviations from sample preparation, analysis, and/or QA/QC procedures, highlights of any excursions from the QC acceptance limits, and pertinent sample data. Once finalized, the laboratory will send the EDD to 120Water.

Information about the documentation to be provided by Microbac – Marietta, OH is contained in the laboratory's QA Manual (Appendix B-1).

1.9.4 Technical Review and Evaluation

Remediation Technicians will conduct a technical review for all fixtures where the sample results equal or exceed the 15 ppb action level. This technical review does not have a specific format but will be handled in a way that best meets the needs of the Facility.

1.9.5 Quarterly and/or Final Reports

The grant funding the LSP requires quarterly and annual reports to the US EPA Regional Project Officer. The WV DHHR will provide the reporting deliverables as outlined in the grant.

1.0 DATA GENERATION AND ACQUISITION

This section of the QA Program Plan describes how the samples will be collected, shipped, and analyzed.

2.1 Sampling Design (Experimental Design)

All sample design will follow SOPs listed in the Sample Protocol (Appendix A-1). If an SOP is updated or revised, the updated or revised SOP will be used for the subsequent sampling event(s). The WV DHHR will document any revisions or updates or both to the SOPs in an amendment to the QAPP.

Before conducting sampling, each Facility Partner will create a sampling plan and sampling map detailing each source of drinking water in the Facility. See Figure 3-1 for an example of a sampling plan; see Figure 2-1 for an example of a sampling map. Drinking water sources may include water fountains (bubblers), water coolers, kitchen sinks and kettles, outside spigots, and others.

If the Facility Partner does not create a sample plan by the project schedule milestone, the Field Services Partner will be deployed to facilitate and accelerate the creation of the facility's sampling plan and collect samples in service of this sampling plan.

Once samples are collected, the Facility Partner or Field Services Partner will repackage the samples in the Testing Kit and use the return mailing label provided to ship the samples to the laboratory. Then, the laboratory will test the drinking water samples for lead and return the results to 120Water and the Facility Partner.

After receiving the lead test results, the Remediation Technician will review the results with the Facility Partner. If lead sampling results are equal to or greater than the 15 ppb action level, the Remediation Technician will suggest remediation actions the Facility Partner can take to abate drinking water lead exposure. The Facility Partner will make the sampling results available to the public. The Facility Partner will also report whether they implemented any remediation actions to the WV DHHR.

Follow-up testing will be available to determine the impact of remediation efforts. All follow-up testing will occur similarly as described above.

2.2 Sampling Methods

2.2.1 Drinking Water Sampling

All samples will be collected using the SOPs included in the Sampling Protocol (Appendix A-1). If an SOP is updated or revised, the amended SOP will be used for the subsequent sampling event(s). Any revisions/updates to SOPs will be documented in an amendment to the QAPP.

Before sampling begins, the Facility Partner or Field Services Partner must verify water at the Facility had been stagnant between 8 – 18 hours prior to sampling. The Facility Partner or Field Services Partner will collect drinking water samples in pre-cleaned rigid plastic 250 mL bottles. Facility Partners or Field Services Partner will always collect water at a medium rate of speed and only at a cold temperature. The Program Consultant may designate a hot water sample if the Facility Partner or Field Services Partner indicates hot water is used for consumption (kitchen kettle, cooking, etc.).

The Facility Partner or Field Services Partner will verify the bottle label matches the location of the fixture on the sampling map and the fixture description on the sample collection form before collecting water in the sample bottle. Contacts will begin initial draw sampling at the drinking water fixture closest to where water enters the Facility (“entry point”). Initial draw sampling will then proceed towards the drinking water fixture furthest from the entry point. In multistory facilities, sampling will proceed from the lowest floor to the highest. The Facility Partner or Field Services Partner will reduce potential sample contamination by ensuring the bottle’s lip does not touch any other surface. Once all samples have been collected, the Facility Partner or Field Services Partner will place the filled sample bottles back into the Testing Kit.

After all initial draw sampling has been completed, the Facility Partner or Field Services Partner will then proceed with regard to collecting a 30-second flush sample. The Facility Partner or Field Services Partner will verify the bottle label (specifically denoting Sample Type) matches the location of the fixture on the sampling map and the fixture description on the sample collection form before collecting water in the sample bottle. Contacts will begin flush sampling at the drinking water fixture closest to where water enters the Facility (“entry point”). Flush sampling will then proceed towards the drinking water fixture furthest from the entry point. In multistory facilities, sampling will proceed from the lowest floor to the highest. The Facility Partner or Field Services Partner will reduce potential sample contamination by ensuring the bottle’s lip does not touch any other surface. Once all flush samples have been collected, the Facility Partner will place the filled sample bottles back into the Testing Kit.

Using the provided shipping label, the Facility Partner or Field Services Partner will then close the Testing Kit, apply the shipping label on to the Testing Kit, and send the samples to the laboratory. Table 2-3 summarizes the analytical method, containers, preservation technique, and holding time requirements for each analysis.

2.2.2 Field Health and Safety Procedures

Facility Partners are encouraged to follow the health and safety guidelines laid out by their districts or managers inclusive of PPE measures.

2.2.3 Field Variances

As conditions at each Facility vary, it may become necessary to implement minor modifications to the sampling procedures and protocols described in this QAPP. If or when this is necessary, the Facility Partner will notify the Program Consultant to obtain verbal or written approval prior to implementing any changes. The Program Consultant will note this approval in the sampling plan on 120Water's online data platform and communicate this update to the Project Manager.

2.2.4 Disposal of Residual Materials

Various types of potentially contaminated wastes will be generated in the process of collecting water samples for this project. These contaminated wastes may include:

- Used PPE,
- Disposable sampling bottles/containers or equipment
- Excess water collected for sample container filling

The above will be disposed as follows:

- Used personal protective equipment (PPE) and disposable containers/equipment will be double bagged and placed in a municipal refuse dumpster. These wastes are not considered hazardous and can be sent to a municipal landfill. Any used PPE and disposable containers or equipment (even if it appears to be reusable) will be rendered inoperable before disposal in the refuse dumpster.
- Excess water collected for sample container filling will be poured onto the ground or down a drain.

2.2.5 Quality Assurance for Sampling

Documentation of deviations from this QAPP or applicable SOPs is the responsibility of the Facility Partner. The Facility Partner will record deviations noted during sample collection, preapproved by the Program Consultant (see section 2.2.3) or otherwise, in the sampling plan stored on 120Water's online data platform.

2.3 Sample Handling and Custody

This section describes the sample handling and custody procedures from sample collection through transport and laboratory analysis. It also includes procedures for the ultimate disposal of the samples.

2.3.1 Sample Container and Preservatives

The Program Consultant will utilize the Sampling Plan to determine the number of sampling bottles needed at a particular Facility. 120Water will source the correct number and type of sample bottles and deliver them to the facility in a Testing Kit. Additional, blank sampling bottles will be provided to accommodate any fixtures missed during the sampling plan creation process. The sample bottles will be pre-cleaned and require no washing or rinsing by Facility Partner prior to sample collection.

2.3.2 Sample Packaging and Shipping

All sample bottles will arrive and leave from the Facility in the Testing Kit provided by 120Water. A return shipping label will be included with the kit. Once the Facility Partner or Field Services Partner finishes sampling, they will seal the sample bottles in the Testing Kit, seal the box, attach the return label, and send the Testing Kit to the laboratory.

2.3.3 Sample Custody

The Facility Partner or Field Services Partner is responsible for custody of the samples from when they have been collected until they have been shipped to the laboratory. (Note: As few people as possible will handle the samples to ensure sample custody.) The Facility Partner or Field Services Partner must complete the COC form (see Appendix A-2) in the field.

Once at the laboratory, laboratory personnel are then responsible for the care and custody of samples. Microbac – Marietta, OH will track sample custody through their Facility using a separate sample tracking form, as discussed in the laboratory's QA Manual included in Appendix B-1.

One has custody of a sample if:

- The sample is in the sampler's physical possession
- The sample has been in the sampler's physical possession and is within sight of the sampler
- The sample is in a secure/designated area, and/or
- The sample has been in the sampler's possession and has been locked up

2.3.4 Sample Disposal

Following sample analysis, the laboratory will store the unused portions for 30 days. At that time, the laboratory will properly dispose of all the samples. Sample disposal procedures at the laboratory are discussed in the laboratory's QA Manual included in Appendix B-1.

2.4 Analytical Methods

Microbac – Marietta, OH must use the EPA approved drinking water method listed in Table 2-3 for the analysis of lead. The laboratory must be capable of reporting lead to a reporting limit of less than or equal to 2 ppb.

Once samples are acidified with concentrated nitric acid to a pH of less than 2 Standard Unit ("S.U."), the samples must sit for 24 hours, after which the pH measurement is repeated. The pH must be less than 2 S.U. before proceeding with the analysis. If a sample result exceeds 90% of the linear dynamic range, the sample must be diluted and re-analyzed.

The laboratory will summarize the data and deliver it in the EDD format requested by 120Water within ten (10) business days after receiving samples.

2.5 Quality Control Requirements

This section identifies the QC checks that are in place for the sample collection, field measurement, and laboratory analysis activities that will be used to assess the quality of the data generated from this project.

See Table 2-4: Quality Control Requirements for Analyses

2.5.1 Laboratory Analysis Quality Control

QC is the responsibility of the personnel and QA/QC department of Microbac – Marietta, OH. The laboratory's Quality Assurance Manual details the QA/QC procedures it follows (see Appendix B-1). The following elements are part of standard laboratory quality control practices:

- Analysis of laboratory control samples
- Instrument calibration (including initial calibration, calibration blanks, and calibration verification)
- Analysis of matrix spikes
- Analysis of duplicates

The data quality objectives for Microbac – Marietta, OH (including frequency, QC acceptance limits, and corrective actions if the acceptance limits are exceeded) are detailed in their QA Manual (as in Appendix B-1) or in this QAPP. The laboratory must document any excursions from these objectives and report them to the Program Consultant.

The WV DHHR has reviewed the laboratory's control limits and corrective action procedures and feels that these will satisfactorily meet the state's project data quality needs. A summary of this information is

included in Table 2-4. These include laboratory control samples, matrix spikes, and laboratory duplicates.

Laboratory Control Samples - Laboratory control samples (LCS) are laboratory-generated samples analyzed as a normal sample and by the laboratory using normal sample preparation and analytical procedures. An LCS is used to monitor the day-to-day performance (accuracy) of routine analytical methods. An LCS is an aliquot of clean water spiked with the analytes of known concentrations corresponding to the analytical method. LCS are used to verify that the laboratory can perform the analysis on a clean matrix within QC acceptance limits. Results are expressed as percent recovery of the known amount of the spiked analytical parameter.

One LCS is analyzed per sample batch. Acceptance criteria (control limits) for the LCS are defined by the laboratory and summarized in Table 2-4. In general, the LCS acceptance criteria recovery range is 70 to 130 percent of the known amount of the spiked analytical parameter. Corrective action, consisting of a rerunning of all samples in the affected batch, will be performed if LCS recoveries fall outside of control limits. The laboratory will document such problems in their data report.

Matrix Spikes - Matrix spikes (MS) are prepared by adding a known amount of the analyte of interest to a sample. MS are used as a similar function as the LCS, except that the sample matrix is a real-time sample rather than a clean matrix. Results are expressed as percent recovery of the known amount of the spiked analytical parameter. Matrix spikes are used to verify that the laboratory can determine if the matrix is causing either a positive or negative influence on sample results.

One matrix spike is analyzed per sample batch. MS acceptance criteria are defined by the laboratory and summarized in Table 2-4. In general, the MS acceptance criteria recovery range is 70 to 130 percent of the known amount of the spiked analytical parameter. Generally, no corrective action is taken for matrix spike results exceeding the control limits, as long as the LCS recoveries are acceptable. However, the matrix effect will be noted in the laboratory report's narrative statement and documented in the tribe's reports for each sampling event.

Laboratory Duplicates - A laboratory duplicate is a laboratory-generated split sample used to document the precision of the analytical method. Results are expressed as relative percent difference between the laboratory duplicate pair.

One laboratory duplicate will be run for each laboratory batch or every 20 samples, whichever is more frequent. Acceptance criteria (control limits) for laboratory duplicates are specified in the laboratory QA Manual and SOPs and are summarized in Table 2-4. If laboratory duplicates exceed criteria, the corrective action will be to repeat the analyses. If results remain unacceptable, the batch will be rerun.

Specific information regarding acceptance criteria and corrective actions is documented in the Laboratory's SOPs for the approved drinking water method(s) used for the lead analysis of the drinking water samples. Laboratories may elect to develop an SOP specific for the analysis of lead in drinking water for samples collected in West Virginia Facilities that contain the requirements of this QAPP.

If any sample result(s) is qualified, this must be clearly indicated on the Electronic Data Deliverable ("EDD"). The Program Consultant must be consulted in order to determine how to address the qualified results.

2.6 Instrument/Equipment Testing, Inspection, and Maintenance

2.6.1 Field measurement Instruments/Equipment

No field instruments are anticipated for this project.

2.6.2 Laboratory Analysis Instruments/Equipment (Off-Site)

Inspection and maintenance of laboratory equipment is the responsibility of Microbac – Marietta, OH. All laboratory equipment will be tested, calibrated, and maintained in accordance with existing SOPs approved by the laboratory and described in their QA manual (Appendix B-1).

2.7 Instrument/Equipment Calibration and Frequency

2.7.1 Laboratory Analysis Instruments/Equipment

Laboratory instruments will be calibrated according to the appropriate analytical methods. The EPA approved analytical methods for lead listed in the National Primary Drinking Water Contaminant Regulations at 40 CFR 141.23 and Appendix A to Subpart C require that the instrument calibration be performed on a daily basis.

2.8 Inspection/Acceptance Requirements for Supplies and Consumables

2.8.1 Field Sampling Supplies and Consumables

120Water will ship Testing Kits to the Facilities before the day of sampling. Testing Kits contain:

Shipping container: Cardboard box holding up to 30 sample bottles. Box is organized with individual compartments for each sample bottle, which provides a sequenced manner for sample collection.

Sample Bottle: Sampling bottles are unpreserved, certified 250 ml wide-mouth plastic bottles. Facility Partners will inspect bottles for cracks, dents, or other damage. 120Water will replace any damaged bottles.

Bottle Label: Includes the following information:

- Facility Name
- Facility ID
- Sample ID

- Fixture ID
- Sample Draw Type
- Fixture Type
- Location ID
- Location Description

Sampling Instructions: Describes steps to collect samples. See Appendix A-1.

Paper Chain of Custody form (Appendix A-2) includes:

- Facility Name, Facility ID, Building Name
- Sample Collector Name, Phone Number, Email Address, Signature
- Date and Time Water Last Used
- Sample Collection Date
- Sample ID, Fixture Code, Sample Type, Location Description, Fixture type, Time Sample Collected, Notes

Return shipping label: Returns shipping container directly to laboratory

2.8.2 Laboratory Analyses (Off-Site) Supplies and Consumables

The laboratory's requirements for supplies and consumables are described in their QA Manual, which is provided in Appendix B-1.

2.9 Data Acquisition Requirements (Non-Direct Measurements)

Facility Partners may choose to use pre existing Facility maps to create sampling maps.

2.10 Data Management

All data collected by the LSP will be maintained in an electronic database. The laboratory will send results via EDD to 120Water. 120Water will email results to the facilities and upload results to the online data platform.

3.0 ASSESSMENT AND OVERSIGHT

This section describes how activities will be checked to ensure that they are completed correctly and according to procedures outlined in this QA Project Plan.

3.1 Assessments/Oversight and Response Actions

The Project Manager and Program Consultant will assess any problem that arises in the field. If necessary, modifications to technical procedures may be considered. Any changes in technical procedures will be reported by the Facility Partner or Field Services Partner to the Project Manager and evaluated to determine if there will be any impact to the data.

Laboratory personnel will perform self-audits and institute corrective actions in accordance with their respective written procedures.

3.2 Reports to Management

The Program Consultant will provide biweekly program management updates to the Project Manager and Project Sponsor. At a minimum, the Program Consultant will provide a verbal report on:

- The number of facilities enrolled in each step of the program
- The total number of samples completed
- Program implementation successes and challenges
- Other issues, as deemed necessary by the Project Manager or Project Sponsor

Additional, less formal internal reports may take place throughout the program (see 1.9.2 - 1.9.4).

4.0 DATA REVIEW AND USABILITY

This section describes the criteria and procedures for reviewing and interpreting the project's data.

4.1 Data Review, Verification, and Validation Requirements

Setting data review, verification, and validation requirements helps to ensure that project data are evaluated in an objective and consistent manner. For the current project, such requirements have been defined for information gathered and documented as part of field sampling activities, as well as for data generated by the off-site laboratory.

4.1.1 Field Sampling Data

Any information collected or generated during sample collection is considered field data. This includes sampling plans, sampling maps, photographs, chain of custody forms, and any other documented information created during field sampling. This data is created either by the Facility Partner or the Field Services Partner.

Following field sampling, the Program Consultant will conduct a technical review of the field data to ensure that all information is complete and was collected in accordance with the Sampling Protocol SOPs (Appendix A-1).

4.1.2 Laboratory Data

Microbac – Marietta, OH is responsible for their own internal data review and verification before submitting the associated data results package to 120Water. The details of the laboratory's review are discussed in the QA Manual (Appendix B-1).

If the laboratory "flags" any sample results based on poor or dubious data quality, the Program Consultant will coordinate resampling of that sample. The Program Consultant will also evaluate whether trends of flagged data develop which could be traced back to incorrect field sampling techniques. The Program Consultant will have the authority to suggest new training techniques for the Facility Partners or Field Services Partner in order to improve sample collection. Any changes will be incorporated into the Sampling Protocol (Appendix A-1) and this QAPP, as necessary.

4.1.3 Remediation Data

Any information noted or generated that relates to action(s) that correspond with a fixture that had an elevated lead concentration is considered remediation data. This includes immediate response, short-term control measures, and permanent control measures. This data is created either by the Facility Partner or a contractor hired by the Facility Partner to perform the work on their behalf.

4.2 Verification and Validation Methods

Defining the data verification and validation methods helps to ensure that project data are evaluated in an objective and consistent manner.

4.2.1 Field Data

The Program Consultant will review field data in accordance with the discussion provided in section 4.1.1.

4.2.2 Laboratory Data

Data review of all laboratory-generated data is performed by the Laboratory QA Manager. It is the responsibility of the QA Manager to ensure that all data generated are correct and of known and documented quality. Once the review is completed, the QA Manager will sign and date the appropriate QA/QC checklist according to the Laboratory's SOP utilized for the analysis for lead in the drinking water samples.

The Program Consultant and Facility Partner will review the EDD report and identify any limitations on the use of the data. Any limitations on the use of data will be noted in the 120Water software.

4.2.3 Remediation Data

The Program Consultant will liaise with the Facility Partner on a recurring basis to gather information on the status of the suggested remediation action(s). Similarly, the Facility Partner can themselves provide this information through the 120Water platform. When appropriate, additional documentation (e.g., invoice/ work order) will be provided by the Facility Partner to corroborate the remediation action(s), especially when these action(s) are supported by unspent LSP funds.

4.3 Reconciliation with User Requirements

The purpose of the Lead Sampling Program for Schools and Child Care Facilities is to assess the presence of lead in drinking water at West Virginia Facilities as well as support remediation actions for drinking water fixtures with elevated lead concentration. Data collected must fulfill the requirements of this QAPP to be useful for the overall program. This section describes the steps to be taken to ensure data usability (after all the data have been assembled, reviewed, verified, and validated) prior to providing any remediation suggestions.

Once all the data from the field and laboratory have been evaluated (as described in Sections 4.1 and 4.2), the Program Consultant will make an overall assessment concerning the final usability of the data in meeting the project's needs. The initial steps of this assessment will include, but not necessarily be limited to:

- Review of deviations from the QAPP or associated SOPs
- Review for completeness of EDD
- Evaluation of result accuracy given known context (does the data make sense or are their unexpected outliers)

Additionally, the Program Consultant and Project Manager will regularly assess the effectiveness of the sampling program and data collection. Sampling SOPs, trainings, and assessments will be modified as needed to reflect the changing needs and project objectives of the LSP. This QAPP will be revised and amended or both accordingly.

5.0 REFERENCES

1. 3Ts for Reducing Lead in Drinking Water Toolkit. Environmental Protection Agency. https://www.epa.gov/ground-water-and-drinking-water/3ts-reducing-lead-drinking-water-toolkit

FIGURES:

Figure 1-1. Organization Chart

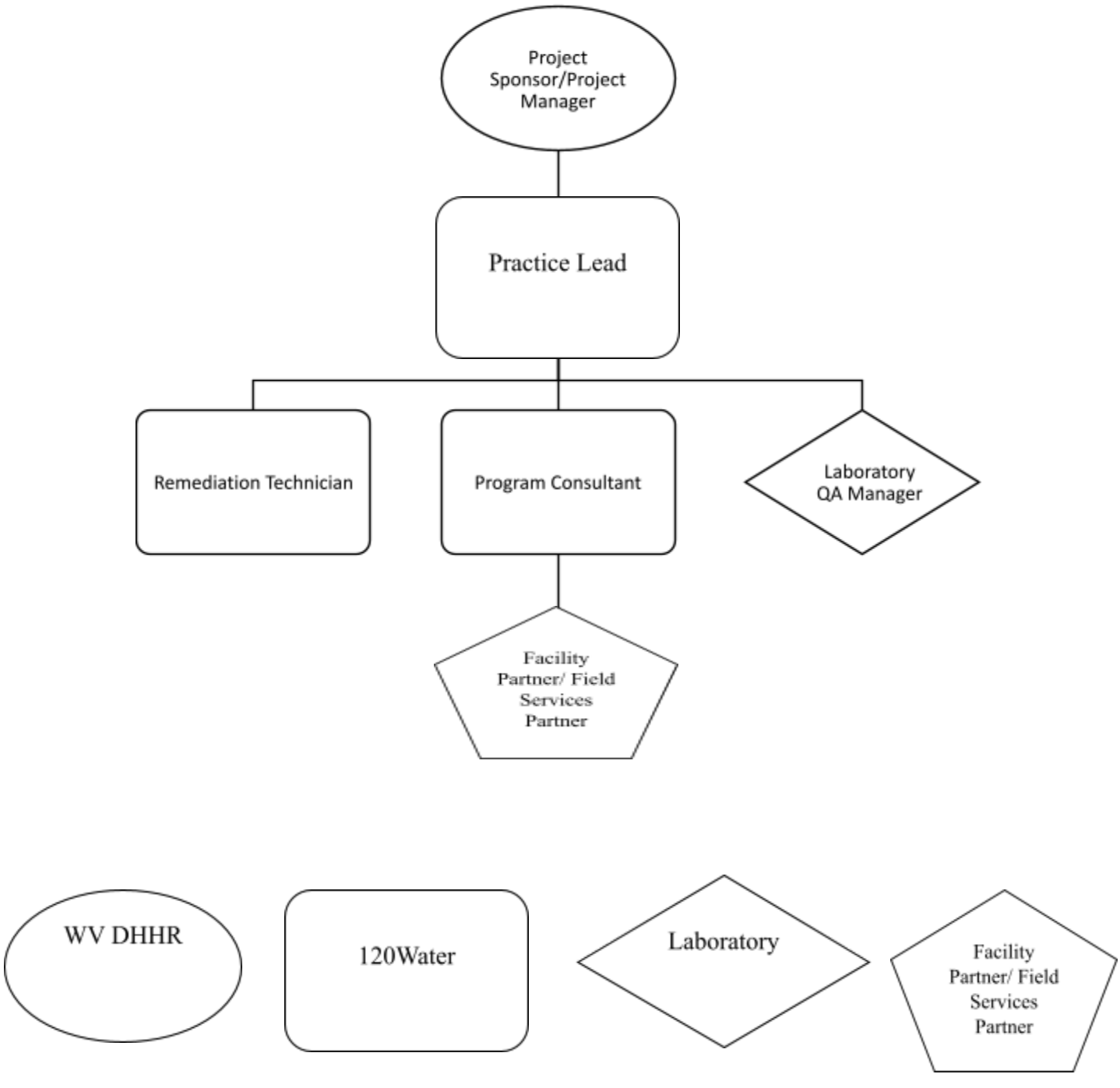


Figure 2-1. Example Sampling Map with Fixture Locations

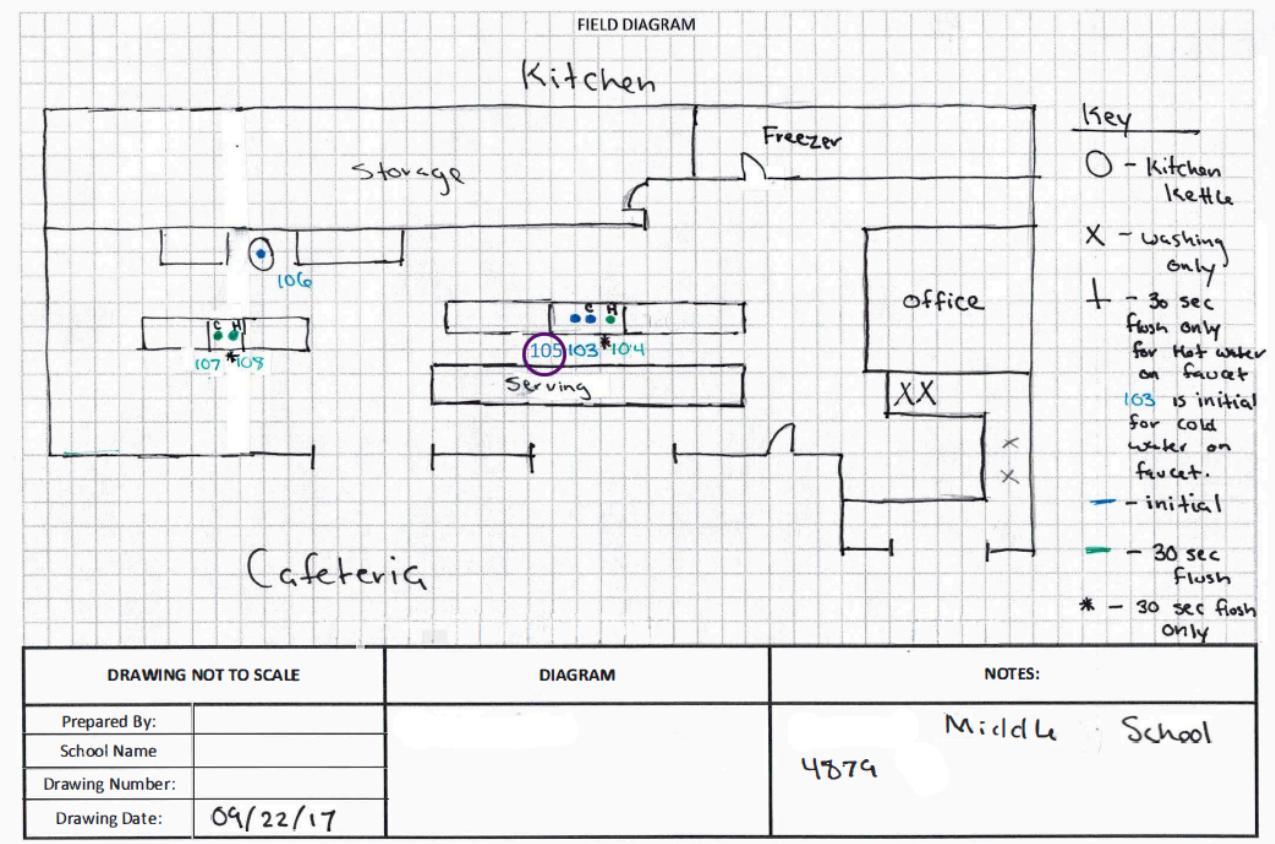
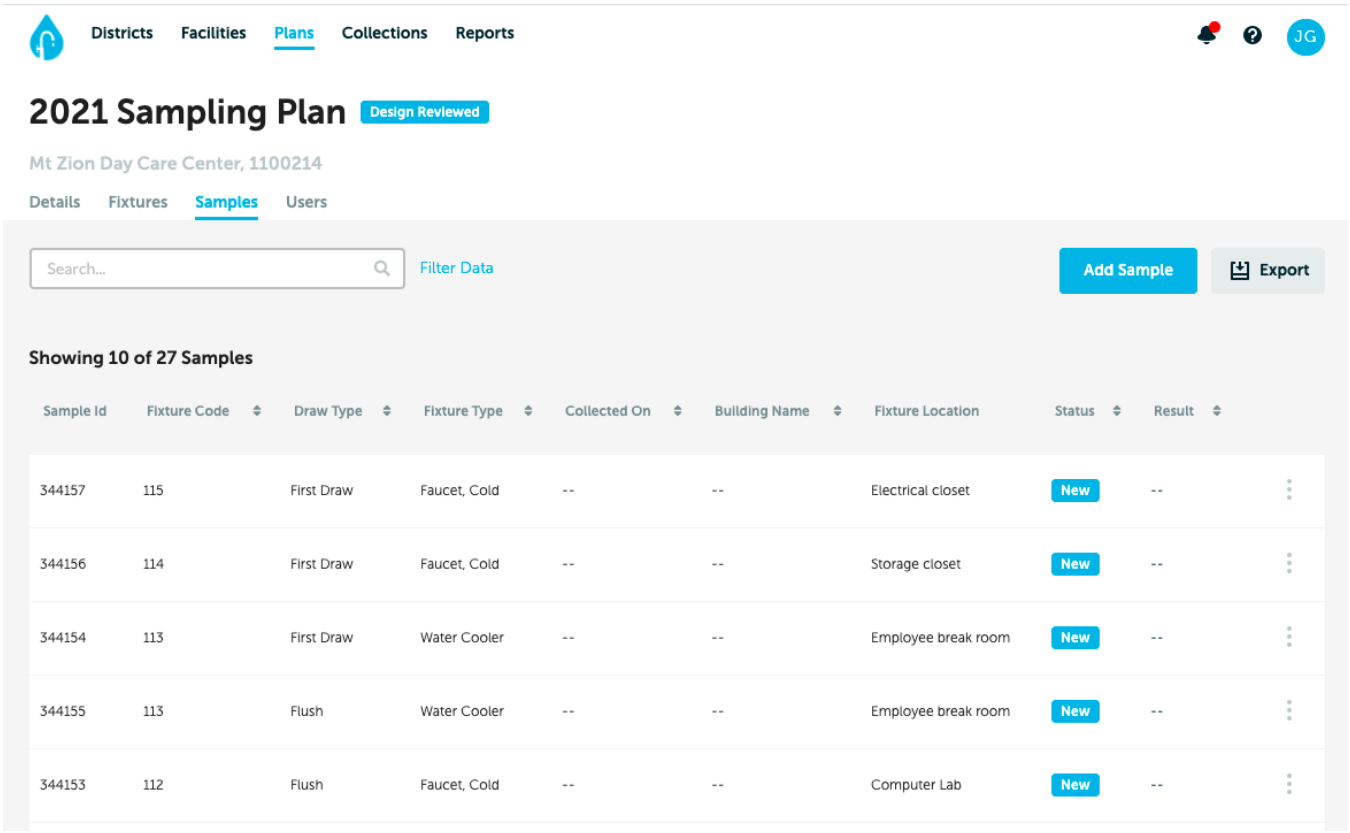


Figure 3-1. Example Sampling Plan



TABLES:

Table 1-1. Analytical Parameters and Target Limits

Analytical Parameters and Target Limits Matrix/Media:			
Analytical Parameter	Project Action Limit/Level (ppb)	Laboratory Limits[1] (ppb)	
		Quantitation Limits	Detection Limits (if appropriate)
Lead (Pb)	15 ppb	1.0 ppb	0.5 ppb

[1] Laboratory quantitation limits and detection limits are those that an individual laboratory or organization is able to achieve for a given analysis on a routine basis.

Quantitation limits are the minimum concentrations that can be identified and quantified above the detection limit within some known limits of precision and accuracy/bias. It is recommended that the quantitation limit is supported by the analysis of a standard of equivalent concentration (typically, the lowest calibration standard).

Detection limits are the minimum concentration that can be detected above background or baseline/signal noise of an instrument.

Table 1-2 Document Creation and Storage

Original documents (X) will be stored as follows:

Document:	Facility Partner	Remediation Tech	Program Consultant	Project Sponsor/Project Manager	Laboratory Partner
QAPP	Copy	Copy	Copy	X	Copy
Sampling Protocol	Copy	Copy	Copy	X	Copy
Laboratory QA Manual	n/a	Copy	Copy	Copy	X
Sampling Map	X	Copy	Copy	Copy	n/a
Sampling Plan	Copy	Copy	X	Copy	n/a
Sample Bottle Labels	n/a	Copy	X	n/a	Copy
Photographs	X	Copy	Copy	Copy	n/a
Chain of Custody	Copy	Copy	Copy	Copy	X
Training Documents	Copy	Copy	X	Copy	n/a
Laboratory Electronic Data Delivery	Copy	Copy	Copy	Copy	X
Results Email	X	Copy	Copy	Copy	n/a
Remediation Recommendations	Copy	X	Copy	Copy	n/a

Table 2-1. Sampling Design and Rationale

Sampling Design and Rationale				
Fixture Types	Matrix/ Media	Draw Type	Analytical Parameter[1]	Rationale for Sampling Design[2]
Faucets, drinking water coolers, drinking water fountains, kitchen kettles, spigots, bottle fillers, and other	Drinking Water	Initial and 30-second flush	Total Lead, EPA 200.8 ICP-MS	All sources of cooking/drinking water supplied to children in the facility

[1] Analytical parameters include all planned field measurements (e.g., dissolved oxygen, turbidity, pH, etc.), field screening analysis (e.g., PCBs by immunoassay test kit, selected metals by XRF), and laboratory analyses.
[2] Rationale supports the selection of sampling locations and associated analytical parameters.

Table 2-3. Analytical Method, Containers, Preservation, and Holding Times Requirements

Analytical Method, Containers, Preservation, and Holding Times Requirements Matrix/Media:				
Analytical Parameter[1] and/or Field Measurements[2]	Analytical Method Number	Containers (number, size/volume, type)	Preservation Requirements (chemical, temperature, light protection)	Maximum Holding Times[3]
ANALYTICAL PARAMETER:				
Lead	EPA 200.8 for ICP Mass Spectrometry	250 ml rigid plastic wide-mouth bottles	N/A	within 14 days of collection

[1] Analytical parameter includes both field and laboratory analyses.
[2] Field measurement parameters include those parameters measured directly in the field (e.g., dissolved oxygen, turbidity, pH, etc.).
[3] Maximum holding times include all pertinent holding times for each analytical parameter (e.g., from sample collection to sample preparation, from sample preparation to analysis, from sample collection to analysis, etc.) and field measurement (e.g., from sample collection to measurement).

Table 2-4. Quality Control Requirements for Analyses

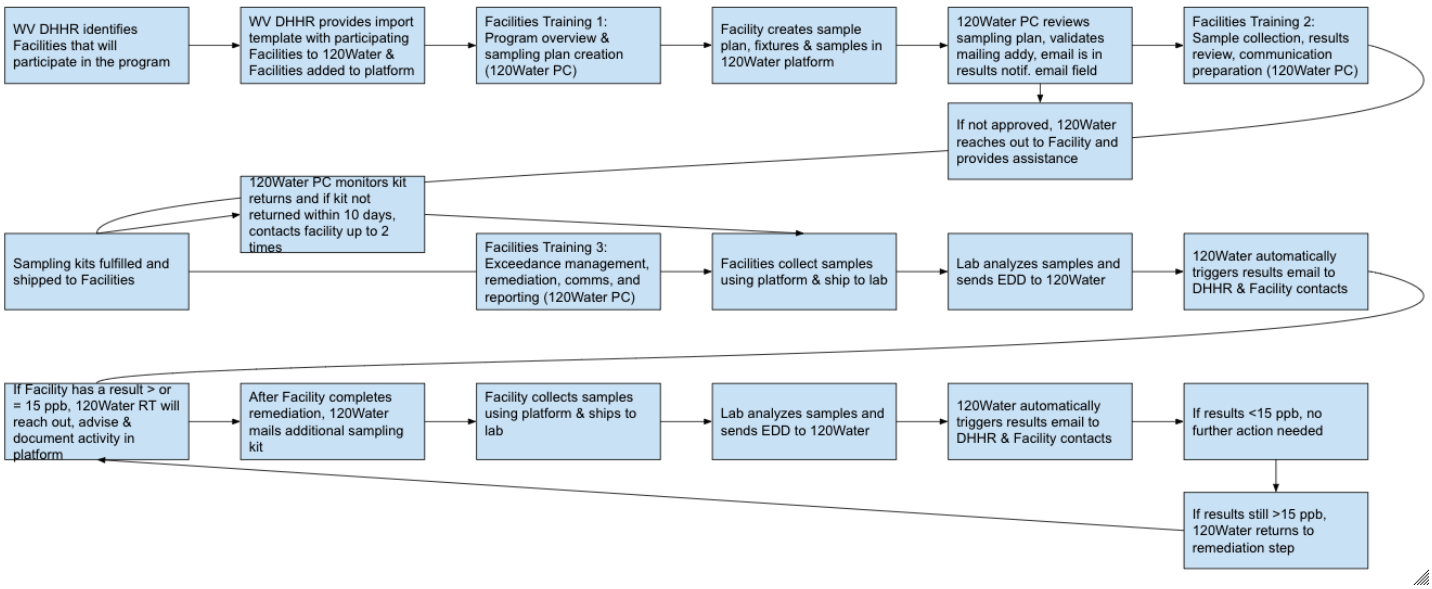
Quality Control Requirements for Analyses (Drinking Water for Analyses of Lead) Analytical Method/SOP: EPA Method 200.8					
QC Sample:	Data Quality Indicator (DQI)	Frequency/ Number	Method/SOP QC Acceptance Limits	Acceptance Criteria/ Measurement Performance Criteria[1]	Corrective Action
LABORATORY ANALYSIS:					
Calibration Verification	**Accuracy**	**1 per 10 samples**	**90-110%**	**90-110%**	**Re-analyze calibration verification, or re-analyze batch**
Method Blank	**Bias**	**1 per batch of up to 20 samples**	**< RL or < MDL x 2.2**	**< 1.0 ppb**	**Re-analyze method blank, or re-analyze batch**
LCS (or Blank Spike - BS)	**Accuracy**	**1 per batch of up to 20 samples**	**85-115%**	**85-115%**	**Re-analyze LCS, or re-analyze batch**
MS	**Bias due to matrix effect**	**1 per 10 samples**	**70-130%**	**70-130%**	**Narrate any matrix effect**
Laboratory Duplicate	**Precision**	**1 per batch of up to 20 samples**	**RPD ≤ 20%**	**RPD ≤ 20%**	**Re-analyze sample and duplicate, or re-analyze batch**

[1] Information supports the acceptance criteria/measurement performance criteria introduced in Section 1.7.3.

APPENDICES

APPENDIX A. Field Documentation

A-1: Sampling Design & Collection Protocol



A-2: Field Data Forms and Chain-of-Custody Documentation

Chain of Custody	**Chain of Custody (CoC) Instructions:** The CoC is an official record that accounts for your water samples and **must** be filled out. You can either collect samples with your 120Water account or by using this form. If you collect samples within your 120Water account, simply fill out section 1 and use return to lab shipping label included in kit and drop kit off at post office. If you use this form to collect samples, fill out both sections 1 and 2, make sure to write down the time you collected each sample and then use return to lab shipping label included in kit and drop kit off at post office. Have questions? Call **800.674.7961** or email **support@120water.com**
Facility Name:	
Facility ID:	
Building Name:	

SECTION 1 MUST BE COMPLETED (even if you collect samples with your 120water.com account)

Sampling Date (MM/DD/YYYY):	**Sample Collector's Email:**
Sample Collector(s) Name (s) (Please Print):	**Sample Collector's Phone:**
Sample Collector(s) Signature:	**When was water last used in the building?** **DATE:** **TIME:**

Did you collect samples within your 120Water account? ☐ **YES** ☐ **NO, I will use this form**

****

SECTION 2 (NEXT PAGE) MUST BE COMPLETED IF YOU USE THIS FORM TO COLLECT SAMPLES

If you use this form to collect samples (instead of collecting within the 120Water platform) you must write the time each sample was collected in Section 2.

Lab Use Only

RECEIVED IN LAB BY:	DATE:	TIME:	**Matrix:** DW-Lead
			Analyte: Total Lead
WORK ORDER:		Lab Reporting: Email EDD to results@120water.com	**Sample Type:** Grab

APPENDIX B. Laboratory Documentation

B-1: QA Manual

Attached to the end of this document

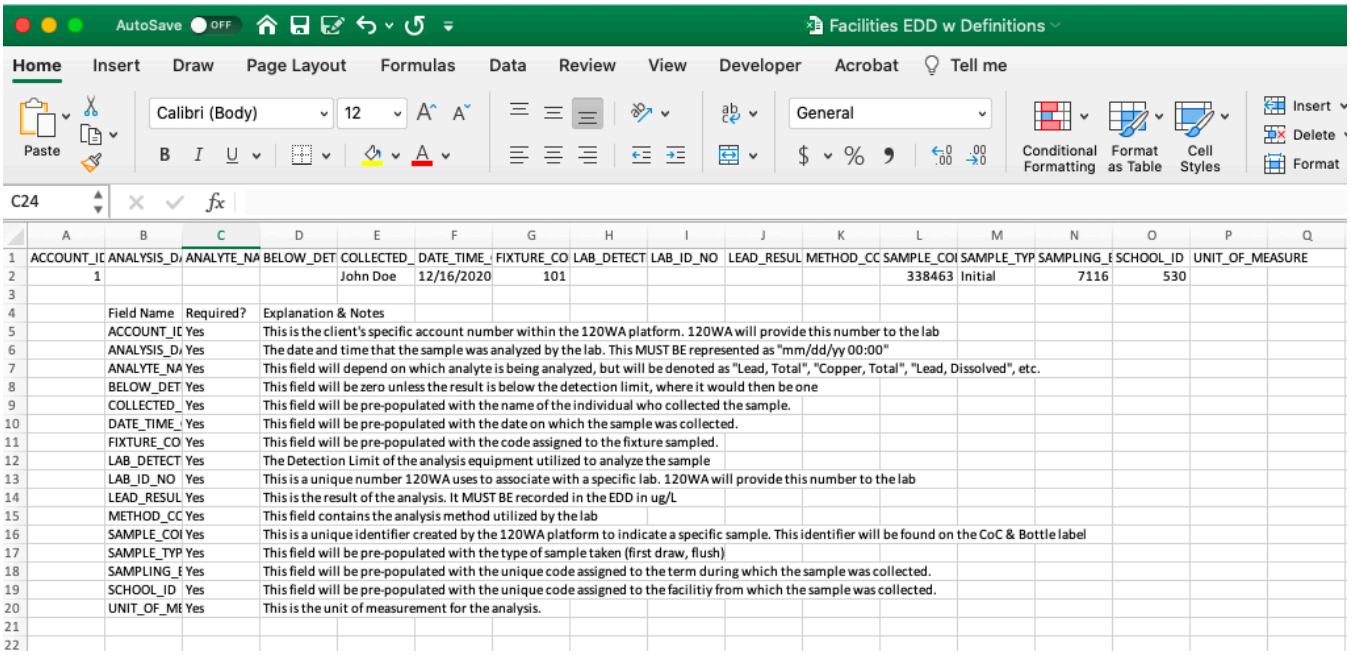
B-2: Standard Operating Procedures

Attached to the end of this document

B-3: Data Report Format

Attached to the end of this document

B-4: Electronic Data Deliverable



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	ACCOUNT_ID	ANALYSIS_D/	ANALYTE_NA	BELOW_DET	COLLECTED_	DATE_TIME_	FIXTURE_CO	LAB_DETECT	LAB_ID_NO	LEAD_RESUL	METHOD_CC	SAMPLE_COI	SAMPLE_TYP	SAMPLING_E	SCHOOL_ID	UNIT_OF_MEASURE	
2	1				John Doe	12/16/2020	101					338463	Initial	7116	530		
3																	
4		Field Name	Required?	Explanation & Notes													
5		ACCOUNT_ID	Yes	This is the client's specific account number within the 120WA platform. 120WA will provide this number to the lab													
6		ANALYSIS_D/	Yes	The date and time that the sample was analyzed by the lab. This MUST BE represented as "mm/dd/yy 00:00"													
7		ANALYTE_NA	Yes	This field will depend on which analyte is being analyzed, but will be denoted as "Lead, Total", "Copper, Total", "Lead, Dissolved", etc.													
8		BELOW_DET	Yes	This field will be zero unless the result is below the detection limit, where it would then be one													
9		COLLECTED_	Yes	This field will be pre-populated with the name of the individual who collected the sample.													
10		DATE_TIME_	Yes	This field will be pre-populated with the date on which the sample was collected.													
11		FIXTURE_CO	Yes	This field will be pre-populated with the code assigned to the fixture sampled.													
12		LAB_DETECT	Yes	The Detection Limit of the analysis equipment utilized to analyze the sample													
13		LAB_ID_NO	Yes	This is a unique number 120WA uses to associate with a specific lab. 120WA will provide this number to the lab													
14		LEAD_RESUL	Yes	This is the result of the analysis. It MUST BE recorded in the EDD in ug/L													
15		METHOD_CC	Yes	This field contains the analysis method utilized by the lab													
16		SAMPLE_COI	Yes	This is a unique identifier created by the 120WA platform to indicate a specific sample. This identifier will be found on the CoC & Bottle label													
17		SAMPLE_TYP	Yes	This field will be pre-populated with the type of sample taken (first draw, flush)													
18		SAMPLING_E	Yes	This field will be pre-populated with the unique code assigned to the term during which the sample was collected.													
19		SCHOOL_ID	Yes	This field will be pre-populated with the unique code assigned to the facilitiy from which the sample was collected.													
20		UNIT_OF_ME	Yes	This is the unit of measurement for the analysis.													
21																	
22																	

B-5: Microbac – Marietta, OH's WV DW Analysis Certificate

Attached to the end of this document

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MICROBAC®

STANDARD OPERATING PROCEDURES
MICROBAC LABORATORIES, INC.
MARIETTA DIVISION
LABORATORY QUALITY ASSURANCE PLAN

Issue / Implementation Date: 25 February 2022

Last Review Date: 25 February 2022

Microbac Laboratories, Inc.
Marietta Division
158 Starlite Drive
Marietta, Ohio 45750
(740) 373-4071

Robert R. Ramnarine, Quality Assurance Manager — Date: 2-14-22

Larry M. Gwinn, Jr., Laboratory Technical Director — Date: 2-25-2022

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Quality Manual Concurrence and Approval Signatures

Microbac Laboratories, Inc.
Marietta Division
158 Starlite Drive
Marietta, Ohio 45750

The Microbac Laboratory Quality Assurance Plan, LQAP (effective 3-16-2020) is applicable to the analytical testing and operations of this division and governs all testing performed after 3-16-2020, as indicated by the signatures below:

Anthony D. Canter, Operations Manager

Deanna I. Hesson, Technical Director, Wet Chemistry

Chad E. Barnes, Support Services Supervisor

April D. Greene, Wet Chemistry Supervisor

Chris S. Hill, Semivolatiles Supervisor

Stephanie L. Mossburg, Customer Relationship Manager

Kim H. Rhodes, Metals Supervisor

Laboratory Quality Assurance Plan

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3.0 STATEMENT OF POLICY

This Quality Manual summarizes the policies and operational procedures of Microbac Laboratories, Inc. Marietta Division, located at 158 Starlite Drive in Marietta, Ohio. Specific protocols for sample handling and storage; chain-of-custody, laboratory analyses, data reduction, corrective action, and reporting are described. All policies and procedures have been structured in accordance with: the National Environmental Laboratory Accreditation Conference (NELAC) and The NELAC Institute (TNI) standards adopted in 2003, 2009 and 2016 (current as of the date of this publication); Department of Defense (DoD), Department of Energy (DOE) Consolidated Quality Systems Manual (QSM) Versions 5.3 and 5.4; and applicable United States Environmental Protection Agency (EPA) requirements, regulations, guidance, and technical standards. This manual has been prepared in accordance with the guidance documents listed in Section 17.0. Further details on these policies and procedures are contained in Standard Operating Procedures (SOP) and related documents. This Quality Manual, SOPs, and related documentation describe the quality system for Microbac. Top management makes the following quality policy statements and commitments:

- Laboratory management is committed to good professional practice, to the quality of our testing, and to providing excellent service to our customers.

- Microbac's management commitment to providing the highest standard of service, with respect to data quality and information to our clients, is embodied in Microbac's corporate policy on quality assurance.

- The purpose of our management system is to ensure that all our work shall be performed in a professional manner, and all data shall be scientifically valid, legally defensible, and of known precision and accuracy.

- Management will assure, through documented annual refresher training that all laboratory staff are familiar with relevant and applicable aspects of the quality management and will implement these policies and procedures in their work.

- Laboratory management has established policies and procedures to comply with the quality system requirements of ISO 17025 and is committed to a mission of continuous quality improvement.

Every level of management, the laboratory staff, and project scientists are committed to the Quality Assurance (QA) program described in this Quality

Manual and as such ensure that the appropriate facilities and resources are available before producing any analytical results.

All work is performed in accordance with standards developed by TNI and any applicable state or EPA regulations or requirements.

This program is revised, as needed, to address special client or project requirements and to keep pace with developing technologies, good laboratory practices and total management of testing services.

All new employees are educated and trained in their ethical and legal responsibilities including the potential punishments and penalties for improper, unethical, or illegal actions. Our written policy for ethical standards of behavior exists in a separate document entitled “Ethics Policy”, Microbac SOP ETH01.

Microbac performs chemical analyses for inorganic and organic constituents in water, solid, hazardous waste and drinking water. Microbac’s goals are as follows:

- To protect our clients’ interests by providing them with fully documented, legally defensible data that is useable for sound environmental decisions.
- Ensure our client’s confidentiality through safeguards related to data reporting by telephone, facsimile, modem, disk, mail, and all other physical and electronic means.
- Protect our company’s two most important resources, our people and our reputation, by maintaining an environment that fosters excellence.
- Guard against and correct performance shortcomings that could erode data or technical quality.

Microbac-Marietta is licensed, certified, and/or accredited by numerous accrediting programs. A copy of each certificate and list of approved parameters (scope) is maintained in the laboratory reception area.

4.0 ORGANIZATION AND RESPONSIBILITY

Microbac Laboratories, Inc. has its corporate headquarters in Pittsburgh, Pennsylvania. The corporate organizational chart for Microbac Laboratories, Inc. is presented in Figure 4-1. Microbac's laboratory in Marietta, Ohio is a full-service environmental laboratory facility for analysis of groundwater, municipal and industrial wastewater, drinking water, and soil and solid waste. The Marietta Division's organizational chart is provided in Figure 4-2 along with a laboratory floor plan, which is furnished in Figure 4-3. Microbac's Analytical Statement of Qualifications provides the qualifications and experience summaries for key professionals within Microbac. The duties and responsibilities of all key positions at the Marietta facility are provided in Appendix D.

4.1 Responsibilities and Authorities

All employees, including the Managing Director, have the responsibility and authority to identify and report nonconforming work, to initiate actions to prevent Quality Management System (QMS) departures and nonconformances, to participate in internal audits and corrective action investigations, and to adhere to the QMS procedures.

4.2 Key Personnel – See Appendix D for job descriptions.

4.3 Coverage for Temporary Absence of Key Personnel

4.3.1 Microbac has sufficient staff redundancy and level of experience to cover for extended absence of all personnel described above. The production and report review duties of the Laboratory Technical Director are covered by the Operations Manager. The duties of the Quality Assurance Officer (QAO) are delegated to the Quality Specialist with oversight from the Laboratory Manager. Responsibilities of departmental supervisors/group leaders are delegated to the senior chemist or analyst in the department, with oversight from the Operations or Laboratory Manager. Corporate IT is assigned the duties of the IT (Information Technologies) Supervisor in his absence. The Laboratory Technical Director will perform the duties of Customer Service Manager(s) in the case of absence. All key personnel have an average of over ten years' experience and are cross trained for multiple positions.

4.3.2 If the Laboratory Technical Director will be absent for over fifteen (15) consecutive days, another full-time staff member meeting the qualification of technical manager is designated to temporarily perform this role. If the absence exceeds thirty-five (35) days, the primary accreditation body is to be notified in writing.

Figure 4-1
Microbac Corporate Organizational Chart

Note: The Microbac Corporate Organizational Chart is updated as needed. A current version is stored electronically and is available upon request.

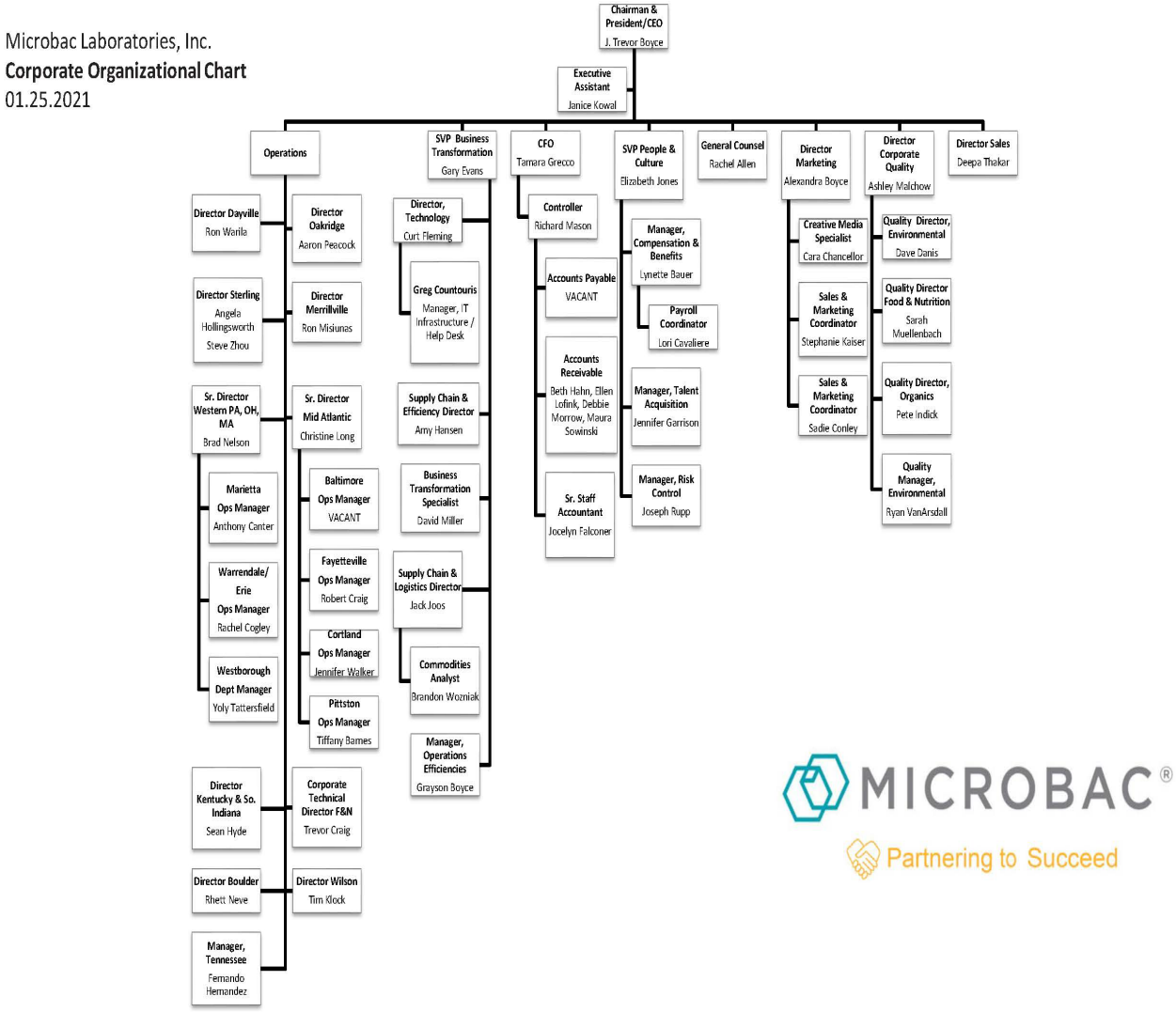
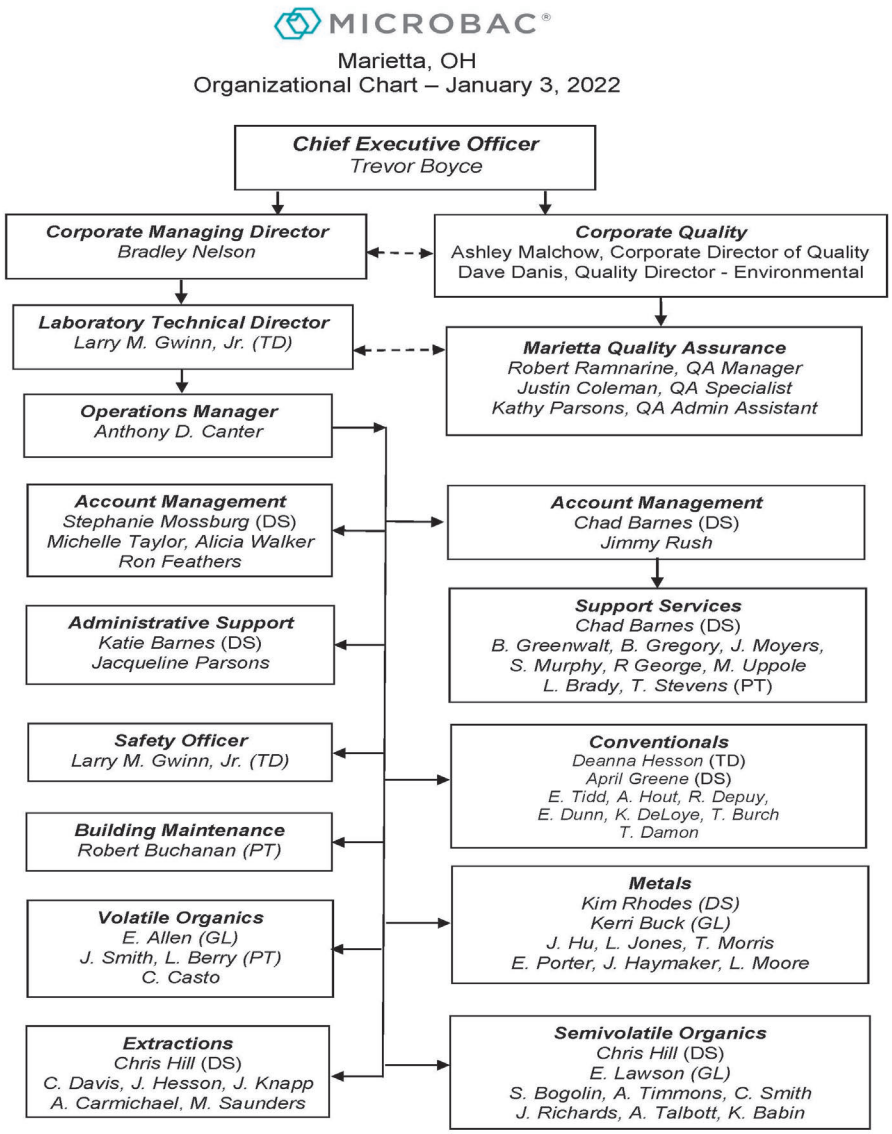


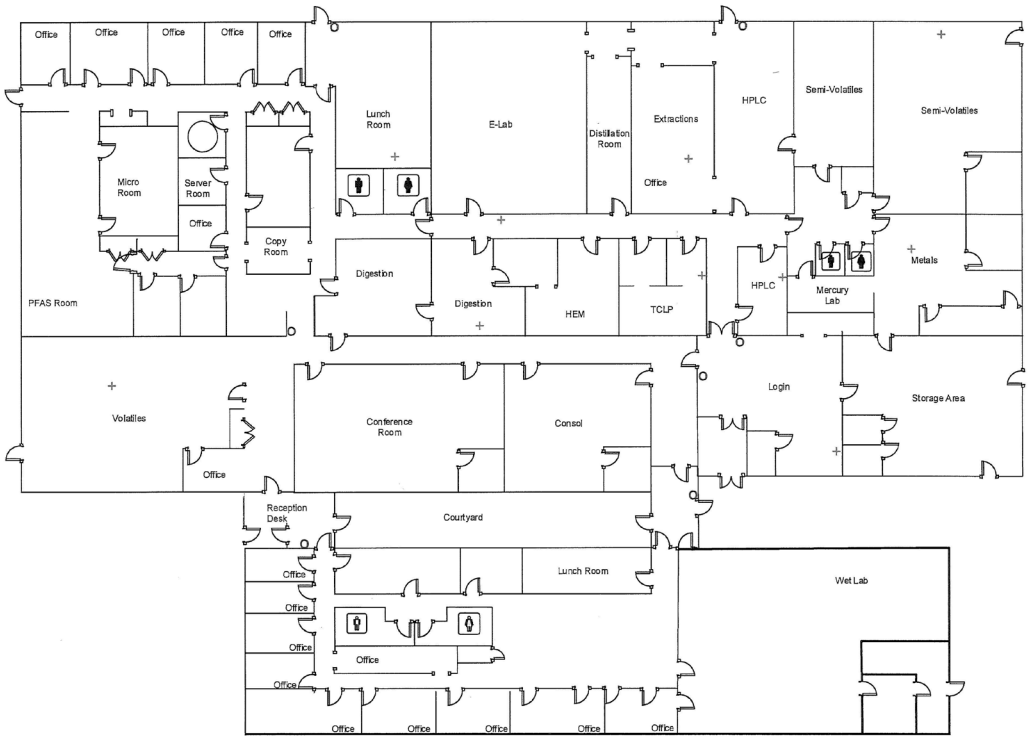
Figure 4-2

Note: The Microbac Marietta Division Organizational Chart is updated as needed. A current version is stored electronically and is available upon request.



Key: TD Technical Director
GL Group Leader
DS Department Supervisor
PT Part-Time

Figure 4-3
Microbac Laboratories, Inc.
Marietta, OH
Laboratory Floor Plan



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5.0 GENERAL POLICIES AND PROCEDURES

5.1 NELAC Policy Statement

This quality manual, also known as the Laboratory Quality Assurance Plan (LQAP), addresses the elements defined in the 2016 TNI Standard and the DoD QSM Version 5.3. A list of all accreditations is presented in Appendix C. Microbac complies with all requirements for all laboratory work covered by our accreditations.

5.2 Employee Protection from Undue Pressure

It is the policy of this company to protect laboratory employees from undue outside pressures from commercial, financial, or other sources originating from management or clients. This protection is afforded through the implementation of related policies for capacity evaluation, ethics training, and an “open door” policy from upper management. All employees are encouraged to discuss their concerns about such pressures with management.

5.3 Ethics Training

The laboratory requires all new employees to participate in formal training sessions on professional laboratory ethics. Refresher training is also provided to all employees on an annual basis. All employees are educated and trained in their ethical and legal responsibilities including the potential punishments and penalties for improper, unethical, or illegal actions. All training is documented in accordance with the “Ethics and Data Integrity Policy”. The Ethics Policy is presented in Microbac SOP ETH01. The Microbac Team Manual specifies requirements for ethical behavior and general performance expectations. The Team Manual provides formal policies for disciplinary action and consequences of unethical behavior and other general policy violations.

5.4 Departures from Documented Policies and Procedures

All workload performed under our certifications will be in accordance with this quality manual and all supporting standard operating procedures and policies. In the unlikely event that departures from documented policies and procedures (either technical or non-technical) becomes necessary, only the Managing Director or Quality Assurance Officer has the authority to approve such deviations. Such deviations (or Planned Departures) must be documented and approved.

5.5 Reviewing New Work and Capacity Evaluation

The laboratory adheres to the following mechanism to evaluate new work. The first step is the evaluation of method capability, which includes an initial review of the procedure supplied by the client requesting the work. Management then assesses the laboratory's ability to perform the work with existing apparatus, instrumentation, facilities, and personnel. If management determines that the capability exists, or may be developed, it then evaluates the financial feasibility of performing the new work. The managing director has the sole authority for approval of new work after the above evaluation is completed. All new method development is performed in accordance with Microbac SOP 45 Method Validation Procedures.

Laboratory capacity is periodically evaluated in conjunction with scheduling and forecasting tools, status updates on outstanding proposals, and the current backlog. The laboratory requires client notification of all sample shipments and clients are advised when large shipments may tax the laboratory ability to meet holding times or delivery dates. It is the policy of laboratory management to evaluate production capacity prior to acceptance of all major work.

5.6 Complaints

Microbac Laboratories is committed to complete satisfaction of customers and other interested parties. If for any reason a party believes we have not complied with agreed upon specifications or policies, then the following procedures will be implemented:

1. Initiation

The appropriate service representative or manager will document in writing the nature of the complaint.

2. Investigation

The problem will be investigated to verify the validity of the complaint or concern. If the issue is one of quality control, or breach of policy or procedure, an internal audit will be conducted. If Microbac is found negligent in meeting the written specifications or policies, or if our data is judged to be invalid or unusable for any reason, the problem is referred to the Technical Director, QAO or other authorized laboratory representative, for a resolution. If the proposed course of action is not acceptable, the problem is referred to the Managing Director.

3. Resolution

In cases of laboratory negligence, the following courses of action are offered:

- Offer to perform services/analyses again at no charge.
- Refund or credit for specific services.
- Assist client in dealing with the consequences, i.e., consultation with agency, letter of explanation, re-sampling assistance; and/or
- Seek a resolution that is acceptable to all involved parties.

4. Documentation

Written documentation of problem and resolution is maintained in the CAPA Records. All personnel are responsible for recording and responding to complaints. Whenever possible, the laboratory will acknowledge receiving the complaint and provide the customer with progress reports and the outcome. The resolution of the complaint should be approved by individuals not involved in the original activity in question, where able. Whenever possible, the laboratory shall give formal notice of the end of the complaint handling to the complainant.

5.7 Document Control and Maintenance

Microbac-Marietta has written procedures for controlling both internally generated and external documents that comply with the requirements of ISO 17025. These procedures are detailed in Microbac SOP GP-DOC-Control.

5.7.1 Laboratory management shall approve, prior to distribution, all internal and external documents that are part of the management system.

5.7.2 The laboratory shall uniquely identify all quality system documents and include date of issuance, revision number, page numbering, total number of pages, and the issuing authority.

5.7.3 The document control officer, under the oversight of the QAO, shall maintain master lists that uniquely identify each document, revision status, and record of distribution of all controlled documents. The master lists shall be readily available for review.

5.7.4 The document control system and associated master lists shall preclude the use of any invalid or obsolete documents.

5.7.5 Authorized versions shall be made available (either electronically or hardcopy) to all laboratory units where documents are essential to effective operations.

5.7.6 All controlled documents are reviewed periodically and revised as necessary to comply with all applicable requirements.

5.7.7 All obsolete or invalid documents are promptly removed to prevent any unintended use.

5.7.8 All obsolete documents are retained in an archive system to meet legal requirements and to maintain historical continuity.

5.7.9 All changes in documents shall be reviewed by the same function (management personnel) that performed the original review. These personnel shall have access to the pertinent background and information that is needed for review and approval.

5.7.10 Document Integrity

Laboratory management will ensure the integrity of the quality management system as required by ISO 17025. An important element of the annual document reviews will be to assess and eliminate any contradictions within and between internal documents.

5.7.11 Archiving

The QAO is responsible for maintaining an archive copy of each controlled document. Archive copies will be retained for ten (10) years.

5.8 Laboratory Records

The laboratory has written procedures for managing laboratory records and established policies for records retentions that comply with ISO 17025. The laboratory has established a policy to archive and retain analytical data, reports, and other records in electronic format, consisting of magnetic tape, CDs, or other electronic media. Most contracts specify a minimum retention time of five or ten years, however, Microbac will retain all electronically archived data in accordance with contractual and regulatory agency requirements. The disposition or transfer of laboratory records will be negotiated with individual clients upon any change in business status. Additional details are found in Microbac SOP GP-Records.

5.9 Analyst Training and Demonstration of Capability

All analysts must go through a formal training program that includes initial and annual Demonstration(s) of Capability (DOC) for each procedure they perform. These demonstrations are performed in accordance with the requirements of NELAC, and details are presented in Microbac SOP 47 – Employee Training. Alternatively, the laboratory uses the following option to assess Demonstration of Capability when the method is not amenable to Proficiency Testing evaluation, or standard measures of precision and accuracy:

- Four consecutive samples are analyzed with direct observation from another certified analyst, or
- Results of four analyses are compared to those performed by another certified analyst.

5.10 Protecting Confidentiality and Proprietary Rights

Two factors must be observed regardless of the method chosen to convey information and data to a client. These are client confidentiality and accurate record keeping. The need to preserve the clients' confidentiality must never prevent recording of the date, time, person contacted and subject of the communication. Data capture software allows entire case files/final reports to be captured and put into a file format. This can then be put on disk or sent by email to a client. This has great value for providing preliminary data to clients on quick turn projects.

The laboratory will inform the customer in advance of any information it intends to place in the public domain. Information about the customer obtained from sources such as regulators or complainants will be kept confidential between the customer and the lab. The identity of the provider will not be divulged unless agreed to by the source.

5.10.1 Confidentiality Agreements

Protecting the confidentiality of client information and data is of the utmost importance to Microbac. All Microbac employees, as a condition of employment, must sign the Employee Confidential Information and Non-compete Agreement, which was developed to protect the proprietary records and data of Microbac and all our clients. Upon request from Ohio Environmental Protection Agency (OEPA), Microbac will provide access to OEPA data and documents, or information related to Ohio Voluntary Action Program (OVAP).

5.10.2 Client Data

SOP CRC01 provides instructions for ensuring that, where clients require transmission of test results by telephone, facsimile or other electronic means, confidentiality is preserved.

5.11 Identification of Approved Signatories

The Laboratory Technical Director has the authority to sign contracts, approve new company policies and procedures (SOPs) and certify (sign) laboratory reports. The Operations Manager, Laboratory Technical Director, and QAO have the authority to approve laboratory policies and procedures (SOPs) and to certify laboratory reports. The Managing Director or Laboratory Technical Director may grant authority to other qualified personnel to certify laboratory reports or other official documents for special projects, or in case of emergency.

5.12 Monitoring and Controlling System Time

The system date and time reported by the LIMS (Laboratory Information Management System) and all networked data systems is synchronized to the date/time of the mail server, which is synchronized with the internet using network time protocol. Daylight savings time adjustments are made automatically. Laboratory staff are not authorized to make manual changes. Unauthorized changes in data system date or times may be considered a violation of the laboratory ethics policy (See SOP ETH01).

5.13 Changes of Ownership/Key Staff

In the event of change in ownership, the laboratory must notify all customers, accrediting bodies, and relevant agencies within 30 days of any changes in ownership. This letter will clearly identify the extent of these changes, and discuss policies for ownership, storage, and access to historical data and records. The laboratory must also notify accrediting bodies within 30 days of any changes in any key management staff, including the Laboratory Technical Director, or Quality Manager.

5.14 Method References

The laboratory will include the official method references on laboratory documents including bench sheets, laboratory SOP cover pages, and laboratory analysis reports. These references shall correspond to those listed in the relevant Scope of Accreditation.

5.15 A2LA Advertising Policy

The laboratory will adhere to the most recent directives established by The American Association for Laboratory Accreditation (A2LA) regarding display and use of symbols and documents reflecting its accreditation by A2LA. The laboratory will ethically and accurately represent areas of products and services for which this accreditation is applicable, and where used, the laboratory will assure clear exception of products and services outside the scope of that accreditation. Where used, the following restrictions are to be observed:

- The "A2LA" symbol cannot be used by the laboratory for any purpose. Only the "A2LA Accredited" symbol can be used by the laboratory to indicate its accreditation by A2LA. The "A2LA Accredited" symbol may be modified for size and/or color, but the integrity of the symbol must be maintained in all respects.

- The laboratory can use the "A2LA Accredited" symbol on business cards, but the location of the symbol is important. The symbol should not be placed near the name of the individual, to in any way suggest accreditation of that individual.

- Only the specific laboratory accredited by A2LA can use the "A2LA Accredited" symbol; therefore, corporate stationary, websites, and marketing materials, which encompass all laboratories under the corporate structure, cannot carry the "A2LA Accredited" symbol.

As acknowledged by the A2LA directive, not every possible inappropriate use of the "A2LA Accredited" symbol is addressed in R105 – Requirements when making reference to A2LA Accredited status; however, all laboratory personnel involved in the promotion of the laboratory's capabilities and credentials are required to review the specific examples, including graphics presented in the Appendix, for unacceptable usage of the "A2LA Accredited" symbol. Review and training of staff to ensure clear and unambiguous understanding of the proper use of the "A2LA Accredited" symbol and ramifications of non-compliance will be conducted annually.

5.16 Purchasing Supplies and Services

The laboratory has developed written policies and procedures in Microbac SOP GP-Purchasing for the selection and purchasing of services and supplies that comply with ISO 17025.

5.17 Estimating Measurement Uncertainty

Microbac states on the cover page of all laboratory reports that uncertainty data is available when requested by the client. Microbac will produce a separate report in comma separated value (CSV) format that presents the data as a concentration interval about the reported value for each analyte. The lower and upper limits of the interval express the uncertainty estimate for each result, and where applicable are based on the analyte's quality control limits for blank spike samples (BS). The expressed uncertainty makes no attempt to address sampling error or other errors outside the laboratory's control. Procedures for estimating measurement uncertainty in accordance with ISO 17025 are found in Microbac SOP GP-Uncertainty.

5.18 Review of Requests, Proposals, and Contracts

Microbac-Marietta has established policies, procedures, and a system of records for the review of requests (RFP), tenders (proposals), and contracts. The review includes any work that is subcontracted, and all contract amendments. The customer is informed of any deviations to contracts before the work begins. Details of the procedures are found in Microbac SOP GP-Contracts.

When the customer requests a statement of conformity to a specification such as pass/fail or exceedance of a limit, the decision rule must be clearly defined and communicated to and agreed to by the customer.

5.19 Measurement Traceability

The laboratory will adhere to the most recent directives established by A2LA regarding policy related to measurement traceability, as defined in A2LA document P113-A2LA Policy on Measurement Traceability for Life Sciences Testing Laboratories. Section 8.4 details laboratory policy related to the traceability of calibration standards. The proper procedure and frequency for the calibration of balances, weights, thermometers, pipets, and the spectrophotometers, that are used in the laboratory is detailed in lab SOP K0002 Calibration Techniques.

5.20 Trip Blank Hold Times

Microbac Marietta – Trip Blank Collection Date Policy

The collection date and time of trip blank(s) should be the same as the last sample collected on the chain of custody with which the trip blank(s) is associated. Microbac records the date and time the trip blank(s) are prepared at the laboratory; this date and time should not be used as the collection date and time on the chain of custody. If the prepared date and time are mistakenly entered on the chain of custody for the trip blank, we will edit the date and time of collection of the trip blank to coincide with the last sample listed on the chain of custody. If the collection date and time listed on the chain of custody for the trip blank is within the collection date and time of the first and last sample on the chain of custody, we will use the collection date and time as presented for hold time evaluation.

This policy has been established at the recommendation from the MICE interpretation regarding hold times for trip blanks and is consistent with EPA guidance: "… a trip blank has the same "life" as a sample with which they are sent. Trip blanks are the same age as the sample set and are used to determine if the sample MAY have been contaminated in transit."

This policy may be superseded by project or state specific requirements. Compliance with this policy will contribute to the production of valid data.

5.21 Control of Electronic Signatures

Electronic signatures must be controlled by the individual as electronic files. Electronic signature files must be stored in a secure password protected environment and are not sent to or used by other individuals. Electronic signatures carry the same weight as handwritten signatures with regards to document approval.

5.22 Computer Security

Laboratory Management is responsible for ensuring that threats to the LIMS and LIMS data have been assessed, safeguards implemented, and, where required, other established security requirements implemented. Refer to Microbac SOP 47 for details regarding computer security training.

At least 30 days prior to significant LIMS hardware or software changes that may impact electronic data, clients will be notified electronically. This communication will clearly state the extent of these changes and discuss access to historical data and records as well as the laboratory plan for continuity of electronic data deliverables during and after the period of change.

6.0 SAMPLING PROCEDURES

Microbac functions as an environmental analytical facility and as such is not directly responsible for the sampling events. However, Microbac does utilize independent field personnel. Below are sampling guidelines that were developed to outline the primary objective of any external sampling event. The objective is the collection of samples which, when analyzed, will consistently generate accurate, precise, and representative data. By developing comprehensive standard sampling procedures and training personnel in the procedures, this objective can be met. These sampling procedures are offered as guidance to field project managers to assure sample integrity. Following the sampling procedures promotes sample integrity and the highest degree of quality control throughout the sampling event.

6.1 General Sampling Guidelines

SOPs should be utilized by all field project managers for potential sample sources. The SOPs should be based on State and EPA guidance documents. SOPs should be available to and reviewed by all field personnel. The following are general guidelines to be used in the collection of environmental samples:

6.1.1 Sample containers which are prepared in the laboratory may contain measured volumes of preservative and must not be rinsed prior to filling with sample.

6.1.2 Sample containers for VOA, pH, and TOX must be filled with no headspace. All other sample analyte containers must be filled to approximately 95% capacity.

6.1.3 VOA samples must be collected in a manner which minimizes disturbance of the sample and potential for volatilization. Fill vials until convex meniscus forms then carefully place the septum cap on the vial and tighten. Invert the vial and check for the presence of air bubbles.

6.1.4 Field sampling equipment must always be appropriately decontaminated before and after use.

6.1.5 During the collection of all environmental samples, appropriate personal protective equipment (PPE) must be worn. Gloves and safety glasses are the minimum acceptable level of PPE to be worn when samples are collected.

6.1.6 Use pre-cleaned laboratory prepared glassware for the collection of samples whenever possible.

6.2 Microbac Sampling Containers

The measurement of trace constituents in environmental samples demands methods capable of maximum precision and sensitivity. The selection and proper care of laboratory glassware and sample containers is an important part of the quality control program to eliminate errors due to contamination from improper cleaning procedures.

Laboratory supplied containers constructed of materials which are both compatible and non-reactive with the material to be sampled will be used. Microbac uses commercial sample containers which are certified pre-cleaned to EPA standards. These containers are shipped in sealed boxes with custody seals. Glassware is certified cleaned according to Protocol A, B, or C described below. Sample containers used by Microbac follow washing procedures equivalent to these protocols.

Table 6-1
Glassware Cleaning Protocol

Protocol A	Protocol B	Protocol C
Laboratory-grade detergent wash and rinse	Laboratory-grade detergent wash and rinse	Laboratory-grade detergent wash and rinse
Acid rinse Deionized water rinse Solvent rinse	Multiple deionized water rinses	Acid rinse Multiple deionized water rinses
Oven drying, capping, and packing under quality control conditions	Oven drying, capping, and packing under quality control conditions	Oven drying, capping, and packing under quality control conditions

6.3 Sample Preservation

Use of cooling, pH control, and chemicals to retard biological activity or to stabilize the chemical species of a sample is known as preservation. Sample kits prepared by the laboratory include sample containers prepared with the appropriate type and volume of preservative for the analyte of interest. Addition of preservative to samples in the field is not normally required when using the prepared kits. This procedure minimizes the potential for incorrect or inadequate sample preservation. The most common form of preservation is cooling the sample to 0 to 6°C (without freezing) using ice or refrigeration. Other common preservatives used include, but are not limited to:

- Hydrochloric acid 1:1
- Nitric acid 1:1
- Sulfuric acid 1:1
- Sodium hydroxide 50%
- Sodium thiosulfate – for dechlorination
- TRIZMA for PFAS by 537/537.1

Table 6-2 lists the container type, volume required, preservation techniques, and holding times employed by Microbac for each sample type. Holding time is defined as time elapsed from sample collection date and time to the analysis date and time, except for semivolatile extractables. Semivolatile holding times in the table denote designated time allowed from collection to sample extraction. Analytical hold time for semivolatile analysis from date of extraction is 40 days.

6.4 Sample Documentation

6.4.1 Sample labels

When using laboratory prepared sample kits, pre-labeled and preserved sample containers are provided. Each sample collected is clearly labeled using waterproof ink with the following information:

- Client name
- Date and time of collection
- Sample source
- Preservative required
- Name(s) of sampler(s)
- Analyses requested
- Sample identification

6.4.2 Field records

Sampling personnel should maintain complete and accurate records of all field activities. Bound field notebooks and/or field logs specific to the media sampled should be completed during each sampling project. All pertinent information on the sampling event is included in the field record.

6.4.3 Chain-of-Custody

All samples should be accompanied by a completed chain-of-custody form when shipped or hand delivered to the laboratory. Information required on the chain-of-custody includes:

- Sample date and time
- Name(s) of sampler(s)
- Sample ID
- Project name and number
- Analyses requested
- Number of sample containers
- Signature and date of all individuals who have custody of the samples

6.5 Sampling Equipment Decontamination

All field sampling equipment must be appropriately pre-cleaned prior to leaving the base of operations. Use phosphate-free detergent, hot tap water, and analyte free rinse water for this cleaning following the procedure specified for the analytes of interest. Cleaned equipment must be wrapped or enclosed to maintain cleanliness during transport to the field for use. Adequate quantities of sampling equipment must be provided for each event to minimize the need for field decontamination.

Decontamination procedures for sampling equipment may include:

- Phosphate-free detergent and tap water wash
- Rinse with tap water

For sampling equipment used for trace metals sampling, rinse with 1:1 reagent grade nitric acid. **Do not rinse stainless steel equipment with nitric acid**.

- Rinse thoroughly with deionized water
- Rinse with isopropanol or methanol
- Thoroughly rinse with analyte-free water (if available)
- Air dry
- Wrap securely to prevent contamination if equipment is to be stored

Information on specific decontamination procedures is provided in each sampling SOP. Special decontamination procedures will be implemented as necessary, based upon contaminant encountered.

Equipment which is heavily soiled may require steam cleaning and/or high pressure washing. Drilling equipment and other heavy equipment used in field sampling activities will likely require this type of cleaning. If equipment cannot be adequately decontaminated, it will be discarded.

6.6 Field Waste Disposal Practices

Field generated waste must be disposed as required by project specifications and in accordance with applicable local, state, and federal requirements. Wastes commonly generated include drill cuttings, drilling fluids, well development water, well purge water, decontamination fluids, and contaminated personal protective equipment. Based upon site and project specific requirements, liquid wastes should be containerized for characterization and disposal or discharged directly to an appropriate discharge location. Solid wastes should be containerized and left on-site for disposal or, if appropriate, disposed as general refuse. Prior to initiating any sampling activity, the waste handling requirements should be determined to ensure timely disposal in compliance with regulatory requirements.

6.7 Laboratory Sub-Sampling Procedures

6.7.1 Soil

Microbac employs the following procedures for taking soil subsamples in all methods and departments except for percent moisture determinations and volatile organic analyses:

a) Remove sample bottle contents and place in tray lined with wax paper (metals lab) or aluminum foil (organics extraction lab). Alternatively, remove vertical core sections (top to bottom) that are representative of the bottle contents and transfer to the tray.
b) Mix sample with an inert rod or scoop and break up lump(s). Remove all large stones, sticks, leaves, etc. Do not over mix the sample.
c) Obtain representative sample either by random removal of 3-10 portions of the sample from the pan or by using a “standard” scoop designed to retrieve a linear cross-section of the pan contents.
d) The analyst will not attempt to target an exact weight once a method specified minimum amount is weighed.
e) The remaining sample will be returned to the sample container.

NOTE: These procedures do not apply to samples for volatile organics analysis, except the requirement not to target a specific mass of sample.

6.7.2 Water and Liquid Wastes

Unless otherwise stated in the method SOPs, the analyst will homogenize water and low viscosity liquid wastes by shaking each sample vigorously immediately prior to taking the sample aliquot. Viscous liquids such as oils shall be stirred with a glass rod prior to aliquot removal.

NOTE: This procedure does not apply to samples for volatile organics analysis.

6.7.3 Multiphasic Samples

The laboratory will attempt to identify multiphasic samples prior to login. Our policy is to contact the client to determine whether to attempt homogenization, or to do a phase separation, and log as separate samples. Homogenization may require special procedures such as the use of a blender, however, our recommended approach is to separate the phases. The analyst should notify the Customer Relations Group member if a multiphasic sample is discovered after receipt.

6.8 Sample Dilutions

The laboratory may dilute samples prior to analysis for the following reasons:

- Previous analysis yielded a result above the upper calibration range for the method.
- Sample contains a target, or non-target analyte, at sufficient concentration to damage sensitive instrumentation.
- Sample matrix interference, confirmed by poor surrogate or spike recoveries, prevents accurate analysis without dilution.

In each case the laboratory will document the sample dilution by reporting the dilution factor, adjusting the reporting and detection limits by that factor. The report narrative will provide additional detail as needed. If dilution analysis is not performed, the laboratory will assign appropriate qualifiers to any results reported above the upper calibration range.

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Table 6-2
Sample Containers, Preservation and Hold Times[3]

NOTES:
1: P or PE = Polyethylene (preferred when acceptable), G = Borosilicate glass with Teflon lined cap, PP = Polypropylene, HDPE = high density polyethylene
2: Cool, 0-6°C, but not freezing
3: For a current list of method and preservations, see LIMS tables, Products/Containers.

INORGANICS – AQUEOUS

PARAMETER	MINIMUM VOLUME (mL)	CONTAINER TYPE[1]	PRESERVATION[2]	HOLD TIME
Acidity	100	P, G	Cool, 0-6°C	14 Days
Alkalinity	100	P, G	Cool, 0-6°C	14 Days
Ash Content @ 750°C	25	P, G	Cool, 0-6°C	n/a
Biochemical Oxygen Demand (BOD)	500	P, G	Cool, 0-6°C	48 Hours
BTU	10	P, G	Cool, 0-6°C	n/a
Chemical Oxygen Demand (COD)	25	P, G	Cool, 0-6°C, H_2SO_4, pH < 2	28 Days
Chloride	25	P, G	Cool, 0-6°C	28 Days
Chlorine, Total Residual	100	P, G	Cool, 0-6°C	15 Minutes
Chromium, Hexavalent	150	P, G	Cool, 0-6°C	24 Hours
Chromium, Trivalent (calc)	n/a	P, G	Cool, 0-6°C	n/a
Coliform, Fecal	120	Sterile P, G	Cool, 0-10°C, $Na_2S_2O_3$	8 Hours
Coliform, Fecal (MPN)	100	Sterile P, G	Cool, 0-10°C, $Na_2S_2O_3$	8 Hours
Coliform, Total	100	Sterile P, G	Cool, 0-10°C, $Na_2S_2O_3$	8 Hours
Color, Platinum-Cobalt	50	P, G	Cool, 0-6°C	48 Hours
Conductivity (Specific Conductance)	100	P, G	Cool, 0-6°C	28 Days
Corrosivity (pH)	50	P, G	Cool, 0-6°C	n/a
Cyanide, Amenable to Chlorination	100	P, G	Cool, 0-6°C, NaOH, pH > 12	14 Days
Cyanide, Total	50	P, G	Cool, 0-6°C, NaOH, pH > 12	14 Days
Dissolved Oxygen	300	G	Cool, 0-6°C	15 Minutes
Fluoride	25	P, G	Cool, 0-6°C	28 Days
Fluoride, Total (Distilled/Non-Distilled)	200	P, G	Cool, 0-6°C	28 Days
Formaldehyde	20	G	Cool, 0-6°C	3 Days
Hardness	100	P, G	Cool, 0-6°C, HNO_3, pH < 2	6 Months
Ignitability (Flash Point)	75	P, G	Cool, 0-6°C	28 Days
MBAS (Surfactants)	100	P, G	Cool, 0-6°C	48 Hours
Microcystins by EPA 546	40	Amber G	Cool, 0-10°C, Sodium thiosulfate	14 Days
Nitrogen, Ammonia (Distilled/Non-Distilled)	100	P, G	Cool, 0-6°C, H_2SO_4, pH < 2	28 Days
Nitrogen, Nitrate	75	P, G	Cool, 0-6°C	48 Hours
Nitrogen, Nitrate-Nitrite	25	P, G	Cool, 0-6°C, H_2SO_4, pH < 2	28 Days
Nitrogen, Nitrite	50	P, G	Cool, 0-6°C	48 Hours
Nitrogen, Organic (calc)	100	P, G	Cool, 0-6°C, H_2SO_4, pH < 2	28 Days
Oil and Grease	1,000	G	Cool, 0-6°C, HCl, pH < 2	28 Days
Perchlorate	125	P	Cool, 0-6°C	28 Days
pH (in lab)	50	P, G	Cool, 0-6°C	15 Minutes
Phenolics, Total	100	Amber G	Cool, 0-6°C, H_2SO_4, pH < 2	28 Days
Phosphorus, Orthophosphate (PO4)	50	P, G	Cool, 0-6°C	48 Hours

PARAMETER	MINIMUM VOLUME (mL)	CONTAINER TYPE[1]	PRESERVATION[2]	HOLD TIME
Phosphorus, Total	50	P, G	Cool, 0-6°C, H_2SO_4, pH < 2	28 Days
Reactivity, Cyanide	10	P, G	Cool, 0-6°C	n/a
Reactivity, Sulfide	10	P, G	Cool, 0-6°C	n/a
Settleable Solids	1,000	P, G	Cool, 0-6°C	48 Hours
Specific Gravity	50	P, G	Cool, 0-6°C	n/a
Sulfate	25	P, G	Cool, 0-6°C	28 Days
Sulfide	500	P, G	Cool, 0-6°C, Zinc Acetate, NaOH, pH > 9	7 Days
Sulfite	50	P, G	Cool, 0-6°C	15 Minutes
Sulfur, Total (Organic)	10	P, G	Cool, 0-6°C	n/a
Total Dissolved Solids	50	P, G	Cool, 0-6°C	7 Days
Total Solids	50	P, G	Cool, 0-6°C	7 Days
Total Suspended Solids	200	P, G	Cool, 0-6°C	7 Days
Total Volatile Solids	50	P, G	Cool, 0-6°C	7 Days
Turbidity	50	P, G	Cool, 0-6°C	48 Hours
Volatile Dissolved Solids	50	P, G	Cool, 0-6°C	7 Days
Volatile Suspended Solids	200	P, G	Cool, 0-6°C	7 Days

METALS – AQUEOUS

METALS – AQUEOUSPARAMETER	MINIMUM VOLUME (mL)	CONTAINER TYPE[1]	PRESERVATION[2]	HOLD TIME
Metals (except Mercury)	500	P, G	HNO_3, pH < 2	6 Months
Mercury	50	P, G	HNO_3, pH < 2	28 Days

TCLP – AQUEOUS

PARAMETER	MINIMUM VOLUME (mL)*	CONTAINER TYPE[1]	PRESERVATION[2]	HOLD TIME
TCLP Mercury	100	P, G	Cool, 0-6°C	28 Days
TCLP Metals (except Mercury)	100	P, G	Cool, 0-6°C	6 Months
TCLP Herbicides	100	G	Cool, 0-6°C	14 Days
TCLP Pesticides	100	G	Cool, 0-6°C	14 Days
TCLP Semi-Volatiles	100	G	Cool, 0-6°C	14 Days
TCLP VOA	100	G	Cool, 0-6°C	14 Days

*For one TCLP parameter, 100 mL is required. For all TCLP parameters, 1,000 mL is required.

SEMIVOLATILE ORGANICS – AQUEOUS

PARAMETER	MINIMUM VOLUME (mL)	CONTAINER TYPE[1]	PRESERVATION[2]	HOLD TIME
Algal Toxins by EPA 545	60	Amber, G	Cool ≤ 10°C Sodium Bisulfate, Ascorbic acid	28 Days
Diesel Range Organics (DRO)	1,000	G	Cool, ≤ 6° C	7 Days
EDB/DBCP	3.40	G	Cool ≤ 6° C	7 Days
Herbicides	1,000	G	Cool, ≤ 6° C	7 Days
Microcystins by EPA 544	500	Amber, G	Cool 0-10°C, Trizma, 2-chloroacetamide, Ascorbic acid, EDTA	28 Days
*Pesticides/PCBs	1,000	G	Cool, ≤ 6° C	7 Days
PFAS by EPA 533	250	PP or PE with PP screw cap	Ammonium acetate 1.0g/L; Cool 0-10°C, Store at 0-6°C	28 Days Ext / 28 Days Anal.
PFAS by EPA 537/537.1	250	PP with PP screw cap	Trizma 5.0g/L; Cool 0-10°C, Store at 0-6°C	14 Days Ext / 28 Days Anal.
PFAS by LCMS, Compliant with DoD QSM 5.3 Table B-15	250	HDPE with HDPE screw cap	Cool 0-10°C, Store at 0-6°C	14 Days
Polyaromatic Hydrocarbons (PAH)	1,000	G	Cool, ≤ 6° C	7 Days
Semivolatile Organics (625.1, 8270)	1,000	G	Cool, ≤ 6° C	7 Days

*Sodium thiosulfate is added for dechlorination for EPA 608.3

VOLATILE ORGANICS (VOA/VOC) – AQUEOUS

PARAMETER	MINIMUM VOLUME (mL)	CONTAINER TYPE[1]	PRESERVATION[2]	HOLD TIME
Gasoline Range Organics (GRO)	40	G, Septa Caps	Cool, 0-6°C, HCl, pH < 2	14 Days
Volatiles (VOA)	40	G, Septa Caps	Cool, 0-6°C, HCl, pH < 2	14 Days
VOA by EPA 624.1	40	G, Septa Caps	Cool, 0-6°C	7 Days
VOA EPA 624.1 (chlorinated)*	40	G, Septa Caps	Cool, 0-6°C, $Na_2S_2O_3$	7 Days

*Provided upon client request when samples contain chlorine.

SOILS

PARAMETER	MINIMUM AMOUNT (g)	CONTAINER TYPE[1]	PRESERVATION[2]	HOLD TIME
Chromium, Hexavalent	50	G	Cool, 0-6°C	30 Days
DRO	30	G	Cool, 0-6°C	28 Days
GRO	1	G	Cool, 0-6°C	14 Days
Herbicides	50	G	Cool, 0-6°C	14 Days
Paint Filter Liquids Test	100	P, G	Cool, 0-6°C	n/a
Percent Moisture	25	P, G	Cool, 0-6°C	n/a
Percent Solids	25	P, G	Cool, 0-6°C	n/a
Perchlorate	100	G	N/A	28 Days
Petroleum Hydrocarbons	30	G	Cool, 0-6°C	14 Days
PFAS by ASTM D7968	100	PP, G	Cool, 0-6°C	28 Days
PFAS by LCMS, Compliant with DoD QSM 5.4 Table B-24	100	P	Cool, 0-6°C	90 Days
Semi-Volatiles	30	G	Cool, 0-6°C	14 Days
TCLP Mercury	105	G	Cool, 0-6°C	28 Days
TCLP Metals (except Mercury)	105	G	Cool, 0-6°C	6 Months
TCLP Pesticides/Herbicides	105	G	Cool, 0-6°C	14 Days
TCLP Semi-Volatiles	105	G	Cool, 0-6°C	14 Days
TCLP VOA	105	G	Cool, 0-6°C	14 Days
Total Mercury	2	G	Cool, 0-6°C	28 Days
Total Metals (except Mercury)	3	G	N/A	6 Months
TPH by EPA 9071	100	G	Cool, 0-6°C	28 Days
Volatiles	1	G	Cool, 0-6°C	14 Days
Wet Chemistry (where applicable, may require leaching first)	1-100	G	Cool, 0-6°C	24 Hours – 28 Days

7.0 SAMPLE CUSTODY

In recognition of the critical nature of sample custody protocols, Microbac Laboratories has implemented stringent standard operating procedures, designed to ensure sample integrity and thorough documentation. This section provides a clear description of sample traceability from sampling kit to final sample disposition.

7.1 Sampling Kits

Microbac Laboratories, at the client's request, will provide sampling kits to the client. Additional information on sampling kits can be found in Microbac SOP LOGIN01.

7.2 Field Custody (Also see Section 6.0)

A vital component of Microbac's quality assurance program is to ensure that a clear and detailed record is kept of all samples and sampling activity. Chain-of-

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Custody (COC) forms (Figure 7-1) are submitted with all samples. These are kept in the appropriate project files. Waterproof ink is used to label samples as protection against loss of information due to accidental erasure. Microbac's sample custody protocol requires that the following information be recorded.

7.2.1 Date and Time of Sample Collection

7.2.2 Specific description of sample location. This may include a monitoring well number in the case of groundwater sampling. For soil sampling, sample points may be sketched on a site map and confirmed via surveying. For surface water and sediment sampling, the drum number, (if labeled), drum location, suspected contents, and phase of drum materials (liquid, solid, or sludge) may be noted, as well as which layer or layers within the drum were sampled.

7.2.3 Name(s) of sampler(s) will be identified.

7.2.4 A description of weather conditions and general site conditions (disturbed soils, standing water, ongoing activities, etc.) may be provided.

7.2.5 A description of the sampling equipment used, including method for purging monitoring wells may be indicated.

7.2.6 The specific field ID number for a sample may be recorded. The sample sequence number is the order in which a particular sample was taken with respect to all other samples retrieved at the site. The sample sequence number may also be recorded.

7.2.7 Components or constituents of sample to be analyzed are to be noted.

7.2.8 Signature(s) of sampler(s) will be provided.

7.2.9 Types of preservatives and, if necessary, the results of field check (pH, etc.) may be recorded.

7.2.10 Field measurement data (i.e., pH, specific conductance, etc.) may be recorded.

7.3 Sample Transport

Samples are transported to Microbac's laboratory by one of three modes:

7.3.1 Microbac Courier - on many projects, Microbac will have responsibility for preparation of sample bottles, sample kit assembly and delivery of sample kits to the project site. Microbac will also pick up the samples at the project site and

transport them to the laboratory. Microbac drivers will follow these established protocols:

- They will carry proper Microbac identification, which they will be prepared to display before entering project sites.
- They will sign the Chain-of-Custody forms when picking up the samples.
- They are responsible for the integrity and security of samples while in their custody.
- They must always secure the vehicle when it is necessary to stop and be away from the vehicle for any reason during the transportation of samples to the laboratory.

All samples returned by Microbac personnel are delivered immediately to the sample custodian in the sample receiving area. The Shipping and Receiving entrance is to be used for such deliveries. If delivery is made after hours, the driver will take the cooler temperature, fill out the appropriate form for the sample custodian and store the cooler in a locked sample storage unit.

7.3.2 USPS, UPS, FedEx, or other common carrier – Transporters are directed to the Shipping and Receiving entrance and the samples are delivered to the sample custodian.

7.3.3 Client Deliveries - Clients may deliver samples in person via the designated Receiving entrance but must be escorted while within the facility.

7.4 Laboratory Custody Procedures

The National Enforcement Investigations Center (NEIC) of EPA defines custody of evidence in the following manner:

- It is in your possession, or;
- It is in your view after being in your possession, or;
- It was in your possession and then you locked or sealed it to prevent tampering, or;
- It is in a secure area.

7.4.1 Normal Custody Procedures

For the purpose of sample custody, Microbac Laboratories maintains that the laboratory in its entirety is a secure area and all samples received and logged into the laboratory remain in the custody of the Sample custodian, Supervisor or Analyst, until time of disposal. Refrigerators, freezers, and other designated sample storage areas will be securely maintained or locked. Only the designated sample custodian or supervisory personnel will have keys to locked

sample storage units until removed for sample preparation or analysis. The following minimum custody procedures are followed for all samples:

- All samples are received and inspected in accordance with Section 7.5.
- The sample custodian signs and dates the chain-of-custody form provided by the client.
- The samples are stored in the appropriate storage unit. (The storage unit is also designated in the LIMS when the samples are logged in.)
- Several laboratory documents are used to document which laboratory personnel handled the samples, including bench sheets, sample preparation logbooks, and instrument run logbooks.
- The original copy of the chain-of-custody form is included in the laboratory report to the client and a copy is maintained in the laboratory files.

7.4.2 Internal Laboratory Custody (Internal Chain of Custody (ICOC))

To satisfy more stringent chain-of-custody requirements, the following standard operating procedures can be implemented by Microbac Laboratories, Inc. upon the request of the client:

- The work request prepared by the Customer Relations Group member must specify which projects require extended internal laboratory custody. All sample bottles designated for ICOC are identified on the label for easy identification.
- After the samples are logged into the LIMS, a unique container number and barcode is generated and printed on the bottle label (Figure 7-4).
- Samples must remain in secure sample storage units until removed for sample preparation or analysis. All transfers of samples into and out of storage will be posted to the LIMS using a standard barcode reader.
- Removal of samples from storage requires a barcode scanning procedure that produces an electronic record of the transaction in the LIMS.
- After a sample container has been removed from storage, the analyst is responsible for the custody and integrity of the sample. While the samples are in the custody of the laboratory, they must be locked in the storage units if not in immediate custody of the analyst.
- Samples returned to the storage units must be scanned to document the transfer from analyst back to the custodian.
- The custodian will scan each container at the time of disposal of the sample container. Transfer of sample extracts and digests may be documented on the laboratory preparation bench sheets.

7.5 Sample Receipt and Inspection

The sample custodian or designated assistant will receive all incoming samples. The following procedures are outlined in Microbac SOP LOGIN01. The following information is documented on the Sample Receipt Form (Figure 7-2A & 7-2B). The custodian will open the shipping containers and note the presence/absence of Chain-of-Custody forms and seals, air bills, or bills-of-lading. The sample temperature is then read. The custodian will examine the shipping container to verify the integrity of the sample(s) and examine the sample documentation and identification to assure it is correct and the proper preservative has been used. The preservatives or non-preservatives where required, are checked by the sample custodian.

If inspection indicates samples were damaged in transit, the shipping container will be moved to the hood in Log-in, assessment of the damage will be made, and the appropriate service representative will be notified. The client will be immediately contacted and determination of the degree of hazard will be made. If damage is minimal and the client requests it, an attempt to salvage the sample(s) will be made if it can be done safely. In the event of damaged hazardous samples, Microbac's Spill Response Team will be notified per the Chemical Hygiene Plan.

If samples are received after hours, when the sample custodian is absent, they will be placed in the walk-in refrigerator. The person receiving the shipping container will sign for the container, take the cooler temperature if appropriate and place the dated forms on the Custodian's desk. The sample custodian will log in the samples on the next business day. The LIMS system will indicate the actual date and time received and the original receipt documentation will be included with the COC form.

The sample custodian will compare the COC forms and labels to verify agreement of information contained therein. If discrepancies are found, they will be documented on the Sample Receipt Form and the appropriate service representative will be immediately notified. Written documentation of all problem resolutions will be placed in the project/case file. If there are no problems with the samples received, the sample custodian files the signed COC form and Sample Discrepancy Form in the project/case file. After the sample is logged in, it will be immediately stored under the proper conditions.

Sample labels or other sample documents that appear to be contaminated due to sample breakage or other problems will be dried under a fume hood and be separately sealed in plastic bags, if necessary, prior to being placed in case files. The appropriate service representative must also be notified.

7.6 Sample Logging Procedures

The following procedures are outlined in Microbac SOP LOGIN01. The sample custodian is responsible for logging all samples into the Laboratory Information Management System (LIMS), signing the COC form, completing the Sample Receipt Form, reporting all problems, inconsistencies, or anything questionable to the services representative, placing all samples in storage, monitoring conditions in sample storage areas, and maintaining records for laboratory COC.

As a new login number is initiated in the LIMS, the sample custodian generates and/or enters the following information about the project shipment:

- Microbac Login Number
- Client Project Identification
- Mode of Transportation
- Date and Time Received/Date Due
- Matrix/Sample ID
- Date and Time of Sample Collection
- Storage Location/Container Size/Type/Preservative
- List of Analyses
- Notation of Problems/Special Instructions

In order to maintain sample identity, each sample received will be assigned a unique sample I.D. number. The LIMS will assign the unique Microbac Sample Number at the time of log-in, as shown in the following example:
EXAMPLE: M1A0001-01

- The first seven digits identify a group of related samples and becomes the login number and report number.
- The two-digit number after the dash identifies a specific sample in the order.
- These numbers are used by Microbac for continuous identification of the sample from receipt to completion of analysis.
- In the event of multiple samples for a single analysis, such as 2 vials for volatile organic compounds, letter designations will be added to the end of the identification number.

Sample containers will be clearly identified with the appropriate sample number. The sample labeling process is accomplished by the LIMS system which prints the required number of computer labels (Figure 7-3). Extract vial numbers and metal digests will correspond to the Microbac sample number from which they originated. These numbers will also be recorded on sample tracking documentation.

7.7 Sample Storage

Samples and extracts will be stored in uniquely identified refrigerators which are in secure areas of the laboratory. The sample custodian or designated assistant will check the temperature of each refrigerator in the log-in area, twice daily (once on weekends and holidays) and maintain a record book. This record book will be reviewed monthly by the Support Services Supervisor to note any trends or inconsistencies. The acceptable range for sample storage is 0 to 6°C. The sample custodian will notify the Support Services Supervisor or designee of any refrigerator temperature problem which cannot be corrected by simple thermostat adjustment. A list of emergency repair numbers for the refrigeration units is attached to the walk-in refrigerator's exterior. A separate storage is required for USDA regulated soils.

7.8 Sample Distribution and Tracking

Both the preparation and the analysis of samples will be documented using special forms (logbooks). Once analysis is complete, the analyst will return the unused sample to the sample custody area for return to the main cooler or to the Sample Archive Room, whichever is appropriate. Samples will be returned to their original storage units after completion of analyses. Samples which have exceeded their regulated holding period will be placed in the Sample Archive Room. They are routinely stored in this area for a minimum of 14 days after the due date for the analytical report. They are then disposed per protocol listed in Microbac's "Waste Management SOP". Extended archive beyond 14 days with refrigeration is available for specific projects or as required by contract.

It is important to note that samples received for analysis of VOA are segregated from other samples. Standards are also segregated from all samples in designated storage units.

7.9 Sample Security

All sample storage refrigerators are equipped with a lock. The units are monitored by the sample custodian during business hours. After business hours, the units are kept locked and only authorized personnel have access (by key) to the sample storage unit. All sample extracts and digests will be stored in segregated areas.

7.10 Laboratory Building Security

All access doors to the building, except for the main entrance to the reception area, remain locked. Only Microbac employees have keys to the access doors to the building. The main entrance is unlocked only on business days between the hours of 8:00 AM and 5:00 PM. The facility is also equipped with an electronic alarm system and employees are assigned unique codes for entry.

7.10.1 Employee Access

All employees must enter the building through the employee entrance. Keys are required. Employees may exit through the employee entrance when it is locked without the use of a key, but keys are required for re-entry.

7.10.2 Visitors, Vendors and Deliveries

All visitors to the office or laboratory must enter the main lobby through the main entrance and sign in with the receptionist. Visitors must always be escorted to all areas of the facility. Vendors and delivery personnel are directed to use the door to the Shipping and Receiving area. Access to this door is controlled by the Microbac employee on duty, and upon entrance, the visitor must always be escorted.

7.11 Sample Subcontracting/Shipping

For certain projects, it may be necessary for Microbac to subcontract some analyses. Samples to be analyzed will be shipped to the contracted laboratory using the Microbac sample kit. To prevent sample breakage, only EPA-approved sample containers will be used. Freezer packs will be included in each sample kit to serve as a separation divider for the samples and to increase the cooling capacity.

To maintain the temperature of samples at 0 to 6°C, wet ice will be supplied by the client when required. Each shipping kit will contain the following:

- Partitions to hold sample bottles.
- Freezer pack(s) (if ice is not used).
- Chain-of-Custody form

The sample kit will be packed in a hard sided cooler. The sample kit will be sealed with Microbac Chain-of-Custody seals.

7.12 Electronic Data Security

Data integrity is insured through LIMS multi-level security. Access to the specific user privileges can be individually controlled. Each user has a personal login and password which allows certain privileges. Hard copy data, which contains all the data regarding a group of samples, are kept in a master file, labeled with the login numbers. Microbac provides electronic data deliverables (EDD) in client specified formats. E-mails, CD-ROM, and USB flash drives are commonly used for electronic transfer of data.

Figure 7-1
MICROBAC CHAIN-OF-CUSTODY RECORD

MICROBAC Return to: 158 Starlite Drive Marietta Ohio 45750

CHAIN OF CUSTODY RECORD
Number
Instructions on back
TO BE COMPLETED BY MICROBAC
Temperature Upon Receipt (°C)
Therm ID
Holding Time
Samples Received on Ice? Yes No N/A
Custody Seals Intact? Yes No N/A

Lab Report Address	Invoice Address	Turnaround Time
Client Name:	Client Name:	[ ] Routine (5 to 7 business days) [ ] RUSH* (notify lab)
Address:	Address:	
City, State, Zip:	City, State, Zip:	(needed by)
Contact:	Contact:	Report Type
Telephone No.:	Telephone No.:	[ ]Results Only [ ]Level 1 [ ]Level 2 [ ]Level3 [ ]Level 4 [ ]EDD

Send Report via: [ ] Mail [ ] Fax [ ] e-mail (address) Send Invoice via: [ ] Mail [ ] Fax [ ] e-mail (address)

Project: Location: PO No.: Compliance Monitoring? [ ] Yes [ ] No ( ) Agency/Program

Sampled by (PRINT): Sampler Signature: Sampler Phone No.:

* Matrix Types: Soil/Solid (S), Sludge, Oil, Wipe, Drinking Water (DW), Groundwater (GW), Surface Water (SW), Waste Water (WW), Other (specify)
** Preservative Types: (1) HNO3, (2) H2SO4, (3) HCl, (4) NaOH, (5) Zinc Acetate, (6) Methanol, (7) Sodium Bisulfate, (8) Sodium Thiosulfate, (9) Hexane, (U) Unpreserved

REQUESTED ANALYSIS

Lab ID	Client Sample ID	Date Collected	Time Collected	No. of Containers	Matrix	Grab / Comp	Preservative Types **											Additional Notes

Possible Hazard Identification [ ] Hazardous [ ] Non-Hazardous [ ] Radioactive Sample Disposition [ ] Dispose as appropriate [ ] Return [ ] Archive

Comments	Relinquished By (signature)	Date/Time	Received By (signature)	Date/Time
	Relinquished By (signature)	Date/Time	Received By (signature)	Date/Time
	Relinquished By (signature)	Date/Time	Received By (signature)	Date/Time

Rev: 07/18/2018 Page ____ of ____

Figure 7-2A
Sample Receipt Form

MICROBAC®

SAMPLE RECEIPT CONFIRMATION
M0B0199

Cooler Information

Cooler ID	Temperature
00107173	1.80 °C

Inspection Checklist

Number	Question	Result
01	Ice Present or not required?	Yes
02	Shipping containers sealed or not required?	Yes
03	Custody seals intact or not required?	Yes
04	Chain of Custody (COC) Present?	Yes
05	COC includes customer information?	Yes
06	Relinquished and received signature on COC?	Yes
07	Sample collector identified on COC?	Yes
08	Sample type identified on COC?	Yes
09	Correct type of Containers Received	Yes
10	Correct number of containers listed on COC?	Yes
11	Containers Intact?	Yes
12	COC includes requested analyses?	Yes
13	Enough sample volume for indicated tests received?	Yes
14	Sample labels match COC (Name, Date & Time?)	Yes
15	Samples arrived within hold time?	Yes
16	Correct preservatives on COC or not required?	Yes
17	Chemical preservations checked or not required?	Yes
18	Preservation checks meet method requirements?	Yes
19	VOA vials have zero headspace, or not recd.?	Yes

Microbac Laboratories Inc., - Marietta, OH
158 Starlite Drive | Marietta, OH 45750 | 800.373.4071 p | www.microbac.com

Uncontrolled Copy

Figure 7-2B
Sample Receipt Form

MICROBAC®

Work Order # _____

COOLER TEMP >6° C LOG

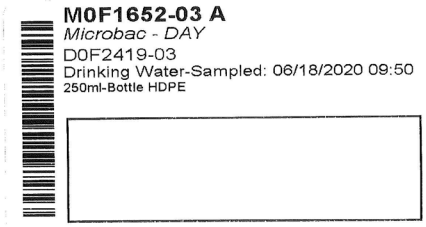
SAMPLE ID	Bottle 1 °C	Bottle 2 °C	Bottle 3 °C	Bottle 4 °C	Bottle 5 °C	Bottle 6 °C

pH Lot #_____ pH Exceptions

SAMPLE ID	Bottle 1	Bottle 2	Bottle 3	Bottle 4	Bottle 5	Bottle 6

Uncontrolled Copy

Figure 7-3
MICROBAC BOTTLE LABEL



8.0 ANALYTICAL PROCEDURES, STANDARDS, AND REAGENTS

This section provides information about the method selection process and provides general analytical policies and procedures which are common to all methods in use in the laboratory. The process for method selection is described along with the policy on multiple versions of the same method. This section also addresses method validation and project specific criteria. Procedures are outlined for selection and cleaning of laboratory glassware, the requirements for Class A glassware, and the preparation and documentation for reagents and analytical standards. Also included are procedures for logbooks, proper container labeling, and requirements for storage and disposal. An example of measurement traceability utilizing a final report is given in Section 8.4.13. This information is addressed in more detail for each analytical method in the specific SOPs.

8.1 Analytical Methods

8.1.1 Selection

Methods which are used for compliance with local, state, US-EPA or other regulatory authorities must meet minimum performance criteria. Methods for which Microbac maintains performance criteria are listed in Microbac's SOP list. Other methods exist that can be used for screening, or for estimating concentrations, or may not have defined performance specifications. Such methods are used for limited applications, or when written approval is granted by the client or agency. In general, analytical methods that are selected for implementation by Microbac must meet one of the following criteria:

- It is a promulgated version of an EPA approved method.
- It is another version of an EPA method that is specified in writing by the client or the project specific QAPP.
- It is a modified EPA method, or a standard method other than EPA which has been specified by the client or in the project specific QAPP. Examples include American Society for Testing and Materials (ASTM), National Institute for Occupational Safety and Health (NIOSH), or a client written method for which an official authorization has been given for use.

8.1.2 Method References

It is Microbac's policy to reference preparatory and analytical methods in appropriate documents including SOPs, preparation log sheets, instrument run logs, method detection limit (MDL) studies, and analysis reports. The SOP will reference the official source and the current version of each method. Unless directed otherwise, Microbac will use the latest version of a method for which a

validation study and SOP exists. It is our goal to implement the latest promulgated version of a method within the deadlines established by the agency or project specific QAPP. It may be necessary to maintain multiple versions of the same method due to project specific QAPPs which are often several years old. Project management tools are used by the client Project Chemist / Data Specialist to assure proper versions are used. Additional information on this process may be found in Microbac SOP 44.

8.1.3 Method Validation

The procedures employed for method validation are found in Microbac SOP 45. The basic requirements include meeting all the reference method criteria for sample preparation, calibration and linearity checks, analytical precision and accuracy, MDL, method blank, surrogates, and the development and approval of the method SOP. Complete records of each validation study are maintained on file.

8.1.4 Project or Client Specific Criteria

The performance criteria established in the tables found in Microbac's analytical SOPs represent laboratory generated statistics often from multiple analysts and instruments. For example, the reporting limits (RL) do not necessarily represent the lowest analyte concentrations that can be achieved by the method, nor are they guaranteed for every sample. In other cases, these basic laboratory statistics are superseded by client or project specific requirements for MDL, RL, acceptable control limits, or other special requirements. These situations will require the use of project specific QAPPs and/or SOPs. These are separate documents that are reproduced and distributed in project "kick-off" meetings in which specific project requirements are communicated to the QC and production staff. In such cases, project specific analysis codes are programmed into the LIMS which specify the required RLs and control limits.

8.2 Glassware

The measurement of trace constituents in water, demands methods capable of maximum precision and sensitivity. Since the very sensitive analytical systems are subject to errors from improper choice of apparatus, as well as to contamination effects due to improper cleaning procedures, the selection and proper care of laboratory glassware and sample containers play an important role in our quality control program. Laboratory vessels serve three functions: storage of reagents and samples, measurement of solution volumes, and confinement of reactions.

Borosilicate glass, i.e., Pyrex® or Kimax®, is the mainstay of the laboratory. The analytical method usually states whether borosilicate type glassware is acceptable. A notable example is the analysis of boron, where the digestions are carried out in plastic or Vycor®.

8.2.1 Volumetric Glassware

The precision of volumetric work depends in part, on the precision with which volumes of samples and other reagents can be measured. By common usage, accurately calibrated glassware for precise measurement of volume has become known as volumetric glassware. Glassware that meets Federal Specification for Volumetric Glassware is designated as Class A. Except for The National Institute of Standards and Technology (NIST) certified glassware, Class A is the most precise grade and is available in burettes, volumetric flasks, and volumetric pipettes. Class A glassware must be used in the following laboratory procedures:

- Preparation of all primary standards require Class A volumetric flasks and pipettes.
- Preparation and dilution of stock standards require Class A flasks and pipettes.
- All titrimetric standardizations require the use of Class A burettes, volumetric flasks and pipettes.
- Class A glassware will be always used as specified in the standard analytical method for essential volumetric measurements.

8.2.2 Glassware Cleaning Requirements

Table 8-1 summarizes the general cleaning procedures to be used for all laboratory glassware and reusable sample bottles (glass). All glassware must be scrupulously cleaned to remove any possibility of contamination of the sample. **NOTE**: Under no circumstances are sample containers for trace level inorganic or organic analyses ever cleaned and reused.

8.3 Reagents and Solvents

8.3.1 Reagent Water

Reagent water produced at Microbac meets the standards of ASTM Type II Water. Reagent water is produced by an IonPure System maintained by the vendor and consists of a series of 5 filter beds:

- Carbon bed (removes chlorine and organics)
- 4 mixed beds in series (removes remaining negatively and positively charged ions)

The electrical resistivity is checked daily by means of a remote sensor electrical resistivity meter and recorded by login department personnel. This remote sensor is located in-line, immediately following the filter beds. The finished reagent water must maintain a minimum resistivity of 15 MΩ-cm at 25°C. The laboratory agreement with the vendor stipulates that the vendor will perform an annual calibration of the in-line resistivity meter.

The final two mixed bed tanks are both equipped with a 5-range purity light. These tanks are in series, so a light monitoring system is utilized as a control to determine when tanks need to be replaced. When the indicator light on the first tank in the series changes from green to red, the vendor is called, and service is requested. The second mixed bed tank continues to service the laboratory during this period. The indicator lights and the electrical resistivity meter are checked twice daily until the tanks are changed. If the resistivity of the reagent water is > 1 MΩ-cm the system is viable. After the tanks are changed, the lines are flushed, and the electrical resistivity is rechecked.

Additional UV polishing systems are used in the volatiles laboratory to eliminate any trace organics.

8.3.2 Raw Materials

The raw materials which are used in the laboratory must be of a grade which meets or exceeds the method specifications. Inorganic reagents must be American Chemical Society (ACS) reagent grade or better. Acids used for preservatives or digestion for metals methods must be of a grade specified for trace metals. Solvents which are used to prepare standards, reagents and to extract samples must be of the highest grade available for the applicable method. Each lot of solvents or acids must be tested prior to use in the laboratory by using the analysis of a solvent (or reagent) blank which is concentrated to the same level as the sample extracts. Analysis by the method must confirm the absence of interfering substances before the lot is introduced for client sample analysis. Reagents which are used in the digestion/extraction/analysis process are certified as an ultra-pure grade by the manufacturer with certificates of analysis kept on file. All chemicals and reagents are labeled with the date received, date opened and date of expiration.

The laboratory will ensure that all solvents, reagents, standards, and other materials that affect the quality of the analyses, will not be used until they have been inspected for compliance with required method or program specifications. The laboratory will not report data from any analysis, if quality control checks fail to confirm acceptability of solvents, reagents, standards, or materials

consumed in the analysis. The laboratory will test and verify all reagents, solvents, and standards prior to use on Department of Defense (DoD) samples.

8.3.3 Preparation Records

The preparation of reagents is done in accordance with requirements in the method specific SOP. The laboratory maintains detailed recipes and preparation records within the LIMS, or in hardcopy, for each analytical reagent. Required content of the reagent records are outlined below and an example LIMS record is presented as Figure 8-1.

- Reagent ID
- Recipe – lists the preparation details
- Preparer's initials
- Date prepared
- Expiration Date
- Disposal Date
- Concentrations of constituents
- Units
- Reviewer's initials

The preparation date and expiration date must be the same for all reagents prepared fresh daily. The department supervisor is required to perform a periodic review of the logbooks.

8.3.4 Labeling

Labeling of laboratory reagents must contain the following minimum content:

- Reagent name
- Concentration and units
- Initials of preparer
- Date prepared (mm-dd-yy)
- Expiration Date (mm-dd-yy)
- Reagent ID

The reagent ID provides traceability to the LIMS records for the preparation described in Section 8.3.3.

8.3.5 Storage

All reagent storage at Microbac is done in such a way that safety is always considered first. All flammable compounds are stored in a flammable cabinet. Volatile reagents are always stored and used in a well-ventilated area. Table 8-2 gives a list of common reagents and solvents used at Microbac and the method with which they are stored. Unless otherwise stated, borosilicate glass or polyethylene bottles are acceptable for storage of reagents used in inorganic analyses.

8.3.6 Waste Disposal

Since all laboratory work with chemicals eventually produces waste, we are aware of the regulatory obligations to utilize sound waste management policies and procedures. Therefore, the disposal of reagent waste at our facility is an issue of great importance and one which has been given much attention. All laboratory waste is accumulated, stored, and disposed in accordance with all federal, state, and local laws and regulations. The specifics of Microbac's waste management system are included in Microbac SOP 33 – Laboratory Waste Management.

8.4 Analytical Standards

This section describes all the procedures required to document the preparation and use of calibration and quality control standards. Policies covered include source material selection, receipt, traceability, preparation and labeling of stock, intermediate, and working standards, LIMS records, labeling, storage, and disposal. Microbac maintains complete records for standards preparation and traceability electronically within the LIMS. Figures 8-2 through 8-5 present example records from the LIMS.

8.4.1 Standard Sources and Preparation

The accuracy of data produced from analytical instrumentation depends primarily on the quality of calibration standards. Microbac uses fully documented procedures to assure that calibration and quality control standards are prepared to the highest level of accuracy available for a particular analyte. Concentrated stocks are prepared only with the highest purity standards available. Only standards that are certified traceable to NIST and are A2LA, ISO Guide 34, and/or ISO 17025 certified, will be used.

8.4.2 Standard Receipt and Traceability

Once purchased standards are received, they are immediately brought to the area in which they are to be used. At this point, the supervisor or analyst will place the standard in its proper storage area. Volatile standards are stored in a freezer. Semi-volatile standards which are purchased neat are stored at room temperature. Stock standards purchased commercially are stored according to the manufacturer's recommendation, or to the following:

- Water or methanol-based standards are stored at 0-6°C.
- Methylene chloride or hexane-based standards are stored in a freezer.
- Standards of compounds which easily precipitate are stored at room temperature.
- PCB spiking standards are stored at room temperature.

All standards will be stored separately from samples. Safety Data Sheets (SDS) for all standards are stored in a notebook and are available to any analyst. Other certification sheets will be kept on file within each lab division and stored for future reference. Since much of the important information is provided on the label, (manufacturer, lot number, concentration, purity, formula, compound name and health information), it also serves as a good source of information.

8.4.3 Certificate of Analysis (CoA)

The laboratory will maintain a system for identifying and filing certificates of analysis (CoA) for all purchased standards. The analyst will log the CoA into the LIMS, which assigns a unique serial CoA number. The laboratory will file electronic (pdf) copies of each CoA in the CoA folder of the network. See Figure 8-2.

8.4.4 Primary Standards

Primary standards are used in the classical chemistry laboratory to standardize selected titrants. These chemicals must specify "primary standard grade" to be acceptable for this purpose. The laboratory maintains primary standards for potassium hydrogen phthalate (KHP) and potassium dichromate, which can be used to standardize a wide variety of acid/base and redox titrants, if necessary. The department supervisor is responsible for the custody of these and other standard reference materials.

8.4.5 Neat Standard Materials

Most calibration and quality control standards are purchased as a concentrated stock solution from an approved vendor, however high purity neat standards may be used in some custom applications. Only materials of a known, certified purity are chosen for this purpose. Certificates of analysis for each of these neat materials are archived in LIMS to provide complete documentation and traceability.

8.4.6 Stock Solutions

A record of the preparation of concentrated stock standards will be maintained for each parameter. When a primary standard or concentrated stock standard is prepared, a number is assigned to that standard, along with the date, analyst, compound, lot number, purity net weight, weight adjusted for purity, dilution volume and actual concentration are recorded. When a standard solution is prepared from a neat compound, if the entire sample is used the label is removed from the container and attached to the standards form. When the parent stock is purchased through a commercially prepared source, these standards (i.e. 1,000 µg/mL metal standards) must have the vendor, concentration, expiration date and lot number of this stock recorded into the standard logbook. Often commercially prepared mixes are purchased.

8.4.7 Intermediate Standards

Once the stock standards are prepared, they are then diluted to prepare intermediate-level standards and/or final working standards using volumetric pipettes and glassware. The choice of the correct apparatus is very important (see Section 8.0). It is in the intermediate stage that more than one parameter is mixed in the right concentration for the final mix. This dilution must also be documented in the same manner as the concentrated stocks. An example LIMS record is presented in Figure 8-3.

8.4.8 Working Standards

These are the final dilutions that are used in the calibration or analysis stage of the method. The same procedures and LIMS documentation that were described for intermediate standards also apply to the working solutions.

8.4.9 Electronic Records

Electronic records for the preparation, documentation, and traceability of calibration and quality control standards are maintained in the LIMS. Each stock, intermediate, and working standard has a unique number that is cross-referenced to the electronic tables. See Figures 8-2 - 8-5.

8.4.10 Labeling

Labeling of calibration and quality control standards must contain the following minimum content:

- Standard name
- Concentration and units
- Initials of preparer
- Date prepared
- Expiration date
- Standard number (unique reference)

Due to the very small size of standard containers employed in gas chromatographic analyses, space may not allow for all the above information.

8.4.11 Storage

Analytical and quality control standards are stored in the individual laboratories (see Table 8-3). Wet Chemistry, Extraction, Semivolatile Organics, and Volatile Organics have refrigerators which are dedicated to reagents and standards. Standards for organic methods are stored in borosilicate glass containers with a Teflon lined cap which have been cleaned and solvent rinsed. Standards used in the Wet Chemistry laboratory are stored in containers compatible with the analyte and solvent i.e., of the same composition as the required sampling container. Metals standards are stored at room temperature and placed in a storage cabinet. Storage of metals standards must be in a polyethylene container, except where noted in the method, i.e., silver. Standards which have expired must be immediately removed from the storage unit and taken to the support services supervisor for proper disposal. Samples and standards must never be stored in the same refrigerator.

8.4.12 Disposal

The disposal of all standards is performed in accordance with procedures outlined in Microbac SOP 33, “Laboratory Waste Management”.

8.4.13 The Certificate of Analysis provided with final reports provides information for traceability of each measurement reported. The header for each analysis lists:

- Sample # - which is the laboratory work order ID
- Client ID – which is the sample name provided by the client on the chain of custody
- Matrix – names the matrix classification of the sample
- Workgroup # - is the LIMS ID for the group of samples included in the analytical batch, the workgroup includes tracking of spiking solutions and reagents used when applicable. The analytical workgroup is also linked in the LIMS to sample preparation workgroups where applicable.
- Collect Date – date of sample collection provided on the chain of custody
- Sample Tag – used to denote separate analyses performed on the particular sample fraction per analytical method
- PrePrep Method – used to track methods like TCLP or water leachate preparations prior to analytical preparations
- Prep Method – lists specific sample preparation methods of extraction or digestion
- Analytical Method – lists specific analytical methods employed
- Analyst – Identifies the analyst who performed the analysis
- Dilution – shows the dilution factor at which the analysis was performed
- Units – the units that apply to the numerical values presented on the associated analysis
- Instrument – indicates the particular instrument used to determine the results being reported
- Prep Date – lists the date analytical sample preparation was performed
- Cal Date – is the date the instrument was calibrated
- Run date – is the date the particular analysis was performed
- File ID – is the raw data file the analytical data for a particular analysis was collected in and stored under

This information can be used to trace the result back to the instrument(s) and analyst(s) who performed the analysis and the standards and reagents used in each step of the analytical process. The exact configuration of the instrument(s) used is recorded in the instrument maintenance logs. The calibration standards and calibration verification standards, internal standards (if applicable), analytical column (if applicable), the laboratory SOP (ID and version) used for that days' analytical sequence, the data file name, analytical dates and times are recorded in the run logs. The run logs also show the analysis of calibration and verification standards relevant to the results reported.

8.5 Standardization of Titrating Solutions

Table 8-4 gives a listing of the reagents used as titrants. All solutions are purchased pre-standardized by the manufacturer. The manufacturer's certificate of analysis provides the following information:

- Nominal Concentration (Normality)
- Concentration Limits
- Lot Number
- Primary Standard (Certified traceable to NIST)

As a daily quality control check on the commercial solutions, the laboratory verifies the certified values through the analyses of a blank spike. The standardization is checked monthly using the primary standard. If the results of this analysis indicate a problem, i.e., an out-of-control situation, then re-standardization against primary standards is required. Alternatively, the out-of-specification solutions are discarded, and fresh solutions are obtained as replacements.

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TABLE 8-1
LAB GLASSWARE CLEANING PROCEDURES

Analysis/Parameter	Cleaning Procedure (in specified order)
Extractable Organics (including Pesticides and Herbicides)	1-3, 8, 4, 7, 10, 12, 13
Purgeable Organics	Use either disposable glassware or follow steps 2, 3, 4, 7
Trace Metals: glass plastic	1-6 1-4, 15, 6
Nutrients	1-4, 12
Minerals, COD, BOD, Radiochemistry, Cyanide, Phenols	1-4, 12
Residues	1-4, 9 or 10, 12
MBAS	1-4, 14, 12
Petroleum Hydrocarbons	1-4, 7, 14, 13
Oil & Grease	1-4, 7, 14, 9

Cleaning Procedures:

1. Remove all labels using sponge or acetone.
2. Using a suitable laboratory-grade detergent (see list below), wash with hot tap water and a brush to scrub inside of glassware, stopcocks, and other small pieces, if possible.
   - Organics – Liquinox, Alconox or equivalent
   - Inorganic anions – Liquinox or equivalent
   - Inorganic cations – Liquinox, Alconox, Micro or equivalent
   - Bacteriologicals – must pass an inhibitory residue test
3. Rinse thoroughly with hot tap water.
4. Rinse thoroughly with deionized water.
5. Rinse or soak with 10% Nitric Acid.
6. Rinse 3 times with deionized water.
7. Rinse thoroughly with pesticide grade Methanol.
8. Rinse with 25% sulfuric acid.
9. Bake at 105°C for 3-4 hours.
10. Bake at 180°C for 3-4 hours (prior to use as per method).
11. After use, rinse with last solvent used.
12. Store inverted or capped with suitable material or suitable container stopper.
13. Last step (prior to use) must be a rinse with the solvent used in analysis.
14. Rinse thoroughly with acetone.
15. Rinse or soak with 1:1 HCl (Hydrochloric Acid).

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TABLE 8-2
REAGENT STORAGE

REAGENT	METHOD OF STORAGE
Hydrochloric Acid (HCl) Sulfuric Acid (H_2SO_4) Nitric Acid (HNO_3) Acetic Acid ($C_2H_4O_2$) Phosphoric Acid (H_3PO_4)	Stored in original containers in a vented cabinet designed for acid storage.
Ammonium Hydroxide (NH_4OH)	Stored in original containers in a vented cabinet designed for base storage.
Acetone (C_3H_6O) Methanol (CH_3OH) Propyl Alcohol (C_3H_8O) Isopropyl Alcohol (C_3H_8O) Pyridine (C_5H_5N) Ethyl Acetate ($C_4H_8O_2$)	Stored in original containers in a vented cabinet designed for flammable materials.
Chloroform ($CHCl_3$) Methylene Chloride (CH_2Cl_2) Ethyl Ether ($C_4H_{10}O$) Hexane (C_6H_{14})	Stored in original containers in a vented cabinet designed for volatile organics storage.

TABLE 8-3
STANDARD PREPARATION AND SOURCES

Instrument Group	Standard Type	Storage	Preparation from Source	Standard Expiration
VOLATILE				
Gas Chromatography Mass Spectrometry (GC/MS)	primary stock mixture at variable concentrations	freezer	primary stock mixtures are commercially prepared solution mixes	6 months or manufacturer expiration date
	intermediate standards at variable concentrations	freezer	intermediate standards are prepared from commercially purchased stock mixes	1 month
	working concentration	used immediately	working standards are prepared from intermediates	prepared fresh daily
SEMI-VOLATILE				
Gas Chromatography (GC)	primary stock mixture at variable concentrations	freezer	primary stock mixtures are commercially prepared solution mixes	6 months or manufacturer expiration date
	intermediate standards at variable concentrations	freezer	intermediate standards are prepared from commercially purchased stock mixes	6 months
	working concentration	used immediately	working standards are prepared from intermediates	prepared fresh daily
Gas Chromatography/ Mass Spectrometry (GC/MS)	primary stock mixture at variable concentrations	Manufacturer instructions	primary stock mixtures are commercially prepared solution mixes	6 months or manufacturer expiration date
	intermediate standards at variable concentrations	freezer	intermediate standards are prepared from commercially purchased stock mixes	6 months
	working concentration	freezer	working standards are prepared from intermediates	6 months
Ion Chromatograph (IC)	primary stock mixture at variable concentrations	room temperature	primary stock solution commercially prepared	12 months from date of opening or manufacturer's expiration date
	intermediate standards at variable concentrations		intermediate standards are prepared from commercially purchased stock mix	48 hours
	working concentration		working standards are prepared from intermediates	48 hours
Liquid Chromatography/Mass Spectrometry (LC/MS)	primary stock mixture at variable concentrations	room temperature	primary stock solution is commercially prepared	Manufacturer expiration date
	intermediate standards at variable concentrations		intermediate standards are prepared from commercially purchased stock mix	12 months
	Working concentration		working standards are prepared from intermediates	12 months
High Performance Liquid Chromatography (HPLC)	primary stock mixture at variable concentrations	freezer	primary stock mixtures are commercially prepared solution mixes	1 month (8330) or manufacturer expiration date
	Working concentration	freezer	working standards are prepared from primary stocks	24 hours
METALS				

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Instrument Group	Standard Type	Storage	Preparation from Source	Standard Expiration
Atomic Absorption Cold Vapor	primary stock mixture at variable concentrations ≥ 1,000 µg/mL	0-6°C	primary stock mixtures are commercially prepared solution mixes	12 months or manufacturer expiration date
	intermediate standards at variable concentrations ≥ 10 µg/mL (high standard)	room temperature	intermediate standards are prepared from commercially purchased stock mixes	6 months
	working concentration	room temperature	working standards are prepared from intermediates	24 hours
Inductively Coupled Plasma (ICP) & ICP-MS	primary stock mixture is at variable concentrations	room temperature	primary stock mixtures are commercially prepared solution mixes	12 months or manufacturer expiration date
	intermediate standards are at variable concentrations	room temperature	intermediate standards are prepared from commercially purchased stock mixes	6 months
	Working concentration	room temperature	working standards are prepared from intermediates	prepared fresh daily
WET CHEMISTRY				
Total Organic Carbon (TOC)	primary stock at 1,000 mg/L	room temperature	primary stock is a commercially prepared solution	6 months or manufacturer expiration date
	Working concentration	room temperature	working standards are prepared from intermediate	prepared fresh daily
pH meters and Tiamo pH meters	pH buffers at 4, 7, 10	room temperature	commercial stocks	fresh daily
Turbidimeters	purchased AMCO 10 NTU and 50 NTU	room temperature	commercial stocks	Manufacturer expiration date
Conductivity Meter	Primary stock at 14,130 µmho/cm	room temperature	commercial stocks	6 months
	Working concentration	0-6°C	1,413 µmho/cm	24 hours
Tiamo Conductivity Meter	primary stock at 1,000 µmho/cm	0-6°C	commercial stock	Manufacturer expiration date
WET CHEMISTRY – AUTO-ANALYZERS				
Ammonia	primary stock at 1,000 mg/L	room temperature	Commercial stock	Manufacturer expiration date
	working standards at variable concentrations	room temperature	working standards prepared from primary stock	1 month
Chloride	primary stock at 1,000 mg/L	room temperature	Commercial stock	Manufacturer expiration date
	working standards at variable concentrations	room temperature	working standards prepared from primary stock	1 month
Cyanide	primary stock at 1,000 mg/L	0-6°C	Commercial stock	Manufacturer expiration date
	working standards at variable concentrations	0-6°C	working standards are prepared from primary stock	1 month
Nitrate	primary stock at 100 mg/L	room temperature	Commercial stock	Manufacturer expiration date
	working standards at variable concentrations	room temperature	working standards are prepared from primary stock	1 month
Alkalinity	primary stock at 1,000 mg/L	room temperature	prepared by Microbac from sodium carbonate	6 months
	working standards at variable concentrations	room temperature	working standards are prepared from primary stock	1 month

Instrument Group	Standard Type	Storage	Preparation from Source	Standard Expiration
Sulfate	primary stock at 1,000 mg/L	room temperature	used as received commercially prepared	Manufacturer expiration date
Phosphorus	primary stock at 200 mg/L	room temperature	prepared by Microbac from KH_2PO_4	6 months
	working standards at variable concentrations	room temperature	working standards are prepared from primary stock	1 month
Total Kjeldahl Nitrogen (TKN)	primary stock at 200 mg/L	room temperature	prepared by Microbac from $(NH_4)_2SO_4$	6 months
	working standards at variable concentrations	room temperature	working standards are prepared from primary stock	1 month

TABLE 8-4
STANDARDIZATION OF TITRATING SOLUTIONS

Parameter	Titrating Solution	Primary Standard	Frequency of Standardization
Acidity	NaOH	KHP, NIST traceable	Pre-standardized by the manufacturer, checked monthly
Alkalinity	H_2SO_4	Sodium Carbonate Standard Solution, NIST traceable	Pre-standardized by the manufacturer, checked monthly
Hardness	EDTA	Calcium carbonate as $CaCl_2$, NIST traceable	Pre-standardized by the manufacturer, checked monthly

Note: All titration solutions are purchased pre-standardized.

Figure 8-1
Example – LIMS Reagent Record

Figure 8-1
Example—LIMS Reagent Record

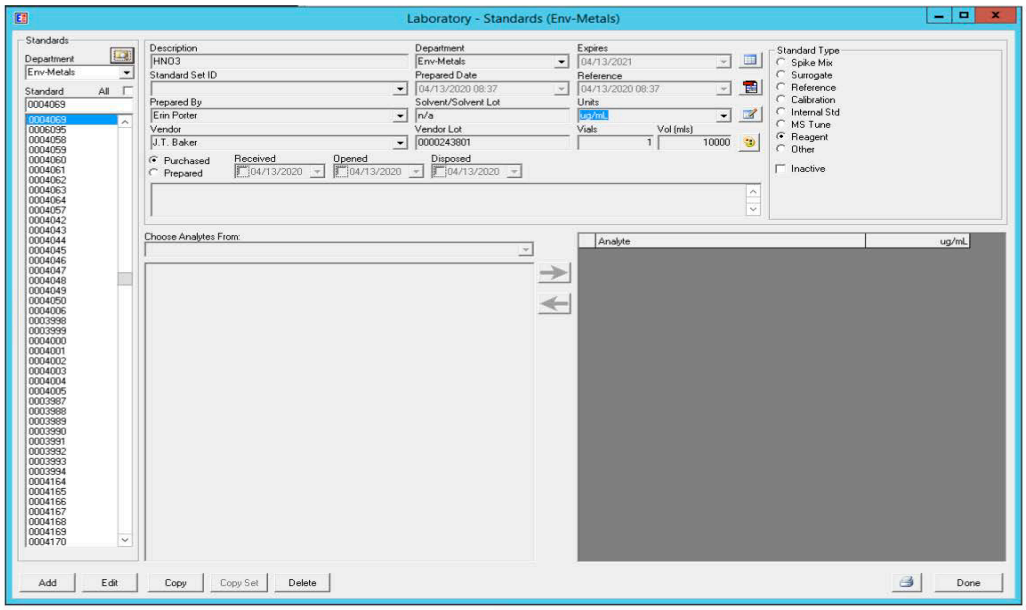


Figure 8-2
Example – LIMS Certificate of Analysis Record

Figure 8-2
Example—LIMS Certificate of Analysis Record

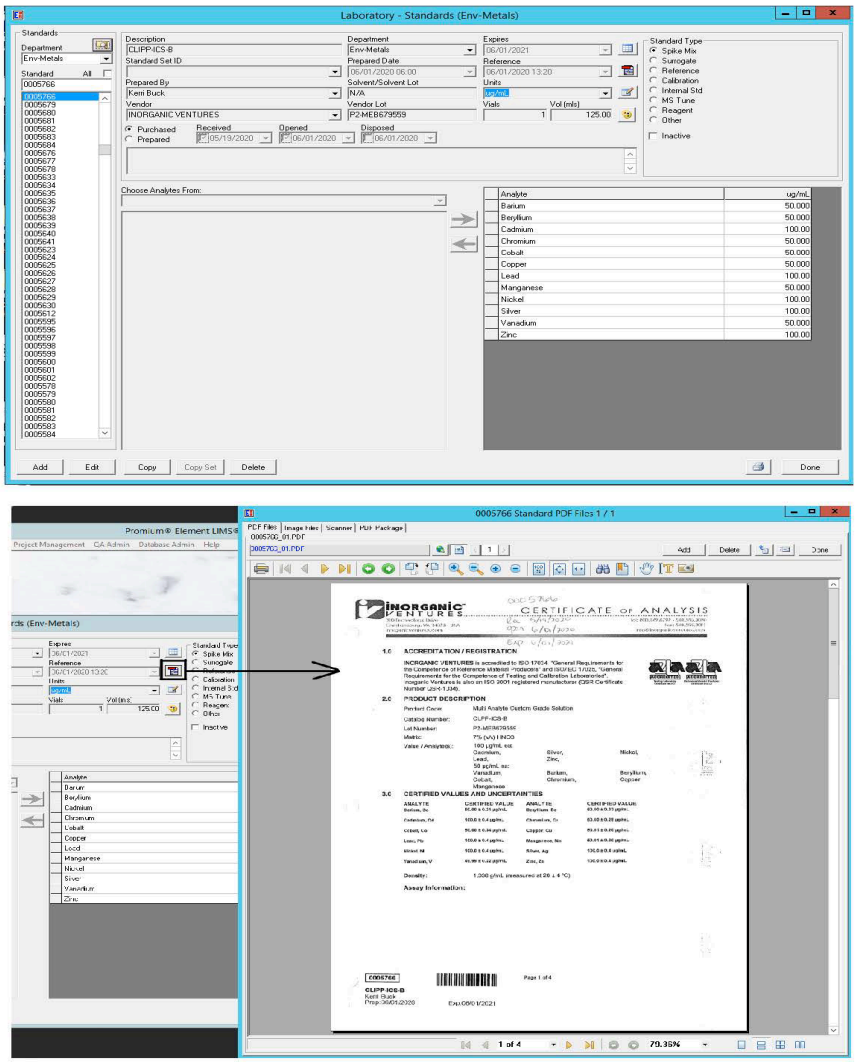


Figure 8-3
Example – LIMS Standard Record

Figure 8-3
Example—LIMS Standard Record

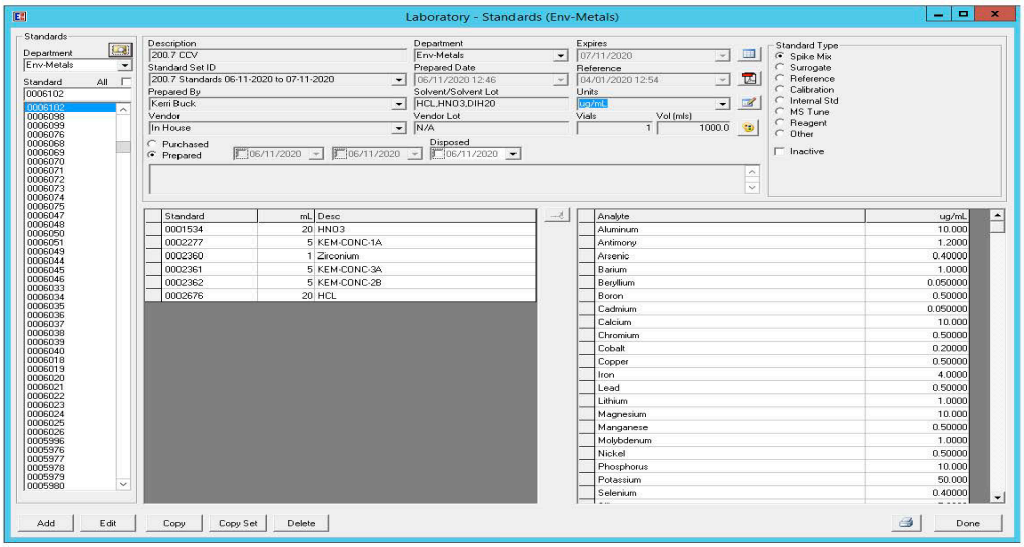
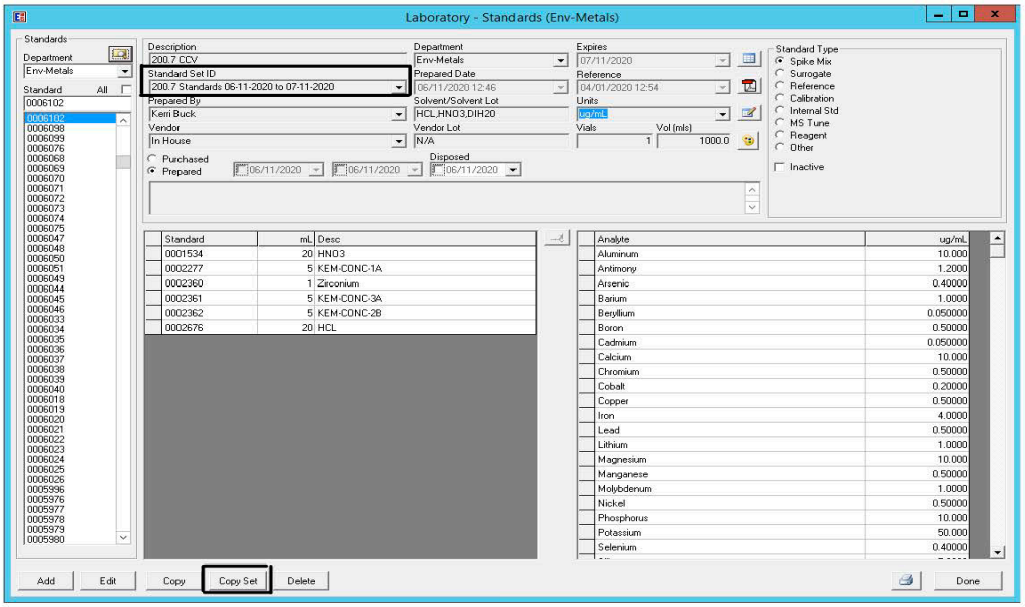


Figure 8-4
Example – LIMS Standard Set ID

Figure 8-5
Example—LIMS Standard Set ID



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9.0 CALIBRATION PROCEDURES AND FREQUENCY

9.1 Instrumentation

Since the modern analytical laboratory depends heavily upon instrumentation, their calibration, operation, and maintenance must be a primary concern in the production of satisfactory data.

The Equipment List is updated as needed. A current version is stored electronically and is available upon request.

9.2 General Calibration Requirements

All laboratory instrumentation must be properly calibrated before it is put into official use. Some general policies and guidelines are provided in the following sections, but complete details are found in the Microbac SOPs for the methods. Specific program or project requirements may be provided in the project QAPP or the sampling and analysis plan (SAP) and may supersede the method and Microbac's SOPs.

9.2.1 Initial Calibration

The initial calibration (ICAL) must meet the minimum requirements for the method in use. The calibration must contain the minimum number of points and the curve must pass the method criteria. If more than the minimum number of calibration points is analyzed for initial calibration, it is acceptable to eliminate points only at the top or bottom of the range, to get the curve to pass ICAL criteria. Points may not be eliminated from the middle portion of the curve.

9.2.2 Second Source Verification

It is the general policy of Microbac to verify the initial calibration with the analysis of a standard from a second source (different vendor). If a second vendor is not available, a second lot number will be purchased from the primary vendor. Acceptance criteria for the second source initial calibration verification (ICV) may be found in the specific SOP, the project QAPP, or the SAP. Any problems with the ICV that cannot be resolved by corrective action must be noted in the report narrative and the data properly qualified.

9.2.3 Continuing Calibration Verification

Continuing calibration verification (CCV) must be performed at the method specified frequency and meet the method SOP, QAPP, and/or SAP requirements. When required by the method, all samples must be bracketed by passing CCVs. Samples not bracketed by passing CCVs must be reanalyzed. Any problems with the CCV that cannot be resolved by corrective action must be noted in the report narrative and the data properly qualified.

9.3 Gas Chromatography

- ECD (Electron Capture Detector): Pesticides, PCBs, Herbicides, EDB/DBCP
- FID (Flame Ionization Detector): 8015/DRO/GRO
- EDCD (Electrolytic Conductivity Detector): Halogenated Volatiles

Linear ICAL is at least 5 points in the detector's range. Levels contain all target compounds. Quadratic ICAL is at least 6 points. The lowest calibration standard has a concentration that is ≤ the RL. Curves are checked by calculating the %RSD for all analytes.

Initial calibration and run sequence:

1. Initial calibration
2. ICV
3. Blank
4. BS/BSD
5. Analyze 10 samples
6. DUP/MS/MSD
7. CCV
8. Continue with steps 3-7 for remainder of run

Daily continuing calibration and run sequence:

1. CCV
2. Blank
3. BS/BSD
4. Analyze 10 samples
5. DUP/MS/MSD
6. CCV
7. Continue with steps 2-6 for remainder of run

Samples must be bracketed by passing CCVs. If the CCV does not meet criteria, all affected samples must be rerun. Exceptions will be noted on corrective action forms and approved by management.

9.4 Gas Chromatography/Mass Spectrometry

- Volatile Organic Analysis: 624.1, 8260
- Semivolatile Organic Analysis: 625.1, 8270

Linear ICAL is at least 5 points in the detector's range. Levels contain all target compounds. Quadratic ICAL is at least 6 points. The lowest calibration standard has a concentration that is ≤ the RL. Curves are checked by calculating the %RSD for all analytes.

Initial calibration and run sequence (must be within the specified tune time interval for BFB or DFTPP):

1. Run BFB or DFTPP and pass tune criteria
2. Initial calibration
3. ICV
4. Blank
5. BS/BSD
6. Analyze 10 samples
7. DUP/MS/MSD
8. CCV
9. Continue with steps 1 and 4-7 for remainder of run

Daily continuing calibration and run sequence (must be within the specified tune time interval for BFB or DFTPP):

1. Run BFB or DFTPP and pass tune criteria
2. CCV
3. Blank
4. BS/BSD
5. Analyze 10 samples
6. DUP/MS/MSD
7. CCV
8. Continue with steps 1-6 for remainder of run

Refer to the appropriate reference method for the tune criteria.

9.5 LC-MS/MS: Perchlorate and PFAS

Linear ICAL is at least 5 points in the detector's range. Levels contain all target compounds. The lowest calibration standard has a concentration that is ≤ the RL. Curves are checked by calculating the %RSD for all analytes.

Initial calibration and run sequence:

1. Initial calibration
2. ICV
3. Blank
4. BS/BSD
5. Analyze 10 samples
6. DUP/MS/MSD
7. CCV
8. Continue with steps 3-7 for remainder of run

Daily continuing calibration and run sequence:

1. CCV
2. Blank
3. BS/BSD
4. Analyze 10 samples
5. DUP/MS/MSD
6. CCV
7. Continue with steps 2-6 for remainder of run

Samples must be bracketed by passing CCVs. If the CCV does not meet criteria, all affected samples must be rerun. Exceptions will be noted on corrective action forms and approved by management.

9.6 HPLC-VWD/FD: Explosives

Linear ICAL is at least 5 points in the detector's range. Levels contain all target compounds. The lowest calibration standard has a concentration that is ≤ the RL. Curves are checked by calculating the %RSD for all analytes.

Initial calibration and run sequence:

1. Initial calibration
2. ICV
3. Blank
4. BS/BSD
5. Analyze 10 samples
6. DUP/MS/MSD
7. CCV
8. Continue with steps 3-7 for remainder of run

Daily continuing calibration and run sequence:

1. CCV
2. Blank
3. BS/BSD
4. Analyze 10 samples
5. DUP/MS/MSD
6. CCV
7. Continue with steps 2-6 for remainder of run

Samples must be bracketed by passing CCVs. If the CCV does not meet criteria, all affected samples must be rerun. Exceptions will be noted on corrective action forms and approved by management.

9.7 IC – Conductivity Detector: Anions

Linear ICAL is at least 5 points in the detector's range. Levels contain all target compounds. The lowest calibration standard has a concentration that is ≤ the RL. Curves are checked by calculating the %RSD for all analytes.

Initial calibration and run sequence:

1. Initial calibration
2. ICV
3. Blank
4. BS/BSD
5. Analyze 10 samples
6. DUP/MS/MSD
7. CCV
8. Continue with steps 3-7 for remainder of run

Daily continuing calibration and run sequence:

1. CCV
2. Blank
3. BS/BSD
4. Analyze 10 samples
5. DUP/MS/MSD
6. CCV
7. Continue with steps 2-6 for remainder of run

Samples must be bracketed by passing CCVs. If the CCV does not meet criteria, all affected samples must be rerun. Exceptions will be noted on corrective action forms and approved by management.

9.8 Cold Vapor Atomic Absorption

Linear ICAL is a minimum of five standards and a blank within the range of the detector. The lowest calibration standard has a concentration that is ≤ the RL.

Initial Calibration and Run Sequence:

1. Initial calibration
2. ICV/ICB
3. CCV/CCB
4. BS/BSD
5. Analyze 10 samples
6. DUP/MS/MSD
7. CCV/CCB
8. Continue with steps 4-7 for remainder of run

9.9 ICP-AES, ICP-MS

Linear ICAL is a minimum of five standards and a blank.

Initial Calibration and Run Sequence:

1. Initial calibration
2. ICV/ICB
3. Interference Checks
4. CCV/CCB
5. BS/BSD
6. Analyze 10 samples
7. DUP/MS/MSD
8. CCV/CCB
9. Continue with steps 5-8 for remainder of run

Samples must be bracketed by passing CCVs. If the CCV does not meet criteria, all affected samples must be rerun. Exceptions will be noted on corrective action forms and approved by management.

9.10 Support Equipment

9.10.1 pH Meter

The pH meter is recalibrated before each use or after 2 hours of use.

9.10.2 Turbidimeter

The Turbidimeter is calibrated every 2 months and is verified before each use.

9.10.3 Thermometers

Each thermometer in use in the laboratory is identified with a unique ID number which is printed on an attached tag. When a thermometer is put into use, it is checked against a NIST certified thermometer and documented in the thermometer calibration logbook. Any variation from the certified thermometer is indicated on the ID tag as a correction factor. If no adjustment is necessary, it is indicated by writing "No Correction Necessary" or "NCN" in the book and "NCN" on the tag. If temperature correction is required, it is added to or subtracted from the actual thermometer reading. Microbac records only the corrected temperature. Each thermometer is checked annually against the certified thermometer using the procedures outlined in Microbac SOP K0002 and documented in the thermometer logbook. The thermometer ID is documented in all logbooks used for temperature monitoring.

9.10.4 Mechanical Pipets and Syringes

The laboratory will verify mechanical pipets and syringes employing the procedures found in Microbac SOP K0002. Mechanical pipets are verified daily, and gas tight syringes are checked quarterly. The laboratory maintains electronic or hardcopy records of all checks of these devices.

9.10.5 Balances

An important piece of equipment in any laboratory is the analytical balance. The accuracy of data related to weight-prepared standards can be no better than that of the analytical balance. For this reason, proper care and use of the analytical balance is of the highest priority.

The following describes the requirements for the calibration and care of analytical balances:

- Analytical balances are mounted on a heavy, shock-proof table, constructed of either marble or concrete, and placed in an area of low traffic.
- The balance level is checked daily and adjusted when necessary.
- Balances must be protected from extreme temperature and humidity changes.
- A beaker of silica gel desiccant is placed in the balance and changed frequently.
- All spills on the pan or inside the balance must be avoided, and the balance must always be kept scrupulously clean.
- Balances will be checked and adjusted at least annually under a balance calibration service contract.

- Balances must be checked prior to each day's use applying the criteria specified in Microbac SOP K0002.

9.10.6 Sample Storage Units

Sample Storage Units requiring temperature control are equipped with electronic temperature probes (ETP) which are calibrated at least quarterly against a NIST certified thermometer employing the procedures found in Microbac SOP K0002. The temperature is recorded electronically every four hours and a 24/7 email system notifies responsible persons of any temperature excursions per Microbac SOP GP - TEMP-SSU.

9.11 Logbooks

Logbooks are maintained for all analytical instruments, balances, refrigerators, and incubators in the laboratory. All hardcopy logbooks are controlled documents with each page labelled with the document ID number and page numbers, logbooks may also be in electronic form.

9.11.1 Balances

Each balance has a logbook to record daily calibration checks. Maintenance and service records must be entered in the logbook. The daily calibration records must include the date, time, the initials of the operator, and the certified weights used to verify the balance per Microbac SOP K0002. Each balance is checked with weights covering the range of use on that balance.

9.11.2 Ovens and Incubators

Each oven and incubator has a logbook to record its daily operating temperatures. Each oven and incubator has a calibrated thermometer which is read during its operation. The operating temperatures are recorded in the logbook to document that the proper operating temperature has been utilized.

9.11.3 Instrument Logbooks

Each analytical instrument in the laboratory has a logbook. Daily operational notes, problems, routine maintenance procedures and repairs are kept in the instrument maintenance logbook. Calibrations, QC samples, and sample run information is documented in the instrument run log.

TABLE 9-1

LABORATORY EQUIPMENT SUMMARY*

Equipment	Manufacturer/Model
Balances, Analytical	Various
Balances, Top Loading	Various
Bomb Calorimeters	Various
CN Distillation System	Easy Dist
COD Reactors	Various
DO Meter	YSI-5000
Horizon 3000 XL with Controller	3000 XL
pH/ISE Meters	Orion
Automated Chemistry Analyzers	Various
Spectrophotometers	Various
Evaporators	Various
Titrators	Tiamo
TOC Analyzer	Shimadzu
Distillation System	Westco
Conductivity Meter	YSI Model 32
Turbidimeters	Various
Osmometer	Various
Ovens	Various
Muffle Furnaces	Various
BOD Incubators	Various
Coli Incubators	Various
Autoclaves	Various
Refrigerators	Various
Waterbaths	Various
Sealer	Model 2X
Black Box	CM-10A
Black Light	EA-160
TKN/Phosphorus Digestor	BD50
NH3 Block Digestor	C8000
Microplate Reader, 8 Channel	Abraxis 4303
Wristaction Shaker	Burrel
Laboratory Microwaves	Various
Flashpoint Analyzer	Pensky Marten
8 Place, 2 Liter SEP-Funnel Shakers	Glass Col
Ultrasonicators	Misonix XL 2020
N-EVAP112	OA-SYS
Stir Plates	Various

Equipment	Manufacturer/Model
Puck Mill	Essa
6 Place Soxhlet Apparatus	Indosati
12 Place Sep-funnel Rotary Agitator	Phipps & Bird
Tumblers	Associated Design
Hotblocks	DigiPrep
PSA System	Millennium
Autosamplers	Various
Chillers	Thermo Flex 900
ICP Instruments	Thermo Scientific
ICP-MS Instrument	Various
Mercury Analyzer CV-AAS	CETAC M-7600
SVOA GC-ECDs	Various
SVOA GC-FIDs	Various
HPLCs	Various
Centrifuges	Various
SVOA GC-MSs	Various
Ion Chromatographs	Various
LC/MS/MS	Thermo
VOA Purge & Trap Concentrators and Autosamplers	Various
VOA GC-FID/TCD	Agilent
VOA GC-PID/FID	Agilent

*Refer to the current Microbac-Marietta Equipment List file for all current instruments, equipment, and their locations within the lab.

10.0 PREVENTIVE MAINTENANCE

10.1 Routine Maintenance Activities

All Microbac's instruments undergo routine maintenance, cleaning, and inspection on a daily, weekly, or monthly basis, according to the manufacturer's recommendation, and/or the requirements of the methods employed.

Maintenance logs and instrument maintenance checklists are kept, noting problems and the steps taken to correct them. Records are kept on repairs requiring non-Microbac service technicians. Each instrument has an electronic or hardcopy log, which contains the records of any maintenance or repairs, performed.

Table 10-1 provides a summary list of the preventive maintenance activities for all major laboratory instrumentation.

10.2 Contingency Plan

In the event of a major instrument failure, most of Microbac's instrumentation has a back-up instrument. All instrumentation is listed in the Equipment List file.

There are multiple volatile and semivolatile GC/MSs, as well as multiple ECDs, ELCDs, FIDs and PIDs. In the inorganic laboratory there are multiple pH meters, spectrophotometers, and ICPs.

If no backup is available, and the sample has holding time left, the sample will be held until repairs have been completed. If the sample is getting close to the end of its holding time, the sample will be subcontracted out to another certified laboratory, or a re-sample will be requested from the client. This decision will be left up to the client. Microbac, under no circumstances, will analyze samples out of holding time or subcontract to another laboratory, without client notification and approval.

TABLE 10-1

LABORATORY INSTRUMENTATION PREVENTIVE MAINTENANCE

EQUIPMENT	MAINTENANCE ACTIVITY
Gas Chromatographs (GC) Semivolatile Organics	change septum change liners check carrier gas change carrier gas change in-line filters clip column replace ECD replenish ECD solvents change ion exchange resin replace nickel tubing bake out column at completion of sample batch run check system for gas leaks at each column change silanize or replace injection port liners
Gas Chromatographs (GC) Volatile Organics	check gases change gases clip chromatographic column clean PID Lamp clean FID Detector change Trap bake out column
Gas Chromatograph/Mass Spectrometers (GC/MS) Semivolatile Organics	clean mass spectrometer source change septum change liners check carrier gas change carrier gas change in-line filters clip column replace nickel tubing bake out column check system for gas leaks silanize or replace injection port liners
Gas Chromatograph/Mass Spectrometers (GC/MS) Volatile Organics	clean mass spectrometer check helium change helium bake or change trap clip column change Purge and Trap ferrules bake out column
HPLC – VWD/FD	monitor system pressure change guard cartridges change line filters reverse column filter samples at 0.45 microns filter eluents at 0.20 microns if needed monitor eluent reservoir content

EQUIPMENT	MAINTENANCE ACTIVITY
IC – Conductivity Detector	monitor system pressure monitor baseline detector output change guard column filter samples at 0.45 microns filter eluents at 0.20 micron if needed degas eluent monitor eluent volume monitor waste volume
CVAA (mercury)	change tubing check optics check gases check rinse change drying tube
AFS (Selenium)	change tubing check gas monitor waste make rinse daily check dryer assembly weekly
Inductively Coupled Plasma (ICP & ICP-MS)	clean nebulizer check torch check gases change tubing check optics (ICP)
pH Meters	clean probe
TOC Meter	clean detector
Specific Conductivity Meters	clean probe check cell constant replenish/replace probe redetermine cell constant
DO Meter	clean probe check membrane change membrane
Balances	check pans and compartment verify balance is level cleaning/calibration/service
Ovens	temperature monitoring
Refrigerators	temperature monitoring
Incubators	temperature monitoring
LC/MS/MS	monitor system pressure change guard cartridges filter samples at 0.45 microns monitor eluent reservoir content check curtain plate for residue buildup monitor Ion Transfer Tube, clean weekly

11.0 QUALITY CONTROL CHECKS, ROUTINES TO ASSESS PRECISION, ACCURACY, AND CALCULATION OF METHOD DETECTION LIMIT

This section describes the basic techniques of laboratory quality control and quality assessment normally used to evaluate analytical proficiency. General concepts are defined and discussed as measurement tools for evaluation of data quality. Topics addressed include analytical methods, the concept of batch control, specific types of quality control samples, routines to assess accuracy and precision, statistical control, method detection limits and reporting limits, and internal and external performance evaluation samples. For additional information on related subjects, refer to Section 9.0 for instrument calibration procedures and to Section 13.0 for corrective action criteria.

11.1 Analytical Methods

An important element in Microbac's Quality Assurance/Quality Control (QA/QC) program is strict adherence to the referenced analytical methods. Whenever possible, Microbac will use only methods that are US-EPA approved and promulgated for analytical investigations. The quality control samples described in Section 11.3 are designed to meet requirements of SW-846, Chapter 1, as well as the specific method QA/QC criteria. However, if program or project QA/QC requirements are more stringent, Microbac will comply with the specific project requirements or document the individual variances.

11.2 The Batch Concept

The basic unit for laboratory production and quality control is the **batch**. Samples are most effectively handled and processed in related groups. Examples of batches and their corresponding laboratory identifiers are discussed briefly below. The Sample Delivery Group (SDG) is a group of samples received in one shipment for a specific project and client and become a login batch. They are assigned a unique workorder number by the LIMS at the time of login. The login number also is the unit for the **laboratory reporting batch.**

The **preparation batch** is a group of twenty or less samples of the same matrix type that are prepared for analysis by a unique analytical procedure. Examples include extraction batches for semivolatile organics and digestion of samples prior to analysis for metals. A preparation batch employs the same analyses, reagents, equipment, processing, clean up, and concentration procedures. Each preparation batch has associated with it the appropriate quality control samples required by the method and usually includes the preparation blank (method blank), blank spike, blank spike duplicate, matrix spike, sample

duplicate and/or matrix spike duplicate. Each preparation batch is assigned a unique LIMS tracking number referred to as a **batch**.

The **sequence** refers to a group of client and laboratory QC samples for which the analytical results are entered and verified in the LIMS. A unique identifier referred to as the run ID is assigned to this sequence. A sequence may contain multiple preparation batches.

11.3 Batch Quality Control Samples

Each preparation and analytical batch is assigned a unique number by the LIMS called a workgroup. For analyses such as wet chemistry procedures and purge and trap methods for volatile organics, the preparation batch and analytical batch are one and the same. Other methods require a separate extraction or digestion prior to analysis by the instrument and separate preparation workgroups are applicable. The following analytical quality control samples will be associated with each workgroup if the control procedure is applicable to the analysis. Data tabulation and control charting procedures for these quality control samples are described in more detail in Section 11.7. Acceptance criteria and corrective action measures are in each specific laboratory SOP.

11.3.1 Method Blank

A method blank (MB), reagent blank (RB) or preparation blank (PB) is analyzed with each preparation batch as a check on analytical system contamination. A sample consisting of laboratory reagent water or analyte free laboratory sand or Teflon chips is processed through the entire analytical method including all sample preparation procedures such as extraction, digestion, and filtration. As a quality control sample, the results are used in conjunction with other control data to validate overall system performance and data quality. Client samples are associated with the method blank by sharing a common preparation workgroup number.

11.3.2 Blank Spike

The Blank Spike (BS) is used to assess the general performance of the analytical procedure. The BS is a quality control sample, similar in composition to the method blank, spiked with the analytes of concern at a known concentration, and is processed through the entire analytical procedure. The purpose of these samples is to monitor analysis control and to assess the accuracy of the procedure in the absence of matrix interference. The results of the BS are charted or tabulated and must meet the criteria established by the

project data quality objectives or the laboratory derived statistical control limits. The BS is normally used to verify system control, but evaluation should take into consideration several factors including the number of spiked analytes, their performance characteristics, and the severity of the non-compliance. NELAC requires that all certified analytes be included in the BS over a two-year period, including all EPA Appendix IX organics, pesticides and Aroclors. When the spike list is extensive, there exists a high probability of having a few analytes outside the acceptance limits. If the spiking concentrations are not specified in the project QAPP, an attempt is made to spike at a level near the mid-range for the method. Client samples are associated with a specific BS by sharing a common preparation workgroup number.

11.3.3 Blank Spike Duplicate

A Blank Spike Duplicate (BSD) is prepared with the BS for those batches that do not have another measure of precision, such as a sample duplicate (DUP), or matrix spike / matrix spike duplicate (MS/MSD). The BSD must meet the same acceptance requirements for accuracy (% recovery) as the BS and the same precision requirements (RPD) as the DUP or MS/MSD.

11.3.4 Matrix Spikes

Matrix Spikes (MS) are analyzed with each batch of samples of a similar matrix. They consist of a field sample that is spiked with the same analytes as the BS and normally at the same concentration. The MS is used to assess the performance of the method in the client's sample matrix. The percent recoveries are tabulated in a summary report and the results are used to assess bias or other matrix effects. The MS is not used to establish laboratory control but can be used to qualify data.

If sufficient sample quantity is available, the laboratory will select samples for matrix spiking based on the following approach:

- All client specified MS, MSD or sample duplicates (DUP) are logged into the LIMS and reported to the client.
- If no client specified samples have been submitted, the laboratory will randomly select a sample for the MS/MSD or DUP based on sample availability and client approval requirements.
- If there is insufficient sample volume to perform MS/MSD or DUP analysis, the laboratory will perform a BS/BSD to provide a measure of precision and accuracy for the analytical batch.

11.3.5 Duplicates and Matrix Spike Duplicates

Sample Duplicates (DUP) or Matrix Spike Duplicates (MSD) may be analyzed with each batch of samples of a similar matrix to monitor the method precision. The results in relative percent difference (RPD) are calculated as outlined in Section 11.5. This data may be used to evaluate the precision of the method in real sample matrices. For analytical methods for which spiking is inappropriate, a DUP is used to assess precision.

11.3.6 Selecting Samples for MS/MSD/DUP (Batch QC)

The laboratory will implement one of the following procedures for selecting samples for DUP, MS, and MSD.

a) If client samples are specified for batch QC in the LIMS or in the project QAPP, the analyst must select these samples.
b) If there are no client-specified samples, but extra sample aliquots are available for batch QC, the analyst will randomly select samples for the MS/MSD or DUP. Do not select a sample if it depletes all of the remaining sample. There must be enough sample remaining to allow for re-analysis, if necessary.
c) If there is insufficient volume of field samples available for DUP, MS, MSD, and re-analysis, the analyst will include a BSD in the batch in lieu of MS, MSD, or DUP.

11.4 Quality Assurance Summary Reports

Quality assurance summary reports are prepared for each analytical workgroup. Whenever samples are analyzed, the batch quality control sample results described in Section 11.3 are entered into the laboratory database. Reports are generated by workgroup for review by department supervisors, QA/QC personnel, and/or general management. Copies of the quality assurance summary reports are provided to the client upon request. They are included in all laboratory reports designated as Level 2, or higher, as described in Section 12.0.

11.5 Measuring Precision, Accuracy and Method Detection Limits

This section discusses method performance parameters and how they are related to data quality objectives (DQO). Definitions are given for precision, accuracy, representativeness, completeness, comparability (PARCC), MDL and RL. Tables which provide current statistics for methods including MDLs, RLs, precision and accuracy are reviewed at least annually and are available in the individual method SOPs (listed in Appendix B). The following definitions that

are used establish baseline data quality objectives for all analytical projects. The PARCC parameters and MDL/RL data are a useful template for development of SAP and QAPP for a wide scope of programs.

11.5.1 Precision (%RPD)

The laboratory objective is to equal or exceed the precision data generated by the applicable method validation studies on similar matrices. Relative percent difference (%RPD) as derived from duplicate matrix spike results, duplicate sample results, or duplicate BS results will be used to evaluate precision. With each analysis of a duplicate sample, MS/MSD or BS/BSD, the %RPD is calculated from the following formula:

$$RPD = \left[\frac{|C_1 - C_2|}{(C_1 + C_2)/2} \right] 100$$

where:
C_1 = Concentration of the first sample
C_2 = Concentration of the second sample

Method precision can be evaluated through the analysis of duplicate samples, MS duplicates, or BS duplicates. For most inorganic methods, the results of duplicate analyses are used to calculate advisory limits, but the upper limit for the RPD is usually set at 20%. Another measure of precision is the method standard deviation. The standard deviation determined from the analysis of laboratory control samples can also be used to estimate the upper control limit for the RPD. The latter procedure, which is taken from Standard Methods 1020B (18th Edition), is used for organic methods having long lists of analytes. However, for most projects the advisory upper limit for the RPD of organic analytes is set at 40% or as required by the method.

11.5.2 Accuracy (% recovery)

The laboratory objective is to equal or exceed the accuracy data generated by the applicable method validation studies on similar matrices. Percent recovery, as derived from the analysis of the BS is used to evaluate accuracy. The BS contains all the analytes of interest at the concentration of interest, either at the midrange of the method, or as specifically defined in the QAPP.

Accuracy statements (ranges) are derived from statistical analysis of the percent recoveries for the BS for the applicable media. Criteria are established at three standard deviations from the mean BS recoveries. The ranges for accuracy are generally used as control limits, however, projects DQO's, laboratory policies, or performance method requirements may dictate exceptions. Recovery (%R) is defined mathematically below.

For a Blank Spike:

$$\%R = \left(\frac{C_x}{C_t}\right)100$$

where:

C_x = the measured concentration of the analyte in the BS
C_t = the theoretical spike concentration.
$\%R$ = percent recovery

For a Matrix Spike:

$$\%R = \left[\frac{(C_{spk} - C_x)}{C_t}\right]100$$

where:

C_{spk} = the concentration of the analyte in the spiked sample
C_x = the concentration of the analyte in the reference (parent) sample
C_t = the theoretical spike concentration.
$\%R$ = percent recovery

11.5.3 Representativeness

Representativeness ensures that a set of data accurately depicts the distinguishing characteristics of the sample source. This is usually achieved through sample collection in accordance with statistically defined bounds of the population mean and variance, and by following existing sampling protocols.

11.5.4 Comparability

To achieve a performance level in terms of accuracy and precision for sample parameters in similar matrices, so that one set of data is comparable to another in terms of quality of measurement on a consistent basis. This assures that all Microbac analyses fall within an acceptable range.

11.5.5 Completeness

Refers to the percentage of measurements made which are judged to be valid. The completeness goals for most methods are 95% on all water analyses and 90% on all soil analyses.

11.6 Statistical Evaluation of Data

11.6.1 Statistical Methods

Microbac has established its statistical approach to quality control based on the following standards:

- Handbook for Analytical Quality Control in Water and Wastewater Laboratories, EPA-60014-79-019, March 1979.
- Standard Methods for the Examination of Water and Wastewater, 23rd Edition, APHA/AWWA/WEF, Methods 1010, 1020, 1030.
- Test Methods for Evaluating Solid Waste – Physical/Chemical Methods, SW-846, Chapter 1.

11.6.2 BS Control Limits

The laboratory shall establish statistically derived control limits for laboratory control samples. The laboratory will evaluate the data from at least thirty (30) BS data points to compute the mean and standard deviation (s).

The lower control limit (LCL) shall be established at the mean - 3s
The upper control limit (UCL) shall be established at the mean + 3s

Review of control charts may be used to verify that the established limits are supported by the laboratory data or are updated to reflect new statistics.

11.6.3 MS/MSD Control Limits

MS/MSD limits may be determined in the same manner as BS control limits in 11.6.2. BS control limits may be used to evaluate MS/MSD data, unless the project QAPP specifies otherwise.

11.6.4 Annual Evaluation

The laboratory will also generate an annual BS summary report from the LIMS. The summary report will display the individual BS results in concentration and percent recovery, computing the mean, standard deviation, and limits at ± 3s. This evaluation will occur concurrently with the annual SOP review. The supervisor and QAO will compare the statistics to the existing default control limits, to determine if these limits are supported by the new statistic. The laboratory will update the LIMS QC tables and the appropriate SOP tables, as necessary. The laboratory supervisor will review the data for method bias, trends, and shifts, and forward the data package to the QAO. The QAO will review, approve, and /or initiate investigations based on the data.

11.7 General Control Charting Procedure

The laboratory constructs control charts using percent recovery data from the BS. Control Charts are made for all inorganic analytes and a representative group of organic analytes from each method. In constructing an initial chart, twenty or more consecutive data points are necessary, and the time required to generate such a chart will vary with the frequency of the analysis (daily, weekly, monthly, etc.). This data is charted against the control limits effective during the evaluation period. Control charts are used not only to monitor system control and to evaluate accuracy and precision, but also to check for general trends. Each analyst is trained to interpret and identify problems such as shifts, trends and biases. This method ensures continued evaluation of laboratory and personnel performance. An example of a Microbac Control Chart is shown in Figure 11-1.

11.8 Method Detection Limits

The MDL is defined as the minimum concentration of an analyte that can be determined with 99 percent confidence that the measured concentration is distinguishable from method blank results. All MDL determinations provided by Microbac are made in accordance with Microbac SOP 45, which is derived from the USEPA procedures outlined in 40 CFR part 136, Appendix B. MDL's are evaluated annually and/or verified quarterly. Verification consists of analyzing a detectability check standard (DCS), which is a fortified blank spiked at a concentration near the concentration of the laboratory MDL and must not exceed the standard reporting limit. This check confirms that the laboratory MDL, which is derived from multiple instruments and analysts, is routinely achievable on a specific instrument and method over the course of time. To be considered acceptable, the MDL verification must give a measurable response that also meets the method's qualitative criteria or is at least distinguishable from the response in a blank sample. The laboratory will perform MDL verification immediately after each (initial) MDL study and quarterly thereafter. The laboratory will perform a verification if MDLs must be lowered for any reason.

The laboratory shall evaluate the acceptability of MDLs at the time of the SOP review for the method. This review shall include the status and acceptability of the MDL data for water and soil in the initial MDL studies and quarterly verification data, if applicable. Based on these reviews, the laboratory may choose to revise current MDLs, or determine the need for additional studies.

11.9 Quantitation Limits and Reporting Limits

Practical Quantitation Limits (PQL) and Limits of Quantitation (LOQ) are defined as the smallest concentration of analyte that can be reported to a known level of accuracy. The PQL is often defined as 3-10 times the MDL, but Microbac normally sets the PQL as the concentration of the lowest standard in the initial calibration curve for the method. Laboratory RLs (reporting limits) are often used in place of the PQL (PQL = RL) since they are generally accepted by the environmental industry. They can be adjusted for specific projects requirements but are independent of instrument variation and statistics. At Microbac, the RL/PQL/LOQ is usually at least two times the MDL for that analyte and is normally equivalent to the concentration of the lowest standard on the calibration curve. The RL must be ≥ MDL. For some programs such as DoD, it is necessary to report both the MDL and the RL. The standard laboratory reporting limits are in the applicable SOP and the LIMS.

11.10 Proficiency Testing (PT) Studies

Microbac currently participates in several PT studies: WS, WP, SOIL, DMRQA. For each of these programs, it is our internal policy to evaluate each department's performance and prepare corrective action plans for all unacceptable results. All PT reports and our corrective actions are available to clients and state agencies upon request. See also Section 14.2.

For certified methods for which there are not commercially available PT samples, Microbac Marietta will rely on QC checks for assuring the quality of testing results. The QC checks include, but are not limited to, alternate source check standards or comparison of new standard lots to previous standard lots prior to use. These QC checks must be analyzed at least twice per year.

For those accrediting bodies that require the submission of proficiency testing results and, associated CAPAs if necessary, the laboratory will submit as per the stated requirement.

Figure 11-1
CONTROL CHART

Figure 11-1
Control Chart

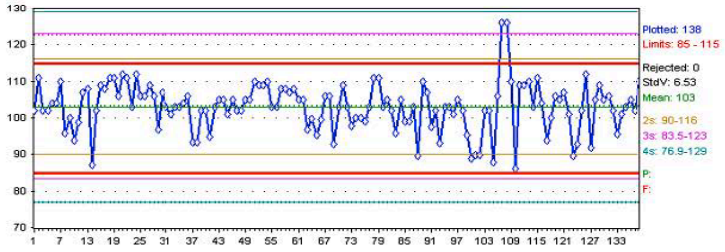
QA Control Chart

Printed: 06/23/2020 2:55 pm

Client: All Clients
Project: All Projects
Matrices: All Matrices
Instruments: CVAA1
Extractions: All Extractions

Prepared By: All Extractionists
Analyzed By: All Analysts

Mercury *BS %R*



Rjct	Sample ID	Prepared	Analyzed	Spike Level	Result	%R	Limits	Qualifiers
	B9H1696-BS1	8/30/19	9/4/19	0.004 mg/L	0.00407	102	85-115	
	B9I0004-BS1	9/3/19	9/4/19	0.004 mg/L	0.00445	111	85-115	
	B9I0146-BS1	9/5/19	9/6/19	0.004 mg/L	0.00407	102	85-115	
	B9I0231-BS1	9/6/19	9/6/19	0.004 mg/L	0.00416	104	85-115	
	B9I0307-BS1	9/9/19	9/13/19	0.004 mg/L	0.00415	104	85-115	
	B9I0544-BS1	9/11/19	9/13/19	0.004 mg/L	0.00441	110	85-115	
	B9I0603-BS1	9/12/19	9/13/19	0.004 mg/L	0.00383	95.7	85-115	
	B9I0702-BS1	9/13/19	9/16/19	0.004 mg/L	0.00400	100	85-115	
	B9I0729-BS1	9/13/19	9/17/19	0.004 mg/L	0.00375	93.8	85-115	
	B9I1313-BS1	9/24/19	9/24/19	0.004 mg/L	0.00395	98.7	85-115	
	B9I1397-BS1	9/25/19	9/25/19	0.004 mg/L	0.00427	107	85-115	
	B9I1482-BS1	9/26/19	9/26/19	0.004 mg/L	0.00431	108	85-115	
	B9I1484-BS1	9/26/19	9/30/19	0.004 mg/L	0.00349	87.2	85-115	
	B9I1551-BS1	9/27/19	10/1/19	0.004 mg/L	0.00409	102	85-115	
	B9I1649-BS1	9/30/19	10/3/19	0.004 mg/L	0.00435	109	85-115	
	B9J0085-BS1	10/2/19	10/3/19	0.004 mg/L	0.00432	108	85-115	
	B9J0440-BS1	10/8/19	10/10/19	0.004 mg/L	0.00442	111	85-115	
	B9J0732-BS1	10/14/19	10/14/19	0.004 mg/L	0.00445	111	85-115	
	B9J0949-BS1	10/16/19	10/17/19	0.004 mg/L	0.00425	106	85-115	
	B9J1064-BS1	10/17/19	10/18/19	0.004 mg/L	0.00448	112	85-115	
	B9J1120-BS1	10/18/19	10/21/19	0.004 mg/L	0.00445	111	85-115	
	B9J1222-BS1	10/21/19	10/22/19	0.004 mg/L	0.00412	103	85-115	
	B9J1294-BS1	10/22/19	10/23/19	0.004 mg/L	0.00448	112	85-115	
	B9J1396-BS1	10/23/19	10/24/19	0.004 mg/L	0.00424	106	85-115	
	B9J1470-BS1	10/24/19	10/24/19	0.004 mg/L	0.00425	106	85-115	
	B9J1552-BS1	10/25/19	10/28/19	0.004 mg/L	0.00437	109	85-115	
	B9J1669-BS1	10/28/19	10/29/19	0.004 mg/L	0.00424	106	85-115	

12.0 DATA REDUCTION, REVIEW, VERIFICATION, AND REPORTING

This section describes the process of data reduction, data review, data validation, data entry, and editing that begins with the raw data generated at the bench level in the laboratory and culminates with information in the form of summary laboratory reports and data deliverable packages.

12.1 Data Reduction

12.1.1 Data reduction is the conversion of raw data from instrument readings to reportable results. The raw data is converted into reportable values by instrument hardware and software or by other manual procedures per the appropriate reference method.

12.1.2 Policy on Significant Figures

The following policies relating to the use of significant figures for reporting analytical data apply in general to all departments and methods except as noted in the individual method SOPs. All analytical results which are taken from bench sheets, instrument quantitation reports, or other raw data shall be rounded to three (3) significant figures as per Section 12.1.3 and entered without adjustment into the LIMS. The LIMS is programmed to generate the final analytical report with the appropriate number of significant figures based on the project requirements.

- All PT sample results will be reported with three (3) significant figures using the rounding rules specified in Section 12.1.3.
- All QC sample results will be reported with three (3) significant figures.
- All surrogate compound recoveries will be reported with three (3) significant figures.
- All results for client samples will be reported with three (3) significant figures (except as noted below).
- Project specific requirements may override these general guidelines and the LIMS products and data entry screens will be modified accordingly.

12.1.3 Rules for Rounding

For rounding off numbers to the appropriate level of precision (significant figures), the laboratory staff shall follow these rules:

- If the figure following the digit to be retained is < 5, round down.
- If the figure following the digit to be rounded is ≥ 5, round up.

Examples:

Three Significant Figures:	Two Significant Figures:	One Significant Figure:
6.014 rounds to 6.01	0.0511 rounds to 0.051	0.015 rounds to 0.02
6.016 rounds to 6.02	0.0519 rounds to 0.052	0.016 rounds to 0.02
6.015 rounds to 6.02	0.0515 rounds to 0.052	1.9 rounds to 2
35.27 rounds to 35.3	67.5 rounds to 68	25 rounds to 30
6794 rounds to 6790	133 rounds to 130	261 rounds to 300
13558 rounds to 13600	1451 rounds to 1500	24 rounds to 20

12.2 Review of Data and Deliverables

The laboratory has established policies and procedures for internal review of data and deliverables (reports) to assure the quality of reported environmental/analytical data.

This is a multi-tiered process involving the sample receiving staff, a detailed analytical review by the primary analyst, and a secondary technical review by the department supervisor, or a qualified peer analyst. Additionally, a random selection of final laboratory reports will undergo administrative and/or Quality Assurance reviews for completeness, reasonableness, and to identify any errors. These reviews utilize a combination of manual and electronic tools.

Detailed procedures for review of data and deliverables are presented in SOP GP – Review of Analytical Data.

12.3 Data Entry and Verification

The Marietta LIMS has been programmed to retrieve data directly from instrumentation using a datafile uploading process. Other data must be manually entered by a data specialist or technician. Data verification is a check on the data that is entered into the LIMS. Data is entered by the analyst or a clerical staff assistant and is checked for accuracy by the department supervisor or a designated peer reviewer. Incorrect entries are immediately corrected. EDDs are generated by either the Project Manager or Information Technologies (IT) personnel. Electronic files are verified by either the IT staff or the project manager before being submitted to the client.

12.4 Report Content and Levels

Microbac provides four levels of laboratory reports to match the documentation level required by specific projects. A summary of the four levels of data reporting follows:

Level 1: Standard Laboratory Report

- Cover page with signature
- Results of analysis
- Reporting units
- Reporting/detection limits
- Analysts and analysis dates
- Method references
- Chain-of-custody form
- Surrogate recovery

Level 2: Level 1 with QA/QC Summary of MB, BS/BSD, MS/MSD, and DUP.

Level 3: Level 2 with additional summary forms. Does not include raw data.

Level 4: CLP-like report with summary forms and raw data.

Reporting level requirements are logged into the LIMS system with the sample set. Level 1 and 2 data packages are assembled upon printout of the final report by the data entry staff. Copies of the raw analytical data for level 4 data packages are turned in by the analysts upon completion of analysis. Data summary forms are printed from specialized software packages by the analysts in each laboratory department. For a list of Microbac data qualifiers, refer to Table 12-1.

12.5 Data Integrity, Storage and Archive

Ensuring data integrity is one of Microbac's main objectives. QA controls, as well as Good Laboratory Practice are instituted by Microbac to achieve this objective. In the daily flow of data, laboratory personnel initial and date any corrections in the data. Unused areas of the daily bench sheets and instrument logs are crossed out, initialed, and dated by the corresponding analyst or technician. Controlled bench sheets and logbooks are required to maintain data integrity. Each sample delivery group is assigned a unique login number when initially logged into the LIMS system. The report master files are stored in order of the login number and can be easily retrieved using this system. Each login is scanned electronically and stored in the Masterfile up to 18 months then removed to an External Hard Drive for a period of five to ten years depending

on regulatory or contractual agreements. OVAP requires notification prior to disposal of any records.

Computer records from the LIMS are maintained on the system up to one year and are then archived on an External Hard Drive. Two backup copies of the system are maintained on a Hard Disk Drive (HDD), which is a local backup, and on an External Hard Disk Drive for an offsite backup. The Offsite Backups are retained indefinitely.

Table 12-1 – Data Qualifier Codes

Qualifier	Description
<	< [Custom Value]
>	> [Custom Value]
A	Absent
A0	Sample acceptance criteria was not met.
A1	Sample was received outside of recommended temperature.
A11	Sample was filtered (0.45um) and preserved with Nitric Acid to pH <2 on receipt.
A12	Sample was preserved with Sulfuric Acid to pH <2 on receipt.
A13	Sample was preserved with Sodium Hydroxide to pH >12 on receipt.
A14	Sample was preserved with Hydrochloric Acid to pH <2 on receipt.
A15	Proper preservation cannot be achieved due to the sample matrix.
A16	MBAS calculated as LAS, mol wt XXXXX.
A17	Analysis was performed on a composite sample.
A18	Analysis was performed on a grab sample.
A19	Analysis was performed by client.
A2	Sample was not received on ice.
A20	Sample was field filtered by client.
A21	Sample was filtered in the laboratory before analysis.
A22	The sample was not filtered within 24 hrs of collection as required by method.
A23	Sample was unpreserved when received by the laboratory; the pH was adjusted and sample analyzed per client request.
A24	The sample was not filtered within 15 minutes of sample collection as specified in the analytical method. The samples were filtered in the laboratory prior to sample digestion and/or analysis.
A3	Sample contained residual chlorine.
A35	Sample container was not full at receipt
A4	Sample was received with head space.
A5	Sample was filtered (0.45 um) before analysis.
A6	Sample turbidity <1 NTU. No digestion was performed.

Qualifier	Description
A7	Insufficient sample.
A8	Sample was received in an improper container.
A9	Sample was improperly preserved.
AC	[Custom Value]
B	Analyte found in the blank at or above the method acceptance criteria.
B1	Target analyte is detected in the method blank at or above the reporting limit. There is no impact on the reported value.
B2	Target analyte is detected in the method blank at or above the reporting limit. The sample concentration is 10 times that found in the blank.
B3	Target analyte is detected in the initial calibration blank at or above the reporting limit.
B4	Target analyte is detected in the initial calibration blank at or above the reporting limit. There is no impact on the reported value.
B5	Target analyte is detected in the continuing calibration blank at or above the reporting limit.
B6	Target analyte is detected in the continuing calibration blank at or above the reporting limit. There is no impact on the reported value.
B7	Target analyte is detected in the associated trip blank.
B8	Target organism was detected in the associated method blank.
C	Confirmatory analysis was performed.
C1	Confirmatory analysis was performed by second column.
C2	Confirmatory analysis was performed by GC/MS.
C3	Confirmatory analysis was not performed.
CC	[Custom Value]
COM	Completed
D	Dilution performed on sample.
D1	Dilution was performed due to matrix interference.
D2	Dilution was performed due to insufficient sample.
D3	Dilution was performed due to high target analyte concentration.
D4	Dilution was performed due to high non-target analyte concentration.
D5	Liquid portion of dual phase sample analyzed only.
D6	Solid portion of dual phase sample analyzed only.
D7	Analysis performed on a water extract.
D8	Sample yielded less than 2.5 mg dried residue with less than one liter volume filtered.
E	Estimated Result.
E1	Estimated result due to sample matrix interference.
E2	Estimated result due to target analyte exceeding calibration range.
F	Did not flash.

Qualifier	Description
F1	Did not ignite.
F2	Did not fire.
FL	Free Liquids
H	Sample was analyzed past holding time.
H1	Sample was received past holding time.
H2	Initial analysis was within holding time. Reanalysis was past holding time.
H3	Sample was extracted and prepared within holding time and analyzed past holding time.
H4	The test was performed outside of the EPA recommended holding time of 15 minutes.
H5	Sample was extracted, prepared and analyzed past holding time.
I	Semiquantitative result (out of instrument calibration range).
I1	Internal standard was outside of acceptance limits.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
JN	The analyte is a non-target or non-client requested analyte that has been tentatively identified using a mass spectral library search as present. The associated numerical value is the estimated concentration in the sample.
K	Sample dilutions did not meet the minimum dissolved oxygen criteria.
K1	Unseeded dilution blank depletion exceeds 0.2 mg/L.
K2	Glucose/glutamic acid recovery was below acceptance limits. The reported value is estimated.
K3	Glucose/glutamic acid recovery was above acceptance limits. The reported value is estimated.
K4	Sample did not meet the minimum dissolved oxygen depletion in any dilution.
K5	Sample did not meet the minimum dissolved oxygen remaining in any dilution.
K6	Evidence of toxicity is present. The reported value is calculated from the highest dilution.
K7	Seed control did not meet method criteria.
K8	Test replicates show more than 30% difference between high and low dilutions.
K9	The initial dissolved oxygen reading for the sample was > 9.0 mg/L.
L1	Elevated reporting limit due to insufficient sample.
L2	This analyte is not reported due to a laboratory accident.
L3	Elevated reporting limit due to sample foaming.
M	Matrix interference is present.
M1	Matrix spike recovery is outside of acceptance limits, biased high.
M2	Matrix spike recovery is outside of acceptance limits, biased low.
M3	Matrix spike recovery is outside of acceptance limits. The post digestion spike recovery is acceptable.

Qualifier	Description
M4	Matrix spike recovery was acceptable. Post digestion spike is outside of acceptance limits.
M5	Post digestion spike is outside of acceptance limits.
M6	Matrix spike recovery was not calculated. The analyte concentration is 4X the spiking level.
M8	Due to the sample matrix, the method defined ratio could not be achieved and the reported results may be biased.
N	Tentatively identified compound (TIC).
N1	Dioxin screen based on EPA 625. Conclusive analysis can be performed by EPA 1613.
NA	Not Applicable
ND	None Detected
NEG	Negative
NF	None Found
NFL	No Free Liquids
P	Present
P1	Concentrations >40% difference between the two GC columns.
POS	Positive
PP	Presumptive Positive
Q	One or more quality control criteria failed.
Q1	LCS recovery is above acceptance limits. The reported value is estimated.
Q10	Analysis of acrolein and/or acrylonitrile was performed from a sample that was field preserved to pH < 2, which is less than the pH range of 4-5 specified in the test method and required for NPDES compliance per 40CFR Part 136.
Q11	Analysis of 2-chloroethyl vinyl ether was performed from a sample that was field preserved to pH < 2 with HCl. Acid preservation is not allowed for this parameter by the test method or for NPDES compliance per 40CFR Part 136.
Q2	LCS recovery is above acceptance limits. However, there is no impact on the reported value.
Q3	LCS recovery is below acceptance limits. The reported value is estimated.
Q4	ICV recovery is above acceptance limits. The reported value is estimated.
Q5	ICV recovery is below acceptance limits. The reported value is estimated.
Q6	CCV recovery is above acceptance limits. The reported value is estimated.
Q7	CCV recovery is above acceptance limits. However, there is no impact on the reported value.
Q8	CCV recovery is below acceptance limits. The reported value is estimated.
Q9	Calibration curve linearity did not meet acceptance limits. The reported value is estimated.
R	Sample result is rejected.

Qualifier	Description
R1	Duplicate RPD is outside of acceptance limits.
R2	Duplicate RPD is outside of acceptance limits. Visual examination confirms sample is non-homogeneous.
R3	Duplicate RPD is outside of acceptance limits. Results are less than 2X the MRL.
S	Spike recovery outside of acceptance limits.
S1	Surrogate recovery is above acceptance limits.
S2	Surrogate recovery is below acceptance limits.
S3	Surrogate was diluted out.
S4	Surrogate recovery cannot be accurately measured due to matrix interference.
S5	Surrogate recovery is outside of acceptance limits. There is no sample available for reanalysis.
S6	Surrogate recovery is outside of acceptance limits. No compound of interest is associated with this surrogate. There is no data impact.
S7	Sample was not applicable for percent solids, therefore percent solids was set to 100%.
T	TNTC
T1	Confluent growth.
T2	Sample incubation period exceeded method requirements.
T3	Sample incubation period was shorter that the method requirement.
T4	Incubator temperature was outside the acceptable temperature range.
T5	TCLP list was reported from a total analysis. The total results were lower than TCLP limits.
T6	Insufficient sample for full volume TCLP extraction.
T7	TCLP Extract: The sample filtered through 0.7um glass fiber filter paper and was <0.5% solids. As specified by SW846 1311, the filtrate is by definition the TCLP extract. Initial and final pH values are not taken when the filtrate is the extract.
T8	The TCLP was not extracted within the required temperature range
TIC	A mass spectral library search was used to identify whether this analyte was presumptively identified.
U	The analyte was analyzed for but was not detected above the reported quantitation limit. The quantitation limit has been adjusted for any dilution or concentration of the sample.
X	Exceeds regulatory limit.
Y	This analyte is not on the laboratory's current scope of accreditation.
Y1	Accreditation is not offered by the accrediting body for this analyte.

13.0 CONTROL OF NONCONFORMING WORK

13.1 Nonconforming Work

The laboratory implements general procedures to be followed when departures from documented policies, procedures and quality control have occurred or when any aspect of testing, result generation or reporting does not conform to established procedures or contract requirements of the customer. The procedures detailed in Microbac SOP GP-RCA, "Root Cause Analysis" and Microbac SOP GP-CAPA, "Corrective Action and Preventive Action: Initiating, Tracking and Monitoring", are to be followed when such occurs. The department supervisor and/or the analyst have the ultimate authority and responsibility for the management of nonconforming work and the appropriate actions to be taken. The department supervisor, analyst and/or the QA department have the authority, under their scope of responsibilities, to initiate the necessary procedure. The procedure insures that:

- An evaluation of the significance of the nonconforming work is made.
- Corrective actions are taken immediately, as necessary.
- When necessary, the customer is notified, and the work is recalled.

Where there is doubt about the compliance of laboratory operations with policies or procedures with the ISO 17025 standard or a determination is made that nonconforming work could recur, the QA department will audit the appropriate areas of activity per Microbac SOP GP-INTAUDIT, Internal Audit Guidelines and Microbac SOP GP-CAPA, "Corrective Action and Preventive Action: Initiating, Tracking and Monitoring."

13.2 Corrective Action

Corrective action may be required because of both analytical and non-analytical events. The purpose of the corrective action is not only to provide documentation of the event, but also to correct and prevent recurrence of the nonconformance or departure from the policies and procedures.

The procedures in Microbac SOP GP-RCA, Root Cause Analysis and Microbac SOP GP-CAPA, Corrective Action and Preventative Action: Initiating, Tracking and Monitoring detail and insure the following:

- An investigation is made to determine the root cause(s) of the problem.
- Potential corrective actions are identified and subsequently the most appropriate are implemented.
- Corrective actions are chosen appropriate to the magnitude of the problem.
- The entire process is properly documented.
- Follow-up is made to monitor and determine the effectiveness.

13.3 Preventive Action

Preventive action is the proactive identification of potential problems or areas for improvement. No nonconforming event needs to take place to stimulate a preventive action. This practice applies to the quality management system. Needed improvements and potential sources of nonconformance, whether administrative, technical, or quality related are identified, selected, implemented, monitored, and documented following Microbac SOP GP-CAPA, "Corrective Action and Preventive Action: Initiating, Tracking and Monitoring". Effectiveness of these actions is evaluated during the management review process.

13.4 General Analytical Requirements

Analysts have the primary responsibility for assessing method compliance and evaluating the acceptability of the batch quality control samples. Laboratory criteria that must be met and the resultant corrections are addressed in the individual SOPs. An example of the contents is outlined in Table 13-1 of the analytical SOPs. Some methods have additional control criteria such as surrogates, ICVs, CCVs, etc. A departure occurs if a blank, calibration standard, laboratory control sample, sample replicate, or spike recovery analyses fail to meet the quality control criteria outlined in the SOPs. An investigation to find the cause of the problem is undertaken by the analyst and department supervisor and a Nonconformance Report (Figure 13.1) may be initiated. This form is used to document the problem, its resolution and to provide the means to inform management (including the QAO) of chronic quality problems and non-compliant systems. Corrective action must be approved by the QAO who will ensure implementation and documentation of the corrective action. More specific discussion of the various laboratory corrections due to nonconformance are discussed in the sections that follow. The special requirements of the OVAP are presented in appropriate section of OVAP SOPs.

13.5 Calibration Requirements

Instrument calibration is fundamental to all quantitative chemical analysis. Each US EPA or other reference method has specified calibration criteria that must be met for the data to be fully useable. Proper initial calibration must be performed in accordance with the method specifications for number, source, and level of calibration standards, as well as meet the linearity requirements. Each initial calibration must be verified at the specified frequencies and meet acceptance limits. Repeated failure of CCV standards necessitates that the analysis be stopped, the instrument evaluated, and the initial calibrations repeated. Data for problematic analytes that do not pass the method specification must be qualified appropriately in the final laboratory summary reports and narratives.

13.6 Blanks

Method blanks are used to evaluate the analytical system for contamination. For most analytes, the upper limit for blank contamination is the reporting limit, however, it is our policy to evaluate the source of any contamination greater than two times the MDL.

The criteria used to determine the acceptability of method blanks varies with the analyte. Factors such as the level of analyte in the sample and the existence of established regulatory limits, or action limits, must be taken into consideration. No correction other than documentation is required when the levels of analyte in the samples are at least ten times the level in the blank. Laboratory action involving blank contamination would include an investigation documented by a nonconformance report and one of the following actions:

- re-preparation and re-analysis of the affected samples
- B-flagging of the data
- documentation of the problem in the report narrative along with the effects on data quality, if any

For other types of blanks, refer to Blanks in Appendix A.

13.7 Blank Spikes

The data from the BS is crucial to assessing the usability of the data from samples in the same batch. Normally, the BS is approached from the standpoint of pass/fail. If the BS is out-of-control, the samples in the associated batch are re-analyzed, starting from the preparation step. This is the standard laboratory policy for single analyte methods such as wet chemistry or metals. For multi-analyte methods such as volatile and semi-volatile organics, both the number and severity of BS outliers must be evaluated. A certain amount of professional judgment is required of the laboratory management as to what constitutes an out-of-control BS. If the number of failing analytes is excessive (i.e., > 10% of the analytes spiked), indicating a general system failure, then correction shall include the re-preparation and re-analysis of the entire batch. When the outliers are out high, there is no correction required if the samples do not contain reportable levels of these analytes. Furthermore, if the analytes are out low, but only marginally, this also might not indicate a method problem. The results of the BS are included in the QC Summary Report and all outliers are appropriately identified. The report narrative will discuss any problems with non-compliant BS data and the proper flags used to qualify the analytical results.

13.8 Matrix Spikes and Duplicates

Evaluating the data from MS, MSD, and DUP samples is more complex than for method blanks and blank spikes. In general, Microbac does not base batch control on the results of these analyses due to matrix effects and the issues of heterogeneity and sampling. If MS control limits are not available, the control limits for the BS will be used to assess the acceptability of the MS/MSD data for the purposes of data flagging only.

13.9 Nonconformance Reports (Figure 13-1)

Nonconformance Reports (NCR) are used to document out of control events, which consists of, but are not limited to, the non-fulfillment of a requirement of a customer, quality management system, or regulatory agency. A NCR can be generated by any employee when nonconformances are identified. The form describes the event, correction and signifies a return to control if achieved. Further action is required if there is not a return to control and/or the out-of-control event is recurring. Further actions include, but are not limited to, corrective action procedures.

13.10 Corrective Action/Preventive Action Reports (Figure 13-2)

Corrective Action/Preventive Action Reports (CAPAs) are used to document nonconformances requiring corrective action, as well as actions designed to prevent initial occurrences of a nonconformance. These reports are typically generated by the analyst or individual who has encountered the nonconforming or potential nonconforming situation. This individual would be responsible for generating the CAPA by describing the nonconformance and recommending or describing the correction taken. After the correction is performed, the root cause is determined and the solution(s) implemented, the CAPA form is reviewed and signed by the department supervisor, the QAO and the laboratory technical director. Post closure monitoring is performed and recorded in the monthly corrective action spreadsheet.

Figure 13-1

MICROBAC®

Marietta Division

NONCONFORMANCE REPORT

Date: _____ **Department:** _____ **Initiator:** _____

Prep WG# _____ **Preparation Date:** _____ **Parameter:** _____

I. Description of Nonconformance:

Sample ID(s) _____

_____

☐ Method Blank _____

☐ LCS Failures _____ analytes out _____

☐ Other _____

_____

_____

II. Correction:

☐ Reprep affected samples only _____

☐ Reprep entire workgroup _____

☐ Reanalyze affected samples only _____

☐ Report data with qualifiers _____

☐ Other _____

_____

III. Return to Control?: Not Applicable _____ Yes _____ No _____

Control Verification _____

IV. Further Action Required?: (required if No is checked in III.)

_____

_____

_____

Approvals:

Department Supervisor: _____ Date: _____

QA Department: _____ Date: _____

Revised: 10/22/2018 Document Control Form #454

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Figure 13-2

MICROBAC®

Marietta Division

CORRECTIVE ACTION / PREVENTIVE ACTION REPORT

Date: _____ **Department:** _____ **Initiator:** _____ **Due:** _____

I. Description of Nonconformance:

II. Correction (CAR only):

_____

_____

_____

III. Root Cause Analysis Results (optional for PAR):

_____

_____

_____

IV. Action to be taken:

_____

_____

_____

_____

V. Describe evidence of effectiveness:

_____

_____

_____

_____

Approvals:

Department Supervisor: _____ Date: _____

QA Department: _____ Date: _____

Director/Manager: _____ Date: _____

CAPA 5048

Last revised: 04-23-2021

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14.0 PERFORMANCE AND SYSTEMS AUDITS

14.1 External Audits

Microbac actively participates in several Federal and State PT programs and system audits. External audits of the facility occur on a regular basis. These include audits by the West Virginia Department of Natural Resources (WVDNR), the Ohio EPA (OEPA), and the Florida Department of Health (FLDOH – TNI Primary Accrediting Agency). Additionally, audits are conducted by the Arizona Department of Health Services and the Department of Defense (U.S. Army Corps of Engineers).

14.2 Performance Audits and Proficiency Testing

Performance audits are required for numerous state and federal programs. These certifications include the submittal of single blind analytical PT samples from certified providers. Microbac formally participates semi-annually in the following PT programs: WS; WP/DMRQA; and Soil.

If problems are identified in any of these programs, the QAO will submit internal PT samples to verify the effectiveness of any corrective actions.

14.3 Internal Audits

The QAO will perform internal audits of the laboratory operations to assure continued adherence to the LQAP, including the referenced methods and SOPs. The QAO may conduct the audits over the course of the year, with assistance from other technical directors or supervisors. The results of the audits shall be documented, and the results are presented in a report to the Laboratory Technical Director. The QAO may perform additional internal audits based on results of internal and external performance feedback. If the laboratory receives a customer complaint, an audit will be used to investigate the appropriate areas. The laboratory will perform corrective actions and notify the client within three business days if any data are affected by findings resulting from an internal or external audit. The laboratory shall typically have thirty (30) days to close out any internal audit finding.

The procedure for conducting the internal audit is in Microbac SOP GP-INTAUDIT.

14.4 Annual Management Review (Laboratory Technical Director)

Senior Management annually conducts a Quality Management Systems Review by the end of the first quarter. Each system is reviewed for client responsiveness, overall efficiency, value towards quality and economic value. Human resources and equipment needs are evaluated. With the summation of the review, corrective actions are implemented, as appropriate, equipment is purchased, and overall business strategy is adjusted. The procedures for conducting the management reviews in accordance with ISO 17025 are presented in Microbac SOP GP-QMSR.

Annual Management Review includes, but is not limited to:

- Effectiveness of the Laboratory Quality Management System
- Report Generation/Content (Hard Copy & EDD)
- Laboratory Data QA/QC
- Improvement of laboratory activities to meet requirements
- LIMS issues, development, and improvement
- Sales/Marketing Function/System
- Proposal/Quotation generation
- Project Management/Technical Service
- Production efficiencies
- Volume and type of work
- Internal audit reports
- Performance evaluation studies
- Client satisfaction
- Client feedback
- Review previous action items

15.0 QUALITY ASSURANCE REPORTS

The QAO and other laboratory technical directors perform an annual review of the quality system. This review includes all the following elements:

- Results of internal audits
- Results of external audits
- Results of Proficiency Testing (PT) studies
- Summary of review of Corrective Action Reports
- Reports and deliverables
- Electronic Data Deliverables (EDD)
- Annual revision of the Quality Assurance Manual

15.1 Laboratory Quality Assurance Reports

The QAO prepares a monthly report for the Managing Director and to Microbac's corporate Director of Quality Improvement. The report summarizes laboratory activities for audits, PT studies, corrective action closure, certification changes, training, customer feedback, and other significant events.

The QAO also presents a written annual report to the Managing Director that summarizes the annual system review activities. Any significant quality assurance or quality control problems along with the recommended solutions for the problems are listed.

15.2 Quality System Review Report

The Quality System Review is conducted annually (see Section 14.4) and a report of this review is issued to the president of the company. This report is included in the Annual Business Plan with the recommendations, observations, and adjustments incorporated in the business plan/strategy for the following year.

15.3 Special Reports

The QAO shall prepare special quality assurance reports as necessary to document special concerns and problems. These reports may include the discussion of chronic PT performance problems, evaluation of Corrective Action Reports, results of storage blanks, follow-up from internal and external audits, customer complaints, and any trends determined from periodic evaluation of statistical data.

16.0 SPECIAL PROGRAM REQUIREMENTS

This section identifies the specific requirements of various state and federal programs that have requirements that go beyond what is outlined in this quality manual and the laboratory policies and procedures (SOPs). It is not the intent to list all the QA/QC requirements of these programs since these documents are incorporated by reference. Only the specifications that are more stringent than our standard protocols are identified.

16.1 Department of Defense (DoD)

Microbac performs analyses for projects that must comply with the DoD Quality Systems Manual (QSM). The QSM is based on the NELAC standards but has special requirements. The appendices to the QSM summarize the QA/QC requirements for several common methods and list special surrogate and BS control limits. To assure compliance with the DoD QSM, Microbac has implemented special procedures described below.

16.1.1 DoD QSM Version 5.3/5.4

DoD QSM 5.3/5.4 requires notification of the client when nonconforming work is discovered. The laboratory analyst, department supervisor and/or QAO, on discovery of nonconforming work which may have a potential impact on data quality, shall notify the relevant Customer Relations Group member who then has the responsibility to notify the client of the nonconformance within 15 business days. Records of corrections taken to resolve the nonconformance which may include Corrective Action Preventative Action will be submitted to the client within 30 business days. Any instances of inappropriate and prohibited lab practices must be reported to the accrediting body within 15 business days of discovery. Corrective actions must be submitted to the accrediting body within 30 business days of discovery.

16.1.2 QAPP and Control Limits

The DoD QSM has special QA/QC acceptance limits for the BS, MS/MSD, and surrogates. The project set up specifications shall identify the QAPP and QC-Key i.e., DOD5. The QC Table is populated with the correct BS/surrogate acceptance limits for DoD5. These steps will assure that the correct control limits are used for all QSM projects.

16.1.3 Internal Standards

Methods 8260 and 8270 must compare the internal standard (IS) area to the mid-point of the ICAL curve. Use project set-up to indicate this requirement.

16.1.4 Soil Sub-sampling – Method 8330B

Microbac will follow the 8330B procedures for drying, sieving, grinding, and multi-increment sub-sampling of soil samples in preparation for SW-846 Method 8330B. The laboratory obtained additional guidance for these procedures from "DoD Guide for Implementing EPA SW-846 Method 8330B", July 7, 2008. Refer to SOP EXTNT02.

16.1. 5 Soil Sub-sampling – Metals

Microbac will use the 3051A procedures for the drying, sieving, grinding, and sub-sampling of soil samples in preparation for metals digestion by SW-846 Method 3051A. This procedure may be extended to other methods if specified in the project QAPP. Refer to SOP ME406.

16.1.6 10% of DoD final reports will undergo review for technical completeness and accuracy by the QAO or designee. This review will be documented in the LIMS under Quality Control.

17.0 REFERENCES

17.1 Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, QAMS-005/80, December 29, 1980, Office of Monitoring Systems and Quality Assurance, ORD, U.S. EPA, Washington, DC 20460.

17.2 RCRA QAPP Instructions, U.S. EPA Region 5, April 1998.

17.3 ASTM D-5283-92. Generation of Environmental Data Related to Waste Management Activities: Quality Assurance and Quality Control Planning and Implementation.

17.4 "American National Standards Specification and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs (ANSI/ASQC E-4)", 1994.

17.5 EPA 2185 – Good Automated Laboratory Practices, 1995.

17.6 ANSI/ISO/IEC 17025 - 2017 General Requirements for the Competence of Calibration and Testing laboratories.

17.7 QA/R-2: EPA Requirements for Quality Management Plans, August 1994.

17.8 QA/G-4: Guidance for the Data Quality Objectives Process EPA/600/R-96/055, September 1994.

17.9 QA/R-5: EPA Requirements for Quality Assurance Project Plans Draft, November 1997.

17.10 QA/G-5: Guidance on Quality Assurance Project Plans EPA/600/R-98/018, February 1998.

17.11 QA/G-6: Guidance for the Preparation of Standard Operating Procedures for Quality-Related Operations EPA/600/R-96/027, November 1995.

17.12 QA/G-9: Guidance for the Data Quality Assessment: Practical Methods for Data Analysis EPA/600/R-96/084, January 1998.

17.13 Manual for the Certification of Laboratories Analyzing Drinking Water, Fifth Edition, January 2005.

17.14 Department of Defense (DoD), Department of Energy (DOE) Consolidated Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3, 2019.

17.15 Department of Defense (DoD), Department of Energy (DOE) Consolidated Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.4, 2021.

17.16 Microbac SOP MISBUR “Management Information Systems Backup and Recovery”.

17.17 Microbac SOP SDWA01 “SDWA Reporting and Exceedance Notifications”

17.18 Microbac SOP K0002 “Calibration Techniques”

17.19 2016 TNI Standard, Environmental Laboratory Sector.

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APPENDIX A

DEFINITIONS

The following definitions are used in the production of this Comprehensive Quality Assurance Plan.

Audit:

A systematic check to determine the quality of operation of some function or activity.

1. **Performance Audit:** Quantitative data are independently obtained for comparison with routinely obtained data in a measurement system. Examples of these audits are EPA performance evaluation programs, commercial performance evaluation programs, split sampling programs involving at least two laboratories, and blind spike samples.

2. **Systems Audit:** These are qualitative in nature and consist of an on-site review and evaluation of a laboratory or field operation quality assurance system and physical facilities for sampling, calibration, and measurements.

Calibration:

Process by which the correlation between instrument response and actual value of a measured parameter is determined.

1. **Calibration Curve:** A curve which plots the concentration of known analyte standards against the instrument response to the analyte. Also known as a Standard Curve or the ICAL.

2. **Calibration Standard:** Solutions or dilutions of a substance or material with a verifiable accuracy which are used to evaluate the sample property of an unknown sample. In analytical terms, these standards are used to establish a calibration curve or standard instrument response factors.

3. **Continuing Calibration Verification (CCV):** Standard analyzed during an analytical set to verify the accuracy of the calibration curve.

4. **Internal Standard:** A compound having similar chemical characteristics to the compounds of interest, but which is not normally found in the environment or does not interfere with the compounds of interest. A known and specified concentration of the standard is added to each sample prior to analysis. The concentration in the

sample is based on the response of the internal standard relative to that of the calibration standard and the compound in the standard.

Confidence Level:

The statistical probability associated with an interval of precision (or accuracy) values in a QC chart. The values of confidence intervals are generally expressed as percent probability. It is a commonly accepted convention that the result being tested is significant if the calculated probability is greater than 99 percent.

Data Quality Objectives:

A set of specifications that the environmental data should meet in order to be acceptable for its intended use in a program area. DQO's are commonly established for limits of detection and quality of data (precision, accuracy, representativeness, and comparability).

1. **Accuracy:** The degree of agreement of a measurement X (or an average of measurements of the same thing), with an accepted reference or true value, T, usually expressed as the difference between the two values, X-T, or the difference as a percentage of the reference or true value, 100 (X/T)/T, and sometimes expressed as a ratio, X/T. Accuracy is a measure of the bias in a system.

2. **Precision:** A measure of mutual agreement among individual measurements of the same property, usually prescribed similar conditions. Precision is best expressed in terms of the standard deviation. Various measures of precision exist, depending upon the "prescribed similar conditions."

3. **Representativeness:** Expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

4. **Comparability:** Expresses the confidence with which one data set can be compared to another.

5. **Completeness:** Completeness refers to the percentage of measurements made which are judged to be valid. The completeness goal is the same for all data uses: that we achieve 95% completeness on our first analysis. Subsequently our goal is to achieve 100% completeness by resampling or doing additional analysis.

Detection Limits:

The smallest concentration/amount of an analyte of interest that can be measured with a stated probability of significance.

1. **Method Detection Limit (MDL):** The smallest concentration of an analyte of interest that can be measured and reported with 99 percent confidence that the concentration is greater than zero. The MDLs are determined from the analysis of a sample in a given matrix containing the analyte at a specified level. Determination of MDLs should be done by procedures determined in Appendix B of 40 CFR, Part 136. Equivalent procedures to determine MDLs may be used.

2. **Detection Limit (DL):** The smallest analyte concentration that can be demonstrated to be different from zero or a blank concentration at the 99% level of confidence. At the DL, the false positive rate (Type I error) is 1%.

3. **Limit of Detection (LOD):** The smallest amount or concentration of a substance that must be present in a sample in order to be detected at a high level of confidence (99%). At the LOD, the false negative rate (Type II error) is 1%.

4. **Limit of Quantitation (LOQ):** The lowest concentration that produces a quantitative result within specified limits of precision and bias. For DoD projects, the LOQ shall be set at or above the concentration of the lowest initial calibration standard.

5. **Practical Quantitation Limit (PQL):** The smallest concentration of an analyte of interest that can be reported with a specific degree of confidence. PQLs shall be determined in the same way as MDLs by using the procedures outlined in Appendix B of 40 CFR, Part 136. The standard deviation (s) derived from the procedure will be used to calculate the PQL: PQL = 10s, which corresponds to an uncertainty of ± 30% in the measured value at the 99 percent confidence level.

6. **Instrument Detection Limit (IDL):** The smallest amount of an analyte of interest that generates an instrument response (signal) under prescribed conditions, so that the magnitude of the signal is larger than the absolute uncertainty (error) associated with it.

Environmental Sample:

Means any sample from a natural source or source that reasonably may be expected to contribute pollution to or receive pollution from groundwaters or surface waters. This includes but is not limited to: receiving waters; waters used to define natural background conditions; soils; sediments; industrial, domestic or municipal discharge effluents; chemical storage or handling facilities; waste disposal facilities or areas;

industrial or agricultural chemical handling or application areas; surface water run-off; and facilities for the handling or applying of chemicals for weed or insect control.

Holding Time:

Sample hold time is defined as the time elapsed from the sample collection date and time to the sample extraction, or analysis, date and time. The LIMS will flag any exceeded hold times.

Parameter Group:

Defined as a group of samples that have been preserved in the same manner, prepared by similar protocols, and analyzed using instruments of similar technology (also known as analyte group). Examples of parameter groups are:

- Volatiles (EPA methods 624.1, 8260)
- Pesticides (EPA methods 608.1, 8081)
- Trace Metals (All metals except mercury)
- Nutrients (Total Kjeldahl Nitrogen, Nitrate-Nitrite, Total Phosphorus)

Proficiency Testing (PT) Samples:

A sample submitted for analysis whose composition and concentration are known to the submitter but unknown to the analyst. Also known as a blind sample or performance evaluation (PE) sample.

Quality Assurance (QA):

A system of activities whose purpose is to provide the producer or user of environmental data the assurance that it meets defined standards of quality with a stated level of confidence.

Quality Assurance Plans (QAP):

An orderly assembly of detailed and specific procedures which delineates how data of known and accepted quality is produced.

Quality Assurance Project Plans (QAPP):

A QA plan that is written for a specific project outlining specific QA targets and data quality objectives as well as protocols and QC measures needed to meet the project specific objectives.

Quality Control (QC) Measures:

1. Blanks:

   An artificial sample of an analytical matrix designed to monitor the introduction of contamination, interferences, or artifacts into the system.

   a) Field Quality Control Blanks

   - Field Blanks: Blanks of analyte-free water prepared on-site by filling the pre-preserved sample containers with reagent water, sealing the containers, and completing the documentation. These blanks should be prepared during the middle to end of a sampling event by filling sample containers with water from the equipment decontamination water transport containers. They are to be treated, stored, transported, and analyzed in the same manner as the sample group for which it was intended. These blanks may be submitted for all water parameter groups.

   - Equipment Blanks: Blanks of analyte-free water that are prepared on-site by pouring the equipment decontamination water through decontaminated field equipment. Appropriate pre-preserved sample containers for each analyte group should be used, and documentation should be completed. These blanks are to be stored, transported and analyzed with the intended parameter groups. At least one equipment blank is required for each water and solid matrix analytical group and should be collected at the beginning of the sampling episode. If field decontamination is performed on-site, additional equipment blanks should be submitted for all water and solid matrix analytical groups.

   - Trip Blanks: These blanks are required for volatile organic compound (VOC) water samples only. Blanks of volatile organic-free water are prepared by the organization providing the sample containers. These are transported to the site with the empty VOC sample containers and shipped to the analyzing laboratory in the same containers. They remain unopened for the entire trip. Proper labeling and documentation should be completed. One trip blank for VOC sent per project unless client requests more.

   b) Laboratory Quality Control Blanks

   - Method Blank: A blank of an analyte-free matrix that is processed (digested, extracted, etc.) and analyzed with a specified sample set.

   - Reagent Blank: An aliquot of analyte-free water or solvent that is analyzed with a sample set.

2. Spiked Samples:

These are samples fortified to a known and validated concentration of analyte. Percent recoveries are calculated for each compound in the spike.

a) Field Spike

- An environmental sample fortified to a known and validated concentration in the field. These may be submitted as blind spike (laboratory does not know they are spiked) or as identified field spikes.

b) Laboratory Spike

- Blank Spike (BS): Samples of an analyte-free matrix (deionized water, sand, soil, etc.) that are fortified to a known and validated concentration of analyte(s) before sample preparation. Also known as Laboratory Control Samples (LCS).

- Sample Spike (Matrix Spike): Environmental sample selected from a set (not blanks) that is fortified to a known and validated concentration of analyte(s) before sample preparation. The concentration of each analyte in the spiking solution should be approximately 3-5 times the level expected in the sample.

- Surrogate Spikes: A compound having similar chemical characteristics to the compounds of interest, but which is not normally found in environmental samples. Known concentrations of these compounds are added to all samples in the set before sample preparation.

3. Replicate Samples:

Samples that have been collected at the same time from the same source (field replicates) or aliquots of the sample that are prepared and analyzed at the same time (laboratory replicates).

a) Duplicate (DUP) samples: Samples that are one type of a replicate sample. The analytical results from replicates are used to determine the precision of a system. If the concentration of analytes in the sample is below detectable limits, duplicate Matrix Spikes may be used to determine precision.

b) Blind Replicates (Duplicates): Samples that are replicates that have been collected (field replicate) or prepared (laboratory replicate) and are submitted and analyzed as separate samples (analyst does not know they are replicates).

4) Quality Control Checks:

Standards or samples from an independent source that are analyzed at a specific frequency.

a) Quality Control Check Standards: Standard solutions from a source other than normal calibration standards that are certified and traceable. These standards are used to check the accuracy of a calibration curve.

b) Quality Control Check Samples: (also known as Reference Materials): Samples obtained from an independent source for which the level(s) of analytes have been validated. These samples are prepared and analyzed with a sample set of similar matrix. If these samples have been obtained from the National Institute of Standards and Testing (NIST, formerly National Bureau of Standards [NBS]), they are referred to as Standard Reference Materials.

5) Split Samples:

Replicates of the same sample that are given to two, or more, independent laboratories for analysis.

Sample Custody:

All records and documentation required to trace a sample from point of origin to disposal after analysis. These records should include, but are not limited to:

a) Field notebooks;
b) Field sample ID tags
c) Chain of Custody forms;
d) Laboratory transmittal forms (if applicable);
e) Laboratory sample receipt logs;
f) Sample extraction/preparation logs or worksheets;
g) Analytical (instrument) logs or worksheets;
h) Calibration and quality control data associated with a sample set;
i) Instrument maintenance logs;
j) Sample disposition logs; and
k) Final reports.

Legal Chain of Custody is a special type of sample custody in which all events associated with a specific sample should be documented in writing. In addition to the records described above, legal chain of custody records should include the following:

a) Sample transmittal forms or tags that have adequate spaces for the dated, original signatures of all individuals who handle the sample (or cleaned sample containers if obtained for a contracted laboratory) from time of collection (or container receipt) to laboratory delivery.

b) Laboratory sample storage logs that identify date, time, and individuals who remove samples from storage.
c) Secure, limited access storage areas.

Sample Matrix:

This means that characteristic of an environmental laboratory sample, associated with its physical and chemical properties, which defines how such a sample is handled when subjected to the intended analytical process. The following samples matrices (major matrix groups), defined below should be used in QA plans whenever specifying data quality objectives:

1. **Reagent or Laboratory Water:** A sample of water which conforms to ASTM TYPE II, III, IV.

2. **Drinking Water (DW):** Includes finished (treated) or raw source water designated as potable water. Such resources may be from surface or ground water.

3. **Non-Potable Water (NPW):**
   a. **Surface Water:** Includes fresh or saline waters from streams, canals, rivers, lakes, ponds, bays, and estuaries (natural or manmade).
   b. **Groundwater:** Includes all waters found below ground in confined or unconfined aquifers.
   c. **Wastewater:** Includes any influent or effluent associated with domestic or industrial waste treatment facilities.

4. **Solid and Chemical Materials (SCM):**
   a. **Chemical Waste:** Includes sludges and residuals from domestic or industrial wastewater processing, and liquid or solid chemicals no longer used for their intended purpose.
   b. **Soil/Sediment:** Surface or subsurface soils and sediments of fresh or saltwater origin.

5. **Biological Tissue:** Includes tissue of plant or animal origin. The most common of these are shellfish, fish, and aquatic plants.

APPENDIX B

STANDARD OPERATING PROCEDURES (SOP)

Note: A current list of Microbac SOPs is stored electronically and are available upon request.

APPENDIX C

ACCREDITATIONS

Note: All current accreditations, certificates, and scopes are stored electronically and are available upon request. This list is current as of the date this manual was revised.

American Association for Laboratory Accreditation (A2LA)
Arizona Department of Health Services
California Water Boards
Connecticut Department of Public Health
Florida Department of Health
Illinois Environmental Protection Agency
Kansas Department of Health and Environment
Kentucky Energy and Environmental Cabinet (NPW)
Kentucky Energy and Environmental Cabinet, Underground Storage Tank (UST)
Louisiana Department of Environmental Quality
Massachusetts Department of Environmental Protection
Nevada Department of Conservation and Natural Resources
New Hampshire Environmental Laboratory Accreditation Program
New York Department of Health
North Carolina Department of Environmental Quality
Ohio Environmental Protection Agency (DW)
Ohio Environmental Protection Agency, Voluntary Action Program (VAP)
Oklahoma Department of Environmental Quality
Pennsylvania Department of Environmental Protection
Rhode Island Department of Health
Tennessee Department of Environmental and Conservation
Texas Commission on Environmental Quality
United States Department of Agriculture, Soil Permit
Virginia Department of General Services
West Virginia Department of Environmental Protection (NPW)
West Virginia Department of Health and Human Resources (DW)

APPENDIX D

KEY PERSONNEL

JOB DESCRIPTIONS

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Job Description for Marietta Division

Position: **Managing Director**
Classification: **Exempt**
Reports To: **President/CEO**

Position Summary and Interrelationships:
The Managing Director reports to the President of Microbac Laboratories, Inc. and manages the business development and technical staff presented in the organization charts of the Laboratory Quality Assurance Plan (LQAP). The Managing Director has primary responsibility for assuring compliance with ISO/IEC 17025. The Laboratory Manager, Organic Department Manager, QAO, and all departmental supervisors will assist in the implementation of the specific requirements of this standard. The Managing Director has general responsibility for business development and operations. Included are strategic planning, resource allocation, and profit and loss for the analytical division. It is the Managing Director's responsibility to obtain and develop both financial and personnel resources to maintain quality services and to match resources with market demands. Additional responsibilities include oversight of the laboratory safety and waste management programs, certifying that personnel with appropriate educational and/or technical backgrounds perform all tests for which the laboratory is accredited, monitoring standards of performance in quality control and quality assurance, and ensuring that enough qualified personnel are employed to supervise and perform the work of the laboratory.

Responsibilities and Authorities:
1. Communicate any quality concerns to the QAO and Laboratory Manager.
2. Performs other duties as directed by the President/CEO.
3. Assists the Technical Director(s) in developing and maintaining the health and safety program and a waste disposal system.
4. Approve policies and procedures.
5. Implement and maintain the quality management system (QMS).
6. Review and approve contracts and tenders.
7. Approve certificates of analysis (laboratory reports).
8. Evaluate staff training effectiveness.
9. Identifying, stopping, and resuming non-conforming work.
10. Quality Planning (Management Review).
11. Identifying departures from the QMS.
12. Initiate actions to prevent departures and non-conformances.
13. Initiate corrective actions.

Education/Experience Requirements:
1. MS/PhD Degree – Chemistry Major and three (3) years of laboratory experience; or
2. BS/BA Degree – Chemistry Major (30 semester hours) and five (5) years of laboratory experience; or
3. BS/BA Degree – Chemistry Minor (20 semester hours) and ten (10) years of laboratory experience.

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Job Description for Marietta Division

Position: **Laboratory Operations Manager**
Classification: **Exempt**
Reports To: **Managing Director**

Position Summary and Interrelationships:
The Laboratory Operations manager is responsible for the daily oversight of laboratory operations, including coordination of production; general administrative and management duties; supervision of employees; profit and loss analysis; and implementation of principal duties, including operation, quality, and service. The Laboratory Operations Manager is experienced in the laboratory's fields of accreditation.

Responsibilities and Authorities:
1. Development and oversight of production schedules. Responsible for on time delivery of laboratory data and deliverables.
2. Implements the Chemical Hygiene Plan, the corporate and facility safety programs, the laboratory quality assurance plan, and laboratory housekeeping policies.
3. Coordinates the development of all new laboratory technology and new analytical methods with the assistance of a technical designee.
4. Coordinates the activities of the support services department, including sample login, sample custody, building maintenance, shipping, receiving, and waste management.
5. Implements the employee training program for safety, quality control, and analytical methodology.
6. Participates in the development and implementation of the Laboratory Quality Assurance Plan.
7. Communicates any quality concerns to the QAO and Managing Director.
8. Reviews and approves laboratory SOPs.
9. Maintains records of laboratory productivity and efficiency and submits periodic reports to the Managing Director.
10. Assures that all analyses and reports meet the quality standards established by the official standards, methods, and company policies and procedures.
11. Evaluates instrumentation and improvements and makes recommendations to the Managing Director.
12. Assists the Managing Director in the profitable operation of the laboratory.
13. Provides client consultation, sales support, and proposal development as needed.
14. Evaluates personnel needs and oversees all employee review, evaluation, and disciplinary actions.
15. Approves technical policies and procedures.
16. Implement and maintain the quality management system (QMS).
17. Review and approve contracts and tenders.
18. Approve certificates of analysis (laboratory reports).
19. Evaluate staff training effectiveness.
20. Identifying and stopping non-conforming work.
21. Performs other duties as directed by the Managing Director.

Education/Experience Requirements:
1. MS/PhD Degree – Chemistry Major and nine (9) years of related laboratory experience; or
2. BS/BA Degree – Chemistry Major (30 semester hours) and eleven (11) years of related laboratory experience; or
3. BS/BA Degree – Chemistry Minor (20 semester hours) and thirteen (13) years of related laboratory experience.

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Job Description for Marietta Division

Position: **Laboratory Technical Director**
Classification: **Exempt**
Reports To: **Managing Director**

Position Summary and Interrelationships:
The Laboratory Technical Director is responsible for the technical oversight of laboratory operations including quality and service. The Laboratory Technical Director is experienced in the laboratory's fields of accreditation. If absent for over 15 consecutive calendar days, another full-time staff member meeting the requirements below will be designated to temporarily perform these functions. If absent for over 35 consecutive calendar days, the primary accreditation body shall be notified.

Responsibilities and Authorities:
1. Implements the Chemical Hygiene Plan, the corporate and facility safety programs, the laboratory quality assurance plan, and laboratory housekeeping policies.
2. Evaluates/coordinates the development of all new laboratory technology and new analytical methods with the assistance of a technical designee.
3. Implements the employee training program for safety, quality control, and analytical methodology.
4. Participates in the development and implementation of the Laboratory Quality Assurance Plan.
5. Communicates any quality concerns to the QAO and Managing Director.
6. Reviews and approves all laboratory SOPs.
7. Assures that all analyses and reports meet the quality standards established by the official standards, methods, and company policies and procedures.
8. Evaluates instrumentation and improvements and makes recommendations to the Managing Director.
9. Provides client consultation, sales support, and proposal development as needed.
10. Evaluates personnel needs and oversees all employee review, evaluation, and disciplinary actions.
11. Approves technical policies and procedures.
12. Implement and maintain the quality management system (QMS).
13. Review and approve contracts and tenders.
14. Approve certificates of analysis (laboratory reports).
15. Evaluate staff training effectiveness.
16. Identifying and stopping non-conforming work.
17. Performs internal audits.
18. Performs other duties as directed by the Managing Director.

Education/Experience Requirements:
1. MS/PhD Degree – Chemistry Major and nine (9) years of related laboratory experience; or
2. BS/BA Degree – Chemistry Major (30 semester hours) and eleven (11) years of related laboratory experience; or
3. BS/BA Degree – Chemistry Minor (20 semester hours) and thirteen (13) years of related laboratory experience.

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Job Description for Marietta Division

Position: Quality Assurance Officer (or Quality Assurance Manager)
Classification: Exempt
Reports To: Quality Director, Environmental

Position Summary and Interrelationships:
The Quality Assurance Officer (QAO) reports to the Quality Director, Environmental, and functions independently of laboratory operations. The QAO supervises the Quality Assurance (QA) Specialist and the QA Administrative Assistant (Document Control Officer). The QAO is responsible for development, implementation, and oversight of the laboratory Quality Assurance Program. It is the QAO's responsibility to assess and help ensure the quality of all work performed in the laboratory. The QAO must have a general knowledge of all the analytical methods performed by the laboratory.

Responsibilities and Authorities:
1. Reviews and approves quality policies, the quality manual, and laboratory SOPs.
2. Maintains SOP files in hard copy and electronic formats and distributes revisions to the various laboratory departments.
3. Reviews laboratory quality assurance data, laboratory records for precision and accuracy, statistical control limits, method detection limits (MDL), limits of detection (LOD), limits of quantitation (LOQ), and analytical demonstrations of capability (DOC).
4. Manages and responds to audits performed by accrediting agencies and clients.
5. Performs internal system and technical audits.
6. Recommends corrective action plans for areas of deficiency.
7. Prepares monthly quality assurance reports to management.
8. Communicates quality concerns to the Laboratory Technical Director and Managing Director.
9. Communicates QA program objectives and requirements to laboratory staff and clients.
10. Schedules and orders proficiency test (PT) samples and evaluates the PT reports.
11. Reviews PT data, communicates unacceptable results to laboratory management. and prepares corrective action plans for auditing or certifying agencies.
12. Implements system for maintaining calibration records of support equipment (e.g. balances, thermometers, weights, pipettors, etc.)
13. Applies for and maintains all laboratory certifications. Maintains all certification records.
14. Assists in the development of technical and quality training procedures and performs staff training.
15. Performs audits of sub-contractor laboratories as necessary.
16. Approve policies and procedures.
17. Implement and maintain the quality management system (QMS).
18. Approve certificates of analysis (laboratory reports).
19. Evaluate staff training effectiveness.
20. Identifying, stopping, and resuming non-conforming work.
21. Performs other duties as directed by the Quality Director and Managing Director.

Education/Experience Requirements:
1. BA/BS Degree in a basic or applied science.
2. Minimum of 4 years of laboratory experience and familiarity with laboratory quality systems.
3. Knowledge of ISO 17025 and NELAC/TNI requirements.

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Job Description for Marietta Division

Position: Organics Laboratory Manager
Classification: Exempt
Reports To: Laboratory Technical Director

Position Summary and Interrelationships:
The Organics Manager reports to the Laboratory Technical Director. The Organics Manager is responsible for coordinating the production and quality control of all work involving all semi-volatile organic sample preparation (organic extractions lab) and instrumental analysis (semi-volatile organic analysis [SVOA] lab) in accordance with all regulations, standards, methods, SOPs, laboratory practices, and company policies. General duties include implementation of the laboratory safety program; implementation of the laboratory quality assurance plan; scheduling production of routine and non-routine work; supervising all technicians and/or analysts involved in sample preparation, standard preparation, and sample analyses; scheduling repair and maintenance; monitoring departmental backlogs; and reviewing and approving departmental data.

Responsibilities and Authorities:
1. Schedules and reviews work of lab supervisors, analysts and technicians.
2. Implements the Chemical Hygiene Plan, the laboratory safety program, laboratory quality assurance plan, laboratory SOPs, and laboratory housekeeping policies.
3. Schedules equipment/instrument maintenance.
4. Performs employee orientation, training, and performance reviews.
5. Performs QC review of all departmental data.
6. Maintains inventory of parts, supplies, and chemicals needed by the department.
7. Performs review of data deliverables.
8. Communicates any quality concerns to the QAO and laboratory management.
9. Reviews and approves all departmental SOPs.
10. Takes corrective action for non-conformances.
11. Evaluates staffing, equipment, and instrumentation requirements and makes recommendations to laboratory management.
12. Implements policies and procedures.
13. Implement and maintain the quality management system (QMS).
14. Evaluate staff training effectiveness.
15. Identifying and stopping non-conforming work.
16. Performs internal audits.
17. Performs other duties as directed by laboratory management.

Education/Experience Requirements:
1. MS/PhD Degree – Chemistry Major and two (2) years of related laboratory experience; or
2. BS/BA Degree – Chemistry Major (30 semester hours) and three to four (3-4) years of related laboratory experience; or
3. BS/BA Degree – Chemistry Minor (20 semester hours) and four to five (4-5) years of related laboratory experience; or
4. AS/BA Degree in science and eight to ten (8-10) years of related laboratory experience.

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Job Description for Marietta Division

Position: Laboratory Department Supervisor (or Group Leader)
Classification: Exempt
Reports To: Laboratory Technical Director

Position Summary and Interrelationships:
The Laboratory Department Supervisor (or Group Leader) reports to the Laboratory Technical Director. The Laboratory Supervisor is responsible for coordinating the production and quality control of all work involving sample preparation and analysis within the analytical department in accordance with all regulations, standards, methods, SOPs, laboratory practices, and company policies. General duties include implementation of the laboratory safety program; implementation of the laboratory quality assurance plan; scheduling production of routine and non-routine work; supervising all technicians and/or analysts involved in sample preparation, standard preparation, and sample analyses; scheduling repair and maintenance; monitoring departmental backlogs and turnaround times; method development for new procedures; and reviewing and approving departmental data.

Responsibilities and Authorities:
1. Schedules and reviews work of all technicians and/or analysts.
2. Implements the Chemical Hygiene Plan, the laboratory safety program, laboratory quality assurance plan, laboratory SOPs, and laboratory housekeeping policies.
3. Schedules equipment/instrument maintenance.
4. Performs employee orientation, training, and performance reviews.
5. Performs QC review of all departmental data.
6. Maintains inventory of parts, supplies, and chemicals needed by the department.
7. Performs review of data deliverables.
8. Communicates any quality concerns to the QAO and laboratory management.
9. Reviews and approves all departmental SOPs.
10. Takes corrective action for non-conformances.
11. Evaluates staffing, equipment, and instrumentation requirements and makes recommendations to laboratory management.
12. Implements policies and procedures.
13. Implement and maintain the quality management system (QMS).
14. Evaluate staff training effectiveness.
15. Identifying and stopping non-conforming work.
16. Performs internal audits.
17. Performs other duties as directed by laboratory management.

Education/Experience Requirements:
1. MS/PhD Degree – Chemistry Major and two (2) years of related laboratory experience; or
2. BS/BA Degree – Chemistry Major (30 semester hours) and three to four (3-4) years of related laboratory experience; or
3. BS/BA Degree – Chemistry Minor (20 semester hours) and four to five (4-5) years of related laboratory experience; or
4. AS/BA Degree in science and eight to ten (8-10) years of related laboratory experience.

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Job Description for Marietta Division

Position: Client Services Supervisor
Classification: Exempt
Reports To: Managing Director

Position Summary and Interrelationships:
The Client Services Supervisor reports to the Managing Director. The Client Services Supervisor is responsible for supervising, coordinating, and reviewing the tasks of the Project Managers (aka Client Service Representatives) and all related departmental activities. The Client Services Supervisor also has the same duties, technical requirements, responsibilities, and authorities as the Project Managers (PMs).

Responsibilities and Authorities:
1. Coordinates, schedules, and reviews work of the Client Services Representatives (CSRs).
2. Implements the laboratory quality assurance plan and departmental SOPs.
3. Performs employee orientation, training, and performance reviews.
4. Performs review of data deliverables (complete, correct, and complies with contract), including EDDs (electronic data deliverables).
5. Communicates any quality concerns to the QAO and laboratory management.
6. Reviews and approves all departmental SOPs.
7. Takes corrective action for non-conformances.
8. Evaluates staffing requirements and makes recommendations to laboratory management.
9. Implements policies and procedures.
10. Implement and maintain the quality management system (QMS).
11. Evaluate staff training effectiveness.
12. Performs technical review for work proposals and new work awarded. Creates technical narratives and tables for proposals based on technical review of RFP/QAP (Request for Proposal / Quality Assurance Plan). Supports Sales personnel by clarifying discrepancies between lab capabilities and proposed project specifications.
13. Prepares workorders, sample kit requests, and project setup in the LIMS.
14. Interfaces with IT for EDD development and tracks progress through final EDD design.
15. Interfaces with sampling crews as needed.
16. Interfaces with validators and auditors.
17. Arranges sub-contracting of laboratory work.
18. Communicates client requirements to lab, and lab issues to client.
19. Review sample login, resolve anomalies with client, and submit sample receipt acknowledgements.
20. Expediting work to ensure turn around times are met (no penalties, capture all premiums).
21. Participation in ongoing process improvement initiatives and cross training. Occasional research into method development and regulations to support future lab work.
22. Some travel may be required, including overnights, for technical sales support and client-required project kick-offs.
23. Identify non-conformances and potential preventive actions.
24. Process client complaints.
25. Accept new work within the capacity guidelines of the Managing Director.
26. Performs other duties as directed by the Managing Director.

Education/Experience Requirements:
1. MS/PhD Degree – Chemistry Major and two (2) years of experience; or
2. BS/BA Degree – Chemistry Major (30 semester hours) and three (3) years of experience; or
3. BS/BA Degree – Chemistry Minor (20 semester hours) and four (4) years of experience; or
4. AS/BA Degree in science and eight to ten (8-10) years of related experience.

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Job Description for Marietta Division

Position: Client Services Representative (CSR)
Classification: Exempt
Reports To: Managing Director

Position Summary and Interrelationships:
The Client Services Representative (aka Project Manager [PM]) reports to the Client Services Supervisor. The CSR is responsible for managing projects from start to finish. At inception, CSRs review all data quality objectives, EDD specifications, requirements, and customize instructions to IT and the lab. Method builds, new applications, and other non-routine requests are researched and processed with the support of management. All data packages and EDDs are reviewed by the PM for completeness, accuracy, and compliance. Post-delivery, the PM fields all technical questions associated with the data package, its validation and integration. The PM coordinates all support services and is the client's primary contact.

Responsibilities and Authorities:
1. Performs technical review for work proposals and new work awarded. Creates technical narratives and tables for proposals based on technical review of RFP/QAP. Supports Sales personnel by clarifying discrepancies between lab capabilities and proposed project specifications.
2. Performs review of data deliverables (complete, correct, and complies with contract), including EDD.
3. Communicates any quality concerns to the QAO and laboratory management.
4. Takes corrective action for non-conformances.
5. Prepares workorders, sample kit requests, and project setup in the LIMS.
6. Interfaces with IT for EDD development and tracks progress through final EDD design.
7. Interfaces with sampling crews as needed.
8. Interfaces with validators and auditors.
9. Arranges sub-contracting of laboratory work.
10. Communicates client requirements to lab, and lab issues to client.
11. Review sample login, resolve anomalies with client, and submit sample receipt acknowledgements.
12. Expediting work to ensure turnaround times are met (no penalties, capture all premiums).
13. Participation in ongoing process improvement initiatives and cross training. Occasional research into method development and regulations to support future lab work.
14. Some travel may be required, including overnights, for technical sales support and client-required project kick-offs.
15. Identify non-conformances and potential preventive actions.
16. Process client complaints.
17. Performs all routine customer service functions.
18. Performs invoicing, transmittal, and accounts receivable functions with accuracy and on time.
19. Requires strong attention to detail, ability to work under pressure, excellent oral and written skills, computer aptitude, and strong interpersonal skills to maintain established standards for client care and interaction with colleagues.
20. Accept new work within the capacity guidelines of the Managing Director.
21. Performs other duties as directed by the Client Services Supervisor.

Education/Experience Requirements:
1. BS/BA Degree – Chemistry Minor (20 semester hours); or
2. AS/BS/BA Degree – Natural Science Major, 8 semester hours of Chemistry, one (1) year of related experience.
3. High School Diploma – two (2) years of related experience.

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MICROBAC®

STANDARD OPERATING PROCEDURE
INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETER
(SW-846 6020 / EPA METHOD 200.8)

Issue/Implementation Date: 27 May 2022

Last Review Date: 27 May 2022

Microbac Laboratories, Inc.
Marietta Division
158 Starlite Drive
Marietta, Ohio 45750

Approved By:

Kim H. Rhodes, Metal Supervisor — Date: 5-10-2022

Robert R. Ramnarine, Quality Manager — Date: 5-10-22

Larry M. Gwinn, Jr., Laboratory Technical Director — Date: 5-12-22

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1.0 SCOPE AND APPLICATION

1.1 This Standard Operating Procedure describes the daily operation, tuning, optimization, and analysis procedures for the analysis of samples according to U.S. EPA Methods 6020, 6020A, 6020B and 200.8 for the elements listed as analytes in Table I using the NexION 300X ICP-MS or the Agilent 7850 ICP-MS.

1.2 This SOP is applicable to the following sample matrices: drinking water, ground waters, surface waters, industrial wastes, sludges, and soil samples.

1.3 When analyzing drinking waters by Method EPA 200.8, collision cell technology cannot be used.

1.4 Acid digestion prior to filtration and analysis is required for groundwater, aqueous samples, industrial wastes, soils, sludges, sediments, and for other solid wastes for which total (acid leachable) elements are required. Sample preparation methods may be found in EPA Methods 3015A and 3051A and are detailed in SOP ME407 and ME406.

1.5 Routine operation and maintenance procedures for the NexION 300X ICP-MS may be found in the NexION Software (Version 1.5) Help Menu. For the Agilent-ICP-MS, Mass Hunter 5.1 software (version D.01.01), File, About.

1.6 Detailed instructions on operating of the NexION 300X ICP-MS operating software may be found in the NexION Software Reference Guide Version 1.5 (Build 1.0.1916.0) for ICP-MS Instrument Control. Instructions for the Agilent MS may be found in the Mass Hunter 5.1 version (Build 653.5).

1.7 Following the appropriate digestion procedure, aqueous sample digestates, leachates, etc. are nebulized into a spray chamber where a stream of argon carries the sample aerosol through a quartz torch and injects it into a R.F. plasma. There the sample is ionized. The ions produced are entrained in the plasma gas and by means of a water-cooled, differentially pumped interface, introduced into a high-vacuum chamber that houses a quadrupole mass spectrometer. The ions are sorted according to their mass-to-charge ratio and measured with a detector.

1.8 Definitions and Acronyms

The following is a list of terms, definitions, and acronyms referenced in this SOP that are unique to the method.

BS	Blank spike
BSD	Blake spike duplicate
CCB	Continuing calibration blank
CCV	Continuing calibration verification
COA	Certificate of analysis
COC	Coefficient of Correlation
DI water	DI water
HCl	Hydrochloric acid
HNO_3	Nitric Acid
ICB	Initial calibration blank
ICP/MS	Inductively Coupled Plasma Mass Spectrometry
ICS/SIC	Interference check sample/Spectral Interference Check
ICV	Initial calibration verification
IDL	Instrument Detection Limit
LIMS	Laboratory Information Management System
LLCCV	Low level continuing calibration verification
LLICV	Low level initial calibration verification
LLOQ	Lower Limits of Quantitation
LOD	limit(s) of detection
LOQ	limits(s) of quantitation
MB	Method blank
MDL	Method detection limit
MS	Matrix spike
MSA	Method of standard additions
MSD	Matrix spike duplicate
NCR	Nonconformance Report
QC	Quality control
RF	Radio frequency
RGT	Reagent
RL	Reporting limit
SDS	Safety data sheet
SOP	Standard Operating Procedure
STD	Standard

Calibration blank – a calibration standard prepared with DI water and carried through the digestion procedure used in establishing the calibration curve.

For a more comprehensive list of common terms and definitions, consult Appendix A in Microbac SOP LQAP.

1.9 Updates that affect concentration, vendor choices, reagents, MDLs, RLs and QC limits are subject to change without notice.

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2.0 SAFETY PRECAUTIONS

2.1 The use of laboratory equipment and chemicals exposes the analyst to several potential hazards. Good laboratory technique and safety practices must always be followed.

2.2 Safety glasses with side shields, lab coats, and gloves must always be worn when handling samples, reagents, or when in the vicinity of others handling these items.

2.3 Liquid argon represents a potential cryogenic hazard and safe handling procedures must always be used when handling liquid argon tanks.

2.4 The NexION 300X and the Agilent ICP-MS are fully interlocked to protect the user from dangers such as high voltages, radio frequency generators, and intense ultra-violet light. At no time should the operator attempt to disable these interlocks or operate the instrument if any safety interlock is known to be disabled or malfunctioning.

2.5 Spilled samples, reagents, and water must be cleaned up from instrument and autosampler surfaces immediately. In the case of acid spills the acid must be neutralized with sodium bicarbonate solution before cleanup.

2.6 All additional company safety practices must always be followed.

2.7 SDS's for each analyte and reagent used within the laboratory are available to all employees. Consult SDS's prior to handling chemicals.

3.0 SAMPLE PRESERVATION AND STORAGE

3.1

Measurement	Digestion Vol./Wt. Req.*	Collection Vol./Wt.	Preservative	Holding Time **
Total recoverable	40 mL	250 - 1000 mL	HNO3 to pH <2	6 months
Dissolved	40 mL	250 - 1000 mL	Filter on-site HNO3 to pH <2	6 months
Suspended	40 mL	250 - 1000 mL	Filter on-site	6 months
Total	40 mL	250 - 1000 mL	HNO3 to pH <2	6 months
Soil	0.5 g	200 g		6 months

* If insufficient sample volume is received a smaller volume of sample will be used and the reagents ratio will be reduced accordingly except for soils.

** Storage time allowed between sample collection and analysis when properly preserved and stored.

*** Storage at ≤ 6° C if mercury is to be analyzed.

3.2 Water samples received unpreserved will be acid preserved in the laboratory and must then rest for at least 24 hours prior to digestion.

4.0 METHOD PERFORMANCE

Instrument Detection Limits (IDLs)

4.1 IDLs are determined according to the procedure outlined in Section 9.3 of Method 6020B. The IDL is estimated as the mean of the blank result plus three times the standard deviation of 10 replicate analyses of the reagent blank solution. Zero is used as the mean if the calculated average is negative. Each measurement must be performed as though it were a separate sample (i.e., with rinsing in between). At a minimum, IDLs will be determined annually at the time of SOP review.

Method Detection Limits (MDLs)

4.2 The laboratory performed an initial assessment of the MDL using the procedures outlined in 40 CFR Part 136. Results are filed electronically at J: Quality Control\MDL.

4.3 The LOD, or verified MDL, are presented in Table 1 and were established using verification procedures outlined in Microbac SOPs 45 and GP- MDL.

4.4 The LOQ are the nominal laboratory RLs and were established per Microbac SOP 45 and GP- MDL. Actual project reporting limits may be higher.

4.5 Precision and accuracy data in Table 1 were derived from an initial demonstration of capability using spiked control samples. The laboratory uses results from BS to assess precision/accuracy and to annually evaluate the associated control limits.

4.6 MDL check samples are analyzed quarterly to verify the MDLs listed in Table 1.

4.7 MDLs for EPA Method 200.8 are updated annually following the procedures in 40CFR Part 136. Additionally, MDLs must be re-determined whenever there is any change to the sample preparation procedure, or any significant change to the instrument (new detector or different sample introduction system used).

Linear Dynamic ranges

4.8 Calibrate the instrument, as described in Section 10.0.

4.9 An initial Linear Dynamic Range is established by running a series of increasing concentration standards close to the upper linear range of the instrument. It is

suggested that multi-element standards be used for the procedure whenever possible.

4.10 Values above the highest calibration standard may be reported without sample dilution if they fall into the established linear range of the instrument. The linear range is defined as the highest concentration where the measure value is within 10% of the actual prepared value of the standard. The linear range is evaluated within each (daily) calibration. The values reported in Table 1 are 90% of the typical linear range verification.

4.11 The upper Linear Dynamic Range must be re-determined whenever one of the following occurs. A new detector is installed. The detector (analog and/or pulse count) voltages are changed. A new PA tube is installed in the RF generator. A different sample introduction system (change in nebulizer or spray chamber type) is installed.

4.12 A demonstration of capability is performed whenever new staff members are trained or significant changes in instrumentation are made. Thereafter an on-going DOC must be performed annually to retain certification.

5.0 INTERFERENCES AND CORRECTIVE ACTION

5.1 Isobaric Interferences occur when an isotope of one element is at the same nominal mass as an isotope of another element (e.g., Mo 98 and Ru 98). Corrections for isobaric interferences must be made by measuring the intensity due to the interfering element at another isotope and using its natural abundance ratios to correct for its presence at the analytical mass of interest. Most used corrections for isobaric interferences are already present as default interference equations in the NexION software. Care should be taken that the isotope measured for correction purposes does not suffer from overlap with other isotopes that may be present in the sample.

5.2 Molecular interferences are caused by molecular species formed in the plasma with plasma or matrix ions (examples of common molecular interferences include ArCl, ClO, Nitrogen dimer, oxygen dimer, oxide species, double charged species, etc.) Predictions about the type of molecular interferences must be made using knowledge about the sample matrix. Molecular interferences can often be corrected for in the same manner as isobaric interferences, i.e., measuring the intensity present at another isotope and using isotope ratios to calculate the amount of the interfering species. For example, corrections for interferences of Ar40Cl35 on As at mass 75 must be made by measuring the intensity of ArCl present at mass 77 (Ar40Cl37) and converting to the apparent intensity of ArCl at mass 75 by using the isotopic ratio of Cl37 to Cl35. A list of the corrections used is given in the listing of the isotopes monitored in the 6020A method in Table 2.

6.0 EQUIPMENT AND SUPPLIES

6.1 Perkin Elmer NexION 300X ICP-MS system, Agilent 7850 ICP-MS system

6.1.1 Perkin Elmer NexION ICP-MS, Agilent ICP-MS

6.1.2 Intel Core I5 computer with Windows 7 Professional, Lenovo enhanced.

6.1.3 NexION Software Version 1.5 (Build 1.5.2384.0), Mass Hunter Software version D.01.01 (Build 653.5)

6.1.4 ESI FAST DX-4 Autosampler, Agilent SPS4 Autosampler

6.2 Peristaltic pump tubing:

6.2.1 Red/Red - 1.14 mm I.D. (for drain)

6.2.2 Green/Orange - 0.38 mm I.D. (for internal standard introduction)

6.2.3 Black/Black – 0.76 mm I.D. (for sample introduction)

6.2.4 Orange/Blue-0.25mm I.D. (Internal Standard)

6.2.5 White/White-0.85mm I. D. (Sample Introduction)

6.2.6 Yellow/Blue-0.75mm I. D. (Drain)

6.3 Calibrated mechanical pipettes:

6.3.1 10-100 uL

6.3.2 100 - 1000 uL

6.3.3 1000 - 5000 uL

6.4 Metal-free plastic pipette tips (for the pipettes specified in 6.4).

6.5 Metal-free15 mL plastic test tubes

6.6 Metal-free 50 mL plastic test tubes

6.7 Class A glass pipettes – for preparation of standard solutions.

7.0 STANDARDS AND REAGENTS

7.1 All reagents may contain impurities that may affect the integrity of the analytical results. Due to the high sensitivity of ICP-MS, high-purity reagents, water, and acids must be used whenever possible. All acids used for this method must be of ultra-high-purity grade. Nitric acid is preferred for ICP-MS to minimize polyatomic interferences. It should be noted that hydrochloric acid is required to maintain stability in solutions containing antimony and silver. When hydrochloric acid is used, corrections for poly-atomic ion interferences must be used. All purchased stock standards and reagents are logged into the LIMS system and assigned numbers. All intermediate and working solutions are similarly logged into the LIMS and assigned numbers. Detailed information regarding solution concentrations, aliquot volumes and final volumes and concentrations are included under the number.

7.2 Nitric acid and hydrochloric acid Instra-analyzed reagent, J.T. Baker or equivalent.

7.3 Reagent water equivalent to ASTM Type II water (ASTM D 1193).

7.4 5% HNO_3 and 1% HCl (in reagent water) – 50 mL HNO_3 and 10 mL HCl in 1000 mL reagent grade water. (for the 6020-water matrix)

9% HNO_3 and 3% HCl (in reagent water) – 90 mL HNO_3 and 30 mL HCl in 1000 mL reagent grade water. (for the 6020-solid matrix)

0.4% HNO_3 and 0.2% HCl (in reagent water) – 4 mL HNO_3 and 2 mL HCl in 1000 mL reagent grade water. (for the 200.8-water matrix)

Internal Standard Stocks

7.5 ICP-MS Internal Standard - 100 mg/L Li, Sc, Y, In, Tb and Bi in 1% HNO_3, CPI International or equivalent.

7.6 Germanium – 1000 mg/L in 2% HNO_3, CPI International or equivalent.

7.7 Internal Standard Working Solutions - Prepare the working solution by pipetting 100 mL of nitric acid into approximately 1000 mL of reagent water in a 2000 mL volumetric flask. Pipette 1 mL of ICP-MS internal standard and 1 mL of germanium single-element standard into the flask. Dilute to 2000 mL with reagent water. The concentrations of the working internal standard solution can be found in Table 7-1.

Tuning Solution and Daily Performance Check Solution

7.8 ICP-MS Internal Standard – 100 mg/L Li, Sc, Tb, Y, In and Bi in 1% HNO_3 CPI or equivalent.

7.9 QC-MS1 – 10 mg/L Al, Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Ni, Se, Ag, Tl, U, V and Zn in 2% HNO_3, SCP Science or equivalent.

7.10 IV-Stock-35 – 1000 mg 5% HNO_3, Inorganic Ventures, Inc. or equivalent.

7.11 Cerium (Ce) – 1000 mg/L in 5% HNO_3 – Inorganic Ventures, Inc. or equivalent

7.12 Stock Tuning Solution – Prepare the stock tuning solution by pipetting 5 mL of nitric acid into 80 mL of reagent grade water in a 100 mL volumetric flask. Add 0.02 mL of 1000 mg/L Ce and 0.02 mL of IV-STOCK-35, add 0.2 mL of ICP-MS Internal Standard and 2 mL of QC-MS1, dilute to 100 mL with reagent grade water.

7.13 Working Tuning Solution – Prepare the working tuning solution by pipetting 50 mL of nitric acid into 500 mL of reagent grade water in a 1000 mL volumetric flask. Add 5 mL of stock tuning solution into the flask, dilute to 1000 mL with reagent grade water. The concentrations of the working tuning solution also used as the daily performance check solution can be found in Table 7-2.

Calibration Solutions (ICAL and CCV)

7.14 Purchased Standard Mixes:

Microbac CAL-MS1
8 ug/mL As, Mo, Pb, Co, Sb, Se, Ag, V, U, Sn, Ti, Th
24 ug/mL Ba
1.6ug/mL Be, Tl
4.8 ug/mL Cd
16 ug/mL Cr, Cu, Mn
32 ug/mL Ni
160 ug/mL Zn
SCP Science or equivalent

7.15 IV-Stock-35 - 1000 ug/mL Ca, Fe, K, Mg, Na Inorganic Ventures, Inc. or equivalent

7.16 Working Calibration Solution – Prepare the working solution (high standard) by pipetting the appropriate volume of HNO_3 and HCl into approximately 250 mL

DI water in a 500 mL volumetric flask. For the 6020-matrix, this is 25 mL of HNO_3 and 5 mL of HCl. For the 6020-solid matrix, this is 45 mL of HNO_3 and 15 mL of HCl. For the 200.8 water matrix, this is 2 mL of HNO_3 and 1 mL of HCl. Pipette 5mL each of CAL-MS1 and IV-Stock-35 into the flask. Dilute to 500 mL with DI water. The concentration of the working solution can be found in Table. 7-3.

7.17 Prepare calibration standards using a matrix matched HNO_3/HCl solution (7.4) and the working solution (high standard) (7.16).

7.18 Blank (for establishing internal standard intensities) and S1 (STD 1) – matrix matched HNO_3/HCl Solution. (7.4).

7.19 S2 (STD 2) – 1/200 high standard: matrix matched HNO_3/HCl solution.

7.20 S3 (STD 3) – 1/40 high standard: matrix matched HNO_3/HCl solution

7.21 S4 (Std 4) – ½ high standard: matrix matched HNO_3/HCl solution

7.22 S5 (Std 5) – high standard solution (7.16)

7.23 Working Continuing Calibration Verification Solution (CCV) - Prepare the working solution (QC STD 6) by pipetting the appropriate volume of HNO_3 and HCl into approximately 500 mL DI water in a 1000 mL volumetric flask. For the 6020-water matrix, this is 50 mL of HNO_3 and 10 mL of HCl. For the 6020-solid matrix, this is 90 mL of HNO_3 and 30 mL of HCl. For the 200.8 water matrix, this is 4 mL of HNO_3 and 2 mL of HCl. Pipette 4 mL each of CAL-MS1 and IV-STOCK-35 into the flask. Dilute to 1000 mL with DI water. The concentrations can be found in Table 7-4.

Initial Calibration Verification Solution (ICV)

7.24 Microbac -22A
8 ug/mL Sb, Mo, Sn, Ti
Inorganic Ventures, Inc or equivalent

7.25 Microbac – 22B
8 ug/mL As, Pb, Co, Se Ag, V, U, Th
24 ug/mL Ba
1.6 ug/mL Be TL
4.8 ug/mL Cd
16 ug/mL Cr, Cu, Mn

32 ug/mL Ni
160 ug/mL Zn
Inorganic Ventures or equivalent

7.26 IV-STOCK-35 – 1000 mg/L Ca, Fe, Mg, K and Na in 2% HN03 – Inorganic Ventures, Inc. or equivalent

7.27 Working Continuing Calibration Verification Solution – Prepare working solution (QC STD 6) by pipetting the appropriate volume of HNO3 and HCI into approximately 500mL of DI water in a 1000 mL volumetric flask. For the 6020-water matrix, this is 50 mL of HNO_3 and 10 mL of HCI. For the 6020-solid matrix, this is 90 mL of HNO_3 and 30 mL of HCI. For the 200.8 water matrix, this is 4 mL of HNO_3 and 30 mL of HCI. Pipette 4 mL each of CAL-MS1 and IV-STOCL-35 into the flask. Dilute to 1000 mL with DI water. The concentrations can be found in Table 7-4.

7.28 ICB – (QC Std 2) and Continuing Calibration Blank (QC Std 7) – matrix matched HNO_3 /HCI solution (7.4)

Spectral Interference Check Solutions (ICSA and ICSAB)

7.29 6020ICS-9A – 21215 mg/L Cl^-, 2000 mg/L C, 3000 ppm Ca, 2500 mg/L Fe and Na, 1000 mg/L Al, Mg, P, K and S and 20 ppm Mo and Ti in 1% HNO_3 – Inorganic Ventures, Inc. or equivalent

7.30 Microbac QC-MS1 -10 mg/L As, Al, Ba, Be, Cd, Co, Cr, Cu, Pb, Mn, Ni, Sb, Se, Ag, Tl, U, V and Zn in 5% HNO_3 –SCP Science or equivalent

7.31 Working ICSA Solution - Prepare working solution by pipetting the appropriate amount of HNO_3 and HCI into approximately 100 mL of DI water in a 200 mL volumetric flask. For the 6020-water matrix, this is 10 mL of HNO_3 and 2mL HCI. For the 6020-solid matrix, this is 18 mL of HNO_3 and 6mL of HCI. For the 200.8* water matrix, this is 0.8mL of HNO_3 and 0.4 mL of HCI. Pipette 1 mL 6020ICS-9A and 2mL of QC-MS1 into the flask and dilute to 200 mL with DI water. The concentrations can be found in Table 7-5.

7.32 Working ICSAB Solution - Prepare the working solution by pipetting the appropriate amount of HNO_3 and HCI into approximately 100 mL of DI water in a 200 mL volumetric flask. For the 6020-water matrix, this is 10 mL of HNO_3 and 2mL of HCI. For the 6020-solid matrix, this is 0.8 mL of HNO_3 and 6 mL of HCI. For the 200.8* water matrix, this is 0.8 mL of HNO_3 and 0.4mL of HCI. Pipette 1 mL of 6020ICS-9A and 2 mL of Microbac QC-MS1 into the flask and dilute to 200 mL with DI water. The concentrations can be found in Table 7-5.

*Note: The 200.8 method does not require analysis of an ICSA/ICSAB. However, it is required for some clients per their request or per their QAPP.

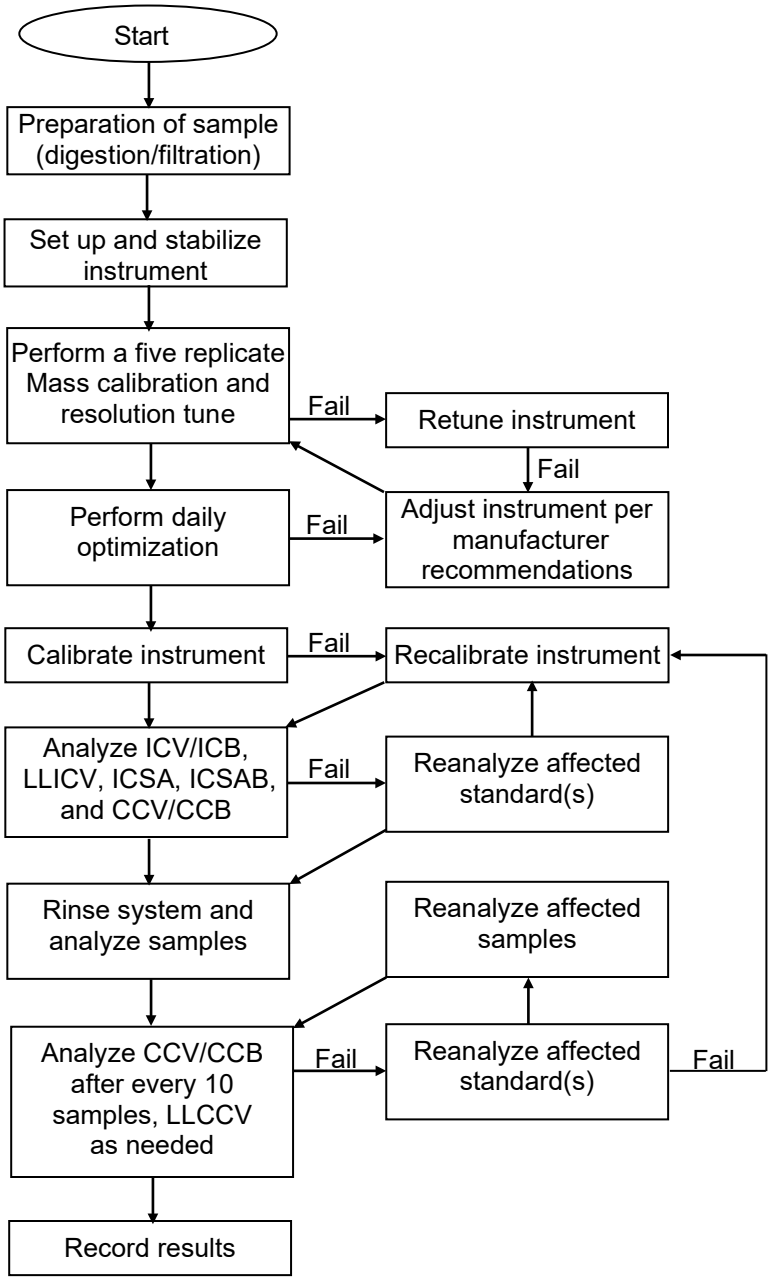
Low Level Calibration Verification Solutions (LLICV and LLCCV)

7.33 The LLICV Solution (7.35) is used to establish and/or verify the lower limit of quantitation; and is analyzed for 6020A and DoD5 only.

7.34 The solution from 7.35 is also used as the LLCCV solution and is analyzed for 6020A and DoD5 only.

7.35 Prepare the Low-Level Calibration Verification by pipetting the appropriate amount of $HN0_3$ and HCO into approximately 50 mL of DI water into a 100 mL volumetric flask. For the 6020-water matrix, this is 5 mL of $HN0_3$ and 1 mL of HCI. For the 6020-solid matrix, this is 9 mL of $HN0_3$ and 3 mL of HCI. For the 200.8 water matrix, this is 0.4 mL of $HN0_3$ and 0.2 mL of HCI. Pipette 1 mL of high standard (7.16) into the flask and dilute to100 mL DI water. The concentrations can be found in Table 7-6.

8.0 DIAGRAM OR TABLE TO OUTLINE PROCEDURES



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9.0 SAMPLE PREPARATION

9.1 Sample preparation is dependent on matrix and digestion type. Refer to the following methods:

Microbac SOP ME406 - Microwave Digestion of Sediments/Sludges/Soils/Oils
Microbac SOP ME407 - Microwave Digestion – Aqueous
Microbac SOP ME401A – 200.8 Digestion

10.0 CALIBRATION PROCEDURES

10.1 Initial Calibration - The instrument is calibrated before analysis of any samples with a blank and four calibration standards. The concentrations of the standards used must be entered into the calibration page of the analytical method in the instrument software according to the values of the standards prepared in Section 7.18 through 7.22. For WV solid/soil sample(s), a linear calibration must be selected for all analytes. For all other clients, a weighted linear calibration may be used. (7.18) will be run as a blank, before the analysis of any actual calibration standards. This blank is used to monitor the internal standard intensities throughout the analytical sequence. The first standard run must be the calibration blank, followed by standards of increasing concentration to minimize cross-contamination and carryover. The prepared calibration standards are analyzed in three replicates with the reported results being the arithmetic mean (average) of the three replicate readings. See Appendix A for the weighted linear and linear calibration algorithm.

Once the calibration curve has been generated and found acceptable, Method 6020B requires reprocessing of the data to establish concentration values for the lowest calibration standard (7.19) and the midlevel standard (7.21). The low standard concentrations must be within ± 20% of true values. The midlevel standard concentrations must be within ± 10% of the true values.

The low calibration standard must contain the elements of interest at concentrations at or below the reporting limit or a low-level calibration check standard at or below the reporting limit must be analyzed after calibration and before sample analysis. See Tables 13-1, 13-4, 13-6 and 13.7 for acceptance criteria and corrective action for the curve and low-level calibration check standard.

10.2 ICV Analysis – The ICV analysis must be performed immediately after calibration standards to verify calibration. See Tables 13-1, 13-4, 13-6, and 13-7 for acceptance criteria and corrective actions.

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10.3 CCV Analysis - The CCV is required to be analyzed after every 10 samples, at the end of the analysis and prior to sample analysis. See Tables 13-1, 13-4, 13-6 and 13-7 for acceptance criteria and corrective action.

10.4 ICB and CCB Analysis - The solution used is the calibration blank (7.18). See Tables 13-1, 13-4, 13-6 and 13-7 for acceptance criteria and corrective action.

10.5 LLICV Analysis – The LLICV analysis is performed after the calibration but prior to sample analysis. See Tables 13-1, 13-4, 13-6 and 13-7 for acceptance criteria and corrective action.

10.6 LLCCV Analysis – The LLCCV analysis is performed for Method 6020A and as required by specific QAPPS. The LLCCV is analyzed minimally at the end of each relevant batch or more frequently (eg: following every 10 samples) as desired. See Table 13-6 for acceptance criteria and corrective action.

10.7 ICSA and ICSAB (SIC) Analysis – Required at the beginning of a 6020 analytical run or every 12 hours, whichever is more frequent. See Tables 13-1, 13-6 and 13-7 for acceptance criteria and corrective action.

10.8 Internal Standards – An internal standard is a non-analyte isotope that is added to standards and samples before a determination. Internal standards allow you to correct for changes in instrument hardware response or for sample-to-sample variations in sensitivity. Intensities must be monitored in all solutions. Intensities of internal standards in all subsequent analyses of CCV and CCB solutions must be greater than 80% and less than 120%, (> 30% for 6020B) of the levels in the original calibration blank. Failure action is to terminate the analysis, correct the problem, re-calibrate, and reanalyze all affected samples. See Tables 13-1, 13-4, 13-6 and 13-7 for acceptance criteria and corrective actions for analytical and quality control samples. See 12.8 for an example calculation of how the internal standard is used to adjust measured intensities of analyte elements.

10.9 Calibration standards for 200.8 analysis will be made fresh every two weeks or sooner if warranted.

10.10 Calibration training materials are available on the intranet home page in the “General” links section, “Calibration Training”. Review of “Calibration Models” and “The Effect that Saturation of the Detector has Upon Calibration” are recommended training for all new analysts. There are additional calibration training materials available through the same link on the homepage.

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11.0 ANALYTICAL PROCEDURES

Perkin Elmer NexION 300X

11.1 Initiate the plasma and allow a warm-up of at least 30 minutes. The tuning procedures must be carried out after warm-up.

11.2 Perform the mass calibration and resolution at least once a day prior to analysis.

11.2.1 Place internal standard probe and rinse probe in a tube containing working tuning solution.

11.2.2 Open Mass Cal window by clicking on Mass Cal on the NexION Tool Bar. Depress start Mass Cal button. The instrument will now perform the Mass calibration and resolution procedure.

11.2.3 The measured mass of each isotope must be ± 0.05 amu of the exact mass and ± 0.03 amu for resolution optimization to pass.

11.2.4 Peak height (%) for resolution optimization is 10%. Target resolution (amu) is 0.70. The number of replicates is 5 with 5% RSD.

11.2.5 After passing the mass calibration and resolution, click Smart Tune on the NexION Tool Bar for the daily performance check.

11.2.6 Click Optimize for daily performance check.

11.3 The following criteria must be met for best results:

Be intensity > 2000 cps
Mg intensity > 15000 cps
In intensity > 40000 cps
U intensity > 30000 cps
Ce^{+2}/Ce < 0.03 cps
CeO/Ce < 0.025 cps
Bkgd ≤ 1 cps @ mass 220

11.3.1 If these criteria are not met, further optimizations may be needed. See the NexION Software Reference Guide Version 1.0 in the Help Menu.

Agilent 7850

11.4 Turn on ICP-MS Mass hunter Workstation.

11.4.1 Click instrument control.

11.4.2 Click Home, Click Plasma, Click OK.

11.4.3 Instrument will automatically run the daily performance check.

11.4.4 If the performance check passes, generate the report. If it does not pass, run the performance check again.

11.5 The following criteria must be met for best results:

Be 7 intensity > 2550
Y 89 intensity > 8500
TL205 intensity > 5100
CeO/Ce < 1.38%
$Ce+^{2}/Ce$ < 3%
Bkgd < 10 @ mass 7 and mass 89
< 30 @ mass 205

11.5.1 If these criteria are not met, further optimizations may be needed. See the Agilent MassHunter 5.1 Software Version D.01.01, File, About.

11.6 After the performance check is done, open the method needed for analysis.

11.6.1 Click Home, Click add to Queue.

11.6.2 Instrument will begin to run the QC turn report.

11.6.3 If the tune report check passes, Click Home, Click Resume.

11.6.4 The instrument will begin calibration.

11.6.5 If the tune check report fails, click sample list requeue to rerun the tune check report.

11.7 The measured mass of each isotope must be ± 0.01 amu of the exact mass to pass.

11.7.1 For the resolution optimization, the peak height is 5% and the target resolution (amu) is 0.90.

11.7.2 The number of replicates is five with a 5% RSD.

11.8 Calibrate the instrument at least once a day followed by the analysis of the ICV, ICB, LLICV, ICSA, ICSAB, SIC, CCV, and CCB prior to the analysis of samples. See Tables 13-1, 13-4, 13-6, and 13.7 for acceptance criteria and corrective actions.

11.8.1 Prepare the four calibration solutions using the high standard and/or 5% HNO_3 (in polished water). The calibration standards are prepared as follows:

Blank: 5% HNO_3 water
S1: 5% HNO_3 water (analyzed from Blank cup)
S2: 1/200 high standard in 5% HNO_3 water
S3: 1/40 high standard in 5% HNO_3 water
S4: ½ high standard in 5% HN03 water
S5: high standard solution
Load Blank, S1, S2, S3, S4 and S5 into autosampler locations 1,2,3,4 and 5 respectively.

11.8.2 Pour the ICV solution into a tube and place it in autosampler location 201. Pour the LLICV/LLCCV solution into a tube and place in location 202. Pour the CCV solution into a tube and place it in location 101.

11.8.3 Put the ICSA in location 203 and ICSAB in location 204.

11.8.4 Put ICB/CCB in location 102.

11.8.5 Select the sample window from the NexION tool bar. Click on batch tab.

- Enter sample numbers (including digest workgroup numbers) in the Sample ID column.
- Enter the autosampler location number for each sample in the A/S Loc. Column.
- Make sure the appropriate command appears in the measurement action column for each sample. It must read “Run Sample” for samples that will not be auto-diluted by the instrument and “Run Diluted Sample” for samples that will be auto-diluted by the instrument. If the instrument is to be calibrated before the first sample is analyzed, then the measurement action cell for that sample only must read “Run Blank, Stds, and Sample” if the sample is not to be auto-diluted, and “Run Blank, Stds, and Dil. sample” if the sample is to be auto-diluted. This is edited by clicking the right mouse button on the cell that

is to be edited and selecting the desired command from the list that appears using the left mouse button.

- Enter the factor which indicates the "fold" of dilution in the description column for each sample. For instance, if the sample is to be analyzed at a 1 to 5 dilution, then enter 5 in the description column for that sample. If the sample is not to analyzed at a dilution, then enter 1 in the description column. This must be entered regardless of whether the operator or the instrument will be performing the dilutions.

- It is not necessary to enter the sample preparation factors. These will be applied during the data upload to LIMS procedure.
- Save the sample file.

- Print the run list by selecting the print command from the file menu and clicking on the print button in the NexION file print window that appears.

11.8.6 Select the method button from the NexION tool bar. Select File/Open. When the open window appears, choose Service 6020 Methods/6020A.mth or Methods/6020B.mth.

- Select the QC tab. Enter an "X" in the initial column next to the appropriate QC Std # for all the QC standards that must be analyzed after the calibration is finished (if the instrument is to be calibrated). A list of the names and the standards to which they correspond follows:

  QC Std 1 - ICV
  QC Std 2 - ICB
  QC Std 3 - LLICV
  QC Std 4 - ICSA
  QC Std 5 - ICSAB
  QC Std 6 - CCV
  QC Std 7 - CCB
  QC Std 8 - LLCCV

- In the final column, enter an "X" beside the QC Std # that corresponds to the QC standards that must be analyzed after all samples have been analyzed. In the before A/S Loc. Column, enter the number that corresponds to the autosampler position of the sample that will run after the standards. For instance, 12 samples are loaded in autosampler positions 11-22, and a CCV and CCB must be analyzed after the sample in A/S position 20 and at the end. An "X" must be entered next to QC Std 6 and QC Std 7 in the final column

and “21” must be entered in the first before A/S Loc. Next to QC Std 6 and QC Std 7.

- Click on the report tab located on the right edge of the window. Edit the cell report filename in the following manner. The file path must read “c:\NexIONdata\ReportOutput\mmddyy.rep” where mmddyy is the current date. Edit only the current date portion of the file path. Do not edit anything else in this section.

- Save the Method.

11.8.7 Prepare samples and load into autosampler positions indicated in sample file. Samples for 200.8 analysis are diluted by a 2.5x factor prior to analysis, e.g., 20 mL digestate diluted to 50 ml with DI water. This dilution will adjust the chloride level in the sample. This is done during the digestion process.

11.8.8 Click on the sample window from the NexION tool bar. Choose the batch tab.

- Select the samples to be analyzed by highlighting the row of the first number and, while holding down the left mouse button, moving down the row numbers until all the samples to be analyzed have been highlighted.

- Aspirate the rinse for at least 10 minutes after daily optimization before beginning analysis to avoid carry-over and contamination.

- Click on analyze batch button in the upper left corner of the window. The instrument should now begin analysis.

- The sample results are an arithmetic mean (average) of three replicate readings per analyte. For any analyte with a result greater than the reporting detection limit, the % RSD between the replicate readings must be less than 20.

12.0 DETAILS OF CALCULATIONS

12.1 Each metal is analyzed within the calibration range. Refer to Table 1 for upper limits. Dilutions must be performed if the upper limit is exceeded.

12.2 After the calibration is complete, the software performs a weighted linear regression with a calculated intercept. The weighting factor equals the inverse of the square of the concentration of the standard. Weighting emphasizes measurements in the low concentration region of the calibration curve. The instrument calculates the correlation coefficients for each metal and the analyst

can view each curve for acceptance. The results are calculated from the calibration curve. See Appendix A for the weighted linear calibration algorithm.

12.3 Dilution factors and preparation factors are calculated into the final result, which is computed from the mean of three exposures, during the data upload procedure.

12.3.1 For Liquid Samples:

$$mg/L\ metal\ in\ sample = mg/L\ in\ digestate \times \frac{Final\ Prepared\ Volume\ (mL)}{Initial\ Volume\ (mL)} \times \frac{Total\ Diluted\ Volume}{Sample\ aliquot}$$

12.3.2 For Solid Samples:

$$mg/kg\ metal\ in\ sample = mg/L\ in\ digestate \times \frac{Final\ Prepared\ Volume\ (mL)}{Initial\ Weight\ (g)} \times \frac{Total\ Diluted\ Volume}{Sample\ aliquot}$$

12.4 BS

$$\%R = \left(\frac{C_x}{C_t}\right)100$$

where:

C_x = the concentration of the analyte in the reference (parent) sample
C_t = the theoretical spike concentration.
$\%R$ = percent recovery

12.5 Spike Percent Recovery is calculated as follows:

$$\%R = \left[\frac{(C_{spk} - C_x)}{C_t}\right]100$$

where:

C_{spk} = the concentration of the analyte in the spiked sample
C_x = the concentration of the analyte in the reference (parent) sample
C_t = the theoretical spike concentration.
$\%R$ = percent recovery

12.6 Relative Percent Difference (RPD) is calculated as follows:

$$RPD = \left[\frac{|C_1 - C_2|}{(C_1 + C_2)/2} \right] 100$$

where:

C_1 = Concentration of the first sample
C_2 = Concentration of the second sample

12.7 Percent Difference is calculated as follows:

$$\%D = \left[\frac{|C_1 - C_2|}{C_1} \right] 100$$

where:

C_1 = Concentration of the first sample
C_2 = Concentration of the second sample

12.8 Adjusted Analyte Intensity is calculated from the internal standard as follows:

$$\frac{A_{meas}}{I_{meas}} \times I_{std} = A_{adjusted}$$

where:

A_{meas} = Measured intensity of analyte
$A_{adjusted}$ = Adjusted intensity of analyte
I_{meas} = Measured intensity of the internal standard
I_{std} = Intensity of the internal standard in the blank solution analyzed prior to calibration

12.9 See Figure 12.1 for a sample calculation summary.

13.0 QUALITY CONTROL REQUIREMENTS

Overview

13.1 Refer to Section 10.0 for instrument calibration and instrument QC samples. Each preparation batch (or workgroup) consists of a maximum of twenty (20) samples plus QC Samples. The QC samples are prepared and digested identically to the analytical samples. The following QC are digested and or

analyzed with every preparation batch. The frequency, acceptance criteria and corrective action for this QC is listed in Table 13-1, 13-4, and 13-6.

Batch Quality Control

13.2 Method blank (Prep Blank (PB)) - An aliquot of DI water that is digested with the sample batch and contains all reagents identical with the sample.

13.3 BS, BSD - A BS or BS/BSD must be analyzed using the same sample preparations, analytical methods, and QA/QC procedures used for test samples. One BS must be prepared and analyzed for each sample batch of 20 samples. Acceptance ranges are 80–120% for method 6020 and 85–115% for 200.8. The final concentration is outlined in Table 13-2. QC Acceptance ranges are outlined in Tables 13-3 and 13-5.

13.4 Duplicate sample analysis (200.8 and 6020B optional) - Analyze one duplicate sample in a batch of twenty samples or less. The formulas for calculation of the RPD between the duplicate determinations are in Section 12.6. A control limit of 20% RPD must not be exceeded for analyte values greater than 100 times the IDL. If the control limit is exceeded, the reason for the out-of-control situation must be corrected and any samples analyzed during the out-of-control condition reanalyzed.

13.5 MS/MS or MS/MSD – A sample that is spiked in duplicate and then digested with the sample batch. It is prepared by taking 3 aliquots of sample, 2 of which are spiked with 0.25 mL of Microbac QC-MSI (7.9) for each 50 mL of sample. The final concentration spiked into the two spiked samples is outlined in Table 13-2 Batches that include samples for method 200.8 must include a spiked sample for every ten 200.8 samples.

Interference Tests – Post Digestion

13.6 Dilution Test - If the analyte concentration is within the linear range of the instrument and is a factor of at least 100 times the MDL, (25 times for 6020B) the analysis of a five-fold dilution of the sample must agree within 10% (20% for 6020B) of the original determination. If not, an interference must be suspected. The dilution is prepared by adding 1 mL of sample to 4 mL of 5% HNO_3 DI water.

One dilution test must be performed for each twenty samples or less of each matrix in a sample batch.

13.7 Post digestion matrix spike - An analyte spike added to a portion of a prepared sample or its dilution must be recovered to within 75-125% of the known value of the spike or within laboratory derived acceptance criteria. The final concentration spiked into the two spiked samples is outlined in Table 13-2. The spike value should be based upon the indigenous level of the analyte in the sample. If the spike is not recovered within the acceptance limits, the sample must be diluted and reanalyzed to compensate for the matrix effect. The results of the dilution must agree within 10% (20% for 6020B) of the original determination (see Section 13.6). The use of the method of standard additions may be used to compensate for matrix effects.

Control of Nonconforming Data

13.8 The laboratory implements general procedures to be followed when departures from documented policies, procedures and quality control have occurred. The policies and procedures are found in Section 13.0 of Microbac SOP LQAP (Laboratory Quality Assurance Program), Microbac SOP GP-CAPA (Corrective Action/Preventive Action: Initiating, Tracking and Monitoring) and Microbac SOP GP-RCA (Root Cause Analysis.

13.8.1 Nonconformances Requiring Corrections

A nonconformance occurs when any aspect of the method QC in an analysis, as outlined in Sections 11.0 and 13.0 and Tables 13-1, 13-4, 13-6 and 13-7 does not meet acceptance criteria. When nonconforming data occurs, the employee initiates an NCR and proceeds with indicated corrections as per Sections 11.0 and 13.0 and Tables 13-1, 13-4, 13-6 and 13-7.

All data shall be scrutinized by the analysts for method and project specific compliance. Checklists are utilized and accompany each data batch. A nonconformance shall be documented in the NCR followed by one or more of the following actions.

- Reanalysis of the sample(s) in question
- Discussion and qualification of data (report and narrative)
- Client notification with approval
- Data qualification (Q-flagging)
- Re-sampling and reanalysis (client decision)

13.8.2 Nonconformances Requiring Corrective Action

Corrective action is required when a nonconformance is recurring, if the correction is ineffective or if the departure is so significant that it negatively

effects data quality, sample integrity or customer satisfaction. When an event requiring corrective action is identified, the employee shall initiate a Corrective Action/ Preventive Action form as per Microbac SOP GP-CAPA. The corrective action process includes a root cause analysis as per Microbac SOP GP-RCA, corrections, corrective action(s) and evidence of effectiveness.

13.8.3 Nonconformances Not Requiring Corrections

There are some standard contingencies to the traditional corrections that maybe invoked, provided they comply with the project QAPP requirements. In many situations it may not be necessary to perform sample reanalysis or re-extraction for the following quality control departures, provided they are not a chronic problem or indicative of a trend, and the laboratory provides documentation in the report narrative and project files. In addition, the employee is required to initiate a NCR to record the event.

- An ICV, CCV or BS recovery exceeds the upper control limit, but the corresponding sample results are non-detect.
- A method blank, ICB or CCB exceeds the upper limit, but the corresponding sample results are non-detect.
- A method blank, ICB or CCB exceeds the upper limit, but the corresponding sample results are greater than ten (10) times the level in the blank.

14.0 DATA REVIEW AND REPORTING REQUIREMENTS

14.1 Data Review

Data is archived from the instrument computer to the LIMS where it is stored in a CSV format. When analysis is complete, the analyst must create a sequence in the LIMS. The analyst must then review the sequence for accuracy. This includes verifying that the correct matrix is selected, verifying that the correct standard IDs are applied to all sequence standards, verifying that all samples and QC samples are included and named correctly in the sequence, verifying that all samples are in the order in which they were analyzed, verifying that the correct instrument is selected, and verifying that the correct date and time of analysis is entered. The analyst must then upload the relevant CSV files including calibration, check standards, QA/ QC samples, and client samples into LIMS. This is done via Microbac's customized upload program. When the upload is complete, the analyst must check the date for correct digestion factors, dilutions and RLs. The analyst must also verify that the correct analyst initials and instrument name are applied to the data. Any elements that are not to be reported must be changed to non-reportable in the Data Entry/Review

Screen. This will be determined by the primary analyst through real time review of all QC elements as summarized in Tables 13-1, 13-4, 13-6, and 13-7. Re-shots will need created for any client samples/elements that require re-analysis. After reviewing the data completely, the analyst must lock the data and set all client samples to a status of "analyzed". The completed package is then submitted for secondary review.

The secondary review consists of an additional 100% review of the data for QA/QC compliance. This review also consists of a double check of the batch QA/QC summary and associated post spikes and serial dilutions. Sample results are reviewed for completeness, reasonableness, and compliance with any special project or client requirements.

When all levels of review have been completed, all samples are taken to a status of "reviewed" in LIMS.

15.0 PREVENTIVE MAINTENANCE

The following sections describe some commonly occurring problems and proposed solutions.

15.1 Poor recovery on selected QC Analytes: If poor recoveries are obtained on only particular analytes in a Quality Control Standard and it had been verified that the sample has been properly prepared, it may be possible that the problem could be related to a problem with the internal standard used. Look at the entire list of elements grouped with an internal standard. If the results for all elements are not satisfactory but the results for other elements not grouped with that internal standard are acceptable, there could be a problem with the internal standard used for that grouping.

15.1.1 Try using a different internal standard and reprocessing the data.

15.1.2 Look at the monitored intensities of the internal standards. If the internal standard used for the elements with unacceptable results is not within the allowable range or the percent recovery for this internal standard significantly different that the others, use a different internal standard and reprocess the data.

15.2 Poor relative standard deviation (precision (RSD)) on standards and samples.

15.2.1 Poor RSDs can be caused by many things. First check that the interface cones are in good condition and the orifices of both cones are round and of the proper size.

15.2.2 Check that the nebulizer is operating properly by checking the aerosol with the plasma off and the spray chamber removed. Turn on the nebulizer gas and the peristaltic pump - must be a visible aerosol leaving the spray chamber. If there is not, clean or replace the nebulizer.

15.2.3 Check that the peristaltic pump tubing is in good condition and not worn. When the autosampler probe is removed and reinserted in the wash solution an air bubble will be visible in the tubing. Watch the progress of this bubble and adjust the tension on the pump tubing so the flow is smooth without any pulsations.

15.3 Sequence occurs improperly on startup of a batch analysis. The sample file has either not been saved or re-opened properly. Save the sample file and then reopen this same sample file. The full path name of the method must appear in the Method field of the sample list.

15.4 Further troubleshooting procedures for the NexION 300X can be found in Appendix A of the NexION Software Reference Guide Version 1.0 located in the Help menu in the instrument software. Troubleshooting for the Agilent MS can be found in the ICP-MS Maintenance and troubleshooting (update 05/2018)

15.5 The instrument configuration for the NexION 300X can be found in the hardcopy Maintenance Log header on the “Contents” page. Replacement of instrument components will be recorded in the relevant daily maintenance log and updated in the log header, on the “Contents” page, as needed.

16.0 WASTE MANAGEMENT AND POLLUTION CONTROL

16.1 Microbac is dedicated to eliminating or minimizing all laboratory waste which requires disposal or contributes to pollution of any type. To that extent Microbac has implemented new technology and converted to micro techniques when available to facilitate these goals.

16.2 Each laboratory generates specific waste streams which are segregated and collected in labeled satellite containers. The analysts in each department are responsible for proper disposal of the spent samples and chemical waste in the specified satellite waste collection vessel. The waste management technician checks the satellite containers either daily, or as needed. They are then combined into waste drums in our explosion-proof waste building located

outside of the Microbac laboratory facility. These drums are labeled with start date and a manifest is created for each. They are picked up on a regular basis for disposal at a licensed disposal facility.

16.2.1 The waste streams are as follows:

Metals Laboratory - acid waste is neutralized and disposed of in the sewer per agreement with the city of Marietta.

16.3 Laboratory policies and procedures for management of hazardous waste are found in Microbac SOP 33 - Laboratory Waste management and the waste management section of the analytical SOPs contain procedures specific to each method. All laboratory waste is accumulated, stored, and disposed in accordance with all federal and state laws and regulations. Each employee receives training in the proper handling and disposal of hazardous waste that is specific to their job descriptions. As a hazardous generator, we are subject to inspection from the Ohio EPA.

17.0 REFERENCES

17.1 **"**Inductively Coupled Plasma-Mass Spectrometry", EPA Method 6020, Revision 0", September 1994

17.2 **"**Inductively Coupled Plasma-Mass Spectrometry", EPA Method 6020A, Revision 1", February 2007

17.3 **"**Inductively Coupled Plasma-Mass Spectrometry", EPA Method 6020B, Revision 2", July 2014

17.4 NexION 300X ICP-MS Software Reference Guide, 2009 Version 1.0, Perkin-Elmer Corporation.

17.5 EPA Method 200.8, "Determination of Trace Elements in Water, and Wastes by Inductively Coupled Plasma-Mass Spectrometry," Revision 5.4, 1994

17.6 Agilent ICP-MS Mass Hunter WorkStation Software, Revision A, October 2020

17.7 Microbac SOP ME407 "Microwave Digestion for Aqueous Matrices – SW3015".

17.8 Microbac SOP ME406 "Microwave Digestion of Sediments, Sludges, Soils and Oils 3051A".

17.9 Microbac SOP LQAP “Laboratory Quality Assurance Plan”.

17.10 Microbac SOP 45 “Method Validation Procedures”.

17.11 Microbac SOP GP-CAPA “Corrective Action/Preventative Action: Initiating, Tracking and Monitoring”.

17.12 Microbac SOP GP-RCA “Root Cause Analysis”.

17.13 Microbac SOP 33 “Laboratory Waste Management”.

17.14 Microbac SOP GP-MDL “Determination and Verification of Method Detection Limits”

17.15 Microbac SOP ME401A “Preparation of Aqueous Samples for Determination of Metals by Inductively Coupled Plasma Atomic Emission Spectroscopy and Inductively Coupled Plasma Mass Spectroscopy (EPA 200.7) (EPA 200.8)

17.16 Department of Defense, Quality Systems Manual Revision 5.3

17.17 TNI Standard 2016

Appendix A

Weighted Linear Calibration Algorithm

When working at low level concentrations it provides an alternative calibration scheme that weighs the low standards to a greater degree.

Determine the slope, intercept, and correlation coefficient for the equation:

$$y = b_0 + b_i x$$

Where y is the measured net corrected intensity (blank subtracted). The weights are applied by multiplying the intensity by the weighting factor for each standard. In this calibration the weighting factor is the reciprocal of the square of the user entered concentration value for each standard.

where:

x = concentration value of the standard
y = measured intensity of the standard
n = number of standards
i = index for the standards
b_0 = intercept
b_1 = slope
COC = correlation coefficient

$$w_1 = \sum \frac{1}{x_i^2} \qquad w_4 = \sum \frac{y_i}{x_i^2}$$

$$w_2 = \sum \frac{x_i}{x_i^2} \qquad w_5 = \sum \frac{y_i^2}{x_i^2}$$

$$w_3 = \sum \frac{x_i^2}{x_i^2} = n \qquad w_6 = \sum \frac{x_i y_i}{x_i^2}$$

Intercept:

$$b_0 = \frac{(w_4 w_3) - (w_6 w_2)}{(w_1 w_3) - w_2^2}$$

Slope:

$$b_1 = \frac{(w_1 w_6) - (w_4 w_2)}{(w_1 w_3) - w_2^2}$$

Weighted Linear Calibration Algorithm (continued)

Correlation Coefficient: $$COC = \frac{(w_1 w_6) - (w_2 w_4)}{\sqrt{\left[(w_1 w_3) - w_2^{\,2}\right]\left[(w_1 w_5) - w_4^{\,2}\right]}}$$

Linear Calibration Algorithm

This calibration curve is established by assuming that the relationship between concentration (the X values) and intensity (the Y values) is linear and that the following equation describes this relationship:

$$Y = MX + B$$

where:

X = concentration
Y = intensity
M = slope of the calibration curve
B = y-axis intercept

Given 2 or more data points, the values for M and B are calculated using the following equations [1, 2].

N = number of standards (includes the blank)

In this equation, the blank is subtracted from all solutions and included in the calculation of the calibration curve.

[1] $$M = \frac{(n)\sum_{n}^{i=1}(X_i Y_i) - \sum_{n}^{i=1}(X_i)\sum_{n}^{i=1}(Y_i)}{(n)\sum_{n}^{i=1}\left(X_i^{\,2}\right) - \left(\sum_{n}^{i-1} X_i\right)^2}$$

[2] $$B = \frac{\sum_{n}^{i=1}\left(X_i^{\,2}\right)\sum_{n}^{i=1}(Y_i) - \sum_{n}^{i=1}(X_i Y_i)\sum_{n}^{i=1}(X_i)}{(n)\sum_{n}^{i=1}\left(X_i^{\,2}\right) - \left(\sum_{n}^{i-1} X_i\right)^2}$$

$$COC = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sqrt{\left(\sum x^2 - \frac{(\sum x)^2}{n}\right)\left(\sum y^2 - \frac{(\sum y)^2}{n}\right)}}$$

where:

x = standard concentration
y = mean intensity
n = number of standards

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Table 1
ICP-MS IDLs, MDLs, and Linear Ranges

Analyte	Symbol	Mass	IDL* (ug/L)	Linear Range ** (ug/L)	Water MDL (ug/L)	Water RL (ug/L)	Soil MDL (mg/Kg)	Soil RL mg/Kg
Beryllium	Be	9	0.033	90	0.1	0.2	0.02	0.04
Vanadium	V	51	0.108	90	0.2	4.0	0.5	1.0
Chromium	Cr	52	0.213	144	2.0	4.0	0.2	0.4
Manganese	Mn	55	0.082	144	2.5	5.0	0.25	0.5
Cobalt	Co	59	0.034	90	0.5	1.0	0.25	0.5
Nickel	Ni	60	0.088	288	2.0	4.0	0.4	0.8
Copper	Cu	65	0.171	144	1.0	2.0	0.3	0.6
Zinc	Zn	66	2.11	1440	12.5	25.0	1.25	2.5
Arsenic	As	75	0.124	90	0.5	1.0	0.2	0.3
Selenium	Se	82	0.238	90	0.5	1.0	0.1	0.2
Silver	Ag	107	0.031	90	0.5	1.0	0.1	0.2
Cadmium	Cd	111	0.025	90	0.3	0.6	0.05	0.1
Antimony	Sb	123	0.322	90	2.5	5.0	0.2	0.4
Barium	Ba	135	0.069	216	1.5	3.0	0.15	0.3
Thallium	Tl	203	0.019	90	0.1	0.2	0.02	0.04
Lead	Pb	208	0.032	90	0.5	1.0	0.1	0.2
Uranium	U	238	0.087	90	0.5	1.0	0.2	0.4

* Updated quarterly
** Values reported are 90% of the verified upper linear range

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Table 2
Table of Isotopes Monitored and Equations Used

Analyte	Symbol	Isotopes Monitored	Correction Equations
Aluminum	Al	27	
Antimony	Sb	123	Sb 123 = Sb 123 – 0.127189 * Te 125
Arsenic	As	75	As 75 = As 75 – 3.127 * (ArCl 77 – (0.87496 * Se 82))-2.73*Kr 83
Barium	Ba	135	
Beryllium	Be	9	
Cadmium	Cd	111,114	Cd 111 = Cd 111 – 0.0014 * Mo 98
Chromium	Cr	52,53	
Cobalt	Co	59	
Copper	Cu	65	
Lead	Pb	206,207,208	Pb 208 = Pb 208 + 1 * Pb 206 + 1 * Pb 207
Manganese	Mn	55	
Nickel	Ni	60	
Selenium	Se	77,82	Se 82 = Se 82 – 0.6 * Kr 83
Silver	Ag	107	
Thallium	Tl	203,205	
Vanadium	V	51	V 51 = V 51 – 3.127 * [ClO 53 – (0.113 * Cr 52)]
Zinc	Zn	66	
Internal Standards			
Lithium	Li	6	
Scandium	Sc	45	
Yttrium	Y	89	
Rhodium	Rh	103	
Indium	In	115	
Terbium	Tb	159	
Bismuth	Bi	209	
Germanium	Ge	72	
(Information Only)			
Molybdenum	Mo	98	Mo 98 = Mo 98 – 0.110588 * Ru 101
Uranium	U	238	
Calcium	Ca	44	
Magnesium	Mg	24	
Sodium	Na	23	
Potassium	K	39	
Iron	Fe	54	Fe 54 = Fe 54 – 0.028226 * Cr 52

Table 7-1
Internal Standard Solution

Analyte	Symbol	Stock Concentration (mg/L)	Secondary Concentration (mg/L)
Lithium	Li	100	0.025
Scandium	Sc	100	0.025
Germanium	Ge	1000	0.25
Yttrium	Y	100	0.025
Indium	In	100	0.025
Terbium	Tb	100	0.025
Bismuth	Bi	100	0.025

Table 7-2
Tuning Solution and Daily Performance Check Solution

Analyte	Symbol	Stock Concentration (mg/L)	Secondary Concentration (mg/L)
Aluminum	Al	10	0.001
Antimony	Sb	10	0.001
Arsenic	As	10	0.001
Barium	Ba	10	0.001
Beryllium	Be	10	0.001
Bismuth	Bi	100	0.001
Cadmium	Cd	10	0.001
Calcium	Ca	1000	0.400
Cerium	Ce	1000	0.001
Chromium	Cr	10	0.001
Cobalt	Co	10	0.001
Copper	Cu	10	0.001
Indium	In	100	0.001
Iron	Fe	1000	0.400
Lead	Pb	10	0.001
Lithium	Li	100	0.001
Magnesium	Mg	1000	0.400
Manganese	Mn	10	0.001
Nickel	Ni	10	0.001
Potassium	K	1000	0.400
Scandium	Sc	100	0.001
Selenium	Se	10	0.001
Silver	Ag	10	0.001
Sodium	Na	1000	0.400
Terbium	Tb	100	0.001
Thallium	Tl	10	0.001
Uranium	U	10	0.001
Vanadium	V	10	0.001
Yttrium	Y	100	0.001
Zinc	Zn	10	0.001

Table 7-3
Calibration

Analyte	Symbol	Stock Conc. (mg/L)	S1 (mg/L)	S2 (mg/L)	S3 (mg/L)	S4 (mg/L)	S5 (mg/L)
Antimony	Sb	8	0	0.0004	0.002	0.04	0.08
Arsenic	As	8	0	0.0004	0.002	0.04	0.08
Barium	Ba	24	0	0.0012	0.006	0.120	0.24
Beryllium	Be	1.6	0	0.00008	0.0004	0.008	0.016
Calcium	Ca	1000	0	0.05	0.25	5	10
Cadmium	Cd	4.8	0	0.00024	0.0012	0.024	0.048
Chromium	Cr	16	0	0.0008	0.004	0.08	0.16
Cobalt	Co	8	0	0.0004	0.002	0.04	0.08
Copper	Cu	16	0	0.0008	0.004	0.08	0.16
Iron	Fe	1000	0	0.05	0.25	5	10
Lead	Pb	8	0	0.0004	0.002	0.04	0.08
Magnesium	Mg	1000	0	0.05	0.25	5	10
Manganese	Mn	16	0	0.0008	0.004	0.08	0.16
Molybdenum	Mo	8	0	0.0004	0.002	0.04	0.08
Nickel	Ni	32	0	0.0016	0.008	0.16	0.32
Potassium	K	1000	0	0.05	0.25	5	10
Selenium	Se	8	0	0.0004	0.002	0.04	0.08
Silver	Ag	8	0	0.0004	0.002	0.04	0.08
Sodium	Na	1000	0	0.05	0.25	5	10
Titanium	Ti	8	0	0.0004	0.002	0.04	0.08
Tin	Sn	8	0	0.0004	0.002	0.04	0.08
Thallium	Tl	1.6	0	0.00008	0.0004	0.008	0.016
Uranium	U	8	0	0.0004	0.002	0.04	0.08
Vanadium	V	8	0	0.0004	0.002	0.04	0.08
Zinc	Zn	160	0	0.008	0.04	0.8	1.60

Table 7-4
CCV/ICV Solutions

Analyte	Symbol	Stock Concentration (mg/L)	CCV/ICV Concentration (mg/L)
Antimony	Sb	8	0.032
Arsenic	As	8	0.032
Barium	Ba	24	0.096
Beryllium	Be	1.6	0.0064
Calcium	Ca	1000	4
Cadmium	Cd	4.8	0.0192
Chromium	Cr	16	0.064
Cobalt	Co	8	0.032
Copper	Cu	16	0.064
Iron	Fe	1000	4
Lead	Pb	8	0.032
Magnesium	Mg	1000	4
Manganese	Mn	16	0.064
Molybdenum	Mo	8	0.032
Nickel	Ni	32	0.128
Potassium	K	1000	4
Selenium	Se	8	0.032
Silver	Ag	8	0.032
Sodium	Na	1000	4
Titanium	Ti	8	0.032
Tin	Sn	8	0.032
Thallium	Tl	1.6	0.0064
Uranium	U	8	0.032
Vanadium	V	8	0.032
Zinc	Zn	160	0.640

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Table 7-5
Interference Check Solutions

Analyte	Symbol	Stock Concentration (mg/L)	ICSA Concentration (mg/L)	ICSAB Concentration (mg/L)
Aluminum	Al	1000	5	5
Antimony	Sb	10	0	0.1
Arsenic	As	10	0	0.1
Barium	Ba	10	0	0.1
Beryllium	Be	10	0	0.1
Calcium	Ca	3000	15	15
Cadmium	Cd	10	0	0.1
Chromium	Cr	10	0	0.1
Cobalt	Co	10	0	0.1
Copper	Cu	10	0	0.1
Iron	Fe	2500	12.5	12.5
Lead	Pb	10	0	0.1
Magnesium	Mg	1000	5	5
Manganese	Mn	10	0	0.1
Molybedenum	Mo	20	0.1	0.1
Nickel	Ni	10	0	0.1
Potassium	K	1000	5	5
Selenium	Se	10	0	0.1
Silver	Ag	10	0	0.1
Sodium	Na	2500	12.5	12.5
Thallium	Tl	10	0	0.1
Titanium	Ti	20	0.1	0.1
Uranium	U	10	0	0.1
Vanadium	V	10	0	0.1
Zinc	Zn	10	0	0.1
Chlorine	Cl^-*	21215	106.1	106.1
Carbon	C*	2000	10	10
Phosphorus	P*	1000	5	5
Sulfur	S*	1000	5	5

* Although these are non-metals, they are essential for verifying the absence of mass interferences.

Table 7-6
LLICV / LLCCV Solutions

Analyte	Symbol	Microbac QC-MS (mL)	LLICV / LLCCV Concentration (ug/L)
Antimony	Sb	0.08	0.8
Arsenic	As	0.08	0.8
Barium	Ba	0.24	2.4
Beryllium	Be	0.016	0.16
Cadmium	Cd	0.048	0.48
Chromium	Cr	0.16	1.6
Cobalt	Co	0.08	0.8
Copper	Cu	0.16	1.6
Lead	Pb	0.08	0.8
Manganese	Mn	0.16	1.6
Nickel	Ni	0.32	3.2
Selenium	Se	0.08	0.8
Silver	Ag	0.08	0.8
Thallium	Tl	0.016	0.16
Uranium	U	0.08	0.8
Vanadium	V	0.08	0.8
Zinc	Zn	1.6	16.0

Table 13-1
Quality Control Criteria
Total Metals – ICP/MS Method 6020

CONTROL ITEM	FREQUENCY	ACCEPTANCE CRITERIA (1)	CORRECTIVE ACTION
Initial calibration	Daily at beginning of analytical run	Correlation coefficient must be ≥ 0.995	Investigate, reanalyze the aberrant standard or recalibrate
Initial Calibration Verification (ICV)	After calibration	90 – 110%	Stop analysis, investigate, reanalyze. If still outside limits, recalibrate
Continuing Calibration Verification (CCV)	Minimum every 10 samples	90 - 110%	Stop analysis, investigate, reanalyze. If still outside limits, recalibrate, reanalyze all samples run after the last compliant CCV
Low Level Initial Calibration Verification (LLICV) (at or below RL)	Minimum of once per calibration prior to sample analysis unless multipoint calibration with low std at or below RL is performed	All analyte(s) within ± 50% of expected value for SW-846 and AFCEE QAP 3.1. All analytes within ± 20 % of expected value for DOD Version 4 and AFCEE QAP 4.0	Correct problem then reanalyzes
Mass Calibration and Resolution	Daily prior to calibration 5 replicates	Measured mass within ± 0.05 amu of exact mass; Resolution ± 0.03 amu RSD < 5% with 10% peak height	Retune Instrument
Initial Calibration Blank (ICB)	After ICV	< RL < 1/2 RL < 3 x IDL < MDL	Stop analysis, investigate, reanalyze. If still outside limits, recalibrate
Continuing Calibration Blank (CCB)	minimum every 10 samples	< RL < 1/2 RL < 3 x IDL < MDL	Stop analysis, investigate, reanalyze. If still outside limits, recalibrate, reanalyze all samples run after the last compliant CCB
Method Blank	One per batch (20 samples maximum per batch)	< RL or <MDL x 2	Stop analysis, investigate, reanalyze. If still > limit, Redigest batch (required by Ohio VAP projects) or qualify data and address in narrative
ICP Interference Check	Run at beginning of each run (12 hour maximum)	All non-spiked analytes <2 x MDL (unless they are a verified trace impurity from one of the spiked analytes) Spiked analytes ± 20% of expected value.	Stop analysis, investigate, reanalyze. If still outside limits, recalibrate.
Blank Spike/ Spike Duplicate (BS/BSD)	One per batch (20 samples maximum per batch)	Control Limits 80 - 120%	Stop analysis, investigate, reanalyze. If still outside limits, redigest batch (required by Ohio VAP projects) or qualify data and address in narrative
Matrix spike/ Matrix Spike Duplicate (MS/MSD)	One per batch (20 samples maximum per batch)	75 - 125% recovery RPD ≤ 20%	Perform post digestion spike and/or serial dilution. Qualify data and address in narrative if client specified
Duplicate (optional)	One per batch (20 samples maximum per batch)	RPD ≤ 20%	Qualify data and address in narrative if client specified
Post digestion spike	5%, or minimum of 1 per batch	75 - 125% recovery	Serial dilution
Serial Dilution	If post digestion spike fails	± 10% of original determination	Dilute and repeat Post digestion spike
Internal Standards	Every sample	CCV/CCB 80-120% all others Intensity >30% < 120% of that of the blank run prior to calibration	Stop analysis, investigate, dilute sample if interference is apparent or recalibrate and reanalyze affected samples.
Daily Performance Report (Manufacturer's recommendations)	Daily after Mass calibration and Resolution	Background < 1 cps @ Mass 220 Mg sensitivity > 15000 cps CeO/Ce = ≤ 0.025 Ce^{++}/Ce = < 0.03 Be sensitivity > 2000 In sensitivity > 40000 U sensitivity > 30000	Stop analysis, investigate, reanalyze. If still outside limit, examine and replace cones.

(1) Acceptance criteria are project specific. Consult QAPP.

Uncontrolled Copy

Table 13-2
Spike Concentrations
Total Metals – ICP/MS Method 6020

Analyte	Symbol	BS		MS/MSD		Post Spike	
		Water mg/L	Soil mg/Kg	Water mg/L	Soil mg/Kg	Water mg/L	Soil mg/Kg
Silver	Ag	0.032	8.0	0.032	8.0	0.032	8.0
Antimony	Sb	0.032	8.0	0.032	8.0	0.032	8.0
Arsenic	As	0.032	8.0	0.032	8.0	0.032	8.0
Lead	Pb	0.032	8.0	0.032	8.0	0.032	8.0
Selenium	Se	0.032	8.0	0.032	8.0	0.032	8.0
Thallium	Tl	0.0064	1.6	0.0064	1.6	0.0064	1.6
Barium	Ba	0.096	24.0	0.096	24.0	0.096	24.0
Cadmium	Cd	0.0192	4.8	0.0192	4.8	0.0192	4.8
Chromium	Cr	0.064	16.0	0.064	16.0	0.064	16.0
Cobalt	Co	0.032	8.0	0.032	8.0	0.032	8.0
Copper	Cu	0.064	16.0	0.064	16.0	0.064	16.0
Manganese	Mn	0.064	16.0	0.064	16.0	0.064	16.0
Nickel	Ni	0.128	32.0	0.128	32.0	0.128	32.0
Uranium	U	0.032	8.0	0.032	8.0	0.032	8.0
Vanadium	V	0.032	8.0	0.032	8.0	0.032	8.0
Zinc	Zn	0.640	160.0	0.640	160.0	0.640	160.0
Beryllium	Be	0.0064	1.6	0.0064	1.6	0.0064	1.6

Table 13-3
Microbac's QA Objectives and Analytical Methods for Inorganic Metals Analyses of Groundwater

Analyte	Symbol	CAS #	EPA SW-846 Method	Accuracy (% Recovery)	Precision (% RPD)	MDL Water (ug/L)	Reporting Limits Water (ug/L)
Antimony	Sb	7440-36-0	6020	80-120	20	2.5	5.0
Arsenic	As	7440-38-2	6020	80-120	20	0.5	1.0
Lead	Pb	7439-92-1	6020	80-120	20	0.5	1.0
Selenium	Se	7782-49-2	6020	80-120	20	0.5	1.0
Thallium	Tl	7440-28-0	6020	80-120	20	0.1	0.2
Silver	Ag	7440-22-4	6020	80-120	20	0.5	1.0
Barium	Ba	7440-39-3	6020	80-120	20	1.5	3.0
Cadmium	Cd	7440-43-9	6020	80-120	20	0.3	0.6
Chromium	Cr	7440-47-3	6020	80-120	20	2.0	4.0
Cobalt	Co	7440-48-4	6020	80-120	20	0.5	1.0
Copper	Cu	7440.50-8	6020	80-120	20	1.0	2.0
Manganese	Mn	7439-96-5	6020	80-120	20	2.5	5.0
Nickel	Ni	7440-02-0	6020	80-120	20	2.0	4.0
Uranium	U	7440-61-1	6020	80-120	20	0.5	1.0
Vanadium	V	7440-62-2	6020	80-120	20	2.0	4.0
Zinc	Zn	7440-66-6	6020	80-120	20	12.5	25.0
Beryllium	Be	7440-41-7	6020	80-120	20	0.1	0.2

Table 13-3 (continued)
Microbac's QA Objectives and Analytical Methods for
Inorganic Metals Analyses of Solid Waste

Analyte	Symbol	CAS #	EPA SW-846 Method	Accuracy (% Recovery)	Precision (% RPD)	MDL Soil (ug/Kg)	Reporting Limits Soil (ug/Kg)
Antimony	Sb	7440-36-0	6020	80-120	20	200	400
Arsenic	As	7440-38-2	6020	80-120	20	200	300
Lead	Pb	7439-92-1	6020	80-120	20	100	200
Selenium	Se	7782-49-2	6020	80-120	20	100	200
Thallium	Tl	7440-28-0	6020	80-120	20	20	40
Silver	Ag	7440-22-4	6020	80-120	20	100	200
Barium	Ba	7440-39-3	6020	80-120	20	150	300
Cadmium	Cd	7440-43-9	6020	80-120	20	50	100
Chromium	Cr	7440-47-3	6020	80-120	20	200	400
Cobalt	Co	7440-48-4	6020	80-120	20	250	500
Copper	Cu	7440-50-8	6020	80-120	20	300	600
Manganese	Mn	7439-96-5	6020	80-120	20	250	500
Nickel	Ni	7440-02-0	6020	80-120	20	400	800
Uranium	U	7440-61-1	6020	80-120	20	200	400
Vandium	V	7440-62-2	6020	80-120	20	500	1000
Zinc	Zn	7440-66-6	6020	80-120	20	1250	2500
Beryllium	Be	7440-41-7	6020	80-120	20	20	40

Table 13-4
Quality Control Criteria
Total Metals – ICP/MS Method 200.8

CONTROL ITEM	FREQUENCY	ACCEPTANCE CRITERIA (1)	CORRECTIVE ACTION
Initial Calibration	Daily at beginning of analytical run	Correlation coefficient must be ≥ 0.995	Investigate, reanalyze the aberrant standard or recalibrate
Initial Calibration Verification (ICV)	After calibration	90 – 110%	Stop analysis, investigate, reanalyze. If still outside limits, recalibrate
Continuing Calibration Verification (CCV)	Minimum every 10 samples	90-110%	Stop analysis, investigate, reanalyze. If still outside limits, recalibrate, reanalyze all samples run after the last compliant CCV
Low Level Initial Calibration Verification (LLICV) (at or below RL)	Minimum of once per calibration prior to sample analysis unless multipoint calibration with low std at or below RL is performed	All analyte(s) with ± 50% of expected value for SW-846 / EPA Method 200.8 and AFCEE QAP 3.1. All analytes within ± 20 % of expected value for DOD Version 4 and AFCEE QAP 4.0	Correct problem then reanalyze
Mass Calibration and Resolution	Daily, minimum of 5 replicates	Measured mass within 0.05 amu of exact mass; RSD < 5% Peak width < 0.75 amu at 5% peak height Resolution ± 0.03	Retune Instrument
Initial Calibration Blank (ICB)	After ICV	< RL < 1/2 RL < 3 x IDL < MDL	Stop analysis, investigate, reanalyze. If still outside limits, recalibrate
Continuing Calibration Blank (CCB)	minimum every 10 samples	< RL < 1/2 RL < 3 x IDL < MDL	Stop analysis, investigate, reanalyze. If still outside limits, recalibrate, reanalyze all samples run after the last compliant CCB
Method Blank	One per batch (20 samples maximum per batch)	< RL or <MDL x 2	Stop analysis, investigate, reanalyze. If still > limit, redigest batch (required for Ohio VAP projects) or qualify data and address in narrative
Blank Spike/ Blank Spike Duplicate (BS/BSD)	One per batch (20 samples maximum per batch)	Control Limits 85 - 115%	Stop analysis, investigate, reanalyze. If still outside limits, redigest batch (required by Ohio VAP projects) or qualify data and address in narrative
Matrix Spike/ Matrix Spike Duplicate (MS/MSD)	One per ten 200.8 samples	70 - 130% recovery RPD ≤ 20%	Perform post digestion spike and/or serial dilution. Qualify data and address in narrative if client specified
Duplicate	One per batch (20 samples maximum per batch)	RPD ≤ 20%	Qualify data and address in narrative if client specified
Post digestion spike	5%, or minimum of 1 per batch	75 - 125% recovery	Serial dilution
Serial Dilution	If post digestion spike fails	± 10% of original determination	Dilute and repeat Post digestion spike
Internal Standards	Every sample	60 - 125%	Stop analysis, investigate, dilute sample if interference is apparent or recalibrate and reanalyze affected samples.
Daily Performance Report (Manufacturer's recommendations)	Daily after Mass Calibration and Resolution	Background < 1 cps @ Mass 220 Mg sensitivity > 15000 cps CeO/Ce = ≤ 0.025 Ce^{++}/Ce= < 0.03 Be sensitivity > 2000 In sensitivity > 40000 U sensitivity > 30000	Stop analysis, investigate, reanalyze. If still outside limit, examine and replace cones.
Quality Control Sample (QCS) (120 ppb)	Run Quarterly	90-110%	Stop analysis, investigate, reanalyze. If still outside limit, recalibrate.

(1) Acceptance criteria are project specific. Consult QAPP.

Table 13-5
Microbac's QA Objectives and Analytical Methods for Inorganic Metals Analyses

Analyte	Symbol	CAS #	EPA SW-846 Method	Accuracy (% Recovery)	Precision (% RPD)	MDL Water (ug/L)	Reporting Limits Water (ug/L)
Antimony	Sb	7440-36-0	200.8	85-115	20	1.0	2.0
Arsenic	As	7440-38-2	200.8	85-115	20	1.6	2.5
Lead	Pb	7439-92-1	200.8	85-115	20	0.5	1.0
Selenium	Se	7782-49-2	200.8	85-115	20	0.5	1.0
Thallium	Tl	7440-28-0	200.8	85-115	20	0.1	0.2
Silver	Ag	7440-22-4	200.8	85-115	20	0.5	1.0
Barium	Ba	7440-39-3	200.8	85-115	20	1.5	3.0
Cadmium	Cd	7440-43-9	200.8	85-115	20	0.3	0.6
Chromium	Cr	7440-47-3	200.8	85-115	20	3.5	4.0
Cobalt	Co	7440-48-4	200.8	85-115	20	0.5	1.0
Copper	Cu	7440.50-8	200.8	85-115	20	1.0	2.0
Manganese	Mn	7439-96-5	200.8	85-115	20	2.0	4.0
Nickel	Ni	7440-02-0	200.8	85-115	20	2.0	4.0
Uranium	U	7440-61-1	200.8	85-115	20	0.5	1.0
Zinc	Zn	7440-66-6	200.8	85-115	20	15.0	30.0
Beryllium	Be	7440-41-7	200.8	85-115	20	0.1	0.2

Table 13-6
Quality Control Criteria
Total Metals – ICP/MS Method 6020A

CONTROL ITEM	FREQUENCY	ACCEPTANCE CRITERIA (1)	CORRECTIVE ACTION
Initial Calibration	Daily at beginning of analytical run	Correlation coefficient must be ≥ 0.998	Investigate, reanalyze the aberrant standard or recalibrate
Initial Calibration Verification (ICV)	After calibration	90 – 110%	Stop analysis, investigate, reanalyze. If still outside limits, recalibrate
Continuing Calibration Verification (CCV)	Minimum every 10 samples	90 - 110%	Stop analysis, investigate, reanalyze. If still outside limits, recalibrate, reanalyze all samples run after the last compliant CCV
Low Level Initial and Continuing Calibration Verification (LLICV / LLCCV) (at or below RL)	Following Calibration prior to sample analysis and minimally at the close of each analytical batch	All analyte(s) within ± 30% of expected value or QAPP specific limits	Correct problem then reanalyzes
Mass Calibration and Resolution	Daily prior to calibration minimum of 5 replicates	Measured mass within 0.05 amu Of exact mass; Peak within < 0.7 amu at 10% peak height RSD < 5% resolution ± 0.03	Retune Instrument
Initial Calibration Blank (ICB)	After ICV	< RL < 1/2 RL < 3 x IDL < MDL	Stop analysis, investigate, reanalyze. If still outside limits, recalibrate
Continuing Calibration Blank (CCB)	minimum every 10 samples	< RL < 1/2 RL < 3 x IDL < MDL	Stop analysis, investigate, reanalyze. If still outside limits, recalibrate, reanalyze all samples run after the last compliant CCB
Method Blank	One per batch (20 samples maximum per batch)	< RL or < MDL x 2 < 10% of RL, regulatory limit or lowest sample concentration	Stop analysis, investigate, reanalyze. If still > limit, redigest batch or qualify data and address in narrative
ICP interference check	Run at beginning of each run (12 hour maximum)	All non-spiked analytes <2 x MDL (unless they are a verified trace impurity from one of the spiked analytes). Spiked analytes ± 20% of expected value.	Stop analysis, investigate, reanalyze. If still outside limits, recalibrate.
Blank Spike/Blank Spike Duplicate BS/BSD)	One per batch (20 samples maximum per batch)	Control Limits 80 - 120%	Stop analysis, investigate, reanalyze. If still outside limits, redigest batch or qualify data and address in narrative
Matrix Spike/ Matrix Spike Duplicate (MS/MSD)	One per batch (20 samples maximum per batch)	75 - 125% recovery RPD ≤ 20%	Perform post digestion spike and/or serial dilution. Qualify data and address in narrative if client specified
Duplicate (optional)	One per batch (20 samples maximum per batch)	RPD ≤ 20%	Qualify data and address in narrative if client specified
Post digestion spike	5%, or minimum of 1 per batch	75-125% recovery	Serial dilution
Serial Dilution	If post digestion spike fails	± 10% of original determination	Dilute and repeat Post digestion spike
Internal Standards	Every sample	≥ 70% recovery of that of blank run prior to calibration. No upper limit.	Stop analysis, investigate, dilute sample if interference is apparent or recalibrate and reanalyze affected samples.
Daily Performance Report (Manufacturer's recommendations)	Daily after Mass Calibration and Resolution	Background < 1 cps @ Mass 220 Mg sensitivity > 15000 cps CeO/Ce = ≤ 0.025 Ce^{++}/Ce= < 0.03 Be sensitivity > 2000 In sensitivity > 40000 U sensitivity > 30000	Stop analysis, investigate, reanalyze. If still outside limit, examine and replace cones.

(1) Acceptance criteria are project specific. Consult QAPP.

Table 13-7
Quality Control Criteria
Total Metals – ICP/MS Method 6020B

CONTROL ITEM	FREQUENCY	ACCEPTANCE CRITERIA (1)	CORRECTIVE ACTION
Initial Calibration	Daily at beginning of analytical run	Correlation coefficient must be ≥ 0.995	Investigate, reanalyze the aberrant standard or recalibrate
Initial Calibration Verification (ICV)	After calibration	90 – 110%	Stop analysis, investigate, reanalyze. If still outside limits, recalibrate
Continuing Calibration Verification (CCV)	Minimum every 10 samples	90 - 110%	Stop analysis, investigate, reanalyze. If still outside limits, recalibrate, reanalyze all samples run after the last compliant CCV
Low Level Read Back Mid-Level Read Back	Following Calibration prior to sample analysis	Low Level All analyte(s) within ± 20% Mid-Level All analyte(s) within ± 10%	Correct problem then reanalyzes
Mass Calibration and Resolution	Daily prior to calibration minimum of 5 replicates	Measured mass within 0.05 amu Of exact mass; Peak within < 0.7 amu at 10% peak height RSD < 5% resolution ± 0.03	Retune Instrument
Initial Calibration Blank (ICB)	After ICV	< ½ LLOQ	Stop analysis, investigate, reanalyze. If still outside limits, recalibrate
Continuing Calibration Blank (CCB)	minimum every 10 samples	< LLOQ	Stop analysis, investigate, reanalyze. If still outside limits, recalibrate, reanalyze all samples run after the last compliant CCB
Method Blank	One per batch (20 samples maximum per batch)	< ½ LLOQ < project specific requirements	Stop analysis, investigate, reanalyze. If still > limit, redigest batch or qualify data and address in narrative
Spectral Interference Check	Analyze at beginning of each analytical run (12 hour maximum)	non-spiked analytes <2 x LLOQ Spiked analytes ± 20% of expected value.	Stop analysis, investigate, reanalyze. If still outside limits, recalibrate.
Blank Spike (BS)	One per batch (20 samples maximum per batch)	Control Limits 80 - 120%	Stop analysis, investigate, reanalyze. If still outside limits, redigest batch or qualify data and address in narrative
Matrix Spike/ Matrix Spike Duplicate (MS/MSD)	One per batch (20 samples maximum per batch)	75 - 125% recovery RPD ≤ 20%	Perform post digestion spike and/or serial dilution. Qualify data and address in narrative if client specified
Duplicate (Unless MSD in batch)	One per batch (20 samples maximum per batch)	RPD ≤ 20%	Qualify data and address in narrative if client specified
Post digestion MS	One per batch	75-125% recovery	Qualify Data
Dilution Test	One per batch	± 20% of original determination	Perform post digestion MS
Internal Standards	Every sample	≥ 30%	Stop analysis, investigate, dilute sample if interference is apparent or recalibrate and reanalyze affected samples.
Daily Performance Report (Manufacturer's recommendations)	Daily after Mass Calibration and Resolution	Background < 1 cps @ Mass 220 Mg sensitivity > 15000 cps CeO/Ce = ≤ 0.025 Ce^{++}/Ce= < 0.03 Be sensitivity > 2000 In sensitivity > 40000 U sensitivity > 30000	Stop analysis, investigate, reanalyze. If still outside limit, examine and replace cones.

Figure 12.1

Example 6020 Calculations
Perkin Elmer NexION 300X

1.0 Initial Calibration (ICAL) Parameters
The system performs linear regression from data consisting of a blank and three standards.

2.0 Calculating the concentration (C) of an element in water using data from prep log, run log, and quantitation report (note:the data system performs this calculation automatically when correction factors have been entered):

$$Cx = Cs \times \frac{Vf}{Vi} \times D$$

Where:	**Example:**
Cs = Concentration computed by the data system (ug/L)	0.1
Vf = Final volume	100
Vi = Initial volume	40
D = Dilution factor as a multiplier (10X = 10)	1
Cx = Concentration of element in (ug/L)	0.25

3.0 Calculating the concentration (C) of an element in soil using data from prep log, run log, and quantitation report (note: the data system performs this calculation automatically when correction factors have been entered):

$$Cx = Cs \times \frac{Vf}{Vi} \times D$$

Where:	**Example:**
Cs = Concentration computed by the data system (ug/L)	0.1
Vf = Final volume	200
Vi = Initial volume	0.5
D = Dilution factor as a multiplier (10X = 10)	1
Cx = Concentration of element in (ug/kg)	40

4.0 Adjusting the concentration to dry weight:

$$Cdry = \frac{Cx \times 100}{Px}$$

Where:	**Example:**
Cx = Concentration calculated as received (wet basis)	40
Px = Percent solids of sample (%wt)	80
$Cdry$ = Concentration calculated as dry weight (ug/kg)	50

50 ug/kg = 0.050 mg/kg

WEST VIRGINIA
Department of
Health & Human Resources
BUREAU FOR PUBLIC HEALTH

Certification Number: **9973 C**
Date Issued: ***January 01, 2022***
Expiration Date: ***December 31, 2022***

Office of Laboratory Services
Environmental Drinking Water Laboratory Certification Program

Certifies that

Microbac Laboratories Inc., Ohio Valley Division
158 Starlite Drive
Marietta, OH 45750

Having duly met the requirements of the regulation (64CSR 3-13) for the Certification of Laboratories Analyzing Drinking Water
Is hereby approved as a

State Certified Drinking Water Laboratory

To perform the analyses as indicated on the Certified Parameter List which must accompany this certificate

Director of Environmental Programs

Associate Director of Environmental Programs

Surrender Upon Revocation
Certificate Not Transferable
Customers are urged to verify the laboratory's current certification status.
Conspicuously display in the laboratory with the Certified Parameter List in a location on the premises visible to the public.

Not Valid Unless Embossed

WEST VIRGINIA
Department of
Health & Human Resources
BUREAU FOR PUBLIC HEALTH

Office of Laboratory Services

Environmental Drinking Water Laboratory Certification Program

LABORATORY CERTIFIED PARAMETER LIST

Microbac Laboratories Inc., Ohio Valley Division
158 Starlite Drive
Marietta, OH 45750

Certificate: ***9973 C***
Issue Date: ***1/1/2022***
Expiration Date: ***12/31/2022***

Trace Metals	Method	Status	Description
Antimony	US EPA 200.8 R 5.4	Certified	
Arsenic	US EPA 200.8 R 5.4	Certified	
Arsenic	US EPA 200.7 R 4.4	Certified	
Barium	US EPA 200.7 R 4.4	Certified	
Barium	US EPA 200.8 R 5.4	Certified	
Beryllium	US EPA 200.7 R 4.4	Certified	
Cadmium	US EPA 200.7 R 4.4	Certified	
Cadmium	US EPA 200.8 R 5.4	Certified	
Chromium	US EPA 200.7 R 4.4	Certified	
Chromium	US EPA 200.8 R 5.4	Certified	
Copper	US EPA 200.8 R 5.4	Certified	
Copper	US EPA 200.7 R 4.4	Certified	
Lead	US EPA 200.7 R 4.4	Certified	
Lead	US EPA 200.8 R 5.4	Certified	
Mercury	US EPA 245.1 R 3.0	Certified	
Nickel	US EPA 200.7 R 4.4	Certified	
Nickel	US EPA 200.8 R 5.4	Certified	
Selenium	US EPA 200.8 R 5.4	Certified	
Sodium	US EPA 200.7 R 4.4	Certified	
Thallium	US EPA 200.8 R 5.4	Certified	

Inorganics	Method	Status	Description
Nitrate-N	SM4500NO3 F 22nd ED	Certified	
Nitrate-N	US EPA 353.2 R 2.0	Certified	
Nitrate-N	US EPA 300.0 R 2.1	Certified	

Certification reciprocity certificate *State of Florida Laboratory ID E87551*

. This is to certify that the laboratory has been approved to perform the indicated procedures on drinking water in accordance with West Virginia 64CSR 3-13.

WEST VIRGINIA
Department of
Health & Human Resources
BUREAU FOR PUBLIC HEALTH

Office of Laboratory Services

Environmental Drinking Water Laboratory Certification Program

LABORATORY CERTIFIED PARAMETER LIST

Microbac Laboratories Inc., Ohio Valley Division
158 Starlite Drive
Marietta, OH 45750

Certificate: ***9973 C***
Issue Date: ***1/1/2022***
Expiration Date: ***12/31/2022***

Organics, Per- and Polyfluoroalky Subs	Method	Status	Description
11chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	US EPA 537.1	Certified	
4,8-dioxa-3H-perfluorononanoic acid	US EPA 537.1	Certified	
9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	US EPA 537.1	Certified	
Hexafluoropropylene oxide dimer acid	US EPA 537.1	Certified	
N-ethyl perfluorooctanesulfonamidoacetic acid	US EPA 537	Certified	
N-ethyl perfluorooctanesulfonamidoacetic acid	US EPA 537.1	Certified	
N-methyl perfluorooctanesulfonamidoacetic acid	US EPA 537	Certified	
N-methyl perfluorooctanesulfonamidoacetic acid	US EPA 537.1	Certified	
Perfluorobutanesulfonic acid	US EPA 537	Certified	
Perfluorobutanesulfonic acid	US EPA 537.1	Certified	
Perfluorodecanoic acid	US EPA 537	Certified	
Perfluorodecanoic acid	US EPA 537.1	Certified	
Perfluorododecanoic acid	US EPA 537.1	Certified	
Perfluorododecanoic acid	US EPA 537	Certified	
Perfluoroheptanoic acid	US EPA 537	Certified	
Perfluoroheptanoic acid	US EPA 537.1	Certified	
Perfluorohexanesulfonic acid	US EPA 537	Certified	
Perfluorohexanesulfonic acid	US EPA 537.1	Certified	
Perfluorohexanoic acid	US EPA 537.1	Certified	
Perfluorohexanoic acid	US EPA 537	Certified	
Perfluorononanoic acid	US EPA 537.1	Certified	
Perfluorononanoic acid	US EPA 537	Certified	
Perfluorooctanesulfonic acid	US EPA 537.1	Certified	
Perfluorooctanesulfonic acid	US EPA 537	Certified	
Perfluorooctanoic acid	US EPA 537.1	Certified	
Perfluorooctanoic acid	US EPA 537	Certified	
Perfluorotetradecanoic acid	US EPA 537	Certified	
Perfluorotetradecanoic acid	US EPA 537.1	Certified	
Perfluorotridecanoic acid	US EPA 537	Certified	
Perfluorotridecanoic acid	US EPA 537.1	Certified	

Certification reciprocity certificate *State of Florida Laboratory ID E87551*

This is to certify that the laboratory has been approved to perform the indicated procedures on drinking water in accordance with West Virginia 64CSR 3-13.

WEST VIRGINIA
Department of
Health & Human Resources
BUREAU FOR PUBLIC HEALTH

Office of Laboratory Services

Environmental Drinking Water Laboratory Certification Program

LABORATORY CERTIFIED PARAMETER LIST

Microbac Laboratories Inc., Ohio Valley Division
158 Starlite Drive
Marietta, OH 45750

Certificate: ***9973 C***
Issue Date: ***1/1/2022***
Expiration Date: ***12/31/2022***

Perfluoroundecanoic acid	US EPA 537.1	Certified
Perfluoroundecanoic acid	US EPA 537	Certified

Certification reciprocity certificate *State of Florida Laboratory ID E87551*

This is to certify that the laboratory has been approved to perform the indicated procedures on drinking water in accordance with West Virginia 64CSR 3-13.

Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Centralized Request for Quote
Public Safety

Proc Folder: 1486277			**Reason for Modification:**
Doc Description: LEAD TESTING IN SCHOOL DRINKING WATER			ADDENDUM 3 TO CORRECT COMMODITY LINE 4 EXTENDED DESCRIPTION
Proc Type: Central Master Agreement			
Date Issued	**Solicitation Closes**	**Solicitation No**	**Version**
2025-04-04	2025-04-08 13:30	CRFQ 0506 EHS2500000001	4

BID RECEIVING LOCATION

BID CLERK
DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
2019 WASHINGTON ST E
CHARLESTON WV 25305
US

VENDOR

Vendor Customer Code: VS0000036770

Vendor Name : 120Water, Inc.

Address : 250

Street : S. Elm Street

City : Zionsville

State : IN **Country :** United States **Zip :** 46077

Principal Contact : Paul Schuler

Vendor Contact Phone: 317.501.3188 **Extension:**

FOR INFORMATION CONTACT THE BUYER
Crystal G Hustead
(304) 558-2402
crystal.g.hustead@wv.gov

Vendor Signature X Craig Herman **FEIN#** 93-4964685 **DATE** 04/07/2025

All offers subject to all terms and conditions contained in this solicitation

ADDITIONAL INFORMATION
THE STATE OF WEST VIRGINIA PURCHASING DIVISION FOR THE AGENCY, WEST VIRGINIA DEPARTMENT OF HEALTH, IS SOLICITING BIDS TO ESTABLISH AN OPEN-END CONTRACT FOR TESTING AND REMEDIATION FOR LEAD CONTAMINATION IN DRINKING WATER AT SCHOOLS AND CHILDCARE PROGRAMS PER THE ATTACHED DOCUMENTS. ***QUESTIONS REGARDING THE SOLICITATION MUST BE SUBMITTED IN WRITING TO CRYSTAL.G.HUSTEAD@WV.GOV PRIOR TO THE QUESTION PERIOD DEADLINE CONTAINED IN THE INSTRUCTIONS TO VENDORS SUBMITTING BIDS***

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
1	Cloud-based Software/Platform				

Comm Code	Manufacturer	Specification	Model #
81162000			

Extended Description:
Contractor to provide cloud-based software/platform

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
2	Managing Cloud-based Software/Platform				

Comm Code	Manufacturer	Specification	Model #
81162000			

Extended Description:
Managing the cloud-based software/platform

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
3	Test Kits and Sample Analysis	2000.00000	KIT		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide Test Kits and Sample Analysis

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
4	Training	300.00000	HOUR		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Training

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
5	Consultation and Remediation Services	300.00000	HOUR		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide consultation, and remediation services

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
6	Fixture Replacement Drinking Fountain	10.00000	EA		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Fixture replacement on eligible facilities drinking fountain

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
7	Fixture Replacement Bottle Filling	10.00000	EA		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Fixture replacement on eligible facilities bottle filling

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
8	Cloud-based Software/Platform-Year 2				

Comm Code	Manufacturer	Specification	Model #
81162000			

Extended Description:
Contractor to provide cloud-based software/platform-Year 2

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
9	Managing Cloud-based Software/Platform-Year 2				

Comm Code	Manufacturer	Specification	Model #
81162000			

Extended Description:
Managing the cloud-based software/platform-Year 2

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
10	Test Kits and Sample Analysis-Year 2	2000.00000	KIT		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide Test Kits and Sample Analysis-Year 2

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
11	Training-Year 2	300.00000	HOUR		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide training-Year 2

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
12	Consultation and Remediation Services-Year 2	300.00000	HOUR		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide consultation, and remediation services-Year 2

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
13	Fixture Replacement Drinking Fountain-Year 2	10.00000	EA		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Fixture replacement Drinking Fountain-Year 2

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
14	Fixture Replacement Bottle Filling-Year 2	10.00000	EA		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Fixture replacement Bottle Filling - Year 2

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
15	Cloud-based Software/Platform-Year 3				

Comm Code	Manufacturer	Specification	Model #
81162000			

Extended Description:
Contractor to provide cloud-based software/platform-Year 3

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
16	Managing Cloud-based Software/Platform-Year 3				

Comm Code	Manufacturer	Specification	Model #
81162000			

Extended Description:
Managing the cloud-based software/platform-Year 3

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
17	Test Kits and Sample Analysis-Year 3	2000.00000	KIT		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide Test Kits and Sample Analysis-Year 3

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
18	Training-Year 3	300.00000	HOUR		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide training-Year 3

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
19	Consultation and Remediation Services-Year 3	300.00000	HOUR		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide consultation and remediation services-Year 3

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
20	Fixture Replacement Drinking Fountain-Year 3	10.00000	EA		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Fixture replacement drinking fountain-Year 3

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
21	Fixture Replacement Bottle Filling - Year 3	10.00000	EA		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Fixture replacement bottle filling-Year 3

INVOICE TO	SHIP TO
HEALTH AND HUMAN RESOURCES	HEALTH AND HUMAN RESOURCES
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES	BPH - ENVIRONMENTAL HEALTH SERVICES
350 CAPITOL ST, RM 313	350 CAPITOL ST, RM 313
CHARLESTON WV	CHARLESTON WV
US	US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
22	Cloud-based Software/Platform-Year 4				

Comm Code	Manufacturer	Specification	Model #
81162000			

Extended Description:
Contractor to provide cloud-based software/platform-Year 4

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
23	Managing Cloud-based Software/Platform-Year 4				

Comm Code	Manufacturer	Specification	Model #
81162000			

Extended Description:
Managing the cloud-based software/platform-Year 4

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
24	Test Kits and Sample Analysis-Year 4	2000.00000	KIT		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide Test Kits and Sample Analysis - Year 4

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
25	Training-Year 4	300.00000	HOUR		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide training -Year 4

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
26	Consultation and Remediation Services-Year 4	300.00000	HOUR		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Provide consultation and remediation services-Year 4

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
27	Fixture Replacement Drinking Fountain -Year 4	10.00000	EA		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Fixture replacement Drinking Fountain -Year 4

INVOICE TO		SHIP TO	
HEALTH AND HUMAN RESOURCES		HEALTH AND HUMAN RESOURCES	
BUREAU FOR PUBLIC HEALTH ENVIRONMENTAL HEALTH SERVICES		BPH - ENVIRONMENTAL HEALTH SERVICES	
350 CAPITOL ST, RM 313		350 CAPITOL ST, RM 313	
CHARLESTON	WV	CHARLESTON	WV
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
28	Fixture Replacement Bottle Filling-Year 4	10.00000	EA		

Comm Code	Manufacturer	Specification	Model #
60104202			

Extended Description:
Fixture replacement Bottle Filling-Year 4

SCHEDULE OF EVENTS

Line	Event	Event Date
1	VENDOR QUESTION DEADLINE	2025-03-17

ADDITIONAL TERMS AND CONDITIONS

See attached document(s) for additional Terms and Conditions

In Response To:

Lead Testing in School Drinking Water

CRFQ 0506

EHS2500000001

Submission To:

Department of Administration
Purchasing Division
2019 Washington Street, East
Charleston, West Virginia 25305-0130

Response Submitted By:

120Water, Inc.
250 S. Elm Street
Zionsville, IN 46077

Primary Contact:

Paul Schuler
Director, State Accounts
317.501.3188
paul.schuler@120water.com
April 7, 2025

120Water

Table of Contents

120Water

1.0 Project Description

120Water, Inc. under WVDOH, will offer educational material and training concerning lead in drinking water and testing for lead contamination in drinking water at approximately 80 facilities.

120Water, Inc. is utilizing EPA's 3Ts guidance to implement the Collaborative Action for Testing H2O Initiative (the Initiative). This includes efforts to (1) Communicate, throughout the implementation of the program, the results and important lead information to facility administration, parents, teachers, and interested community action groups; (2) Train on the risks of lead in drinking water and testing for lead; (3) Test using appropriate testing protocols and a certified laboratory; and (4) Take Action, including the development of a plan for responding to results of testing conducted and making recommendations for potential elevated lead where necessary.

With the Implementation of 120Water, Inc.'s Cloud-Based Software, Tech Enabled Sample Kits and Programmatic Services, 120Water, Inc. will work to meet and surpass the key objectives determining the lead concentration by analyzing 2,000 samples at drinking water fixtures within the enrolled WVDOH facilities. Facility partners will also gain greater awareness for monitoring for presence of lead in drinking water at their facility.

If a drinking water test returns a result for a lead equal to or exceeding 15 ppb, then the Program Consultant will direct the facility partner to isolate the source of drinking water through appropriate and approved actions. If a facility partner enrolls in the program they will have access to all sample data, templates, and will have the necessary resources to properly and effectively communicate with the community.

120Water

1.1 Cover Letter

Paul Schuler
Director, State Accounts
120Water, Inc.
250 S Elm St
Zionsville, IN 46077

April 7, 2025

Crystal G Hustead
Department of Administration
Purchasing Division
2019 Washington Street, East
Charleston, West Virginia 25305-0130

To Crystal and the entire West Virginia Team:

It is with great excitement that 120Water, Inc. submits our proposal for *Testing for Lead Contamination in Schools.* Managing drinking water programs can be highly complex and cumbersome. 120Water, Inc. is on a mission to help state governments, public and private utilities, and facilities streamline these programs, making them clear and simple, for everyone involved, from agency personnel to members of the community.

Our technology, services, and partnerships are purpose-built to simplify the process of ongoing compliance and voluntary sampling programs, such as lead testing in school and childcare facilities. For statewide programs or individual facilities, the 120Water, Inc.'s Digital Water Platform scales to meet the evolving needs of our customers. We are confident that the State of West Virginia will be able to build and maintain a model Lead Testing in Schools and Child Care Facilities on the 120Water foundation, based on the successes with similar programs with clients such as The Indiana Finance Authority, Virginia Department of Health, Chicago Public Schools, and the Kansas Department of Health and Environment.

120Water, Inc. is a privately held, venture-backed, national firm, founded in March 2016 in Indianapolis, IN. Company operations are overseen by Megan Glover, CEO and Co-founder, and supported by multiple executive department leaders. The executive leadership team, investors, and board members have deep roots in environmental consulting, high growth technology companies, logistics, and

water quality and infrastructure. 120Water, Inc. is a non-resident vendor certified as a small business under W. Va. CSR 148-22-9. 120Water, Inc., will furnish proof of the insurance identified on the Solicitation Terms and Conditions Document upon contract award.

We've spent countless hours and years alongside state and municipal agencies, utilities, and facilities providing high-value technology and services to efficiently manage drinking water voluntary and compliance programs. These solutions, developed in partnership with customers and industry thought leaders, are founded on a deep understanding of the public health and cost impact to these organizations, and consumers. Lead testing in school and childcare facility initiatives are highly sensitive and involve many stakeholders, from state agencies to school staff, parents, and children. We are committed to empowering this team to effectively communicate and manage all elements of your Lead Testing in Schools and Child Cares program in a thoughtful and efficient manner, consistent with our established track record of success partnering with other state agencies across the country to implement a 3Ts based program, founded on the guidance provided by the US EPA.

120Water, Inc.'s solution includes the development and implementation of West Virginia's Testing for lead contamination in schools outreach campaign and educational materials, collaboration with childcare facility operators to create sample plans, step-by-step water sampling instructions and protocol for the collection of water samples, sample kit logistics to and from childcare facility program participants, completion of the chain of custody, technical guidance for the childcare facility operators, communication strategy for conveying sampling results and a remediation resource guide for childcare facility participants and corresponding reports and program progress reports to all stakeholders.

120Water, Inc. supplements our technology, logistics, and consulting services with a broad network of national, regional, and local services partnerships including West Virginia State Certified laboratories. We have received commitments from our lab partners that they are willing and able to perform the sample analysis work in accordance with the work plan and volume.

120Water, Inc. will manage all communications, logistics, and reporting related to sampling kits and laboratory analysis within the 120Water, Inc. Digital Water Platform. 120Water, Inc.'s cloud-based software will store all data and documents generated from the project including sampling chain of custody, consent to participate, and all other documentation required by the project work plan. Additionally, 120Water, Inc.'s solution (software, services, and products) tracks actions completed including training courses, educational materials, program-specific mailers, and outreach activities conducted to encourage and increase participation in the project while tracking outputs and outcomes of actions taken.

120Water, Inc.'s Digital Water Platform will collect any other data requested in the project work plan and grant agreement. Access to the cloud base software will be available to users specified by West Virginia Department of Administration, and user accounts with permissions to view, edit, and export certain data may be filtered according to the user and/or user account type. Stakeholders will have access to generating standard and customizable reports per the request of West Virginia Department of Administration to meet the requirements of the work plan and grant agreement.

120Water

Leveraging the combined domain expertise of 120Water, Inc. running these programs at scale, we trust you'll find our solution and unified team approach to tackling your program building blocks - data management, planning, logistics, sampling, and communication - one that provides not only a superior model program but also one that is thoughtful, cost-effective and built with long-term sustainability in mind. Throughout the duration of the project, 120Water, Inc.'s Digital Water Platform will facilitate access to the West Virginia Department of Administration annual progress report, and a final project report that meets the requirements outlined in the grant agreement.

120Water, Inc.'s proposed solution for the project meets all the requirements of this RFP. This

response was prepared by:

Paul Schuler, Director, State Accounts
Brianna Devin, Program Consultant
Taylor Smith, Program Consulting Manager

Abby Warner, Chief Experience Officer
Aija Putelis, Senior Program Consultant

Paul Schuler is the main point of contact, representing 120Water, Inc., and has the authority to answer questions regarding this proposal. Paul's information is listed below.

We thrive on the trust and consultative relationships we build with our clients and look forward to the opportunity to support the State of West Virginia in building a scalable program that works for your facilities and communities.

Respectfully,

Contract Manager:

Paul Schuler

Paul Schuler
Director, State Accounts
paul.schuler@120water.com
317.501.3188
250 S Elm St
Zionsville, IN 46077

1.2 Distribution List

The following is a list of organizations who will partake in the coordination of this program:

Primary:

West Virginia Department of Health and Human Resources
BPH – Environmental Health Services
350 Capitol St, Room 313
Charleston, West Virginia 25301

120Water, Inc.
250 Elm St
Zionsville, IN 46077

Microbac
Laboratories,
Inc.
Marietta, OH.
45750

1.3 120Water, Inc. Qualification

120Water, Inc. has developed and implemented 7 statewide sampling programs, and additional municipal and individual school district programs across the country focused on both schools and child care facility programs. Current 120Water, Inc. customers have consistently renewed and expanded their contracts with 120Water, Inc. due to the positive outcomes and experiences they have had implementing our program methodology.

120Water, Inc. has more than seven years of prior experience in administering lead testing in drinking water programs. 120Water, Inc. has the ability to assist the state in developing a lead testing in drinking water school strategy that supports robust training, monitoring, and maintenance plan that protects children from lead exposure now and in the future. 120Water, Inc. has more than seven years of experience creating and maintaining a cloud-based software database, communication strategies for sampling planning, sample collection and conveying sample results. 120Water, Inc. has more than seven years of working with external laboratories analyzing lead in drinking water using EPA method 200.8.

Use of the 120Water, Inc. platform will allow WVDOH to support the management and planning of sampling at each facility, connect and communicate with all stakeholders in the program, from facility personnel to parents, and access to future product enhancement's purpose built to support lead in school and child care facility testing programs.

120Water, Inc. has been planning, executing, and managing statewide lead testing programs for over seven years. The following three projects exemplify state wide, municipal, and district level programs that required a similar products and services to those of WV requested scope:

1. The Indiana Finance Authority
2. The City of Chicago Public Schools
3. Virginia Department of Health

1. In 2017, The Indiana Finance Authority (IFA) used 120Water, Inc.'s software, kits and services to manage the execution of a state-wide lead testing in schools program, collecting 57,000 total samples across 915 schools, gaining data insights and executing effectively at scale.

   120Water, Inc. helped IFA launch and maintain state-wide lead sampling in schools program assisted at all program levels, including communication plans for voluntary testing;

coordination with populations at high risk of lead exposure; coordination and work with accredited labs to analyze sample; and compliance with federal and state reporting requirements, project schedules, etc.

Through 120Water, Inc.'s solution, IFA was able to use software to manage program at scale, including sample kit ordering and integrated lab analysis, and deliver quick remediation decisions when fixtures exceed action levels via software.

By the end of 2019, the IFA reported these accomplished goals:
- Over 57,000 sample collected
- Audit trail for each fixture and sample
- Communications to regulators and public stakeholders achieved
- Standardized testing & reporting increased confidence in data

The IFA has again renewed its program with 120Water in January of 2024 for another 2 years.

2. In 2018, the City of Chicago Public Schools (CPS) tapped 120Water, Inc. to run their water quality testing in schools, using the software to manage the planning, testing and distribution of results data. They had a goal of testing 526 school campuses between then, and 2022.

   The program had an emphasis on school testing scheduling and distribution of results, mitigation management and tracking, and ease of access to program dashboards and sample results data.

   Using 120Water, Inc., CPS has drastically reduced the time required to schedule sample events, create documentation, collect and log samples, and distribute results. 120Water, Inc. has become the single source for all testing program data.

3. In 2023 the Virginia Department of Health decided that they needed outside assistance for software and program management of their School and Daycare water quality testing program. For two years the program had moderate success being run internally. 120Water was engaged in the summer of 2023 and the program has flourished… participation out pacing funding at one point.

The program is on-going, and to date we have:
- Assisted schools and their labs with formatting results to fit the program.
- Simplified access for schools to track remediation efforts.
- Incorporated VDH's forms into the software so the process is paperless
- Currently tracking more than 450 school facilities and just over 15,000 sample results over the last 2 years.

1.4 Project Distribution Team

Contract Manager: Paul Schuler

- Acts as the primary point of contact for commercial elements of the program, and the main point of contact through the bid process
- Acts as ongoing support to align business objectives with program outcomes

Executive Sponsor: Abby Warner

- Acts as the customer advocate and final point of escalation for any WV Office of Environment critical needs
- Responsible for advocating on behalf of the state as a final point of escalation for any critical quality assurance or quality control needs for this program
- Manages capacity planning for all team members

Program Consultant: Brianna Devin

- Acts as the owner and manager of the Implementation, Project Management, Delivery and Fulfillment operations for this program
- Serves as a direct point of escalation for any team needs
- Acts as a direct point of escalation for any critical quality assurance or quality control needs as they relate to this program
- Approves the PMB, QMP, and control system(s)
- Establishes communication plan
- Oversees the implementation, and continued improvement of the plan
- Provides management reviews of the QMS and approval of internal audits
- Identifies, initiates, and monitors quality improvement efforts
- Reviews feedback and project deliverable review comments with stakeholders
- Verifies that sufficient risk assessments have been carried out
- Monitors the status of the Program using weekly Program control meetings
- Assures qualified and adequate resources are available
- Assigns project staff responsibilities and the engagement of outside services where necessary
- Manages the ongoing, day-to-day execution of the program once go-live is achieved
- Completes the program on time, budget and to required quality level
- Identifies and manages project risks
- Oversees the maintenance of Program records
- Reviews the state of the Program with the Program Consultant at weekly project control meetings
- Develops a strong, collaborative working relationship with West Virginia Office of Environment staff
- Performs ongoing change control regarding scope, budget, and schedules
- Arranges and responds to quality audits
- Communicates and meets with designated WV Office of Environment staff on a regular basis during the execution of the program

Program Consulting Manager: Taylor Smith

- Supports, guides and mentors the Program Consultant and 120Water, Inc. internal team members

Senior Program Consultant: Aija Putelis

- Reports on the status and effectiveness of the Quality Assurance and Quality Control Programs
- Reviews documents to identify project quality requirements
- Oversees the Development, Issuance, and Maintenance of the Quality Management Plan and associated Quality Assurance Procedures
- Oversees surveillance and auditing of product suppliers, shipping partners, and 120Water, Inc. platform
- Identifies, analyzes, tracks, and provides follow-up for nonconformances

- Oversees the development of corrective actions
- Verifies the implementation of corrective actions
- Coordinates with the Program Consultant for quality issues and problem resolution

1.5 Laboratory Partner

For the laboratory analysis portion of this project, 120Water, Inc. will work with an external laboratory. We will be routing all water samples to be analyzed at Microbac Laboratories, Inc.

This laboratory is certified to conduct lead testing in drinking water utilizing EPA Method 200.8. 120Water, Inc. has been working with Microbac for many years (including with the state of West Virginia previously), specifically for the analysis of lead and copper in drinking water as demonstrated in the EPA Lead and Copper Rule.

1.6 Project Task

The State of West Virginia anticipates available funding will provide sampling at 80 Facilities, providing 2,000 sample kits to test fixtures for lead.

Once a Facility has been accepted into the program, the Facility Partner will work with the Program Manager to create a sampling plan. Facility Partners will receive a testing kit from 120Water, Inc. containing all the materials they will need to implement their sampling plan.

The Facility Partner will collect drinking water samples from all drinking water sources, including water fountains (chilled and non-chilled), food preparation fixtures (located in the cafeteria, kitchen, and home economics classrooms) and other fixtures where children might drink the water. Concession stands and outside water fountains (such as in playgrounds and athletic fields) shall also be sampled. Custodial sinks and outside spigots may be sampled if Facility Partners indicate they are used for drinking water.

The Facility Partner will collect first draw samples at all fixtures. They may also collect 30- second flush samples at drinking water fixtures specified in the Sampling Protocol. West Virginia certified laboratories will perform the analysis for lead. Program Consultants will review sample results and coordinate with the Facility Partner on appropriate lead remediation actions, if necessary. Results will be made available for the public's awareness.

1.7 Project Objectives

The overall objective for the State of West Virginia Lead Sampling Program is to determine the lead concentration at drinking water fixtures within enrolled West Virginia Facilities. Facility Partners will also gain greater awareness of monitoring for the presence of lead in drinking water at their Facility.

At the recommendation of the state, the lead sampling program will use an approved drinking water action level such as 15 parts be billion (“ppb”), which follows the EPA Lead and Copper Rule.

Decisions to be made with the data include:

If a drinking water test returns a result for lead equal to or exceeding 15 ppb, then the Program Consultant will direct the Facility Partner to isolate the source of drinking water by turning off the fixture or providing a barrier to the consumption of the water (i.e. tape and bag). The Program Consultant will then work with the Facility Partner to suggest remediation activities

If a Facility Partner enrolls in the Lead Sampling Program and receives lead sampling data, then they will make the results available to their stakeholders (parents, staff, etc.).

1.8 120Water, Inc. Project Execution

120Water, Inc.'s proposed solution for the project meets and exceeds all the requirements of this RFQ.

The 120Water, Inc. Approach

120Water, Inc. is experienced in partnering with state agencies to deliver all of the outcomes and outputs specified in the scope of work, specifically for statewide lead testing in school and child care facility programs. The success of this program will be largely dependent upon close collaboration and alignment between 120Water, Inc. and the West Virginia Department of Administration and key state agencies to achieve these outcomes. Our innovative approach to supporting states, districts, and childcare facilities involves three primary elements:

1. **Cloud-Based Software**
2. **Tech Enabled Sample Kits**
3. **Programmatic Services**

Proposed Methodology for West Virginia's Lead Sampling Program

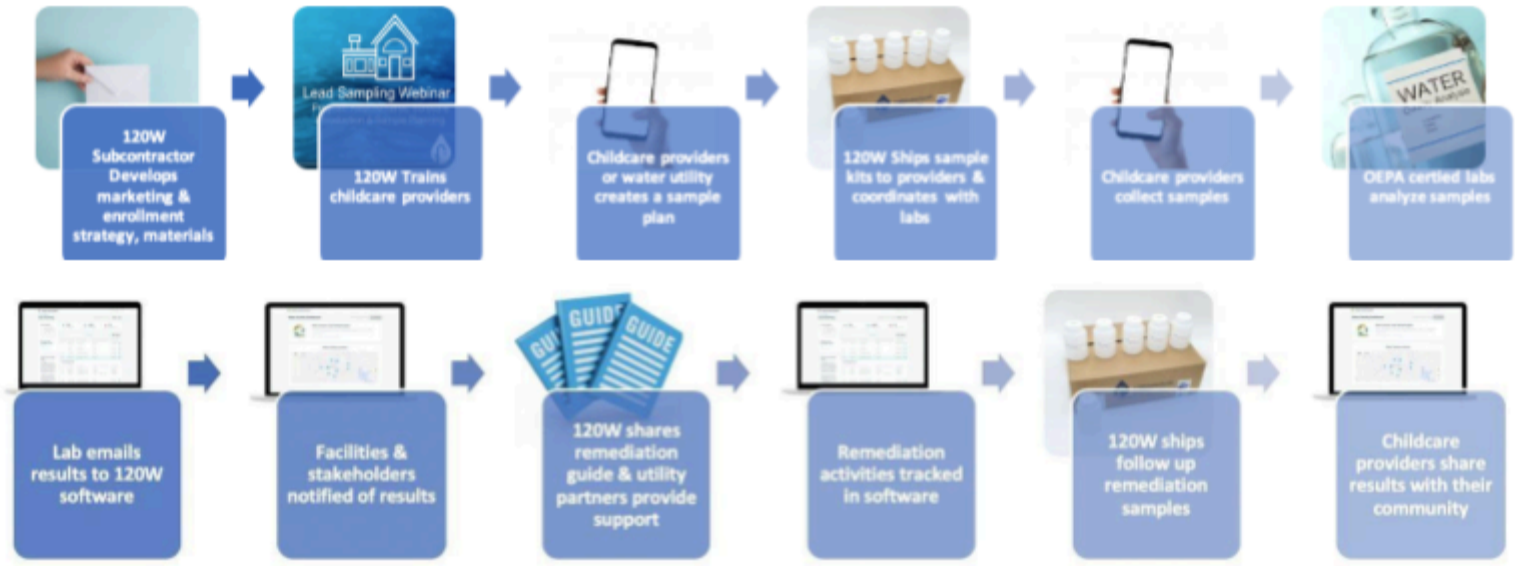

Figure 1. 120Water, Inc.'s proposed workflow for the West Virginia Lead Sampling Program.
Note: In first step, 120Water develops these marketing and enrollment materials directly, and no longer subs out this task.

1.9 Taking Action

We've spent countless hours alongside state and municipal agencies, utilities, and facilities providing high-value technology and services to efficiently manage drinking water voluntary and compliance programs. These solutions, developed in partnership with customers and industry thought leaders, are founded on a deep understanding of the public health and cost impact to these organizations, and consumers. Lead testing in school and childcare facility initiatives are highly sensitive and involve many stakeholders, from state agencies to school staff, parents, and children. We are committed to empowering WVDOH, to effectively communicate and manage all elements of your statewide program in a thoughtful and efficient manner, consistent with our established track record of success partnering with other state agencies across the country.

WVDOH will be able to build and maintain a model lead testing in schools program on the 120Water, Inc. foundation, that can meet shorter term needs, while scaling to address longer term state objectives. The 120Water, Inc. software, kits, and program management services were purpose-built to execute the EPA's 3T's Lead Sampling in School Best Practices and directly align with the requested outcomes outlined in the WVDOH's requested Scope of Work. Clients leverage the 120Water, Inc. Program Management Platform as a centralized data management solution to facilitate all aspects of the program from planning and sampling to communication and reporting. A typical statewide lead testing program includes the following phases:

Program Design & Implementation: This phase includes finalizing the work plan, QAPP, program participation criteria, program objectives, documentation of processes and procedures, training for state agency stakeholders, communication materials, and reporting criteria.

Awareness & Enrollment: This phase focuses on communicating program plans and details to all eligible participants, vetting applicants, finalizing program participants, enrollment procedures for participating facilities, educating program and community stakeholders, and providing initial educational content to participating facilities. Even though the State will prioritize enrollment, 120Water, Inc. will support where and as needed.

Program Execution: This phase includes finalizing facility cohorts, collecting all relevant data on participating facilities, training participants and stakeholders, facility fixture mapping, sample planning, sample collection, troubleshooting/issue resolution, holding facilities accountable to timelines and deliverables, sending samples to the lab for analysis.

Reporting: This phase includes reporting results of sample analysis, communicating all other relevant data to appropriate stakeholders, establishing public access to program information, state agency results review, notifying and reviewing results with facility personnel, and determining any actions based on results.

Remediation: This phase focuses on remediation recommendations, strategies, and actions that can be taken to address any fixtures that result in action level exceedances. Follow up sampling, result reporting, and connecting participants with additional resources or 3rd party plumbing expertise if desired.

We will work with WVDOH to finalize the resource allocation for each phase according to the program plan. 120Water, Inc. currently supports efforts in each phase of the program for lead testing in school and childcare facility clients. Together, we will establish the responsibilities for all stakeholders in each phase, including the State, 120Water, Inc., facility staff, and any other relevant parties.

120Water, Inc. is the only company that has custom-designed and developed kits, purpose-built software, and hands-on training for standardizing lead sampling in schools programs. Our software, kits, and services are informed by years of experience with EPA 3T's protocols. These solutions were created to provide a stand alone, out of the box program management option that would not necessarily require engagement with subcontractors.

To alleviate time and labor costs associated with field facility mapping, fixture inventory, logistics, and sample collection, 120Water, Inc. implements a technology enabled program focused on empowering existing facility personnel to accomplish these tasks during program execution. Most of the lead testing in school and child care facility program clients we've worked with have adopted this model, affording them the opportunity to test a greater number of facilities in a shorter time period. A couple of programs have engaged a 3rd party consulting group to help with planning, sample collection, and remediations, in which case 120Water, Inc. works closely with these partners to execute the program.

The following structure outlines 120Water, Inc.'s typical engagement in the project phases outlined above:

Implementation: 120Water, Inc. will assist WVDOH in finalizing the project plan, requirements, KPIs, documentation of policies and processes, and technical implementation of the software platform. We are predominately the secondary resource in this phase, with the State being the primary resource.

Enrollment: WVDOH would continue to be the primary resource in this phase, with support from 120Water, Inc. We would assist in finalizing participation criteria, mutually agree upon a communication plan based on recommendations from 120Water, Inc.'s experience, and create communication/marketing materials. The agency would distribute communication and enrollment details. 120Water, Inc. would assist in reviewing applications and collecting all enrollment data. Once participants are selected, all relevant data on participating facilities will be uploaded into the software platform.

Training: 120Water, Inc. transitions to being the primary resource in this phase, with necessary support provided by WVDOH. We will evaluate participants and determine cohorts, who will progress through the program together. These cohorts will function on the same timeline through the project, attending remote webinar training sessions together, completing “homework” on the same cadence, and generally moving through program phases simultaneously. 120Water, Inc. will provide virtual technical and programmatic training webinars throughout the event, provide supporting content, and one off questions/issue resolution support. Facility personnel will map fixtures directly in the 120Water, Inc. platform and create sample plans in the software which will be reviewed and approved by 120Water. These would ideally be QA/QC’d and approved by 120Water with a WVDOH user remotely providing oversight if needed through the platform.

Program Management: Once approved, 120Water, Inc.’s fulfillment team will label bottles with fixture IDs and sample types according to the sample plans. These bottles are packaged into kits that include additional sampling instructions, COC forms, and return labs. The kits are shipped directly to the facilities, where the facility personnel then collect samples according to the plans. Once samples are collected, that are placed back into the packaging, the collector puts the return label on the box, and it will be shipped directly to the laboratory. Once the laboratory has analyzed the samples, results are automatically uploaded into the platform for review by users.

All of the data in the software platform will be reportable, with pre-configured report templates and dashboards included to quickly disperse information to all appropriate stakeholders, including the public. Laboratory results are automatically uploaded into the platform once they are analyzed. Users will have real time access to these results in the platform. 120Water, Inc. will often support the communication and interpretation of results to facility personnel. Training would be provided to facilities on public communication, objection handling, and pursuit of remediation for exceedances.

The 120Water, Inc. platform facilitates documentation and tracking of all remediation efforts. We can provide remediation guidance and recommendations on appropriate actions. A subcontractor would be engaged to perform physical remediation work.

2.0 Cloud-Based Software

The 120Water, Inc. Digital Water Cloud Platform was purpose-built to execute the **EPA's 3T's Lead Sampling in School & Childcare Facilities** best practices. Our software provides a cloud-based foundation that centralizes and facilitates oversight and management of all aspects of the program, automates workflows and communications, tracks logistics, and simplifies reporting to all stakeholders. State agencies, cities, childcare facility staff, water utilities, and stakeholders can collaborate, manage, monitor and report on results in real-time. **The ability to access the software on an ongoing basis beyond the sample completion date will rely on successful renewal of the software. Data resulting from the program completion will be made available if the software renewal does not occur.** The following details the features and functionality included for use by West Virginia program users:

User & Role Permissions
120Water, Inc.'s multi-tenant database with user permission structure allows users to manage platform access across multiple program stakeholders such as state, district/franchise, school/childcare level, field samplers, consultants, and regulators. Each user has a unique view of the platform and limited access to data based on their specific permissions.

Facility & Asset Management
120Water, Inc.'s Facility Management product and documents library serve as the database of records for lead sampling programs. Facilities are organized with parent-child relationships, meaning **a group of childcare facilities owned by the same group can be related and managed by the user under one account**. Each facility has access to a document library to store documents and photos and contact management tracking.

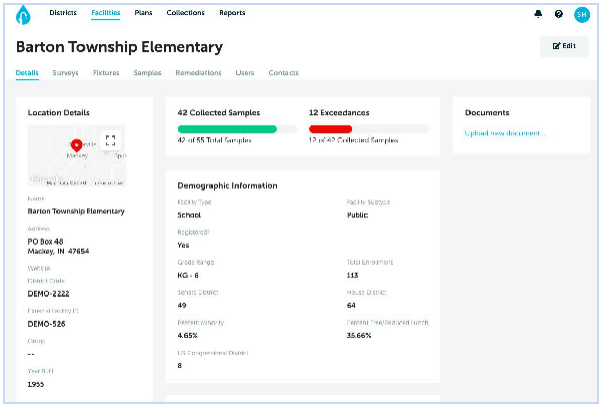

Figure 2. Facility & asset management functionality example on the facility profile.

Sample Planning
120Water, Inc.'s Sample Planning workflow allows the states, consultants, water utilities, or facility staff to inventory assets, fixtures, **capture fixture photos**, **designate fixtures as active or non active, add samples to fixtures** and manage different sampling events in a simple, step by step process. Users can add information **capturing fixture level data, based on 3 T's best practices, about each fixture that supports informed remediation decision-making when results arrive.**

Tablet & Mobile Field Use
Field team members have the **ability to create Sample Plans & Collect Samples directly from a mobile or tablet device.** This capability dramatically improves data integrity and field work efficiency. We feel this functionality is essential for childcare providers, as it makes the software quick and easy to use.

Remediation Management
120Water, Inc.'s Remediation Management feature allows users to provide recommendations and **track remediation** work on fixtures that exceed lead levels the program considers high (at or above 15ppb typically). 120Water, Inc. has the ability to capture discrete remediation actions taken by participating facilities and to report those to the state.

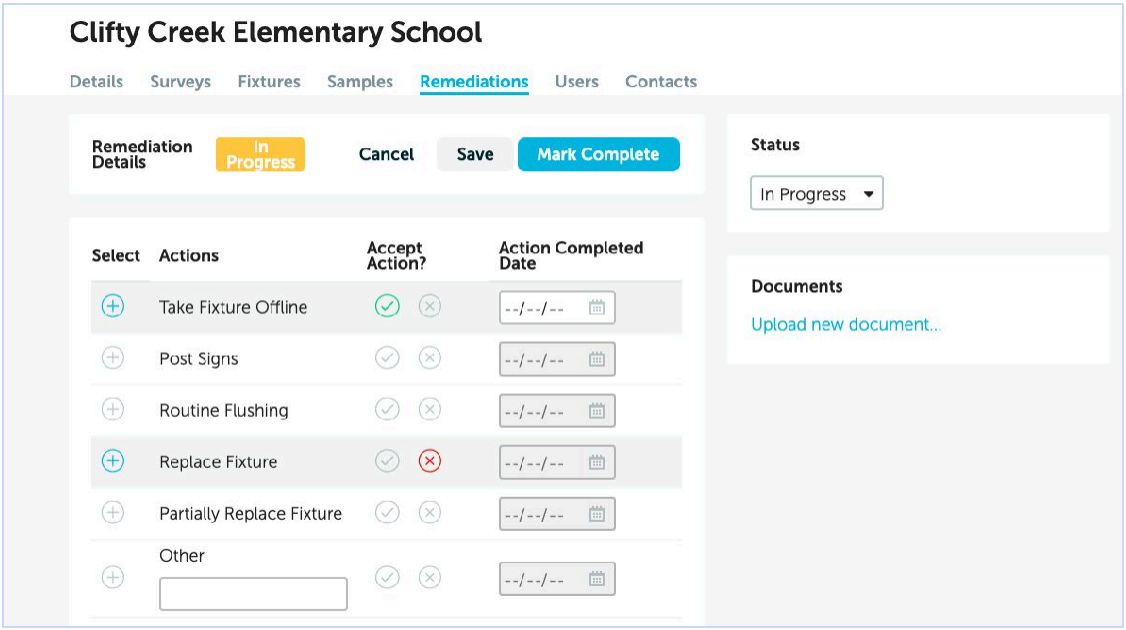

Figure 3. 120Water, Inc.'s Remediation Management Module

120Water

Dashboards, Reports & Notifications

120Water, Inc.'s software includes internal facing dashboards, notifications, and provides real-time access to key program metrics to track program outcomes. In-platform and automatic email notifications ensure that the appropriate users get assigned workflow tasks, are sent reminders to keep programs on track, and provide visibility through every step of the process such as sample plan completion, sample kit collection and sample analysis, etc. Custom fields functionality can be leveraged to enable stakeholders to capture and track any additional metrics about the school/childcare programs the state deems valuable.

120Water, Inc.'s **Public Transparency Dashboard** allows each facility or the state to share results information about the program with school/child care stakeholders and answer the primary questions the community has: Why was testing done? What was found? How were issues resolved?

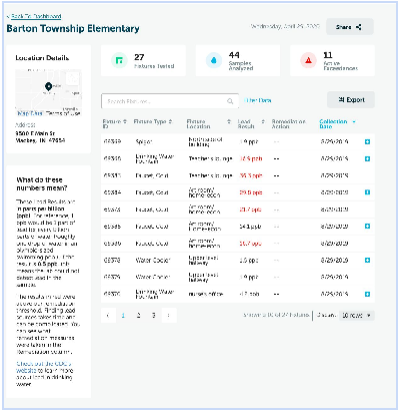

Figure 4. 120Water, Inc.'s Public Transparency Dashboard (PTD) to help facilities and states communicate lead results simply and clearly to the public

Real-Time Reporting

Real-time reporting allows users the ability to sort/filter and download program reports for internal or public consumption related to sampling plans, sample and lab results, field team visits, enrollment metrics, and state-wide program progress. Document libraries for all schools/childcare facilities are within the 120Water, Inc. platform.

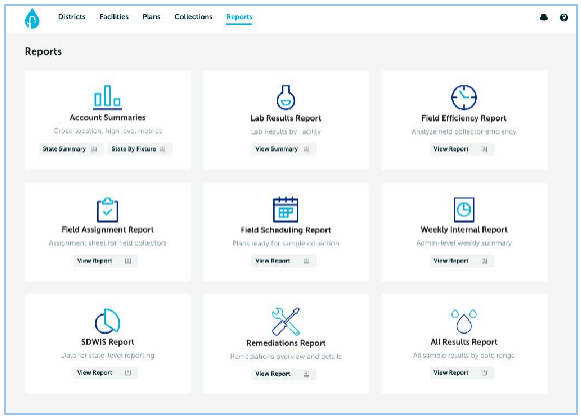

Figure 5. 120Water, Inc.'s standard reports library

2.1 Program Services

Mandatory Contract Services

120Water, Inc. will aid in developing a lead testing in drinking water strategy that supports training, monitoring and maintenance plan that protects children from lead exposure now and in the future. 120Water, Inc. will establish a communication plan for presenting result findings and mitigations when recommended within alignment of the West Virginia Department of Administration. 120Water, Inc. will provide educational materials on lead sampling and remediation to all program stakeholders, participants and affected populations. 120Water, Inc. will provide technical support (phone/email) to school or childcare staff on questions related to lead sample planning, collection and remediation. 120Water, Inc. will provide project management to support schools and childcare facilities, keeping them accountable for completing sample plans, sample collection, submission to the laboratory, sharing results to the schools, childcare facilities and community and other programmatic support initiatives. These services, as well as the ones listed below will be remote based to existing personnel.

Implementation

120Water, Inc.'s implementation and success methodology is phased to align with the lifecycle of the program, and long-term client objectives for the partnership. 120Water, Inc. will work through the following process with WVDOH:

Contract Execution and Program Model Blueprint Approval:

In this phase, we are formalizing our relationship with you through our contract and laying the foundation for our mutual success. A critical element of this phase is establishing our Program Model Blueprint which drives clear, holistic understanding and agreement on your program details and how 120Water, Inc. 's products and services will be implemented to support it and then utilized in the ongoing execution of your program.

Program Implementation:

In this phase, we focus on timeliness and regular communication to design materials, configure your account and ensure program standards are clearly aligned according to the Program Model Blueprint. We create a program implementation plan at the outset of implementation and use it to track and manage the implementation effort as well as facilitate ongoing communication.

Go-Live:

This phase represents the milestone of “going live” with your program as program implementation concludes and as ongoing program execution begins. 120Water, Inc. has created an efficient, repeatable program process to maintain uniformity in sampling procedures and data input across numerous facilities. During this phase we will begin the enrollment of facilities into the program.

Ongoing Program Execution:
This phase continues throughout your program. During this phase, we will guide facilities through the sampling of their buildings leveraging the 120Water, Inc. Platform to ensure data accuracy and consistency.

Program Timeline

A program timeline will be impacted by the program launch date, and is structured to be completed within 24 months of contract execution. Most phases of the programming are rolling throughout the time frame, for example, one cohort of facilities may begin training and program execution, while awareness and enrollment efforts are still in motion to gain additional participation. An official timeline for the WVDOH program will be finalized in a collaborative meeting between all parties. The following table represents a sample plan of deliverables for each program phase, with the typical time frame it takes to complete each step. For the program execution sections, this will be an ongoing set of deliverables for each cohort. Participants will be grouped in cohorts.

Phase	Description / Deliverable	Primary Resource	Secondary Resource	Estimated Time
Implementation	Assist with Design, Draft, and Review QAPP	120 Client Success	WVDOH	1 week
Implementation	Develop and Manage Program Process and Plan	120 Client Success	WVDOH	1-4 weeks
Implementation	Finalize School Selection Criteria & Submission Process	WVDOH	120 Client Success	1 week

120Water

Implementation	Outline process for Approval of Schools, Documents and Communications	WVDOH	120 Client Success	2-3 weeks
Implementation	Document process for Objection and Risk Handling	120 Client Success	WVDOH	1 week
Implementation	Determine Agreed upon Success Criteria for the program	WVDOH	120 Client Success	1 week
Implementation	Determine KPIs and reporting milestones	120 Client Success	WVDOH	1 week
Implementation	State Training - How to Access and Leverage the 120Water, Inc. Software	120 Client Success	WVDOH	1 hour virtual training prior to program kickoff
Enrollment	Create Email Communication Templates to Educate & Invite Participants	WVDOH	120 Client Success	1-2 weeks
Enrollment	Send Communication	WVDOH	120 Client Success	2 weeks
Enrollment	Create Enrollment Form	120 Client Success	WVDOH	1-2 weeks
Enrollment	Create Program Intro Document	120 Client Success	WVDOH	1 week
Enrollment	Create Communication templates including - Kit Return Reminders & Results Notification	120 Client Success	WVDOH	2 weeks
Enrollment	Training Design to Align Program Process to School Execution	120 Client Success	WVDOH	1-2 weeks
Ongoing Program Management	Final Selection of Schools from Submissions	WVDOH	120 Client Success	2-4 weeks

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Ongoing Program Management	Create Facilities in the 120Platform	120 Client Success	WVDOH	1 week
Training	Schools Training: Program Overview and Sample Planning. How to take your samples, results and how to prepare for communication and the Transparency Dashboard. Guides state stakeholders on how to leverage the 120 Platform to check program status.	120 Client Success	WV Facility Participants	1.5-hour virtual session for each cohort
Ongoing Program Management	Following Training, Schools will have assignments to create their Sampling Plans for each of the buildings and fixtures they will sample. The 120 Water team will be available to answer any questions along the way. We will ask that these are completed within approx 2 weeks to help move the program along	WV Facility Participants	120 Client Success	2-3 weeks
Ongoing Program Management	Unless directed otherwise, 120Water will QA / QC all facility sampling plans to ensure the school is set up for success when their sampling kits arrive	120Water	WV Facility Participants	2-3 weeks
Ongoing Program Management	Once Samples Plans are set, 120 will prepare custom sample kits - personalized to each facility and each fixture within that facility	120 Fulfillment	120 Client Success	1-2 weeks
Ongoing Program Management	Once kits Arrive, schools will have approx. 2 weeks to take their samples. Once completed, they will repackage the samples, place the label on the box and schedule a pickup to ship these samples to the lab for analysis	WV Facility Participants	Lab Partner	2-3 weeks

120Water

Phase	Description / Deliverable	Primary Resource	Secondary Resource	Estimated Time
Ongoing Program Management	Final Selection of Schools from Submissions	WVDOH	120 Client Success	2-4 weeks
Ongoing Program Management	Create Facilities in the 120Platform	120 Client Success	WVDOH	1 week
Ongoing Program Management	Lab Analysis - Samples will be analyzed and results reported into the 120 Platform	Lab Partner	120 Client Success	2 weeks
Ongoing Program Management	Parent and Teacher communication - 120 will support and guide the schools on communication best practices	WV Facility Participants	120 Client Success	1-2 weeks
Ongoing Program Management	Reporting to State Stakeholders - based on the determined KPIs, 120 will work with the school to submit any required reporting to the state stakeholders	WV Facility Participants	120 Client Success	1-2 weeks
Ongoing Program Management	Remediation Planning and Execution - in the case of exceedances, 120 will be available to answer questions on how to create and manage exceedances in the 120 Platform. WVDOH will be responsible for advising on the technical best practices to ensure a fix for the issue follows proper plumbing protocols	WV Facility Participants	WVDOH	2-4 weeks
Ongoing Program Management	Remediation Sampling - once the remediation is complete, the schools will create the necessary plan for resampling, which will generate an order for 120 to fulfill and ship kits direct to the school.	WV Facility Participants	120 Client Success	2 - 4 weeks + analysis
Ongoing Program Management	Reporting Coordination: Upon completion of the program, 120 Client Success team will work with state stakeholders to compile required federal reporting. WVDOH will be responsible for finalizing & making the submission.	WVDOH	120 Client Success	2-3 weeks

Ongoing Program Management	Reporting Coordination: Upon completion of the program, 120 Client Success team will work with state stakeholders to compile required federal reporting. WVDOH will be responsible for finalizing & making the submission.	WVDOH	120 Client Success	2-3 weeks

Training

120Water, Inc. will have a training content focused meeting with WVDOH post contract signature to tailor templates to reflect the specific requirements and goals of the program. Training sessions will be delivered online via webinars. Other training content includes videos and FAQ sheets to reinforce learning objectives.

120Water, Inc. will provide a series of training templates based on EPA 3 T's methodology that covers the following concepts:

- Education resources on the potential sources of lead, health risks of lead in drinking water and testing for lead to the community of surrounding residential area that is impacted by testing, as well as key partnerships to support the program
- General information about the program, its partners, and its requirements
- Introduction to the software
- Creating sample plans and collecting samples according to 3 T's protocols
- Remediation strategies
- Communicating with the public about lead risks and lead sampling
- Training and implementation to agency and facility staff on software use
- Webinars for the school staff on program requirements, enrollment, sample planning, collection, remediation and communicating with the public

120Water, Inc. will provide training and education materials on the risks of lead in drinking water and testing for lead to the community of the surrounding residential area that is impacted by testing, as well as key partnerships to support the program.

120Water, Inc. will provide a series of training to State Stakeholder and Facilities

participating in the program including:

State Training:120 Water guides state stakeholders on how to leverage the 120 Platform to check program status

Schools Training: Program Overview and Sample Planning. How to take your samples, results and how to prepare for communication and the Transparency Dashboard. Exceedance Management, Remediations, Communications & Reporting

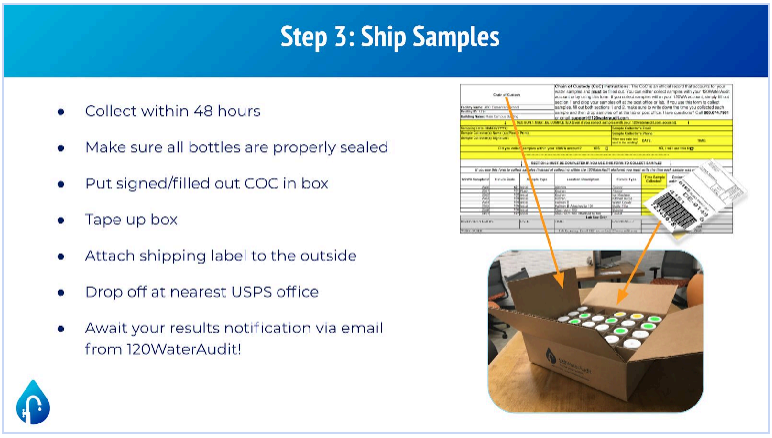

Figure 6. An example of a training webinar 120Water, Inc. gave to facilities in a state-wide lead sampling program for public schools in late 2019.

Sample Planning & Collection

- We propose to develop cohorts based on the enrollment timeline and deliverables. Participants will be organized into cohorts within quarters. Each cohort will go through training, sample planning and sample collection together with support from the 120Water, Inc. Program Manager. Assistance with remediation and communication will be ongoing for all cohorts.
- Following the series of online and in-person trainings, each cohort will be asked to submit sample plans. Participants will be instructed on how to identify all sources of cooking, drinking, and handwashing water. They will also be given instructions about which fixtures to avoid (such as utility sinks) and asked to label these fixtures as “not for drinking”.
- 120Water, Inc. will QA/QC each sample plan and work with facilities to resolve issues. The 120Water, Inc. fulfilment team will send sample kits containing **both initial and 30-second**

flush draw bottles for every identified cooking/drinking/hand washing water source directly to the facility.

- Per EPA 3 T's guidelines, prior to sample collection, participants will be instructed to let all water in the building stagnate for a minimum of 8 hours but not more than 18 hours. Sample collection instructions will be provided both in the training and on document included in the sample kit. The instructions detail:
    - Stagnation time requirements
    - How to collect an initial vs a 30-second flush sample
    - Place the lid bottom-side up and screw on tightly when complete
    - Collect samples from the cold side of each faucet
    - How to collect a sample from an ice machine
    - Contact number for 120Water, Inc. if questions arise
- Once samples are collected and the CoC has been completed, facility staff will apply the pre-postage label back on the sample box, and drop the kit off at the nearest post office.
- The chosen laboratory subcontractor will intake and preserve the samples, analyze them according to EPA 200.8 methods for ICP-MS, and submit an Electronic Data Deliverable (EDD) to the 120Water, Inc. platform along with the official lab report for thorough record keeping.
- The 120Water, Inc. platform will automatically notify each participant when their results have arrived. In the notification email, we will provide a call number and links to helpful resources.
- Water utility partners will have access to the platform, and receive results notifications. If LSLs are suspected, 120Water, Inc. and the utility can coordinate with the facility and other stakeholders to pursue replacement.

Remediation

- Based on the State's Work Plan and the RFQ, 120Water, Inc. proposes to share a remediation guide with each participant. This includes information about immediate, short term, and long term mitigation strategies, as well as measures the facility can take to support water quality throughout the year. We provide individualized remediation guidance per fixture.
- 120Water, Inc. will also provide participants with information about potential funding opportunities for remediation and will connect them with the appropriate state contact when needed.

Communication Support

- 120Water, Inc. will aid in developing a lead testing in drinking water strategy that supports training, monitoring and maintenance plan that protects children from lead exposure now and in the future
- 120Water, Inc. will establish a communication strategy plan for result findings and mitigations when recommended
- 120Water, Inc. will provide educational materials on lead sampling and remediation
- WVDOH & Childcare providers will have access to 120Water, Inc.'s **Public Transparency Dashboard (PTD)**. This solution was developed based on 5 years of experience with public risk communication around lead sampling. Each participant will have the ability to link and/or host the PTD on their website.
- 120Water, Inc. will provide all participants with template letters to use within their communities. Facilities that do not have a website can post the results publicly inside the center, send the letters home with children, or mail them directly to caretakers and parents.

Technical Assistance

- As part of the Program Management services provided in this proposal, Brianna Devin (PC) will work directly with each facility to complete sample plans and answer any questions related to site assessments, sample collection, kits, communication, and program requirements.
- Program Consultant will help facilities navigate remediation options.

Program Management

120Water, Inc. will act as the primary facilitator of the state sampling program through Program Management services. Program Managers guide facilities through the entire process of sample planning to communication and serve as the primary points of contact for the state, field users, facilities, labs, and other stakeholders. Roles and responsibilities can vary based on the program but typically include:

- Being a technical resource to participants on all questions related to completing sample plans, collecting samples, and meeting the expectations of the state.
- QA/QCing sample plans so reduce bottle waste and to ensure all appropriate fixtures are included in the program
- Holding facilities accountable for completing plans, collecting samples, communicating with the public by the deadline, and submitting all other deliverables

- Resolving issues between field teams, labs, and program partners
    1. I.e. undeliverable kits, chain of custody errors, missing sample data, leaking bottles, etc.
- Preparing and submitting reports to stakeholders

Lab Coordination

- Communication with the lab to ensure samples are accepted and analyzed in a timely manner
- Also ensuring results are properly documented for appropriate reporting

Program Consultants

Program Consultants (PCs) have expertise in lead reduction strategies and plumbing design and can provide tailored assistance to enrolled participants looking to identify the most effective and efficient remediation strategies. PCs review all facility and results data, develop and submit mitigation proposals, and field questions from facilities on how to implement the proposal. PC's will prioritize:

- Review each set of results and facility data
- Provide each facility with a tailored mitigation plan with short term and long-term remediation recommendations
- Track remediation recommendations in platform for reporting
- Provide technical assistance to facilities during execution of the remediation plans (phone and email assistance)

Technical Support & Services

The 120Water, Inc. software platform allows you to easily manage, track and report on all aspects of the program. This software serves as the foundation that enables all components of the program workflows, therefore we place heavy emphasis on technical training and support throughout the engagement with 120Water, Inc. The platform is designed to be simple and easy for all users, regardless of technical acumen, and limits opportunities for human error to occur during the process. Platform administration is handled by 120Water, Inc., so WVDOH will not require a designated technical administrator. The following technology based services and support are included with the 120Water, Inc. offering:

- Software Platform Setup

- Account Provisioning
- Users and Roles

- Software Training
  - Your 120Water, Inc. Program Consultant will conduct software platform training for you and your team during the program implementation phase prior to Go-Live.

- Software Support
  - 120Water, Inc. provides user support for any questions, issues or bugs that arise during their utilization of the 120Water, Inc. Platform.
  - Users can contact 120Water, Inc. Customer Support:
    - 800-674-7961
    - Support@120Water.com & Sampling@120Water.com
    - Online by Clicking the “Support” link in the 120Water, Inc. Platform 60
  - 120Water, Inc.’s standard support SLAs are:

Priority	First Response	Resolution
Urgent ● Site or customer outage; business stopping issues.	1 Hour	8 Hours
High ● Any issue which significantly degrades performance for some or all users and for which there is no reasonable workaround.	4 Hours	48 Hours
Medium ● Any issue which significantly degrades performance for some or all users and for which there is at least (1) reasonable workaround. ● Issues that have no significant business impact for some or all users, and/or an acceptable	1 Business Day	1 Month

workaround		
Low • All other issues	2 Business Days	1 Month

2.2 Sample Kits
Sample Kits

120Water, Inc. is the only company that has custom-designed and developed kits for standardized lead sampling programs. We provide these kits to help facilities effectively manage testing plans and ensure accuracy during facility sample collections. **120Water, Inc. Sample Kits are tracked within the platform throughout the sample kits lifecycle, such as kit shipments, kit collection, kit analysis, etc.** Each sample kit is prepared with pre-labeled bottles to the corresponding facility and fixture which enables operators or staff to effectively and efficiently collect samples. We maintain lab partnerships with your state certified drinking water labs to ensure consistent EPA sampling methods and protocols across schools. This data is standardized and exported into the platform automatically from the lab. Kits are drop shipped directly to the facility based on the sample plan, then shipped to our partner labs.

Kits include:

- 250mL Certified Bottles (not acidified) for first-draw and 30-second flush samples
- Pre-printed, color-coded bottle labels based on the flush type that corresponds to Sample Plan
- Bottles placed in order of sample codes/sample plan for easy collection
- Site-Specific Chain of Custody forms
- Sample Collection Instructions
- Return Shipping Label to 120Water, Inc. partner lab

Figure 7. 120Water, Inc.'s Lead Sampling Kits for facilities

2.3 QAPP, QMP and Report Examples and Templates

- The benefit of the QAPP for this initiative will be to communicate, to all parties, the specifications for implementation of the project design and to ensure that the quality objectives are achieved for the project. The Program Director will deliver the QAPP for this testing program. The 120Water, Inc. team has experience writing EPA QAPPs for other state-wide initiatives and relies on EPA's most recent *Guidance for Quality Assurance Project Plans.* Our most recent collaborative submission was approved by EPA R5. The West Virginia Lead Sampling in Childcare Facilities QAPP will define and describe the following basic elements:
  - Who will use the data
  - Project goals, objects, and questions
  - Decisions made from the information obtained
  - How, when, and where project information will be generated or gathered
  - Problems that may arise and what actions may be taken to mitigate those challenges
  - Type, quantity, and quality of data involved
  - Qualification of "good" \data to support decision making
  - Information on how the data will be analyzed, assessed, and reported
- To ensure the QAPP meets EPA requirements, The Program Director will:
  - Ensure that the information is accurate and complete
  - Ensure all appropriate elements are included and addressed
  - Ensure the plan identifies the technical and quality objectives of the project and that the intended measurement and data acquisition methods will satisfy these objectives
  - Ensure assessment produces are adequate to evaluate the project
  - Include process to identify any limitations in the use of the data
- The Program Director will work with named 120Water, Inc. lab partners to include and complete sections relevant to labs analysis.

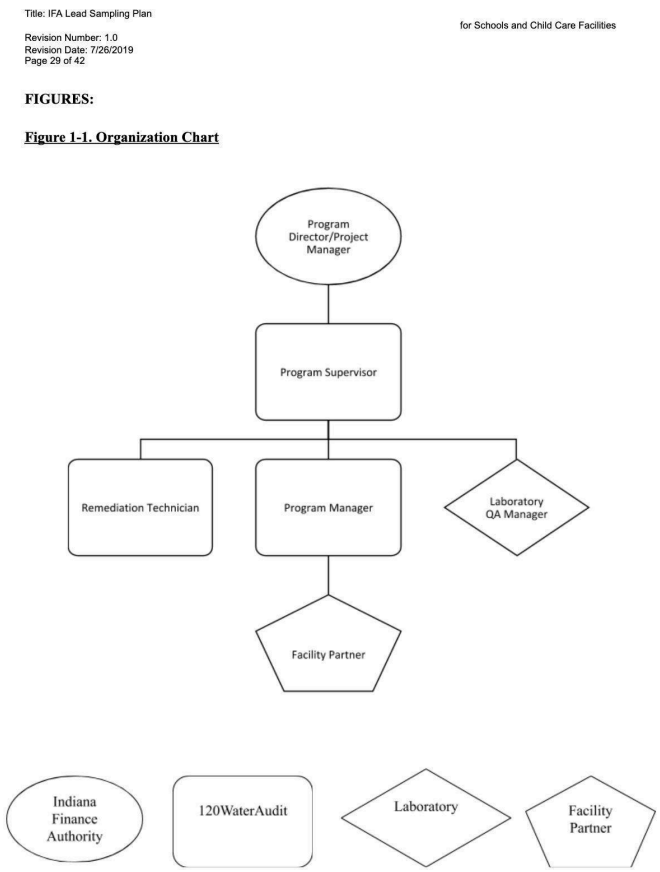

Figure 8. Example of a WIIN-related QAPP submitted and approved by EPA R5

120Water, Inc. has supported clients such as the State of Indiana in drafting a Quality Assurance Project Plan. We will submit a QAPP for this program to the Agency at least 45 days prior to any data being collected to provide EPA adequate time to review (timeline flexible based on WVDOH and EPA requirements).

120Water, Inc. has developed a Quality Management Overview to describe specific quality assurance and control practices as they relate to the Drinking Water Sampling and Analysis Program. The purpose of this overview is to define 120Water, Inc.’s policy and procedures on quality assurance and control practices. A specialized Quality Management Plan (QMP) can be created upon award from WVDOH that details plan specifics

as they relate to the tasks and requirements of the specified program.

120Water, Inc.'s objective is to deliver quality products and program execution services to WVDOH in accordance with their expectations, as outlined in the RFP. 120Water, Inc. has developed a systematic approach to ensure that WVDOH contracted products and services are produced and delivered with the level of quality outlined by this RFP.

This overview addresses the requirements critical to the quality of the products and services provided by 120Water, Inc. and describes how processes are to be implemented, audited, and when necessary, corrected or improved.

120Water, Inc. shall define and document its policy and objectives for, and commitment to, quality. All parties shall ensure that this Quality Policy is understood, implemented, and maintained at all levels, throughout the 120Water, Inc. organization.

120Water, Inc. will establish and maintain a documented quality management process to ensure that the products and services that 120Water, Inc. provides are produced and delivered in accordance with WVDOH requirements, as outlined in the scope of work. This will include the preparation and effective implementation of documented Quality Program procedures, including:

- Quality Management System
- Document Control and Submittal Management
- Inspection
- Identification, Control, and Correction of Non-conforming Conditions
- Corrective Actions
- Documentation by Quality Records
- Training

The key roles and responsibilities of the 120Water, Inc. Team involved in the management and execution of this program are described below:

120Water

120Water, Inc. QA/QC Organization Roles and Responsibilities:

Executive Sponsor

- Acting as the customer advocate and final point of escalation for any WVDOH critical needs as they relate to this program
- Acting as the customer advocate and final point of escalation for any critical quality assurance or quality control needs as they relate to this program

Primary Account Owner

- Acting as the Primary Account Owner and the main point of contact for WVDOH
- Acting as a point of escalation for any WVDOH critical needs as they relate to this program
- Acting as a point of escalation for any critical quality assurance or quality control needs as they relate to this program

Senior Program Consultant

- Reporting on the status and effectiveness of the Quality Assurance and Quality Control Programs
- Reviewing documents to identify project quality requirements
- Overseeing the Development, Issuance, and Maintenance of the Quality Management Plan and associated Quality Assurance Procedures
- Overseeing surveillance and auditing of product suppliers, shipping partners, and 120Water, Inc. platform
- Identifying, analyzing, tracking, and providing follow-up for nonconformance
- Overseeing the development of corrective actions
- Verifying the implementation of corrective actions
- Coordinating with the Program Consultant for quality issues and problem resolution

Program Consultant

- Acting as the owner and manager of the Implementation, Project Management, Delivery and Fulfillment operations as they relate to this program
- Acting as a direct point of escalation for any WVDOH critical needs as they relate to this program
- Acting as a direct point of escalation for any critical quality assurance or quality control needs as they relate to this program
- Approving the PMB, QMP, and control system(s)
- Overseeing the establishment, implementation, and continued improvement of the QMS

- Providing management reviews of the QMS and approval of internal audits
- Identifying, initiating, and monitoring quality improvement efforts
- Reviewing feedback and project deliverable review comments received from WVDOH and other stakeholders
- Verifying that sufficient risk assessments have been carried out
- Monitoring the status of the Program using weekly Program control meetings
- Assuring qualified and adequate resources are available
- Assignment of project staff responsibilities and the engagement of outside services where necessary
- Supporting, guiding and mentoring the 120Water, Inc. Team Members

- Partnering with WVDOH from the program design phase through go-live to ensure that all parties are aligned on expectations, statements of work and go-forward planning both technically and programmatically
- Fully managing all implementation activities to take the program from design to go-live
- Developing a strong, collaborative working relationship with WVDOH staff
- Liaising with WVDOH to understand the various Program requirements
- Confirming the scope of work with MDH for the Program elements and tasks and creating and maintaining the PMB
- Identifying and managing project risks
- Performing change control regarding scope, budget, and schedules
- Organizing completion and approving project deliverables and documentation, in accordance with agreed upon schedules
- Ensuring the executional proficiency of the 120Water, Inc. Team, in accordance with program requirements.
- Demonstrating how the project can be delivered effectively and efficiently
- Establishing project control(s)
- Reviewing the state of the Program with the Senior Program Consultant at daily project control meetings throughout the Implementation phase
- Reviewing Contract documents to identify project quality requirements
- Developing, Issuing, and Maintaining the Quality Management Plan and associated Quality Assurance Procedures

- Managing the ongoing, day-to-day execution of the program once go-live is achieved
- Completing the program on time, budget and to required quality
- Identifying and managing project risks
- Overseeing the maintenance of Program records
- Reviewing the state of the Program with the Program Director at weekly project control meetings
- Developing a strong, collaborative working relationship with WVDOH staff
- Performing ongoing change control regarding scope, budget, and schedules
- Arranging and responding to quality audits
- Communicating and meeting with designated WVDOH staff on a regular basis during the execution of the program