Increasing Data Quality, Defensibility, and Confidence Through Utilization of a Field Sampling and Measurement Organization Quality System

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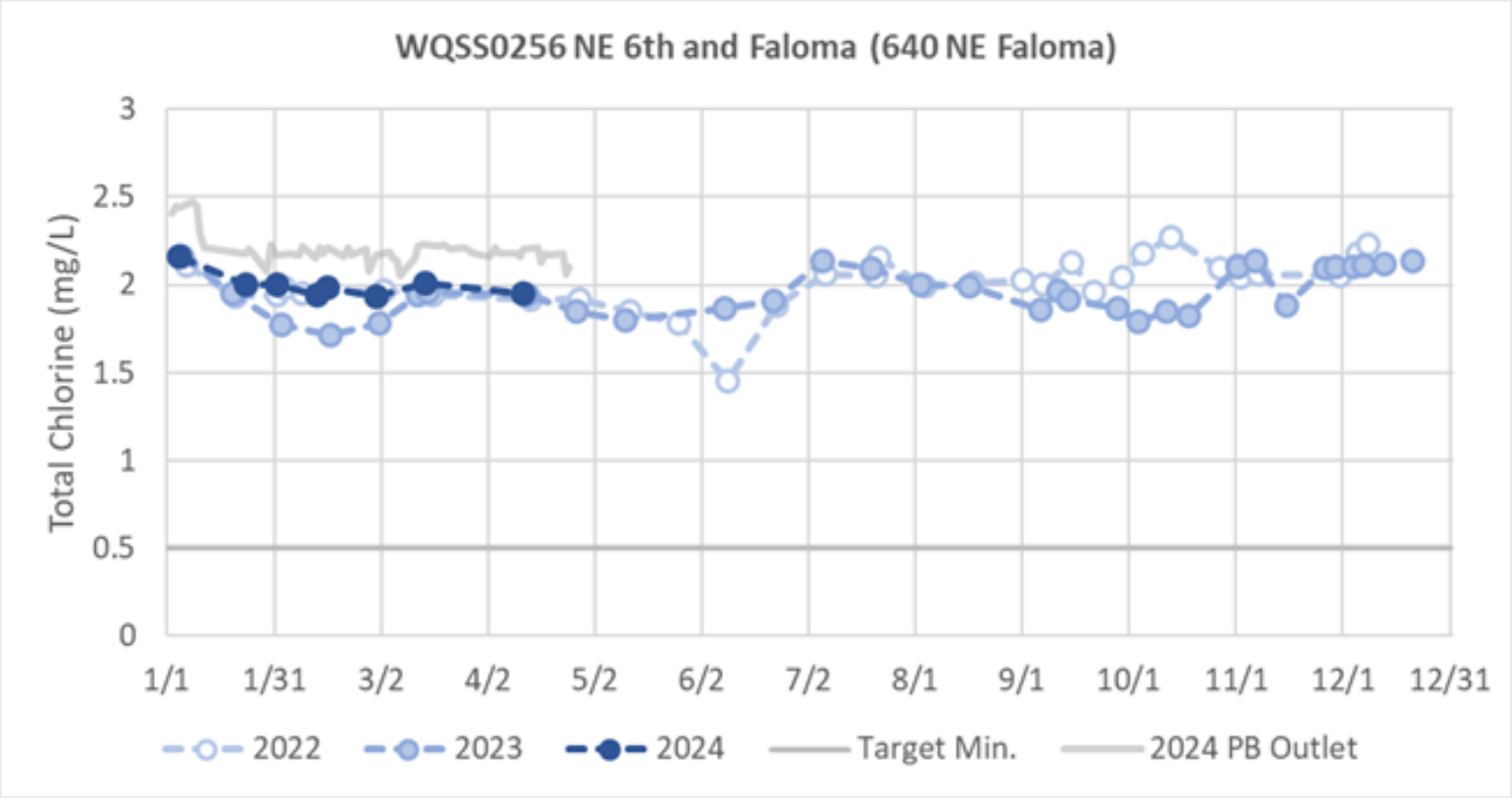
PNWS-AWWA Section Conference

May 2nd, 2024

PORTLAND WATER BUREAU

FROM FOREST TO FAUCET

Field Sampling and Measurement Organization Quality System is a lot of words….



Presentation Outline

1. Background
2. Developing Portland Water Bureau's Quality System
3. Benefits & How to Start a Quality System
4. Summary/Conclusions

Background

- Field Sampling 101
- What is a FSMO Quality System?
- Why Portland Water Bureau?




Field Sampling and Measurement – easy, right?

Much more than filling bottles and taking readings!


Field sampling 101

Location:

- Any work outside legal facility (lab)

Activities:

- Measurement
- Sample collection

Objectives:

- Regulatory Compliance
- Routine Monitoring
- Emergency Response
- Scientific Research

Field sampling 101

Sampling:

- Part of a substance collected for testing that is representative of the whole substance

Measurement:

- Process or result of comparison between sample and standard

Objectives:

- Proper location
- Correct procedures
- Defensible data

Why have a quality system for field sampling?

Increase Scientific Reliability

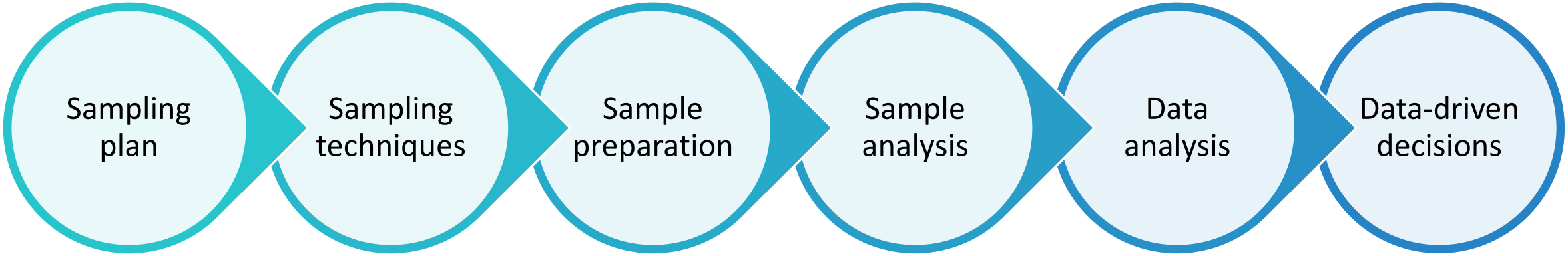
- "proper procedures for sampling and analysis are followed so that the results accurately reflect the content of the sample"

ZHANG, C. (Carl). (2007). *Fundamentals of environmental sampling and analysis*. John Wiley and Sons.

Prevent Defective Data

- Incorrect sampling protocol
- Incorrect analytical protocol
- Defective equipment
- Falsification of test results

Bad data can cost you money



Economic decisions are based upon environmental data

"The quality of the data can only be as good as the quality of the sample" - TNI

What Is a Field Sampling Quality System?

Standard policies and procedures

- Defines and documents standard operating procedures (SOPs) and trainings
- Assures highly ethical approach to field data collection
- Documents technical competency and requirements of FSMO

What Is a Field Sampling Quality System?

Standard policies and procedures

Calibration and field documentation

- Record of traceability for standards, instruments, and inventory
- Reconstructs sampling process through documentation of sample collection procedures, instrument calibration, and QC results

What Is a Field Sampling Quality System?

- Standard policies and procedures
- Calibration and field documentation
- File and record management

- Provides document control and tracking
- Increases data defensibility and reduces risk

What Is a Field Sampling Quality System?

- Standard policies and procedures
- Calibration and field documentation
- File and record management
- Reviews, audits, and corrective actions

- Establishes and maintains data integrity procedures
- Increases efficiency and streamlines processes
- Reduces the “appeal to tradition” logical fallacy

Regulatory requirements

- Not an EPA regulation requirement … yet!
- 1970's EPA set minimum standards for drinking water certification program
- 1995: EPA established NELAC to develop national standards for laboratory accreditation
- 2011: EPA Policy to Assure Competency of Laboratories, Field Sampling, and Other Organizations Generating Environmental Measurement Data under Agency-Funded Acquisitions

Is FSMO Accreditation Required?

- EPA Competency Policy initiating increased field QA
  - Requirement for EPA contracts
- Limited Regulation for Agencies
- May be required for contractual agreements

Why Me?

Before working at Portland Water Bureau:

- Learned field sampling the hard way
- Found support with Laboratory QA Manager
- Developed FSMO QS program
- FSMO QS helped protect Field Services Department during laboratory closure

Joined PWB in 2015:

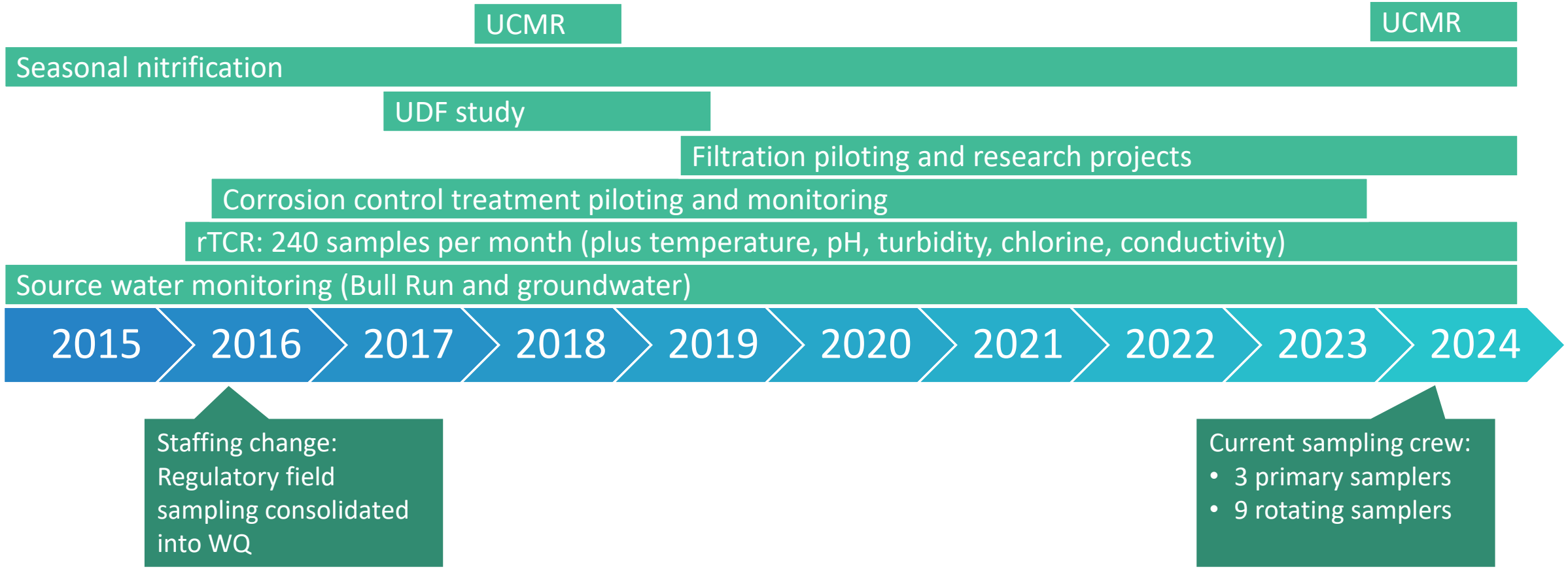
- New opportunity with PWB to share FSMO QS experience
- Received support, encouragement, and opportunity to grow FSMO QS

About the Portland Water Bureau

Water System
- 187,000 connections
- 19 wholesale systems
- 101 million gallons per day

Staff:
- 600 total
- 31 water quality staff
- 9 monitoring staff
- 14 lab staff

Portland's field sampling history



Why build a quality system for Portland?

- Prevent field sampling and data problems
- Increase efficiency and streamlines processes
- Increase public trust and accountability

Developing Portland's Quality System

- **Getting started in 1, 2, 3**
- **What we have done**
- **Quality Manual**

Getting started, Portland's step 1: Scope

- Defined FSMO Scope and Roles
  - Wanted initial QS to be manageable
  - Determined Technical/QA responsibilities
  - Opportunity to expand QS influence
- Focused on Regulatory Monitoring
  - Total Coliform Rule
  - Disinfectant By-Products
  - Lead and Copper Rule
  - UCMR

Getting started, Portland's step 2: Industry standards

Field sampling and measurement organization standards

USEPA Field Operations Group Operational Guidelines for Field Activities

- Provides leadership and promotes national consistency amongst field activities
- Guidelines for the collection of reliable and legally defensible environmental data
- Based off ISO 17025 requirements
- Directive No: CIO 2105-P-02.1

General Requirements For Field Sampling and Measurement Organizations Volume 1

- TNI Standard conforming to ISO/IEC 17025
- Management and Technical Requirements for FSMO's
- Latest update: 2014 (Volume 2 currently in revision)

ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories

- Standards to enable FSMO's to operate competently
- Testing, Sampling, and Calibration
- Latest update: 2017

Getting started, Portland's step 3: Relationships

- TNI Membership
  - FSMO trainings and templates
  - Field Activities Committee member
- Utilized Support From PWB Laboratory
  - Rewrote standard operating procedures
  - Created tracking spreadsheets
  - Improved training and documentation
- Pathway to Success
  - Support from Management
  - Buy-in from colleagues

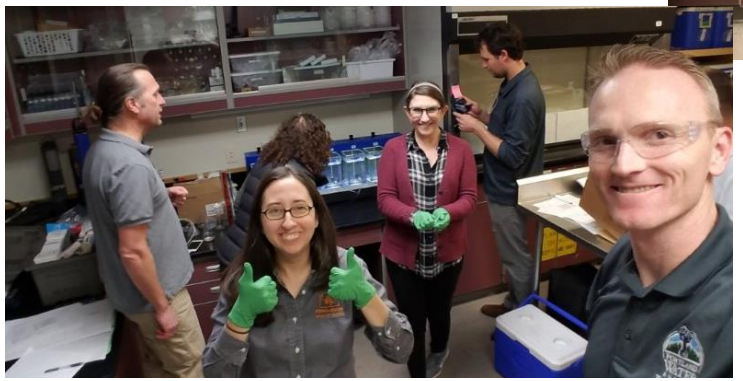
Easy as 1, 2, 3. Right?

- Challenges with starting Quality System
  - Where to begin?
    - Started with rewriting and creating SOPs
  - Overwhelming information
    - Webinars and trainings available on TNI website
  - Buy-in from management and colleagues
    - Open communication and updates
    - Involved personnel into process

What we have done: Portland's field sampling and measurement organization quality system

Established Field Sampling Room

- Demonstration of commitment from management
- Provides dedicated space for field sampling activities
  - Training
  - Calibration
  - Storage
  - Studies
  - Collaboration
  - Identity!



Qualified staff

EPA guidance:
Personnel responsible for field activities shall have appropriate qualifications, education, training, experience and a satisfactory knowledge of the requirements of the activities to be carried out.

Portland's system:

- **Employee Files**
  - Certifications
  - CEU's
  - Resume
  - Trainings

Oregon Health Authority

State of Oregon
Certificate of Compentency

This certifies that

Thomas A Krause

Has by education, experience, and examination met the established qualifications to fulfill the requirements for

DISTRIBUTION LEVEL 2

No. D-09336

Issued: 10/22/2018

Manager, Oregon Drinking Water Services

American Institute of Hydrology

BOARD OF REGISTRATION

CERTIFICATION NUMBER: 22-HT-9033

EXPIRES: 2023/01/15

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AMERICAN INSTITUTE OF HYDROLOGY AIH

THOMAS KRAUSE

Chair, Board of Registration

President, AIH

Training

EPA guidance:
Field groups shall have a documented system to ensure that up-to-date records of training are maintained for field personnel.

Portland's system:

- **Training Records**
  - DOC Records
  - SOP Records
  - Safety Trainings

City of Portland – Water Bureau
Standard Operating Procedure
Sign-Off Form

Portland Water Bureau Water Quality
Standard Operating Procedure Sign-Off F

This agreement documents that the undersigned Portland Water Bureau employe
understands the current version of the standard operating procedure listed below
documents that the undersigned Portland Water Bureau employee agrees to follo
as written.

SOP	Revision #	Initial v

Employee Name (Print) Employee Signature

Supervisor Name (Print) Supervisor Signature

Page 1 of 1

City of Portland – Water Bureau
Standard Operating Procedure
Demonstration of Proficiency

Effective Date _____

Portland Water Bureau Water Quality
FIELD ANALYSIS DEMONSTRATION OF PROFICIENCY

This form is used to document sampler's ongoing demonstration of proficiency in field analyses.

Trainee: _____ Analysis or Task: _____

Trainer: _____ SOP #: _____

Ongoing Demonstration of Proficiency:

Trainee has demonstrated field analysis proficiency _____
Date

Trainer comments for ongoing demonstration of proficiency:

Training is complete, and trainee understands the safety requirements for this procedure, including proper handling or reagents, chemicals, and standards and appropriate use of field analysis equipment

Trainee Name (Print) Trainee Signature Date

Trainer Name (Print) Trainer Signature Date

Page 1 of 1

Document control

EPA guidance:
Field Groups should maintain a system for the control of all documents relating to their activities including the preparation, review, approval, issuance, revision, revocation and archiving of documents

Portland's system:

- **Controlled Documents**
  - SOP Manuals
  - Quality Manual
- **Controlled Notebooks**
  - Instrument Calibration Notebooks
  - Field Book Records

Date	Time	Name	pH 4	pH 7	pH 10	Slope (mV) (-60 to -57.5)	pH 9.00 (8.90 to 9.10)	Notes

PORTLAND WATER BUREAU
FROM FOREST TO FAUCET

pH Calibration Record

- Record pH calibration information for the pH probe listed below.
- Follow instructions in SOP 200 Section 10 to calibrate pH probe.

Probe S/N	
In-Service date:	
Start date:	
End date:	

Records management

EPA guidance:
Field groups shall maintain a records management system to suit their particular circumstances and to comply with applicable Federal and Agency records management regulations, policies, and retention schedules."

Portland's system:

- City of Portland Record Archive Program
- Allows for historical reconstruction of FSMO activities
- Records Maintained:
  - Raw data
  - Instrument Identification
  - Training records
  - SOPs
  - Chain of custodies

Procedures: monitoring plans

EPA guidance:
Field groups shall establish and maintain procedures for the identification, transportation, handling, protection, storage, and retention of samples and other appropriate environmental data during field activities.

Portland's system:

Sampling and Environmental Data Management

- Monitoring Plans
  - Information for field sampling staff

City of Portland – Portland Water Bureau
Interoffice Correspondence
Water Quality Monitoring Plan

DATE:

TO: PWB Lab:
Water Quality Compliance:

FROM:

SUBJECT:

1. Project Manager:

2. Contract Manager:

3. Name of Sampling:

4. LIMS Project Name:

5. Project Number:

6. Purpose:

7. Analyses requested: See Table 1 below:

Table 1: Requested analyses

Type	Parameter	LIMS Code

8. Samples collected by: Water Quality Monitoring and Optimization staff.

9. Sampling dates:

10. Sample location (include LIMS Location code):

Location	LIMS Code

City of Portland – Portland Water Bureau
Interoffice Correspondence
Water Quality Monitoring Plan

11. Number of samples per sampling event:

12. Number and type of bottles: See Table 2 below:

Table 2. PWB bottles

Quantity (per sample) =	Type of Bottle	Analyses

13. Compliance samples:

14. Special Sampling Instructions:

15. Laboratory shipping information:

16. Results needed: (normal/rush/other)

17. Chain of Custody information: Field sheets will be located at:

18. Sampling Plan information: The latest version of the sampling plan will be located at:

19. LIMS Instructions: Please set up samples in process scheduler.

Procedures: field activities

EPA guidance:
Field groups shall establish and maintain procedures to document field activities.

Portland's system:

Sampling and Environmental Data Management

- SOPs
  - Instruments
  - Monitoring Programs
  - Maintenance
- One-Sheets
- Checklists

SOP Title
Standard Operating Procedure

1) SOP Identification Number:

2) Scope of SOP:

3) Measurement, Method, Resolution, and Accuracy:

1. Description:
2. LIMS Method:
3. Reference Method:
4. Range:
5. Absorbance:
6. Resolution:
7. Wavelength:

4) Equipment and Performance Requirements:

5) Calibration Frequency and Reference Standards:

6) Environmental Conditions and Stabilization Requirements:

1. Operating temperature:
2. Storage temperature:
3. Stabilization time:
4. Reaction time:

7) Criteria and/or Requirements for Approval/Rejection and Data Qualifiers:

1. Data recorded following the procedures in this document are accepted u managers determine that there is a reason to reject the data. Data may b failure to follow approved sampling techniques, failure to calibrate instru site other than specified (i.e., wrong location), or if the data were collecte been rejected. Note: *Field data may be kept even though sample was reje*
2. Data are qualified as outlined in *Section 10: Procedure* of this document.
3. Data are qualified as "FE" (field exception) in the event the instrument fa

8) Data to be Recorded:

1. Calibration Record
2. Field Sheet

9) Equipment and Supplies:

Equipment	Number Needed	Notes

10) Procedure:

11) Safety

1. When working in the PWB lab, standard safe laboratory practices are required. This includes wearing appropriate Personal Protective Equipment (PPE) such as safety glasses and gloves for all lab work.
2. Safety Data Sheet (SDS) information for each reagent and buffer is available printed and stored in the SDS folder in the PWB Field Room, online, or on any mobile device, via the PWB HSI Encompass account. Login information is as follows:
   - URL: Otis.osmanager4.com/cityofportland#
   - Company Name: cityofportland
   - LoginID: water
   - Password: water
3. Safety Data Sheet (SDS) Information

SDS ID	Product	Manufacturer	Revision

4. PPE Summary

PPE	Task or Use	Location
Nitrile gloves	Wear gloves when handling chemicals that can cause skin irritation or are corrosive	PWB Laboratory Field Room
Safety glasses	Wear eye protection when handling chemicals that can cause eye irritation	PWB Laboratory Field Room
Long pants and closed-toe shoes	Appropriate clothing and footwear should be worn while working in the laboratory	N/A

5. Field Safety Information
   a. Security phone numbers
      i. Emergency Dispatch: 911
      ii. WB Security: (503) 823-6084
   b. Rapid Response Bio Clean: (503) 477-8765
   c. QR code for tracking field incidents
      i. See *Section 12: Notes, References, and Appendix*
   d. Field Safety Applications
      i. OSHA/NIOSH Heat Index Safety Tool
         1. Used to determine the heat index at various locations.
      ii. PDX Reporter
         1. Used to report abandoned automobiles, campsite reporting, and other issues.
   e. Job Hazard Analysis
      i. Located in the WQMonitoring Safety folder located here: Job Hazard Analysis

12) Notes, References, and Appendix:

1. Notes:
   a. QR code for reporting field incidents (harassment, threats, security, or other environmental concerns):

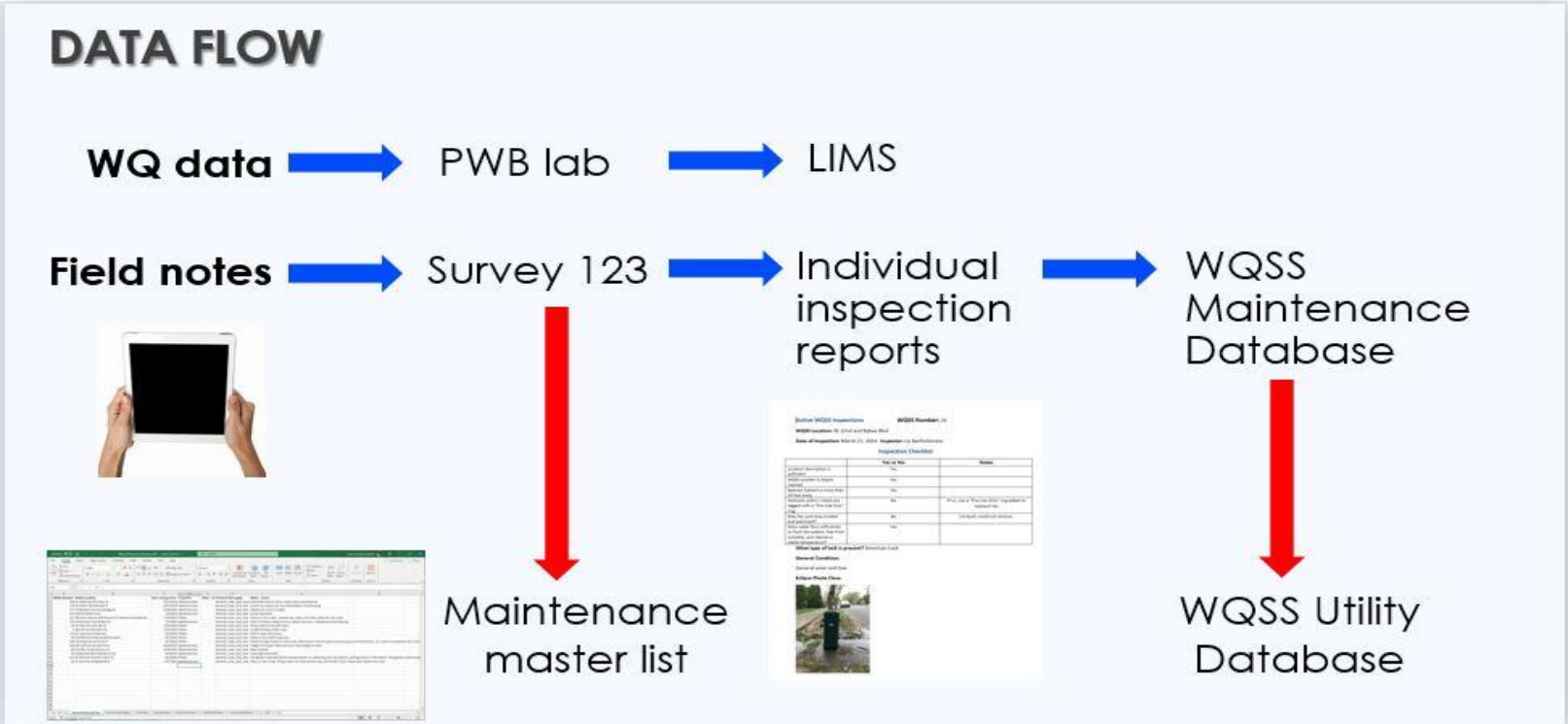
Procedures: field investigations

EPA guidance:
Field groups shall establish and maintain procedures for the planning of field investigations, including inspections.

Portland's system:

Sampling and Environmental Data Management

- Annual Water Quality Sampling Station Inspections
- Customer WQ Investigations

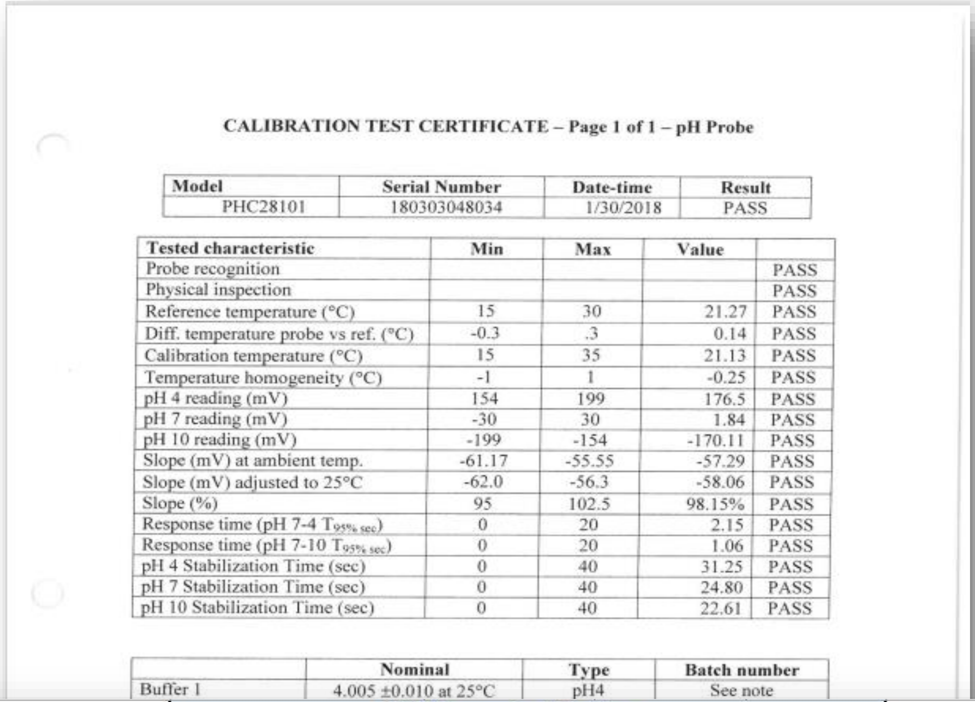


Equipment

EPA guidance:
Field Groups shall establish and maintain procedures for field equipment.

Portland's system:

- **Equipment Records**
  - Certificates
  - Maintenance Log
  - Manuals
  - Side-By-Side Testing
  - Calibration
  - Inventory

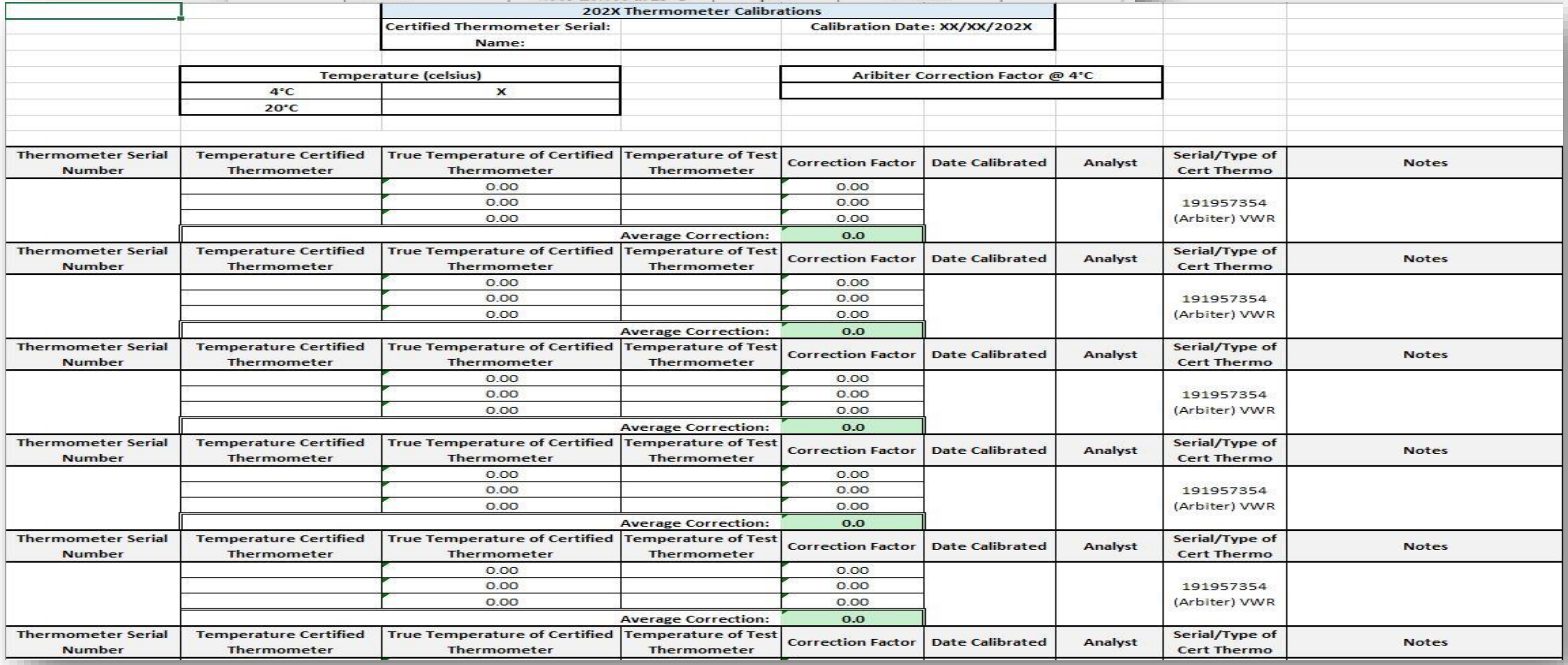


CALIBRATION TEST CERTIFICATE – Page 1 of 1 – pH Probe

Model	Serial Number	Date-time	Result
PHC28101	180303048034	1/30/2018	PASS

Tested characteristic	Min	Max	Value	
Probe recognition				PASS
Physical inspection				PASS
Reference temperature (°C)	15	30	21.27	PASS
Diff. temperature probe vs ref. (°C)	-0.3	.3	0.14	PASS
Calibration temperature (°C)	15	35	21.13	PASS
Temperature homogeneity (°C)	-1	1	-0.25	PASS
pH 4 reading (mV)	154	199	176.5	PASS
pH 7 reading (mV)	-30	30	1.84	PASS
pH 10 reading (mV)	-199	-154	-170.11	PASS
Slope (mV) at ambient temp.	-61.17	-55.55	-57.29	PASS
Slope (mV) adjusted to 25°C	-62.0	-56.3	-58.06	PASS
Slope (%)	95	102.5	98.15%	PASS
Response time (pH 7-4 $T_{95\%\ sec}$)	0	20	2.15	PASS
Response time (pH 7-10 $T_{95\%\ sec}$)	0	20	1.06	PASS
pH 4 Stabilization Time (sec)	0	40	31.25	PASS
pH 7 Stabilization Time (sec)	0	40	24.80	PASS
pH 10 Stabilization Time (sec)	0	40	22.61	PASS

	Nominal	Type	Batch number
Buffer 1	4.005 ±0.010 at 25°C	pH4	See note



202X Thermometer Calibrations

Certified Thermometer Serial:
Calibration Date: XX/XX/202X
Name:

Temperature (celsius)	
4°C	x
20°C	

Aribiter Correction Factor @ 4°C

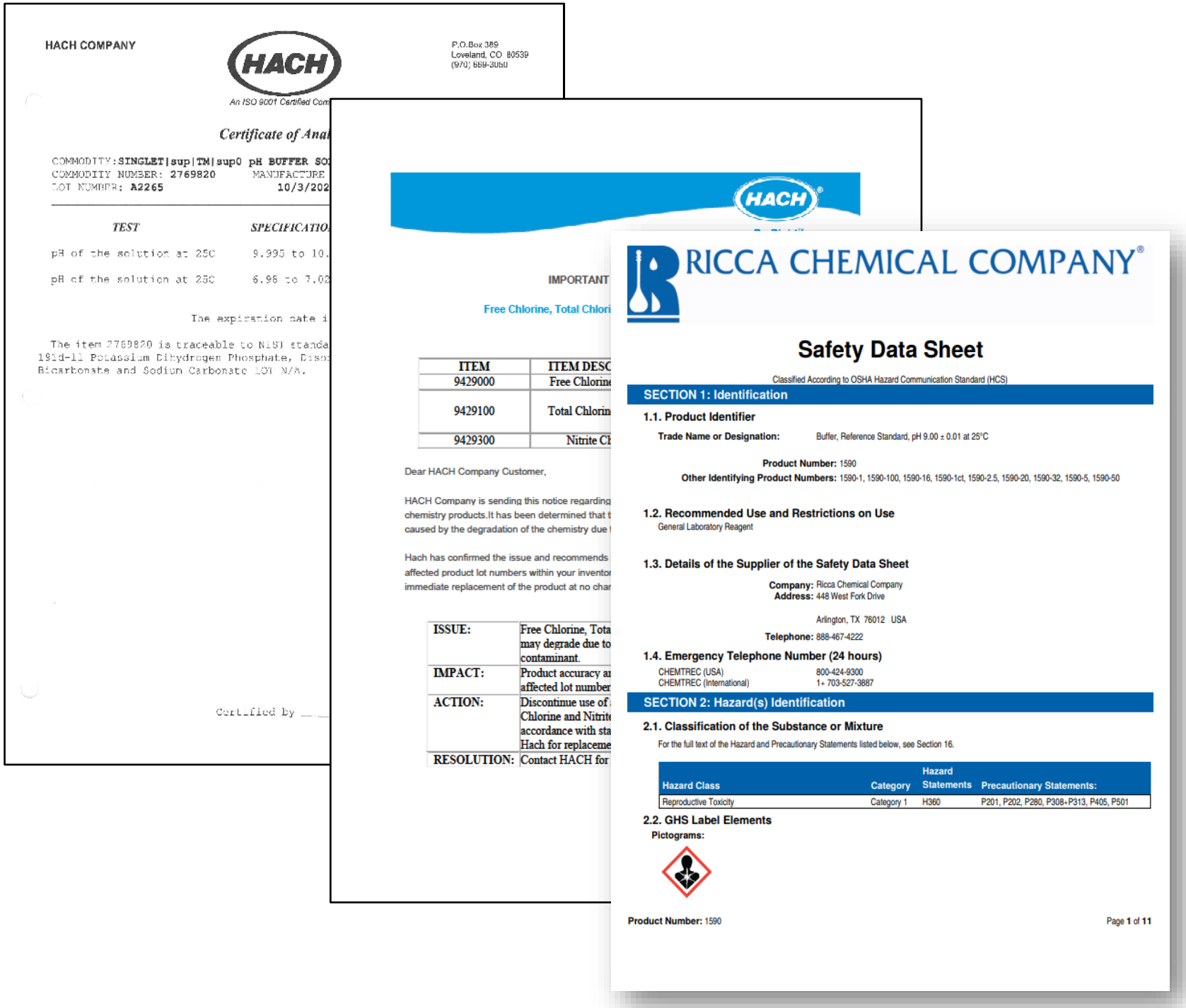
Thermometer Serial Number	Temperature Certified Thermometer	True Temperature of Certified Thermometer	Temperature of Test Thermometer	Correction Factor	Date Calibrated	Analyst	Serial/Type of Cert Thermo	Notes
		0.00		0.00			191957354 (Arbiter) VWR	
		0.00		0.00				
		0.00		0.00				
			Average Correction:	0.0				
Thermometer Serial Number	Temperature Certified Thermometer	True Temperature of Certified Thermometer	Temperature of Test Thermometer	Correction Factor	Date Calibrated	Analyst	Serial/Type of Cert Thermo	Notes
		0.00		0.00			191957354 (Arbiter) VWR	
		0.00		0.00				
		0.00		0.00				
			Average Correction:	0.0				
Thermometer Serial Number	Temperature Certified Thermometer	True Temperature of Certified Thermometer	Temperature of Test Thermometer	Correction Factor	Date Calibrated	Analyst	Serial/Type of Cert Thermo	Notes
		0.00		0.00			191957354 (Arbiter) VWR	
		0.00		0.00				
		0.00		0.00				
			Average Correction:	0.0				
Thermometer Serial Number	Temperature Certified Thermometer	True Temperature of Certified Thermometer	Temperature of Test Thermometer	Correction Factor	Date Calibrated	Analyst	Serial/Type of Cert Thermo	Notes
		0.00		0.00			191957354 (Arbiter) VWR	
		0.00		0.00				
		0.00		0.00				
			Average Correction:	0.0				
Thermometer Serial Number	Temperature Certified Thermometer	True Temperature of Certified Thermometer	Temperature of Test Thermometer	Correction Factor	Date Calibrated	Analyst	Serial/Type of Cert Thermo	Notes
		0.00		0.00			191957354 (Arbiter) VWR	
		0.00		0.00				
		0.00		0.00				
			Average Correction:	0.0				
Thermometer Serial Number	Temperature Certified Thermometer	True Temperature of Certified Thermometer	Temperature of Test Thermometer	Correction Factor	Date Calibrated	Analyst	Serial/Type of Cert Thermo	Notes

Inventory

EPA guidance:
Field Groups shall establish and maintain procedures for field equipment.

Portland's system:

- **Inventory Records**
  - Certificate of Analysis
  - Product Notices
  - Safety Data Sheets
  - Inventory Reception Log
  - Inventory Supplies Log
- **Approved Suppliers**



HACH COMPANY

HACH

An ISO 9001 Certified Com

P.O.Box 389
Loveland, CO 80539
(970) 669-3050

Certificate of Anal

COMMODITY:SINGLET|sup|TM|sup0 pH BUFFER SO
COMMODITY NUMBER: 2769820 MANUFACTURE
LOT NUMBER: A2265 10/3/202

TEST	SPECIFICATIO
pH of the solution at 25C	9.995 to 10.
pH of the solution at 25C	6.98 to 7.02

The expiration date i

The item 2769820 is traceable to NIST standa
1911-11 Potassium Dihydrogen Phosphate, Diso
Bicarbonate and Sodium Carbonate LOT N/A.

Certified by

HACH

IMPORTANT

Free Chlorine, Total Chlori

ITEM	ITEM DESC
9429000	Free Chlorine
9429100	Total Chlorin
9429300	Nitrite Cl

Dear HACH Company Customer,

HACH Company is sending this notice regarding
chemistry products.It has been determined that t
caused by the degradation of the chemistry due

Hach has confirmed the issue and recommends
affected product lot numbers within your inventor
immediate replacement of the product at no char

ISSUE:	Free Chlorine, Tota may degrade due to contaminant.
IMPACT:	Product accuracy ar affected lot number
ACTION:	Discontinue use of Chlorine and Nitrite accordance with sta Hach for replaceme
RESOLUTION:	Contact HACH for

RICCA CHEMICAL COMPANY®

Safety Data Sheet

Classified According to OSHA Hazard Communication Standard (HCS)

SECTION 1: Identification

1.1. Product Identifier

Trade Name or Designation: Buffer, Reference Standard, pH 9.00 ± 0.01 at 25°C

Product Number: 1590
Other Identifying Product Numbers: 1590-1, 1590-100, 1590-16, 1590-1ct, 1590-2.5, 1590-20, 1590-32, 1590-5, 1590-50

1.2. Recommended Use and Restrictions on Use
General Laboratory Reagent

1.3. Details of the Supplier of the Safety Data Sheet

Company: Ricca Chemical Company
Address: 448 West Fork Drive
Arlington, TX 76012 USA
Telephone: 888-467-4222

1.4. Emergency Telephone Number (24 hours)

CHEMTREC (USA) 800-424-9300
CHEMTREC (International) 1+ 703-527-3887

SECTION 2: Hazard(s) Identification

2.1. Classification of the Substance or Mixture

For the full text of the Hazard and Precautionary Statements listed below, see Section 16.

Hazard Class	Category	Hazard Statements	Precautionary Statements:
Reproductive Toxicity	Category 1	H360	P201, P202, P280, P308+P313, P405, P501

2.2. GHS Label Elements

Pictograms:

Product Number: 1590 Page **1** of **11**

Internal and external audits

EPA guidance:
Field groups should periodically conduct internal audits to verify that their operations comply with this procedure

Portland's system:

- **Internal audits**
  - Equipment Inventory Audit
  - Quality System Audit
  - Management Review
  - Annually by QA Officer or as a follow-up to a corrective action
- **External audit**
  - Done by Accreditation Body to maintain accreditation every two years

A	B	C	D	E	F
Audit	Date Initiated	Finding	Resolution	Date Completed	Notes
Equipment Inventory	1/23/2023	Equipment inventory audited.	Equipment spreadsheet updated.	2/6/2023	One UDF thermometer reported missing - all other equipment present.
Equipment Inventory	2/28/2022	SCAN information missing in Equipment Inventory spreadsheet.	Added SCAN information to Equipment Inventory spreadsheet.	3/10/2022	
Equipment Inventory	2/28/2022	Hach Tensette pipettors missing serial numbers.	Labeled Hach Tensette pipettors with serial numbers.	3/10/2022	
Equipment Inventory	2/28/2022	Hach Alkalinity titrators missing labels.	Labeled Hach Alkalinity titrators.	3/10/2022	
Equipment Inventory	2/28/2022	Outdated location information for equipment.	Updated location information for equipment as needed.	3/10/2022	
Equipment Inventory	2/28/2022	Missing GPS. Last used for LCR customer pickups.	Marked as "missing" in inventory spreadsheet.	3/10/2022	
Equipment Inventory	2/28/2022	Update autoflusher with FacID's.	Autoflusher Fac ID's sent by Opie.	4/25/2022	Emailed Opie for ID information.
Equipment Inventory	2/28/2022	Consolidate instruments from WQ to field room.	Instruments consolidated to WQ cabinet/Field Room	1/30/2023	Spare field instruments are stored in WQ Cabinet.
Equipment Inventory	2/28/2022	Retire and remove obsolete instruments not in use.	Obsolete instruments disposed in electrical recycling.	1/30/2023	Find appropriate disposal method; include autosamplers
Thermometer Calibration	3/3/2023	Thermometers calibrated for 2023	Thermometers calibration verified by M. Holt.		Three thermometers not present for first day of calibration verification - brought t
Thermometer Calibration	3/3/2023	Thermometer #448 failed calibration check.	Thermometer #448 taken out of service.	3/6/2023	Disposed 3/6/2023.
Thermometer Calibration	3/3/2022	Thermometer #276 failed calibration check.	Thermometer #276 taken out of service.	3/10/2022	Disposed 7/13/2022.
Thermometer Calibration	3/3/2022	Old LT2 thermometer turned in by Lydia not working. No serial number.	Thermometer taken out of service.	3/10/2022	
Thermometer Calibration	3/3/2022	UDF thermometer #4025 reported as missing.	Marked as "missing" in inventory spreadsheet.	3/10/2022	
Thermometer Calibration	3/3/2022	Legionella thermometer #445 reported as missing.	Marked as "missing" in inventory spreadsheet.	3/10/2022	
Thermometer Calibration	3/3/2022	Two thermometers were labeled with same serial number (566).	Serial numbers updated in spreadsheet as #556 and #566.	3/10/2022	
Thermometer Calibration	3/3/2022	Change acceptance value from 1 C to 0.6 C.	SOP updated to change acceptance range.	9/30/2022	Check number of thermometers outside of proposed range. Update SOP.
Thermometer Calibration	3/4/2022	Update calibration template to increase usability.	Template updated and prepared for 2023 calibration.	1/30/2023	Nick to update template.
Training Records	3/10/2022	FS Training Records spreadsheet has missing information.	Updated FS Training Records spreadsheet with missing information.	3/10/2022	
Training Records	3/10/2022	DOC spreadsheet missing information.	Updated DOC spreadsheet.	3/10/2022	
Training Records	3/10/2022	SOP read spreadsheet missing information.	Updated SOP read spreadsheet.	3/10/2022	
Training Records	3/10/2022	Missing DOC's for instruments and sampling.			Follow up with field technicians to complete missing DOC forms.
Training Records	3/11/2022	Missing SOP read forms for instruments and sampling.			Follow up with field technicians to complete missing SOP read forms.
Training Records	3/13/2022	Include LT2 SOPs, DOCs, trainings?	Added SOP and training shortcuts to QS.	1/30/2023	Contact Ana to add shortcut to LT2 intake and keystation training spreadsheet.
Training Records	3/10/2022	Archive FS Training Records spreadsheet. Replaced by DOC records.	Kept and updated spreadsheet.	1/30/2023	Keep FS trainings; archive trainings replaced with DOC forms.
Approved Supplier	1/30/2023	No new product notices	No action required.	1/30/2023	
Approved Supplier	3/10/2022	New product notice from Hach.	Product notice list updated.	3/10/2022	
Corrective Actions	1/30/2023	No new corrective actions.	All corrective actions closed.	1/30/2023	
Corrective Actions	1/30/2023	No customer complaints.	Customer complaints closed.	1/30/2023	
Corrective Actions	3/10/2022	No new corrective actions.	All corrective actions closed.	3/10/2022	
Corrective Actions	3/10/2022	No customer complaints.	Customer complaints closed.	3/10/2022	
Document Control	4/6/2023	Create document archive.	Procured archive boxes and created document archive in Council Crest WQM closet.	4/6/2023	Document archive includes LT2 archive boxes.
Document Control	1/23/2023	Order new pH calibrtaion booklets with updated 9 pH verification.			
Document Control	1/23/2023	Order new conductivity booklets with verification column.			
Document Control	3/10/2022	Order turbidity calibration booklets.			Contact P&D to order new booklets.
Document Control	3/10/2022	Update SOPs.			SOPs updated; awaiting review/approval.
Document Control	3/10/2022	Update Field Manual.			Work with new Tech II to update Field Manual biannually.

Corrective actions

EPA guidance:
Field groups should establish and maintain a procedure for addressing findings from internal audits through corrective actions whenever nonconformities with these guidelines are identified.

Portland's system:

- Corrective actions provide a permanent fix to a procedural problem
- Procedural not disciplinary action

PORTLAND WATER BUREAU

Field Sampling Corrective Action Form

#

Initiated By: _____
Date Initiated: _____
SOP: _____

Sample ID: _____
Collection Date: _____
Involved Personnel: _____

Issue: _____

Source of Issue (check all that apply)
- ☐ Labeling
- ☐ Collection
- ☐ Paperwork
- ☐ Shipment
- ☐ Other _____

Description of Issue:

_____

_____

Investigation / Proposed Corrective Action

Immediate Action Taken:

_____

_____

Proposed Corrective Actions:

_____

_____

Suggested Root Cause:

_____

_____

Involved Personnel Signature: _____ Date: _____

Follow-Up Review / Closure

Date: _____

Comments:

_____

_____

_____

Program Manager Signature: _____ Completion Date: _____

Steps for an effective correction action

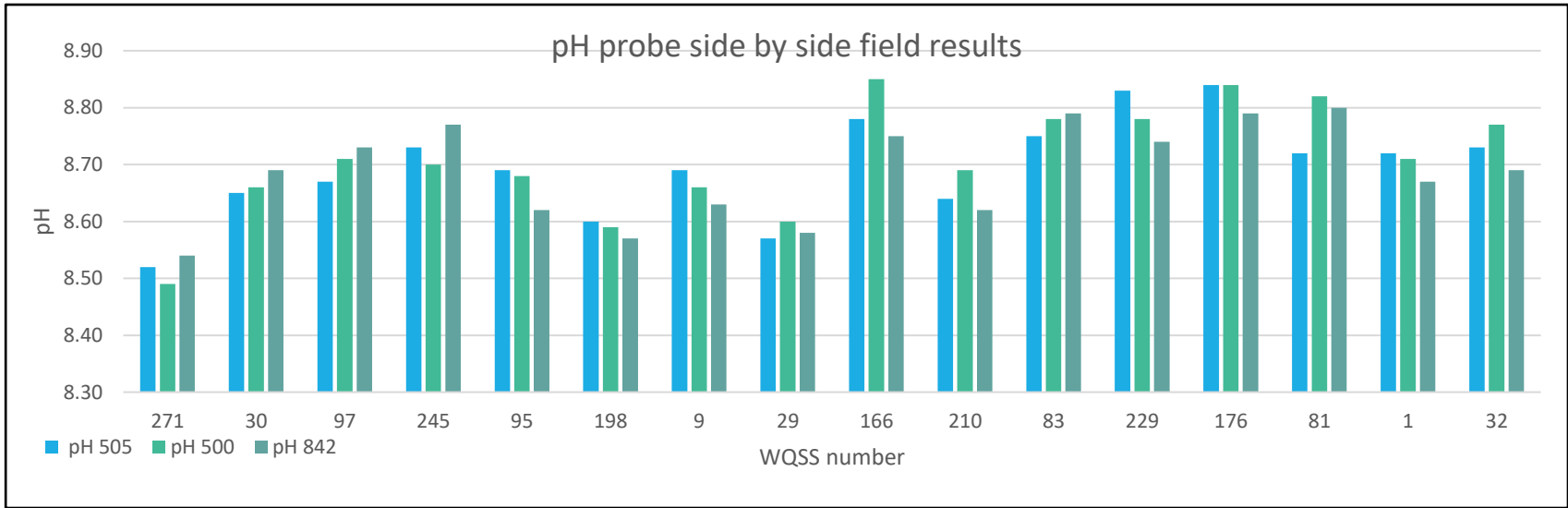
- ✓ Investigate issue
- ✓ Determine root cause
- ✓ Determine appropriate action to correct issue
- ✓ Implement corrective action
- ✓ Monitor corrective action
- ✓ Evaluate effectiveness of correction

Corrective actions

Success Story

Placing new pH probe into service procedure

- Field staff experiencing issues with pH probe calibration and measurements
- Initiated Correct Action and investigated issue through calibration and testing
- Determined pH probe was faulty and unreliable
- Discussed possible reasonable solutions
- Initiated Quarterly side by side testing of all new pH probes



Pulling it all together: Creating a field sampling and measurement organization quality manual

What Is a FSMO Quality Manual?

- Essential part of a Quality System
- Management system structure and supporting procedures
- Documents:
  - Competency
  - Communication
  - Changes
- Helps prevent problems before they occur

Quality Manual Table of Contents

Portland's Quality Manual Contents

5. Management

- Management Requirements
  - Commitment to professional practice and quality of technical operations/competency
- Management Roles and Responsibilities
  - Regulatory Compliance Manager
    - Overall quality, safety, and service performance
    - Provides resources to implement and maintain QS
  - Quality Assurance Manager
    - FSMO Coordinator
    - Internal audits, corrective actions, QS maintenance
  - Technical Manager
    - Supervises FSMO operations and data reporting

Yone Akagi
WQ Manager

WATER QUALITY MONITORING

Ann Levy
Manager

Tom Krause
Environmental Specialist
Distribution System Monitoring

Portland's Quality Manual Contents

18. Management Reviews

- Annual review by Management and QA Officer
- Management Review Topics
  - Policies and procedures
  - Internal audit findings
  - Corrective actions
- Procedures
  - Defines schedule for Management review
  - Review action plan

Portland's Quality Manual Contents

22. Environmental Methods and Method Validation

- Instructions on selecting field sampling methods
- Method Selection
  - Selected on latest edition of method that meets the needs of the program
  - International, Regional, or National standards
  - Manufacturer or laboratory derived standards
  - Laboratory Developed Methods
- Method Validation
- Demonstrate the method is appropriate for intended use
  - Estimation of Analytical Uncertainty

23. Calibration Requirements

- Ensure all equipment and software used for testing and sampling have capable accuracy required for compliance
- General Equipment Requirements
  - Maintenance and repair
  - Calibration frequency and specifications
  - Equipment and software records

Portland's Quality Manual Contents

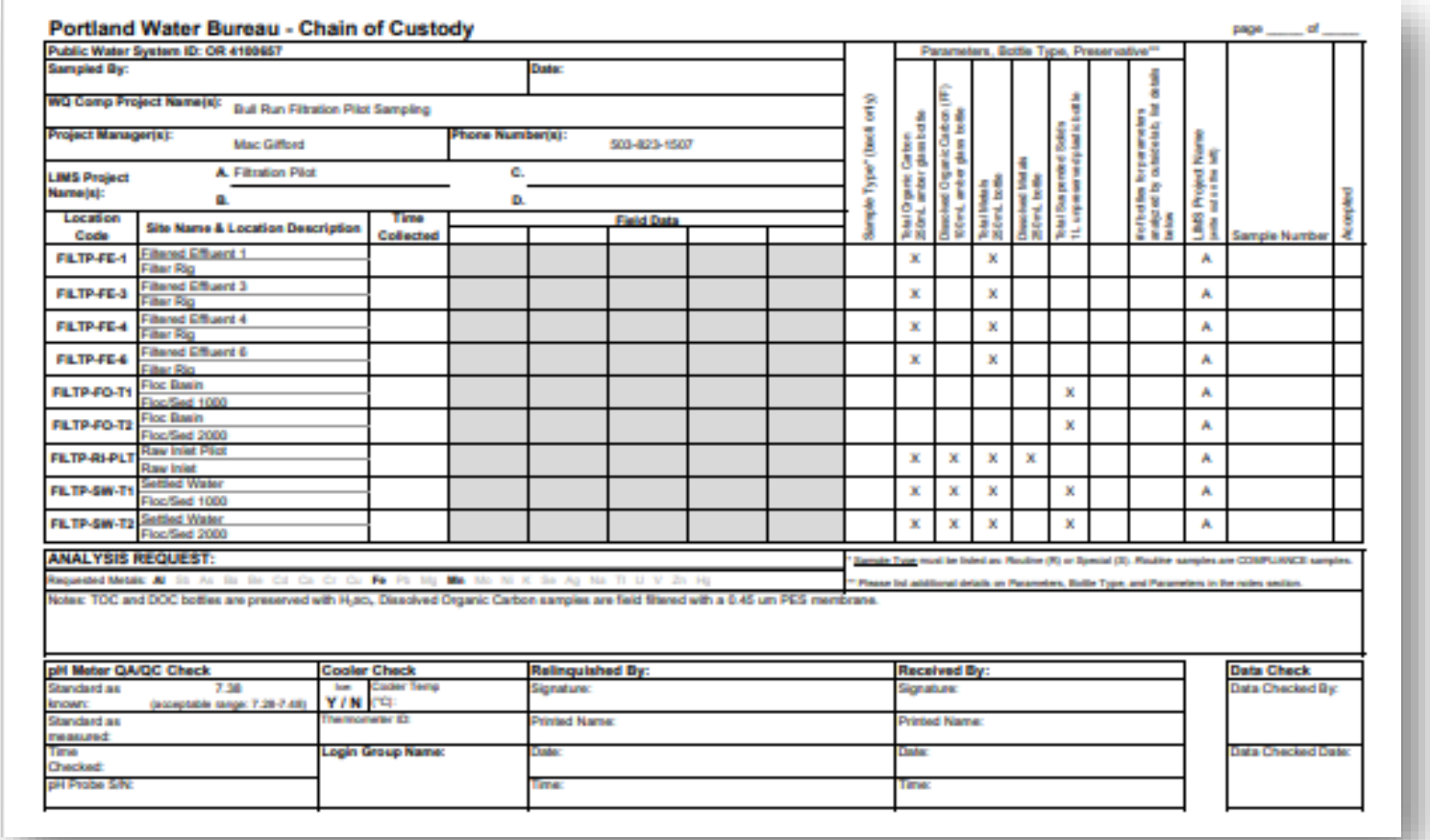
25. Collection of Samples

- Details on sampling program information, field sheets, and field sampling requirement responsibilities
- Sampling Containers
  - Preparation instructions, preservatives, and sample holding time information
- Sampling Plans
  - Documentation and instructions for Laboratory, Field Samplers, and Project Managers
- Sampling Records
  - Information and data recorded on field sheets

Portland's Quality Manual Contents

26. Handling Samples and Test Items

- Sample Receipt
  - Chain of Custody and sample log in information
- Sample Acceptance
  - Laboratory Sample Acceptance Policy
- Sample Identification
  - Sample number and LIMS data



Portland Water Bureau - Chain of Custody

page _____ of _____

Public Water System ID: OR 4100657

Sampled By: | Date:

WQ Comp Project Name(s): Bull Run Filtration Pilot Sampling

Project Manager(s): Mac Gifford | Phone Number(s): 503-823-1507

LIMS Project Name(s): A. Filtration Pilot | B. | C. | D.

Location Code	Site Name & Location Description	Time Collected	Field Data					Sample Type* (back only)	Parameters, Bottle Type, Preservative**							LIMS Project Name (write out on the left)	Sample Number	Accepted
FILTP-FE-1	Filtered Effluent 1 / Filter Rig								X		X					A		
FILTP-FE-3	Filtered Effluent 3 / Filter Rig								X		X					A		
FILTP-FE-4	Filtered Effluent 4 / Filter Rig								X		X					A		
FILTP-FE-6	Filtered Effluent 6 / Filter Rig								X		X					A		
FILTP-FO-T1	Floc Basin / Floc/Sed 1000												X			A		
FILTP-FO-T2	Floc Basin / Floc/Sed 2000												X			A		
FILTP-RI-PLT	Raw Inlet Pilot / Raw Inlet								X	X	X	X				A		
FILTP-SW-T1	Settled Water / Floc/Sed 1000								X	X	X		X			A		
FILTP-SW-T2	Settled Water / Floc/Sed 2000								X	X	X		X			A		

ANALYSIS REQUEST:

Requested Metals: **Al** Sb As Ba Be Cd Ca Cr Co Cu **Fe** Pb Mg **Mn** Mo Ni K Se Ag Na Tl U V Zn Hg

* Sample Type must be listed as Routine (R) or Special (S). Routine samples are COMPLIANCE samples.

** Please list additional details on Parameters, Bottle Type, and Parameters in the notes section.

Notes: TOC and DOC bottles are preserved with H_2SO_4. Dissolved Organic Carbon samples are field filtered with a 0.45 um PES membrane.

pH Meter QA/QC Check	Cooler Check	Relinquished By:	Received By:	Data Check
Standard as known: 7.38 (acceptable range: 7.28-7.48)	Ice Y / N; Cooler Temp (°C):	Signature:	Signature:	Data Checked By:
Standard as measured:	Thermometer ID:	Printed Name:	Printed Name:	
Time Checked:	Login Group Name:	Date:	Date:	Data Checked Date:
pH Probe S/N:		Time:	Time:	

Pause for questions

Benefits & How to Start

- How Has Field Sampling Improved?
- Why Have a FSMO Quality System?
- FSMO NEFAP Accreditation Process

How has field sampling improved?

Standardized training

- Can track initial and refresher training
- Pathway for questions from field staff
- Weekly field staff meetings
- Field Sampling channel on MS Teams

How has field sampling improved?

Standardized training

Comprehensive documentation

- Auditable trail of documents for data defensibility

How has field sampling improved?

Standardized training

Comprehensive documentation

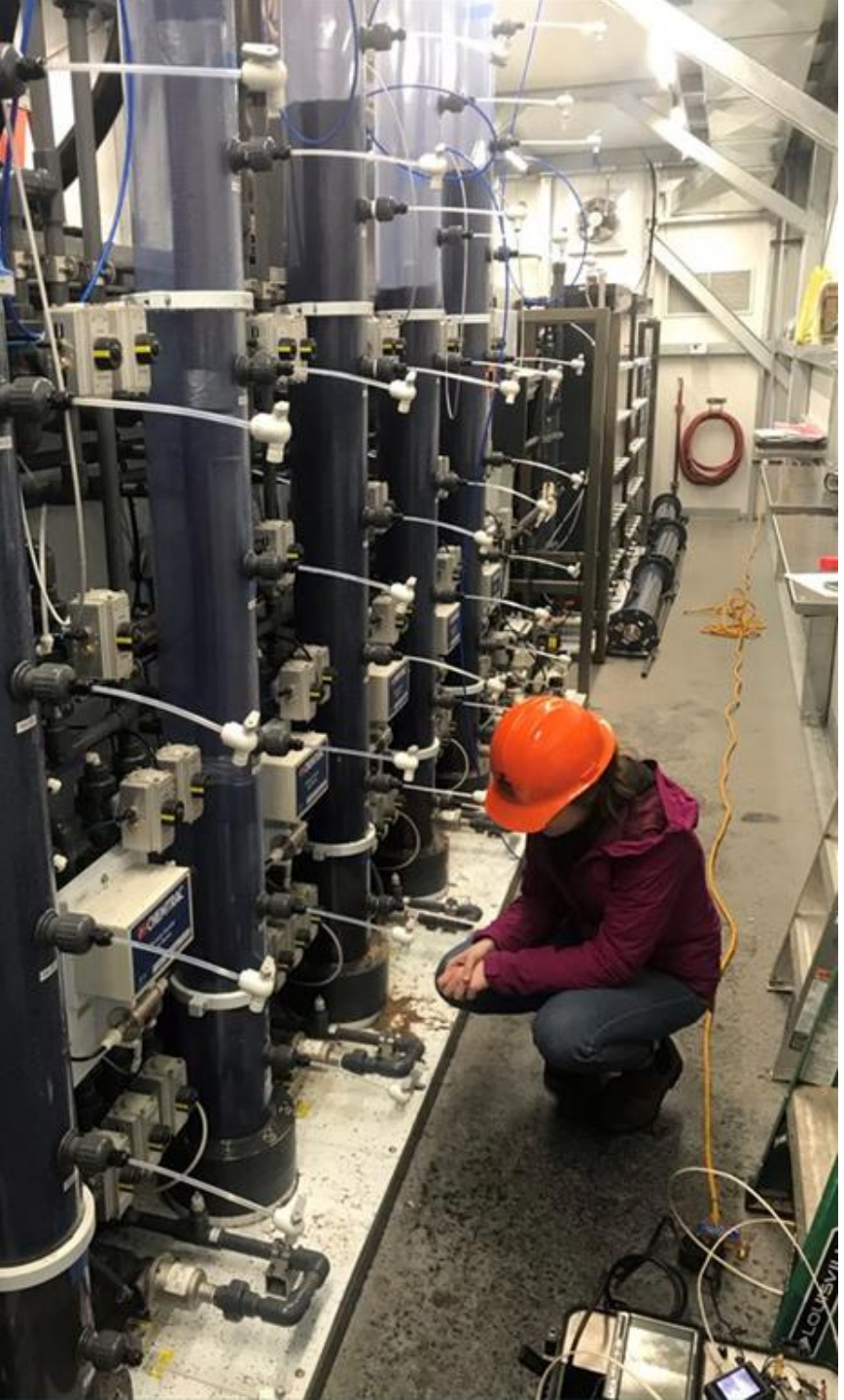
Instrument maintenance

- Procedure for investigating issues
- Ability to resolve problems
- Documentation prevents future issues

How has field sampling improved?

- Standardized training
- Comprehensive documentation
- Instrument maintenance
- Data quality and integrity

- Increased confidence with results
- Can defend data effectively
- Documentation and trainings reduce risk



Why should YOU have a FSMO Quality System?

Don’t wait for failure to address issues!

Reduce risk through consistent processes

Be prepared!

- Possible future State requirements
- Regulatory/Legal data defense

Develop confidence for field staff

- Well defined roles and responsibilities
- Clearly define procedures for training, field sampling, and documentation

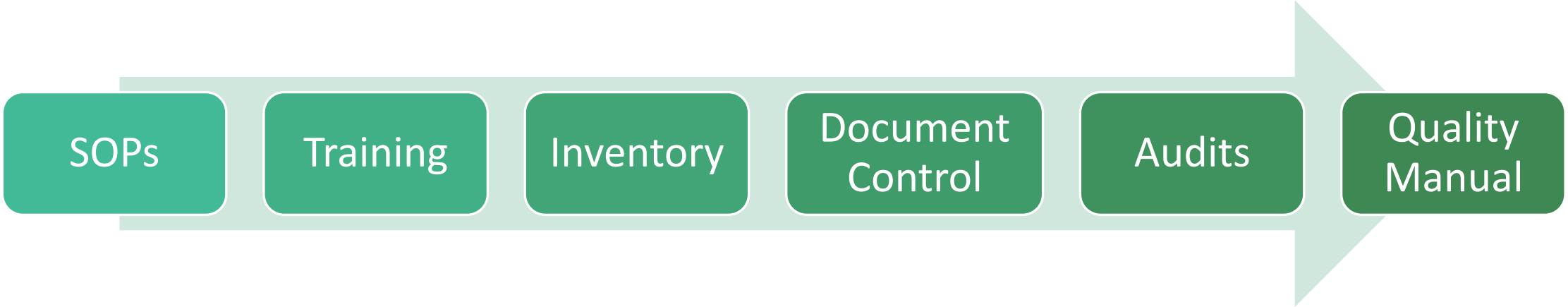
Improved quality while preventing issues from occurring

Avoid up to 5 years in prison and $250,000 in fines!

Creating a FSMO Quality System: don't be overwhelmed!

- ❑ Set scope to scale
- ❑ Engage with field and laboratory staff
- ❑ Utilize TNI NEFAP/AB resources (nelac-institute.org)
- ❑ Read FSMO standards
- ❑ Start small!

Portland's quality system: 10 years in the making



FSMO NEFAP Accreditation Process

- Choose a Certified Accreditation Body
  - ANSI-ASQ National Accreditation Board
  - American Association for Laboratory Accreditation (A2LA)
  - Perry Johnson Laboratory Accreditation, Inc. (PJLA)
- Application
- Management System Review
- Onsite Field Assessment
- FSMO Accreditation
- Follow-up assessment

Conclusions

- A Quality System is a way to document FSMO policies and procedures
- Increases FSMO traceability, documentation, and data defensibility
- Produces high quality data and improves decision making
- Critical component for FSMO NEFAP accreditation

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- **Mikkel Holt** – Environmental Technician II
- **Sarah Messier** – Water Quality Information Coordinator
- **Water Quality Monitoring Group**
- **Portland Water Bureau Laboratory**

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PORTLAND WATER BUREAU

FROM FOREST TO FAUCET

CITY OF PORTLAND, OREGON 1851