Water Quality Parameters & Corrosion Control

How to Monitor Water Quality to Prevent Lead & Copper.. & Excursions

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Drinking Water Services
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Agenda

-0034(1)-(3): CC Tx (6 pgs)

<u>-0036(10)</u>: Monitoring

-0036(10)(f): WQPs (3 pgs)

- Introduction/Goals
 - WHO: Which WSs monitor WQPs?
 - WHAT: Galvanic Corrosion
 - Treating Corrosion, General chemistry
 - Jargon Don't confuse your operator
- Regulatory Overview
 - WHERE do WQPs fit in the sprawling LCR landscape (LCR, LCRR, LCRI, PE, etc..)
- Reporting: DWS's least intuitive forms (WHEN)
- ноw: Procedure, DataOnline, Actions, Schedules



Oregon's 2,000 County-regulated WSs:

900 WSs monitor Lead & Copper (All C & NTNC WSs)

- 80 WSs Treat Corrosion Control ∴ WQPs
 - 65 WSs use either Soda Ash or Caustic Soda
 - (6 orthophosphates)

• Will it increase with new 10 ppb Action Level? (Refresh before a raft of new Exceeders)



Lead and Copper Rule is Tricksy

- Is it the "worst" OAR in 333-061-?
 - Operators must coordinate sampling & overcommunicate with customers
- Maintaining Water Quality Parameters (WQPs) saves operators time & headaches, though...





Goal:

Stop Pipe Corrosion.

Don't Poison Children's Brains.

Establish & Maintain Min. WQP



The Science of Corrosion and WQPs

- Corrosion reducing metals to original form
 - (e.g., gold goes to gold (Au), steel goes to iron (Fe) & alloys)
- Galvanic Corrosion transfer of electrons
 Complex, but ultimately quite <u>simple</u>:
 - Increase pH
 - Increase Alkalinity
 - Increase pipe-coatings, like ortho-phosphate (Passivation)
- How?
 - Add a strong BASE: Caustic Soda, NaOH, pH 14
 - Add a weak BASE: Soda Ash, Na₂CO₃, pH 10
 - PASSIVATE Pipe: Phosphate, -PO₄³⁻



Caustic Soda, Sodium Hydroxide, NaOH

Only increases pH

More difficult to work with a dangerously hot

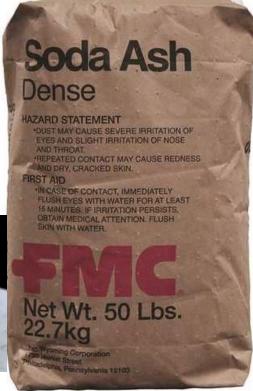
chemical



Soda Ash, Sodium Carbonate, Na₂CO₃

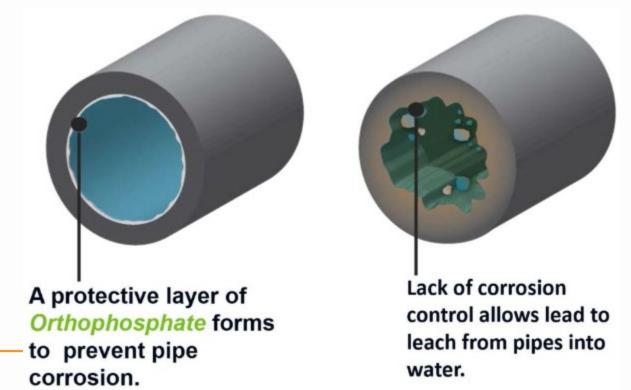
- Adds Alkalinity as well as increases pH
- Slow to dissolve
- Can be difficult to auger
- Easier to work with than burning hot caustic





Zinc Orthophosphate, Zn₃(PO₄)₂

- Different mechanism "Passivation"
- Doesn't affect pH or alkalinity



Intro: Chemistry

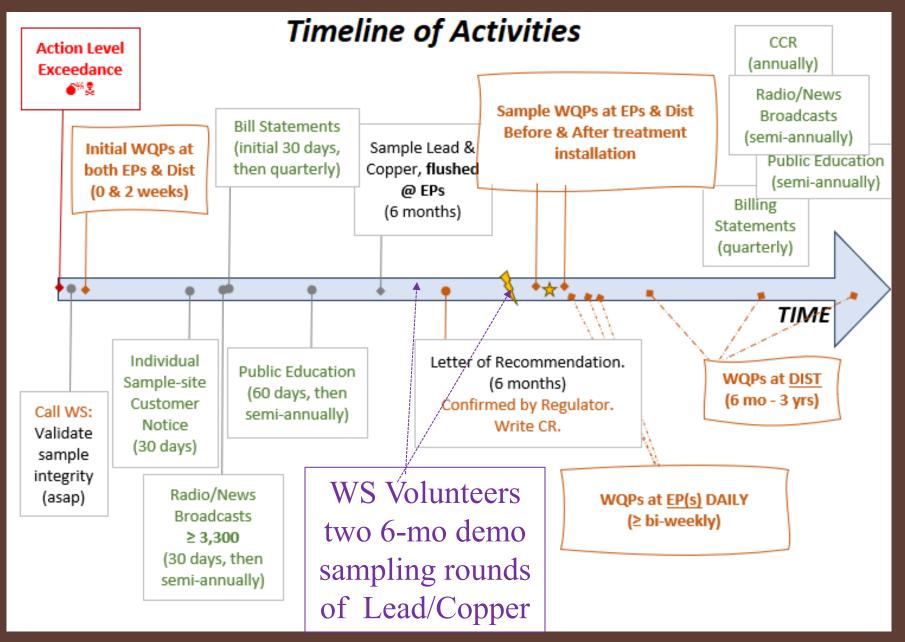
- LCR has some magic in its corrosion chemistry
- WQPs are straight-forward, once you decide the proper treatment (see Slide 16 for flowcharts)
- Caustic vs. Acidity
- Alkalinity, pH & DIC are interrelated
 - Alkalinity & DIC is needed to form protective scale, but too much can solubilize lead(!)
 - ... calcium, conductivity and temperature
- Coatings prevent the exchange of electrons

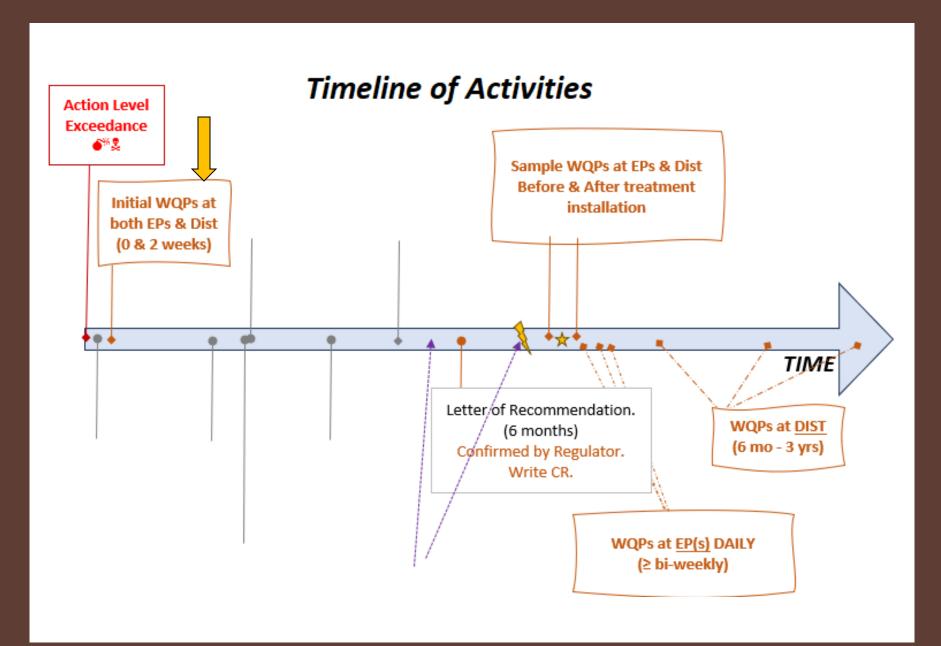


Jargon – Don't Confuse Operators

- WQP Water Quality Parameters:
 - Alkalinity, pH, Calcium, Hardness, Silica, ORP
- Phosphates ortho-, poly-, are slightly different.
 - (Poly-phosphates are typically <u>not</u> for corrosion.)
 - Orthophosphates "passivate" pipe & prevents leaching metals
- DIST v. EP very significant distinctions in WQP monitoring
- Excursions WQP data was skipped or <u>did not meet</u> min.
 - 10 Excursions in half a year (Jan-Jun or Jul-Dec) is a Violation.
 - Return to two 6-month Demonstration Rounds of LCR sampling, asap
- LCR, L/C, CCTx, AL, DIC, "Paired" sampling, "soda," etc.

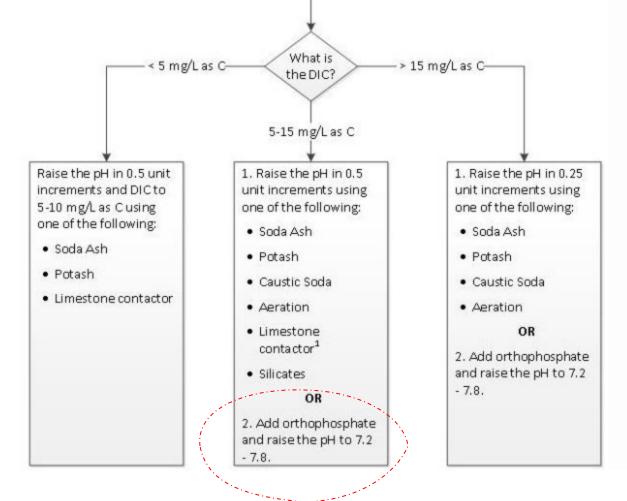






Example Flowchart: Start Here Lead only or Lead & Con

Lead only or Lead & Copper with pH < 7.2



KEY:

AL = Action Level
Caustic soda = sodium hydroxide (NaOH)
DIC = Dissolved Inorganic Carbon

Footnotes:

 Limestone contactors may not be appropriate when DIC > 10 mg/L as C.

Letter of Recommendation - Document

 Make Contact Reports, but esp. for Letter of Recommendation where WS chooses which corrosion control treatment option.

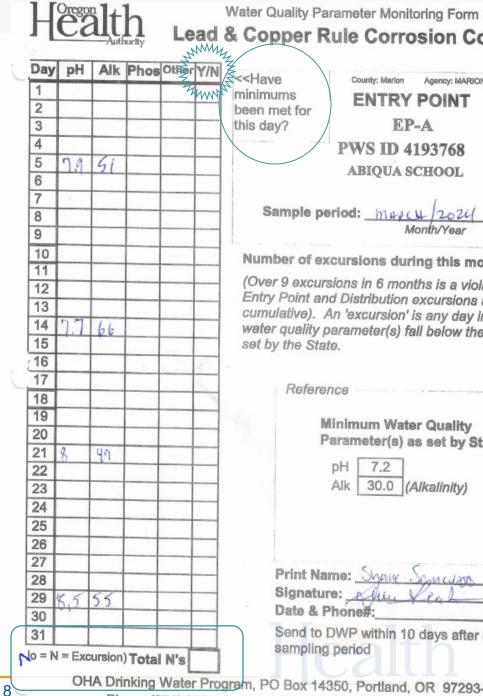


WQP EP Form

- Sample **Daily**
 - at least every fortnight
 - Not semi-monthly

- CONFIRM ≥ Minimums
 - Or go back to 6 mo LCR
- Don't adapt form to compress dates

OHA Public Health Division Drinking Water Services



Phone (971) 673-0405 Website: http://healthoregon.org/dwp/

WQP DIST Form

- Adapt Form for Dates (Important for compliance)
- Coliform sites, not L/C sites
- Due with L/C results sched.
 (6 months to 3 years)
 - Two sample-sets in DIST

 (a few weeks apart is ideal) during each
 monitoring period
 -0036(10)(f)(E)





Water Quality Parameter Monitoring Form

Lead & Copper Rule Corrosion Control

	ID#	Sample Location	рН	Alk	PO4	other	Y/N
Ī	wL I	west Linn Public works	8.05	26			Y
	wL 2		7.90	15			
	wL3	Horton Pump Station	7.84	24			
3	ml4	,	7.91	27			
-	wL5	1391 Skye Parkway	8.39	21			
2	wL6	5578 River St	7.92	28			
,	WL7	Dollar Street 5.5.	7.91	30			
	wl8	22601-M willamethe PR	7.88	25			✓
•	WLI	west Linn Publiz works	8.10	40			Y
	wlz	Maxfeld Sanyle Station		26			1
	WL3	Hoston Pump Station	7.81	27			
	WL4	Rosemont Reservoir	7.83	28			
202	wl5	1391 skye farkway	8.34	30			
200-	wl6	5578 fiver St	7.91	30			
00	WL7	Pollar Steets.5.	7.88	21			
	WL8	22601-M willamette OR	7.83	27			V
		,					
	, .						
				- 1			
		(N = No = Excu	ursion) To	tal N'	s İ	0

Has sample met the minimums?
PWS ID: 41 0 0 9 4 9
System Name: City of Wcst Line

Sample Period: Some 2021

Month/Year
Sample Frequency: Every 36 mo

Distribution Samples required: _

Number of excursions during this Sample Period = _____

(Number of locations when any WQI was less than the minimum.)

Note: Entry Point and Distribution Excursions are cumulative. Add Entr Point and Distribution Excursions to total for sample period.

For OHA use only

Minimum Water Quality Parameters as set by

pH 7.8
Alk 27.0 (Alkalinity)
PO4 (Orthophosphate)
Other (

Print Name: Luke Fullington
Signature: Lu Jullington

Date: 6-30-2021

Distribution Sites by Population:

Standard &

Number of People Served by the Water System —
Standard Number of Sample Sites
>100,000 — 25
10,001-100,000 — 10
3,301 to 10,000 — 3
501 to 3,300 — 2
101 to 500 — 1

Reduced

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Number of People Served by the Water System — Reduced Number of Sample Sites >100,000 — 10 10,001-100,000 — 7 3,301 to 10,000 — 3 501 to 3,300 — 2 101 to 500 — 1 <100 — 1
```

- Use Coliform Sites representative
- Can Reduce if less than $\frac{1}{3}$ A.L. (changing?)



<100 - 1

CCR v. LCR **Violations:**

Violation Number		Monitoring F Begin	Period End	Facility ID		Violation Type - Analyte Count Show analytes for all violations		Points
903389114	Υ	Jul 01, 2023	Jul 05, 2023		CCR	CCR Late/Nonreporting - 1	Returned To Compliance - Jul 05, 2023	1

SYSTEM SCORE SUMMARY

Learn about system scores

Unaddressed Points:

Number of years the oldest violation has been unaddressed (n):

- Don't confuse yourself with jargon, either:

CCR = Excursions
 LCR = L/C sampling

Particularly note Violations that don't Auto-resolve.

2600440	N	Apr 01, 2018	Aug 12, 2020		LCR	Public Notice Late/Nonreporting (Viol # 2600439) - 1 Hide analyte LEAD & COPPER RULE	Returned To Compliance - Aug 12, 2020	1
2600448	Y	Jan 01, 2020	Jun 30, 2020	DIST-A	LCR	LCR Late/Nonreporting - 1 Show analyte	Returned To Compliance - Aug 12, 2020	1
2600447	Y	Apr 01, 2020	Apr 30, 2020		TCR	Routine Coliform - Did Not Report ANY - 1	Returned To Compliance - May 22, 2020	1
2600446	Y	Jul 01, 2019	Dec 31, 2019	DIST-A	LCR	LCR Late/Nonreporting - 1 Show analyte	Returned To Compliance - Aug 12, 2020	1
2600445	Y	Jan 01, 2019	Jun 30, 2019	DIST-A	LCR	LCR Late/Nonreporting - 1 Show analyte	Returned To Compliance - Aug 12, 2020	1

SYSTEM SCORE SUMMARY

Learn about system scores

Unaddressed Points: Number of years the oldest violation has been unaddressed (n):



Data Online





Introduction :: Data Search Options :: Water System Search :: DWS Home :: DWS Rules :: Quick Data Links

PWS ID: 01233 ---- DEER ISLAND WATERWORKS

OR41

Lead & Copper

|--|

Required Minimums

Facility	рН	Alkalinity	Phosphate	Silicate	Required Frequency	Last Modified
DIST-A	7.0				6 Months	6/14/2001
FP-A	7.0				*	6/14/2001



Data Online

Corrosion Control (LCR)

		Mir	nimums Requ	ired For Th	nis System	
Facility	pH	Alkalinity	Phosphate Ph	Silicate	Required Frequency	Last Modified
DIST-A	7.2	30.0			Yearly	Mar 01, 2018
EP-A	7.2	30.0			*	Mar 01, 2018

⁻⁻ indicates that the system is not required to test for that parameter

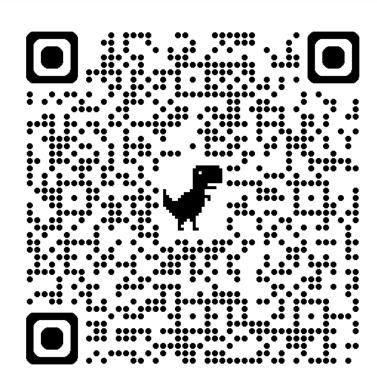
			Test Results	
Period	Facility	Excursions This Period	Total Excursions For <mark>6-Month</mark> Monitoring Period	Date Received
Mar 2024 (pdf)	EP-A	0	0	Apr 01, 2024
Feb 2024 (pdf)	EP-A	0		Feb 29, 2024
Jan 2024 (pdf)	EP-A	0		Jan 29, 2024
Dec 2023 (pdf)	EP-A	0	0	Dec 22, 2023
Nov 2023 (pdf)	EP-A	0		Nov 28, 2023
Oct 2023 (pdf)	EP-A	0		Oct 31, 2023
Sep 2023 (pdf)	EP-A	0		Sep 29, 2023 - Requirement not met*
Aug 2023 (pdf)	EP-A	0		Aug 29, 2023
Jul 2023 (pdf)	EP-A	0		Jul 27, 2023
Jun 2023 (pdf)	EP-A	0	0	Jun 29, 2023
May 2023 (pdf)	EP-A	0		May 26, 2023



^{*} Entry point readings can be taken daily but are required at least every 14 days.

Get Started: WS 1st Exceeds Pb or Cu

- Lead or Copper Exceedance Procedure
- Call WS Invalidate?, Replace Plumbing?*
- Auto-letter:
 - 2 rounds WQPs in 2 weeks
 - PE (if Pb), Notice, Bills, CCR
 - Lead & Copper at EP in 6 mo
 - Volunteer 6 mo. demo L/C
 - Letter of Recommendation



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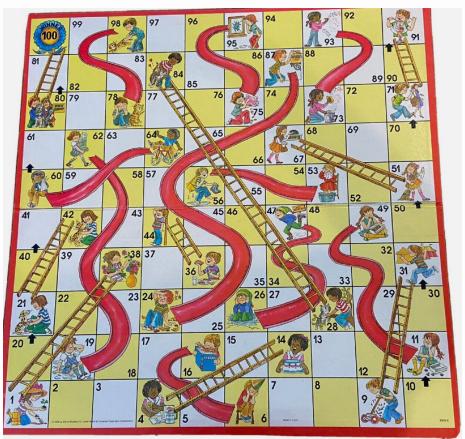
Get Started: WS 2nd+ Exceeds Pb or Cu

- Lead or Copper Exceedance Procedure
- Call WS Invalidate?
- Auto-letter:
 - 2 rounds WQPs in 2 weeks
 - PE (if Pb), Notice, Bills, CCR
 - Lead & Copper at EP in 6 mo
 - Investigate & Repair CC Tx
 - Must do L/C demo sampling



Lead & Copper Rule is like a game... with only chutes

- WS Chutes back to the beginning when:
 - 10 Excursions&
 - Exceeding AL





Resources: Drinking water website



Oregon Drinking Water Services



About Change Healthcare's cybersecurity incident impacting health care providers: Visit the company website or find local resources.

Monitoring Resources

Drinking Water Services

County & Dept. of Agriculture Resources

Water System Surveys

Conferences and Training

Document Library

Inventory Updates

EPA Staff Resources

Coliform Resources

Monitoring Resources

Compliance Resources

Contact Us

The information on this page is designed for and intended for use by Drinking Water Services County and Department of Agriculture partners who have specialized training and are registered as environmental health specialists. If you have questions regarding this material please contact Drinking Water Services at (971) 673-0405.

All documents below are in PDF format.

- Chemical Monitoring Schedules for Community and Non-Transient Non-Community groundwater systems
- Standard Monitoring Framework
- Alerts: What to Do With Chemical Detections
- Arsenic Testing and Follow-up at TNC and Oregon Very Small Water Systems
- Emergency Groundwater Source Monitoring Requirements

Lead and Copper Rule:

- · Lead or Copper Exceedance Procedure
- Plumbing Replacement Program Procedure
- Lead and Copper Tap Sample Invalidation Procedure



Resources: Procedures Online

- LCR Corrosion Control WQP Instructions and Background (2 pgs)
 - How to fill out the EP and DIST forms
 - Compliance issues
- Lead or Copper Exceedance Follow-up (7 pgs)
 - The long & winding road
 - Public Communications, WQPs, EP sampling, refs



QUIZ¹

- Which WSs require alkalinity monitoring? Soda Ash, Na₂CO₃.
- What Corrosion Control Treatments are there? Soda Ash, Caustic Soda, ortho-phosphates... don't sweat anything else.
- How to set the minimum if it is not already set? Paired samples. More quality data is better.



QUIZ²

- When are WQP sampled in the DIST?
 Similar schedule & frequency as Lead & Copper sampling.
- How many times can WS 'sample out of CCTx'?
 Once.
- What's different: Lead or Copper exceedance?

 Public Education...?



QUIZ³

- What's the first thing to do when WS Exceeds? Walk the "Lead or Copper Exceedance Procedure"
- What happens if WS with CC Treatment exceeds L/C while meeting minimum WQPs?
 Re-evaluate WQP minimums with paired sampling.
- Is there a <u>maximum</u> time of non-use of a sample site that invalidates a Lead & Copper sample?
 Nope.

QUIZ4

 Who writes the Letter of Recommendation? You? WS?

WS must decide, but you* 'recommend' to the WS.

- Can the WQPs be different at the EP & DIST? Yes, but... perhaps unnecessary and overly complicated. (Soda ash alkalinity tends to increase with time.)
- Can WSs stop treating corrosion?

Theoretically, Yes, using the dicey procedure of accruing paired sample results.

Questions??



- Pete Farrelly, Technical Services, DWS
- Peter.R.Farrelly@oha.oregon.gov
- 971.201.6428



References

 <u>EPA's</u> Optimal Corrosion Control Treatment Evaluation Technology Recommendation for Primary Agencies. (<u>updated</u>) (Flowcharts!)

 Also has spreadsheet to track compliance actions for WS ≤ and ≥ 50k people.

(next slide example)

To be completed by: Primacy Agencies			
Purpose: To document the regulatory dea		I treatment steps for systems servi	ng 50,000 or fewer people
that have a lead and/or copper action lev	el exceedance.		
Requirement	Timetable for Completing Corrosion Control Treatment Steps ¹	Compliance Date (to be completed by the Primacy Agency)	Corresponding Section of The OCCT Manual
STEP 1: System exceeds the lead or copper action level (AL).			
STEP 2: System recommends optimal corrosion control treatment (OCCT).	Within 6 months ²		Section 4.1.1
STEP 3: Primacy Agency decides whether system must perform a corrosion control study. If system must conduct a corrosion control study, go to Step 5. If not, go to Step 4.	Within 12 months ²		Section 4.1.2
STEP 4: The Primacy Agency designates OCCT for systems that were not required to conduct a study. Go to Step 7.	 Within 18 months² for systems serving 3,301-50,000 people Within 24 months² for systems serving ≤ 3,300 people 		Section 4.1.3
STEP 5: System completes corrosion control study. ³	Within 18 months after Primacy Agency requires that such a study be conducted		Section 4.1.4
STEP 6: Primacy Agency designates OCCT. ³	Within 6 months after completion of Step 5		Section 4.1.5
STEP 7: System installs OCCT.	Within 24 months after the Primacy Agency designates such treatment		Section 5.1
STEP 8: System conducts follow-up sampling for 2 consecutive 6-month periods.	Within 36 months after the Primacy Agency designates OCCT		Section 5.2
STEP 9: Primacy Agency designates optimal water quality parameters (OWQP).4	Within 6 months after completion of Step 8		Section 5.3
STEP 10: System conducts continued WQP and lead and copper tap sampling.	The schedule for required monitoring is based on whether the system exceeds an AL and/or complies with OWQP ranges or minimums		Section 5.4

Exhibit 4.1: Review of CCT Requirements and Deadlines (§141.81(e))

Tracking all the Actions – (More Online these days)



- Find a tracking system that works for you over time.
 - 30 days, 60 days, quarterly, semiannually, etc.

