
Coliform Investigations

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Public Health Division
Drinking Water Services

Oregon
Health
Authority

Find and Fix – cornerstone of RTCR

- Improve public health protection by building on actions already being taken by well-run system
 - “Find-and-fix:” investigations followed by corrective action
- Use total coliform as a more suitable indicator of system operation since it is not an immediate public health concern
 - TC+ as a red flag

**Get out there
and
investigate!**



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Defects vs Deficiency

- Significant deficiencies were identified as issues that DWS would be ready to require correction of. Could be:
 - Construction standards
 - Regulatory requirements
 - Operational
 - Compliance issues
- Sanitary defect is specifically any pathway for microbial contamination

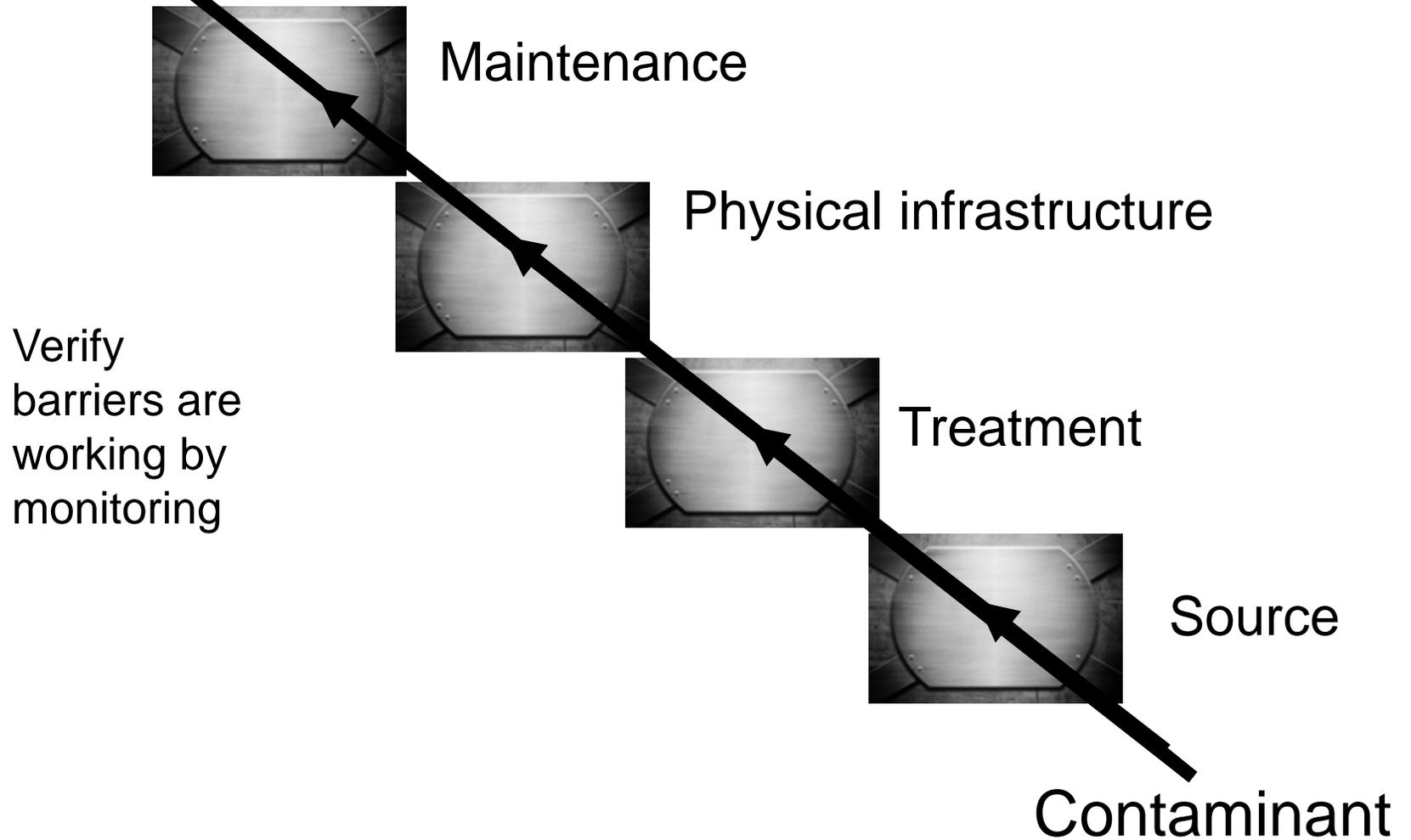
Deficiency or defect?



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Multiple Barriers





Coliform Investigations

- Performed in response to a confirmed TC+ or EC+ within 30 days
- Called Assessments by EPA
- A field examination of the source water, treatment, distribution system and relevant operational practices
- Includes likely cause, corrective action plan, and schedule.
- Form are available on DWS website

Level 1 investigation triggers

- Having two or more total coliform-positive samples in the same month at water systems where fewer than 40 samples per month are collected (**Previous MCL**); or
- Exceeding 5.0% total coliform-positive samples for the month at water systems where 40 or more samples per month are collected; or
- Failing to collect every required repeat sample after any single total coliform-positive sample.

Level 2 Investigation Triggers

- Exceeding the MCL for *E. coli*; or
- A second Level 1 trigger within a rolling 12-month period

Alert process

- You will get an Alert via email
- New procedures, on Partner's page
 - Alert procedure (includes all coliform detects)
 - Investigation procedure
- DMCE will evaluate if investigation is triggered
 - Later, the alert will indicate if investigation is triggered
- Schedule Level 2 investigations right away!

Level 1 process

- Contact water system operator
- They will receive form and cover letter in mail (auto-generated by SDWIS)
 - Also on website
 - Write contact report!
- Investigation must be conducted by representative of water system
- Note that they must send completed form to Reg Agency within 30 days

Level 2 Process

- Conduct Investigation as soon as possible!
- If system is on a boil advisory, and they want to lift the boil before you can get out there:
 - Have system conduct Level 1 investigation
 - Photo document defect(s) found and correction
 - Coliform samples all negative
 - Conduct field Level 2 Investigation as soon as possible
- Submit form to DMCE compliance in-box

Non-EPA systems

- Still not adequately funded
- Still communicate what the rule requires
 - Level 1 investigations for TC+
- Still focus on “bad water” from a public health perspective
 - Consider conducting a Level 2 investigation for EC+
 - Boil water advisory
 - Phone consultation to encourage correcting defects?



Level 1 Coliform Investigation Form
Oregon Health Authority, Drinking Water Services

Complete the coliform investigation and return the form within 30 days to your County, Dept. of Ag, or State regulatory contact

PWS Name:		PWS ID #:	41
	Name	Telephone #	
Operator in Direct Responsible Charge			
Person(s) that collected samples if different than above			
Date of Investigation:			

INVESTIGATION DETAILS			
Did any of the following events occur prior to collection of the positive total coliform samples?	Yes/No	N/A	If Yes, describe issue
1. Loss of pressure anywhere in the system	Y <input type="checkbox"/> N <input type="checkbox"/>		
2. Maintenance on the system that could have introduced contamination	Y <input type="checkbox"/> N <input type="checkbox"/>		
3. Repair of broken water lines	Y <input type="checkbox"/> N <input type="checkbox"/>		
4. New water lines or service connections added to the system	Y <input type="checkbox"/> N <input type="checkbox"/>		
5. Vandalism or unauthorized access to facilities	Y <input type="checkbox"/> N <input type="checkbox"/>		
6. Water line flushing or fire fighting event	Y <input type="checkbox"/> N <input type="checkbox"/>		
7. Low chlorine or chloramine residual anywhere in the system	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>	
8. Failure of chlorination/UV equipment or minimums not met	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>	
9. New or different source of water introduced (example: backup well)	Y <input type="checkbox"/> N <input type="checkbox"/>		
10. Loss of electrical power	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>	
11. Unprotected connection to non-potable water discovered (example: private well, irrigation line, fire sprinkler system)	Y <input type="checkbox"/> N <input type="checkbox"/>		
12. Failure to test all backflow prevention devices within the last year	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>	
13. Discovery of water system components submerged in water (example: well or valves in a flooded vault)	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>	
Wells & Springs - Inspect each groundwater source for physical defects and report:	Yes/No	N/A	If Yes, describe issue
1. Cracks or holes in well seal or casing	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>	
2. Repair/replacement of well/spring components (example: well pump)	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>	
3. Wellhead flooded or water puddled near well	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>	
4. Screen for well vent missing or damaged	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>	
5. Feces, fecal source or other unsanitary conditions at the well/spring	Y <input type="checkbox"/> N <input type="checkbox"/>		
6. Leaking sewer lines or septic tanks near well/spring	Y <input type="checkbox"/> N <input type="checkbox"/>		
7. Cracks or holes in springbox	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>	
8. Water flowing or puddled on the ground around springbox	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>	

Rev. 2/16/16

Unusual Events – Level 1

Combined pressure issues, disinfection, cross connection

Did any of the following events occur prior to collection of the positive total coliform samples?	INVESTIGATION DETAIL		
	Yes/No	N/A	
1. Loss of pressure anywhere in the system	Y <input type="checkbox"/> N <input type="checkbox"/>		
2. Maintenance on the system that could have introduced contamination	Y <input type="checkbox"/> N <input type="checkbox"/>		
3. Repair of broken water lines	Y <input type="checkbox"/> N <input type="checkbox"/>		
4. New water lines or service connections added to the system	Y <input type="checkbox"/> N <input type="checkbox"/>		
5. Vandalism or unauthorized access to facilities	Y <input type="checkbox"/> N <input type="checkbox"/>		
6. Water line flushing or fire fighting event	Y <input type="checkbox"/> N <input type="checkbox"/>		
7. Low chlorine or chloramine residual anywhere in the system	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>	
8. Failure of chlorination/UV equipment or minimums not met	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>	
9. New or different source of water introduced (example: backup well)	Y <input type="checkbox"/> N <input type="checkbox"/>		
10. Loss of electrical power	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>	
11. Unprotected connection to non-potable water discovered (example: private well, irrigation line, fire sprinkler system)	Y <input type="checkbox"/> N <input type="checkbox"/>		
12. Failure to test all backflow prevention devices within the last year	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>	
13. Discovery of water system components submerged in water (example: well or valves in a flooded vault)	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>	

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Unusual Events – Level 2

General Operations Report any defects in general operation of the system:	Yes/No	N/A	
1. Power outages that affected water system facilities during the 30 days prior to the TC+ or EC + findings	Y <input type="checkbox"/> N <input type="checkbox"/>		
2. Water line flushing or fire fighting event	Y <input type="checkbox"/> N <input type="checkbox"/>		
3. Inadequate disinfection during and after repairs or new construction (example: pipe repair, well repair, new tank)	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>	
4. Any other issues/problems/sources of contamination that may have caused the positive coliform result (e.g. vandalism; unauthorized access...)	Y <input type="checkbox"/> N <input type="checkbox"/>		

Unusual Events / Distribution – Level 2

Distribution System Inspect the distribution system for physical defects and report:	Yes/No	N/A
1. Failure to maintain adequate pressure or low pressure event (example: pump failure leading to low pressure)	Y <input type="checkbox"/> N <input type="checkbox"/>	
2. Recent main break or repair of broken water lines	Y <input type="checkbox"/> N <input type="checkbox"/>	
3. New water lines or service connections added to the system	Y <input type="checkbox"/> N <input type="checkbox"/>	
4. Improper construction of new, replaced, or renovated lines or service connections	Y <input type="checkbox"/> N <input type="checkbox"/>	
5. Known leaks in the distribution system	Y <input type="checkbox"/> N <input type="checkbox"/>	
6. Supervisory control and data acquisition (SCADA) and control issues	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>

Unusual Events / Cross Connection – Level 2

Cross Connection and Backflow Inspect the system for cross connections and report:	Yes/No	N/A
1. Unauthorized connections to water mains	Y <input type="checkbox"/> N <input type="checkbox"/>	
2. Known recent unprotected backflow incident	Y <input type="checkbox"/> N <input type="checkbox"/>	
3. Unprotected cross connection(s) discovered (ex. unprotected connection	Y <input type="checkbox"/> N <input type="checkbox"/>	
with a private well)		
4. Failure of installed backflow prevention devices (example: continuous discharge from the relief port on a device)	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>
5. Any water system components submerged in an underground vault	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>
6. Failure to test all backflow prevention devices within the last year	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>

Treatment and Disinfection – Level 2

Treatment and Disinfection	Plant Name	Plant Name	Plant Name
Inspect each treatment plant for physical defects and report:			
1. Inability to maintain residual throughout the distribution system	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>
2. Failure of disinfection equipment	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>
3. Failure to monitor and replace chlorine supply	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>
4. Improper chlorine residual measurements (method or frequency)	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>
5. Failure to meet required minimum chlorine residual at the entry point (GW only)	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>
6. Failure to meet CTs at all times (SW only)	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>
7. Failure to meet turbidity standards (SW only)	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>
8. Failure to meet filtration requirements (SW only)	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>

Wells and Springs – Level 1

Wells & Springs - Inspect each groundwater source for physical defects and report:	Yes/No		N/A	
1. Cracks or holes in well seal or casing	Y <input type="checkbox"/>	N <input type="checkbox"/>	<input type="checkbox"/>	
2. Repair/replacement of well/spring components (example: well pump)	Y <input type="checkbox"/>	N <input type="checkbox"/>	<input type="checkbox"/>	
3. Wellhead flooded or water puddled near well	Y <input type="checkbox"/>	N <input type="checkbox"/>	<input type="checkbox"/>	
4. Screen for well vent missing or damaged	Y <input type="checkbox"/>	N <input type="checkbox"/>	<input type="checkbox"/>	
5. Feces, fecal source or other unsanitary conditions at the well/spring	Y <input type="checkbox"/>	N <input type="checkbox"/>		
6. Leaking sewer lines or septic tanks near well/spring	Y <input type="checkbox"/>	N <input type="checkbox"/>		
7. Cracks or holes in springbox	Y <input type="checkbox"/>	N <input type="checkbox"/>	<input type="checkbox"/>	
8. Water flowing or puddled on the ground around springbox	Y <input type="checkbox"/>	N <input type="checkbox"/>	<input type="checkbox"/>	

Wells and Springs – Level 2

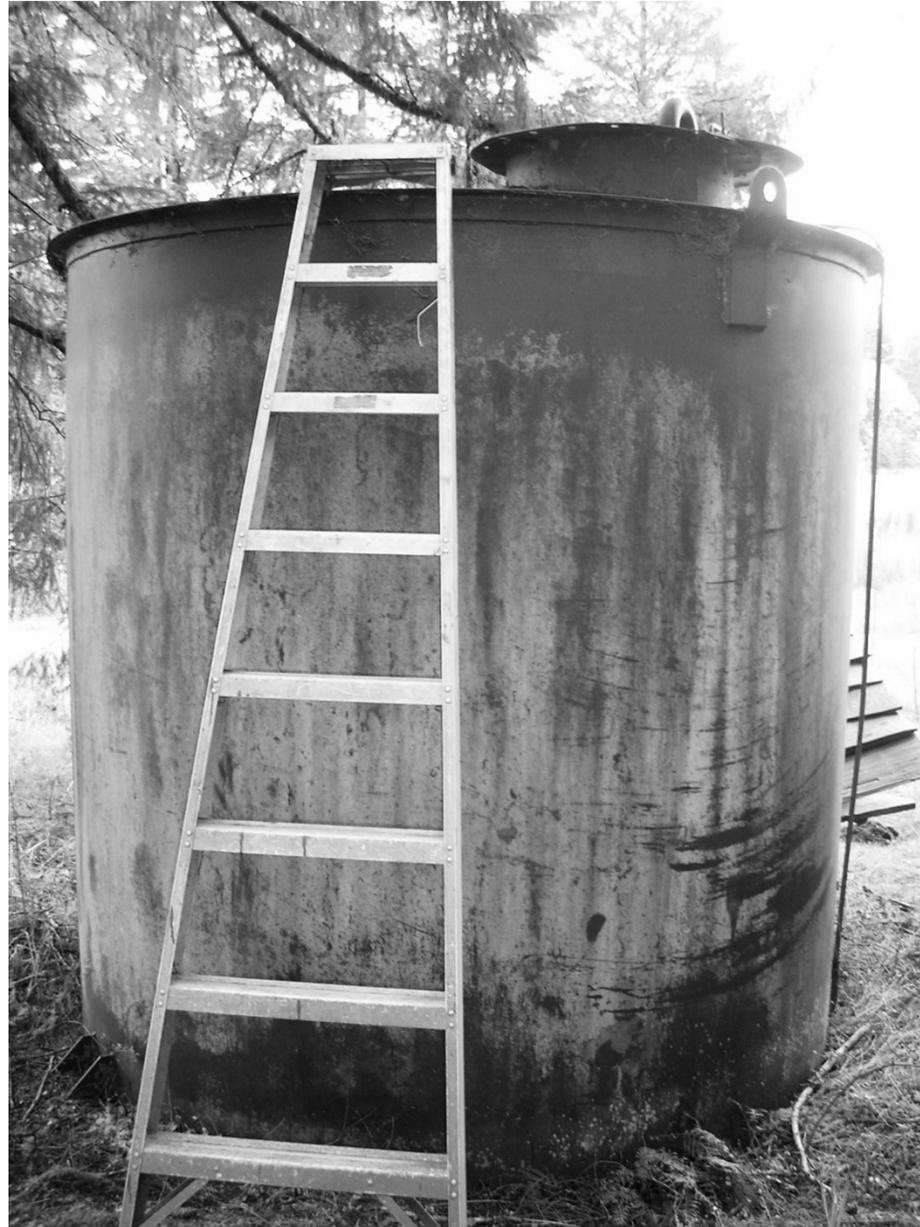
Groundwater Source Inspect each groundwater source for physical defects and report:	Well/Spring Name	Well/Spring Name	Well/Spring Name	W
1. Cracks or holes in well seal or casing	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/>
2. Wellhead lacks a watertight seal	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/>
3. Screen for well vent missing or damaged	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/>
4. Wellhead subjected to flooding or standing water near well	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/>
5. Leaking sewer lines or septic tanks near well/spring	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/>
6. Feces, fecal source observed near well/spring	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/>
7. Unsanitary conditions at the well/spring	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/>
8. Contamination during pump repair/replacement or other wellhead/spring repair	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/>
9. Use of an unapproved or untested source	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/>
10. Indication of surface water entering springbox	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/>
11. Cracks or holes in springbox	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/>

Storage tanks – Level 1

Storage Tanks - Inspect each storage tank for physical defects and report:	Yes/No		N/A
1. Vent screens missing or damaged	Y <input type="checkbox"/>	N <input type="checkbox"/>	<input type="checkbox"/>
2. Roof access hatch or other openings poorly or not sealed	Y <input type="checkbox"/>	N <input type="checkbox"/>	<input type="checkbox"/>
3. Screen or flap valve on overflow pipe outlet missing or damaged	Y <input type="checkbox"/>	N <input type="checkbox"/>	<input type="checkbox"/>
4. Tank in poor condition	Y <input type="checkbox"/>	N <input type="checkbox"/>	<input type="checkbox"/>
5. Tank has not been cleaned in recent memory	Y <input type="checkbox"/>	N <input type="checkbox"/>	<input type="checkbox"/>
6. Presence of contamination in tank (example: dead animals, insects)	Y <input type="checkbox"/>	N <input type="checkbox"/>	<input type="checkbox"/>
7. Recent maintenance or work done on the tank	Y <input type="checkbox"/>	N <input type="checkbox"/>	<input type="checkbox"/>

Storage tanks – Level 2

Storage Tanks	Tank Name	Tank Name	
Inspect each storage tank for physical defects and report:			
1. Holes in tank that could allow entry of insects or small animal	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y
2. Roof access hatch or other openings inadequately sealed	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y
3. Vent screens missing or damaged	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y
4. Screen or flap valve on overflow pipe outlet missing or damaged	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y
5. Presence of contamination in tank (example: dead animals, insects)	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y
6. Recent maintenance or work done on the tank	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y
7. Improperly cleaned or maintained storage tank	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y
8. Leaks in tank that could be harboring growth	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y
9. Inadequate tank controls resulting in poor turnover	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y
10. Bladder pressure tank waterlogged	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y



Sampling protocol – Level 1

Sampling Protocol - Review and report:	Yes/No	N/A
1. Tap flushed for less than 3 minutes	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>
2. Aerator, screen, hose, or other attachment present during sampling	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>
3. Leaky or swivel faucet used	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>
4. Samples not kept cool during storage/transportation	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>
5. Inside of bottle/lid touched or lid set down	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>
6. Heavy rainfall or wind at time of sampling	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>
7. Sampled at site not on sampling plan or at a previously unused site	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>
8. Other sampling problems	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>

Sampling protocol – Level 2 (same)

Sampling Protocol Report any defects in sampling protocol:	Yes/No	N
1. Tap flushed for less than 3 minutes	Y <input type="checkbox"/> N <input type="checkbox"/>	
2. Aerator, screen, hose, or other attachment present during sampling	Y <input type="checkbox"/> N <input type="checkbox"/>	
3. Leaky or swivel faucet used	Y <input type="checkbox"/> N <input type="checkbox"/>	
4. Samples not kept cool during storage/transportation	Y <input type="checkbox"/> N <input type="checkbox"/>	
5. Inside of bottle/lid touched or lid set down	Y <input type="checkbox"/> N <input type="checkbox"/>	
6. Heavy rainfall or wind at time of sampling	Y <input type="checkbox"/> N <input type="checkbox"/>	
7. Sampled at site not on coliform sampling plan or previously unused site	Y <input type="checkbox"/> N <input type="checkbox"/>	
8. Other sampling problems	Y <input type="checkbox"/> N <input type="checkbox"/>	

Other – Level 1

Other	Yes/No	
Any other issues/problems/sources of contamination that may have caused the positive coliform result	Y <input type="checkbox"/> N <input type="checkbox"/>	



Summary – Level 1 and Level 2

SUMMARY: Based on the results of your investigation and any other available information, what do you believe to be the cause(s) of the positive total coliform sample(s) from your water system? (Do not leave blank)

CORRECTIVE ACTIONS: What actions have you taken to correct the above mentioned issue(s)? *If additional time is needed to correct a deficiency, indicate the date that it will be corrected.* (Do not leave blank)

CERTIFICATION: I certify that the information submitted in response to the questions above is accurate to the best of my knowledge.

NAME: _____

TITLE: _____

DATE: _____

Additional comments:

Regulating Agency review process

For Agency Use Only: Reviewed by _____ Date Reviewed: _____ Complete Needs Revision

- PWS sends form to Reg Agency within 30 days
- Reg Ag date stamps with date received
- Reg Agency reviews
 - Complete?
 - Defects found and corrected?
- PDF and submit form to DMCE via the compliance in-box
- We have a dream: Web Portal!

Public Health Division
Drinking Water Services

If defects cannot be corrected in 30 days

- Level 1:
 - Determine if new timeline is reasonable
- Level 2:
 - Set new reasonable deadline with operator
- DMCE will enter new schedule

If form needs to be revised...

- Send back to system with new deadline
- Once Reg Ag is satisfied, send form to DMCE and note new deadline given.

Compliance Issues

- No violations will be issued *at this time* for not completing Level 1 or 2 investigations
- Ecoli MCL violations
- M&R violations
- May be additional health-based violations issued in future

Increased monitoring

- Non-community systems sampling quarterly must increase to MONTHLY sampling if:
 - One level 2 or two level 1 investigations are triggered within a rolling 12-month period, or
 - A level 1 or 2 investigation not completed or identified defects not corrected, or
 - Miss two quarters of sampling or miss one quarter and a coliform investigation is triggered during a rolling 12-month period

Increased monitoring (continued)

- New SDWIS (June or later) should determine automatically; until then must submit a schedule change form
- After 12 months of monitoring, can go back to quarterly monitoring if *all* the following:
 - 12 consecutive months of monitoring completed,
 - No *E. coli* MCLs or investigations required during the previous 12 months, and
 - Water system survey, level 2 investigation or equivalent site visit is done and no sanitary defects identified and has a protected water source

Persistent Coliform

- System needs to install chlorination for **residual maintenance** if:
 - 3 or more Level 1 investigations triggered in 12-month period, or
 - 4 Level 1 Investigations triggered in 24 months, then the system
- Must install within 6 months, or on a schedule agreed upon by the Regulating Agency.

Questions?

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