UTAH DEPARTMENT *of*
ENVIRONMENTAL QUALITY
DRINKING
WATER

Data Quality and Water Treatment
2018 Sanitary Survey Training

Utah Division of Drinking Water

Drinking Water

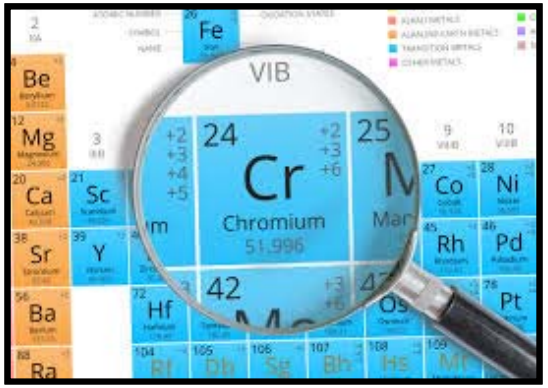
Where does drinking water come from?

Drinking Water

How do we know drinking water is safe?

Drinking Water Quality

I've been drinking the water
I am FINE



Drinking Water Rules

R309-105-10

R309-115-2

R309-110-5

R309-400-4

R309-520-3

R309-205-6

R309-500-5

R309-525-7

R309-215-12

R309-525-7

R309-510-7

R309-540-5

R309-405-4

R309-200-4

R309-550-9

R309-210-8

R309-220-9

Laboratory Analysis – Water Quality

Division of Drinking Water – Data Management

Database

DDW Data managers

Maximum Contaminate Level

- Source
- Treatment
- Distribution System

Is Data Management enough?

EPA Drinking Water Standards

Primary Standards

- Also called Maximum Contaminant Level (MCL)
- Cause health problems
- Enforced for public systems
- Over 80 contaminants
- For example:
  - Nitrate
  - Lead
  - Coliform
  - Most organic chemicals and pesticides

Secondary Standards

- Also called SMCL or RMCL
- Cause aesthetic problems:
  - Staining
  - Taste
  - Odor
- Can naturally occur in ground water
- About 15 contaminants including:
  - Iron
  - Fluoride
  - Chloride

Violation

Sanitary Survey - Data Quality

Opportunity to preform assessment and ask questions

Sanitary Survey - Data Quality

Sample Collection – It matters

Where? When? How?

Sanitary Survey – Data Quality

Show me where you collect the sample

Show me where you record that information

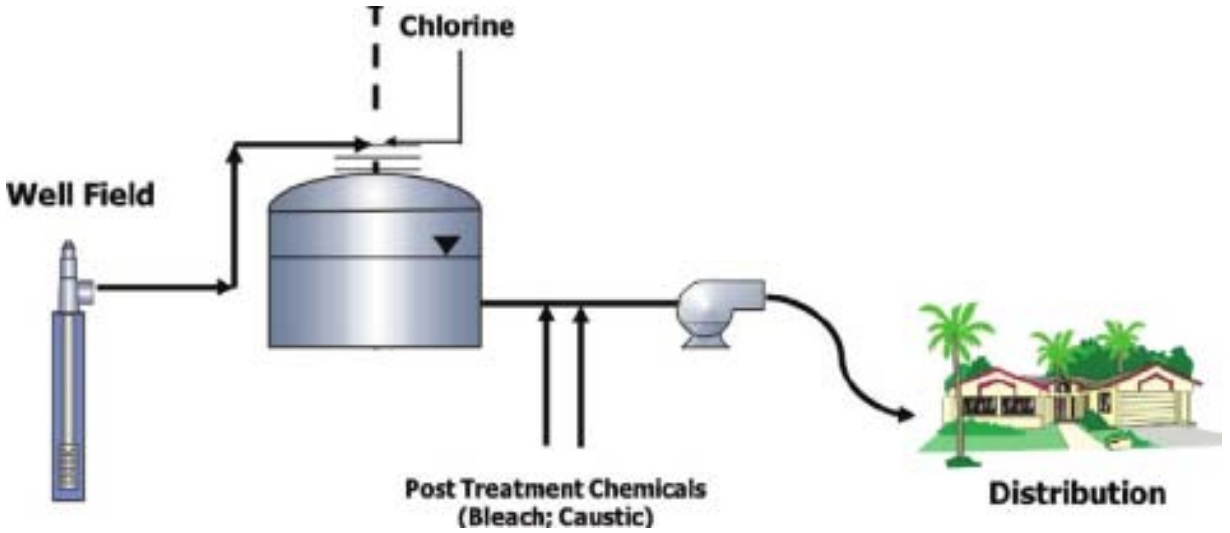
Sanitary Survey – Water Treatment

When good water goes bad

Surface Water Treatment
Ground Water UDI
Microfiltration
Ion Exchange
Chlorination
Ozonation
Fluoridation
Corrosion Control

Sanitary Survey – Water Treatment Chlorination

Ground Water Treatment



Sanitary Survey – Water Treatment Chlorination

Tablet

Gas

Liquid

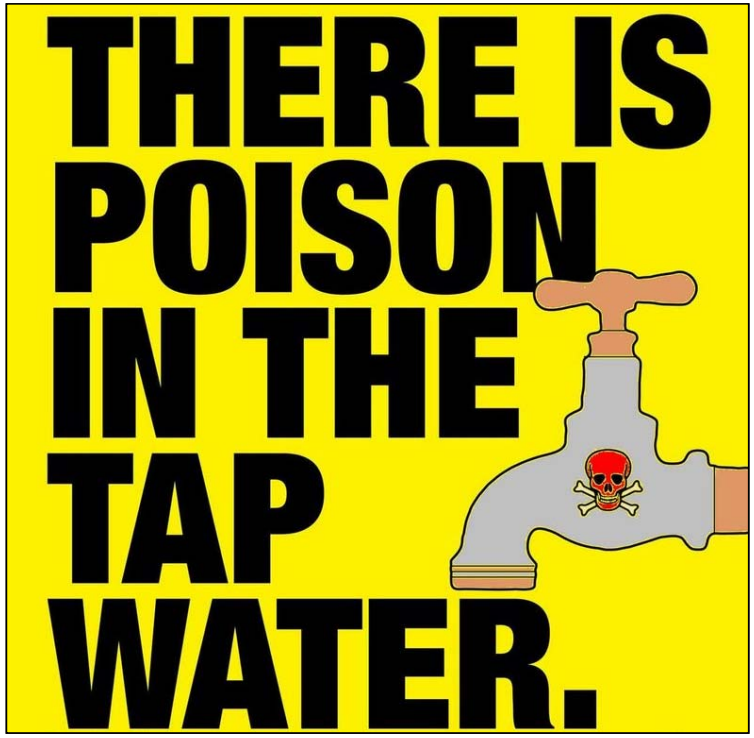
On-site generation

Sanitary Survey – Water Treatment Chlorination

Sanitary Survey – Water Treatment Chlorination

How much Chlorine is added?

Don’t set it and forget it!



Sanitary Survey – Water Treatment Chlorination

Chlorine Monitoring

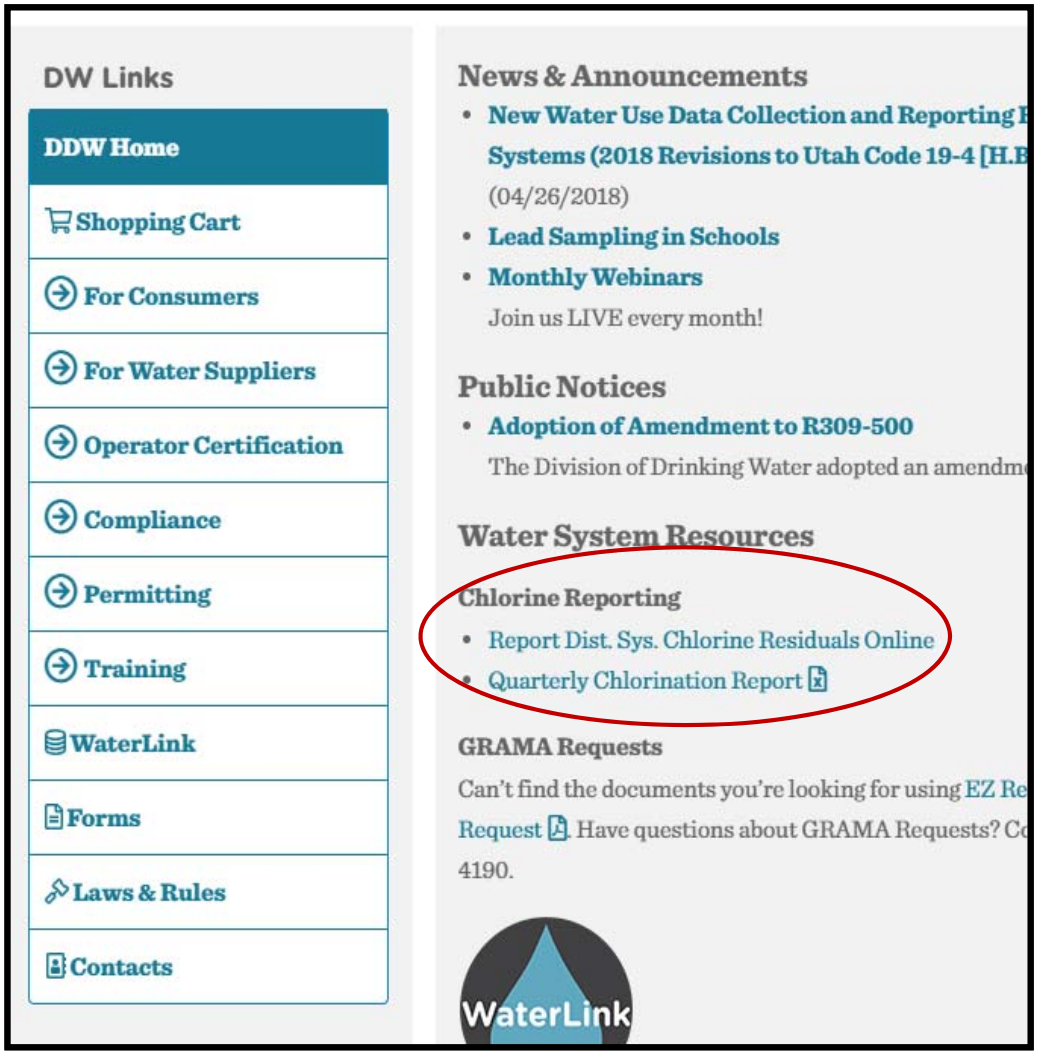
Reports

How much is added?

Quarterly Chlorination Report

How much remains?

Dist. Sys. Chlorine Residuals Online



Sanitary Survey – Water Treatment Chlorination

Chlorine Monitoring

Reports

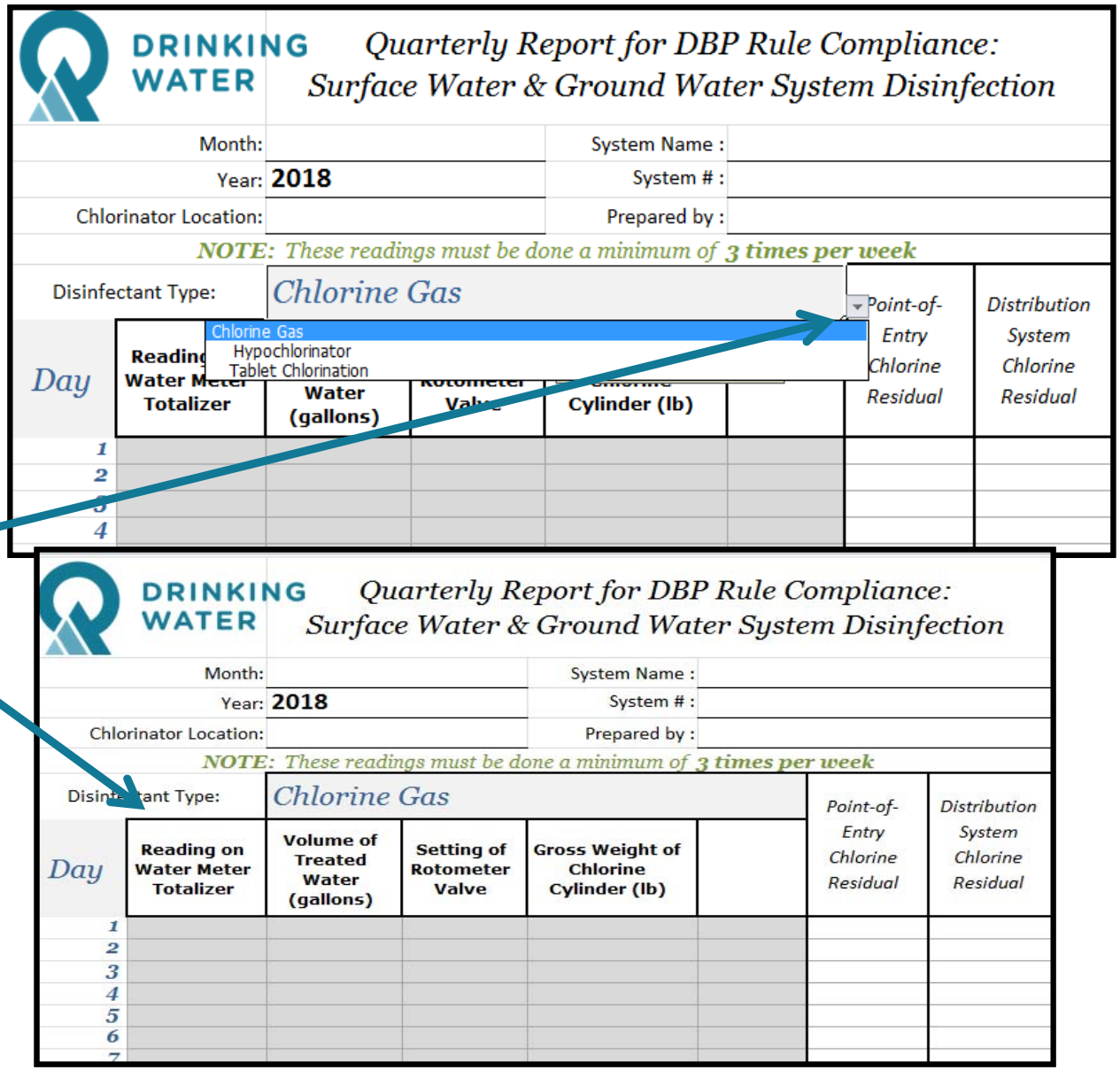
How much is added?

Quarterly Chlorination Report

Operational report

Select type of chlorination

Complete Daily Information



DRINKING WATER

Quarterly Report for DBP Rule Compliance:
Surface Water & Ground Water System Disinfection

Month: | System Name :
Year: 2018 | System # :
Chlorinator Location: | Prepared by :

*NOTE: These readings must be done a minimum of **3 times per week***

Disinfectant Type: Chlorine Gas

Chlorine Gas
Hypochlorinator
Tablet Chlorination

Day	Reading on Water Meter Totalizer	Volume of Treated Water (gallons)	Setting of Rotometer Valve	Gross Weight of Chlorine Cylinder (lb)		Point-of-Entry Chlorine Residual	Distribution System Chlorine Residual
1							
2							
3							
4							

DRINKING WATER

Quarterly Report for DBP Rule Compliance:
Surface Water & Ground Water System Disinfection

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1							
2							
3							
4							
5							
6							
7							

Sanitary Survey – Water Treatment Chlorination

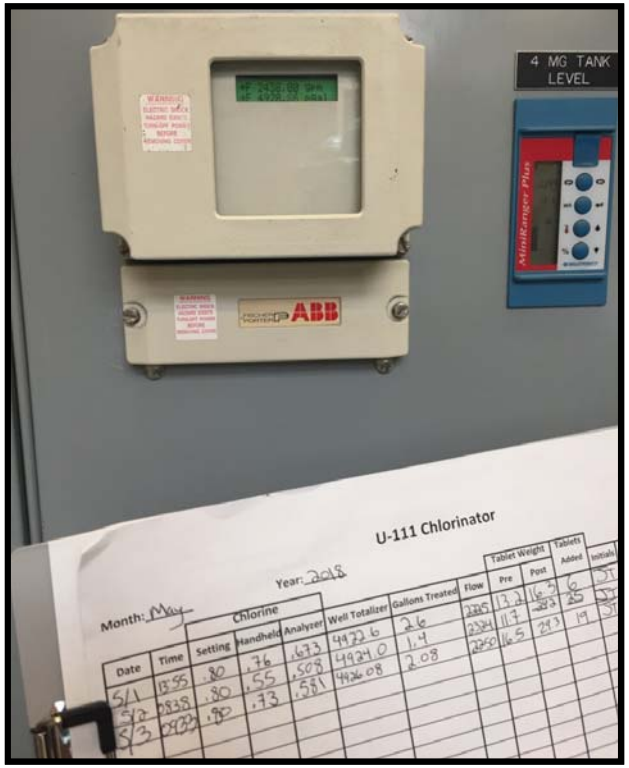
Reports

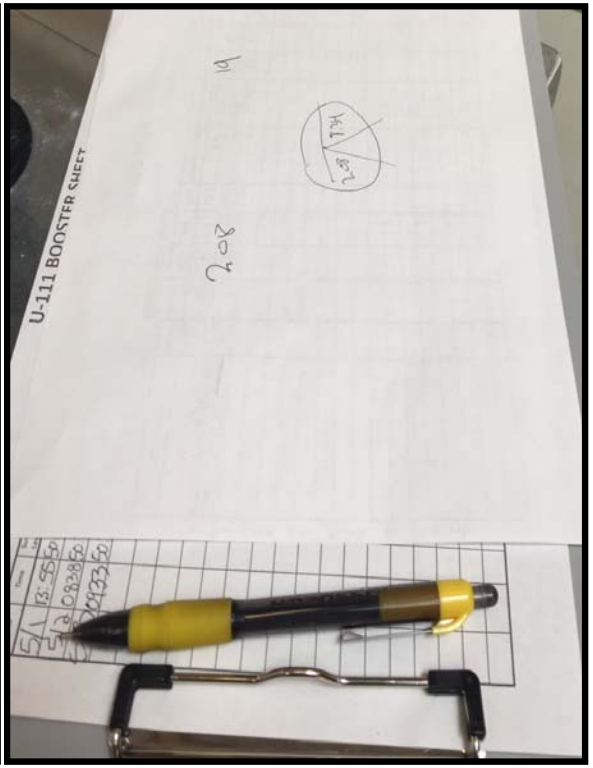
How much is added?

Quarterly Chlorination Report

Show me where you collect the information.

How do you know what dose?





Sanitary Survey – Water Treatment Chlorination

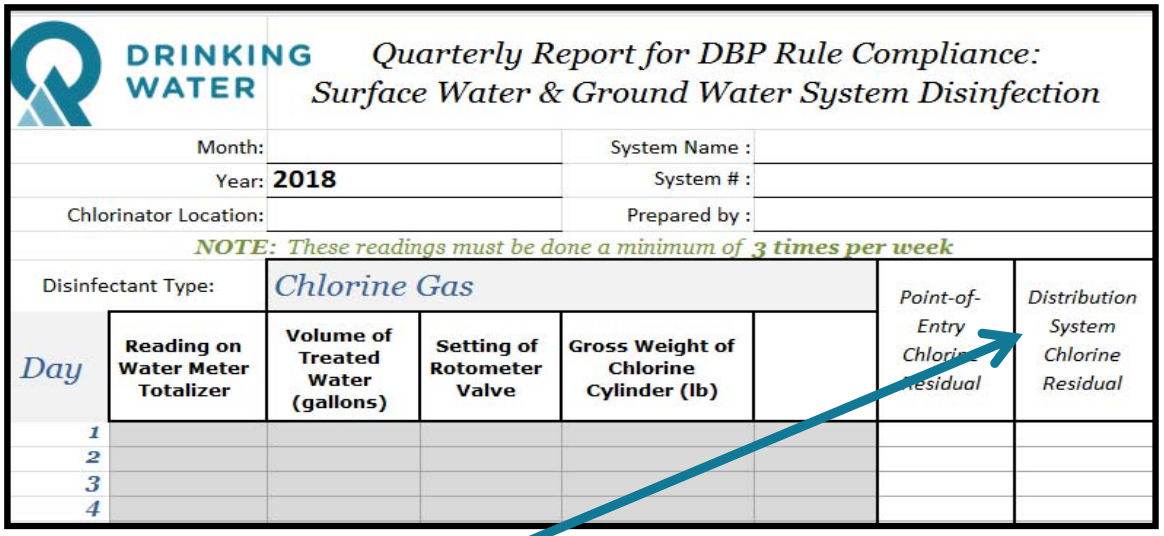
Chlorine Monitoring

Reports

How much remains?

Dist. Sys. Chlorine Residuals Online

- ✓ Test chlorine residual in distribution system at least 3 times a week.
- ✓ Record residuals on operations report.
- ✓ Calculate monthly average.
- ✓ Submit monthly average on *Dist. Sys. Chlorine Residuals Online Report*



DRINKING WATER

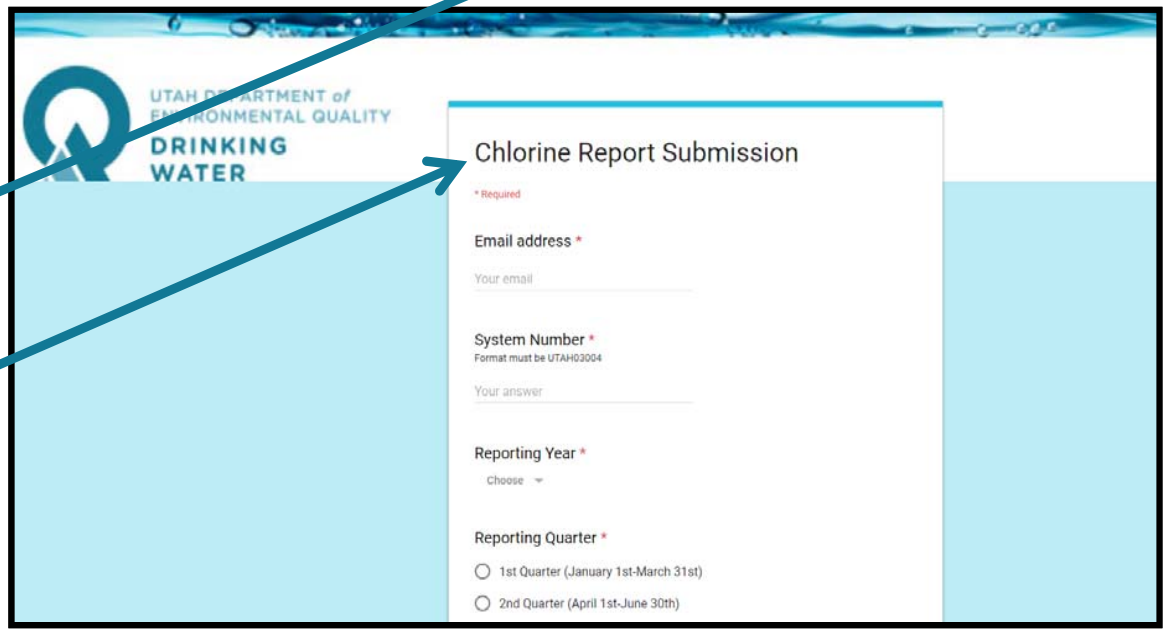
Quarterly Report for DBP Rule Compliance: Surface Water & Ground Water System Disinfection

Month: | System Name :
Year: 2018 | System # :
Chlorinator Location: | Prepared by :

*NOTE: These readings must be done a minimum of **3 times per week***

Disinfectant Type: *Chlorine Gas*

Day	Reading on Water Meter Totalizer	Volume of Treated Water (gallons)	Setting of Rotometer Valve	Gross Weight of Chlorine Cylinder (lb)		Point-of-Entry Chlorine Residual	Distribution System Chlorine Residual
1							
2							
3							
4							



UTAH DEPARTMENT of ENVIRONMENTAL QUALITY
DRINKING WATER

Chlorine Report Submission

* Required

Email address *

Your email

System Number *

Format must be UTAH03004

Your answer

Reporting Year *

Choose

Reporting Quarter *

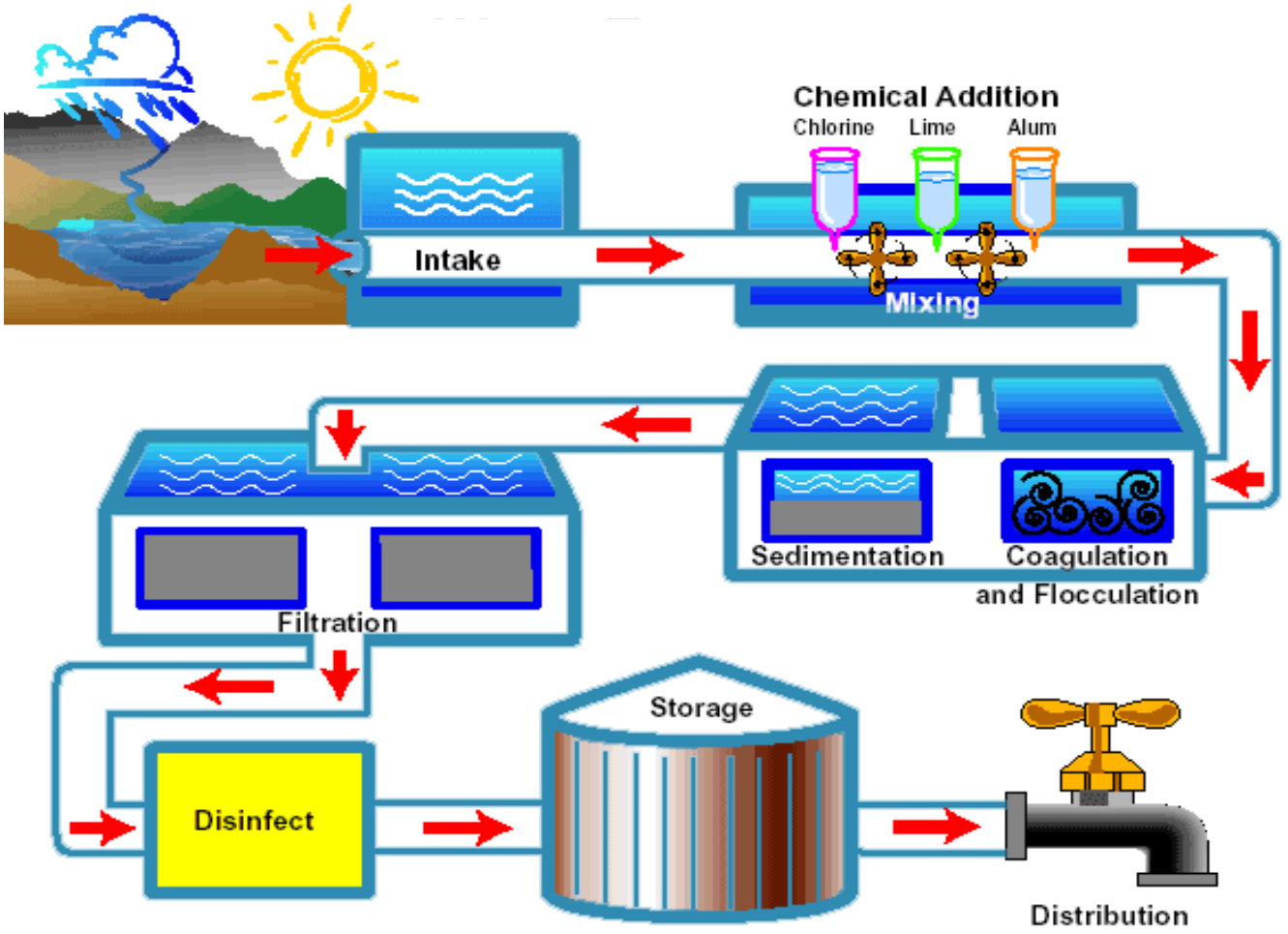
1st Quarter (January 1st-March 31st)

2nd Quarter (April 1st-June 30th)

Surface Water Treatment Basics

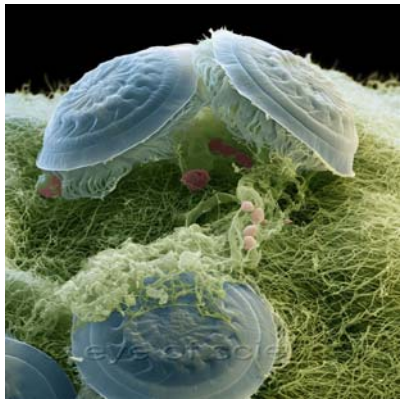
The Chunks

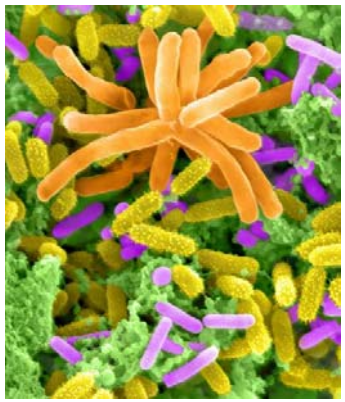
Remove the Chunks Disinfect the Chunks



Surface Water Treatment

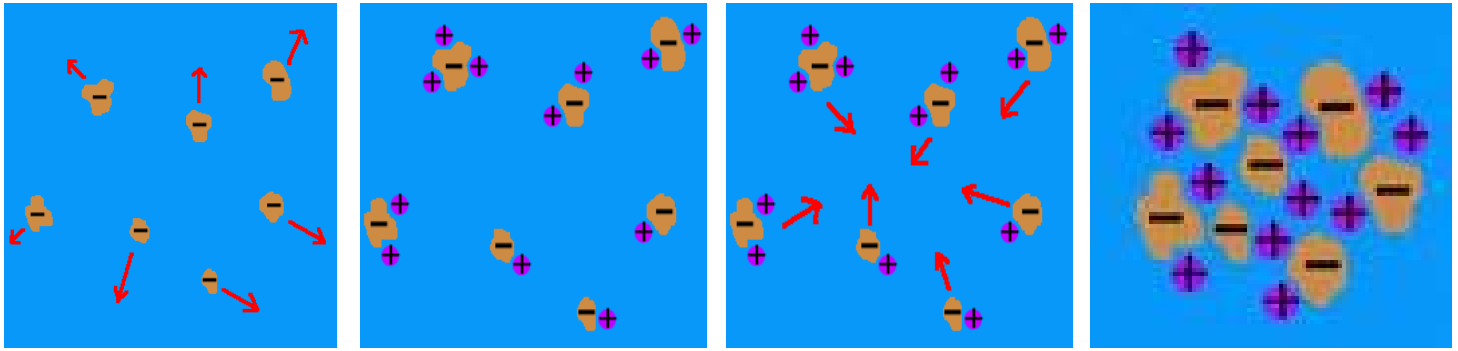
The Chunks

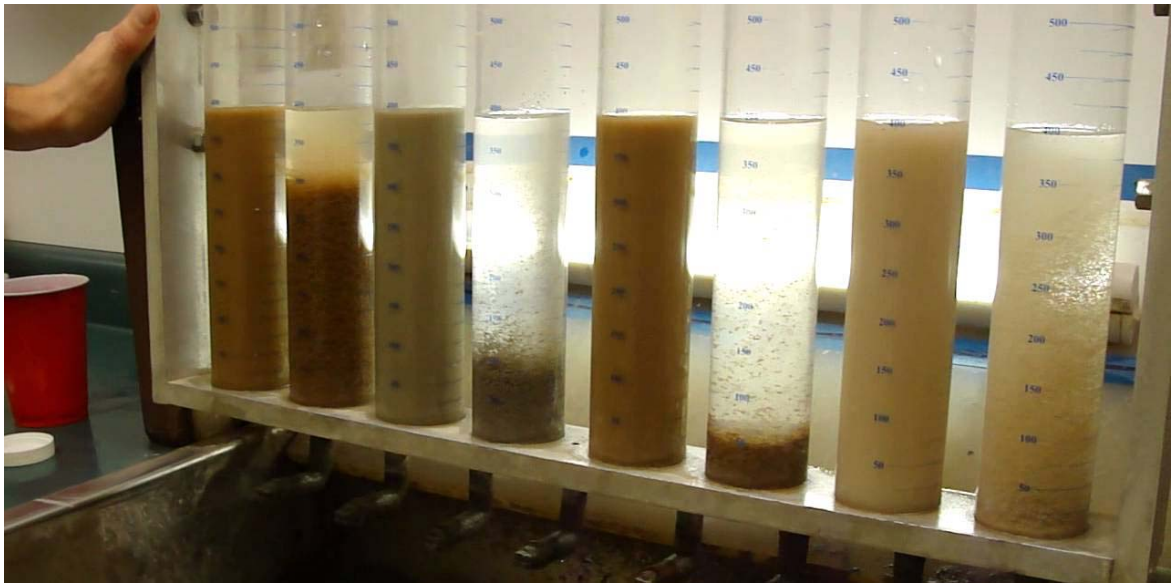




Surface Water Treatment

Remove the Chunks - Add chemicals to create Floc

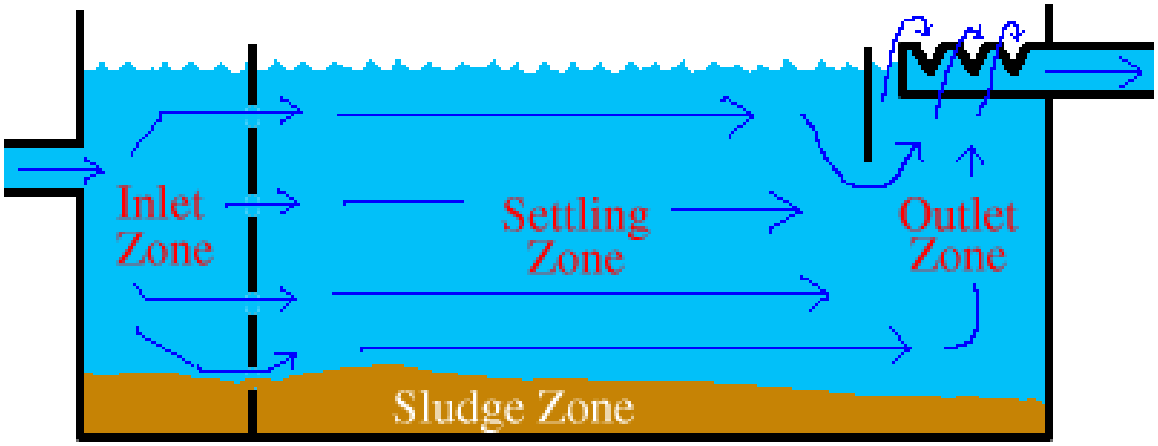




Surface Water Treatment

Remove the Chunks

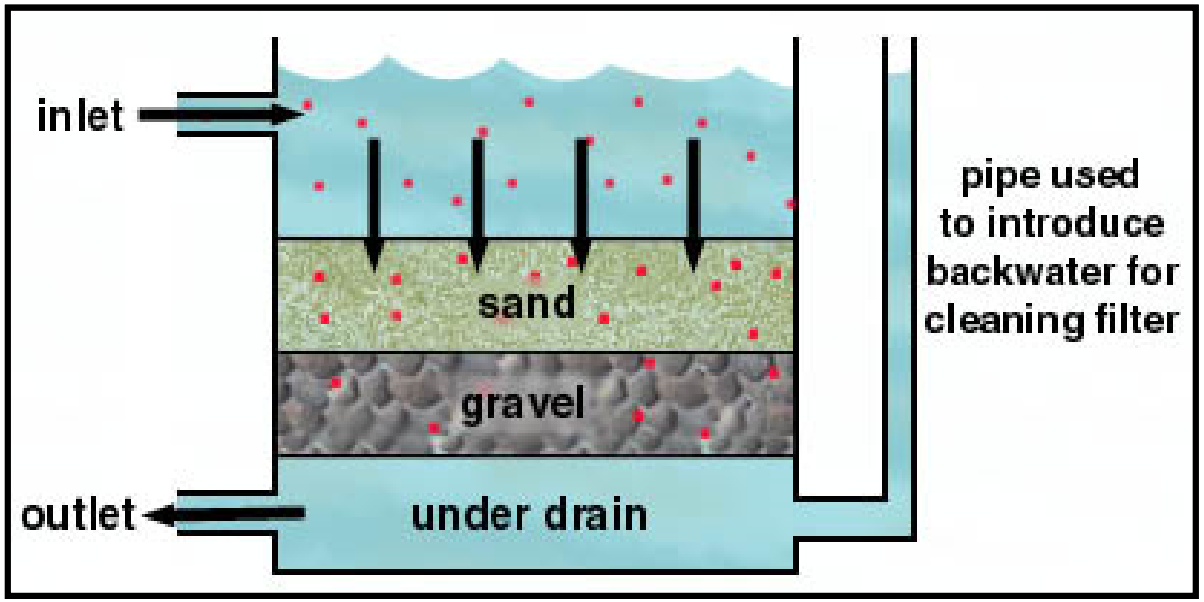
Flocculation and Sedimentation

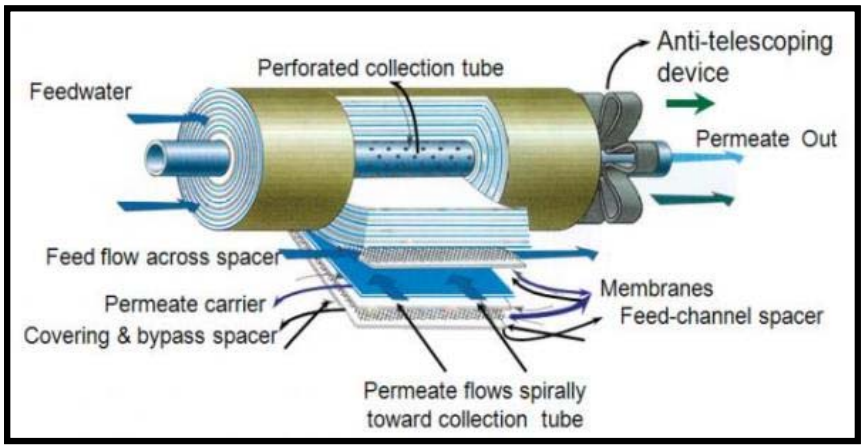


Surface Water Treatment

Remove the Chunks

Filtration

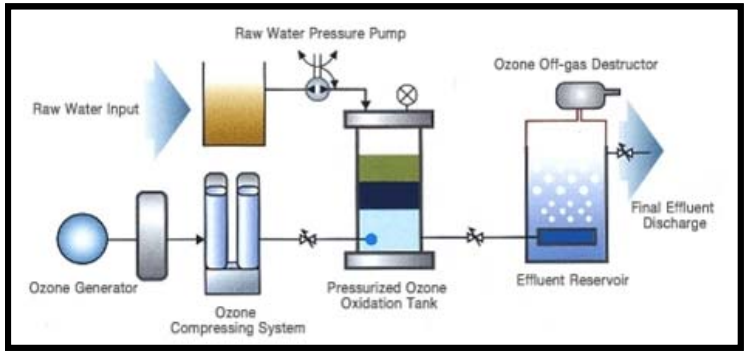




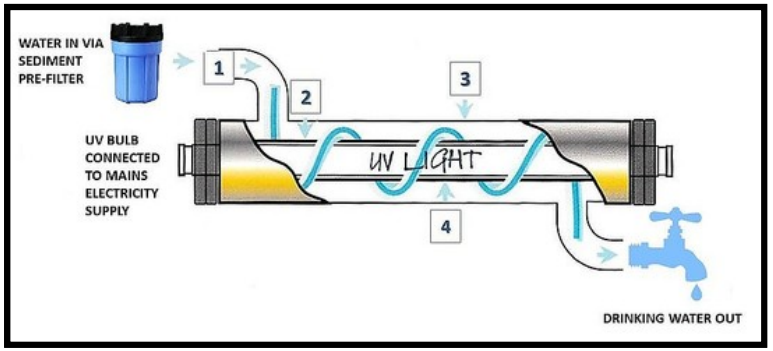
Surface Water Treatment

Disinfect the Chunks

Ozone



Ultraviolet Radiation



Final Product- Drinking Water

Drinking Water Treatment

Remove the Chunks
Disinfect the Chunks
Simple right?

Drinking Water Treatment

The Rules

- Interim Enhanced Surface Water Treatment Rule (ESWTR)
- Disinfection By-products Rule (DBPR)
- Total Coliform Rule (TCR)
- Ground Water Rule (GWR)

Water Treatment Regulation

Verification of
Water Quality and
Treatment Parameters

DDW Treatment Rule Managers

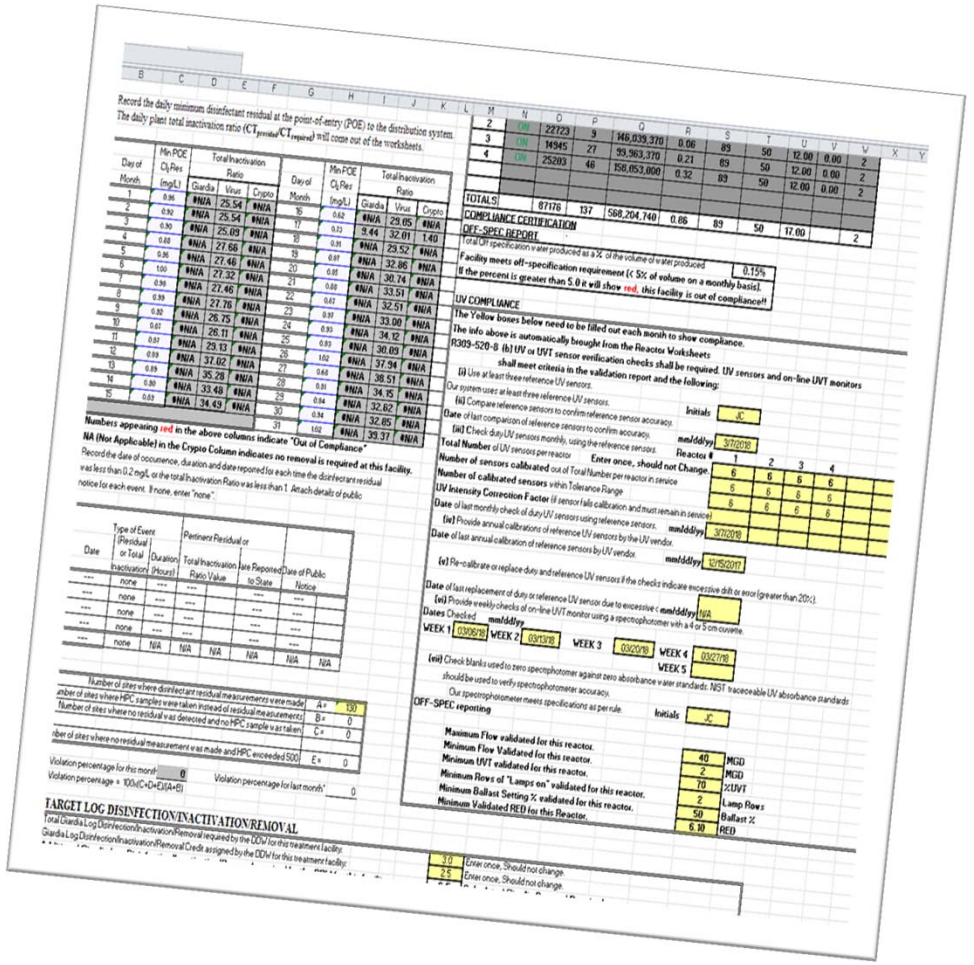
- ✓ Treatment Reports
- ✓ Disinfection Reports

Water Treatment – Data Accuracy

Water Quality and Treatment Parameters

Filter 1 Max NTU Reading	Filter 2 Max NTU Reading	Filter 3 Max NTU Reading	Filter 4 Max NTU Reading	Filter 5 Max NTU Reading	Filter 6 Max NTU Reading	Filter 7 Max NTU Reading	Filter 8 Max NTU Reading	Daily Max (NTU)	Number Readings <0.15 NTU	Number Turbidity Readings	Crypto Log Inactivation
0.00	0.02	0.04	0.02	0.02	0.02	0.02	0.02	0.04	$	$	0.5
0.00	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	$	$	0.5
0.00	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.03	$	$	0.5
0.00	0.02	0.03	0.03	0.04	0.04	0.03	0.03	0.04	$	$	0.5
0.00	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.04	$	$	0.5
0.00	0.02	0.04	0.04	0.02	0.02	0.02	0.02	0.04	$	$	0.5
0.00	0.02	0.02	0.02	0.02	0.04	0.02	0.02	0.04	$	$	0.5
0.00	0.02	0.02	0.02	0.03	0.04	0.02	0.02	0.04	$	$	0.5
0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.04	$	$	0.5
0.00	0.04	0.02	0.02	0.02	0.02	0.02	0.04	0.04	$	$	0.5
0.00	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.05	$	$	0.5
0.00	0.02	0.04	0.02	0.02	0.02	0.04	0.02	0.05	$	$	0.5
0.00	0.02	0.03	0.05	0.02	0.05	0.03	0.02	0.06	$	$	0.5
0.00	0.02	0.02	0.03	0.02	0.03	0.03	0.02	0.07	$	$	0.5
0.00	0.06	0.02	0.02	0.06	0.03	0.03	0.03	0.07	$	$	0.5
0.00	0.04	0.03	0.03	0.03	0.03	0.03	0.04	0.07	$	$	0.5
0.00	0.03	0.04	0.08	0.03	0.03	0.04	0.03	0.07	$	$	0.5
0.00	0.02	0.03	0.04	0.02	0.03	0.04	0.03	0.07	$	$	0.5
0.00	0.03	0.03	0.03	0.03	0.03	0.04	0.02	0.07	$	$	0.5
0.00	0.06	0.03	0.03	0.07	0.03	0.03	0.03	0.07	$	$	0.5
0.00	0.03	0.02	0.02	0.03	0.03	0.02	0.02	0.07	$	$	0.5
0.00	0.02	0.07	0.02	0.02	0.02	0.02	0.02	0.07	$	$	0.5
0.00	0.02	0.03	0.06	0.02	0.02	0.08	0.02	0.07	$	$	0.5
0.00	0.02	0.03	0.03	0.03	0.05	0.03	0.02	0.08	$	$	0.5
0.00	0.02	0.03	0.03	0.03	0.04	0.03	0.00	0.08	$	$	0.5
0.00	0.04	0.03	0.03	0.04	0.03	0.03	0.03	0.08	$	$	0.5
0.00	0.03	0.03	0.04	0.04	0.03	0.02	0.03	0.08	$	$	0.5
0.00	0.03	0.06	0.02	0.02	0.03	0.08	0.03	0.08	$	$	0.5
0.00	0.02	0.04	0.06	0.02	0.03	0.03	0.02	0.08	$	$	0.5
0.00	0.03	0.02	0.02	0.05	0.07	0.03	0.02	0.08	$	$	0.5
0.00	0.06	0.02	0.02	0.02	0.02	0.02	0.02	0.08	$	$	0.5
0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.08	$	$	0.5
0.00	0.02	0.04	0.02	0.03	0.02	0.02	0.00	0.08	$	$	0.5

Total Number of Turbidity Measurements Taken:	248
Total Number of Turbidity Less Than 0.15 NTU	248
Total Number of Turbidity Measurements Less Than 0.15 NTU:	100%
Percent of Turbidity Measurements <.15 NTU 95% of the Time:	Yes
Total Number of Turbidity Measurements <.15 NTU 95% of the Time:	0.5
Crypto Log Credit Claimed For Individual Filter Effluent:	



Record the daily minimum disinfectant residual at the point-of-entry (POE) to the distribution system.
The daily plant total inactivation ratio ($CT_{provided}/CT_{required}$) will come out of the worksheets.

Day of Month	Min POE Cl_2 Res (mg/L)	Total Inactivation Ratio Giardia	Virus	Crypto
1	0.86	#N/A	25.54	#N/A
2	0.92	#N/A	25.54	#N/A
3	0.90	#N/A	25.03	#N/A
4	0.68	#N/A	27.66	#N/A
5	0.96	#N/A	27.46	#N/A
6	1.00	#N/A	27.32	#N/A
7	0.96	#N/A	27.46	#N/A
8	0.93	#N/A	27.76	#N/A
9	0.80	#N/A	26.75	#N/A
10	0.61	#N/A	26.11	#N/A
11	0.67	#N/A	29.13	#N/A
12	0.69	#N/A	37.02	#N/A
13	0.69	#N/A	35.28	#N/A
14	0.50	#N/A	33.48	#N/A
15	0.69	#N/A	34.43	#N/A
16		0.62	#N/A	29.05	#N/A
17		0.73	5.44	32.01	1.40
18		0.91	#N/A	23.52	#N/A
19		0.87	#N/A	32.86	#N/A
20		0.85	#N/A	30.74	#N/A
21		0.88	#N/A	33.51	#N/A
22		0.67	#N/A	32.51	#N/A
23		0.90	#N/A	33.00	#N/A
24		0.93	#N/A	34.12	#N/A
25		0.93	#N/A	30.09	#N/A
26		1.02	#N/A	37.94	#N/A
27		0.68	#N/A	38.51	#N/A
28		0.91	#N/A	34.15	#N/A
29		0.84	#N/A	32.62	#N/A
30		0.94	#N/A	32.65	#N/A
31		1.02	#N/A	39.37	#N/A

Numbers appearing red in the above columns indicate "Out of Compliance"
NA (Not Applicable) in the Crypto Column indicates no removal is required at this facility.
Record the date of occurrence, duration and date reported for each time the disinfectant residual was less than 0.2 mg/L or the total Inactivation Ratio was less than 1. Attach details of public notice for each event. If none, enter "none".

Date	Type of Event (Residual or Total Inactivation)	Duration (Hours)	Pertinent Residual or Total Inactivation Ratio Value	Date Reported to State	Date of Public Notice
---	none	---	---	---	---
---	none	---	---	---	---
---	none	---	---	---	---
---	none	---	---	---	---
---	none	---	---	---	---
	N/A	N/A	N/A	N/A	N/A

Number of sites where disinfectant residual measurements were made: A = 130
Number of sites where HPC samples were taken instead of residual measurements: B = 0
Number of sites where no residual was detected and no HPC sample was taken: C = 0
Number of sites where no residual measurement was made and HPC exceeded 500: E = 0
Violation percentage for this month: 0
Violation percentage = 100(C+D+E)/(A+B)
Violation percentage for last month: 0

TARGET LOG DISINFECTION/INACTIVATION/REMOVAL
Total Giardia Log Disinfection/Inactivation/Removal required by the DDW for this treatment facility: 3.0 Enter once, Should not change
Giardia Log Disinfection/Inactivation/Removal Credit assigned by the DDW for this treatment facility: 2.5 Enter once, Should not change

2	ON	23723	9	146,039,370	0.06	89	50	12.00	0.00	2
3	ON	14545	27	99,963,370	0.21	89	50	12.00	0.00	2
4	ON	25203	46	158,053,000	0.32	89	50	12.00	0.00	2
TOTALS		87176	137	588,204,740	0.86	89	50	17.00		2

COMPLIANCE CERTIFICATION
OFF-SPEC REPORT
Total Off-specification water produced as a % of the volume of water produced: 0.15%
Facility meets off-specification requirement (< 5% of volume on a monthly basis).
If the percent is greater than 5.0 it will show red, this facility is out of compliance!!

UV COMPLIANCE
The Yellow boxes below need to be filled out each month to show compliance.
The info above is automatically brought from the Reactor Worksheets
R309-520-8 (b) UV or UVT sensor verification checks shall be required. UV sensors and on-line UVT monitors shall meet criteria in the validation report and the following:
(i) Use at least three reference UV sensors.
Our system uses at least three reference UV sensors.
(ii) Compare reference sensors to confirm reference sensor accuracy. Initials: JC
Date of last comparison of reference sensors to confirm accuracy. mm/dd/yy: 3/7/2018
(iii) Check duty UV sensors monthly, using the reference sensors.
Total Number of UV sensors per reactor. Reactor #: 1 2 3 4
Number of sensors calibrated out of Total Number per reactor in service. Enter once, should not Change: 6 6 6 6
Number of calibrated sensors within Tolerance Range: 6 6 6 6
UV Intensity Correction Factor (if sensor fails calibration and must remain in service): 6 6 6 6
Date of last monthly check of duty UV sensors using reference sensors. mm/dd/yy: 3/7/2018
(iv) Provide annual calibrations of reference UV sensors by the UV vendor.
Date of last annual calibration of reference sensors by UV vendor. mm/dd/yy: 12/15/2017
(v) Re-calibrate or replace duty and reference UV sensors if the checks indicate excessive drift or error (greater than 20%).
Date of last replacement of duty or reference UV sensor due to excessive < mm/dd/yy: n/a
(vi) Provide weekly checks of on-line UVT monitor using a spectrophotometer with a 4 or 5 cm cuvette.
Dates Checked mm/dd/yy
WEEK 1: 03/06/18 WEEK 2: 03/13/18 WEEK 3: 03/20/18 WEEK 4: 03/27/18 WEEK 5:
(vii) Check blanks used to zero spectrophotometer against zero absorbance water standards. NIST traceable UV absorbance standards should be used to verify spectrophotometer accuracy.
Our spectrophotometer meets specifications as per rule. Initials: JC
OFF-SPEC reporting

Maximum Flow validated for this reactor.	40	MGD
Minimum Flow Validated for this reactor.	2	MGD
Minimum UVT validated for this reactor.	70	%UVT
Minimum Rows of "Lamps on" validated for this reactor.	2	Lamp Rows
Minimum Ballast Setting % validated for this reactor.	50	Ballast %
Minimum Validated RED for this Reactor.	6.10	RED

Water Treatment – Data Accuracy

Water Quality and Treatment Parameters

Where does the data come from?

Need for the Sanitary Survey

Sanitary Survey - Data Accuracy

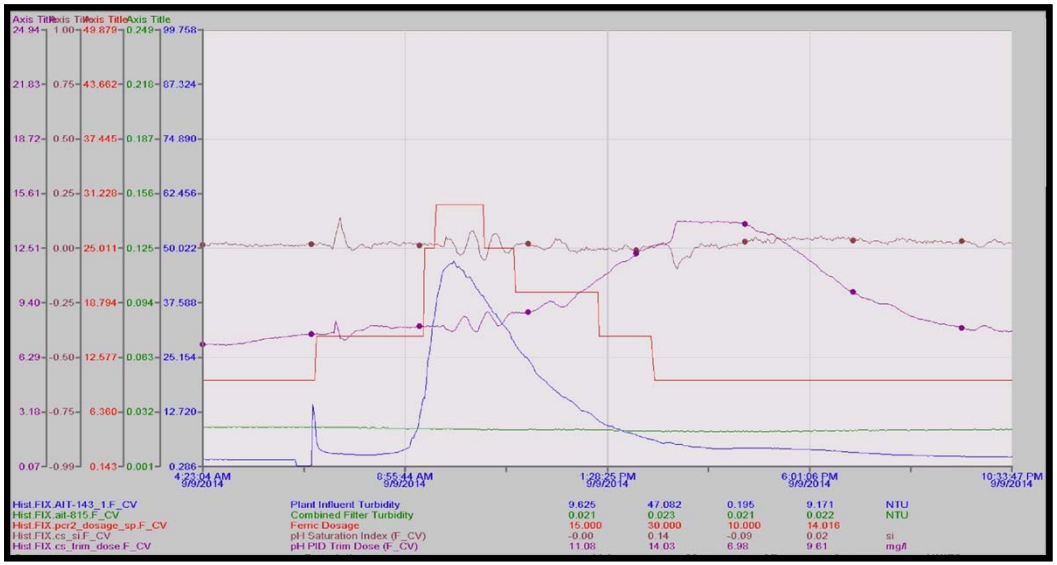
Opportunity to preform assessment and ask questions

Sanitary Survey – Data Accuracy

Show me where you collect the data

Show me where you record the information

Sanitary Survey – Data Accuracy



Real time continuous monitoring

Manual Readings

How is data collected and recorded?

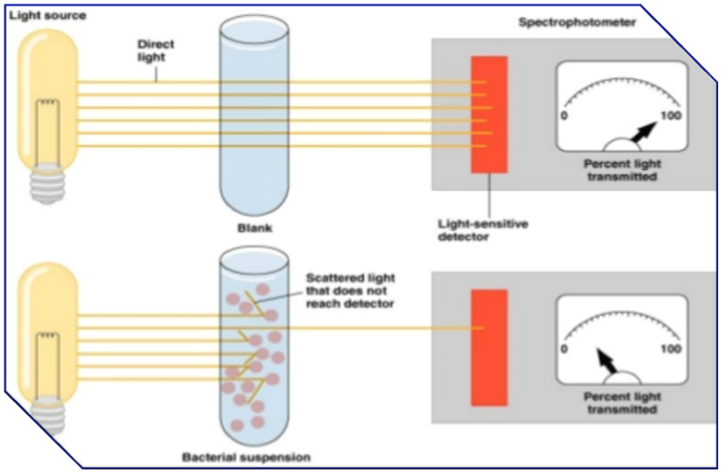
Random Data check – WTP or Disinfection Report Parameters

Sanitary Survey Questions

Know the How and the Why

Example - Turbidity

Survey Questions
What is the filter effluent quality goal? (e.g. turbidity goal in NTU)?
How often is the turbidity meter calibrated?
How often is the flow of turbidity meter verify?



<u>Deeper Look</u>

Is this the correct location to monitor?

How does the flow look?

Ask to remove the head.

Does the reading change?

Is there water in the meter?

Sanitary Survey Questions

Know the How and the Why

Example - Filtration

Survey Questions
When was the last time the filters were evaluated to determine the condition of the media?
What is the maximum filtration rate throughout the year (in gpm/sf)?
What criteria are used to determine when a filter backwash is needed?
What is the typical turbidity of the filter influent water (in NTU)?
What is the typical turbidity of the filter effluent (in NTU)?

<u>Deeper Look</u>

Check individual filter turbidity meters?

How does the flow look?

Ask for the data and calculation used for flow rate (gpm/sf)

Ask for a quick peak at data or filter trends.

Ask how do they collect a media sample.

Sanitary Survey Questions

Know the How and the Why

Example – Chemical Application

Survey Questions
Means to accurately measure the quantities of chemicals used.
Daily operating records reflect chemical dosages and total quantities used.
Do the operators know where all of the chemical application points are and which points are being utilized?

Deeper Look

Do chemical calibration apparatus look un-used and non-functioning?

Ask them to preform a calibration on the spot.

How do they acquire data for chemical dosage?

Do they have spare parts for chemical pumps?

Do the settings on the pump look MAXED out

Sanitary Survey Questions

Know the How and the Why

Example – Recycled Water

Survey Questions
If there is any recycling being performed where does the recycle water re-enter the treatment plant?
What percent of influent flow is recycled backwash water?

Deeper Look - The Chunks

Where does sludge and backwash water go?

Plant influent sample collection location – *is it before or after recycled water is introduced?*

How do you determine percent of recycled water?

Sanitary Survey Questions

Know the How and the Why

Example – Disinfection

Survey Questions
When chlorination is required, has the disinfection process operated uninterrupted during the past year while water was being delivered?
Means to measure the volume of water treated.
Chlorine residual test equipment available capable of measuring residuals to the nearest 0.1 mg/l in the range below 0.5 mg/l, to the nearest 0.3 mg/l between 0.5 mg/l and 1.0 mg/l and to the nearest 0.5 mg/l above 1.0 mg/l.
Spare parts available to replace parts subject to wear and breakage.

<u>Deeper Look</u>

Where do you collect water quality data for concentration/time (CT) requirements.

Where do you determine flow for CT calculation?

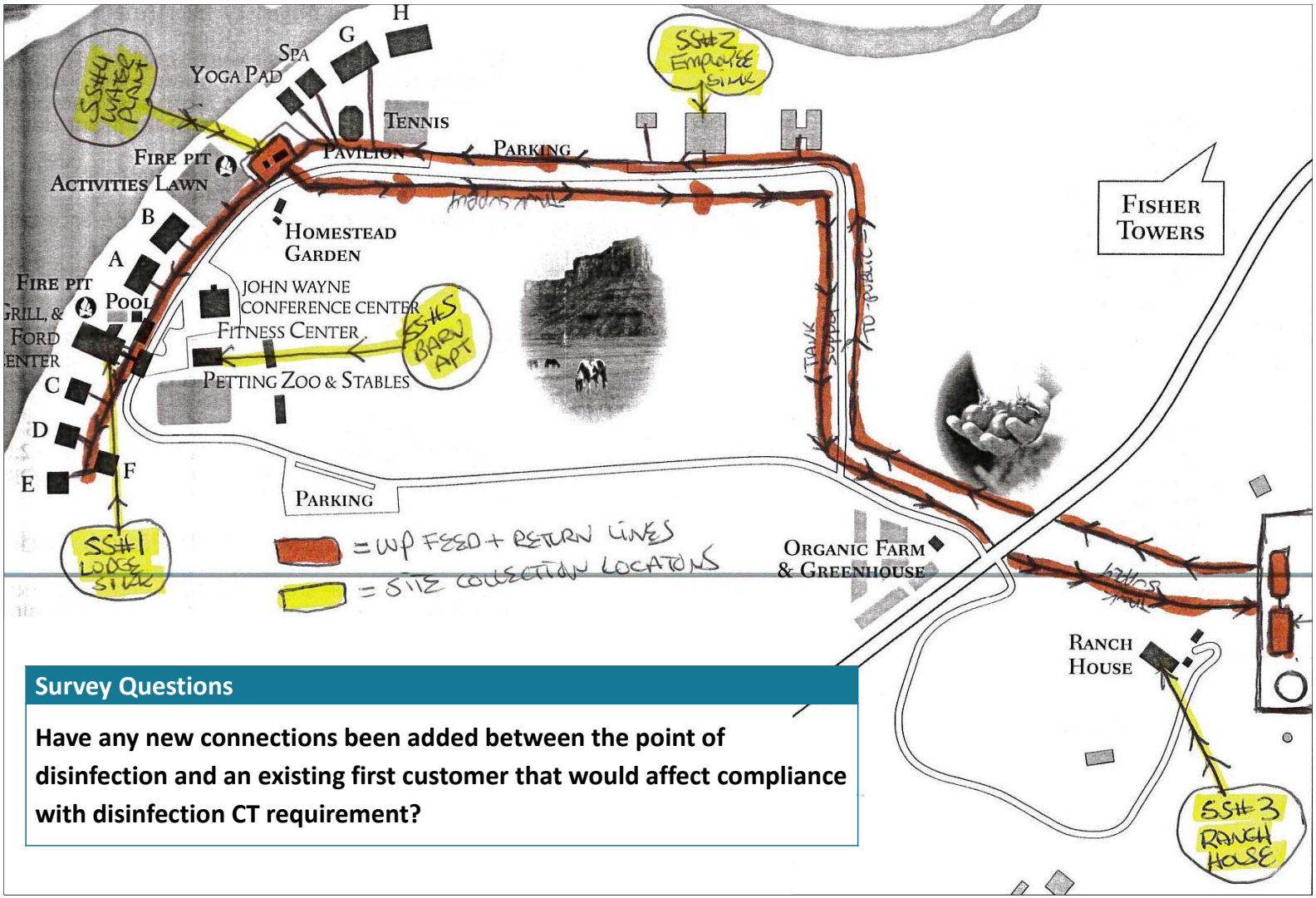
How often do you calibrate the pH meter?

How often do you check the flow and preform maintenance on chlorine meter?

Sanitary Survey Questions

Know the How and the Why

Example – Disinfection



Survey Questions

Have any new connections been added between the point of disinfection and an existing first customer that would affect compliance with disinfection CT requirement?

The Big Picture

Review the Data

Preform the inspection

Ensure Compliance

To sum it all up

Safe Drinking Water
takes
Team Work
between the
Regulator
and the
Water System

Questions?