GROUND WATER RULE INSTRUCTIONS FOR COMPLETING THE TREATMENT PLANT DISINFECTION MONTHLY OPERATION REPORT

The sections requested below only apply to ground water systems.

PUBLIC WATER SYSTEM INFORMATION

PWS Name: Print or type name of public water system (PWS).
STU Name: Print or type source treatment unit (STU) name
PWSID #: Enter the PWS ID number.
STU # Enter the STU ID number.

LABORATORY INFORMATION

Reporting Period: Enter month and year of the report.

Analytical Lab ID: For systems that serve a population of greater than 3,300 or adjust pH, enter the laboratory ID number for the lab that performed the chlorine, pH and temperature.
For systems that serve a population of less than 3,300, enter "100" if the methods used to report the analytical results comply with the methods outlined OAC 3745-81-27.

Analytical Lab Name: Enter the name of the laboratory or if you have entered "100" above enter the PWS name.

DISTRIBUTION DISINFECTANT REPORTING OAC 3745-81-01(C)(1), OAC 3745-83-01(G)(1)(2), OAC 3745-81-72(B)(4)

(a) Enter the number of disinfectant samples analyzed during the reporting period.
(b) Enter the number of disinfectant samples analyzed that had results below the minimum required residual level. The residual disinfectant concentration in distribution shall not be less than 0.2 mg/L free or 1.0 mg/L combined in more than 5% of the samples for any two consecutive months.

(c) Enter the percent of disinfectant samples meeting the required residual level:

$$\frac{a-b}{a} \times 100$$ where a = number of samples analyzed and b = number of samples below required residual.

(d) Enter the percent of disinfectant samples that met the minimum disinfectant requirement in the previous month.

CLEARWELL INFORMATION

(e) Circle/Select whether the CT calculation is simple or complex. An example of a simple calculation involves one clearwell or multiple clearwells with identical water depths, effective volume factors and identical values for pH, temperature and disinfectant. Another example of a simple calculation involves cylindrical tanks/pipes (plug flow) with identical diameters, height and flow rate and identical values for pH, temperature and disinfectant. An example of complex calculation involves two or more clearwells or cylindrical tanks/pipes with at least one dissimilar variable.

(f) Circle/Select whether or not the disinfectant is monitored continuously (circular pen chart or 6 minute data logging). PWS > 3,300 population shall monitor and record residual disinfectant concentration of the water entering the distribution system (EP001) or prior to the first customer (GWR001) continuously. If there is a failure of the continuous disinfectant monitoring equipment, grab sampling every 4 hrs shall be conducted but continuous monitoring must be placed back on line in no more than 5 working days after the failure. PWS ≤3,300 population, with acceptance from the director, may take four hour grab samples in lieu of continuous monitoring.

If chloramines are utilized in the distribution system, the continuous analyzer should monitor combined chlorine residual (typically requires the simultaneous monitoring of free and total chlorine residuals) otherwise the continuous analyzer should measure free chlorine.

(g) Enter the log removal/inactivation required.
- Conventional (4.0)
- Slow sand (4.0)
- Direct filtration (4.0)
- Other approved requirement

(h) Enter the Clearwell ID
(i) Enter the Clearwell surface area (sq ft) and/or cylindrical/ pipe diameter (inches) and
(j) Enter the approved effective volume factor of each clearwell.

<u>DATA FIELD DESCRIPTIONS FOR DISINFECTION ANALYTICAL INFORMATION</u> (For example CT calculations**, see pg 5).**

(k) Free/Combined. Report the lowest free or combined chlorine residual (mg/L) in the water entering the distribution system (EP001) or prior to the first customer (GWR001) for each day the system is in operation.

If chloramines are utilized in the distribution system, report the lowest combined chlorine residual. Otherwise, report the lowest free chlorine residual. It is only necessary to report either free or combined chlorine residual depending upon whether chloramines or free chlorine is utilized in the distribution system.

(l) Duration Chlorine Residual Fell Below Requirement: For systems required continuous monitoring enter the duration of time (to the nearest 0.1 hour) that the residual disinfectant fell below the requirement of 0.2 mg/L free or 1.0 mg/L combined. Other systems report the time it took in bringing the residuals up to the required level. The residual disinfectant concentration in the water entering the distribution system shall not be less than 0.2 mg/L free chlorine or 1 mg/L combined chlorine for more than four consecutive hours.

(m) Peak Hourly Treatment Flow: Enter the peak hourly treatment flow (maximum treated water flow) in gallons per minute (gpm) for each day the system is in operation. Peak hourly flow should be total treated water flow, **NOT** high service pumping rate, unless there is no other way to measure total flow. Contact your district office for additional guidance.

(n) Highest pH: Systems with continuous monitoring for pH; pH readings must be recorded daily and pH equipment calibrated weekly. Systems that adjust pH, the highest pH measured during the peak hourly flow for the treated water for each day must be recorded daily. For systems that do not have continuous monitoring equipment, collect and record pH measured during the peak hourly flow for the treated water once a week.

(o) Lowest Temp. Enter the lowest temperature in Celsius measured during the peak hourly flow once a week. [°C = (°F - 31) / 1.8]

(p) Lowest Clearwell Operating Depth/Level – Pipe Length: If only one clearwell is used or if two or more clearwells are used and the CT calculation is simple (identical values for water depth, temperature, pH and chlorine residual in all clearwells), enter the lowest operating depth/level (ft) during peak hourly flow. If only one cylindrical/pipe is used enter the length of the cylindrical/pipe (ft). If two or more clearwells are used and the CT calculation is complex, then leave this column blank and report the clearwell ID and the lowest operating level/depth during peak hourly flow (i.e., #1-26 ft, #2-30 ft) in the 'Comments' column. If two or more cylindrical/pipes are used and they are of different diameters, then leave this column blank and report the cylindrical/pipes ID and their respective length during peak hourly flow (i.e., #1-26 ft, #2-30 ft) in the 'Comments' column. If temperature, pH or chlorine residual also vary between clearwells, include this information for each clearwell.

(q) Lowest Disinfectant Concentration: Enter the lowest disinfectant concentration of the clearwell effluent in mg/L (EP001) or prior to the first customer (GWR001) during the peak hourly flow for each day.

(r) Effective Disinfectant...Enter the effective disinfectant contact time (minutes) the disinfectant was in contact with the water.

$$\frac{[\text{clearwell surface area (sqft)(j) x lowest clearwell depth (q) x approved effective volume factor(k) x 7.48}]}{\text{peak hourly flow (n)}}$$

$$\frac{[\{(\text{pipe diameter (in)(j) / 24}\}^2 \text{ X } 3.1415\}\text{x pipe length (q) x approved effective volume factor(k) x 7.48}]}{\text{peak hourly flow (n)}}$$

(s) Minimum Actual CT. Enter the minimum actual CT value (minutes x mg/L) achieved during peak hourly flow [(r) x (s)]. When the peak flow rate lasts more than 1 hour, the system serves a population of greater than 3,300 and/or adjust pH select the concurrent pH, temperature, clearwell depth/level, and disinfectant concentration which results in the lowest minimum actual CT value. You can visit the Ohio EPA web site and download the appropriate Excel Spreadsheet to calculate your actual CT using your recorded data. The web site address is http://epa.ohio.gov/ddagw/gwr.aspx

(t) Required CT. Enter the required CT value (minutes x mg/L) necessary to provide adequate disinfection (from CT Tables in OAC 3745-81-72). Without interpolation use the table that has the nearest but lowest temperature recorded at the peak hourly flow, and then the higher pH. If no interpolation is used, for virus inactivation at a pH greater than nine, the required CT shall be the same as the required CT at a pH equal to ten.

Report Certification

(u) Signature: Operator-of-Record (DOR) must sign report.
(v) Certification number: Print the Operator's Certification number.
(w) Date: Print the date the report was completed.

The monthly operating report is to be submitted to your local Ohio EPA office by the tenth day of the following month. Send your report to the attention of: Division of Drinking and Ground Waters for your corresponding District Office.

Ohio EPA
Northwest District Office
347 North Dunbridge Road
Bowling Green, OH 43402
(419) 352-8461

Ohio EPA
Northeast District Office
2110 East Aurora Road
Twinsburg, OH 44087
(330) 963-1200

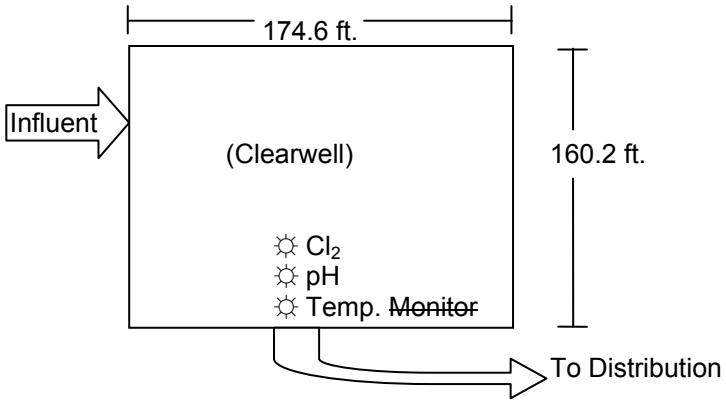
Ohio EPA
Central District Office
PO Box 1049
Columbus, OH 43216-1049
(614) 728-3778

Ohio EPA
Southwest District Office
401 East Fifth Street
Dayton, OH 45402
(937) 285-6357

Ohio EPA
Southeast District Office
2195 Front Street
Logan, OH 43188
(740) 385-8501

EXAMPLE CT CALCULATION #1

SIMPLE CALCULATION - 1 clearwell with an Approved Effective Volume Factor of 0.2



NOTE: All areas must be in square feet, and all flow rates must be in gallons per minute.

During Peak Hourly Flow:

Free chlorine concentration of clearwell effluent:	1.1 mg/L
Water temperature of clearwell effluent:	8.5°C
Water depth in clearwell:	17.5 feet
pH of clearwell effluent:	8.2
Peak hourly flow:	12,490 gpm

NOTE: Peak hourly flow is total treated water flow, **NOT** high service pumping rate!

STEP 1. Calculate the Surface Area of Clearwell

A = (160.2 x 174.6)
A = 27,970 sq. ft.

STEP 2 Calculate Effective Contact Time (T)

$$T = \frac{\text{(Effective Volume Factor)} \times \text{(Surface Area)} \times \text{(Minimum Clearwell Level)} \times (7.48)}{\text{Peak Hourly Flow}}$$

$$T = \frac{0.2 \times 27{,}970 \times 17.5 \times 7.48}{12{,}490}$$

T = 58.627 minutes

T = 59 minutes (rounded)

STEP 3 Calculate the Actual CT Value during the Peak Hourly Flow

CT = (Free chlorine concentration of clearwell effluent) x (Contact Time)
CT = 1.1 mg/L x 59 min
CT = 64.9 mg/L – min
CT = 65 (rounded)

STEP 4 Determine the Required CT Value

Temperature of clearwell effluent	8°C
pH of clearwell effluent	8.2
Free Chlorine Concentration of clearwell effluent	1.1 mg/l
Disinfection for Log Inactivation Required	

Note: Temperature is rounded down to 8°C and pH is rounded up to 9.0, results may be interpolated from the tables.

CT Values for Inactivation of Viruses by Free Chlorine (pH 8.0- 9.0)

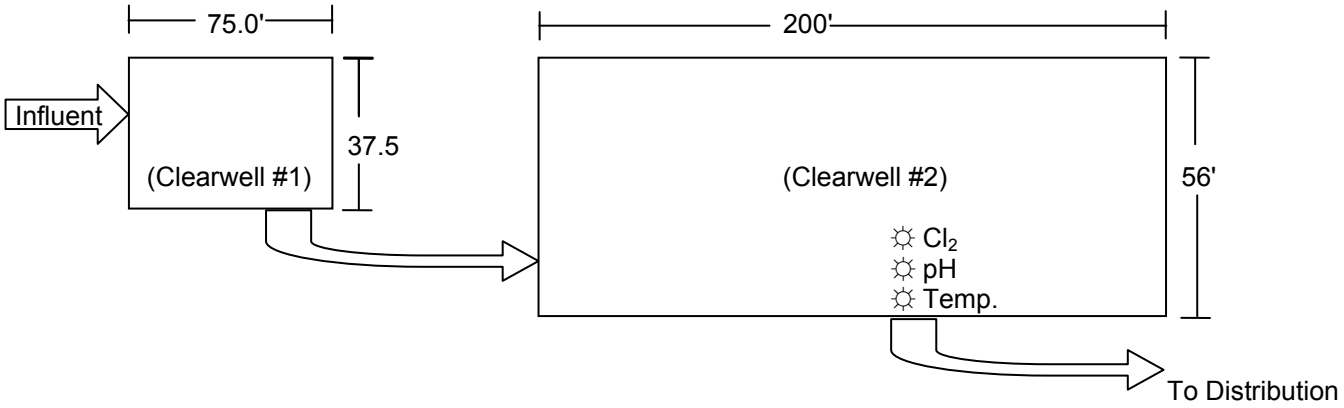
A	Degree °C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
B	4-log Inactivation	11.6	10.7	9.8	8.9	8.0	7.6	7.2	6.8	6.4	6.0	5.6	5.2	4.8	4.4	4.0	3.8	3.6	3.4	3.2	3.0

The required CT value is 6.8 mg/L - min.
For viruses inactivation

Compare your CT value from Step 3 above with the value you circled in Line B of the table below. If your CT is a number larger than the number you circled in Line B then your system probably provides at least 4-log treatment of viruses.

EXAMPLE CT CALCULATION #2

Complex Calculation - 2 clearwells with different Approved Effective Volume Factors and different clearwell levels.



Approved Effective Volume Factors
- Clearwell # 1 - 0.1
- Clearwell # 2 - 0.6

During Peak Hourly Flow:

Free chlorine concentration of clearwell effluent#2	1.1 mg/L
Water temperature of clearwell effluent #2	8°C
Minimum Operating Water depth in clearwells	
Clearwell # 1	8 feet
Clearwell # 2	10 feet
pH of clearwell effluent #2	8.2
Peak hourly flow	4,150 gpm

NOTE: Peak Hourly Flow is total treated water flow, NOT high service pumping rate!

STEP 1. Calculate the Surface Area (A) of each Clearwell

Clearwell # 1 $A_1 = 37.5 \times 75$ Clearwell # 2 $A_2 = 56 \times 200$

A_1 = **2,813 sq. ft.** A_2 = **11,200 sq. ft.**

STEP 2. Calculate Effective Contact Time (T) for each clearwell.

$$T = \frac{\text{(Effective Volume Factor) x (Surface Area) x (Minimum Clearwell Level) x 7.48)}}{\text{Peak Hourly Flow}}$$

Clearwell #1 $T_1 = \frac{0.1 \times 2{,}813 \times 8 \times 7.48}{4{,}150}$ Clearwell # 2 $T_2 = \frac{0.6 \times 11{,}200 \times 10 \times 7.48}{4{,}150}$

T_1 = 4.056 minutes T_2 = 121.121 minutes

T_1 = **4 minutes** (rounded) T_2 = **121 minutes** (rounded)

STEP 3. Calculate the Total Effective Contact Time (Tt)

Tt = T1 + T2

Tt = 4 + 121 = **125 minutes**

STEP 4. Calculate the Actual CT Value During the Peak Hourly Flow

CT = (Free chlorine concentration of clearwell effluent) x (Contact Time)

CT = 1.1 mg/L x 125 min
CT = 137.5 mg/L - min
CT = **138** (rounded)

STEP 5. Determine the Required CT Value

Water Temperature at clearwell effluent #2	8°C
pH at clearwell effluent #2	8.2
Free Chlorine Concentration at clearwell effluent #2	1.1 mg/L

Note: Temperature is rounded down to 8°C and pH is rounded up to 9.0, results may be interpolated from the tables.

CT Values for Inactivation of Viruses by Free Chlorine (pH 8.0- 9.0)

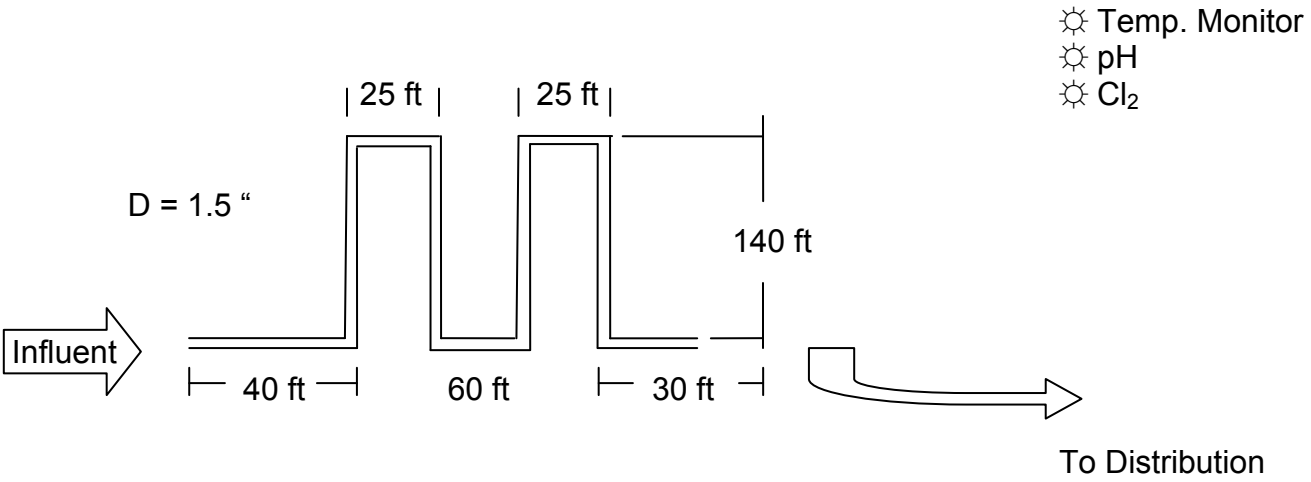
A	Degree °C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
B	4-log Inactivation	11.	10.7	9.8	8.9	8.0	7.6	7.2	6.8	6.4	6.0	5.6	5.2	4.8	4.4	4.0	3.8	3.6	3.4	3.2	3.0

The required CT value is 6.8 mg/L - min.
For viruses inactivation

Compare your CT value from Step 3 above with the value you circled in Line B of the table below. If your CT is a number larger than the number you circled in Line B then your system probably provides at least 4-log treatment of viruses.

EXAMPLE CT CALCULATIONS # 3

SIMPLE CALCULATION - 1 Cylindrical/Pipe with an Approved Effective Volume Factor of 1.0



NOTE: All areas must be in square feet, and all flow rates must be in gallons per minute.

During Peak Hourly Flow:

Free chlorine concentration at EP001 or GWR001:	1.1 mg/L
Water temperature at EP001 or GWR001:	8.5°C
Cylindrical tank/pipe Diameter:	24 inches
pH at EP001 or GWR001:	8.2
Peak hourly flow:	10 gpm

NOTE: Peak hourly flow is total treated water flow, **NOT** high service pumping rate!

STEP 1. Calculate the Surface Area of pipe

$A = [\{D, in/24]^2 \times 3.1415$
$A = \{[1.5\ inch/24]^2 \times 3.1415\}$
$A = 0.0123\ ft^2$

STEP 2 Calculate Effective Contact Time (T)

$$T = \frac{(\text{Effective Volume Factor}) \times (\text{Surface Area}) \times (\text{Pipe height}) \times (7.48)}{\text{Peak Hourly Flow}}$$

$$T = \frac{1.0 \times 0.0123 \times 740 \times 7.48}{10}$$

T = 6.88 minutes

T = 6.9 minutes (rounded)

STEP 3 Calculate the Actual CT Value during the Peak Hourly Flow

CT = (Free chlorine concentration) x (Contact Time)
CT = 1.2 mg/L x 6.9 min
CT = 8.28 mg/L – min
CT = 8.3 (rounded)

Note: Temperature is rounded down to 8°C and pH is rounded up to 9.0, results may be interpolated from the tables.

CT Values for Inactivation of Viruses by Free Chlorine (pH 8.0- 9.0)

A	Degree °C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
B	4-log Inactivation	11.6	10.7	9.8	8.9	8.0	7.6	7.2	6.8	6.4	6.0	5.6	5.2	4.8	4.4	4.0	3.8	3.6	3.4	3.2	3.0

The required CT value is 6.8 mg/L - min.
For viruses inactivation

Compare your CT value from Step 3 above with the value you circled in Line B of the table below. If your CT is a number larger than the number you circled in Line B then your system probably provides at least 4-log treatment of viruses.

Appendix A: 1.SW Form

OhioEPA

Division of Drinking and Ground Waters

PWS Name:
STU Name:
PWSID #:
STU #:

Surface Water Treatment Plant
Monthly Operating Report (MOR)

Reporting Period:
Analytical Lab ID:
Analytical Lab Name:

Distribution Disinfectant Reporting

(a) Number of Samples Analyzed
(b) Number Below Required Residual
(c) Percent Meeting Disinfectant Requirement
(d) Previous Month: Percent Meeting Disinfectant Requirement

Clearwell Information

Calculation Type: Simple or Complex (e)
Disinfectant Monitored Continuously Yes No (f)
Filtration Type: Conventional, Slow Sand, Direct (g)
Log Inactivation Requirement: _____ (h)

Clearwell ID	Surface Area	Approved Effective Volume Factor
(i)	(j)	(k)

Date	Lowest Chlorine Residual at Entrance to Distribution System		Duration Chlorine Residual Fell Below Requirement (hours, tenths)	Peak Hourly Treatment Flow (gpm)	Highest pH	Lowest Temp. (°C)	Lowest Clearwell Operating Depth/Level (feet)	Lowest Disinfectant Concentration (mg/L)	Effective Disinfectant Contact Time (minutes)	Minimum Actual CT (min. x mg/L)	Required CT (min. x mg/L)	Interpolation (Y/N)	Raw Alkalinity (mg/L)	Raw TOC (mg/L)	Finished TOC (mg/L)	Comments
	Free	Combined														
	(l)		(m)	(n)	(o)	(p)	(q)	(r)	(s)	(t)	(u)	(v)	(w)	(x)	(y)	(z)

Operator of Record: __(ww)_____ Certification Number:___(xx)_____ Date: ____(yy)____ DRAFT 11/24/2009