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CN 600129316
RN 105598759

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

October 3, 2011

Mr. Tyson Traw, P.E.
Biggs & Mathews, Inc. Consulting Engineers
2500 Brook Avenue
Wichita Falls, Texas 76301-6105

Subject: Revised Contact Time Study for
The City of Wichita Falls – PWS ID No. 2430001
Cypress Water Treatment – 2010 Plant
Wichita County, Texas

Dear Mr. Traw:

On April 4, 2011, the Texas Commission on Environmental Quality (TCEQ) received your letter dated April 1, 2011 requesting a revised Contact Time (CT) study for the City of Wichita Falls (CWF) Cypress Water Treatment Plant (CWTP) 2010 Water Treatment Plant (WTP) in order to demonstrate that the WTP can meet applicable disinfection requirements for the modifications to the WTP. The information in this TCEQ letter for CWF CWTP WTP should replace, not supplement, all previous CT studies for this facility.

The CWF CWTP WTP is a 10-million-gallons-per-day (MGD) conventional treatment facility receiving raw water from Lake Kickapoo and Lake Arrowhead to a secondary raw water reservoir located at the WTP. Raw water from the reservoir travels through a 42-inch raw water pipe into a splitter basin where it is divided into the three separate treatment facilities within the CWTP. The WTP consists of a rapid mix basin, a 90-foot diameter (dia.) clarifier, a re-carbonation basin, five multi-media gravity filters, a 0.20-million-gallon (MG) clearwell and pump station, and three ground storage tanks. Upstream of the 0.20-MG clearwell and pump station, finished water from the RO Membrane treatment plant, is combined with filtered water from the WTP increasing the capacity of the WTP to 20 MGD.

The proposed disinfection protocol involves the injection of chlorine dioxide (ClO_2) downstream of the secondary reservoir, and chlorine (Cl_2) and liquid ammonia gas (NH_4) downstream of the splitter basin, and upstream of the 0.20-MG clearwell and transfer pump station. Chlorine dioxide residual is monitored at three locations along the 42-inch raw water pipe at 400, 900 and 5,600 linear feet downstream of the reservoir pump station, prior to entering the splitter basin. Chloramine residual is monitored downstream of the five multi-media gravity filters, downstream of the 0.10-MG clearwell and transfer pump station, and downstream of the three ground storage tanks, prior to entering the distribution system.

A disinfection zone is a segment of the treatment process which begins at a disinfectant application point and ends at the subsequent disinfectant application or residual sampling point. Each disinfectant application point, regardless of the frequency of use, represents the beginning of a separate disinfection zone. However, a plant may have only one disinfectant point and choose to monitor at more than one point, creating multiple disinfection zones. Based on the information we had at the time of our review, we have identified six disinfection zones at the CWF CWTP WTP. The first disinfection zone, D1, consists of 400 linear feet (LF) of 42-inch raw water pipe. The second disinfection zone, D2, consists of 500 LF of 42-inch raw water pipe. The third disinfection zone, D3, consists of 5,600 LF of 42-inch raw water pipe. The fourth disinfection zone, D4, consists of 220 LF of 36-inch pipe, the rapid mix basin, 90-foot diameter clarifier, re-carbonation basin, and the five multi-media gravity filters. The fifth disinfection zone, D5, consists of the 0.10-MG clearwell and transfer pump station. The sixth disinfection zone, D6, is divided into three treatment units D6A, D6B and D6C for each of the three ground storage tanks. The treatment unit D6A consists of a 206-foot diameter, 10.0-MG ground storage tank. The treatment unit D6B consists of a 150-foot diameter, 5.0-MG ground storage tanks, and the treatment unit D6C consists of a 123-foot diameter, 3.0-MG ground storage tank.

CT calculations are used to evaluate the disinfection process. Since T_{10} values are required to calculate the CT for the treatment process, Table 1 was developed for the CWF CWTP WTP. The T_{10} values are based on the information provided in your CT template dated April 4, 2011, TCEQ Comprehensive Compliance Investigation (CCI) conducted September 3, 2008, and the most recent TCEQ-approved CT Study dated January 31, 2007.

TABLE 1: T_{10} TABLE FOR CWF CWTP WTP

DISINFECTION ZONE	TREATMENT UNIT	VOLUME (GAL)	FLOW RATE (MGD)	BAFFLING FACTOR	T_{10} (MIN)	
					Unit	Sum
D1	42-inch Raw Water Pipe	28,800 ⁽¹⁾	42.00 ⁽¹⁴⁾	1.0 ⁽²¹⁾	0.987	0.99
D2	42-inch Raw Water Pipe	36,000 ⁽²⁾			1.234	1.23
D3	42-inch Raw Water Pipe	403,100 ⁽³⁾			13.82	13.82
D4	36-inch Raw Water Pipe	11,600 ⁽⁴⁾	10.00 ⁽¹⁵⁾	1.0 ⁽²¹⁾	1.675	70.06
	Rapid Mix Basin	4,850 ⁽⁵⁾		0.1 ⁽²²⁾	0.07	
	30-inch Pipe	3,100 ⁽⁶⁾		1.0 ⁽²¹⁾	0.45	
	Clarifier	926,500 ⁽⁷⁾		0.3 ⁽²³⁾	40.028	
	Re-carbonation Basin	183,000 ⁽⁸⁾		0.5 ⁽²⁴⁾	13.177	
	Multi-media Filters (5)	29,100 ⁽⁹⁾	2.00 ⁽¹⁶⁾	0.7 ⁽²⁵⁾	14.659	
D5	0.10 MG Clearwell	109,100 ⁽¹⁰⁾	20.00 ⁽¹⁷⁾	0.5 ⁽²⁶⁾	3.928	3.93
D6A	10.0 MG Ground Storage Tank	4,987,000 ⁽¹¹⁾	36.40 ⁽¹⁸⁾	0.3 ⁽²⁷⁾	59.186	59.19
D6B	5.0 MG Ground Storage Tank	2,485,500 ⁽¹²⁾	6.76 ⁽¹⁹⁾	0.1 ⁽²⁸⁾	52.951	52.95
D6C	3.0 MG Ground Storage Tank	1,493,500 ⁽¹³⁾	8.84 ⁽²⁰⁾		24.328	24.33

Notes:

- (1) Based on 400 linear feet (LF) of 42-inch raw water pipe, as per the CT submittal by Biggs & Mathews, Inc. Consulting Engineers (BMI) dated April 4, 2011.
- (2) Based on 500 LF of 42-inch raw water pipe, as per the CT submittal by BMI dated April 4, 2011.
- (3) Based on 5,600 LF of 42-inch raw water pipe, as per the CT submittal by BMI dated April 4, 2011.
- (4) Based on 220 LF of 36-inch raw water pipe, as per the CT submittal by BMI dated April 4, 2011.
- (5) Based on one rapid mix basin 27-feet long by 6-feet wide with a side water depth of 4-feet, as per the CT submittal by BMI dated April 4, 2011.
- (6) Based on 85 LF of 30-inch pipe, as per the CT submittal by BMI dated April 4, 2011.
- (7) Based on one clarifier basin having a 90-foot diameter, a side water depth of 18.9-feet and a center water depth of 20.6-feet, as per the CT submittal by BMI dated April 4, 2011.
- (8) Based on one re-carbonation basin 45.5-feet long by 32-feet wide with a side water depth of 16.8-feet, as per the CT submittal by BMI dated April 4, 2011.
- (9) Based on one filter, 24-feet by 15-feet each, with a media and underdrain depth of 7-feet and a minimum water depth of 6.8-feet over the media as per the approved TCEQ CT study dated January 31, 2007. An average porosity of 50% is assumed for the media.
- (10) Based on a "worst case" operating condition. In the absence of site-specific information, a minimum operating level of 50% of the nominal capacity is assumed. As per the CT submittal by BMI dated April 4, 2011, the clearwell is 0.2 MG.
- (11) Based on a "worst case" operating condition. In the absence of site-specific information, a minimum operating level of 50% of the nominal capacity is assumed. As per the CT submittal by BMI dated April 4, 2011, the clearwell is 10.0 MG.
- (12) Based on a "worst case" operating condition. In the absence of site-specific information, a minimum operating level of 50% of the nominal capacity is assumed. As per the CT submittal by BMI dated April 4, 2011, the clearwell is 5.0 MG.
- (13) Based on a "worst case" operating condition. In the absence of site-specific information, a minimum operating level of 50% of the nominal capacity is assumed. As per the CT submittal by BMI dated April 4, 2011, the clearwell is 3.0 MG.
- (14) Based on the design capacity of the combined SWTP (42 MGD), this flow volume represents all flow from the secondary reservoir to the splitter basin, where flow is regulated to all three separate treatment facilities. As per the CT submittal by BMI dated April 4, 2011.
- (15) Based on the design capacity of the City of Wichita Falls '10 Plant, TCEQ ID 15134 (10 MGD), as per the CT submittal by BMI dated April 4, 2011.
- (16) Based on the design capacity of the City of Wichita Falls '10 Plant (10 MGD), divided equivalently between the five filtration units (2.0 MGD per filter), as per the CT submittal by BMI dated April 4, 2011.
- (17) Based on the design capacity for the City of Wichita Falls '10 WTP (10 MGD) combined with the design capacity for the City of Wichita Falls RO Membrane WTP (10 MGD), for a total combined capacity of (20 MGD), as per the CT submittal by BMI dated April 4, 2011.
- (18) Based on 70% of the overall design capacity of the City of Wichita Falls Cypress Surface Water Treatment Plant (52 MGD) divided between the three ground storage tanks. 70% of the TPC for the 10.0 MG GST is equal to 36.4 MGD. As per the CT submittal by BMI dated April 4, 2011.
- (19) Based on 13% of the overall design capacity of the City of Wichita Falls Cypress Surface Water Treatment Plant (52 MGD) divided between the three ground storage tanks. 13% of the TPC for the 5.0 MG GST is equal to 6.76 MGD. As per the CT submittal by BMI dated April 4, 2011.
- (20) Based on 17% of the overall design capacity of the City of Wichita Falls Cypress Surface Water Treatment Plant (52 MGD) divided between the three ground storage tanks. 17% of the TPC for the 3.0 MG GST is equal to 8.84 MGD. As per the CT submittal by BMI dated April 4, 2011.

- (21)Based on the assumption of “perfect” baffling characteristics for pipe.
- (22)Based on the assumption of “unbaffled” baffling characteristics.
- (23)Based on the assumption of “poor” baffling characteristics for clarifiers.
- (24)Based on the assumption of “average” baffling characteristics. The re-carbonation basin has four internal baffles and a length to width of (40:1) as per the CT submittal by BMI dated April 4, 2011.
- (25)Based on the assumption of “superior” baffling characteristics for filters.
- (26)Based on the assumption of “average” baffling characteristics for basins with two internal baffles and a length to width of 30:1. As per the CT submittal by BMI dated April 4, 2011.
- (27)Based on the assumption of “poor” baffling characteristics for basins having two inlets, one outlet and three interior baffle walls.
- (28)Based on the assumption of “unbaffled” baffling characteristics

Below is a Disinfection Process Parameters Table to help operators at the plant complete their Surface Water Monthly Operating Report (SWMOR). In Table 2, we have characterized the T₁₀ available in each of the disinfection zones based on the flow rate through the unit(s) that contributes most to the disinfection process within that zone. We have also provided the operators with the disinfection requirements that they must meet on a continual basis.

TABLE 2: DISINFECTION PROCESS PARAMETERS

APPROVED CT STUDY PARAMETERS						PERFORMANCE STANDARDS	
Parameters	Disinfection Zones					Log Inactivations	
	D1	D2	D3	D4	D5	Giardia	Viruses
Flow Rate (MGD)	42.00	42.00	42.00	10.00	20.00	0.5	2.0
T ₁₀ (minutes)	1.0	1.2	13.8	70.1	3.9		

APPROVED CT STUDY PARAMETERS						PERFORMANCE STANDARDS	
Parameters	Disinfection Zones					Log Inactivations	
	D6A	D6B	D6C	D7	D8	Giardia	Viruses
Flow Rate (MGD)	36.40	6.76	8.84	na	na	0.5	2.0
T ₁₀ (minutes)	59.2	53.0	24.3	na	na		

If your monitoring plan has changed as a result of this CT study, please submit an updated monitoring plan at the address below.

Monitoring Plan Coordinator (MC – 155)
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, TX 78711

Further information can be found in Regulatory Guidance (RG) 384 “How to Develop a Monitoring Plan for a Public Water System” or at TCEQ’s website:

http://www.tceq.state.tx.us/permitting/water_supply/pdw/monitoring_plans/monitoring_plans.html

Mr. Tyson Traw, P.E.
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If you have any questions concerning our evaluation or if we may be of further assistance, please contact Ms. Rian McMorris at (512) 239-4487, by e-mail at rian.mcmorris@tceq.texas.gov or correspondence at:

Technical Review and Oversight Team (MC-159)
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, TX 78711-3087

Sincerely,



Ada Lichaa, P.G., Manager
Plan & Groundwater Review Section
Water Supply Division
Texas Commission on Environmental Quality

AL/RM/av

Enclosure: CT Worksheet

cc: w/ enclosure: TCEQ Tracer Study File
TCEQ PWS File
TCEQ Region 3, Abilene
The Honorable Lanham Lyne, Mayor, City of Wichita Falls,
Attn: Mr. Mark Southard, Water Purification, City of Wichita Falls,
P. O. Box 1431, Wichita Falls, TX 76307-1431

CT STUDY

FOR PUBLIC WATER SYSTEMS THAT ARE USING SURFACE WATER SOURCES
OR GROUND WATER SOURCES UNDER THE INFLUENCE OF SURFACE WATER (cont.)

Description Worksheet

PUBLIC WATER

SYSTEM NAME: City of Wichita Falls PWS ID No.: 2430001

PLANT NAME

Month: May

OR NUMBER: Cypress Water Treatment Plant: '10 Plant

Day: 5

Year: 2011

Enter a detailed narrative description of the plant treatment processes and disinfection protocol.

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Detailed narrative description of the plant treatment processes and disinfection protocol (cont)