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PWS#2430001/CO
CN600129316
RN101611275

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

August 25, 2008

Mr. Daniel K. Nix
Public Utilities Operations Manager
City of Wichita Falls
P. O. Box 1431
ATTN: Amy Wilson - Water Purification
Wichita Falls, Texas 76307-1431

Subject: Public Drinking Water System
Approved CT Study for Cypress RO Membrane Plant
City of Wichita Falls – PWS ID No. 2430001
Wichita County, Texas

Dear Mr. Nix:

We have reviewed your submittal letter, dated July 29, 2008, your emails dated August 15, 2008 and August 18, 2008, and the information from your meeting on August 20, 2008 with the Texas Commission on Environmental Quality (TCEQ), comprising your request for the City of Wichita Falls a CT study for the new Cypress Reverse-Osmosis (RO) Membrane plant, which includes the Lake Kemp Headquarters Road Pump Station (HRPS) and a 3.3-MGD RO microfiltration (MF) membrane plant at the Cypress Water Treatment Facility. The CT study is necessary to assess the disinfection process at the new plant to ensure compliance with the disinfection requirements of the Surface Water Treatment Rule. The information in this letter establishes the first approved CT study for the Cypress RO Membrane Plant.

The Cypress RO Membrane water treatment plant (WTP) receives raw water from the Lake Kemp HRPS, which pumps raw water from a 12-MG reservoir fed by the Lake Kemp watershed, which includes Lake Diversion and the Southside Canal system. Water from the canal is stored in the 12-MG reservoir for flow-balancing purposes. The HRPS pumps 27 MGD of water from the reservoir to the Cypress RO Membrane Plant through a 42-inch pipeline approximately 65,000 feet long. Chlorine dioxide is injected into the pipeline at the effluent of the HRPS to maximize detention time. At the Cypress RO Membrane Plant, the water receives further treatment through clarification, microfiltration, reverse osmosis, and the Cypress 1961 WTP 123,420-gallon clearwell. The disinfection protocol involves injecting chlorine dioxide 65,000 feet upstream of the Cypress RO Membrane Plant. Chlorine dioxide residual is monitored 85 feet downstream of the chlorine dioxide injection point, then 2,310 feet downstream of the chlorine dioxide injection point, and finally at the influent of the Cypress RO Membrane Plant. Chloramines residual is monitored downstream of the Cypress 1961 WTP 123,420-gallon clearwell.

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. Four disinfection zones (D1A, D1B, D1C, and D2) are defined for the Cypress RO Membrane Plant. The first disinfection zone (D1A) contains the initial 85 feet of the 42-inch diameter raw water

Mr. Daniel K. Nix, Public Utilities Operations Manager

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We have prepared a Disinfection Process Parameters table to help operators complete the Cypress RO Membrane Plant SWMOR. In Table 2, we have characterized the T_{10} 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 the Cypress RO Membrane Plant must meet on a continual basis.

TABLE 2: DISINFECTION PROCESS PARAMETERS

APPROVED CT STUDY PARAMETERS						PERFORMANCE STD's	
PARAMETERS	Disinfection Zones					Log Inactivation	
	D1A	D1B	D1C	D2	D3	<i>Giardia</i>	Viruses
Flow Rate (MGD)	27.0	27.0	27.0	37.0	na	0.0	2.0
T_{10} Time (minutes)	0.3	8.9	249.2	0.2	na		

Please note that we have based the detention time for disinfection zone D2 on the volume and flow rate through the Cypress 1961 WTP Clearwell. The CT calculations on the Cypress RO Membrane Plant SWMOR for the Cypress 1961 WTP Clearwell in disinfection zone D2 are based on the detention time the clearwell experiences in the Cypress 1961 WTP with the assumption the Cypress 1961 WTP discharge pumps downstream of the clearwell have a higher capacity than the Cypress RO Membrane Plant. Also note that we will not require the membrane plant to provide a minimum level of *Giardia* inactivation as long as the membrane processes are achieving at least a 3.0-log removal of *Giardia*.

If you have any questions concerning our evaluation or if we may be of other assistance, please contact me at (512) 239-4729 or at the address on the letterhead.

Sincerely,



William R. Melville, P.E.
Technical Review & Oversight Team
Public Drinking Water Section
Water Supply Division, MC 155

Enclosure: CT Worksheet

cc w/ enclosure: TCEQ Tracer Study File
TCEQ PWS File #2430001
TCEQ Abilene Regional Office – R3

cc w/o enclosure: Mr. Gary Chauvin, TCEQ, Technical Review & Oversight Team (MC 155)

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

OR NUMBER: Cypress RO Membrane Plant

Month: August

Day: 25

Year: 2008

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

The Cypress Reverse-Osmosis (RO) Membrane water treatment plant (WTP) receives raw water from the Lake Kemp Headquarters Road Pump Station (HRPS). The Lake Kemp HRPS pumps raw water from a 12-MG reservoir fed by the Lake Kemp watershed, which includes Lake Diversion and the Southside Canal system. Water from the canal is stored in the 12-MG reservoir for flow-balancing purposes. The HRPS pumps 27 MGD of water from the reservoir to the Cypress RO Membrane Plant through a 42-inch pipeline approximately 65,000 feet long. Chlorine dioxide is injected into the pipeline at the effluent of the HRPS to maximize detention time.

At the Cypress RO Membrane Plant, the water receives further treatment through clarification, microfiltration, reverse osmosis, and the Cypress 1961 WTP 123,420-gallon clearwell.

Disinfection is accomplished by injecting chlorine dioxide 65,000 feet upstream of the Cypress RO Membrane Plant. Chlorine dioxide residual is monitored 85 feet downstream of the chlorine dioxide injection point, or 2,310 feet downstream of the chlorine dioxide injection point, or 65,000 feet downstream of the chlorine dioxide injection point at the influent of the Cypress RO Membrane Plant. Chloramines residual is monitored downstream of the Cypress 1961 WTP 123,420-gallon clearwell.

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. Four disinfection zones (D1A, D1B, D1C, and D2) are defined for the Cypress RO Membrane Plant. The first disinfection zone (D1A) contains the initial 85 feet of the 42-inch diameter raw water line. The next possible disinfection zone (D1B) includes the initial 2,310 feet of the 42-inch diameter raw water line. The next possible disinfection zone (D1C) holds the entire 65,000 feet of the 42-inch diameter raw water line. The last disinfection zone (D2) holds the Cypress 1961 WTP 123,420-gallon clearwell.

Disinfection Zones for the City of Wichita Falls Cypress RO Membrane Plant

- D1A - Initial 85 feet of 42-inch diameter raw water line
- D1B - Initial 2,310 feet of 42-inch diameter raw water line
- D1C - Entire 65,000 feet of 42-inch diameter raw water line
- D2 - Cypress 1961 WTP Clearwell (123,420 gallons)

CT STUDY

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

Summary Worksheet

PUBLIC WATER

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

PLANT NAME

OR NUMBER: Cypress RO Membrane Plant Date: August 25, 2008

Disinfection Zone	Treatment Unit	Volume* (each) (gal)	Flow Rate* (each) (MGD)	Baffling Factor*	T ₁₀ * (min)	
					Unit	Zone
D1A	Piping (1)	6,118	27.000	1	0.3	0.3
D1B	Piping (1)	166,275	27.000	1	8.9	8.9
D1C	Piping (1)	4,672,612	27.000	1	249.2	249.2
D2	Cypress 1961 WTP Clearwell (1)	61,360	37.000	0.1	0.2	0.2

* These values are calculated on the T10 Details Sheet

TCEQ - (6-10-03)

CT STUDY

Baffling Characteristics: Perfect
Approved Baffling Factor:

T₁₀ 8.9 min

D1B FLOW RATE 27.000 mgd

T10 SUM FOR D1B 8.9 min

Disinfection Zone: D1C Disinfectant: Chlorine Dioxide

Unit - 1 Type: Piping Shape: Pipe

Further Description: Piping

<u>Characteristic</u>		<u>Comments</u>
Number of Units	1	
Diameter	42 in	Per Wichita Falls CT study July 28, 2008
Length	64,915 ft	Per Wichita Falls CT study July 28, 2008
Volume (each)	4,672,612 gal	
Flow Rate (each)	18,750 gpm	
Detention Time	249.2 min	

Baffling Factor 1.0

Baffling Characteristics: Perfect
Approved Baffling Factor:

T₁₀ 249.2 min

D1C FLOW RATE 27.000 mgd

T10 SUM FOR D1C 249.2 min

Disinfection Zone: D2 Disinfectant: Chloramines

Unit - 1 Type: Clearwell Shape: Other

Further Description: Cypress 1961 WTP Clearwell

<u>Characteristic</u>		<u>Comments</u>
Number of Units	1	
Maximum Volume (each)	123,420 gal	Based on rectangular clearwell dimensions of 275 cubic feet X 60-foot length. Per email correspondence on 8-15-08 with Dan Nix, Public Utilities Operations Manager, City of Wichita Falls
Worst Case Volume (each)	61,360 gal	
Percent of Maximum Volume	50 %	
Worst Case Volume (each)	61,360 gal	

CT STUDY

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

PUBLIC WATER
SYSTEM NAME:

City of Wichita Falls

PLANT NAME
OR NUMBER:

Cypress RO Membrane Plant

PWS ID No.:

2430001

Date:

August 25, 2008

DISINFECTION PROCESS PARAMETERS									
APPROVED CT STUDY PARAMETERS					PERFORMANCE STANDARDS				
Parameters	Disinfection Zones				Log Inactivations	Giardia lamblia Cysts	Viruses		
	D1A	D1B	D1C	D2					
Flow Rate (MGD)	27.000	27.000	27.000	37.000		0.0			
T ₁₀ (minutes)	0.3	8.9	249.2	0.2			2.0		

DISINFECTION PROCESS DATA										
INDIVIDUAL DISINFECTION ZONES										
Disinfectant	C (mg/L)	Flow (MGD)	Temp (°C)	pH	CT _{CALC}	Giardia CT _{REQD}	Virus CT _{REQD}	Giardia Log	Virus Log	Inact. Ratio
CLO2 D1A	6.20	27.000	20.0	8.0	2.0	NA	2.0	0.41	2.00	
CLO2 D1B	0.23	27.000	20.0	8.0	2.0	NA	2.0	0.41	2.02	
CLO2 D1C	0.05	27.000	20.0	8.0	12.5	NA	2.0	2.53	12.32	1.00
CLA D2	4.0	37.000	20.0	8.0	1.0	NA	303.0	0.00	0.01	(3)
D3										
PLANT TOTAL										

Certificate No.
and Grade:

SUBMITTED BY:

Date:

TCEQ - (6-10-03)

CT STUDY