APPENDIX Q

TCEQ Conditional Letters of Approval

September 5, 2013 & October 15, 2013

Summary of Temporary Exceptions / Conditions

Bryan W. Shaw, Ph.D, *Chairman*
Toby Baker, *Commissioner*
Zak Covar, *Executive Director*

PWS/2430001/CO/09-05-2013/Exception
PWS/2430001/CO/09-05-2013/Plan Ltr

Texas Commission on Environmental Quality

Protecting Texas by Reducing and Preventing Pollution

September 5, 2013

Mr. Kerry D. Maroney, P.E.
Biggs & Mathews, Inc.
2500 Brook Avenue
Wichita Falls, Texas 76301

Re: City of Wichita Falls - Public Water System ID No. 2430001
Conditional Approval to Conduct a Full-Scale Verification Test for a Temporary Direct Potable Reuse Water Treatment Plant
Temporary Exception Requests
- Treated Wastewater Effluent as a Public Water System Raw Water Source
- Pre-formed Chloramines for Predisinfection
- Hollow Fiber Microfiltration Membrane Treatment
- Use of Reverse Osmosis Membrane Treatment
- pH Adjustment

Preliminary Engineering Report for Temporary Reuse of Wastewater Effluent as a Source of Direct Potable Reuse (DPR)
Engineer Contact Telephone: (940) 766-0156
Plan Review Log No. P-07172013-114
Wichita County, Texas

RN 105598759; CN 600129316

Dear Mr. Maroney:

On April 25, 2013, the Texas Commission on Environmental Quality (TCEQ) received your letter dated April 23, 2013 requesting temporary exceptions to the minimum requirements in Title 30 of the Texas Administrative Code (30 TAC) Chapter 290, Subchapter D for public water systems. Due to the ongoing drought conditions, the City of Wichita Falls (City) has requested approval to modify the City's Cypress 2008 and 2010 Surface Water Treatment Plants (SWTPs) to treat the City's River Road Wastewater Treatment Plant (RR WWTP) effluent to a safe level for human consumption. On May 13, 2013, the TCEQ received your letter dated May 9, 2013, including a preliminary engineering report (PER) and a Full-Scale Verification Test Protocol (Protocol) for the City's proposed Direct Potable Reuse Water Treatment Plant (DPR WTP). These documents were submitted to support the temporary exception requests for the City's proposed temporary reuse of wastewater effluent as a raw water source for the City's public water system and related modifications to the Cypress surface water treatment facility. In addition, responses to TCEQ questions, concerns, and requests for more detailed information were submitted in your letters dated June 27, 2013, July 16, 2013, July 25, 2013, July 31, 2013, and in numerous emails.

Because of the drought emergency nature of this project, we reviewed the exception requests regarding wastewater effluent as a source of water for a public water system, the site-specific temporary exceptions for the temporary Cypress DPR WTP, the Protocol requirements, and the PER concurrently. The TCEQ encourages the City to take reasonable measures to increase conservation and extend water supplies. Your Drought Contingency Plan (DCP) is an important tool in conserving and managing your water supply during emergency drought conditions. We encourage you to review your DCP and be prepared to move to the next stage of restrictions, if necessary. You are required to notify TCEQ when you change stages in your DCP. The temporary exception requests, Protocol, and PER are addressed under separate headings below.

Because of the drought emergency nature of this project, the review of future submittals will continue to be expedited. Please note that failure to provide all of the monitoring data required by the TCEQ can result in part of the verification testing having to be redone or more stringent operating conditions for approval to discharge treated RR WWTP effluent to the City's distribution system for human consumption. In addition, failure to submit the data collected in the formats specified in this letter and enclosures will result in a delay of the TCEQ's review.

Project Description

The City proposes to augment its water supply with the implementation of temporary reuse of wastewater effluent from the RR WWTP as source water for the DPR WTP for a period to last no longer than six months. The project proposed to utilize the existing Cypress SWTPs as a part of the temporary DPR WTP project. The treated wastewater from the RR WWTP will be delivered to the 2008 SWTP facility via a proposed temporary pump skid located at the RR WWTP. From the temporary pump station, the treated wastewater is delivered to the Cypress WTPs through approximately 12-miles of 32-inch high density polyethylene temporary above-ground transmission line. The effluent will enter the treatment process through an existing flow control vault located prior to the 2008 SWTP Microfiltration/Reverse Osmosis (MF/RO) clarifier. Both the above-ground transmission line and temporary pump skid were approved by TCEQ's Water Quality Division letter dated April 8, 2013. The project proposes to blend treated wastewater effluent from the RR WWTP and raw surface water from the Secondary Reservoir that will be fed from Lake Arrowhead and Lake Kickapoo before the existing raw water splitter box. A maximum of five (5.0) million gallons per day (MGD) partially treated RR WWTP effluent from the 2008 MF/RO SWTP will be utilized to blend with the raw surface water from the Secondary Reservoir. The blending is proposed at a ratio of 50-percent partially treated RR WWTP effluent and 50.0 percent Lake Arrowhead and Lake Kickapoo surface water from the Secondary Reservoir. The blended water will then be treated through the existing 2010 SWTP prior to distribution. As stated in TCEQ's response to the City's concept paper for this project, if the City determines that the DPR WTP will be needed on a recurring or more permanent basis, the TCEQ will request that the City install additional barrier(s) to inactivate *Cryptosporidium* oocysts and control any organic compounds that are not removed by the RO membranes.

Requested Temporary Exceptions

The proposed use of WWTP effluent as a raw water source and the associated treatment processes for a DPR WTP require exceptions to 30 TAC Chapter 290, Subchapter D regulations. The TCEQ staff review requests for exceptions to ensure that a public water system will provide a safe quality and adequate quantity of drinking water to their customers as required by the *Texas Health and Safety Code* (THSC) §341.0315(a).

According to 30 TAC §290.39(l), exception requests and approvals must precede the submission of engineering plans and specifications. According to 30 TAC §290.42(g), on-site studies are required for exception approval for the innovative treatment processes proposed for this project. Due to ongoing drought considerations, the TCEQ has agreed to conditionally grant temporary exceptions needed to construct the proposed temporary DPR treatment process. As a condition of approval, the City must conduct a Full-Scale Verification Test after construction is complete and submit a TCEQ-acceptable Full-Scale Verification Test Report (Report) to the TCEQ for review. The Full-Scale Verification Test must be conducted with adequate monitoring to demonstrate that the proposed temporary DPR WTP can continuously produce safe potable water that meets the drinking water standards in 30 TAC Chapter 290, Subchapter F and TCEQ-specified treatment technique requirements. The Full-Scale Verification Test must be performed following the TCEQ-approved Protocol, incorporating all conditions put in place by the TCEQ's approval. After review of a TCEQ-acceptable Report, the TCEQ will determine the conditions for operation of the City's proposed six months of temporarily discharging the DPR WTP effluent to the distribution system for human consumption.

The conditional granting of the temporary exceptions listed below and approval to construct do not grant approval for the water from the proposed temporary DPR WTP facility to be discharged to the City's potable water distribution system. The City is required to discharge all water generated from the proposed temporary DPR WTP to waste until it receives written TCEQ approval to discharge the treated effluent to distribution for human consumption.

Please be aware that these conditionally granted temporary exceptions, and any exceptions granted in the future, **are subject to TCEQ revision or revocation** if:

- Monitoring results, on-site alarms, or other data indicate that the temporary Cypress DPR WTP is producing a finished water quality—after all removal, chemical treatment and blending—that is a potential risk to public health;
- The U.S. Environmental Protection Agency (EPA) revises the allowable maximum contaminant levels for existing regulated contaminants or establishes maximum contaminant levels or treatment technique requirements for chemical or microbiological contaminants that are currently unregulated;
- Substantiated data becomes available establishing a public health risk for one or more unregulated contaminants at a specified concentration level in drinking water; or
- The City fails to comply with one or more of the conditions of the temporarily granted exceptions.

Below are listed the City's requested temporary exceptions and some additional temporary exceptions that the TCEQ staff have determined are necessary for the TCEQ to issue approval to construct the proposed modifications for converting two of the Cypress facility's SWTPs into a temporary DPR WTP. Exceptions are required for:

- The use of RR WWTP effluent in lieu of groundwater or surface water as a source of water for a public water system [30 TAC §290.41];
- Isolation of the Cypress 1961 and 1987 SWTPs' equipment and piping from the temporary Cypress DPR WTP equipment and piping during the verification testing to prevent potential contamination of these facilities and a risk to public health when the Cypress 2008 and 2010 SWTPs are returned to normal operation treating only raw surface water [30 TAC §290.42(d)(2)];

- The use of pre-formed chloramines as a pre-disinfectant [30 TAC §290.42(e)(3)(G)];
- The use of chloramines for inactivation credit [30 TAC §290.42(e)(3)(G)];
- MF membranes for removal of pathogens [30 TAC §290.42(g)(3)];
- RO membranes for the removal of primary and secondary drinking water chemical contaminants [30 TAC §290.42(g)]; and
- Post-RO membrane pH adjustment [30 TAC §290.42(g)].

The above **temporary exceptions are conditionally granted** provided the City complies with all of the conditions contained in this letter and enclosures:

1. These temporary exceptions shall be revoked once the City has completed a TCEQ acceptable Full-Scale Verification Test. Approval of additional temporary exceptions will be considered during the TCEQ's review of a TCEQ-acceptable Report.
    a. The conditional granting of the temporary exceptions is valid for a period of two years from the date of this letter or until the City completes a TCEQ-acceptable Full-Scale Verification Test, whichever occurs first. If the City fails to complete construction of the TCEQ-approved modifications in accordance with all TCEQ requirements, conduct a TCEQ-approved Full-Scale Verification Test of the DPR WTP, and submit a TCEQ-approvable Report within two years of the date of this letter, all temporary exceptions will be revoked. If the City wishes to pursue the DPR WTP project after the revocation of these temporary exceptions, all temporary exception requests and supporting documentation must be resubmitted for TCEQ review.
    b. The conditional granting of the above temporary exceptions is valid only for the approval to construct the TCEQ-approved modifications to the Cypress SWTPs and conduct verification testing of the proposed temporary Cypress DPR WTP treatment process contained in the City's Concept Paper for the Emergency Reuse of Wastewater Effluent as a Source for Direct Potable Reuse in Wichita Falls (received November 13, 2012) and Preliminary Engineering Report For Temporary Direct Potable Reuse Project For City of Wichita Falls, Texas (dated May 2013).
2. The City must adopt and comply with all TCEQ-required amendments and revisions to the City's proposed Protocol as specified in this letter and enclosures for the verification testing of the temporary Cypress DPR WTP. Failure to comply with one or more of the conditions of this letter and its enclosures may result in the City being required to shut down the Full-Scale Verification Test and possibly restart it in order to accomplish the TCEQ's minimum required test duration while complying with the TCEQ conditions.

RR WWTP Effluent as Public Water System Source Water

3. During the required verification testing, the effluent from the proposed temporary Cypress DPR WTP cannot be discharged to the City's potable water distribution system. Instead, this effluent must be discharged through a permitted outfall in accordance with the RR WWTP TPDES wastewater discharge permit or reused in accordance with a TCEQ issued reclaimed water reuse authorization.

4. Only effluent from the RR WWTP that meets all the requirements in the City's Chapter 210 reclaimed water reuse authorization and in the RR WWTP's wastewater discharge Permit No. WQ00104419-000 can be sent to the temporary Cypress DPR WTP. In addition, pursuant to the provision No. 11, under "Monitoring and Reporting Requirements" of the RR WWTP's wastewater discharge Permit, all publicly owned treatment works (POTWs) must provide adequate notice to the executive director (with a copy to the Regional Office), of any substantial change in volume or character of pollutants being introduced into the POTW by a source introducing pollutants at the time of issuance of the permit. As such, prior to the effluent from the proposed temporary Cypress DPR WTP being discharged, during the verification testing, via a permitted outfall in No. WQ00104419-000, proper notification to TCEQ central office and the appropriate regional office must be provided.
5. During the TCEQ-approved verification test period (interrupted only during backwashing of filters and membranes and cleaning procedures for the membranes), the temporary Cypress DPR WTP must continuously demonstrate it can produce a safe quality of water. A minimum total treatment of 9.0-log for viruses, 7.0-log for Giardia and 5.5-log for *Cryptosporidium* must be provided. The requirements are:
    a. Effluent water quality from the 2010 SWTP clearwell that does not exceed:
        i. Any maximum contaminant level for any regulated primary or secondary drinking water standards contained in 30 TAC Chapter 290, Subchapter F; and
        ii. 10.0 milligrams per liter (mg/L) for nitrate.
    b. A minimum 4.0-log removal of viruses;
    c. A minimum 6.0-log removal of *Giardia* cysts;
    d. A minimum 5.5-log removal of *Cryptosporidium* oocysts; and
    e. Sufficient inactivation through disinfection throughout the proposed DPR WTP that under varying source water qualities and with the 10.0-million gallon (MG) GST in service (at a minimum 50.0-percent volume) to demonstrate that the following will be achieved:
        i. A minimum of 5.0-log inactivation of viruses; and
        ii. A minimum of 1.0-log inactivation of *Giardia* cysts must be provided at all times regardless of the amount of removal achieved.
6. Prior to beginning the verification testing, **automatic shut-down controls and alarms** for summoning the operators must have been constructed and tested for taking:
    a. The RR WWTP effluent transfer pumps (to the Cypress facility) out of service when the effluent exceeds the Chapter 210 reclaimed water reuse authorization discharge requirements;
    b. A MF membrane unit out of service when its filtrate turbidity level is greater than 0.100 nephelometric turbidity units (NTU) for two consecutive five-minute readings;
    c. Waste Lagoon No. 3's reuse pumps out of service when the partially treated RR WWTP flow rate is greater than the Secondary Reservoir's raw surface water flow rate to the Cypress Splitter Box;
    d. A gravity media filter out of service when the individual filter effluent turbidity level exceeds 0.3 NTU (or 0.15 NTU if additional removal credit is being sought) for two consecutive 15-minute readings;

e. All the 2010 SWTP clearwell's transfer pumps out of service when the volume of filtered water in the 2010 SWTP clearwell is less than 50.0-percent of the reported full operating capacity.

f. All the 10.0-MG GST's high service pumps out of service when:

   i. The nitrate level in the 10.0 MG GST's effluent is greater than 10.0 mg/L; or
   ii. The 10.0-MG GST's volume of water is less than 50.0-percent of the reported full operating capacity.

7. The results of the above testing of the automatic shutdown triggers and controls must be included in the Full-Scale Verification Test Report.

8. *Giardia* and *Cryptosporidium* levels (enumeration) in the RR WWTP effluent, water in different stages of treatment, and the effluent from the 2010 SWTP clearwell must be monitored and reported using a real-time, on-site quantitative polymerase chain reaction (qPCR) analytical method, reported as being currently used by the City, and an off-site EPA Method 1623 at the frequencies specified in Enclosure A: Full-Scale Verification Test Protocol Minimum Monitoring and Reporting of Water Qualities and Flow Rates. When samples are collected for analysis at an off-site laboratory using EPA Method 1623, a portion of the same water (split sample) must also be collected for analysis using the on-site qPCR method.

   The City has reported that it has been using the qPCR method on-site, but has some concerns about the validity of the results and interferences when analyzing the RR WWTP effluent. The City uses the MoBio RapidWater® DNA Isolation Kit, which includes a disclaimer in the manual, stating that the kit is for research purposes only. Splitting samples and comparing the results from the two analytical methods will provide the TCEQ and the City with data from both methods to review and compare. After the Full-Scale Verification Test is complete, the TCEQ will determine the appropriate application of the data.

   In addition, the City has reported that it would like to use an alternate real-time, on-site analytical method or possible surrogate for representing the number of *Giardia* cysts and *Cryptosporidium* oocysts in the RR WWTP effluent and water after different stages of treatment. However, the City has not provided a TCEQ-acceptable alternative for review at this time. If the City desires to evaluate an alternate analytical method or surrogate during the verification testing, the City will need to collect split samples at the same time as the on-site qPCR samples are collected. The results of these City tests will need to be submitted with the Report in comparison tables and graphs with the above required qPCR and EPA Method 1623 results as specified in Enclosure E: Full-Scale Verification Test Report Format.

   As noted in the TCEQ's July 17, 2013-email, a TCEQ-acceptable real-time, on-site monitoring method must be used by the City when the proposed temporary DPR WTP is discharging effluent to the distribution system. Without a TCEQ acceptable real-time, on-site monitoring method, additional measures will have to be implemented to verify that the public's health is being continuously protected.

9. The flow rate of the partially treated RR WWTP effluent from waste Lagoon No. 3 to the influent of the Cypress Splitter Box must continuously be 50.00-percent, or less, of the total flow rate after blending with the Secondary Reservoir raw surface water.

10. Continuous flow monitoring, flow control, alarms and automatic shut-down controls must be in place to prevent the blended flow from the Splitter Box from containing greater than 50.00-percent partially treated RR WWTP effluent from waste Lagoon No. 3.
11. All treatment chemicals and media used in the treatment of the RR WWTP effluent and Secondary Reservoir raw surface water must conform to American National Standard Institute/National Sanitation Foundation (ANSI/NSF) Standard 60 for direct additives and ANSI/NSF Standard 61 for indirect additives and must be certified by an organization accredited by ANSI. This includes the disinfectants, acids, caustics, fluosilicic acid, and all chemicals used in the cleaning of the MF and RO membranes.

Approval of a temporary, six-month exception for use of RR WWTP effluent as public water system source water will be contingent on submittal of scientifically-sound documentation addressing the following:

- *A total 9.0-log removal and/or inactivation of viruses has been achieved;*
- *A total 7.0-log removal and/or inactivation (including at least 1.0-log of inactivation) of Giardia has been achieved;*
- *A total 5.5-log removal and/or inactivation of Cryptosporidium has been achieved;*
- *The total culturable virus concentration is no greater than 2.222×10^{-7} most probable number (MPN)/L;*
- *The Giardia cyst concentration is no greater than 7.000×10^{-6} cysts/L;*
- *The Cryptosporidium oocyst concentration is no greater than 2.999×10^{-5} oocysts/L;*
- *No E. coli is present; and*
- *The levels for all primary and secondary drinking water standards do not exceed the regulatory levels in 30 TAC Chapter 290, Subchapter F.*

Even if the water meets the above-listed criteria, it may not be sent to distribution without further written approval from the TCEQ. During the Full-Scale Verification Test, and until written approval for distribution is received from the TCEQ, the water from the 2010 SWTP clearwell shall be discharged via a current TPDES-permitted outfall. This could be accomplished either through the Cypress Water Treatment Plant RO discharge TPDES Permit No. WQ0004419000, the WQ River Road WWTF discharge TPDES Permit No. WQ001059001, or the North Side WWTF discharge TPDES Permit No. WQ0010509005, based on permitted flow capacity remaining. If the water from the 2010 SWTP clearwell is discharged through the Cypress Water Treatment Plant RO discharge TPDES Permit No. WQ0004419000, the water shall be de-chlorinated to less than 0.1 mg/l chlorine residual and the City shall monitor chlorine residual daily by grab sample after the de-chlorination process.

Required Isolation of Water in Different Stages of Treatment and Equipment Not Used in the Treatment of RR WWTP Effluent

12. Because of concerns regarding introducing contamination into the Lake Kemp/Headquarters Road Reservoir raw water line, 1961 SWTP and 1987 SWTP treatment equipment and associated clearwells and piping, the 3.0-MG, 5.0-MG and 10.0-MG GSTs, and associated appurtenances, the following conditions must be met:
    a. The 2008 SWTP flow control vault's valve located on the Lake Kemp/Headquarters Road Reservoir pipeline must remain closed at all times during the verification testing (and during the proposed six-month temporary discharge of potable water to the distribution system). The City must take the following actions:

i. The valve and flow meter after the valve and before the tee must be inspected at least once each eight-hour shift;
ii. If leaking of the RR WWTP effluent back into the Headquarters Road transmission pipeline is noted, immediate corrective actions must be taken to stop the leaking and prevent the exposure of the pipeline to the RR WWTP effluent; and
iii. The results of the eight-hour visual inspections and any corrective actions must be recorded and included with the Report.

b. The weir gates in the Cypress Splitter Box to the 1961 and 1987 SWTPs must be maintained closed and:

i. Visually inspected at least once each eight-hour shift for leakage;
ii. If leaking from either of these two weir gates is noted, immediate corrective actions must be taken to stop the leaking and prevent the exposure of the 1961 and 1987 SWTPs' pretreatment facilities to the partially treated RR WWTP effluent;
iii. As proposed by the City in your July 29, 2013 email, the drain valve in the 1961 SWTP settling basin must be maintained open during the verification testing (and during the proposed six-month temporary discharge to the potable water distribution system);
iv. The drain valve in the 1987 SWTP Parshall flume must be maintained open during the verification testing (and during the proposed six-month temporary discharge to the potable water distribution system); and
v. The results of the eight-hour visual inspections and any corrective actions must be recorded and included with the Report.

c. As shown in Detail No. 1 on Sheet 2 of the engineering drawings in the PER's Appendix N, also included with your July 16, 2013 letter, the RO membrane permeate 36-inch pipeline from the RO permeate tanks to the 2010 and 1961 SWTP clearwells must be cut (or an appropriate fitting removed) after the RO permeate flow meter and connected to the proposed temporary above-ground, 24-inch pipeline to waste Lagoon No. 3. The 36-inch pipe to the clearwells must have a blind flange installed or be capped to prevent the entrance of contaminants during the DPR WTP's verification testing.

d. Detail No. 2 on Sheet 2 of the engineering drawings in the PER's Appendix N, also included with your July 16, 2013 letter, must be modified to require a minimum separation distance of nine (9) inches from the bottom of the 24-inch pipe to the top elevation of the waste Lagoon No. 3's berm.

e. A 42-inch, 90-degree elbow must be removed (as proposed by the City in your email dated July 29, 2013) from the 2010 SWTP transfer pumps' discharge and the discharge piping connected to the temporary 12-inch, above-ground pipe discharging into the manhole that drains to the 2010 SWTP recovery well located on waste Lagoon No. 2. A blind flange or cap must be installed on the 42-inch pipe to the 3.0-MG, 5.0-MG and 10.0-MG GSTs to prevent the entrance of contaminants during the DPR WTP's verification testing and TCEQ-approved temporary operation.

f. Detail No. 4 on Sheet 2 of the engineering drawings in the PER's Appendix N, also included with your July 16, 2013 letter, must be modified to require a minimum separation distance of nine (9) inches from the bottom of the 12-inch pipe to the top elevation of the manhole.

g. The backwash supply pipe for the 2010 SWTP gravity media filters must be disconnected from the backwash pumps' pipe coming from the Cypress High Service Pump Station during the verification testing. The pipe from the pump station will need to be temporarily plugged or capped at the point of disconnection to prevent the entrance of contaminants. During the verification testing, the City will need to use one of the following methods to supply backwash water for the 2010 SWTP gravity media filters by temporarily connecting the backwash supply pipe at the 2010 SWTP gravity media filters either:

   i. To a pipe from the temporary 2010 SWTP transfer pumps' discharge header (going to waste) with necessary flow and pressure control valves to prevent blowing media out of the filters;
   ii. Directly to the discharge of one of the 2010 SWTP transfer pumps with any necessary flow and pressure control valves solely for the purpose of backwashing the tested 2010 SWTP gravity media filters; or
   iii. To a temporary dedicated pump and any necessary flow and pressure control valves that is taking suction from either:
      1. The 2010 SWTP clearwell; or
      2. An acceptable temporary storage tank that will be filled with gravity media filtered water or water from the 2010 SWTP clearwell transfer pumps.

13. All of the above referenced valve and gate closures and piping modifications must be completed prior to the RR WWTP transfer pumps being turned on after connecting the wastewater effluent piping to the temporary Cypress DPR WTP. TCEQ staff will inspect the DPR WTP to confirm isolation as described in Item No. 12 has been completed. The inspection must occur before the Full-Scale Verification Test may begin.

14. As noted in the TCEQ letters approving exceptions for the use of membranes and construction for the Cypress 2008 SWTP, each individual MF membrane unit's and RO membrane skid's piping must be equipped with cross-connection protection in the form of an air gap, double block-and-bleed valve system, isolation valves with removable pipe spools, or another TCEQ-approved method. The following piping must have cross-connection protection:

   a. Feed water piping;
   b. MF filtrate piping;
   c. RO permeate piping;
   d. Backwash supply piping;
   e. Backwash waste piping;
   f. RO concentrate piping;
   g. Maintenance clean solution feed piping;
   h. Maintenance clean recirculation piping;
   i. Maintenance clean solution waste piping;
   j. Clean-in-place (CIP) solution feed piping;
   k. CIP solution recirculation piping; and
   l. CIP solution waste piping.

Pre-formed Chloramines as a Pre-disinfectant

15. The City must provide an additional 1.0-log viral inactivation when using pre-formed chloramines (ammonia before chlorine) as a pre-disinfectant. Based on consultation with EPA Region 6 staff, the TCEQ has concluded that 1.0-log of additional viral log inactivation will provide an equivalent safety factor to that provided when chlorination precedes ammonia addition. Therefore, using pre-formed chloramines will require at least 9.0-log of total viral removal and inactivation through the temporary Cypress DPR WTP.

16. The City must monitor for cyanide at the effluent of the 2010 SWTP clearwell during the verification testing as specified in Enclosure A: Full-Scale Verification Test Protocol Minimum Monitoring and Reporting of Water Qualities and Flow Rates.

    Please note that during the six months of temporary operation of the Cypress DPR WTP, regulatory compliance monitoring will have to be conducted in accordance with 30 TAC §290.106 for cyanide at the entry point to distribution.

Chloramines for Inactivation of Pathogens at Subsequent Disinfection Zones

17. The City must monitor and use the monochloramine residual to calculate the inactivation credit for a disinfection zone where chloramines—specifically monochloramine—are the disinfectant during the verification testing. (This monitoring and reporting of inactivation will also be required during the six months of temporary operation when the City is subsequently discharging to the distribution system.)

18. During the verification testing, the free ammonia, free chlorine, total chlorine and nitrite levels while treating the RR WWTP effluent must be monitored at the locations and frequencies specified in Enclosure A: Full-Scale Verification Test Protocol Minimum Monitoring and Reporting of Water Qualities and Flow Rates. The following analytical methods must be used:

    a. Free ammonia: EPA 350.1 or SM* 4500-NH_3-G;

    b. Free chlorine: One of the methods in 30 TAC §290.110(d)(1) except that a color comparator cannot be used;

    c. Monochloramine: SM* 4500-Cl D or SM* 4500-Cl F;

    d. Total chlorine: One of the methods in 30 TAC §290.110(d)(1) except that a color comparator cannot be used; and

    e. Nitrite: EPA 300.0 or EPA 353.2.

    * Standard Methods for the Examination of Water and Wastewater, APHA

Microfiltration Membranes

19. The temporary exception to use MF membranes in the treatment of the RR WWTP effluent is specifically and exclusively for the Siemens Memcor (previously distributed by USFilter) S10V MF membranes for which an exception was previously granted and for which the City received TCEQ approval to construct on August 19, 2004. The following conditions remain in place:

    a. A feed-side surface area of 334.9 square-feet (sf);

    b. A nominal pore size of 0.2-micron;

    c. Maximum transmembrane pressure (TMP) of -12 pounds per square-inch (psi);

d. Water temperature range of 1° to 40° C; and

e. pH tolerance range of 2 to 12.

Further, these specific membranes were approved for operation with:

f. Five tanks containing 504 submerged MF membrane elements;

g. A maximum instantaneous flux rate of 19.6 gallons per square-foot per day (gfd) at 20° C;

h. A three-minute backwash duration once every 25 minutes;

i. A 32-minute maintenance clean once per day; and

j. A CIP procedure once every 30 days.

20. The City submitted a 2004 MWH Challenge Study prepared for the California Department of Health Services. Based on this study and the previously submitted direct integrity testing, TCEQ can approve a 2.8-log removal for *Cryptosporidium* and *Giardia* for the installed membranes. A separate letter will be prepared and mailed to the City with a response to the Challenge Study submittal.

21. Unless superseded by a more current TCEQ letter, the City must conduct a direct integrity test (DIT) on each MF membrane unit treating water during the verification testing using the **test pressure (P_{test}) of 16.5 pounds per square-inch (psi)** and **upper control limit (UCL) of 1.65 psi/minute** specified in the TCEQ's April 30, 2012 letter:

    a. At least once each 24-hour period;

    b. After each CIP procedure;

    c. After failing a preceding DIT; and

    d. Before a MF membrane unit being tested is returned to service after being removed for repair and/or removed from service for exceeding 0.100 NTU for two consecutive five-minute readings.

22. The City can use a lower control limit (LCL) that is less than 1.65 psi/minute, such as the 0.65 psi/minute noted in your letter dated July 31, 2013. Whether the City uses the TCEQ-approved UCL or a selected LCL, the pressure sensors/gauges must have a plus-minus error small enough to ensure that the measured P_{test} is high enough and pressure decay rate is less than the approved UCL.

23. When any one of the MF membrane units used during the verification testing has an individual filtrate turbidity level greater than 0.100 NTU for two consecutive five-minute readings, the MF membrane unit must automatically shut-down, an audible alarm be sounded to summon the operators, the membrane repaired, and the unit must pass a TCEQ-approved DIT before being returned to service.

24. If the selected MF membrane unit for verification testing cannot be repaired, cannot pass a TCEQ-approved DIT, or exceeds the 0.100 NTU limit for two consecutive five-minute readings in a one-hour period after being returned to service, then the verification testing must be temporarily halted and the City must contact the TCEQ Technical Review & Oversight Team at (512) 239-4691 to discuss the problem.

25. The selected MF membrane unit's influent and effluent water qualities and operating parameters must be monitored, analyzed, and recorded as specified in the Full-Scale Verification Test Protocol section of this letter, Enclosure A: Full-Scale Verification Test Protocol Minimum Monitoring and Reporting of Water Qualities and Flow Rates, and

Enclosure B: Full-Scale Verification Test Protocol Monitoring and Reporting of Operating Processes.

Reverse Osmosis Membranes

26. The temporary exception to use RO membranes for the removal of chemical contaminants from the RR WWTP is only for the eight-inch diameter by 40-inch long Hydranautics RO elements currently installed, that previously received an exception and approval to construct, based on:
    a. Six RO units/skids with two-stages per unit; and
    b. Operated at a maximum permeate flux rate of 14.9 gfd (average of the two stages flux rates).
27. The selected RO membrane skid's influent and effluent water qualities and operating parameters must be monitored, analyzed, and recorded during the verification testing as specified in the TCEQ's:
    a. Enclosure A: Full-Scale Verification Test Protocol Minimum Monitoring and Reporting of Water Qualities and Flow Rates; and
    b. Enclosure B: Full-Scale Verification Test Protocol Monitoring and Reporting of Operating Processes.

pH Adjustment

28. The 2010 SWTP clearwell's effluent:
    a. Must have a pH level of 7.0 or greater;
    b. Cannot be corrosive; and
    c. The Langelier Saturation Index (LSI) and pH levels must be monitored and reported as specified in Enclosure A: Full-Scale Verification Test Protocol Minimum Monitoring and Reporting of Water Qualities and Flow Rates of this letter.

Fluoride Addition

29. The filtered water discharge from the 2010 SWTP clearwell must be monitored, analyzed, and the results recorded as specified in the Enclosure A: Full-Scale Verification Test Protocol Minimum Monitoring and Reporting of Water Qualities and Flow Rates, and Enclosure D: Design, Operating and Monitoring Requirements for Fluoride Adjustment during the verification testing.

All Temporary Exceptions

30. Continuous coagulation and flocculation must be maintained for the 2008 SWTP radial flow clarifier and 2010 SWTP Accelator clarification basins during the verification testing.
31. The 2008 SWTP radial flow clarifier basin cannot be operated at a surface overflow rate greater than 0.6 gpm/sf.
32. The 2010 SWTP Accelator clarification basin cannot be operated at a surface overflow rates greater than 1.0 gpm/sf.

33. If one of the 2010 SWTP gravity media filter's effluent exceeds 0.3 NTU for two consecutive 15-minute readings during the verification testing:

    a. The filter must be automatically taken out of service;

    b. An alarm must sound to summon the operators;

    c. The filter must be backwashed; and

    d. The effluent discharged to filter-to-waste until the turbidity level is less than 0.3 NTU before returning to service.

    If the City wishes to optimize the gravity media filters' individual performance during the verification testing for additional log removal credits, then a 2010 SWTP gravity media filter's effluent that exceeds 0.15 NTU for two consecutive 15-minute readings during the verification testing:

    e. Must be automatically taken out of service;

    f. An alarm must sound to summon the operators;

    g. The filter must be backwashed; and

    h. The effluent discharged to filter-to-waste until the turbidity level is less than 0.15 NTU before returning to service.

34. Surface Water Monthly Operation Reports (SWMORs) must be completed for the Secondary Reservoir raw surface water and RR WWTP effluent sources using the TCEQ temporary CT Templates in Enclosure F: Full-Scale Verification Test Temporary CT Templates and submitted with the Report.

    Since the 10.0-MG GST will not be included in the verification testing, the TCEQ has created these templates with the City's proposed Disinfection Zone 5 split into two disinfection zones: Temporary Blended Disinfection Zone 5 for the 2010 SWTP clearwell and Temporary Blended Disinfection Zone 6 for the 10.0-MG GST. The TCEQ understands that the minimum required inactivations for virus and *Giardia* probably will not be met at the effluent of the 2010 SWTP clearwell during the Full-Scale Verification Test period, even at the reduced flow rate of the verification test. Therefore, for the City to demonstrate the effectiveness of its final Disinfection Zone 5, the City staff will need to take the following actions once each eight-hour period during a day to simulate the inactivation being achieved in the 10.0-MG GST:

    a. Collect a sample of water from the 2010 SWTP clearwell's effluent;

    b. Record the flow rate at the 2010 SWTP clearwell's effluent when the water sample is collected;

    c. Calculate the hydraulic detention time for the 10.0-MG GST using the 50-percent volume and the recorded flow rate;

    d. Calculate the T_{10} in minutes (theoretical disinfectant contact time based on the design of a basin/unit) for the 10.0-MG GST using the hydraulic detention time calculated in condition c above and a baffling factor of 0.3;

    e. Maintain the water samples collected in Condition No. 32.a in a manner that simulates storage in the 10.0-MG GST (for example, at ambient water temperature and in the dark) for a duration not less than the calculated T_{10} from condition d;

f. After the water has resided in the sample container for the calculated T_{10} from condition d, measure:

   i. The monochloramine residual;
   ii. pH level; and
   iii. Water temperature.

g. For each day (midnight to midnight as specified for reporting on the TCEQ's SWMOR), the City must calculate the simulated virus and *Giardia* inactivation achieved for each of the three samples;

h. Enter the sample set results (flow rate, monochloramine residual, pH level and water temperature) that achieved the lowest inactivation for virus and *Giardia* on the SWMORs for both the Secondary Reservoir raw surface water and RR WWTP effluent sources; and

i. Record the results from this simulated inactivation for TCEQ Sample Sets 41A and 42A of Enclosure A: Full-Scale Verification Test Protocol Minimum Monitoring and Reporting of Water Qualities and Flow Rates.

35. No gravity media filter backwash waste, MF and RO membrane backwash or chemical cleaning waste, or clarifier blow-down waste can be discharged to waste Lagoon No. 3.

36. All liquid and solid waste generated during the verification testing must be disposed of in accordance with the TCEQ permits, rules and regulations.

All exceptions are subject to periodic review and may be revoked or amended if warranted. A copy of this letter and all related monitoring data must be maintained with your records for as long as these exceptions are in effect. These records must be made available to TCEQ staff upon request.

Please note that these exceptions are not intended to waive compliance with any other TCEQ requirement in 30 TAC Chapter 290. These exceptions cannot be used as a defense in any enforcement action resulting from noncompliance with any other requirement of 30 TAC Chapter 290.

Full-Scale Verification Test Protocol

The TCEQ is approving the City's requested Full-Scale Verification Test Protocol (Protocol) under the following conditions:

1. The verification test period must include:

   a. At least one continuous operation period of no less than 30 days with at least one of each of the treatment processes in operation. At least one MF membrane unit, RO membrane unit, and gravity media filter must be tested at the City's selected maximum flow rates and operating parameters. The City may be required to start the Full-Scale Verification Test period over if:

      i. Monitoring results, on-site alarms, or other data indicate that the temporary Cypress DPR WTP is producing a filtered water quality that indicates a potential risk to public health or an inadequate supply of water for human consumption will be produced;
      ii. Monitoring of the RR WWTP effluent for pathogens indicates that a greater removal and/or inactivation is required than the City has received TCEQ approval for;

iii. The U.S. EPA revises the allowable maximum contaminant levels for existing regulated contaminants or establishes maximum contaminant levels or treatment technique requirements for chemical or microbiological contaminants that are currently unregulated;
iv. The U.S. EPA adopts requirements, guidance or begins rule making for treatment of reclaimed wastewater for human consumption;
v. Substantiated data becomes available establishing a public health risk for one or more unregulated chemical or microbiological contaminants at a specified concentration level in drinking water;
vi. The City fails to comply with one or more of the conditions of the temporarily granted exceptions or one of the TCEQ approved Protocol requirements; or
vii. Any other event or procedure that the TCEQ determines could affect the temporary DPR WTP effluent quality and create a potential public health risk, such as, but not limited to, change in flux rates, blending ratio, hydraulic loading rates, backwash/cleaning procedures, chemicals used, chemical injection locations, etc.

b. Performing a CIP procedure on the selected MF and RO membrane units;

c. Continuation of the verification testing at the same selected maximum flow rates and operating parameters for at least ten (10) more days after the CIP to verify that the CIP procedures were effective in flux recovery; and

d. A CIP procedure performed on the selected RO membrane skid at the same time as the MF membrane unit(s) CIP procedure is performed.

Please note that the City may choose to conduct the verification testing for a longer duration, but not less.

2. During the verification testing, the City must monitor and record verification data 24 hours a day and seven days a week at the specified frequencies listed in the TCEQ's Enclosure A: Full-Scale Verification Testing Protocol Minimum Monitoring and Reporting of Water Qualities and Flow Rates and Enclosure B: Full-Scale Verification Test Protocol Monitoring and Reporting of Operating Processes.

   If acceptable monitoring taps, on-line monitors or flow indicators are not currently installed at acceptable locations to collect the data in the TCEQ's Enclosures A and B, the City must submit engineering drawings and specifications for the TCEQ's review and approval of these modifications prior to beginning the verification testing.

3. Prior to beginning the Full-Scale Verification Test, the Protocol must be amended to include:

   a. All conditions for the granting of temporary exceptions listed above in the Requested Temporary Exceptions section of this letter;

   b. All requirements in the Pretreatment Requirements section of this letter listed below;

   c. All of the requirements in this letter's enclosures and methods to comply with the requirements within each enclosure:

      i. Enclosure A: Full-Scale Verification Testing Protocol Minimum Monitoring and Reporting of Water Qualities and Flow Rates;
      ii. Enclosure B: Full-Scale Verification Test Protocol Monitoring and Reporting of Operating Processes;

iii. Enclosure C: Acceptable Analytical Methods, Calibration Methods and Calibration Frequencies;
iv. Enclosure D: Design, Operating and Monitoring Requirements for Fluoride Adjustment;
v. Enclosure E: Full-Scale Verification Test Report Format; and
vi. Enclosure F: Temporary Full-Scale Verification Test CT Templates

4. Any planned simulated distribution system (SDS) testing for potential increases in disinfection byproduct levels within the City's and purchased water systems' distribution systems. It is recommended that the Uniform Formation Conditions method specified by the Information Collection Rule (ICR) be used.

Once these changes have been made to the Protocol and the other conditions in this letter have been met, the Full-Scale Verification Test may be conducted.

TCEQ Review of Preliminary Engineering Report and Plans

The requirements for the DPR WTP are not addressed in state and federal regulations. Based on the information of the PER, the project generally addresses the conditions set by the TCEQ's letter dated February 8, 2013—TCEQ's review of the City's Concept Paper for the Emergency Reuse of Wastewater Effluent as Source for Direct Potable Reuse (DPR). **We look forward to the receipt of a sealed final engineering report and detailed engineering plans and specifications for review and approval of the temporary site piping and modifications at least 45 days prior to beginning the Full-Scale Verification Test.** The final plans shall include the following items for review:

1. The final report and plans shall include page numbers and an appendix that lists all conditions from this letter with cross references to the page number(s) that show compliance with each condition of the temporary exceptions and preliminary plan review.

2. The partially treated wastewater effluent that will be blended from the 2008 MF/RO SWTP shall not exceed five MGD and the flow rate of the raw surface water from the Secondary Reservoir. The blended water from RR WWTP and Lake Arrowhead and Lake Kickapoo raw surface water from the Secondary Reservoir shall not exceed a blending ratio of 50.0 percent. A blending report with a detailed description for monitoring the process controls of the required ratio must be submitted for review with the final engineering plans and specifications.

3. Provision shall be made for the 2008 MF/RO SWTP and 2010 SWTP plant carrying treated wastewater effluent to be separated from the Lake Kemp raw surface water, the 1961 and 1987 SWTPs, and Cypress ground storage tanks. Please submit scaled detailed plans with the final engineering report and plans demonstrating the complete isolation of the facilities as detailed in Condition No. 12 under "Required Isolation of Water in Different Stages of Treatment and Equipment Not Used in the Treatment of RR WWTP Effluent" section of this letter.

4. The final plans and specification must address all the terms and conditions, including but not limited to, requirements for air gaps, flow monitoring, flow control, monitoring locations, alarms and automatic shutdown and control mechanisms, for the proposed temporary DPR WTP as indicated above in the Temporary Exceptions.

5. Any additional chemical storage and feed system for pH adjustment, fluoride addition and additional chlorine demand that is required during the operation of proposed temporary DPR WTP must comply with the requirements of 30 TAC Section 290.42(f).

The proposed temporary piping at the 2010 SWTP is **approved for construction and full scale testing but NOT for use** if it consists of:

- Modifications of an existing 36-inch waterline upstream of an existing RO meter vault with a cap to isolate the treated wastewater to prevent it flowing to the clearwell of the 1961 SWTP and 2010 SWTP; approximately 3,800 linear feet (l.f) of proposed 24-inch above-ground waterline to divert the treated RR WWTP wastewater to an existing storage Lagoon No. 3 with a nine-inch vertical separation between the bottom of the pipe and the top of the lagoon's berm. To be approved the line to storage Lagoon No. 3 must be modified as stated in Condition No. 12.d.
- Modifications of a waterline upstream of the 2010 SWTP transfer pumps with the removal of a 42-inch 90-degree elbow to isolate the DPR WTP water from the existing Cypress ground storage tanks; approximately 4,400 l.f. of 12-inch above-ground waterline from the 2010 SWTP transfer pumps to a manhole with air gap; ; To be approved the line must be modified as stated in Condition No. 10.f;
- Modifications of an existing 2010 SWTP lagoon valve vault with approximately 2,100 l.f. of proposed 24-inch above-ground waterline to discharge the blended water to the river; and
- Related valves, fittings and appurtenances.

The submittal received on April 25, 2013 consisted of a preliminary engineering report which included two sheets of schematic diagrams of temporary piping modifications. Supplemental sheets were provided later to address review questions.

Full-Scale Verification Test Report

Failure to provide all of the monitoring data required by the TCEQ can result in part of the verification testing having to be redone or more stringent operating conditions for approval to discharge treated RR WWTP effluent to the City's distribution system for human consumption. In addition, **failure to submit the data collected in the formats specified will result in a delay of the TCEQ's review**.

- The Report must contain all of the verification testing data at the specified monitoring frequencies listed in:
    - Enclosure A: Full-Scale Verification Test Protocol Minimum Monitoring and Reporting of Water Qualities and Flow Rates;
    - Enclosure B: Full-Scale Verification Test Protocol Monitoring and Reporting of Operating Processes; and
    - Enclosure D: Design, Operating and Monitoring Requirements for Fluoride Adjustment.
- The Report must contain documentation demonstrating that the analytical methods used during the verification testing comply with those specified in Enclosure C: Acceptable Analytical Methods, Calibration Methods and Calibration Frequencies.
- The verification testing results must be presented in the formats specified in Enclosure E: Full-Scale Verification Test Report Format.

- A list of all on-line monitors and benchtop equipment with the manufacturers' names , model numbers, and analytical methods must be included.
- The Report must include a flow diagram and a list of all locations grab samples were collected.
- The Report must include a flow diagram with the locations of all on-line water quality and flow monitors with triggers for:
    - Alarms only; and
    - Alarms with automatic shut-down controls.
- Provide a list of the equipment that will be taken out of service for each automatic shut-down controller in the Report.
- The Report must contain the following documents for TCEQ review and approval for the temporary six-month operation of the DPR WTP sending water to distribution for human consumption:
    - Revised Monitoring Plan;
    - Revised Operation & Maintenance Manual;
    - Method of providing "Public Notice" to the City's retail service and purchased water system customers;
    - A current list of the members and who they represent for the City's:
        - DPR Task Force;
        - Disease Surveillance and Response Program; and
        - Water Quality Task Force.
    - A current revised (as a result of past TCEQ comments and the verification testing) list of triggers that will activate each of the above health groups and actions that will be taken; and
    - A list of triggers for when the City will notify the TCEQ Water Supply Division and Abilene Regional Office staff and the method of notification.
- All of the verification test data must be submitted with the Report.

  The City's proposal contained in your July 13, 2013 letter to submit the Report in five parts over a time frame of approximately two months will not afford the TCEQ the opportunity to review a comprehensive Full-Scale Verification Test study; as such, TCEQ cannot accept this proposed submittal timeline. Recognizing the drought conditions that the City faces, TCEQ staff can start review of the Report without the radionuclide and last viral results.
- The City must submit the number of completed Reports to the following TCEQ staff at addresses under the TCEQ Contacts section of this letter below:
    - Two copies to the Technical Review & Oversight Team;
    - One copy to the Utilities Technical Review Team; and
    - One copy to the Water Quality Division.

Required DPR WTP CT Studies

Based on the results of the Full-Scale Verification Test, the City may wish or find it necessary to revise the previously submitted CT Templates and proposed disinfection protocols for one or both source waters. Please submit complete CT Study requests for both sources of water after completion of the verification testing for the operation of the temporary DPR WTP, even if the City does not have any changes. Please note that the City will need a TCEQ-approved CT Study for both sources of water to be used in the DPR WTP before water from the proposed DPR WTP's effluent can be discharged to the distribution system for human consumption.

The TCEQ has conducted a review of the City's CT Templates for the Secondary Reservoir raw surface water (from Lake Arrowhead and Lake Kickapoo) and the RR WWTP effluent sources. Staff noted some discrepancies and lack of supporting documentation for the submitted data. We have enclosed the TCEQ's modifications and corrections in Enclosure H: CT Templates for an Operational DPR WTP. Since the CT Template does not readily allow tracking of changes, we have listed these revisions and questions below:

- For the Secondary Reservoir raw surface water CT Workbook:
  - On the Calculator Worksheet the log inactivations for the raw surface water source required for:
    - "*Giardia Lamblia* Cysts" must be 0.5, not 1.0 as was entered; and
    - "Viruses" must be 2.0, not 5.0 as was entered.
  - On the Calculator Worksheet the disinfectant for disinfection zones (DZ) Nos. 2 and 3 should be chlorine dioxide, not chloramines.
  - Please note that since chlorine and ammonia are injected in the Cypress splitter box side-by-side, a measurable chlorine dioxide residual must always be measured at the end of DZ 1. Therefore, the TCEQ's revised Calculator Worksheet residual for DZ 1 shows 0.05 as a residual.
  - The Schematic Worksheet must match the description for disinfection zones. The Description Worksheet describes three (3) disinfection zones for the pipeline from the Secondary Reservoir to the Cypress splitter box, but the Schematic Worksheet only shows one disinfection zone.
- For the RR WWTP source water CT Workbook:
  - On the Schematic Worksheet please revise the zones shown as DZ 3A and DZ 3B into a single disinfection zone, DZ 3.
  - On the T10 Details Worksheet under DZ 1, the pipe diameter was changed from 30 inches to 27 inches to reflect the actual inside diameter, water volume, and resulting T10 value. This change was based on the information provided to the TCEQ in your email dated August 29, 2013 after the TCEQ discovered a discrepancy between the City's CT Template, which had a 30-inch diameter, and the TCEQ Water Quality Division's April 8, 2013 letter, which approved a 32-inch diameter transmission line from the RR WWTP to the Cypress 2008 SWTP.
  - On the T10 Details Worksheet under DZ 2, the unit description for the radial flow clarifier only had the volume listed. This unit has never been claimed for CT credit by the City in the past. No reference was listed in the adjacent "Comment" cell for how the submitted volume was calculated. After review of the engineering drawings for the proposed DPR WTP, this section was revised as noted in in Enclosure H. The TCEQ staff determined that:

- A volume of 3,875,583 gallons is a valid CT volume for this unit, not 5,000,000 gallons.

- On the T10 Details Worksheet under DZ 3, the unit description for the MF membrane feed trough only had the volume listed. This unit also has never been claimed for CT credit by the City in the past. No reference was listed in the adjacent "Comment" cell for how the submitted volume was calculated. Since this is a rectangular basin, that "shape" from the available drop down box was selected, and we entered the width, length and side-water depth. After review of the old Cypress 2008 SWTP engineering drawings for the proposed DPR WTP, this section was revised as noted in Enclosure H. The TCEQ staff determined that:
  - A volume of 5,508 gallons is a valid CT volume for this unit, not 30,637 gallons; and
  - A "Baffling Factor" of 0.1 is representative of the flow characteristics, not 0.5

- On the T10 Details Worksheet under DZ 3, the unit description for the MF membrane tank only had a volume. This unit has also never been claimed for CT credit by the City in the past. No reference was listed in the adjacent "Comment" cell for how the submitted volume was calculated. After review of the engineering drawings for the proposed DPR WTP, this section was revised as noted in Enclosure H. The TCEQ staff determined that:
  - A volume of 9,557 gallons is a valid CT volume for this unit replacing the submitted volume of 9,208 gallons;
  - A maximum flow rate of 2,297 gpm per MF tank should be used, not 1,936 gpm; and
  - The submitted reference for each MF membrane tanks' maximum flow rate is inaccurate. The TCEQ's approved MF membrane filtrate capacity in our August 19, 2004 letter was for a net filtrate available for RO feed water. This is the gross filtrate produced (504 membranes × 339.4 sf/membrane × 19.6 gfd/1440) minus the filtrate used for backwash and maintenance cleans each day. While this quantity of filtrate would not be available as RO feed water, as noted in the TCEQ's August 5, 2002 exception letter, it is the quantity of filtrate needed to supply the RO membranes and meet the cleaning needs of the MF membranes.

  The TCEQ approved flux rate of 19.6 gfd is for a water temperature of 20° C. A higher flow could be achieved at higher temperatures, but lower flow rates will occur at lower temperatures during the verification testing using a TCEQ temperature correction equation, but a lower flux rate will also result at lower temperatures. Also, this is based on the TCEQ exception conditions for using the MF membranes that include the frequency and duration for the backwash and maintenance clean events. Since the City will now be treating the RR WWTP effluent, the frequencies and durations of the backwash and maintenance clean events could increase and result in less net filtrate available for RO feed water.

- The flow rate through each MF tank must be monitored and the highest flow rate entered for DZ 3 on the Calculator Worksheet.

- On the T10 Detail Worksheet for both CT Templates in Enclosure H, please note:
  - The flow rates were revised to accurately indicate and use 5.000 MGD, 7.5 MGD, 10.000 MGD, etc. in the CT calculations. This was done by entering flow rates on the T10 Details Worksheet using the following equation:

= Q*10^6/1440, where Q is the flow rate in MGD.

- On the T10 Details Worksheets under DZ 4, the unit description for the gravity media filters, the "Number of Units" was changed to "4" to correctly reflect the City's operation of four filters on-line with a fifth filter either on standby or in backwash. Please note that for the Calculator Worksheet to correctly reflect the inactivation of the gravity media filters, four gravity media filters must always be operated together and at equal flow rates.
- When the two CT Study requests are submitted, please clarify the "Comment" in Cell-G1335 of both T10 Details Worksheets. It is unclear what was meant by:

  "100% of 10 MGD Max at Cypress (7 MGD)."

- Please review the TCEQ's added details on the both CT Templates' Description Worksheet for correctness and clarification.
- To facilitate the TCEQ's review and response, please ensure that the DPR WTP CT Study requests include all of the necessary engineering drawings with all dimensions, and side-water depths. At a minimum, those engineering drawings referenced on the Enclosure H CT Templates must be included. For odd shaped basins (such as the MF tank) used for CT credit that the CT Template does not have provisions for entering all the dimensions, include the volume calculations with the previously approved submitted engineering drawings.

Industrial Contributions to the RR WWTP

There is a concern regarding the variability and unpredictability of certain industrial discharges into the headworks of the RR WWTP during the operation of the temporary direct portable reuse facility. In order to increase the pretreatment measures in place to protect the supply of drinking water, human health, and the environment, the TCEQ recommends that the City of Wichita Falls take the following actions related to industrial discharges into the RR WWTP:

- Do not accept hauled waste at the RR WWTP during the operation of the temporary direct portable reuse facility.
- Do not accept Underground Storage Tank (UST) clean-up waste at the River Road WWTP during the operation of the temporary direct portable reuse facility
- Either do not accept waste streams from the Liquid Waste Processing (LWP) Facility at the River Road WWTP during the operation of the temporary direct potable reuse facility or implement additional precautions, such as follows:
  - Provide additional monitoring capabilities at the LWP;
  - Provide additional safeguards to prevent untreated waste from escaping the facility;
  - Have the facility submit copies of manifests of every load of waste delivered to the facility;
  - Increase sampling frequency for biochemical oxygen demand (BOD) and require the facility to sample for fats, oils, and grease (FOG);
  - Increase inspection frequency of the facility;
  - Require the LWP facility to perform a comprehensive evaluation of each wastestream source for existing waste streams and evaluate how such wastestreams impact the LWP's treatment process and its ability to comply with local limits;

  - Require the LWP facility to inform the city of the results of the evaluation and obtain written approval from the city prior to accepting new waste streams. The city should verify the categorical determination of LWP and revise the industrial discharge permit as necessary to reflect accurate categorization, effluent permit limit limits, and other conditions or requirements; and
  - The city should pay close attention to the definition of centralized waste treatment (CWT) wastewater and CWT wastewater sources.
- Minimize any new users discharging to the RR WWTP during the operation of the temporary direct potable reuse facility. All new industrial contributions, if any, must complete a Baseline Monitoring Report of their wastewater and be evaluated for their ability to meet the City's technology-based effluent limits (TBLLs). The City should require additional pretreatment facilities at the industry, as necessary, to comply with those limits. If the Baseline Monitoring Report shows that compliance with TBLLs cannot be met, new industries shall not be allowed to enter the RR WWTP collection system.
- Require all Significant Industrial Users (SIUs) to notify the City in advance of any planned action to substantially increase the volume or change the characteristic of their discharges to the River Road WWTP. The City must carefully evaluate these notifications and determine whether the proposed changes may cause problems. In such cases, these changes should be denied.
- Demonstrate how the current TBLLs are still protective of the RR WWTP and receiving streams before the beginning of the diversion of the effluent to be used as a supply source for the DPR WTP.
- Continue to inspect, on a regular basis, the Sheppard Air Force Base (SAFB) to be aware of all the waste streams in each building including those operated by any tenants located at SAFB. Please pay close attention to any medical operations. Coordinate the investigation with the TCEQ Pretreatment Coordinator of TCEQ's Region 4 Office. Please provide copies of inspection reports to TCEQ that include all the waste streams in each building that discharge and how each waste stream is or will be managed before the end of the full scale verification study.
- Continue to require the facilities permitted and regulated under the Metal Finishing Point Source Category (40 CFR Part 433) to submit and implement a Toxic Organics Management Plan (TOMP) on an annual basis and obtain written approval from the city. The City should also continue to inspect these facilities for the absence or presence of toxic organic chemicals. The industries shall provide required certifications each month during the operation of the temporary direct portable reuse facility. The TOMP will aide to manage toxic organics and prevent their discharge to the sanitary sewer system. During the inspections of these type of industries, the city should also conduct a thorough review of chemicals used to ensure that no chemicals are being used or stored at the facilities that contain any TTOs and verify procedures stated in the TOMP are adequate and are being followed. The City needs to require the industry to make any modifications necessary in order to ensure that toxic organics will not be introduced into the sanitary sewer system. Modifications to the TOMP need to be reviewed and approved by the City before the industries make the changes to their operations.
- Continue to require all permitted SIUs to develop and implement a Slug Discharge Control Plan (SDCP) that includes detailed accidental spill cleanup and notification requirements. For facilities that currently have an approved SDCP, evaluate its effectiveness and require modifications as needed to ensure that slug loads will be prevented and that adequate procedures exist to respond to worst-case accidental spills and notification procedures to the City's pretreatment program and RR WWTP personnel if a slug discharge or accidental spill occurs. The city shall approve all SDCPs and revisions to them in writing.

- Continue to require a Spill Prevention, Control, and Countermeasures (SPCC) Plan of every industry permitted by the City.
- Notify all permitted or regulated industrial users (IUs) of the project, reinforce the need to comply with all the pretreatment regulations, and make them aware of potential implications that changes in their process could impact the City's ability to use wastewater effluent as a source of water. The City shall keep documentation of notifications to each regulated IU.
- Encourage all permitted or regulated IUs to seek ways to minimize waste, reduce use of raw materials by increasing the efficiency of their production activities (e.g., maximizing product yield and minimizing by-products), improve the efficiency of their wastewater treatment system, substitute less-toxic chemicals, and implement any other pollution prevention activities that will reduce the volume and concentration of pollutants discharged to the sanitary sewer system. Continue to encourage pollution prevention measures and best management practices in all industrial permits.
- During the Full-Scale Verification Test, the City of Wichita Falls will be subject to an increased frequency of pretreatment compliance inspections (PCIs) by regional inspectors and pretreatment audits by central office staff.

TCEQ Contacts

- If you have any questions or need further assistance regarding the City's Chapter 210 reclaimed water reuse authorization, the RR WWTP Permit, operation of the wastewater collection system, and RR WWTP monitoring and operation during the verification testing for the temporary Cypress DPR WTP, please contact Ms. Jaya Zyman-Ponebshek, P.E., by email at Jaya.Zyman-Ponebshekl@tceq.texas.gov or by telephone at (512) 239-2012 or by correspondence at the following address:

  Water Quality Division - MC 145
  Texas Commission on Environmental Quality
  P.O. Box 13087
  Austin, Texas 78711-3087

- If you have any questions concerning this letter or need further assistance regarding the conditions for the temporary exceptions, Protocol and Report, please contact Mr. James "Red" Weddell by email at james.weddell@tceq.texas.gov or by telephone at (325) 481-8056 or by correspondence at the following address:

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

- If you have any questions concerning this letter or need further assistance regarding the TCEQ's review of the PER and approval to construct, please contact Vera Poe at (512) 239-6988 or by email at vera.poe@tceq.texas.gov or by correspondence at the following address:

  Utilities Technical Review Team - MC-159
  Texas Commission on Environmental Quality
  P.O. Box 13087
  Austin, Texas 78711-3087

Sincerely,

James "Red" Weddell, P.E.
Technical Review & Oversight Team
Plan and Technical Review Team
Water Supply Division
Texas Commission on Environmental Quality

Vera Poe, P.E., Team Leader
Utilities Technical Review Team
Plan and Technical Review Team
Water Supply Division
Texas Commission on Environmental Quality

Linda Brookins, Director
Water Supply Division
Office of Water
Texas Commission on Environmental Quality

LB/VP/PT/JSW/av

Enclosures:
Enclosure A: Full-Scale Verification Test Protocol Minimum Monitoring and Reporting of Water Qualities and Flow Rates
Enclosure B: Full-Scale Verification Test Protocol Monitoring and Reporting of Operating Processes
Enclosure C: Acceptable Analytical Methods, Calibration Methods and Calibration Frequencies
Enclosure D: Design, Operating and Monitoring Requirements for Fluoride Adjustment
Enclosure E: Full-Scale Verification Test Report Format
Enclosure F: Temporary Full-Scale Verification Test CT Templates
Enclosure G: Long Term 2 Enhanced Surface Water Treatment Rule Bin Classification Letter
Enclosure H: CT Templates for an Operational DPR WTP

cc: Honorable Glenn Barham, Mayor, City of Wichita Falls, P.O. Box 1431, Wichita Falls, TX 76307-1431
Mr. Darron Leiker, City Manager, 1300 7th Street Room, Wichita Falls, TX 76301
Mr. Russell Schreiber, P.E., Director of Public Works, City of Wichita Falls, P.O. Box 1431, Wichita Falls, TX 76307
Mr. Daniel K. Nix, Utilities Operations Manager, City of Wichita Falls, P.O. Box 1431, Wichita Falls, TX 76307

ENCLOSURE A

Full-Scale Verification Test Protocol

Minimum Monitoring and Reporting of Water Qualities and Flow Rates

Enclosure A

Full-Scale Verification Testing Protocol
Minimum Monitoring and Reporting of Water Qualities and Flow Rates

Minimum required water quality monitoring for chemical and microbiological constituents and monitoring frequencies are listed and marked with a check (√) in Table A below. These minimum required parameters and specified monitoring frequencies have been selected for the City's Full-Scale Verification Test so that the TCEQ can verify the continuous protection of public health by the removal and/or inactivation of chemical and microbiological contaminants through the different proposed treatment processes at the tested flow rates and operating parameters. Please note:

- **Yellow highlighted areas** indicate items that need to be added or revised to the City's submitted Proposed Verification Protocol received July 25, 2013.
- **Struck out sampling frequencies** (indicated with "~~WF~~") proposed by the City were changed to the TCEQ's original sampling frequency or a new sampling frequency.
- **Blue highlighted parameters with "WF" for sampling frequencies** are those parameters the City has selected for monitoring in addition to the TCEQ's minimum requirements. The TCEQ commends the City on its proposed monitoring for unregulated contaminants of concern. These include some contaminants under investigation by the EPA for possible future regulation previously recommended for monitoring by the City. Although not regulated at this time, the results of all additional monitoring conducted by the City during the Full-Scale Verification Test must be included with the City's Full-Scale Verification Test Report.
- Continuous 5-minute, 15-minute, 2-hour, 4-hour, and daily (and anytime the flow rate changes) monitoring frequencies are **to be conducted on-site using a TCEQ acceptable method.**
- **Twice per week analyses** can be either conducted on-site by City staff or analyzed off-site at a TCEQ acceptable laboratory. Twice per week sample collections are to be conducted at a consistent frequency no closer than three days apart.
- Samples collected weekly (once every 7 days) and at longer frequencies are **to be submitted to an off-site NELAP accredited laboratory for drinking water analysis**.
- Analyses marked for **both on-site and off-site monitoring** are required for quality control to verify the accuracy of the onsite monitoring equipment/method and are to be collected as split samples when the off-site samples are collected.

PWS ID NO. 2430001

Enclosure A
Full-Scale Verification Test Protocol
Minimum Monitoring and Reporting of Water Qualities and Flow Rates

Table A

	Continuous, every						Twice per week	Once every 7 days	Startup, every 30 days & end
	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
TCEQ Sample Set (TCEQ)-1A: River Road Wastewater Treatment Plant (RR WWTP) Effluent (at RR WWTP chlorine injection box after second clarification & prior to WW DZ 1 chlorine injection point before the RR WWTP Chlorine Contact Basin)									
1. DPR transmission pipeline flow rate (gpm)		√							
2. Turbidity (NTU)		√							
3. Temperature (°C)		√							
4. *Escherichia coli (E. coli)* enumeration					√[1]				√[2]
5. *Giardia* (cysts/L) enumeration					√[1]				√[2]
6. *Cryptosporidium* (oocysts/L) enumeration					√[1]				√[2]
7. 5-day Carbonaceous biochemical oxygen demand (CBOD5, mg/L)					√				
8. Total suspended solids (TSS, mg/L)					√				
9. Daily flow rate (gpd)					√				
10. Nitrate (mg/L)					√[2]				√[2]
11. Total dissolved solids (TDS, mg/L)								√	
12. Alkalinity (mg/L)								√	
13. Total organic carbon (TOC, mg/L)								√	
14. Dissolved organic carbon (DOC, mg/L)								√	
15. Full metal scan (mg/L, arsenic, barium, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver, zinc)								√	
16. Algae counts (CFU/L)									√
17. Chemicals listed in §290.106(b) Inorganic Chemicals[4]									√
18. Chemicals listed in §290.107(b) Organic Chemicals[4]									√
19. Chemicals listed in §290.108(b)(1) (radium 226, radium 228, uranium, gross alpha activity)									√
20. Chemicals listed in §290.108(b)(2) & 40 CFR §141.66(d) (gross beta particle & photon radioactivity, tritium, strontium 90)									√
21. Chemicals listed in §290.118(b) Secondary Chemicals									√

1 Samples are to be collected at each of the designated locations once per day and tested using a TCEQ accepted real-time (on-site) analytical method.

2 A split sample is to be collected in conjunction with the above daily samples at each location at startup, every 30 days and at the last day of the Full-Scale Verification Test and submitted to an of-fsite NELAP laboratory certified for conducting these drinking water quality tests.

3 Either a Hach Model 1720E (or TCEQ approved equivalent) or Model 660 FilterTrak turbidimeter may be used for the 15-minute filtered water turbidity level monitoring and reporting. The City's Protocol needs to specify which method will be used.

4 Please assure that the laboratory monitors for all of the inorganic and organic compounds. Compounds that some labs do not include, but are required are: asbestos, cyanide, endothall, diquat, glyphosate, asbestos, and the dioxins.

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	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
22. Lead (ug/L)									√
23. Total trihalomethanes (TTHM, report the species: chloroform, dichlorobromomethane, dibromochloromethane, bromoform) (ug/L)							WF	√	
24. Haloacetic acids (group of 5) (HAA5, report the species: monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, dibromoacetic acid) (ug/L)							WF	√	
25. Bromate (mg/L)							WF	√	
26. Total culturable viruses (MPN/L)									WF
27. Enterovirus (CFU/L)									WF
28. Norovirus (CFU/L)									WF
29. N-Nitroso-dimethylamine (NDMA, ng/L)									WF
30. N-Nitroso-pyrrolidine (NPYR, ng/L)									WF
31. Pharmaceuticals (ug/L)									WF
32. Hormones (ng/L									WF
33. Personal care products (ng/L)									WF
34. Fluoridated alkyl-acids (PFOS, PFOA, PFNA, PFHxS, PFHpA, & PFBS) (ng/L)									WF
35. Sucralose (ug/L)									WF
36. Perchlorate (ug/L)									WF
TCEQ-2A: Begin Wastewater (WW) Disinfection Zone (DZ) 1 (after RR WWTP Chlorine Contact Basin)									
1. Free ammonia level before chlorine injection (mg/L)				√					
2. Free chlorine dosage (mg/L)				√					
3. Total chlorine residual after chlorine injection (mg/L)				√					
4. Monochloramine residual after chlorine injection (mg/L)				√					
5. Free chlorine residual after chlorine injection (mg/L)				√					

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	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
6. Free ammonia level after chlorine injection (mg/L)				√					
7. pH level at monochloramine residual monitoring tap				√					
8. Water temperature at monochloramine residual monitoring tap (°C)				√					
9. Quantity of chlorine used (pounds per day, ppd)					√				
10. Bromate (mg/L)								WF	
TCEQ-3A: End WW DZ 1 (end of RR WWTP effluent transmission line at Cypress 2008 MF/RO SWTP's Flow Control Vault & prior to existing 12-inch gate valve)									
1. Total chlorine residual (mg/L)		√							
2. Monochloramine residual (mg/L)		√							
3. Free chlorine residual (mg/L)		√							
4. Free ammonia level (mg/L)		√							
5. pH level at monochloramine monitoring tap		√							
6. Water temperature at monochloramine monitoring tap (°C)		√							
TCEQ-4A: 2008 MF/RO SWTP's Static Mixers and Coagulant Addition (at Cypress 2008 MF/RO SWTP's Flow Control Vault)									
1. Influent alkalinity level (mg/L)				√					
2. Influent water temperature (°C)				√					
3. Coagulant dosage (mg/L)				√					
4. Quantity of coagulant used (gpd)					√				
5. *Escherichia coli (E. coli)* enumeration					√[1]				√[2]
6. *Giardia* (cysts/L)					√[1]				√[2]
7. *Cryptosporidium* (oocysts/L)		.			√[1]				√[2]
TCEQ-5A: Begin WW DZ 2 (at 2008 MF/RO SWTP's radial flow clarifier's flocculator with chlorine and ammonia injection)									
1. Influent flow rate (gpm)		√							
2. Free chlorine dosage (mg/L)				√					
3. Ammonia dosage (mg/L)				√					

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	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
4. Total chlorine residual, after ammonia injection (mg/L)				√					
5. Monochloramine residual, after ammonia injection (mg/L)				√					
6. Free chlorine residual, after ammonia injection (mg/L)				√					
7. Free ammonia level, after ammonia injection (mg/L)				√					
8. pH level at monchloramine residual monitoring tap				√					
9. Water temperature at monochloramine residual monitoring tap(°C)				√					
10. Quantity of chlorine used (ppd)					√				
11. Quantity of ammonia used (ppd)					√				
TCEQ-6A: 2008 MF/RO SWTP Radial Flow Clarifier (flocculation & clarification)									
1. Effluent flow rate (gpm)		√							
2. Settled water turbidity level (NTU)			√						
3. Effluent pH level				√					
4. Calculated flocculator hydraulic detention time (Based on influent flow rate, mins.)						√			~~WF~~
5. Calculated clarifier surface overflow rate (gpm/sf)						√			~~WF~~
6. Effluent TOC (mg/L)								√	
7. Effluent DOC (mg/L)								√	
TCEQ-7A: End WW DZ 2 (at 2008 MF/RO SWTP's radial flow clarifier's effluent pipe)									
1. Total chlorine residual (mg/L)		√		~~WF~~					
2. Monochloramine residual (mg/L)		√		~~WF~~					
3. Free chlorine residual (mg/L)		√		~~WF~~					
4. Free ammonia level (mg/L)		√		~~WF~~					
5. pH level at monochloramine monitoring tap		√		~~WF~~					
6. Water temperature (°C) at monochloramine monitoring tap		√		~~WF~~					

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	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
TCEQ-8A: Begin WW DZ 3 (at MF membrane units' feed trough)									
1. Free chlorine dosage rate (mg/L)				√					
2. Ammonia dosage rate (mg/L)				√					
3. Total chlorine residual, after ammonia injection (mg/L)				√					
4. Monochloramine residual, after ammonia injection (mg/L)				√					
5. Free chlorine residual, after ammonia injection (mg/L)				√					
6. Free ammonia level, after ammonia injection (mg/L)				√					
7. Water temperature at monochloramine residual monitoring tap (°C)				√					
8. pH level at monochloramine residual monitoring tap				√					
9. Quantity of chlorine used (ppd)					√				
10. Quantity of ammonia used (ppd)					√				
TCEQ-9A: Selected MF Membrane Unit (at influent to selected MF units' feed trough/tank)									
1. Inlet pressure, head on bottom of membranes' feed side (psi)		√							
2. Influent silt density index (SDI)					√				
TCEQ-10A: Selected MF Membrane Unit Filtrate Quality (after vacuum pump & prior to blending with any other MF filtrate)									
1. Effluent turbidity (mNTU)	√								
2. Effluent flow rate (gpm)		√							
3. Outlet pressure, vacuum (psi)		√							
4. Selected MF unit's effluent flow rate (gpm)		√							
5. Temperature (°C)		√							
6. pH level		√							
7. Calculated average transmembrane pressure (TMP, psi)				√					
8. Calculated average flux rate (gallons per square-foot per day, gfd)				√					

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	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
9. Calculated average specific flux rate (gfd/psi) at measured temperature				√					
10. Calculated average specific flux (gfd/psi) normalized to 20° C				√					
11. SDI					√				
12. Alkalinity (mg/L)								√	
13. TOC (mg/L)								√	
14. DOC (mg/L)								√	
15. *Escherichia coli (E. coli)* enumeration									WF
16. *Giardia* (cysts/L) enumeration									WF
17. *Cryptosporidium* (oocysts/L)									WF
18. Total culturable viruses (MPN/L)									WF
19. Enterovirus (CFU/L)									WF
20. Norovirus (CFU/L)									WF
TCEQ-11A: End WW DZ 3 (at selected MF membrane unit's filtrate piping & prior to combined MF filtrate pipe)									
1. Total chlorine residual (mg/L)		√							
2. Monochloramine residual (mg/L)		√							
3. Free chlorine residual (mg/L)		√							
4. Free ammonia level (mg/L)		√							
5. pH level at monochloramine residual monitoring tap		√							
6. Water temperature at monochloramine residual monitoring tap (°C)		√							
TCEQ-12A: Sodium Bisulfite Feed System									
1. Sodium bisulfite dosage (mg/L)				√					
2. Quantity of sodium bisulfite used (ppd)					√				

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TCEQ-13A: Break Tank (RO membrane feed water tank)									
1. Effluent flow rate (gpm)		√							
2. Water level (feet)				√					
3. Calculated hydraulic detention time (using effluent flow rate, mins.)						√			~~WF~~
4. Effluent free chlorine residual (mg/L)				√					
5. Effluent total chlorine residual (mg/L)				√					
6. SDI					~~WF~~				
TCEQ-14A: Sulfuric Acid Feed System									
1. Sulfuric acid dosage (mg/L)				√					
2. pH level after injection				√					
3. Quantity of sulfuric acid used (gpd)					√				
TCEQ-15A: Antiscalant Feed System									
1. Antiscalant dosage (mg/L)				√					
2. Quantity of antiscalant used (gpd)					√				
TCEQ-16A: Selected RO Membrane Unit Feed Water (after selected RO unit feed pump & prior to selected RO unit)									
1. Influent flow rate (gpm)		√							
2. Influent turbidity (mNTU)		√							
3. Inlet pressure (psi)				√					
4. Temperature (° C)				√					
5. Nitrate (mg/L)				√[1]	~~WF~~				√[2]
6. TDS (mg/L)				√	~~WF~~				
7. TSS (mg/L)				√	~~WF~~				
8. SDI					√				

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9. pH level					√				
10. Hardness as calcium carbonate (mg/L)					√				
11. Alkalinity (mg/L)					√				
12. TOC (mg/L)								√	
13. DOC (mg/L)								√	
14. Nitrite (mg/L)									√
15. Silica (mg/L)									√
TCEQ-17A: First Stage RO Membranes									
1. Temperature (°C)					√				
2. Flow rate (gpm) at measured temperature					√				
3. Calculated total flux rate (gfd) at measured temperature					√				
4. Calculated maximum (or average) net driving pressure (psi)					√				
5. Calculated specific flux rate (gfd/psi) normalized to 20° C					√				
TCEQ-18A: Second Stage RO Membranes									
1. Temperature (°C)					√				
2. Flow rate (gpm) at measured temperature					√				
3. Calculated total flux rate (gfd) at measured temperature					√				
4. Calculated maximum (or average) net driving pressure (psi)					√				
5. Calculated specific flux rate (gfd/psi) normalized to 20° C					√				
TCEQ-19A: Selected RO Membrane Unit Reject Water Quality (at effluent of RO unit's concentrate piping)									
1. Flow rate (gpm)		√							
2. Pressure (psi)		√							
3. TDS (mg/L)					√				
4. Free ammonia (mg/L)					√				

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5. Nitrate (mg/L)					√				
6. pH level							√		
7. Turbidity (NTU)							√		
8. Temperature (°C)							√		
9. CBOD5 (mg/L)							√		
10. Full metal scan (mg/L, arsenic, barium, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver, zinc)							√		
TCEQ-20A: Selected RO Membrane Unit Permeate Quality (at selected RO unit permeate piping & prior to blending with other RO units' permeate)									
1. Flow rate per unit (gpm)		√							
2. TDS (mg/L)		√							
3. Effluent pressure (psi)		√							
4. Temperature (°C)				√					
5. pH level				√					
6. Maximum daily TDS (mg/L)					√				
7. Calculated average flux rate (gfd) at measured temperature					√				
8. Calculated average net driving pressure (psi)					√				
9. Calculated average specific flux rate (gfd/psi) normalized to 20° C					√				
10. Nitrate (mg/L)					√[1]				√[2]
11. Nitrite (mg/L) *if nitrite is detected in RO membrane feed water*					√[1]				√[2]
12. *Escherichia coli (E. coli)* enumeration					√[1]				√[2]
13. *Giardia* (cysts/L)					√[1]				√[2]
14. *Cryptosporidium* (oocysts/L)					√[1]				√[2]
15. Alkalinity (mg/L)								√	
16. TOC (mg/L)								√	

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17. DOC (mg/L)								√	
18. TTHM (ug/L)								√	
19. HAA5 (ug/L)								√	
20. Bromate (mg/L)								√	
21. Chemicals listed in §290.106(b) Inorganic Chemicals[4]									√
22. Chemicals listed in §290.107(b) Organic Chemicals[4]									√
23. Chemicals listed in §290.108(b)(1) and §290.108(b)(2) & 40 CFR §141.66(d)									√
24. Chemicals listed in §290.118(b) Secondary Chemicals									√
25. Total culturable viruses									WF
26. Enterovirus (CFU/L)									WF
27. Norovirus (CFU/L)									WF
28. N-Nitroso-dimethylamine (NDMA, ng/L)									WF
29. N-Nitroso-pyrrolidine (NPYR, ng/L)									WF
30. Pharmaceuticals (µg/L)									WF
31. Hormones (ng/L									WF
32. Personal care products (ng/L)									WF
33. Fluoridated alkyl-acids (PFOS, PFOA, PFNA, PFHxS, PFHpA, & PFBS; ng/L)									WF
34. Sucralose (ug/L)									WF
35. Perchlorate (ug/L)									WF
TCEQ-21A: Calculated %-Removal (based on RR WWTP effluent quality & the RO membrane unit's permeate quality prior to discharge to waste Lagoon 3)									
1. Nitrite removal (%, if detected in RO feed water)					√				
2. Nitrate removal (%)					√				
3. TDS removal (%)					√				

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NO. 2430001
PWS
Q-37

Enclosure A
Full-Scale Verification Test Protocol
Minimum Monitoring and Reporting of Water Qualities and Flow Rates
Table A

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	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
4. TOC removal (%)								√	
5. DOC removal (%)								√	
6. Removal of inorganics (%)									√
7. Removal of organics (%)									√
8. Removal of all radionuclides (%)									√
9. Removal of secondary chemicals (%)									√
10. TTHM removal (%)								√	
11. HAA5s removal (%)								√	
12. Bromate removal (%)								√	
TCEQ-22A: Temporary RO Permeate Lagoon Effluent (at waste Lagoon No. 3 recycle pump station & before blending with Secondary Reservoir source water)									
1. Flow rate (gpm)		√							
2. Turbidity (NTU)				√					
3. pH level				√					
4. Temperature (oC)				√					
5. Nitrate (mg/L)					√[1]				√[2]
6. Free ammonia level (mg/L)					√				
7. Alkalinity (mg/L)								√	
8. TOC (mg/L)								√	
9. DOC (mg/L)								√	
TCEQ-23A: Raw Secondary Reservoir Source Water Quality (prior to chlorine dioxide injection)									
1. Flow rate (gpm)		√							
2. Turbidity (NTU)		√							
3. Temperature (°C)		√							
4. pH				WF					

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Enclosure A
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Table A

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	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
5. TDS (mg/L)					√				
6. TSS (mg/L)					√				
7. Daily flow rate (gpd)					√				
8. Nitrate (mg/L)					√[1]				√[2]
9. Alkalinity (mg/L)								√	
10. TOC (mg/L)								√	
11. DOC (mg/L)								√	
12. Bromate (mg/L)								√	
13. Chemicals listed in §290.106(b) Inorganic Chemicals [4]									√
14. Chemicals listed in §290.107(b) Organic Chemicals [4]									√
15. Chemicals listed in §290.108(b)(1) and §290.108(b)(2) & 40 CFR §141.66(d)									√
16. Chemicals listed in §290.118(b), Secondary Chemicals									√
17. *Escherichia coli (E. coli)* enumeration					√[1]				√[2]
18. *Giardia* (cysts/L)					√[1]				√[2]
19. *Cryptosporidium* (oocysts/L)					√[1]				√[2]
20. Total culturable viruses (MPN/L)									WF
21. Enterovirus (CFU/L)									WF
22. Norovirus (CFU/L									WF
23. N-Nitroso-dimethylamine (NDMA, ng/L)									WF
24. N-Nitroso-pyrrolidine (NPYR, ng/L)									WF
25. Pharmaceuticals (µg/L)									WF
26. Hormones (ng/L									WF
27. Personal care products (ng/L)									WF

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28. Fluoridated Alkyl-Acids (PFOS, PFOA, PFNA, PFHxS, PFHpA, & PFBS; ng/L)									WF
29. Sucralose (ug/L)									WF
30. Perchlorate (ug/L)									WF
TCEQ-24A: Begin Secondary Reservoir raw water (RW) DZ 1 (at chlorine dioxide injection point on Secondary Reservoir raw water transmission pipe)									
1. Chlorine dioxide dosage (mg/L)				√					
2. pH level				√					
3. Temperature (°C)				√					
4. Quantity of chlorine dioxide used (ppd)					√				
TCEQ-25A: End RW DZ 1 (at 1st monitoring point on raw Secondary Reservoir transmission pipe 400 feet from chlorine dioxide injection point)									
1. Chlorine dioxide residual (mg/L)				√	~~WF~~				
2. pH level				√	~~WF~~				
3. Temperature (°C)				√	~~WF~~				
TCEQ-26A: End RW DZ 2 (begins at end of RW DZ 1 and ends at 2nd monitoring point on raw Secondary Reservoir transmission pipe 900 feet from chlorine dioxide injection point)									
1. Chlorine dioxide residual (mg/L)				√	~~WF~~				
2. pH level				√	~~WF~~				
3. Temperature (°C)				√	~~WF~~				
TCEQ-27A: End RW DZ 3 (begins at end of RW DZ 2 & ends prior to tee for blending waste Lagoon No. 3 effluent at 3rd monitoring point on raw Secondary Reservoir transmission pipe 6,500 feet from chlorine dioxide injection point)									
1. Flow rate (gpm)		WF							
2. Chlorine dioxide residual (mg/L)				√					
3. pH level				√					
4. Temperature (°C)				√					
5. Turbidity (NTU)				WF					

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6. Total alkalinity (mg/L as $CaCO_3$)					WF				
7. Nitrate (mg/L)					WF				
TCEQ-28A: Cypress Splitter Box Effluent (blended partially treated RR WWTP effluent from waste Lagoon No. 3 with Secondary Reservoir source water)									
1. Combined flow rate (gpm)				√					
2. Turbidity (NTU)				√					
3. pH				√					
4. Temperature (°C)				WF					
5. *E. coli* enumeration					√[1]				√[2]
6. *Giardia* (cysts/L)					√[1]				√[2]
7. *Cryptosporidium* (oocysts/L)					√[1]				√[2]
8. Nitrate (mg/L)					√[1]				√[2]
9. Water color					√				
10. Odor (threshold odor number)					√				
11. TOC (mg/L)								√	
12. DOC (mg/L)								√	
13. TTHM (mg/L)								√	WF
14. HAA5 (mg/L)								√	WF
15. Bromate (mg/L)								√	WF
16. Chemicals listed in §290.106(b) Inorganic Chemicals [4]									√
17. Chemicals listed in §290.107(b) Organic Chemicals [4]									√
18. Chemicals listed in §290.108(b)(1) radionuclides									√
19. Chemicals listed in §290.108(b)(2) & 40 CFR §141.66(d) manmade radionuclides									√
20. Chemicals listed in §290.118(b) Secondary Chemicals									√

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	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
21. Total culturable viruses (MPN/L)									WF
22. Enterovirus (CFU/L)									WF
23. Norovirus (CFU/L)									WF
TCEQ-29A: Calculated % Change in Water Quality (between RO membrane unit permeate, prior to discharging to waste Lagoon No. 3 and the Splitter Box's effluent blended water quality)									
1. Nitrate change as % reduction (-) or % increase (+)					√[1]				√[2]
2. Chlorite change as % reduction (-) or % increase (+)					WF				
3. TOC change as % reduction (-) or % increase (+)								√	
4. DOC change as % reduction (-) or % increase (+)								√	
5. TTHM change as % reduction (-) or % increase (+)								√	WF
6. HAA5 change as % reduction (-) or % increase (+)								√	WF
7. Bromate change as % reduction (-) or % increase (+)								√	WF
TCEQ-30A: Begin Blended partial treated RR WWTP & Secondary Reservoir waters (Blended) DZ 4 (at chlorine & ammonia injection after Cypress Splitter Box and before 2010 Rapid Mix)									
1. Free chlorine dosage (mg/L)				√					
2. Ammonia dosage (mg/L)				√					
3. Total chlorine residual, after ammonia injection (mg/L)				√					
4. Monochloramine residual, after ammonia injection (mg/L)				√					
5. Free chlorine residual, after ammonia injection (mg/L)				√					
6. Free ammonia residual, after ammonia injection (mg/L)				√					
7. pH level at monochloramine residual monitoring tap				√					
8. Water temperature at monochloramine monitoring tap (°C)				√					
9. Quantity of chlorine used (ppd)					√				
10. Quantity of ammonia used (ppd)					√				

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REVISED 10-24-2001

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TCEQ-31A: Conventional 2010 SWTP Rapid Mix and Coagulant Addition									
1. Influent alkalinity level (mg/L)				√					
2. Coagulant dosage (mg/L)				√					
3. Quantity of coagulant used (gpd)					√				
TCEQ-32A: Conventional 2010 SWTP Flocculation & Clarification (Accelator solids-contact flocculation and clarification)									
1. Effluent flow rate (gpm)		√							
2. Settled water turbidity (NTU)			√						
3. Cationic polymer dosage (mg/L)				√					
4. Lime feed rate (gpm)				√					
5. Quantity of cationic polymer used (gpd)					√				
6. Quantity of lime used (ppd)					√				
7. Calculated flocculator hydraulic detention time (mins.)						√			~~WF~~
8. Calculated clarifier surface overflow rate (gpm/sf)						√			~~WF~~
9. Effluent TOC (mg/L)								√	
10. Effluent DOC (mg/L)								√	
TCEQ-33A: Conventional 2010 SWTP Recarbonation Basin									
1. Carbon dioxide dosage (mg/L)					√				
2. Effluent pH level					√				
3. Quantity of carbon dioxide used (ppd)					√				
TCEQ-34A: Blended Phosphate Addition System (after Conventional 2010 SWTP Recarbonation Basin and prior to gravity media filters)									
1. Blended phosphate dosage (mg/L)					√				
2. Quantity of blended phosphate used (gpd)					√				

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TCEQ-35A: Selected Conventional 2010 SWTP Gravity Media Filter									
1. Selected individual filter's effluent (IFE) turbidity level (NTU)		√							
2. Selected IFE flow rate (gpm)				√					
3. Combined filters' effluent water flow rate (gpm)				WF					
4. Calculated selected IFE hydraulic loading rate for selected filter (gpm/sf)						√			WF
TCEQ-36A: End Blended DZ 4 (at effluent of selected Conventional 2010 SWTP filter)									
1. Total chlorine residual (mg/L)		√							
2. Monochloramine residual (mg/L)		√							
3. Free chlorine residual (mg/L)		√							
4. Free ammonia level (mg/L)		√							
5. pH level at monochloramine residual monitoring tap		√							
6. Water temperature (°C) at monochloramine residual monitoring tap		√							
TCEQ-37A: Fluoride Adjustment System (after Conventional 2010 SWTP filters and prior to chlorine injection point)									
1. Fluoride level, pre-fluosilicic injection (mg/L)					√				
2. Fluosilicic acid dosage (mg/L)					√				
3. Quantity of fluosilicic acid used (gpd)					√				
TCEQ-38A: Begin Blended DZ 5 (at chlorine injection prior to Conventional 2010 SWTP Clearwell)									
1. Free chlorine dosage (mg/L)				√					
2. Ammonia dosage (mg/L)				√					
3. Total chlorine residual, after ammonia injection (mg/L)				√					
4. Monochloramine residual, after ammonia injection (mg/L)				√					
5. Free chlorine residual, after ammonia injection (mg/L)				√					
6. Free ammonia level, after ammonia injection (mg/L)				√					

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7. pH level at monochloramine residual monitoring tap				√					
8. Water temperature at monochloramine residual monitoring tap (°C)				√					
9. Quantity of chlorine used (ppd)					√				
10. Quantity of ammonia used (ppd)					√				
TCEQ-39A: End Temporary Blended DZ 5 (at Conventional 2010 SWTP Clearwell's transfer pumps)									
1. Total chlorine residual (mg/L)		√							
2. Monochloramine residual (mg/L)		√							
3. Free chlorine residual (mg/L)		√							
4. Free ammonia level (mg/L)		√							
5. pH level at monochloramine residual monitoring tap		√							
6. Water temperature at monochloramine residual monitoring tap (°C)		√							
TCEQ-40A: Conventional 2010 SWTP Clearwell Effluent Water Quality (after 2010 clearwell transfer pumps and prior to GSTs)									
1. Flow rate (gpm)		√							
2. Turbidity (NTU)		√[3]							
3. Turbidity (mNTU)		√[3]							
4. Nitrate (mg/L)		√[1]			~~WF~~				√[2]
5. TDS (mg/L)		√[1]			~~WF~~				√[2]
6. *E. coli* enumeration					√[1]				√[2]
7. *Giardia* (cysts/L)					√[1]				√[2]
8. *Cryptosporidium* (oocysts/L)					√[1]				√[2]
9. Fluoride (mg/L)					√[1]				√[2]
10. Daily quantity of water treated (MGD)					√				
11. Chlorine dioxide (mg/L)					√				
12. Chlorite (mg/L)					√				

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13. Color (color units)					√				
14. Odor (threshold odor number)					√				
15. Alkalinity (mg/L)								√	
16. Hardness as calcium carbonate (mg/L)								√	
17. Calculated Langelier saturation index (LSI)								√	
18. Chemicals listed in §290.106(b) Inorganic Chemicals [4]									√
19. Chemicals listed in §290.107(b) Organic Chemicals [4]									√
20. Chemicals listed in §290.108(b)(1) (radium 226, radium 228, uranium, gross alpha activity)									√
21. Chemicals listed in §290.108(b)(2) & 40 CFR §141.66(d) (gross beta particle and photon radioactivity, tritium, strontium 90)									√
22. Chemicals listed in §290.118(b) Secondary Chemicals									√
23. TTHM (ug/L)								√	
24. HAA5 (ug/L)								√	
25. Lead (mg/L)									√
26. Total culturable viruses (MPN/L)									WF
27. Enterovirus (CFU/L)									WF
28. Norovirus (CFU/L)									WF
29. N-Nitroso-dimethylamine (NDMA, ng/L)									WF
30. N-Nitroso-pyrrolidine (NPYR, ng/L)									WF
31. Pharmaceuticals (µg/L)									WF
32. Hormones (ng/L)									WF
33. Personal care products (ng/L)									WF
34. Fluoridated alkyl-acids (PFOS, PFOA, PFNA, PFHxS, PFHpA, & PFBS; ng/L)									WF

NO. 24300001

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35. Sucralose (ug/L)									WF
36. Perchlorate (ug/L)									WF
Simulated CT for 10.0-MG GST				8-hrs.		End of three 8-hr. shifts			
TCEQ-41A: Begin Temporary Blended DZ 6 (no disinfectant injection, includes Cypress 10.0-MG GST)									
1. Collect water sample at effluent of 2010 clearwell				√					
2. 2010 clearwell transfer pumps' flow rate (gpm)				√					
3. Calculate hydraulic detention time of 10.0 MG GST at 50-% capacity (mins.)				√					
4. Calculate T10 using a baffling factor of 0.3 (mins.)				√					
TCEQ-42A: End Temporary Blended DZ 6 (at Cypress high service pumps' discharge header)									
1. Water temperature of sample after holding sample for calculated T10 (°C)				√					
2. pH level of sample after holding sample for calculated T10				√					
3. Monochloramine residual of sample after holding sample for calculated T10 (mg/L)				√					
4. Record 2010 clearwell transfer pumps' 8-hr. flow rate result that corresponds to the lowest virus and *Giardia* inactivation on Full-Scale Verification Test SWMOR (gpm)						√			
5. Record water sample temperature for the 8-hr. result that corresponds to the lowest virus and *Giardia* inactivation on Full-Scale Verification Test SWMOR (°C)						√			
6. Record water sample pH level for the 8-hr. result that corresponds to the lowest virus and *Giardia* inactivation on Full-Scale Verification Test SWMOR						√			
7. Record monochloramine residual for the 8-hr. result that corresponds to the lowest virus and *Giardia* inactivation on Full-Scale Verification Test SWMOR (mg/L)						√			

1 Samples are to be collected at each of the designated locations once per day and tested using a TCEQ accepted real-time (on-site) analytical method.

2 A split sample is to be collected in conjunction with the above daily samples at each location at startup, every 30 days and at the last day of the Full-Scale Verification Test and submitted to an of-fsite NELAP laboratory certified for conducting these drinking water quality tests.

3 Either a Hach Model 1720E (or TCEQ approved equivalent) or Model 660 FilterTrak turbidimeter may be used for the 15-minute filtered water turbidity level monitoring and reporting. The City's Protocol needs to specify which method will be used.

4 Please assure that the laboratory monitors for all of the inorganic and organic compounds. Compounds that some labs do not include, but are required are: asbestos, cyanide, endothall, diquat, glyphosate, asbestos, and the dioxins.

Enclosure B:

Full-Scale Verification Test Protocol

Monitoring and Reporting of

Operating Processes

Enclosure B
Full-Scale Verification Testing Protocol
Monitoring and Reporting of Operating Processes

The operating processes marked with a check (√) in Table B below selected by the TCEQ as the minimum operating processes to be recorded during the Full-Scale Verification Testing of the proposed temporary DPR WTP. This will allow the TCEQ to have a more complete understanding of operating parameters that can interfere with the DPR WTP's ability to continuously produce a safe quality of water.

Table B

PROCEDURES	Each Event
MF/RO 2008 Radial Flow Clarifier	
All Blowdown Events	
Blowdown date	√
Blowdown start time	√
Blowdown duration (mins.)	√
Quantity of sludge wasted (gals.)	√
MF Membranes Unit	
Selected Unit No. for testing	√
Daily maximum flux rate (gpm/sf)	√
Daily maximum specific flux rate (gpm/sf-psi)	√
1) All Backwash (BW) Events	
BW trigger (time, gals. treated, specific flux, transmembrane pressure (TMP))	√
BW frequency (mins.)	√
BW duration (mins.)	√
BW flow rate (gpm)	√
BW supply pH	√
Chemical added to BW supply	√
Chemical concentrations	√
BW supply temperature (° C)	√
Quantity filtrate used (gals.)	√
2) All Chemical Maintenance Clean (MC) Events	
MC trigger (time, gals. treated, specific flux, TMP)	√
MC frequency (mins.)	√
MC date	√
MC start time	√
MC solution flow rates (gpm)	√
MC soak duration (mins.)	√
MC air flow rate (cfs)	√
MC air flow duration (mins.)	√
MC chemicals used	√
MC chemical concentrations (mg/L)	√
MC solution temperature (° C)	√
MC solution pH	√
MC flush flow rate (gpm)	√

PROCEDURES	Each Event
MC flush duration (mins.)	√
Total MC duration (mins.)	√
Quantity of filtrate used (gals.)	√
Filtrate pH immediately after MC flush	√
3) All Clean-In-Place (CIP) Events	
CIP trigger (time, gals. treated, specific flux, TMP)	√
CIP date	√
CIP start time	√
CIP frequency (mins.)	√
CIP solution flow rate (gpm)	√
CIP soak duration (mins.)	√
CIP air flow duration (mins.)	√
CIP chemicals used	√
CIP chemical concentrations (mg/L)	√
CIP solution temperature (° C)	√
CIP solution pH	√
CIP flush flow rate (gpm)	√
CIP flush duration (mins.)	√
Total CIP duration (mins.)	√
Quantity filtrate used (gals.)	√
Filtrate pH immediately after CIP flush	√
4) All Direct Integrity Test (DIT) Results	
DIT date	√
DIT start time	√
Starting test pressure (psi)	√
Duration (mins.)	√
Ending test pressure (psi)	√
Deterioration rate (psi/min)	√
Calculated log removal value (LRV_{DIT})	√
5) All Repairs & Replacements	
Date of repair or module replacement	√
Module No.	√
Type of repair or module replacement	√

Enclosure B
Full-Scale Verification Testing Protocol
Monitoring and Reporting of Operating Processes

PROCEDURES	Each Event
RO Membrane Unit	
Selected Unit No. for testing	√
Daily maximum flux rate (gpm/sf)	√
Daily maximum specific flux rate (gpm/sf-psi)	√
1) All Clean-In-Place (CIP) Events	
CIP trigger (time, gals. treated, specific flux, TMP)	√
CIP frequency (hrs.)	√
CIP date	√
CIP start time	√
CIP solution flow rate (gpm)	√
CIP soak duration (mins.)	√
CIP air flow rate (cfs)	√
Quantity of permeate used (gals.)	√
2) All RO Membrane Molecular DIT (if applicable)	
DIT date	√
DIR start time	√
Molecular indicator selected	√
Target log removal value (LRV)	√
Required feed solution volume (gals.)	√
Required dosage rate (mg/L)	√
Duration for equilibrium to occur (mins.)	√
Sample size (liters)	√
No. of samples collected	√
Sample frequencies (mins.)	√
Feed sample concentrations (mg/L)	√
Permeate sample concentrations (mg/L)	√
All calculated LRV_{DIT} Values	√
Quantity of permeate wasted (gals.)	√
3) All Repairs & Replacements	
Date(s) of repair or element replacement	√
Stage No.	√
Pressure Vessel No.	√
Module No.	√
Type of repair or replacement	√
Person/company performing repair	√

PROCEDURES	Each Event
Conventional 2010 SWTP Accelator Solids-Contact Clarifier	
All Blowdown Events	
Blowdown date	√
Blowdown start time	√
Blowdown duration (mins.)	√
Quantity of sludge wasted (gals/event)	√
Conventional 2010 SWTP Media Filter	
Selected Filter No. for testing	√
Maximum daily hydraulic loading rate (gpm/sf)	√
All Backwash (BW) Events	
BW date	√
BW trigger (time, loss-of-head, turbidity, other)	√
Filter run time (hrs.)	√
BW start time	√
BW duration (mins.)	√
BW flow rate (gpm/sf)	√
Quantity of filtered water used for BW (gals.)	√
Filter-to-waste duration (mins.)	√
Filter ripening duration (mins.)	√
Unit filter run volumes (gals./day)	√

Enclosure C:

Acceptable Analytical Methods, Calibration Methods and Calibration Frequencies

Enclosure C:
Acceptable Analytical Methods, Calibration Methods and Calibration Frequencies

The Full-Scale Verification Test must be conducted using the below analytical methods, calibration requirements, and laboratory requirements.

- The samples collected must be analyzed using the methods listed in the following sections in Title 40 of the Code of Federal Regulations (40 CFR) contain acceptable drinking water analytical methods:
  - 40 CFR §141.21(f) for microbiological;
  - 40 CFR §141.74(a)(1) for turbidity;
  - 40 CFR §141.23(k) for inorganics;
  - 40 CFR §141.24(e), (f), and (g) for organics;
  - 40 CFR §141.25 for radionuclides;
  - 40 CFR §141.131(a) and (b) for total trihalomethanes and haloacetic acids;
  - 40 CFR §141.131(c) for disinfectants other than ozone;
  - 40 CFR §141.131(d) for alkalinity, bromide, magnesium, total organic carbon, dissolved carbon, specific ultraviolet absorbance, and pH;
  - 40 CFR §141.89 for lead and copper; and
  - 40 CFR §141.89, Subpart C, Appendix A for other drinking water analyses.
- The PowerWater® DNA Isolation Kit provided by MoBio is hereby accepted by the TCEQ for use during the Full Scale Verification Test for performing the real-time polymerase chain reaction (qPCR) procedure. The Report must include information on the qPCR procedure. Please provide a description of all quality assurance and quality control procedures, including a copy of the system-specific standard operating procedure for sample collection (including sample volume), a copy of the standard operating procedure for sample analysis (including sample cleaning processes), a description of any planned strategies used to ensure thermostability, a description of planned frequencies and methods for generating standard curves, and a description of calibration or verification methods and strategies.
- All on-line monitors must be calibrated at startup and once every 30 days thereafter.
- All on-line monitors must be compared against a benchtop monitor at least once every seven days between monthly calibrations. If a difference of more than 20% then the on-line monitor will need to be recalibrated.
- All flow-indicating devices and rate-of-flow controllers must be calibrated prior to startup of the verification testing, once every 30 days, and at the completion of the verification testing period. For meters that cannot be calibrated, a validation test must be described in the Report and performed at the same frequency.
- All off-site analytical testing must be conducted at a laboratory accredited under the National Environmental Laboratory Accreditation Program (NELAP) and must use an acceptable EPA or SM method (American Public Health Association (APHA). 2006. "Standard Methods of Water and Wastewater. 21th ed. (or more current version)" American Public Health Association, American Water Works Association, Water Environment Federation publication. APHA, Washington D.C.).
- Copies of all laboratory quality control and quality assurance tests (such as spike results) must be provided with the analytical results.

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Enclosure D:

Design, Operating and Monitoring Requirements for Fluoride Adjustment

Enclosure D:
Design, Operating and Monitoring Requirements for Fluoride Adjustment

The City has proposed to adjust the fluoride level in the temporary Cypress Direct Potable Reuse (DPR) Water Treatment Plant's (WTP) finished water prior to distribution using fluosilicic acid. The conditional granting of this temporary exception is contingent on the following conditions:

1. The fluoride adjustment system must be in operation during the verification testing of the proposed Cypress DPR WTP.

2. The fluosilicic acid must conform to American National Standards Institute/National Sanitation Foundation (ANSI/NSF) Standard 60 for direct additives and must have been certified by a testing organization accredited by ANSI.

3. A day tank must be provided to prevent chemical overfeeds.

4. Texas Commission on Environmental Quality (TCEQ)-approved spill containment must be provided for both the bulk storage and day tanks. If modifications are required to meet this requirement, engineering amendments or change orders must be submitted for the TCEQ's review prior to the modifications being made.

5. During the verification testing, the fluoride level in the filtered water from the 2010 clearwell shall not exceed 2.0 milligrams per liter (mg/L).

6. The daily quantity of fluosilicic acid used, dosage, and the fluoride residual must be monitored and recorded at frequencies specified in Enclosure A: Full-Scale Verification Test Protocol Monitoring and Reporting of Operating Processes.

7. On-site analytical equipment that meets the requirements in Title 30 of the Texas Administrative Code (30 TAC) §290.119 must be used for on-site monitoring of the fluoride residual at a sample site directly after the fluosilicic acid injection.

8. The calibration records of the equipment for monitoring the fluoride residual must be performed as required in 30 TAC §290.46(s).

9. To evaluate the performance of the fluoride system, each public drinking water system is required by 30 TAC §290.42(b)(4) and (d)(15)(C)(viii) to monitor and record the following:
    a. The daily quantity of fluoride compound used; and,
    b. The daily fluoride residuals of the water entering the distribution.

10. The City must ensure that adequate safety equipment and training in the use and handling of fluosilicic acid are provided to the operators.

11. The temporary Cypress DPR WTP's Operation & Maintenance Manual and Monitoring Plan must include monitoring information and safety procedures associated with the fluoride addition and be submitted with the Full-Scale Verification Test Report.

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Enclosure E:

Full-Scale Verification Test Report Format

Enclosure E
Full-Scale Verification Test Report Format

The Full-Scale Verification Test Report (Report) must be prepared by the system's professional engineer, who must be licensed by the Texas Board of Professional Engineers, and accompanied by a cover letter that is sealed, signed, and dated. The Report must contain the following data in the formats noted. All references to equations to be used for membranes are from the U.S. Environmental Protection Agency's (EPA's) Membrane Filtration Guidance Manual (MFGM) – EPA 815-R-06-009, November 2005 (EPA MFGM).

The hard copy of the Report must contain all raw data collected during the verification testing along with the information and methods listed in this enclosure. Because of the large volume of data, electronic versions of the data should also be included. Electronic data submitted must be Excel 2010 compatible.

Report Introduction

The following site information needs to be included:

- The name of the public water system and water treatment plant(s) involved in the verification testing;
- The public water system identification (PWSID) number;
- The name of the wastewater treatment plant and any surface or groundwater sources that will be used for blending;
- A copy of the City's Chapter 210 reclaimed water reuse authorization and the RR WWTP wastewater discharge Permit No. WQ00104419-000;
- A USGS 7.5-minute quadrangle map showing the location of the wastewater treatment plant and full-scale DPR WTP; and
- A schematic of the treatment train that shows chemical feed points, pre-treatment facilities, all equipment, flow meters, and monitoring points.

Report Organization and Labeling

To facilitate the TCEQ's review, the Report needs to be organized using the following format:

- Provide a Table of Contents identifying the page number for each major division or tab;
- Submit the tables and graphs for the different parameters listed in the TCEQ's Enclosures A and B in the same order as they are listed in Enclosures A and B of this letter;
- Submit the results for each Enclosure A Sample Set water quality parameters/flow rates in an individual section or appendix, and submit the results for each Enclosure B Procedure in individual sections or appendices of the Report;
- Identify all submitted graphs, tables, and raw data sheets for each of the TCEQ's Enclosures A and B using the TCEQ's identifying numbers (TCEQ-A1, TCEQ-A2, TCEQ-B1, etc.) and TCEQ associated descriptions used in the enclosures to this letter;
- Column and/or row headings for tables that are on more than one page must appear on each page;
- Provide summaries and validated conclusions; and
- Except for the off-site laboratory sheets, each page of the Report and attachments need to have a number for referencing in follow-up conversations and correspondence. The City's Report will contain multiple attachments/appendices; therefore, if each attachment/appendix page does not have a header and title identifying which attachment or appendix (i.e.; A, B, C, etc.) it relates to, then each page number needs to include the attachment or appendix identification (i.e.; A-1, A-2, B-1, B-2, etc.) in the footer.

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Enclosure E
Full-Scale Verification Test Report Format

Collected Data

The Report must contain the following tables and graphs for each of the water qualities, flow rates and operating parameters listed in:

- Enclosure A: Required Monitoring and Reporting of Water Qualities and Flow Rates;
- Enclosure B: Full-Scale Verification Test Protocol Monitoring and Reporting of Operation Processes; and
- Enclosure D: Design, Operating and Monitoring Requirements for Fluoride Adjustment.

Tables for Monitored Results

Each of the summary tables must contain the number of data points collected, the range of data values (i.e., the maximum and minimum values), the average value, and the 95th percentile value if more than 10 data points were collected. The following tables must be included with the Report. Other tables may be included to support the City's and engineer's conclusions and request to discharge the treated wastewater to the distribution system for human consumption. Please include:

- Water quality tables for all off-site analytical results for each of the monitoring locations listed in Enclosure A in the treatment train. In addition to the summary table, a table with all of the off-site analysis results must be provided.
- Water quality tables for all on-site monitoring results (collected at five-minute, 15-minute, two-hour, four-hour, and daily frequencies) for each of the monitoring locations in the treatment train.
- Tables comparing the results of on-site and off-site split sampling.
- A separate disinfection data table for each injection point that includes the dosages, residuals, and quantity of chlorine dioxide, chlorine and ammonia used each 24-hour period.
- A separate disinfection byproducts data table for each monitoring point that includes concentrations of:
  - Total trihalomethane (TTHM);
  - Haloacetic acid (HAA5);
  - Bromate;
  - Chlorite
  - Chlorine dioxide; and
  - Any monitored unregulated disinfection byproducts of concern.
- Individual tables for the 2008 SWTP and the 2010 SWTP coagulation, flocculation and clarification treatment and equipment operation.
- Microfiltration (MF) membrane unit's performance and operating tables summarizing the following:
  - Feed water flow rates;
  - Filtrate water flow rates;
  - Filtrate flux rates;
  - Transmembrane pressures (TMP);
  - Feed water temperatures;
  - Specific flux rates adjusted to 20° C;
  - %-recovery of specific flux after a chemical maintenance clean (MC);

PWSD No. 0430001

- %-recovery of specific flux after a chemical clean-in-place (CIP);
- %-loss of original (at startup of full-scale verification test) specific flux due to irreversible fouling;
- Each direct integrity test's (DIT) beginning pressure, ending pressure and test duration;
- MC frequencies, durations, and flow rates; and
- Backwash frequencies, durations, and flow rates.

- Reverse osmosis (RO) membrane skid's operating and performance tables summarizing the following:
  - Feed water flow rates;
  - Feed water temperatures;
  - Permeate flow rates;
  - Concentrate flow rates;
  - Stage 1 and 2 permeate flux rates at feed water temperature;
  - Net driving pressures (NDP);
  - Stage 1 and 2 specific flux rates at 20° C;
  - %-recovery of specific flux after a CIP; and
  - %-loss of original (at startup of full-scale verification test) specific flux due to irreversible fouling.

Graphs for Monitored Results

Each graph must show the time the data was collected on the x-axis and the results on the y-axis. The scale of each axis must be such that data at four-hour intervals can be clearly identified. Use different symbols (+, x, Δ, •, ◇, etc.) and colors for data points and lines when more than one set of data is graphed on a single graph. The following graphs are to be provided with the Report. Other graphs may be included to support the City's and engineer's conclusions and request to discharge the treated waste water to the distribution system for human consumption.

- Comparison of the wastewater treatment plant's 15-minute effluent turbidity levels and flow rates plotted against time;
- Comparison of the wastewater treatment plant's 15-minute effluent turbidity levels and the reported onsite and offsite *Cryptosporidium* and *Giardia* levels plotted against time;
- Comparison of all the on-site *Cryptosporidium* and *Giardia* levels and the offsite *Cryptosporidium* and *Giardia* levels plotted against time;
- Comparison of each disinfection zone's (one graph for each disinfection zone) chlorine dioxide and monochloramine residuals and the reported TTHM and HAA5 levels at the end of the zone plotted against time;
- Comparison of the 2008 SWTP Radial Flow Clarification Basin's influent and effluent turbidity levels plotted against time;
- Comparison of the 2010 SWTP Accelator Clarification Basin's influent and effluent turbidity levels plotted against time;
- Comparison of the MF membrane unit's 15-minute feed water and five-minute filtrate turbidity levels plotted against time;
- Comparison of the MF membrane unit's daily feed water and filtrate silt density index (SDI) levels plotted against time;

PWS ID No. 2430001

- Comparison of the MF membrane unit's 15-minute feed water turbidity and daily feed water SDI levels plotted against time;
- Comparison of the MF membrane unit's temperatures and TMPs with all maintenance clean and CIP events identified plotted against time;
- Comparison of the MF membrane unit's four-hour specific flux rates (adjusted to 20° C) and %-recovery of original (at startup of full-scale verification test) specific flux due to backwash, maintenance clean, and CIP events plotted against time. Use MFGM Equation 2.13 for calculating specific flux:

  Equation 2.13: $\mathbf{M_{20} = J_{20} / TMP}$

- Comparison of the RO membrane skid's 15-minute feed, concentrate and permeate total dissolved solids (TDS) levels plotted against time;
- Comparison of the RO membrane skid's feed water turbidity levels, permeate flux rates and net driving pressures (NDP) plotted against time;
- Comparison of the RO membrane skid's feed water temperatures, permeate flux rates and NDP plotted against time;
- Comparison of the RO membrane skid's daily average specific/normalized flux rates (adjusted to 20° C) and % recovery of original (at startup of full-scale verification test) plotted against time . Use MFGM Equation 2.21 for calculating specific flux:

  Equation 2.21: $\boldsymbol{M_{20} = J_{20} / NDP}$

- Comparison of the RO membrane skid's %-loss of original (at startup of full-scale verification test) specific flux rate and permeate feed water TDS levels;
- Individual graphs for the RO membrane skid's %-removal of:
  - Nitrate (and nitrite if detected in the RO feed water);
  - TDS, TOC, and DOC;
  - TTHM;
  - HAA5;
  - Bromate;
  - Inorganics detected in the permeate
  - Organics detected in the permeate;
  - Radionuclides detected in the permeate;
  - Secondary drinking water constituents detected in the permeate;
  - Any monitored unregulated disinfection byproducts of concern detected in the permeate; and
  - Any monitored unregulated contaminants of concern detected in the RO permeate.
- A single graph with the 2010 gravity filter's hydraulic loading rate (HLR), turbidity and backwash events marked.
- Individual graphs for the %-change in the water quality after blending the partial treated RR WWTP effluent and the Secondary Reservoir water source:
  - Nitrate;
  - TOC and DOC;
  - TTHM;
  - HAA5;
  - Bromate; and

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- Chlorite.

MF Membrane System

- The Report must contain the following manufacturer's information for the MF membranes:
  - The manufacturer's name, model number, and serial;
  - Documentation that the MF membrane elements and pressure vessels conformed to American National Sanitation Institute/National Sanitation Foundation (ANSI/NSF) Standard 61 and have been certified by a testing organization accredited by ANSI;
  - Material the membrane fiber is constructed of;
  - Length of membrane fiber;
  - Surface area of the feed water side of the membrane module/element;
  - Flow direction (inside out or outside in)
  - Nominal and maximum pore sizes;
  - Oxidant resistance;
  - Water temperature operating range;
  - Feed water turbidity operating limit;
  - Method of operation (dead-end or crossflow);
  - Maximum recommended instantaneous filtrate flux rate;
  - Maximum allowable TMP using:

    Equation 2.4: **TMP** = P_f (feed pressure in psi) − P_p (permeate pressure in psi)
  - Confirmation of all the parameters used in the DIT formulas.
- The Report must provide the following information in tables for backwash, MC, and CIP data for each MF membrane procedure used during the verification test:
  - All chemicals and their concentrations;
  - Documentation that all chemicals used conform to ANSI/NSF Standard 60 and have been certified by a testing organization accredited by ANSI;
  - Flow rates;
  - Durations;
  - Frequencies;
  - Quantity of filtrate/permeate water used;
  - Disinfectant residual (if applicable);
  - pH of the chemical solution;
  - Temperature of the chemical solution;
  - Description of the M.C. and CIP waste neutralization procedures; and
  - Disposal method of chemical and backwash waste.

RO Membrane System

- The Report must contain the following manufacturer's information for the RO membranes:
  - The manufacturer's name, model number, and serial number(s);
  - The number of RO elements per pressure vessel;
  - Number of pressure vessels in Stage 1 of each skid;
  - Number of pressure vessels in Stage 2 of each skid;
  - Documentation that the RO membrane elements and pressure vessels conform to ANSI/NSF Standard 61 and have been certified by a testing organization accredited by

PWSD No. 2430001

ANSI;

- Materials of construction for the RO membrane elements and pressure vessels;
- Surface area of the feed water side of the membrane element;
- Oxidant resistance;
- Water temperature operating range;
- Feed water constituent limitations (i.e., turbidity, metals, minerals, SDI, etc.);
- Maximum recommended instantaneous permeate flux rate per stage (gfd);
- Operating pressure range;
- Dimensions of the RO membrane elements (element diameter and length, leaf length and area);
- Maximum allowable net driving pressure (NDP) using MFGM Equation 2.17:

  Equation 2.17: $\mathbf{NDP} = \{[(\mathbf{P}_f + \mathbf{P}_c) \div 2] - \mathbf{P}_p\} - (\{[(\mathbf{TDS}_f + \mathbf{TDS}_c) \div 2] - \mathbf{TDS}_p\} \times 0.01)$
- Vendor specific constant "U" for the temperature correction factor using MFGM Equation 2.19 to adjust the RO flux rate to 25° C using Equation 2:20:

  Equation 2.19: $\mathbf{TCF} = e^{(U \times \{[1 / (T + 273)] - (1 / 298)\})}$

  Note: replacing "298" (for 25° C) with "293" (for 20° C) in MFGM Equation 2.19 then allows MFGM Equation 2.19 to give a $\mathbf{TCF}_{20}$ (for 20° C) and MFGM Equation 2.20 gives J_{20} (flux adjusted to 20° C) instead of J_{25}.

  Equation 2.20: $J_{25} = J_T \times \mathbf{TCF}$
- A description of the manufacturer's required membrane preconditioning method, if applicable.

- The Report must provide the following CIP data for the RO membrane skid and CIP procedure used.
  - All chemicals and their concentrations;
  - Documentation that all chemicals used conform to ANSI/NSF Standard 60 and have been certified by a testing organization accredited by ANSI;
  - Flow rate;
  - Duration;
  - Quantity of permeate water used;
  - Disinfectant residual (if applicable) of CIP solution;
  - pH of the chemical solution;
  - Temperature of the chemical solution;
  - Description of CIP and waste neutralization procedures;
  - Disposal method of chemical and backwash waste; and
  - The expected chemical CIP frequency if different from that used during the full-scale verification test.

Alarms and Automatic Shut-down Controls

- Test results of all alarms with automatic shut-down controls must be provided.
- Test results for on-line monitoring equipment with alarms only.
- Provide the trigger point for each alarm and automatic shut-down control.
- Provide a description and corrective actions taken for each alarm or automatic shut-down event during the verification testing.

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Events

- Provide the date, duration and amount of rainfall on the Lake Arrowhead, Lake Kickapoo and Secondary Reservoir watersheds during the verification test period;
- Provide the date, time, duration, and corrective actions taken for any water quality (i.e.; TSS, turbidity, pathogens, etc.) spikes from the RR WWTP and exceedances of the City's Chapter 210 reclaim water reuse authorized limits.

Quality Control/Quality Assurance

- The Report must include the following data for all on-site analytical tests:
  - A list of the analytical methods and equipment used during the verification test;
  - Laboratory quality assurance documentation for all samples (including standard operating procedures and statements of qualifications for analysts);
  - A description of the calibration procedures and frequencies; and
  - A copy of each calibration procedure for the analytical equipment and flow measuring devices.
- The Report must include the following data for all off-site laboratories used during the verification study:
  - Names of the laboratories;
  - Analytical tests conducted;
  - Analytical methods used;
  - Analytical test results in the graph and table formats as discussed above;
  - Copies of all the results for all quality assurance and quality control (QA/QC) procedures conducted for the analytical testing of samples;
  - Analytical equipment calibration methods and frequencies; and
  - Sample blank and spike results.

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Enclosure F

Temporary Full-Scale Verification

Test CT Templates

Enclosure F1: 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: Temporary CT for DPR Full-Scale Verification Test - RR WWTP Source

Month: August
Day: 29
Year: 2013

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

This Temporary CT Workbook only evaluates the required disinfection protocol for the source water from the River Road Wastewater Treatment Plant (RR WWTP) effluent during the Full-Scale Verification Test. Due to the construction of the CT Template, a separate Temporary CT Workbook (included as Enclosure F2) was developed for the disinfection protocol for the water from Lake Arrowhead and Lake Kickapoo. During the Full Scale Verification Test, the City must complete and submit two separate SWMORs: one for the water from the RR WTP and a second one for the water from the lakes.

After completion and approval of the Full Scale Verification Report, during the City's proposed operation of the temporary direct potable reuse (DPR) water treatment plant (WTP), the 2008 Microfiltration/Reverse Osmosis (MF/RO) Membrane Surface Water Treatment Plant (2008 SWTP, TP 21567), is proposed to receive approximately 7.5-million gallons per day (MGD) of the RR WWTP's effluent through approximately 62,500 feet of 32-inch outside diameter (O.D.) HDPE pipe with a 27-inch inside diameter (I.D.). The flow rate for the proposed Full-Scale Verification Test the same or less than the proposed temporary operational flow rate during the verification test.

The 2008 SWTP consists of rapid mix, coagulation, flocculation, radial flow clarification, five MF membrane units, six RO membrane two-stage units, and chloramine disinfection. At least one MF membrane unit (tank) and one RO membrane unit (skid) will be tested at the City's proposed maximum flow rate for these units when sending the temporary DPR WTP effluent to distribution for human consumption. However, the MF membranes' flux rate may not exceed the TCEQ's approved 19.6 gallons per square-foot per day (gfd) at 20 ° C and the RO membranes' flux rate may not exceed 14.9 gfd.

The RO permeate (partially treated RR WWTP effluent) will be temporarily diverted to one of the Cypress Facility's backwash waste lagoons (Lagoon No. 3). During the treatment of RR WWTP effluent, no clarifier blow-down, filter backwash, membrane backwash, nor chemical cleaning waste shall be discharged to Lagoon No. 3.

The RO permeate will be transferred from Lagoon No. 3 by four existing backwash waste recycle pumps to the existing 42" diameter pipeline from the Secondary Reservoir at a connection before the Cypress Facility's splitter box. At this point, it will be blended with raw surface water from the Secondary Reservoir. The blended source water may not contain more than 50.00-percent partially treated RR WWTP effluent at any time.

Normally the splitter box diverts raw surface water to the 1961 SWTP, 1987 SWTP and 2010 SWTP. When RR WWTP effluent is being treated, the 1961 SWTP and 1987 SWTP will be off-line. The 2010 SWTP will provide further treatment for the two blended source waters.

(continued on next page)

Submitted by: _____

Contact Information: _____

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

The 2010 SWTP consists of rapid mix, coagulation, flocculation, solids-contact clarification, gravity media filtration, and a 0.254-MG clearwell. At least one gravity media filter will be tested continuously at the maximum flow rate that corresponds to the City's proposed operation of the 2010 SWTP when sending the temporary DPR WTP effluent to distribution for human consumption. However, the filter flow rate cannot exceed a 5.0 gallons per minute per square-foot (gpm/sf) loading rate either during the Full Scale Verification Test or after approval.

The Cypress Facility's three ground storage tanks (GSTs)—10.0-MG, 3.0-MG, and 5.0-MG—will not be on line during the verification testing. Only the 10.0-MG GST is proposed for operation when the temporary DPR WTP is operating and discharging effluent to the City's distribution system for human consumption. Therefore this CT study template was created so that the City can estimate the pathogen inactivation in the 10.0-MG ground storage tank (GST) during the verification test.

This proposed disinfection protocol during the Full-Scale Verification Test will include six disinfection zones (DZ).

Wastewater (WW) DZ 1 will begin at the free chlorine injection point at the RR WWTP chlorine contact basin to combine with the free ammonia in the RR WWTP effluent to create "pre-formed chloramines." No attempt will be made to achieve breakpoint chlorination to obtain a free chlorine residual. WW DZ 1 will end at the 2008 SWTP's flow control and static mixer vault. A disinfection monitoring site will be present at that location.

WW DZ 2 will begin at the chlorine and liquid ammonia sulfate (LAS) injection in the rapid mix of the 2008 radial flow clarifier's mixer and end at the radial flow clarifier's effluent pipe. A disinfection monitoring site will be present at that location.

WW DZ 3 will begin with the addition of chlorine and LAS in the 2008 MF membrane tanks' feed trough and end on the combined filtrate pipeline. A disinfection monitoring site will be present at that location.

Blended (Secondary Reservoir and partially treated RR WWTP effluent waters) DZ 4 will begin with the addition of chlorine gas and ammonia gas in the Cypress Facility splitter box and end after the 2010 SWTP's gravity media filters. A disinfection monitoring site will be present at that location.

Blended DZ 5 (temporary for verification test) will begin with the addition of chlorine gas and ammonia gas before the 0.254-MG 2010 SWTP's clearwell and end at the 2010 SWTP transfer pumps. A disinfection monitoring site will be present at that location.

Blended DZ 6 (temporary for verification test) will not be in service during the Full-Scale Verification Test. It will begin after the Blended DZ 5 monitoring point, without any addition of disinfectant, and include the 10.0-MG GST. It will end at the Cypress Facility's high service pumps. During the verification testing, the inactivation in Blended DZ 6 will be estimated. For estimation, a water sample will be collected from the Blended DZ 5 monitoring point. The water sample will be held (simulating the conditions of water in the 10.0-MG GST) for a hydraulic detention time based on the verification test's flow rate at Blended DZ 5 and the 10.0-MG GST being at least 50-percent full (20 feet side-water depth). After that holding time, the monochloramine residual, temperature and pH level shall be measured and entered in the CT calculator.

Enclosure F1: CT STUDY

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

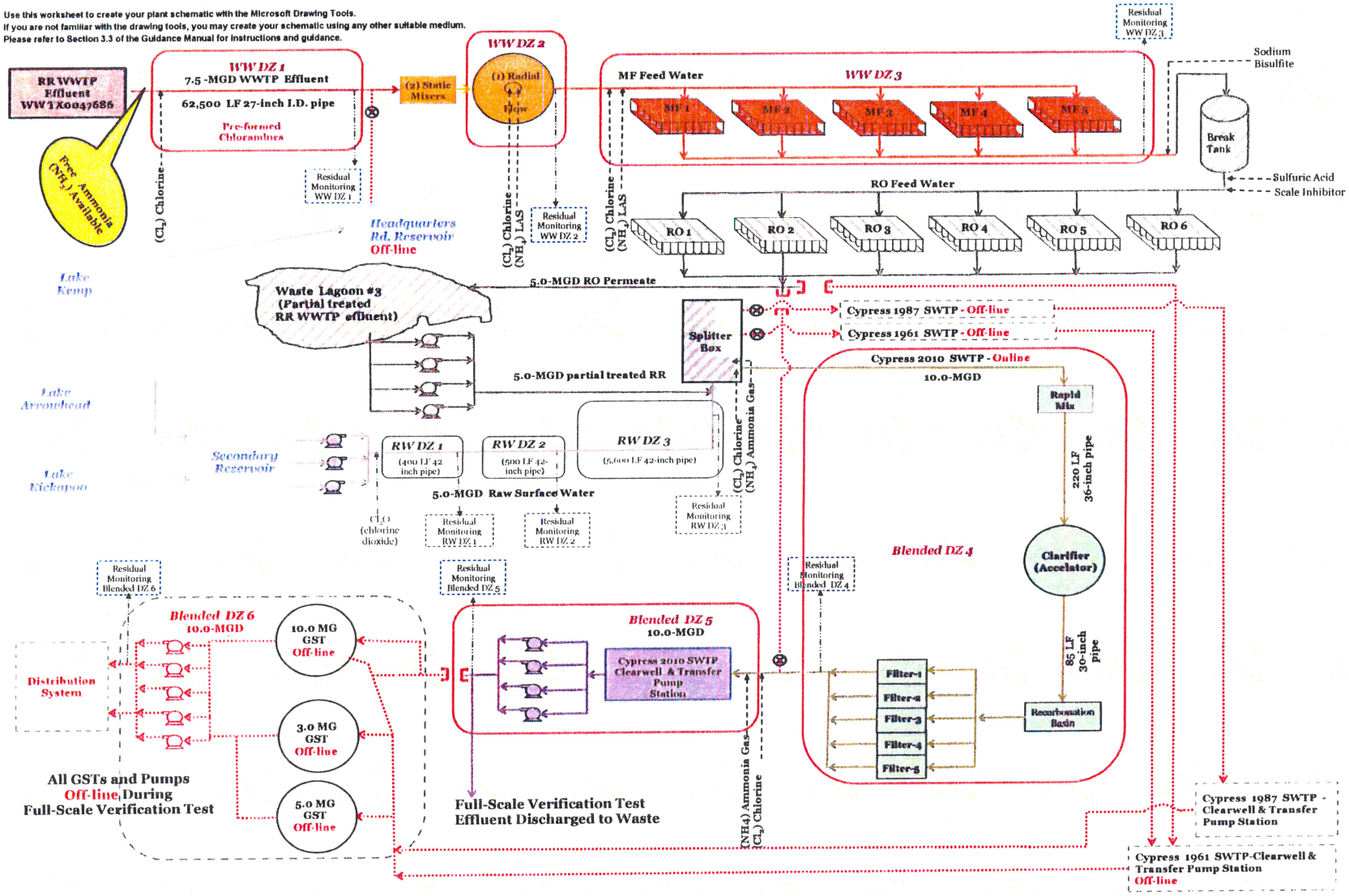
PUBLIC WATER SYSTEM NAME: City of Wichita Falls

PLANT NAME OR NUMBER: Temporary CT for DPR Full-Scale Verification Test - RR WWTP Source

PWS ID No.: 2430001

Date: August 29, 2013

Use this worksheet to create your plant schematic with the Microsoft Drawing Tools.
If you are not familiar with the drawing tools, you may create your schematic using any other suitable medium.
Please refer to Section 3.3 of the Guidance Manual for instructions and guidance.



Enclosure F1: CT STUDY

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

T10 Details Worksheet

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

PLANT NAME OR NUMBER: Temporary CT for DPR Full-Scale Verification Test - RR WWTP Source Date: August 29, 2013

Treatment Plant Capacity: 10.000 mgd / 6,944 gpm

Peak flow rate through the Cypress 2008 MF/RO SWTP is estimated to be 7.5 MGD to produce 5.0 MGD of RO permeate (partial treated RR WWTP effluent for blending with 5.0 MGD of Secondary Reservoir surface water. Total flow of 10 MGD

Disinfection Zone: D1 **Disinfectant:** Chloramines

Unit - 1 Type: Piping Shape: Pipe

Further Description: ~11.8 miles of piping from RR WWTP to Cypress 2008 MF/RO parshall flume

Characteristic			Comments
Number of Units	1		RR WWTP effluent pipe (210 Permit)
Diameter	27	in	32" O.D. HDPE with 27" I.D. per K. Maroney 8/29/2013 email
Length	62,500	ft	8/15/13 email
Volume (each)	1,859,189	gal	
Flow Rate (each)	5,208	gpm	7.5 MGD
Detention Time	357.0	min	
Baffling Factor	1.0		plug flow
			Baffling Characteristics: Perfect
			Approved Baffling Factor:
T_{10}	**357.0**	**min**	

D1 FLOW RATE	**7.500**	**mgd**
T10 SUM FOR D1	**357.0**	**min**

Disinfection Zone: D2 **Disinfectant:** Chloramines

Unit - 1 Type: Clarifier Shape: Circular

Further Description: 2008 Cypress MF/RO Flocculator-Radial flow clarifier

Characteristic	Comments

F1: CT STUDY

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

T10 Details Worksheet

Number of Units	1		Clarifier for MF membranes
Diameter	155	ft	Based on two engineering drawings for this clarifier: (1) CH2MHill DWG 4A-S-3, dated Sept 2002; and (2) USFilter DWG 40507-101 dated 2004.
Side Water Depth	25.3	ft	Same as above
Center Water Depth	31.76	ft	Same as above
Volume (each)	3,875,583	gal	
Flow Rate (each)	5,208	gpm	7.5 MGD
Detention Time	744.1	min	
Baffling Factor	0.3		Based on a concentric cylindrical baffle wall with an approximate diameter of 50 feet that extends 10 feet into the basin and a settled water launder along the perimeter fo the clarifier basin.
			Baffling Characteristics: Poor
			Approved Baffling Factor:
T_{10}	**223.2**	**min**	

D2 FLOW RATE	**7.500**	**mgd**
T10 SUM FOR D2	**223.2**	**min**

Disinfection Zone: D3 **Disinfectant:** Chloramines

Unit - 1 Type: Piping Shape: Pipe

Further Description: 2008 Settled water pipeline

Characteristic			Comments
Number of Units	1		
Diameter	36	in	Per City's 8/15/13 email
Length	250	ft	Per City's 8/15/13 email
Volume (each)	13,221	gal	
Flow Rate (each)	5,208	gpm	
Detention Time	2.5	min	
Baffling Factor	1.0		
			Baffling Characteristics: Perfect
			Approved Baffling Factor:
T_{10}	**2.5**	**min**	

Unit - 2 Type: Other Shape: Rectangular

Further Description: 2008 MF Membrane Feed Trough

Characteristic	Comments

F1: CT STUDY

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

T10 Details Worksheet

Number of Units	1		for 5 submerged MF membrane tanks
Length	25.16	ft	Based on CH2MHill DWG 4-S-10 dated 2002 and the length of the channel from the inlet to the center of the first pair of MF tanks
Width	11	ft	Based on CH2MHill DWG 4-S-10 dated 2002
Side Water Depth	2.66	ft	Based on CH2MHill DWG 4_S10 and DWG 4-S-11, both dated 2002
Volume (each)	5,508	gal	
Flow Rate (each)	5,208	gpm	Based on the the flow rate to the first deversion point
Detention Time	1.1	min	
Baffling Factor	0.1		
			Baffling Characteristics: Unbaffled
			Approved Baffling Factor:
T_{10}	**0.1**	**min**	

Unit - 3 Type: **Other** Shape: **Other**

Further Description: Submerged MF tanks

Characteristic			Comments
Number of Units	1		
Volume (each)	9,557	gal	Per 8/15/20013 City email, and CH2MHill DWG-4-s-1 and DWG4-S-11, both dated 2002
Volume (each)	9,557	gal	
Flow Rate (each)	2,297	gpm	Based on 504 modules with a total surface area of 334.9 sf per moduel and a maximum flux rate of 19.6 gfd at 20 C, TCEQ exception approval letter dated Aug. 5, 2002
Detention Time	4.2	min	
Baffling Factor	0.7		Based configuration of the MF tank with the submerged MF membranes
			Baffling Characteristics: Superior
			Approved Baffling Factor:
T_{10}	**2.9**	**min**	

D3 FLOW RATE	**3.308**	**mgd**
T10 SUM FOR D3	**5.6**	**min**

Disinfection Zone: D4 **Disinfectant:** Chloramines

Unit - 1 Type: **Piping** Shape: **Pipe**

F1: CT STUDY

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

T10 Details Worksheet

Further Description: 36-inch pipe with blended WWTP effluent & Secondary reservoir surface water

Characteristic			Comments
Number of Units	1		From Cypress splitter box to 2010 rapid mix.
Diameter	36	in	As per CT dubmittal dated April 4, 2011
Length	220	ft	As per CT dubmittal dated April 4, 2011
Volume (each)	11,634	gal	
Flow Rate (each)	6,944	gpm	Combined 5.0-MGD raw SW + 5.0-MGD WW
Detention Time	1.7	min	
Baffling Factor	1.0		
			Baffling Characteristics: Perfect
			Approved Baffling Factor:
T_{10}	**1.7**	**min**	

Unit - 2 Type: **Rapid Mix** Shape: **Rectangular**

Further Description: 2010 SWTP Rapid Mix

Characteristic			Comments
Number of Units	1		
Length	27	ft	As per CT submittal dated April 4, 2011
Width	6	ft	As per CT submittal dated April 4, 2011
Side Water Depth	4	ft	As per CT submittal dated April 4, 2011
Volume (each)	4,848	gal	
Flow Rate (each)	6,944	gpm	10 MGD flow rate
Detention Time	0.7	min	
Baffling Factor	0.1		Typical baffling factor for "unbaffled" basin
			Baffling Characteristics: Unbaffled
			Approved Baffling Factor:
T_{10}	**0.1**	**min**	

Unit - 3 Type: **Piping** Shape: **Pipe**

Further Description: 30-inch pipe to 2010 SWTP Calrifier

Characteristic			Comments
Number of Units	1		
Diameter	30	in	As per CT submittal dated April 4, 2011
Length	85	ft	As per CT submittal dated April 4, 2011
Volume (each)	3,122	gal	
Flow Rate (each)	6,944	gpm	
Detention Time	0.4	min	
Baffling Factor	1.0		
			Baffling Characteristics: Perfect
			Approved Baffling Factor:
T_{10}	**0.4**	**min**	

Unit - 4 Type: **Clarifier** Shape: **Circular**

F1: CT STUDY

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

T10 Details Worksheet

Further Description: 2010 SWTP Clarifier

Characteristic			Comments
Number of Units	1		Accelator, solids-contact
Diameter	90	ft	As per CT submittal dated April 4, 2011
Side Water Depth	18.9	ft	As per CT submittal dated April 4, 2011
Center Water Depth	20.6	ft	As per CT submittal dated April 4, 2011
Volume (each)	926,521	gal	
Flow Rate (each)	6,944	gpm	10.MGD flow rate based on TCEQ Aug. 19, 2004 plan approval letter and hydraulic detention time of 120 minuted.
Detention Time	133.4	min	
Baffling Factor	0.3		Typical baffling factor for clarifiers
			Baffling Characteristics: Poor
			Approved Baffling Factor:
T_{10}	**40.0**	**min**	

Unit - 5 Type: **Other** Shape: **Rectangular**

Further Description: 2010 SWTP Recarbonation Basin

Characteristic			Comments
Number of Units	1		
Length	45.5	ft	As per CT submittal dated April 4, 2011
Width	32	ft	As per CT submittal dated April 4, 2011
Side Water Depth	16.8	ft	As per CT submittal dated April 4, 2011
Volume (each)	183,003	gal	
Flow Rate (each)	6,944	gpm	10.0 MGD flow rate
Detention Time	26.4	min	
Baffling Factor	0.5		Typical baffling factor with 4 baffling walls, serptine flow, and a length to width ratio of 40:1.
			Baffling Characteristics: Average
			Approved Baffling Factor:
T_{10}	**13.2**	**min**	

Unit - 6 Type: **Filter** Shape: **Rectangular**

Further Description: 2010 SWTP Gravity Filters

Characteristic			Comments
Number of Units	5		
Length	24	ft	As per CT submittal dated April 4, 2011
Width	15	ft	As per CT submittal dated April 4, 2011
Media Depth	6	ft	As per CT submittal dated April 4, 2011
Underdrain Depth	1	ft	As per CT submittal dated April 4, 2011
Minimum Water Depth Over Media	6.8	ft	As per CT submittal dated April 4, 2011
Average Porosity	50	%	As per CT submittal dated April 4, 2011

F1: CT STUDY

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

T10 Details Worksheet

Volume (each)	29,088	gal	
Flow Rate (each)	1,736	gpm	10.0 MGD flow rate with 4 filters in service and one filter on standby. Approved up to 1,800 gpm based on a TCEQ hydraulic loading rate of 5.0 gpm/sf
Detention Time	16.8	min	
Baffling Factor	0.7		Typical baffling factor for filters
			Baffling Characteristics: Superior
			Approved Baffling Factor:
T_{10}	**11.7**	**min**	
D4 FLOW RATE	**10.000**	**mgd**	
T10 SUM FOR D4	**67.1**	**min**	

Disinfection Zone: D5 **Disinfectant:** Chloramines

Unit - 1 Type: Clearwell Shape: Rectangular

Further Description: 2010 SWTP clearwell & transfer pump basin

Characteristic			Comments
Number of Units	1		
Length	98.4	ft	As per CT submittal dated April 4, 2011
Width	26	ft	As per CT submittal dated April 4, 2011
Side Water Depth	11.3	ft	As per CT submittal dated April 4, 2011
Maximum Volume (each)	216,290	gal	
Minimum Operating Level	5.7	ft	Pump cutoff needed for this elev.
Worst Case Volume (each)	109,102	gal	
Percent of Maximum Volume	50	%	Pump shut-ff at 5.7 feet
Worst Case Volume (each)	109,102	gal	
Flow Rate (each)	6,944	gpm	10.0 MGD flow rate
Detention Time	15.7	min	
Baffling Factor	0.5		Typical baffling factor for basins with two internal baffles
			Baffling Characteristics: Average
			Approved Baffling Factor:
T_{10}	**7.9**	**min**	
D5 FLOW RATE	**10.000**	**mgd**	
T10 SUM FOR D5	**7.9**	**min**	

F1: CT STUDY

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

T10 Details Worksheet

Disinfection Zone: D6 **Disinfectant:** Chloramines

Unit - 1 Type: Clearwell Shape: Circular

Further Description: 10-MG GST

Characteristic			Comments
Number of Units	1		
Diameter	206	ft	As per CT submittal dated April 4, 2011
Side Water Depth	40	ft	As per CT submittal dated April 4, 2011
Center Water Depth	40	ft	As per CT submittal dated April 4, 2011
Maximum Volume (each)	9,974,083	gal	
Minimum Operating Level	20	ft	Based on 'worst case" operating level that is 50 of the GST' capacity. need to install 20' pump cutoff instead of 7'
Worst Case Volume (each)	4,987,042	gal	
Percent of Maximum Volume	50	%	
Worst Case Volume (each)	4,987,042	gal	
Flow Rate (each)	6,944	gpm	10.0 MGD flow rate
Detention Time	718.1	min	
Baffling Factor	0.3		Typical baffling facot for basins having 2 inlets, 1 outlet, 3 interior baffling walls
			Baffling Characteristics: Poor
			Approved Baffling Factor:
T_{10}	215.4	min	

D6 FLOW RATE	10.000	mgd
T10 SUM FOR D6	215.4	min

Disinfection Zone: D7 **Disinfectant:**

Disinfection Zone: D8 **Disinfectant:**

Disinfection Zone: D9 **Disinfectant:**

Disinfection Zone: D10 **Disinfectant:**

Enclosure F1: 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: Temporary CT for DPR Full-Scale Verification Test - RR WWTP Source Date: August 29, 2013

Disinfection Zone	Treatment Unit	Volume* (each) (gal)	Flow Rate* (each) (MGD)	Baffling Factor*	T_{10}* (min) Unit	T_{10}* (min) Zone
D1	s of piping from RR WWTP to Cypress 2008 MF/RO parsha	1,859,189	7.500	1	356.964	356.96
D2	2008 Cypress MF/RO Flocculator-Radial flow clarifier (1)	3,875,583	7.500	0.3	223.235	223.24
D3	2008 Settled water pipeline (1)	13,221	7.500	1	2.539	5.56
	2008 MF Membrane Feed Trough (1)	5,508	7.500	0.1	0.106	
	Submerged MF tanks (1)	9,557	3.308	0.7	2.912	
D4	e with blended WWTP effluent & Secondary reservoir surfa	11,634	10.000	1	1.675	67.13
	2010 SWTP Rapid Mix (1)	4,848	10.000	0.1	0.070	
	30-inch pipe to 2010 SWTP Calrifier (1)	3,122	10.000	1	0.450	
	2010 SWTP Clarifier (1)	926,521	10.000	0.3	40.026	
	2010 SWTP Recarbonation Basin (1)	183,003	10.000	0.5	13.176	
	2010 SWTP Gravity Filters (5)	29,088	2.500	0.7	11.729	
D5	2010 SWTP clearwell & transfer pump basin (1)	109,102	10.000	0.5	7.855	7.86
D6	10-MG GST (1)	4,987,042	10.000	0.3	215.440	215.44

* These values are calculated on the T10 Details Sheet

Enclosure F1: 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: Temporary CT for DPR Full-Scale Verification Test - RR WWTP Source

PWS ID No.: 2430001

Date: August 29, 2013

DISINFECTION PROCESS PARAMETERS

APPROVED CT STUDY PARAMETERS						PERFORMANCE STANDARDS	
Parameters	Disinfection Zones					Log Inactivations	
	D1	D2	D3	D4	D5	Giardia lamblia Cysts	Viruses
Flow Rate (MGD)	7.500	7.500	3.308	10.000	10.000	1.0	5.0
T_{10} (minutes)	357.0	223.2	5.6	67.1	7.9		

DISINFECTION PROCESS DATA

INDIVIDUAL DISINFECTION ZONES										PLANT TOTAL		
Disinfectant	C (mg/L)	Flow (MGD)	Temp (°C)	pH	CT_{CALC}	Giardia CT_{REQD}	Virus CT_{REQD}	Giardia Log	Virus Log	Giardia Log	Virus Log	Inact. Ratio
CLA *D1*					missing	missing	missing	missing	missing			
CLA *D2*					missing	missing	missing	missing	missing			
CLA *D3*					missing	missing	missing	missing	missing			
CLA *D4*					missing	missing	missing	missing	missing			
CLA *D5*					missing	missing	missing	missing	missing			

SUBMITTED BY: _____ Certificate No. and Grade: _____ Date: _____

DISINFECTION PROCESS PARAMETERS

APPROVED CT STUDY PARAMETERS						PERFORMANCE STANDARDS	
Parameters	Disinfection Zones					Log Inactivations	
	D6	D7	D8	D9	D10	Giardia lamblia Cysts	Viruses
Flow Rate (MGD)	10.000					1.0	5.0
T_{10} (minutes)	215.4						

DISINFECTION PROCESS DATA

INDIVIDUAL DISINFECTION ZONES										PLANT TOTAL		
Disinfectant	C (mg/L)	Flow (MGD)	Temp (°C)	pH	CT_{CALC}	Giardia CT_{REQD}	Virus CT_{REQD}	Giardia Log	Virus Log	Giardia Log	Virus Log	Inact. Ratio
CLA *D6*					missing	missing	missing	missing	missing			
D7												
D8												
D9												
D10												

SUBMITTED BY: _____ Certificate No. and Grade: _____ Date: _____

Enclosure F2: Temporary 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: Temporary CT for DPR Full-Scale Verification Test - Secondary Reservoir Raw Surface Water

Month: August
Day: 29
Year: 2013

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

This Temporary CT Workbook only evaluates the required disinfection protocol for the source water from Lake Arrowhead and Lake Kickapoo during the Full-Scale Verification Test. Due to the construction of the CT Template, a separate Temporary CT Workbook (included as Enclosure F1) was developed for the disinfection protocol for the River Road Wastewater Treatment Plant (RR WWTP) effluent. During the Full Scale Verification Test, the City must complete and submit two separate SWMORs: one for the water from the RR WTP and another one for the water from the lakes.

During the City's proposed operation of the temporary direct potable reuse (DPR) water treatment plant (WTP), the 2010 Surface Water Treatment Plant (2010 SWTP TP 410071), will receive 5.0-million gallons per day (MGD) of raw surface water from Lake Kickapoo and Lake Arrowhead through the Secondary Reservoir and Headquarters Road Reservoir and Pump Station. This 5.0-MGD of raw surface water from the Secondary Reservoir travels through 6,500 feet of 42" diameter raw water pipe and the Cypress Facility's splitter box. Immediately before the Cypress Facility's splitter box, the raw surface water will be blended with 5.0-MGD of partially treated wastewater effluent from the RR WWTP.

Approximately 7.5 MGD effluent from the RR WWTP will be delivered through approximately 62,500 feet of 32-inch outside diameter HPE (O.D.) pipe, with a 27-inch inside diameter (I.D.), to the 2008 Microfiltration/Reverse Osmosis (MF/RO) Membrane SWTP (2008 SWTP, TP #21567). At the 2008 SWTP, the RR WWTP effluent will receive partial DPR treatment before the RO permeate is transferred to one of the Cypress Facility's backwash waste lagoons (Lagoon No. 3). During the treatment of RR WWTP effluent, no clarifier blow-down, no filter backwash, no membrane backwash, nor chemical cleaning waste will be discharged to Lagoon No. 3.

Normally the Cypress Facility's splitter box diverts raw surface water to the 1961 SWTP, 1987 SWTP and 2010 SWTP. When RR WWTP effluent is being treated (during the verification test and proposed full-scale operation) by the 2008 SWTP, the 1961 SWTP and 1987 SWTP will be offline. Only the 2010 SWTP will provide treatment for the blended raw surface water and partially treated RR WWTP effluent.

The 2010 SWTP consists of a rapid mix basin, a 90-foot diameter solids-contact clarifier (Accelator), a recarbonation basin, five gravity media filters, a 0.254-million-gallon (MG) clearwell and transfer pump station.

The Cypress Facility's 3.0-MG, 5.0-MG, and 10.0-MG ground storage tanks (GSTs) will not be on-line during the verification testing. Only the 10.0-MG GST will be used after verification testing, when the proposed temporary DPR WTP is operating and discharging effluent to the City's distribution system for human consumption.

(continued on next page)

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

The proposed disinfection protocol during the Full-Scale Verification Test will include six disinfection zones (DZs).

Raw water (RW) DZ 1 will begin at the of chlorine dioxide injection point at the Secondary Reservoir pump station and end 400 feet downstream on the 42" diameter pipeline at a disinfection residual monitoring site.

RW DZ 2 will begin after the RW DZ 1 monitoring point and end 500 feet downstream (900 feet from the chlorine dioxide injection point) on the 42" diameter pipeline at a disinfection residual monitoring site.

RW DZ 3 will begin immediately after the DZ 2 monitoring point. It will include 5,600 feet of 42" diameter pipe. It will end 6,500 feet from the chlorine dioxide injection point and before the blending of partially treated RR WWTP effluent in front of the Cypress Facility splitter box at a disinfection residual monitoring site.

Blended (Secondary Reservoir and partially treated RR WWTP effluent waters) DZ 4: will begin with the injection of chlorine and ammonia gas in the Cypress Facility splitter box. It will include the 2010 SWTP rapid mix, solids-contact clarifier (Accelator), recarbonization basin and end at the effluent of the five gravity media filters, at which point there will be a disinfectant residual monitoring point.

Blended DZ 5 (temporary for verification test) will begin with the injection of chlorine and ammonia gas before the 2010 SWTP clearwell (0.254-MG). During the verification testing, it will only include the 2010 SWTP clearwell at a minimum side-water depth of 5.7 feet and end at the 2010 SWTP clearwell's transfer pumps.

Blended DZ 6 (temporary for verification test) will not be in service during the Full-Scale Verification Test. It will begin after the Blended DZ 5 monitoring point, without any addition of disinfectant, and include the SWTP 10.0-MG GST. It will end at the Cypress Facility's high service pumps. During the verification testing, a water sample will be collected from the Blended DZ 5 monitoring point. After the water sample has been held (simulating the conditions of water in the 10.0-MG GST) for a hydraulic detention time based on the verification test's flow rate at Blended DZ 5 with the 10.0-MG GST at least 50.0-percent full (20 feet side-water depth), the monochloramine residual, pH level, flow rate and temperature shall be measured and entered in the CT calculator.

Enclosure F2: Temporary CT STUDY

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

Schematic Worksheet

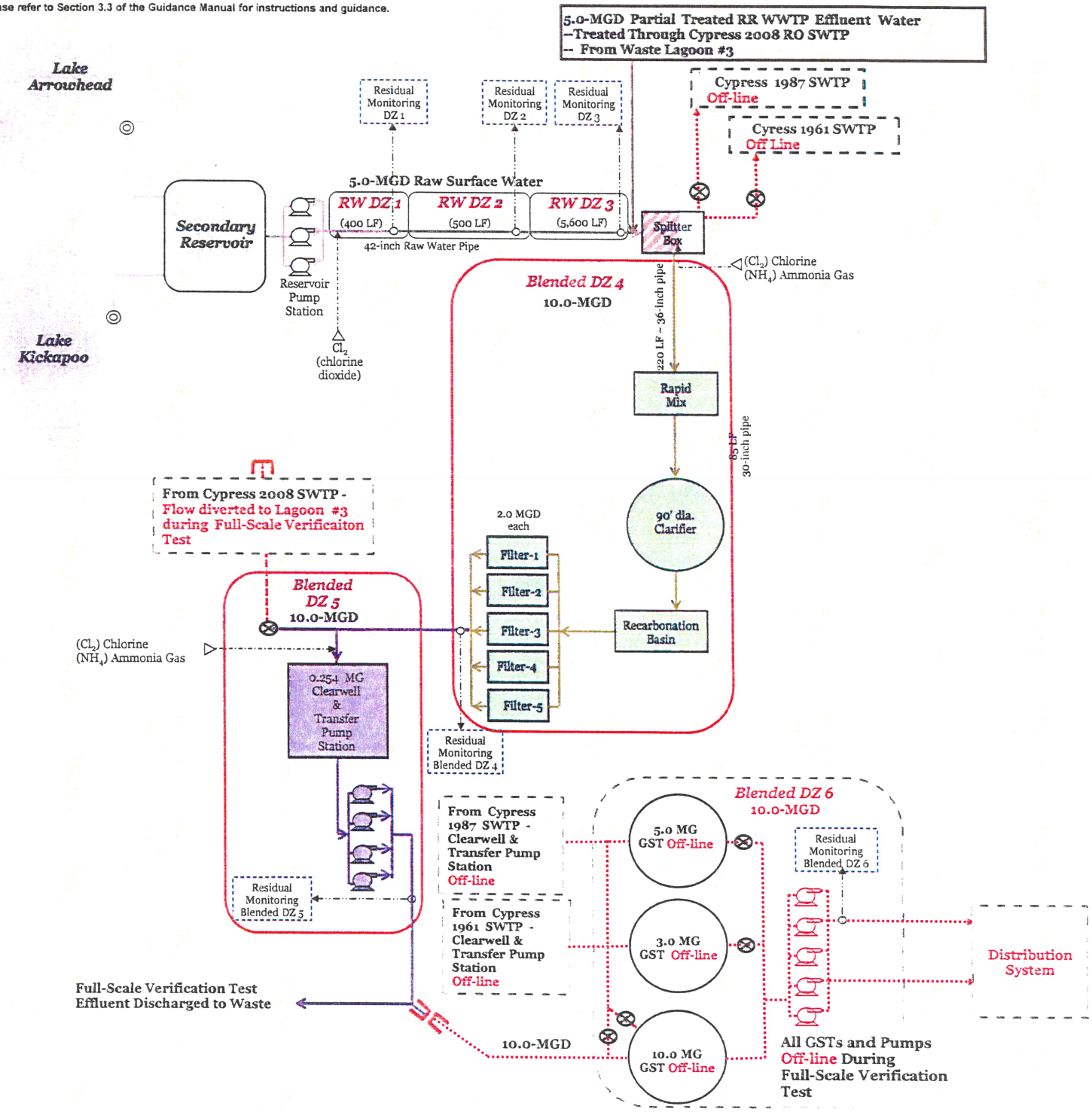
PUBLIC WATER SYSTEM NAME: City of Wichita Falls

PLANT NAME OR NUMBER: Temporary CT for DPR Full-Scale Verification Test - Secondary Reservoir Raw Surface Water

PWS ID No.: 2430001

Date: August 29, 2013

Use this worksheet to create your plant schematic with the Microsoft Drawing Tools.
If you are not familiar with the drawing tools, you may create your schematic using any other suitable medium.
Please refer to Section 3.3 of the Guidance Manual for instructions and guidance.



Enclosure F2: CT STUDY

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

T10 Details Worksheet

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

PLANT NAME OR NUMBER: Temporary CT for DPR Full-Scale Verification Test - Secondary Reservoir Raw Surface Water Date: August 29, 2013

Treatment Plant Capacity: 10.000 mgd / 6,944 gpm

Based on the combined flow rate of 5.0 MGD of partially treated RR WWTP effluent from the Cypress 2008 SWTP and 5.0 MGS of raw surface water from

Disinfection Zone: D1 Disinfectant: Chlorine Dioxide

Unit - 1 Type: Piping Shape: Pipe

Further Description: 42-inch Raw Water Pipe (first zone)

Characteristic			Comments
Number of Units	1		First chlorine dioxide sampling location
Diameter	42	in	As per CT Submittal dated April 4, 2011
Length	400	ft	As per CT Submittal dated April 4, 2011
Volume (each)	28,792	gal	
Flow Rate (each)	3,472	gpm	Based on 5.0 MGD flow rate from Secondary Reservoir
Detention Time	8.3	min	
Baffling Factor	1.0		Typical Baffling Factor for Pipe
			Baffling Characteristics: Perfect
			Approved Baffling Factor:
T_{10}	**8.3**	**min**	

D1 FLOW RATE	**5.000**	**mgd**
T10 SUM FOR D1	**8.3**	**min**

Enclosure F2: CT STUDY

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

T10 Details Worksheet

Disinfection Zone: D2 **Disinfectant:** Chlorine Dioxide

Unit - 1 Type: Piping Shape: Pipe

Further Description: 42-inch Raw Water Pipe (second zone)

Characteristic			Comments
Number of Units	1		Second chlorine dioxide sampling location
Diameter	42	in	As per CT Submittal dated April 4, 2011
Length	500	ft	As per CT Submittal dated April 4, 2011
Volume (each)	35,990	gal	
Flow Rate (each)	3,472	gpm	Based on 5.0 MGD flow rate from Secondary Reservoir
Detention Time	10.4	min	
Baffling Factor	1.0		Typical Baffling Factor for Pipe
			Baffling Characteristics: Perfect
			Approved Baffling Factor:
T_{10}	**10.4**	**min**	

D2 FLOW RATE	**5.000**	**mgd**
T10 SUM FOR D2	**10.4**	**min**

Disinfection Zone: D3 **Disinfectant:** Chlorine Dioxide

Unit - 1 Type: Piping Shape: Pipe

Further Description: 42-inch Raw Water Pipe (third zone)

Characteristic			Comments
Number of Units	1		Third chlorine dioxide sampling location
Diameter	42	in	As per CT Submittal dated April 4, 2011
Length	5600	ft	As per CT Submittal dated April 4, 2011
Volume (each)	403,091	gal	
Flow Rate (each)	3,472	gpm	Based on 5.0 MGD flow rate from Secondary Reservoir
Detention Time	116.1	min	
Baffling Factor	1.0		Typical Baffling Factor for Pipe
			Baffling Characteristics: Perfect
			Approved Baffling Factor:
T_{10}	**116.1**	**min**	

D3 FLOW RATE	**5.000**	**mgd**
T10 SUM FOR D3	**116.1**	**min**

Enclosure F2: CT STUDY

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

T10 Details Worksheet

Disinfection Zone: D4 **Disinfectant:** Chloramines

Unit - 1 Type: Piping Shape: Pipe

Further Description: 36-inch Raw Water Pipe

Characteristic			Comments
Number of Units	1		Splitter box to Rapid Mix
Diameter	36	in	As per CT Submittal dated April 4, 2011
Length	220	ft	As per CT Submittal dated April 4, 2011
Volume (each)	11,634	gal	
Flow Rate (each)	6,944	gpm	Based on 10.0 MGD, the sum of the flow rates from the Secondary Reservoir and partially treated RR WWTP effluent from Lagoon No. 3.
Detention Time	1.7	min	
Baffling Factor	1.0		Typical Baffling Factor for Pipe
			Baffling Characteristics: Perfect
			Approved Baffling Factor:
T_{10}	**1.7**	**min**	

Unit - 2 Type: Rapid Mix Shape: Rectangular

Further Description: Rapid Mix Basin

Characteristic			Comments
Number of Units	1		
Length	27	ft	As per CT Submittal dated April 4, 2011
Width	6	ft	As per CT Submittal dated April 4, 2011
Side Water Depth	4	ft	As per CT Submittal dated April 4, 2011
Volume (each)	4,848	gal	
Flow Rate (each)	6,944	gpm	Based on 10.0 MGD, the sum of the flow rates from the Secondary Reservoir and partially treated RR WWTP effluent from Lagoon No. 3.
Detention Time	0.7	min	
Baffling Factor	0.1		Typical Baffling Factor for an "Unbaffled" Basin
			Baffling Characteristics: Unbaffled
			Approved Baffling Factor:
T_{10}	**0.1**	**min**	

Enclosure F2: CT STUDY

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

T10 Details Worksheet

Unit - 3 Type: **Piping** Shape: **Pipe**

Further Description: 30-inch pipe

Characteristic			Comments
Number of Units	1		Rapid Mix to solids-contact clarifier
Diameter	30	in	As per CT Submittal dated April 4, 2011
Length	85	ft	As per CT Submittal dated April 4, 2011
Volume (each)	3,122	gal	
Flow Rate (each)	6,944	gpm	Based on 10.0 MGD, the sum of the flow rates from the Secondary Reservoir and partially treated RR WWTP effluent from Lagoon No. 3.
Detention Time	0.4	min	
Baffling Factor	1.0		Typical Baffling Factor for Pipe
			Baffling Characteristics: Perfect
			Approved Baffling Factor:
T_{10}	**0.4**	**min**	

Unit - 4 Type: **Clarifier** Shape: **Circular**

Further Description: 2010 Solids-contact clarifier

Characteristic			Comments
Number of Units	1		Accelator
Diameter	90	ft	As per CT Submittal dated April 4, 2011
Side Water Depth	18.9	ft	As per CT Submittal dated April 4, 2011
Center Water Depth	20.6	ft	As per CT Submittal dated April 4, 2011
Volume (each)	926,521	gal	
Flow Rate (each)	6,944	gpm	Based on 10.0 MGD, the sum of the flow rates from the Secondary Reservoir and partially treated RR WWTP effluent from Lagoon No. 3.
Detention Time	133.4	min	
Baffling Factor	0.3		Typical Baffling Factor for Clarifiers
			Baffling Characteristics: Poor
			Approved Baffling Factor:
T_{10}	**40.0**	**min**	

Enclosure F2: CT STUDY

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

T10 Details Worksheet

Unit - 5 Type: **Other** Shape: **Rectangular**

Further Description: 2010 SWTP Recarbonation Basin

Characteristic			Comments
Number of Units	1		
Length	45.5	ft	As per CT Submittal dated April 4, 2011
Width	32	ft	As per CT Submittal dated April 4, 2011
Side Water Depth	16.8	ft	As per CT Submittal dated April 4, 2011
Volume (each)	183,003	gal	
Flow Rate (each)	6,944	gpm	Treatment Plant Capacity for City of Wichita Falls '10 Plant (TCEQ 15134)
Detention Time	26.4	min	
Baffling Factor	0.5		Typical Baffling Factor for Basins with 4 internal baffles and length to width (40:1)
			Baffling Characteristics: Average
			Approved Baffling Factor:
T_{10}	**13.2**	**min**	

Unit - 6 Type: **Filter** Shape: **Rectangular**

Further Description: 2010 SWTP Gravity Filters

Characteristic			Comments
Number of Units	1		
Length	24	ft	As per CT Submittal dated April 4, 2011
Width	15	ft	As per CT Submittal dated April 4, 2011
Media Depth	6	ft	As per CT Submittal dated April 4, 2011
Underdrain Depth	1	ft	As per CT Submittal dated April 4, 2011
Minimum Water Depth Over Media	6.8	ft	As per CT Submittal dated April 4, 2011
Average Porosity	50	%	
Volume (each)	29,088	gal	
Flow Rate (each)	1,736	gpm	Based on 10.0 MGD, the sum of the flow rates from the Secondary Reservoir and partially treated RR WWTP effluent from Lagoon No. 3.
Detention Time	16.8	min	
Baffling Factor	0.7		Typical Baffling Factor for Filters
			Baffling Characteristics: Superior
			Approved Baffling Factor:
T_{10}	**11.7**	**min**	

D4 FLOW RATE	**10.000**	**mgd**
T10 SUM FOR D4	**67.1**	**min**

Enclosure F2: CT STUDY

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

T10 Details Worksheet

Disinfection Zone: D5 **Disinfectant:** Chloramines

Unit - 1 Type: Clearwell Shape: Rectangular

Further Description: 2010 SWTP Clearwell &Transfer Pump Station

Characteristic			Comments
Number of Units	1		
Length	98.4	ft	As per CT Submittal dated April 4, 2011
Width	26	ft	As per CT Submittal dated April 4, 2011
Side Water Depth	11.3	ft	As per CT Submittal dated April 4, 2011
Maximum Volume (each)	216,290	gal	
Minimum Operating Level	5.7	ft	
Worst Case Volume (each)	109,102	gal	
Percent of Maximum Volume	50	%	50% of total volume
Worst Case Volume (each)	109,102	gal	
Flow Rate (each)	6,944	gpm	Based on 10.0 MGD, the sum of the flow rates from the Secondary Reservoir and partially treated RR WWTP effluent from Lagoon No. 3.
Detention Time	15.7	min	
Baffling Factor	0.5		Typical Baffling Factor for Basins with two internal baffles length to width 30:1
			Baffling Characteristics: Average
			Approved Baffling Factor:
T_{10}	**7.9**	**min**	

D5 FLOW RATE	10.000	mgd
T10 SUM FOR D5	7.9	min

Enclosure F2: CT STUDY

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

T10 Details Worksheet

Disinfection Zone: D6 **Disinfectant:** Chloramines

Unit - 1 Type: Clearwell Shape: Circular

Further Description: 10 MG GST

Characteristic			Comments
Number of Units	1		
Diameter	206	ft	As per CT Submittal dated April 4, 2011
Side Water Depth	40	ft	As per CT Submittal dated April 4, 2011
Center Water Depth	40	ft	As per CT Submittal dated April 4, 2011
Maximum Volume (each)	9,974,083	gal	
Minimum Operating Level	20	ft	assumes "worse case" operating level
Worst Case Volume (each)	4,987,042	gal	
Percent of Maximum Volume	50	%	
Worst Case Volume (each)	4,987,042	gal	
Flow Rate (each)	6,944	gpm	Based on 10.0 MGD, the sum of the flow rates from the Secondary Reservoir and partially treated RR WWTP effluent from Lagoon No. 3.
Detention Time	718.1	min	
Baffling Factor	0.3		Typical Baffling Factor for Basins having 2 inlets, 1 outlet, and 3 interior baffles
			Baffling Characteristics: Poor
			Approved Baffling Factor:
T_{10}	**215.4**	**min**	

D6 FLOW RATE	10.000	mgd

T10 SUM FOR D6	215.4	min

Enclosure F2: Temporary 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: Temporary CT for DPR Full-Scale Verification Test - Secondary Reservoir Raw Surface Water Date: August 29, 2013

Disinfection Zone	Treatment Unit	Volume* (each) (gal)	Flow Rate* (each) (MGD)	Baffling Factor*	T_{10}* (min) Unit	T_{10}* (min) Zone
D1	42-inch Raw Water Pipe (first zone) (1)	28,792	5.000	1	8.292	8.29
D2	42-inch Raw Water Pipe (second zone) (1)	35,990	5.000	1	10.365	10.37
D3	42-inch Raw Water Pipe (third zone) (1)	403,091	5.000	1	116.090	116.09
D4	36-inch Raw Water Pipe (1)	11,634	10.000	1	1.675	67.13
	Rapid Mix Basin (1)	4,848	10.000	0.1	0.070	
	30-inch pipe (1)	3,122	10.000	1	0.450	
	2010 Solids-contact clarifier (1)	926,521	10.000	0.3	40.026	
	2010 SWTP Recarbonation Basin (1)	183,003	10.000	0.5	13.176	
	2010 SWTP Gravity Filters (1)	29,088	2.500	0.7	11.728	
D5	2010 SWTP Clearwell &Transfer Pump Station (1)	109,102	10.000	0.5	7.855	7.86
D6	10 MG GST (1)	4,987,042	10.000	0.3	215.440	215.44

* These values are calculated on the T10 Details Sheet

Enclosure F2: Temporary 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: Temporary CT for DPR Full-Scale Verification Test - Secondary Reservoir Raw Surface Water

PWS ID No.: 2430001

Date: August 29, 2013

DISINFECTION PROCESS PARAMETERS

APPROVED CT STUDY PARAMETERS						PERFORMANCE STANDARDS	
Parameters	Disinfection Zones					Log Inactivations	
	D1	D2	D3	D4	D5	Giardia lamblia Cysts	Viruses
Flow Rate (MGD)	5.000	5.000	5.000	10.000	10.000	0.5	2.0
T_{10} (minutes)	8.3	10.4	116.1	67.1	7.9		

DISINFECTION PROCESS DATA

INDIVIDUAL DISINFECTION ZONES										PLANT TOTAL		
Disinfectant	C (mg/L)	Flow (MGD)	Temp (°C)	pH	CT_{CALC}	Giardia CT_{REQD}	Virus CT_{REQD}	Giardia Log	Virus Log	Giardia Log	Virus Log	Inact. Ratio
CLO2 *D1*					missing	missing	missing	missing	missing			
CLO2 *D2*					missing	missing	missing	missing	missing			
CLO2 *D3*					missing	missing	missing	missing	missing			
CLA *D4*					missing	missing	missing	missing	missing			
CLA *D5*					missing	missing	missing	missing	missing			

SUBMITTED BY: _____ Certificate No. and Grade: _____ Date: _____

DISINFECTION PROCESS PARAMETERS

APPROVED CT STUDY PARAMETERS						PERFORMANCE STANDARDS	
Parameters	Disinfection Zones					Log Inactivations	
	D6	D7	D8	D9	D10	Giardia lamblia Cysts	Viruses
Flow Rate (MGD)	10.000					0.5	2.0
T_{10} (minutes)	215.4						

DISINFECTION PROCESS DATA

INDIVIDUAL DISINFECTION ZONES										PLANT TOTAL		
Disinfectant	C (mg/L)	Flow (MGD)	Temp (°C)	pH	CT_{CALC}	Giardia CT_{REQD}	Virus CT_{REQD}	Giardia Log	Virus Log	Giardia Log	Virus Log	Inact. Ratio
CLA *D6*					missing	missing	missing	missing	missing			
CLA *D7*												
CLA *D8*										SEE	PAGE	1
D9												
D10												

SUBMITTED BY: _____ Certificate No. and Grade: _____ Date: _____

Enclosure G

Long Term 2 Enhanced Surface Water Treatment Rule Bin Classification Letter

Bryan W. Shaw, Ph.D., *Chairman*
Carlos Rubinstein, *Commissioner*
Toby Baker, *Commissioner*
Zak Covar, *Executive Director*

PWS/2430001/CO/08-26-2013/LT2

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

August 26, 2013

The Honorable Glenn Barham
Mayor of the City of Wichita Falls
P.O. Box 1431
Wichita Falls, TX 76307-1431

Subject: Clarification of LT2 Bin 1 Classification
City of Wichita Falls - PWS ID No. 2430001
Sources: 1- Lake Kickapoo, Source ID No. S2430001A
2- Lake Arrowhead, Source ID No. S2430001B
Plants: 1- Cypress 2010, Plant ID No. 410071
2- Cypress 1961, Plant ID No. 15131
3- Cypress 1987, Plant ID No. 15132
Wichita County, Texas

Dear Mayor Barham:

***** THE CITY OF WICHITA FALLS CYPRESS 2010, CYPRESS 1961, *****
*****AND CYPRESS 1987 PLANTS ACHIEVED BIN 1 CLASSIFICATION. *****

This letter is to clarify that the City of Wichita Falls Cypress 2010 (Plant ID No. 410071), Cypress 1961 (Plant ID No. 15131) and Cypress 1987 (Plant ID 15132), using Source 1- Lake Kickapoo (Source ID S2430001A), and Source 2- Lake Arrowhead (Source ID S2430001B), meet the Long Term 2 Enhanced Surface Water Treatment Rule (LT2) Bin 1 classification requirements as specified in 30 TAC §290.111(c)(3)(B). The Bin 1 classification was first assigned by the United States Environmental Protection Agency (EPA) per a letter sent to your public water system (PWS) on February 12, 2009 (Enclosure 1). Confirmation of the Bin 1 classification was based on *Cryptosporidium* testing previously sent to the EPA. According to the letter dated February 12, 2009 from the EPA, the City of Wichita Falls collected samples between January 1, 2004 and February 1, 2006.

The Bin 1 classification is only applicable when the surface water treatment facilities are using the above surface waters as the source of raw water. If the plants are using other sources, such as wastewater effluent, this Bin 1 classification does not apply. TCEQ will provide required treatment levels if the City chooses to use alternative source waters.

The TCEQ has reviewed your source water *Cryptosporidium* sample data for your PWS to determine compliance with the source water monitoring requirements of the Title 30 Texas Administrative Code (30 TAC) §290.111(b)(4). Based on the LT2 requirements, and the review of our most recent records, your PWS has completed all *Cryptosporidium* sampling requirements at the PWS raw water sources for the initial round of sampling. The second round of sampling for the City of Wichita Falls will begin on April 1, 2015.

If you have any additional questions or need further assistance, please contact Tamira Konkin-Garcia by email at Tamira.Konkin-Garcia@tceq.texas.gov or by phone at 512-239-1298.

Sincerely,

Joel Klumpp, Team Leader
Technical Review & Oversight Team
Plan & Technical Review Section
Water Supply Division
Texas Commission on Environmental Quality

Enclosure: EPA LT2 Bin 1 Classification letter dated 2/12/2009

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

February 12, 2009

Wichita Falls, City of
Water Utilities Manager
P.O. Box 1431
Wichita Falls TX 76307

RE: LT2 Initial Bin Classification PWS-ID: TX2430001

Dear Water Utilities Manager:

Thank you for completing the initial round of source water monitoring for the **Long Term 2 ("LT2") Enhanced Surface Water Treatment Rule (40 CFR Section 141 Subpart W).** EPA has received adequate source water *Cryptosporidium* monitoring data to comply with the initial source water monitoring requirements of 40 CFR Section 141.701(a)(1) for systems serving at least 10,000 people.

The average results from *Cryptosporidium* samples are less than 0.075 oocysts per liter for each of the enclosed sources that your water system may use. This means your water system meets the Bin 1 classification requirements as specified in 40 CFR Section 141.710(c) with respect to your current source(s) of raw water and is NOT required to provide additional treatment for *Cryptosporidium* at this time.

The LT2 regulation requires that filtered systems report their initial bin classification to EPA for approval. The enclosed documents are provided for this purpose. Please review them and make corrections if necessary. Designate your approval by signing the applicable document(s) and return them to me in the enclosed, self-addressed envelope. You may also provide your own classification certification form if the enclosed documents are not acceptable.

Thank you for your prompt submittals in compliance with the LT2 rule. Please feel free to contact me with any questions at 214-665-8088, or e-mail at mccasland.mark@epa.gov.

Sincerely yours,

Mark E. McCasland, P.E.
LT2ESWTR Manager
Drinking Water Section (6WQ-SD)

Enclosures

cc: Marlo Wanielista Berg, TCEQ

LT2 Initial Bin Classification
Based Upon *Cryptosporidium* Monitoring Results

PWS-ID: TX2430001
PWS Name: WICHITA FALLS, CITY OF

Water Treatment Plant and Source Information:

Source Code: composite
Source Name: Lake Diversion (Cypress WTP)

This certification is to report that the above-named PWS and plant/source has a **Bin 1** classification. This is based upon the monitoring results of *Cryptosporidium* samples taken during the following time period –

First Sample: 1/1/2004

Last Sample: 2/1/2006

The calculated Bin concentration is: 0.000 oocyst/L → Bin Level 1

This bin concentration is based on the highest rolling 12-month average. This concentration does not exceed 0.075 oocyst/L which means additional treatment for the removal/inactivation of *Cryptosporidium* is NOT required for this source.

Name (print) _____

Signature _____

Date _____

****

Please make a copy and mail original to:

Mark McCasland
U.S. EPA Region 6
Drinking Water Section (6WQ-SD)
1445 Ross Ave Suite 1200
Dallas, TX 75202-2733

LT2 Initial Bin Classification
Based Upon *Cryptosporidium* Monitoring Results

PWS-ID: TX2430001
PWS Name: WICHITA FALLS, CITY OF

Water Treatment Plant and Source Information:

Source Code:	composite
Source Name:	Secondary Reservoir (blending reservoir for Arrowhead and Kickapoo lakes for Cypress and Jasper WTPs)

This certification is to report that the above-named PWS and plant/source has a **Bin 1** classification. This is based upon the monitoring results of *Cryptosporidium* samples taken during the following time period –

First Sample: 1/1/2004

Last Sample: 2/1/2006

The calculated Bin concentration is: 0.000 oocyst/L → Bin Level 1

This bin concentration is based on the highest rolling 12-month average. This concentration does not exceed 0.075 oocyst/L which means additional treatment for the removal/inactivation of *Cryptosporidium* is NOT required for this source.

Name (print) _____

Signature _____

Date _____

****

Please make a copy and mail original to:

Mark McCasland
U.S. EPA Region 6
Drinking Water Section (6WQ-SD)
1445 Ross Ave Suite 1200
Dallas, TX 75202-2733

Enclosure H

CT Templates for an Operational DPR WTP

Enclosure H1: 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 Reuse Project PWS ID No.: 2430001

PLANT NAME OR NUMBER: RRWWTP to Cypress through MF/RO/Conventional

Month: _____
Day: _____
Year: _____

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

The City of Wichita Falls Cypress Water Treatment Plant (CWF CWTP) Temporary Reuse Project will combine the use of the Micro-filtration/Reverse Osmosis (MF/RO) treatment facilities with the conventional 2010 CWTP. This CT study takes into account the treated water pumped from the CWF River Road Waste Water Treatment Plant (RRWWTP) to the CWTP through a 32-inch outside diameter (O.D.) HDPE raw water pipe (with a 27-inch inside diameter, I.D.) at a flow of 7.5 million gallons per day (MGD), through the MF/RO treatment facility to a raw water lagoon where 5 MG will then be mixed with 5 MG raw surface water and treated through the conventional 2010 CWTP. The treatment process includes clarification prior to micro-filtration, reverse osmosis where the 5 MG permeate will be sent to a raw water lagoon, pumped back the the splitter basin and mixed with 5 MG of raw surface water prior to the 2010 CWTP. The 2010 CWTP 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 a 10.0-MG ground storage tank. Total capacity through the 2010 CWTP is 10.0-MGD.

The treatment processes for the water from the RRWWTP must achieve a 5.5-log removal or inactivation of Cryptosporidium, a 6.0-log removal or inactivation of Giardia, and a 9.0-log removal or inactivation of viruses before water is distributed to the customers. Based on the combination of treatment processes that will be used at the MF/RO facilities and 2010 CWTP, the disinfection process must be able to achieve a 1.0-log inactivation of Giardia and a 5.0-log inactivation of viruses before treated water enters the distribution system.

The proposed disinfection protocol involves the injection of chlorine (Cl2) at the RRWWTP chlorine contact basin to create "per-formed chloramines" as a disinfectant (i,e, not adding enough Cl2 to reach breakpoint) before being pumped to the CWTP through the 32-inch O.D. raw water pipe to. In the micro-filtration clarifier, chlorine (Cl2) and liquid ammonium sulfate (LAS) are injected in the mix zone to form chloramines. Chlorine (Cl2) and liquid ammonium sulfate are again added at the clarifier effluent to form chloramines through the micro-filtration trough and cells. Once the reverse osmosis permeate is mixed with the raw surface water in the splitter basin, chlorine (Cl2) and liquid ammonia gas (NH4) are added in the splitter box and again just upstream of the CWTP's 0.20 MG clearwell and transfer pump station.

Chloramine residuals are monitored in the raw water vault, prior to the micro-filtration clarifier, in the mix zone of the clarifier, at the effluent collection box of the carifier, in the micro-filtration feed trough and cell filtrate. Chloramine residuals are also monitored downstream of the five multi-media gravity filters, downstream of the 0.20 MG clearwell and transfer pump station and downstream of the 10 MG ground storage tank, prior to entering the distribution system.

The disinfection process with utilize five disinfection zones which are summarized as follows:
D1: 32-inch O.D. HDPE raw water pipeline from the River Road WWTP to the Cypress WTP
D2: 2008 SWTP's clarification unit at the MF/RO treatment facility
D3: 2008 SWTP's MF treatment units and associated piping
D4: 2010 SWTP's clarfier, recarbonation basin, filters, and associated piping
D5: 2010 SWTP's 0.20-MG clearwell and Cypress 10-MG ground storage tank

Submitted by: _____

Contact Information: _____

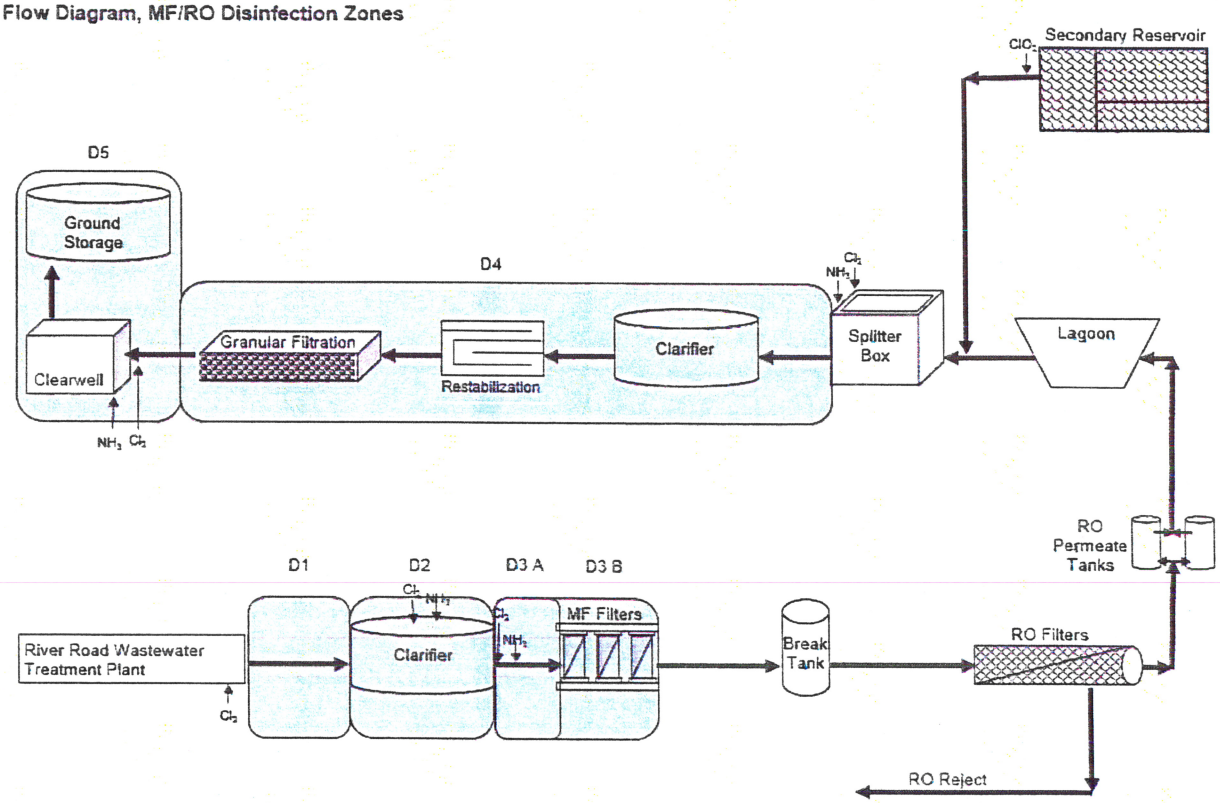
Enclosure H1: CT STUDY

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

PUBLIC WATER SYSTEM NAME:	City of Wichita Falls Reuse Project	PLANT NAME OR NUMBER:	RRWWTP to Cypress through MF/RO/Conventiona
PWS ID No.:	2430001	Date:	

Use this worksheet to create your plant schematic with the Microsoft Drawing Tools.
If you are not familiar with the drawing tools, you may create your schematic using any other suitable medium.
Please refer to Section 3.3 of the Guidance Manual for instructions and guidance.

Flow Diagram, MF/RO Disinfection Zones



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PUBLIC WATER
SYSTEM NAME: City of Wichita Falls Reuse Project PWS ID No.: 2430001

PLANT NAME
OR NUMBER: RRWWTP to Cypress through MF/RO/Conventional Date:

Treatment Plant Capacity 10.000 mgd
6,944 gpm

The peak flow rate through the MF/RO facilities will be 7.5 MGD but the peak flow rate throught the rest of the 2010 CWTP will be 10 MGD, which is the combined flow rate from the MF/RO facilities and the secondary reservoir containing raw water from Lake Arrowhead

Disinfection Zone: D1 Disinfectant: Chloramines

Unit - 1 Type: Piping Shape: Pipe

Further Description: 13 Mile Pipe from RRWWTP to Cypress WTP

Characteristic			Comments
Number of Units	1		Pipe from RRWWTP to CWTP
Diameter	27	in	32" O.D. HDPE with a 27" I.D. per K. Maroney 8/29/2013 email
Length	62500	ft	8/15/2013 email
Volume (each)	1,859,189	gal	
Flow Rate (each)	5,208	gpm	7.5 MGD Flow
Detention Time	357.0	min	
Baffling Factor	1.0		Typical Baffling Factor for Pipe
			Baffling Characteristics: Perfect
			Approved Baffling Factor:
T_{10}	**357.0**	**min**	
D1 FLOW RATE	**7.500**	**mgd**	
T10 SUM FOR D1	**357.0**	**min**	

Disinfection Zone: D2 Disinfectant: Chloramines

Unit - 1 Type: Clarifier Shape: Circular

Further Description: MF/RO Flocc-Clarifier

Characteristic		Comments
Number of Units	1	

Enclosure H1: CT STUDY

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

T10 Details Worksheet

Diameter	155	ft	Based on two engineer drawings for the clarifier structure (the CH2MHill DWG 4A-S-2, dated 2002 and the USFilter DWG 40507-101, dated 2004)
Side Water Depth	25.3	ft	" " "
Center Water Depth	31.76	ft	" " "
Volume (each)	3,875,583	gal	
Flow Rate (each)	5,208	gpm	7.5 MGD Flow
Detention Time	744.1	min	
Baffling Factor	0.3		Based on a concentric cylindrical baffle wall with a diameter of approximately 50 ft that extends 10 ft into the basin and settled water launder along the perimeter of the basin
			Baffling Characteristics: Poor
			Approved Baffling Factor:
T_{10}	**223.2**	**min**	

D2 FLOW RATE	7.500	mgd
T10 SUM FOR D2	223.2	min

Disinfection Zone: D3 **Disinfectant:** Chloramines

Unit - 1 Type: Piping Shape: Pipe

Further Description: 36 Inch Raw Water Pipe

Characteristic			Comments
Number of Units	1		Clarifier to Micro-filtation Trough
Diameter	36	in	8/15/2013
Length	250	ft	8/15/2013
Volume (each)	13,221	gal	
Flow Rate (each)	5,208	gpm	7.5 MGD Flow
Detention Time	2.5	min	
Baffling Factor	1.0		Typical Baffling Factor for Pipe
			Baffling Characteristics: Perfect
			Approved Baffling Factor:
T_{10}	**2.5**	**min**	

Unit - 2 Type: Other Shape: Rectangular

Further Description: Micro-filtration Trough

Characteristic		Comments
Number of Units	1	

Enclosure H1: CT STUDY

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

T10 Details Worksheet

Length	25.16	ft	Based on CH2MHill DWG 4-S-10 dated 2002, and the length of the channel from the inlet to the center of the first pair of filter cells
Width	11	ft	Based on DWG 4-S-10
Side Water Depth	2.66	ft	Based on CH2MHill DWG 4-S-10 and DWG 4-S-11, both dated 2002
Volume (each)	5,508	gal	
Flow Rate (each)	5,208	gpm	Based on the total flow to the first diversion point
Detention Time	1.1	min	
Baffling Factor	0.1		
			Baffling Characteristics: Unbaffled
			Approved Baffling Factor:
T_{10}	**0.1**	**min**	

Unit - 3 Type: **Other** Shape: **Other**

Further Description: Micro-filtration Cells

Characteristic			Comments
Number of Units	1		The flow rate through each individual MF tank must be monitored and the highest flow rate entered on the Calculator Worksheet.
Volume (each)	9,557	gal	Based on CH2MHill DWG 4-S-10 and DWG 4-S-11, both dated 2002
Volume (each)	9,557	gal	
Flow Rate (each)	2,297	gpm	Based on 504 modules with a total surface area of 334.9 ft2 per module and an approved flux rate of 19.6 gfd.
Detention Time	4.2	min	
Baffling Factor	0.7		Based on the configuration of the filter cell and the submerged membrane units
			Baffling Characteristics: Superior
			Approved Baffling Factor:
T_{10}	**2.9**	**min**	

D3 FLOW RATE	**3.308**	**mgd**
T10 SUM FOR D3	**5.6**	**min**

Disinfection Zone: D4 **Disinfectant:** Chloramines

Unit - 1 Type: **Piping** Shape: **Pipe**

Further Description: 36 Inch Raw Water Pipe

Enclosure H1: CT STUDY

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

T10 Details Worksheet

Characteristic			Comments
Number of Units	1		Splitter Box to Rapid Mix
Diameter	36	in	As per CT Submittal Dated April 4, 2011
Length	220	ft	As per CT Submittal Dated April 4, 2011
Volume (each)	11,634	gal	
Flow Rate (each)	6,944	gpm	based on a total 10 MGD flow through the conventional 2010 CWTP facilities
Detention Time	1.7	min	
Baffling Factor	1.0		Typical Baffling Factor for Pipe
			Baffling Characteristics: Perfect
			Approved Baffling Factor:
T_{10}	**1.7**	**min**	

Unit - 2 Type: **Rapid Mix** Shape: **Rectangular**

Further Description: Rapid Mix Basin

Characteristic			Comments
Number of Units	1		
Length	27	ft	As per CT Submittal Dated April 4, 2011
Width	6	ft	As per CT Submittal Dated April 4, 2011
Side Water Depth	4	ft	As per CT Submittal Dated April 4, 2011
Volume (each)	4,848	gal	
Flow Rate (each)	6,944	gpm	10 MGD Flow
Detention Time	0.7	min	
Baffling Factor	0.1		Typical Baffling Factor for an "Unbaffled" Basin
			Baffling Characteristics: Unbaffled
			Approved Baffling Factor:
T_{10}	**0.1**	**min**	

Unit - 3 Type: **Piping** Shape: **Pipe**

Further Description: 30 Inch Raw Water Pipe

Characteristic			Comments
Number of Units	1		Rapid Mix to Clarifier
Diameter	30	in	As per CT Submittal Dated April 4, 2011
Length	85	ft	As per CT Submittal Dated April 4, 2011
Volume (each)	3,122	gal	
Flow Rate (each)	6,944	gpm	10 MGD Flow
Detention Time	0.4	min	
Baffling Factor	1.0		Typical Baffling Factor for Pipe
			Baffling Characteristics: Perfect
			Approved Baffling Factor:
T_{10}	**0.4**	**min**	

Unit - 4 Type: **Clarifier** Shape: **Circular**

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Enclosure H1: CT STUDY

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

T10 Details Worksheet

Further Description: Clarifier

Characteristic			Comments
Number of Units	1		
Diameter	90	ft	As per CT Submittal Dated April 4, 2011
Side Water Depth	18.9	ft	As per CT Submittal Dated April 4, 2011
Center Water Depth	20.6	ft	As per CT Submittal Dated April 4, 2011
Volume (each)	926,521	gal	
Flow Rate (each)	6,944	gpm	10 MGD Flow
Detention Time	133.4	min	
Baffling Factor	0.3		Typical Baffling Factor for Clarifiers
			Baffling Characteristics: Poor
			Approved Baffling Factor:
T_{10}	**40.0**	**min**	

Unit - 5 Type: **Other** Shape: **Rectangular**

Further Description: Recarbonation Basin

Characteristic			Comments
Number of Units	1		
Length	45.5	ft	As per CT Submittal Dated April 4, 2011
Width	32	ft	As per CT Submittal Dated April 4, 2011
Side Water Depth	16.8	ft	As per CT Submittal Dated April 4, 2011
Volume (each)	183,003	gal	
Flow Rate (each)	6,944	gpm	10 MGD Flow
Detention Time	26.4	min	
Baffling Factor	0.5		Typical Baffling Factor for Basins with 4 Internal Baffles and Length to Width (40:1)
			Baffling Characteristics: Average
			Approved Baffling Factor:
T_{10}	**13.2**	**min**	

Unit - 6 Type: **Filter** Shape: **Rectangular**

Further Description: Gravity Filters

Characteristic			Comments
Number of Units	4		To represent the City's operation with four filters always in service and the fifth filter on standby for when one the filters goes into backwash.
Length	24	ft	As per CT Submittal Dated April 4, 2011
Width	15	ft	As per CT Submittal Dated April 4, 2011
Media Depth	6	ft	As per CT Submittal Dated April 4, 2011
Underdrain Depth	1	ft	As per CT Submittal Dated April 4, 2011
Minimum Water Depth Over Media	6.8	ft	As per CT Submittal Dated April 4, 2011
Average Porosity	50	%	

Enclosure H1: CT STUDY

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

T10 Details Worksheet

Volume (each)	29,088	gal	
Flow Rate (each)	1,736	gpm	10 MGD Flow Divided Equally Between Four Filters (Filters Rated at 2.5 MGD Flow Each). Four filters must always be operated together at equal flow rates.
Detention Time	16.8	min	
Baffling Factor	0.7		Typical Baffling Factor for Filters
			Baffling Characteristics: Superior
			Approved Baffling Factor:
T_{10}	**11.7**	**min**	
D4 FLOW RATE	**10.000**	**mgd**	
T10 SUM FOR D4	**67.1**	**min**	

Disinfection Zone: D5 **Disinfectant:** Chloramines

Unit - 1 Type: Clearwell Shape: Rectangular

Further Description: Clearwell/Transfer Pump Station

Characteristic			Comments
Number of Units	1		
Length	98.4	ft	As per CT Submittal Dated April 4, 2011
Width	26	ft	As per CT Submittal Dated April 4, 2011
Side Water Depth	11.3	ft	As per CT Submittal Dated April 4, 2011
Maximum Volume (each)	216,290	gal	
Minimum Operating Level	5.7	ft	
Worst Case Volume (each)	109,102	gal	
Percent of Maximum Volume	50	%	Based on the clearwell's minimum operating level, i.e., 50% of Total Volume
Worst Case Volume (each)	109,102	gal	
Flow Rate (each)	6,944	gpm	10 MGD Flow
Detention Time	15.7	min	
Baffling Factor	0.5		Typical Baffling Factor for Basins with Two Internal Baffles Lenth to Width (30:1)
			Baffling Characteristics: Average
			Approved Baffling Factor:
T_{10}	**7.9**	**min**	

Unit - 2 Type: Clearwell Shape: Circular

Further Description: 10 MG Ground Storage Tank

Characteristic			Comments
Number of Units	1		
Diameter	206	ft	As per CT Submittal Dated April 4, 2011

Enclosure H1: CT STUDY

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

T10 Details Worksheet

Side Water Depth	40	ft	As per CT Submittal Dated April 4, 2011
Center Water Depth	40	ft	As per CT Submittal Dated April 4, 2011
Maximum Volume (each)	9,974,083	gal	
Minimum Operating Level	20	ft	Assumes a "Worst Case" operating level that is 50% of the maximum water depth
Worst Case Volume (each)	4,987,042	gal	
Percent of Maximum Volume	50	%	
Worst Case Volume (each)	4,987,042	gal	
Flow Rate (each)	6,944	gpm	100% of 10 MGD Max at Cypress (7 MGD)
Detention Time	718.1	min	
Baffling Factor	0.3		Typical Baffling Factor for Basins Having 2 Inlets, 1 Outlet and 3 Interior Baffles
			Baffling Characteristics: Poor
			Approved Baffling Factor:
T_{10}	**215.4**	**min**	

D5 FLOW RATE	**10.000**	**mgd**
T10 SUM FOR D5	**223.3**	**min**

Disinfection Zone: D6 **Disinfectant:**

Disinfection Zone: D7 **Disinfectant:**

Disinfection Zone: D8 **Disinfectant:**

Disinfection Zone: D9 **Disinfectant:**

Disinfection Zone: D10 **Disinfectant:**

Enclosure H1: 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 Reuse Project PWS ID No.: 2430001

PLANT NAME OR NUMBER: RRWWTP to Cypress through MF/RO/Conventional Date:

Disinfection Zone	Treatment Unit	Volume* (each) (gal)	Flow Rate* (each) (MGD)	Baffling Factor*	T_{10}* (min) Unit	T_{10}* (min) Zone
D1	13 Mile Pipe from RRWWTP to Cypress WTP (1)	1,859,189	7.500	1	356.964	356.96
D2	MF/RO Flocc-Clarifier (1)	3,875,583	7.500	0.3	223.234	223.23
D3	36 Inch Raw Water Pipe (1)	13,221	7.500	1	2.538	5.56
	Micro-filtration Trough (1)	5,508	7.500	0.1	0.106	
	Micro-filtration Cells (1)	9,557	3.308	0.7	2.912	
D4	36 Inch Raw Water Pipe (1)	11,634	10.000	1	1.675	67.12
	Rapid Mix Basin (1)	4,848	10.000	0.1	0.070	
	30 Inch Raw Water Pipe (1)	3,122	10.000	1	0.450	
	Clarifier (1)	926,521	10.000	0.3	40.026	
	Recarbonation Basin (1)	183,003	10.000	0.5	13.176	
	Gravity Filters (4)	29,088	2.500	0.7	11.728	
D5	Clearwell/Transfer Pump Station (1)	109,102	10.000	0.5	7.855	223.30
	10 MG Ground Storage Tank (1)	4,987,042	10.000	0.3	215.440	

* These values are calculated on the T10 Details Sheet

Enclosure H1: 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 Reuse Project

PLANT NAME OR NUMBER: RRWWTP to Cypress through MF/RO/Conventiona

PWS ID No.: 2430001

Date:

DISINFECTION PROCESS PARAMETERS

APPROVED CT STUDY PARAMETERS						PERFORMANCE STANDARDS	
Parameters	Disinfection Zones					Log Inactivations	
	D1	D2	D3	D4	D5	Giardia lamblia Cysts	Viruses
Flow Rate (MGD)	7.500	7.500	3.308	10.000	10.000	1.0	5.0
T_{10} (minutes)	357.0	223.2	5.6	67.1	223.3		

DISINFECTION PROCESS DATA

INDIVIDUAL DISINFECTION ZONES										PLANT TOTAL		
Disinfectant	C (mg/L)	Flow (MGD)	Temp (°C)	pH	CT_{CALC}	Giardia CT_{REQD}	Virus CT_{REQD}	Giardia Log	Virus Log	Giardia Log	Virus Log	Inact. Ratio
CLA *D1*	1.0	7.500	12.0	7.5	357.0	554.0	1604.5	0.64	1.11			
CLA *D2*	1.0	7.500	12.0	7.5	223.2	554.0	1604.5	0.40	0.70			
CLA *D3*	1.0	3.308	12.0	7.5	5.6	554.0	1604.5	0.01	0.02	3.01	5.20	1.04
CLA *D4*	3.5	10.000	12.0	9.0	234.9	554.0	1604.5	0.42	0.73			
CLA *D5*	3.8	10.000	12.0	8.9	848.5	554.0	1604.5	1.53	2.64			

SUBMITTED BY:

Certificate No. and Grade:

Date:

TCEQ - (05-01-13)

CT STUDY

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Enclosure H1: 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 Reuse Project

PLANT NAME OR NUMBER: RRWWTP to Cypress through MF/RO/Conventiona

PWS ID No.: 2430001

Date:

DISINFECTION PROCESS PARAMETERS

APPROVED CT STUDY PARAMETERS						PERFORMANCE STANDARDS	
Parameters	Disinfection Zones					Log Inactivations	
	D6	D7	D8	D9	D10	Giardia lamblia Cysts	Viruses
Flow Rate (MGD)						1.0	5.0
T_{10} (minutes)							

DISINFECTION PROCESS DATA

INDIVIDUAL DISINFECTION ZONES										PLANT TOTAL		
Disinfectant	C (mg/L)	Flow (MGD)	Temp (°C)	pH	CT_{CALC}	Giardia CT_{REQD}	Virus CT_{REQD}	Giardia Log	Virus Log	Giardia Log	Virus Log	Inact. Ratio
D6												
D7												
D8												
D9												
D10												

SUBMITTED BY:

Certificate No. and Grade:

Date:

Enclosure H2: 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: Cypress WTP Reuse Project **PWS ID No.:** 2430001

PLANT NAME OR NUMBER: Secondary Res. Through Cypress Conventional

Month: _____

Day: _____

Year: _____

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

The City of Wichita Falls Cypress Water Treatment Plant (CWF CWTP) Temporary Reuse Project will combine the use of the Micro-filtration/Reverse Osmosis (MF/RO) treatment facilities with the conventional 2010 CWTP. This CT study takes into account the treated water pumped from the CWF River Road Waste Water Treatment Plant (RRWWTP) to the CWTP through a 30 inch raw water pipe at a flow of 7.5 million gallons per day (MGD), through the MF/RO treatment facility to a raw water lagoon where 5.0 MG will then be mixed with 5.0 MG raw surface water and treated through the conventional 2010 CWTP. The treatment process includes clarification prior to micro-filtration, reverse osmosis where the 5.0 MG permeate will be sent to a raw water lagoon, pumped back the the splitter basin and mixed with 5.0 MG of raw surface water prior to the 2010 CWTP. The 2010 CWTP 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 a 10-MG ground storage tank. Total capacity through the 2010 CWTP is 10 MGD.

The treatment processes for the water from Lake Arrowhead and Lake Kicapoo through the CWF's Secondary Reservoir must achieve a 2.0-log removal or inactivation of Cryptosporidium, a 3.0-log removal or inactivation of Giardia, and a 4.0-log removal or inactivation of viruses before water is distributed to the customers. Based on the combination of treatment processes that will be used at 2010 CWTP, the disinfection process must be able to achieve a 0.5-log inactivation of Giardia and a 2.0-log inactivation of viruses before treated water enters the distribution system.

However, it should be noted that higher levels of inactivation may be required at the 2010 CWTP so that the reuse water from the RRWWTP, which will be passing through the CWTP treatment processes, will be adequately disinfected before treatment is complete and it enters the distribution system.

The proposed disinfection protocol involves the injection of chlorine dioxide (ClO2) downstream of the secondary reservoir, and chlorine (Cl2) and liquid ammonia gas (NH4) downstream of the splitter basin and upstream of the 0.20-MG clearwell and transfer pump station. Chlorine dioxide residual can be measured at three locations along the 42-inch raw water pipe at 400, 900 and 6500 linear feed downstream of the reservoir pump station, prior to entering the splitter basin. Since Cl2 and NH4 are added at the same location, a measureable ClO2 residual must be maintained at the 400 ft sample tap. Chloramine residual is monitored downstream of the five multi-media gravity filters and downstream of the Cypress high service pumps, prior to entering the distribution system.

The disinfection process will utilize five disinfection zones which are summarized as follows:
D1: The segment of the raw water pipeline from the chlorine dioxide injection point to the first monitoring point
D2: The segment of the raw water pipeline between the first and second chlorine dioxide monitoring points
D3: The segment of the raw water pipeline between the second and third chlorine dioxide monitoring points
D4: The 2010 clarfier, recarbonation basin,multi-media gravity filters, and associated piping
D5: The 2010 SWTP 0.20-MG clearwell and 10-MG ground storage tank

Submitted by: _____

Contact Information: _____

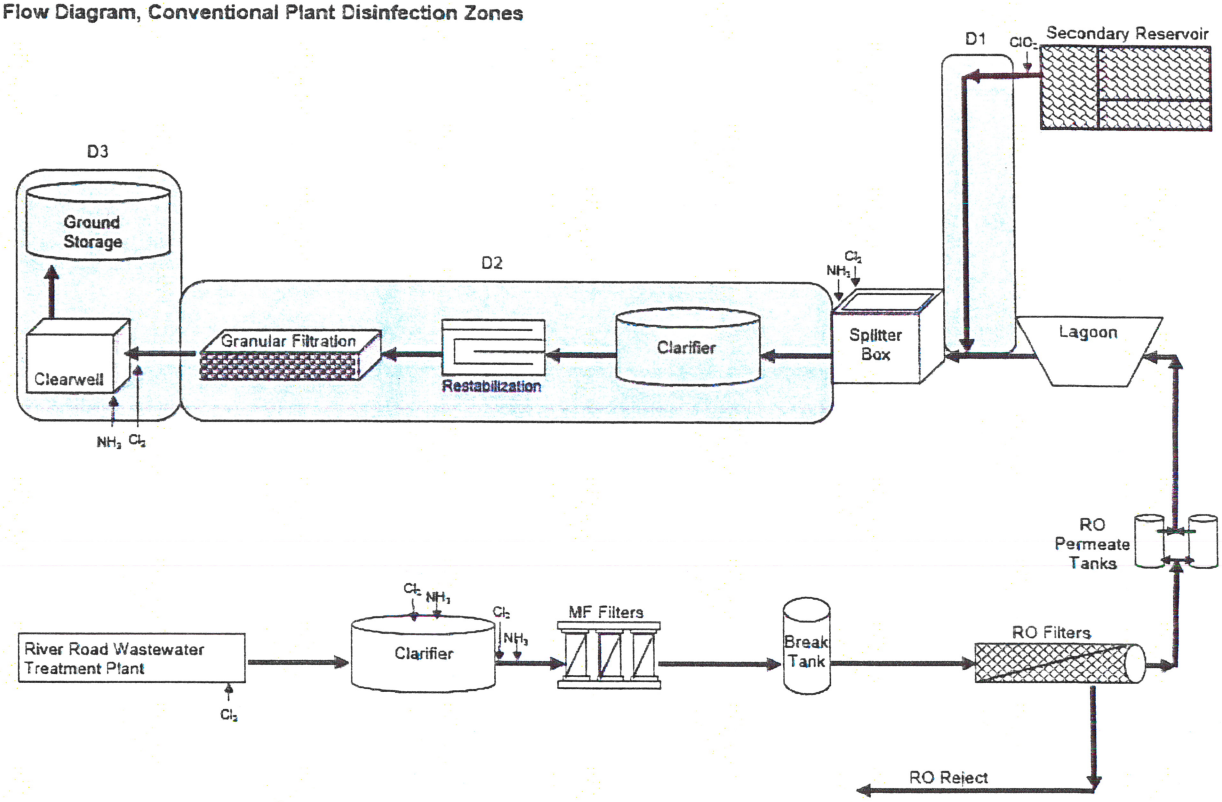
Enclosure H2: CT STUDY

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

PUBLIC WATER SYSTEM NAME:	Cypress WTP Reuse Project	PLANT NAME OR NUMBER:	Secondary Res. Through Cypress Conventional
PWS ID No.:	2430001	Date:	

Use this worksheet to create your plant schematic with the Microsoft Drawing Tools.
If you are not familiar with the drawing tools, you may create your schematic using any other suitable medium.
Please refer to Section 3.3 of the Guidance Manual for instructions and guidance.

Flow Diagram, Conventional Plant Disinfection Zones



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PUBLIC WATER
SYSTEM NAME: Cypress WTP Reuse Project PWS ID No.: 2430001

PLANT NAME
OR NUMBER: Secondary Res. Through Cypress Conventional Date:

Treatment Plant Capacity 10.000 mgd
6,944 gpm

Based on the combined flow rate from the MF/RO facilities and the secondary reservoir containing the raw water from Lake Arrowhead and Lake Kicakpoo through the Secondary Reservoir.

Disinfection Zone: D1 Disinfectant: Chlorine Dioxide

Unit - 1 Type: Piping Shape: Pipe

Further Description: 42 Inch Raw Water Line From Secondary Reservoir to Cypress WTP

Characteristic			Comments
Number of Units	1		
Diameter	42	in	As per CT Submittal Dated April 4, 2011
Length	400	ft	As per CT Submittal Dated April 4, 2011
Volume (each)	28,792	gal	
Flow Rate (each)	3,472	gpm	Based on a 5 MGD Flow Rate of raw water from Lake Arrowhead
Detention Time	8.3	min	
Baffling Factor	1.0		Typical Baffling Factor for Pipe
			Baffling Characteristics: Perfect
			Approved Baffling Factor:
T_{10}	**8.3**	**min**	
D1 FLOW RATE	**5.000**	**mgd**	
T10 SUM FOR D1	**8.3**	**min**	

Disinfection Zone: D2 Disinfectant: Chlorine Dioxide

Unit - 1 Type: Piping Shape: Pipe

Further Description: 42 Inch Raw Water Line From Secondary Reservoir to Cypress WTP

Characteristic			Comments
Number of Units	1		
Diameter	42	in	As per CT Submittal Dated April 4, 2011
Length	500	ft	As per CT Submittal Dated April 4, 2011

Enclosure H2: CT STUDY
T10 Details Worksheet

Volume (each)	35,990	gal	
Flow Rate (each)	3,472	gpm	Based on a 5 MGD Flow Rate of raw water from Lake Arrowhead
Detention Time	10.4	min	
Baffling Factor	1.0		Typical Baffling Factor for Pipe
			Baffling Characteristics: Perfect
			Approved Baffling Factor:
T_{10}	**10.4**	**min**	
D2 FLOW RATE	**5.000**	**mgd**	
T10 SUM FOR D2	**10.4**	**min**	

Disinfection Zone: D3 **Disinfectant:** Chlorine Dioxide

Unit - 1 Type: Piping Shape: Pipe

Further Description: 42 Inch Raw Water Line From Secondary Reservoir to Cypress WTP

Characteristic			Comments
Number of Units	1		
Diameter	42	in	As per CT Submittal Dated April 4, 2011
Length	5600	ft	As per CT Submittal Dated April 4, 2011
Volume (each)	403,091	gal	
Flow Rate (each)	3,472	gpm	Based on a 5 MGD Flow Rate of raw water from Lake Arrowhead
Detention Time	116.1	min	
Baffling Factor	1.0		Typical Baffling Factor for Pipe
			Baffling Characteristics: Perfect
			Approved Baffling Factor:
T_{10}	**116.1**	**min**	
D3 FLOW RATE	**5.000**	**mgd**	
T10 SUM FOR D3	**116.1**	**min**	

Disinfection Zone: D4 **Disinfectant:** Chloramines

Unit - 1 Type: Piping Shape: Pipe

Further Description: Raw Water Pipe from Splitter Box to Rapid Mix

Characteristic	Comments

Enclosure H2: CT STUDY
T10 Details Worksheet

Number of Units	1		Splitter Box to Rapid Mix
Diameter	36	in	As per CT Submittal Dated April 4, 2011
Length	220	ft	As per CT Submittal Dated April 4, 2011
Volume (each)	11,634	gal	
Flow Rate (each)	6,944	gpm	10 MGD, the combined flow rate from the MF/RO facilities and the secondary reservoir containing raw water from Lake Arrowhead
Detention Time	1.7	min	
Baffling Factor	1.0		Typical Baffling Factor for Pipe
			Baffling Characteristics: Perfect
			Approved Baffling Factor:
T_{10}	**1.7**	**min**	

Unit - 2 Type: **Rapid Mix** Shape: **Rectangular**

Further Description: Rapid Mix Basin

Characteristic			Comments
Number of Units	1		
Length	27	ft	As per CT Submittal Dated April 4, 2011
Width	6	ft	As per CT Submittal Dated April 4, 2011
Side Water Depth	4	ft	As per CT Submittal Dated April 4, 2011
Volume (each)	4,848	gal	
Flow Rate (each)	6,944	gpm	based on a total 10 MGD flow through the conventional 2010 CWTP facilities
Detention Time	0.7	min	
Baffling Factor	0.1		Typical Baffling Factor for an "Unbaffled" Basin
			Baffling Characteristics: Unbaffled
			Approved Baffling Factor:
T_{10}	**0.1**	**min**	

Unit - 3 Type: **Piping** Shape: **Pipe**

Further Description: 30 Inch Pipe from Rapid Mix to Clarifier

Characteristic			Comments
Number of Units	1		Rapid Mix to Clarifier
Diameter	30	in	As per CT Submittal Dated April 4, 2011
Length	85	ft	As per CT Submittal Dated April 4, 2011
Volume (each)	3,122	gal	
Flow Rate (each)	6,944	gpm	10 MGD Flow
Detention Time	0.4	min	
Baffling Factor	1.0		Typical Baffling Factor for Pipe
			Baffling Characteristics: Perfect
			Approved Baffling Factor:
T_{10}	**0.4**	**min**	

Enclosure H2: CT STUDY
T10 Details Worksheet

Unit - 4 Type: **Clarifier** Shape: **Circular**

Further Description: 2010 Plant Clarifier

Characteristic			Comments
Number of Units	1		
Diameter	90	ft	As per CT Submittal Dated April 4, 2011
Side Water Depth	18.9	ft	As per CT Submittal Dated April 4, 2011
Center Water Depth	20.6	ft	As per CT Submittal Dated April 4, 2011
Volume (each)	926,521	gal	
Flow Rate (each)	6,944	gpm	10 MGD Flow
Detention Time	133.4	min	
Baffling Factor	0.3		Typical Baffling Factor for Clarifiers
			Baffling Characteristics: Poor
			Approved Baffling Factor:
T_{10}	**40.0**	**min**	

Unit - 5 Type: **Other** Shape: **Rectangular**

Further Description: Recarbonation Basin

Characteristic			Comments
Number of Units	1		
Length	45.5	ft	As per CT Submittal Dated April 4, 2011
Width	32	ft	As per CT Submittal Dated April 4, 2011
Side Water Depth	16.8	ft	As per CT Submittal Dated April 4, 2011
Volume (each)	183,003	gal	
Flow Rate (each)	6,944	gpm	10 MGD Flow
Detention Time	26.4	min	
Baffling Factor	0.5		Typical Baffling Factor for Basins with 4 Internal Baffles and Length to Width (40:1)
			Baffling Characteristics: Average
			Approved Baffling Factor:
T_{10}	**13.2**	**min**	

Unit - 6 Type: **Filter** Shape: **Rectangular**

Further Description: 2010 Plant Gravity Filters

Characteristic			Comments
Number of Units	4		To represent the City's operation with four filters always in service and the fifth filter on standby for when one the filters goes into backwash.
Length	24	ft	As per CT Submittal Dated April 4, 2011
Width	15	ft	As per CT Submittal Dated April 4, 2011
Media Depth	6	ft	As per CT Submittal Dated April 4, 2011
Underdrain Depth	1	ft	As per CT Submittal Dated April 4, 2011
Minimum Water Depth Over Media	6.8	ft	As per CT Submittal Dated April 4, 2011
Average Porosity	50	%	

Enclosure H2: CT STUDY
T10 Details Worksheet

Volume (each)	29,088	gal	
Flow Rate (each)	1,736	gpm	10 MGD Flow divided equally between four filters. Each filter is rated at 2.5 MGD. Four filters must always me operated together at equal flow rates.
Detention Time	16.8	min	
Baffling Factor	0.7		Typical Baffling Factor for Filters
			Baffling Characteristics: Superior
			Approved Baffling Factor:
T_{10}	**11.7**	**min**	
D4 FLOW RATE	**10.000**	**mgd**	
T10 SUM FOR D4	**67.1**	**min**	

Disinfection Zone: D5 **Disinfectant:** Chloramines

Unit - 1 Type: Clearwell Shape: Rectangular

Further Description: 2010 Plant Clearwell/Transfer Pump Station

Characteristic			Comments
Number of Units	7		
Length	98.4	ft	As per CT Submittal Dated April 4, 2011
Width	26	ft	As per CT Submittal Dated April 4, 2011
Side Water Depth	11.3	ft	As per CT Submittal Dated April 4, 2011
Maximum Volume (each)	216,290	gal	
Minimum Operating Level	5.7	ft	
Worst Case Volume (each)	109,102	gal	
Percent of Maximum Volume	50	%	50% of Total Volume
Worst Case Volume (each)	109,102	gal	
Flow Rate (each)	6,944	gpm	10 MGD Flow
Detention Time	15.7	min	
Baffling Factor	0.5		Typical Baffling Factor for Basins with Two Internal Baffles Lenth to Width (30:1)
			Baffling Characteristics: Average
			Approved Baffling Factor:
T_{10}	**7.9**	**min**	

Unit - 2 Type: Clearwell Shape: Circular

Further Description: 10 MG Ground Storage Tank

Characteristic			Comments
Number of Units	1		
Diameter	206	ft	As per CT Submittal Dated April 4, 2011

Enclosure H2: CT STUDY
T10 Details Worksheet

Side Water Depth	40	ft	As per CT Submittal Dated April 4, 2011
Center Water Depth	40	ft	As per CT Submittal Dated April 4, 2011
Maximum Volume (each)	9,974,083	gal	
Minimum Operating Level	20	ft	Assumes "Worst Case" Operating Level
Worst Case Volume (each)	4,987,042	gal	
Percent of Maximum Volume	50	%	
Worst Case Volume (each)	4,987,042	gal	
Flow Rate (each)	6,944	gpm	100% of 10 MGD Max at Cypress (7 MGD)
Detention Time	718.1	min	
Baffling Factor	0.3		Typical Baffling Factor for Basins Having 2 Inlets, 1 Outlet and 3 Interior Baffles
			Baffling Characteristics: Poor
			Approved Baffling Factor:
T_{10}	**215.4**	**min**	

D5 FLOW RATE	**10.000**	**mgd**
T10 SUM FOR D5	**223.3**	**min**

Disinfection Zone: D6 **Disinfectant:**

Disinfection Zone: D7 **Disinfectant:**

Disinfection Zone: D8 **Disinfectant:**

Disinfection Zone: D9 **Disinfectant:**

Disinfection Zone: D10 **Disinfectant:**

Enclosure H2: 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: Cypress WTP Reuse Project PWS ID No.: 2430001

PLANT NAME OR NUMBER: Secondary Res. Through Cypress Conventional Date:

Disinfection Zone	Treatment Unit	Volume* (each) (gal)	Flow Rate* (each) (MGD)	Baffling Factor*	T_{10}* (min) Unit	T_{10}* (min) Zone
D1	aw Water Line From Secondary Reservoir to Cypress	28,792	5.000	1	8.292	8.29
D2	aw Water Line From Secondary Reservoir to Cypress	35,990	5.000	1	10.365	10.37
D3	aw Water Line From Secondary Reservoir to Cypress	403,091	5.000	1	116.090	116.09
D4	Raw Water Pipe from Splitter Box to Rapid Mix (1)	11,634	10.000	1	1.675	67.12
	Rapid Mix Basin (1)	4,848	10.000	0.1	0.070	
	30 Inch Pipe from Rapid Mix to Clarifier (1)	3,122	10.000	1	0.450	
	2010 Plant Clarifier (1)	926,521	10.000	0.3	40.026	
	Recarbonation Basin (1)	183,003	10.000	0.5	13.176	
	2010 Plant Gravity Filters (4)	29,088	2.500	0.7	11.728	
D5	2010 Plant Clearwell/Transfer Pump Station (7)	109,102	10.000	0.5	7.855	223.30
	10 MG Ground Storage Tank (1)	4,987,042	10.000	0.3	215.440	

* These values are calculated on the T10 Details Sheet

Enclosure H2: 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: Cypress WTP Reuse Project

PLANT NAME OR NUMBER: Secondary Res. Through Cypress Conventional

PWS ID No.: 2430001

Date:

DISINFECTION PROCESS PARAMETERS

APPROVED CT STUDY PARAMETERS						PERFORMANCE STANDARDS	
Parameters	Disinfection Zones					Log Inactivations	
	D1	D2	D3	D4	D5	Giardia lamblia Cysts	Viruses
Flow Rate (MGD)	5.000	5.000	5.000	10.000	10.000	0.5	2.0
T_{10} (minutes)	8.3	10.4	116.1	67.1	223.3		

DISINFECTION PROCESS DATA

INDIVIDUAL DISINFECTION ZONES										PLANT TOTAL		
Disinfectant	C (mg/L)	Flow (MGD)	Temp (°C)	pH	CT_{CALC}	Giardia CT_{REQD}	Virus CT_{REQD}	Giardia Log	Virus Log	Giardia Log	Virus Log	Inact. Ratio
CLO2 *D1*	0.05	5.000	5.0	8.2	0.4	4.5	5.7	0.05	0.14			
CLO2 *D2*	0.0	5.000	5.0	8.2	0.0	NA	NA	0.00	0.00			
CLO2 *D3*	0.0	5.000	5.0	8.2	0.0	NA	NA	0.00	0.00	1.56	2.67	1.34
CLA *D4*	3.5	10.000	5.0	9.0	234.9	357.5	857.0	0.33	0.55			
CLA *D5*	3.8	10.000	5.0	8.9	848.5	357.5	857.0	1.19	1.98			

SUBMITTED BY:

Certificate No. and Grade:

Date:

TCEQ - (05-01-13)

CT STUDY

Q-116

Enclosure H2: 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: Cypress WTP Reuse Project

PLANT NAME OR NUMBER: Secondary Res. Through Cypress Conventional

PWS ID No.: 2430001

Date:

DISINFECTION PROCESS PARAMETERS

APPROVED CT STUDY PARAMETERS						PERFORMANCE STANDARDS	
Parameters	Disinfection Zones					Log Inactivations	
	D6	D7	D8	D9	D10	Giardia lamblia Cysts	Viruses
Flow Rate (MGD)						0.5	2.0
T_{10} (minutes)							

DISINFECTION PROCESS DATA

INDIVIDUAL DISINFECTION ZONES										PLANT TOTAL		
Disinfectant	C (mg/L)	Flow (MGD)	Temp (°C)	pH	CT_{CALC}	Giardia CT_{REQD}	Virus CT_{REQD}	Giardia Log	Virus Log	Giardia Log	Virus Log	Inact. Ratio
D6												
D7												
D8												
D9												
D10												

SUBMITTED BY:

Certificate No. and Grade:

Date:

TCEQ - (05-01-13)

CT STUDY

Q-117

Bryan W. Shaw, Ph.D, *Chairman*
Toby Baker, *Commissioner*
Zak Covar, *Executive Director*

PWS/2430001/CO/10-15-2013/Exception
PWS/2430001/CO/10-15-2013/Plan Ltr

Texas Commission on Environmental Quality

Protecting Texas by Reducing and Preventing Pollution

October 15, 2013

Mr. Kerry D. Maroney, P.E.
Biggs & Mathews, Inc.
2500 Brook Avenue
Wichita Falls, Texas 76301

Re: City of Wichita Falls - Public Water System ID No. 2430001
Addendum I:
Requests for Modifications to TCEQ Conditions for Granted Temporary Exceptions
Requests for Modifications to TCEQ Amendments for a Direct Potable Reuse Full-Scale Verification Test Protocol
Addendum J: Full-Scale Verification Test Protocol – Minimum Monitoring and Reporting of Water Qualities and Flow Rates.
Addendum K: TCEQ July 29, 2013 E-mail
Wichita County, Texas
RN 105598759; CN 600129316

Dear Mr. Maroney:

On September 20, 2013, the Texas Commission on Environmental Quality (TCEQ) received your letter dated September 23, 2013 by e-mail regarding the City of Wichita Falls (City) proposed Cypress Direct Potable Reuse (DPR) Water Treatment Plant (WTP). Your letter requested modifications to the temporary exception conditions and to the Full-Scale Verification Test Protocol (Protocol) in the TCEQ's September 5, 2013 letter. On September 13, 2013, you and City staff met with TCEQ Water Supply Division staff in Austin to discuss the TCEQ's September 5, 2013 letter and enclosures. Based on discussions during the September 13, 2013 meeting, your letter of September 23, 2013 contains written requests for modifications of the conditions in the TCEQ's September 5, 2013 letter.

This letter will henceforth be referred to as the TCEQ's September 5, 2013 letter's Addendum I, and should be referenced in the City's Full-Scale Verification Report as such. It solely clarifies those sections in the TCEQ September 5, 2013 letter and its Enclosure A specifically referenced below.

Attached Addendum J completely replaces the September 5, 2013 letter's Enclosure A: Full-Scale Verification Test Protocol- Minimum Monitoring and Reporting of Water Qualities and Flow Rates in its entirety. All monitoring changes approved in Addendum I are shown highlighted in yellow in Addendum J. Please note that all previous highlighting of cells shown in replaced Table A of Enclosure A has been removed from Addendum J. The only cells highlighted in Addendum J are those changed as a result of the TCEQ's further review after the meeting held in Austin on September 13, 2013 and discussed below in Addendum I. Those items previously indicated in Enclosure A and since deleted remain in Addendum J, but are represented struck through and highlighted in yellow. Also, modified descriptions, clarifications, additional parameters to be monitored for, and new monitoring frequencies are highlighted in yellow. All numbering in Addendum J for unchanged parameters is the same as was used in Enclosure A, except for additions, which were inserted at the end of the applicable monitoring location and distinguished with a new identification number. Any monitoring location previously designated in the TCEQ's September 5, 2013 letter by the capital letter "A" is represented in Addenda I and J by the capital letter "J;" for example, the sampling location referred to previously as TCEQ-1A is re-named TCEQ-1J in Addendum J as of the date of this letter and addenda.

Addendum I

In this addendum—Addendum I—we have organized our responses in the same order, and under the same headings, as the City's letter dated September 23, 2013. No implication of approval, agreement, or changes is intended or made based on the wording of the headings.

TCEQ Responses to City of Wichita Falls September 23, 2013 Letter

Items under heading "September 5, 2013 Conditional Letter of Approval Comments:" in the City's letter dated September 23, 2013

Based on the TCEQ Water Supply Division staff's review, we have the following responses:

1. The City questioned the TCEQ's requirement that the microfiltration (MF) membrane unit be taken out of service when its filtrate turbidity level is greater than 0.100 nephelometric turbidity units (NTU) for two consecutive five-minute readings, be repaired as necessary, and pass a TCEQ-approved direct integrity test (DIT) before being placed back in service treating RR WWTP effluent for human consumption.
   The City has incorrectly understood the TCEQ's past references to guidance and rules for MF membranes with regards to the proposed DPR WTP. The point was the questionable protection of public health when operating a MF membrane unit treating surface water, much less WWTP effluent, at greater than 0.100 NTU for two consecutive five-minute readings.

The TCEQ **will not modify** this continuous, on-line indirect integrity test limit in Condition Nos. 6(b), 23 and 24 in our September 5, 2013 letter for automatically removing a MF membrane unit used in the City's proposed temporary DPR WTP from service. Even when operators are on-site at the proposed DPR WTP, if the filtrate turbidity level for a MF membrane unit is greater than 0.100 NTU for two consecutive five-minute readings, that MF membrane unit must be removed from service. Operators must then perform the necessary repairs to the MF membrane unit and/or calibrate the monitoring equipment and the MF membrane unit must pass a TCEQ-approved direct integrity test (DIT) before placing the MF membrane unit back in service.

The City will need to make all physical and operational changes necessary to comply with Condition Nos. 6(b), 23 and 24 in the September 5, 2013 letter during the Full-Scale Verification Test and temporary six-month operation of the Cypress DPR WTP. The City should also ensure that the on-line FilterTrak laser turbidimeters are properly installed and calibrated to prevent incorrect readings from air bubbles or other monitoring equipment problems.

2. No response is required.

3. The City requested clarification language for Condition No. 11 to be modified to include the language form the TCEQ's July 29, 2013 e-mail from Ms. Marlo Berg. Since the City has discussed this with TCEQ staff in the past and the TCEQ has clarified the TCEQ's meaning for the specified wording in the referenced email, there is **no need to modify** the wording in our September 5, 2013 letter. However, we have attached the referenced e-mail as Addendum K to our September 5, 2013 letter for documentation that the e-mail does apply.

4. The City requested that the TCEQ acknowledge that the three enclosed engineering drawings (Sheets 4, 5 and 6 of 7) meet the TCEQ's Condition No. 12(g) for the gravity media filter backwash supply during the Full-Scale Verification Test.
The TCEQ **agrees that the City's proposed modifications** shown on your three September 23, 2013 enclosed engineering drawings comply with the TCEQ Condition No. 12(g) to isolate the existing Cypress backwash supply pumps, other SWTPs, and storage tanks from the partially treated RR WWTP effluent, and to use only filtered water from the 2010 SWTP filters during the Full-Scale Verification Test. The use of the water from the 2010 Clearwell will simulate the proposed temporary, six-month DPR WTP operation. Therefore, your proposed drawings are adequate to meet Condition No. 12(g) of our September 5, 2013 letter.

5. No response is required.

6. The City expressed displeasure with the TCEQ's justification for the approved log removal credit assigned to the Siemens Memcor (previously distributed by US Filter) S10V MF membranes based on the Challenge Test Log Removal Value ($LRV_{C\text{-}Test}$) in Condition No. 20 in our September 5, 2013 letter.

The City did not provide any documentation or data that would support a change to this condition. To protect public health, the requirements for the TCEQ to approve a log removal credit for a DPR WTP cannot be less stringent than those required by federal rule for membranes to be used in a SWTP. Therefore, without a new TCEQ-acceptable Challenge Test Report, the TCEQ **cannot consider modifying** the TCEQ-approved log removal credit of 2.8-log for *Giardia* and *Cryptosporidium* based on the $LRV_{C\text{-}Test}$ value for the Siemens Memcor S10V MF membranes.

Please note that the previously granted log removal credit was based on the TCEQ-approved DIT Log Removal Value (LRV_{DIT}) for membranes installed to treat surface water prior to April 1, 2012. As the TCEQ has informed the City when the City first proposed the Cypress DPR WTP treatment process, the *Giardia* and *Cryptosporidium* log removal credits for the Siemens Memcor S10V MF membranes would be based on the lower of a TCEQ-approved Challenge Test LRV ($LRV_{C\text{-}Test}$) or a TCEQ approved LRV_{DIT}.

Also, $LRV_{C\text{-}Test}$ and LRV_{DIT} are vendor specific and not type specific (i.e., MF versus ultrafiltration). In addition, LRV_{DITs} are design and site-specific. The log removal credit a system can receive will always be based on the lower of the TCEQ approved $LRV_{c\text{-}Test}$ and a TCEQ-approved LRV_{DIT}, not the higher.

Items under heading "A. Items Requiring TCEQ Action" in the City's September 23, 2013 letter

The TCEQ has the following responses:

1. The TCEQ has indicated in Addendum J that monitoring for lead under TCEQ-1J-22 is **conditional, not required,** if the analytical method used for lead under TCEQ-1J-15 for "full metal scan" is acceptable by the U.S. Environmental Protection Agency (EPA) for determining compliance with the drinking water requirements. If the laboratory conducting the full metal scan does not use an EPA-acceptable analytical method for drinking water samples, then the City **will be required** to collect samples in accordance with TCEQ-1J-22 for lead and to submit those samples to a laboratory for analysis using an EPA-acceptable analytical method for drinking water samples.

2. As discussed and requested in your letter, the TCEQ **has changed** all of the references for bromate monitoring to bromide. The following TCEQ Sample Sets were modified to require bromide monitoring rather than bromate monitoring:
    a. TCEQ-1J-25;
    b. TCEQ-20J-20;
    c. TCEQ-21J-12;
    d. TCEQ-23J-12;
    e. TCEQ-28J-15; and
    f. TCEQ-29J-7.

Please note that monitoring for bromate at monitoring location TCEQ-2J-10 was deleted, not changed. This was due to the fact that it was not a TCEQ requirement to begin with. However, to verify that the 2010 SWTP Clearwell's effluent during the verification testing will meet all drinking water standards and does not exceed the maximum contaminant level (MCL) for bromate, the TCEQ **has added bromate** under TCEQ-40J-37 to be monitored once a week along with the other regulated disinfection byproducts at this monitoring location.

3. The City stated that they had not understood that Enclosure B with the TCEQ's March 4, 2013 e-mail was a list of unregulated chemical and microbiological emerging contaminants of concern that the TCEQ *recommended*—not required—for monitoring. Because of this misunderstanding, the City had included these contaminants in the City's submitted Protocol. During the September 13, 2013 meeting and in your letter, the City requested that most of these contaminants be deleted from Enclosure A for monitoring during the verification testing. As you will note in Addendum J, the TCEQ **has deleted** the following monitoring:
    a. TCEQ-1J-27 through TCEQ-1J-35;
    b. TCEQ-10J-19 and TCEQ-10J-20;
    c. TCEQ-20J-26 through TCEQ-20J-34;
    d. TCEQ-23J-21 through TCEQ-23J-29;
    e. TCEQ-28J-22 and TCEQ-28J-23; and
    f. TCEQ-40J-27 through TCEQ-40J-35.

    It is noted that the City will collect total culturable viruses and perchlorate samples during the verification testing.

4. As requested, the TCEQ **clarified** Addendum J for TCEQ-10J-2 "Effluent flow rate (gpm)" and TCEQ-10J-4 "Selected MF unit's effluent flow rate (gpm)." As noted in the September 13, 2013 meeting, TCEQ-10J-2 was intended to represent the combined MF membrane units' flow rate. Since this is the wrong location for measuring this flow rate, the TCEQ has deleted TCEQ-10J-2 flow measurement and added it to TCEQ 11J as Sample No. 7 "Combined MF units' effluent flow rate (gpm)."

5. The City requested that the TCEQ justify the requirement for monitoring the silt density index (SDI) at location TCEQ-10J-11, and that the TCEQ eliminate that monitoring requirement. The TCEQ **did not delete** SDI monitoring requirement for TCEQ-10J-11 at the effluent of the MF membrane unit or at TCEQ-9J-2 at the influent to the MF membrane unit.

    The TCEQ's technical explanation of this requirement is as follows. It is noted that SDI is an indicator of the potential fouling for RO membranes and not MF membranes. However, MF membranes are an industry-accepted method for reducing the SDI of the feed water for RO membranes in order to prevent premature fouling of the RO membranes. Premature fouling of RO membranes can result in loss of production, more frequent cleaning, and early replacement due to irreversible fouling. The monitoring results at locations TCEQ-9J-2 and TCEQ-10J-11 can be used by the City and the TCEQ to verify that the MF membranes are achieving an acceptable SDI reduction during the verification testing when treating the new source water—RR WWTP effluent.

6. The City requested that the TCEQ consider changing the monitoring frequency of nitrate at location TCEQ-16J-5, TDS at location 16J-6, and TSS at location 16J-7 to once a day, rather than every four hours. The TCEQ **did not change** the monitoring frequency from four hours to once per day.

   Due to the acute health threat for nitrate and TSS and TDS being indicators of the effectiveness of treatment, the TCEQ will need a large data set to demonstrate that spikes in actual and potential chemical contaminants and periodic failures of treatment are not occurring during a day.

   Please note that the City may use TCEQ-acceptable on-line monitors for nitrate, TDS and TSS. Also, conductivity can be used in lieu of TDS as long as the City uses an acceptable calculation for converting the conductivity to TDS and submits both values for each four-hour sample result.

7. The City requested that the TCEQ justify the requirement for monitoring alkalinity at locations TCEQ-20J-15 and TCEQ-22J-7 and requested that the TCEQ delete the monitoring requirement for the alkalinity level in the RO membrane permeate before Lagoon No. 3 at TCEQ-20J-15 and in the RO membrane permeate at Lagoon No. 3's effluent before blending with the raw surface water at TCEQ-22J-7.
   a. The TCEQ **did not delete** the requirement to monitor alkalinity once per week in the RO permeate under TCEQ-20J-15. The TCEQ will need complete water quality data for the RO membrane permeate to determine the efficiency of the RO membrane.
   b. The TCEQ **deleted** the requirement to monitor alkalinity once per week under TCEQ-22J-7.

8. The TCEQ **changed** the temperature monitoring frequency for TCEQ-23J-3 to once per day.

9. The TCEQ **changed** the pH monitoring frequency for TCEQ-23J-4 to once per day. As noted in Addendum J, the City **may use** the measured pH levels from TCEQ-23J-4 monitoring location for TCEQ-24J-2.

10. For the TCEQ-24J Begin Secondary Reservoir raw water (RW) DZ 1 monitoring location, the TCEQ **changed** the pH and temperature monitoring frequency from once every four hours to once per day in Addendum J.

11. The TCEQ **did not change** the monitoring frequencies for chlorine dioxide, pH and temperature from once every four hours to once per day for the end of RW DZ 2 and RW DZ 3 for TCEQ-25J-1, -2 and -3 and TCEQ-26J-1, 2, and 3, respectively. This data is associated with the adequacy of disinfection, and is therefore critical for determining whether any variation in that adequacy may occur.

As previously discussed in conference calls between the City and the TCEQ, the City must report the lowest inactivation achieved from the six (6) daily four-hour sample sets at all disinfection zones when completing pages 4 and 5 of the Surface Water Monthly Operating Report (SWMOR).

12. The TCEQ has **changed** the monitoring at locations TCEQ-20J-36, -27J-8, and -28J-4 in Addendum J to include chlorite monitoring.

13. The TCEQ agrees that the City may use the corresponding four-hour pH and temperature readings from monitoring locations TCEQ-36J-5 and 36J-6, respectively, for TCEQ-38J7 and 38J-8, respectively. Please note that the TCEQ **changed** the description for TCEQ-36J monitoring location to correctly designate the end of blended disinfection zone 4 (Blended DZ 4) as being after the Conventional 2010 SWTP combined filter effluent (CFE) and prior to the downstream chlorine injection point.

14. The City asked TCEQ to justify why it was requesting mNTU & NTU measurements for Turbidity at location TCEQ40A. In response, the TCEQ was giving City the option on which method to use at this location as was noted in Footnote 3. The TCEQ **deleted** the units of measurement for milli-turbidity at location TCEQ-40J3 in Addendum J after the City reported that they would be using a turbidimeter that records turbidity in NTU.

15. The TCEQ **did not change** the sampling frequency for TDS in Addendum J at location TCEQ-40J-5 so the required frequency remains every 15 minutes. However, it is noted that an on-line monitoring device may be used to collect this data and transmit it to operators through a supervisory control and data acquisition (SCADA) system. It is not anticipated that manual sample collection should be required.

16. The City requested that the TCEQ reduce the required disinfectant monitoring at locations TCEQ-41J and TCEQ-42J from once every eight hours to daily. The TCEQ **did not change** that required monitoring frequency in Addendum J for these monitoring locations. The inactivation must be calculated each time that the disinfectant monitoring occurs. The sample-set values associated with the lowest inactivation must be entered on the SWMOR, pages 4 and 5. All of the eight-hour data collected during the Full Scale Verification Test must be submitted with the Report in order to document that the sample set with the lowest inactivation was reported on the SWMOR, and to confirm the accuracy of the City's hypothesis that the disinfection level is adequate.
Regarding the CT Study, please note if a location is noted as being a disinfection zone end point monitoring location, that location must be sampled. For example, if the CT Study says there are three (3) zones, even if a disinfectant is added only in the first zone, the residual must be routinely measured and recorded in all three disinfection zones. It is unacceptable to not monitor at a point identified as a disinfection zone endpoint in the City's CT Study. This data is collected to comply with the benchmarking requirements initiated by the EPA under the Interim Enhanced Surface Water Treatment Rule (promulgated by the EPA on December 16, 1998).. During the future temporary six-month use of the DPR WTP, failure of the plant to meet the inactivation requirements for a four-hour period will be recognized as a treatment technique violation.

Items under the heading "B. Items Agreed Upon by both Parties" in the City's letter dated September 23, 2013

1. The TCEQ **agrees** that the flow measurement referenced at location TCEQ-1J-1 will be collected at a location after the RR WWTP Chlorine Contact Basin, and Addendum J has been modified to include this change.

2. The TCEQ **agrees** that the City may conduct weekly TOC and alkalinity analyses on-site in lieu of submitting to an off-site laboratory with National Environmental Laboratory Accreditation Program approval as noted in Addendum J. The City shall provide a current Monitoring Plan documenting the laboratory methods on the Laboratory Approval Form, consistent with 30 TAC §290.121.

3. The TCEQ **agrees** that the free ammonia sample referenced at location TCEQ-2J-1 should be collected prior to the chlorine contact basin. Addendum J correctly reflects this requirement by indicating that the free ammonia for TCEQ 2J will be collected at location TCEQ-1J-37 (added) and also reported for location TCEQ-2JA-1.
   Please note that although the City's letter references ammonia sampling without distinguishing between pre- or post-chlorination monitoring, the TCEQ makes no alteration to the free ammonia sample (after chlorination) referenced at monitoring location TCEQ-2J-6, and no change has been made to Addendum J at this monitoring location.

4. The TCEQ **agrees** that the temperature measurement required for location TCEQ-4J-2 is likely to be essentially the same as that at location TCEQ-3J-6, and that the reading at location TCEQ-3J-6 may be also reported under location TCEQ-4J-2. Addendum J reflects this.

5. The TCEQ **agrees** that the influent flow rate to the clarifier will be the flow rate of the effluent from the upstream RR WWTP chlorine contact basin. Therefore, Addendum J has been modified to reflect that the clarifier influent flow rate under location TCEQ-5J-1 will be measured at location TCEQ-1J-1. However, the City cannot operate the DPR WTP if there is a leak in the RR WWTP pipeline as the flow rates at these two locations would not be the same.
   However, the TCEQ **disagrees** that the clarifier's influent flow rate and effluent flow rate will be the same since the City will be removing sludge from the clarifier. Therefore, the City must monitor the clarifier effluent flow rate and report it under TCEQ-6J-1 as indicated in Addendum J.

6. The City requested to collect pH and temperature measurements at TCEQ-10J—a selected microfiltration membrane—and report them for TCEQ-11J—the combined microfiltration effluent, since the detention time between these locations is low. The TCEQ notes that the combined microfiltration effluent, not the selected MF membrane unit's filtrate, represents the end of disinfection zone WW DZ3. Therefore, the TCEQ modified the description of monitoring location TCEQ-11J to reflect this. The actual temperature and pH is to be measured at location TCEQ-11J, but **agrees** to the City recording the pH and temperature for monitoring location TCEQ-11J can be recorded and reported for monitoring location TCEQ-10J as indicated in Addendum J.

7. After review of Engineering Drawing 4-M-2, the TCEQ **disagrees** that the silt density index (SDI) at monitoring location TCEQ-13J and TCEQ-16J should be the same. The City is injecting sulfuric acid and antiscalant in between these two monitoring locations. Since SDI is a measurement for potential fouling of RO membranes and both of these chemicals are used to control fouling of RO membranes, Addendum J indicates the City must monitor the SDI at both TCEQ-13J, prior to the chemical injection point, and TCEQ-16J, after the in-line static mixer.

8. Since antiscalants change the pH level of the water being treated, the TCEQ **does not agree** that the pH level after the sulfuric acid injection, but prior to antiscalant injection, would be the same after the antiscalant injection point.

   It was the intent of the TCEQ to review data for the change in pH levels due to the sulfuric acid alone. Monitoring the pH only after the antiscalant injection will not provide this information. However, our review of Engineering Drawing 4-M-2 indicates there is only 18 inches between the sulfuric acid and antiscalant injection points on the 24-inch diameter pipe. Because of the short length and diameter of the pipe, there is a strong probability that the sulfuric acid will not be completely mixed with all of the water in the 24-inch diameter pipeline and the chemical reaction completed before the antiscalant is injected so simultaneous chemical reactions will occur. Since the current physical limitation of these two chemical injection points will not allow for monitoring of the sulfuric acid effect alone on the water quality, the TCEQ **has deleted** the pH monitoring for TCEQ 14J monitoring location in Addendum J.

9. The TCEQ **agrees** to the City monitoring the temperature and pH at TCEQ-23J-3 and TCEQ-23J-4, respectively, and also entering the data for the pH and temperature monitoring under TCEQ-24J-2 and TCEQ-24J-3 as indicated in Addendum J.

10. After review of Engineering Drawing 1-M-7, the TCEQ **does not agree** with the City that monitoring the fluoride level for the Conventional 2010 SWTP combined filters' effluent (CFE) under TCEQ-37J-1 should be conducted at monitoring location TCEQ-35J. Monitoring location TCEQ-35J is for the individual filter effluent (IFE) for the single gravity media filter selected for verification testing, not the CFE.
    The TCEQ **agrees** to the City monitoring the fluoride level of the CFE prior to fluoride addition at monitoring location TCEQ-36J End Blended DZ 4 and entering the results with the data for TCEQ-37J as indicated in Addendum J.
    The TCEQ noted that fluoride injection occurs at the same location as chlorine and ammonia injection for the beginning of Begin Blended DZ 5 within the 2010 SWTP Clearwell for the TCEQ-38J monitoring location. Our review of past submitted flow diagrams had caused the TCEQ staff to believe the fluoride injection point was upstream of the chlorine and ammonia addition at the Conventional 2010 SWTP Clearwell, not at the same location inside the clearwell as shown on Engineering Drawing 1-M-7. The City's Full Scale Verification Study Report must document the exact chemical injection locations with accurate, as-built drawings and—if necessary to provide clear, understandable information—photographs.

11. The TCEQ **agrees** to notify the City of any new upcoming regulations for unregulated chemical and microbiological emerging contaminants of concern and proposed changes for any currently regulated chemical MCLs and/or microbiological treatment techniques as soon as staff become aware of these changes.

    At this time, it is impossible for either the TCEQ or the City to know what EPA may change or at what level a substantiated public health risk might be set. Neither the TCEQ nor the City can know if the City's proposed DPR treatment process will provide the continuous protection of public health required by any possible change in EPA regulations. Furthermore, the TCEQ must adopt and enforce EPA drinking water regulations to maintain primacy. Failure to adopt or enforce these EPA regulations can result in the EPA taking enforcement action against public water systems in Texas. Also, the TCEQ is charged under Texas Health & Safety Code §341.0315 to ensure that public water systems are supplying a safe and adequate quantity of drinking water.

    If the City conducts the Full-Scale Verification Test in accordance with our September 5, 2013 letter, Enclosures B-H, Addendums I, J and K and the required data demonstrates that public health will be continuously protected during operation of the proposed temporary DPR WTP; the TCEQ **agrees** that the City should not have to restart the Full-Scale Verification Test. However, the TCEQ cannot agree that events outside our control will not result in the City having to conduct the verification testing for a longer duration or install additional treatment equipment. Such events include (but are not limited to) power and equipment failures, failure of chemical treatment, failure to produce a safe water quality that meets all of the chemical drinking water standards, or failure to meet the TCEQ' site-specific required minimum removal and inactivation of microbiological contaminants.

Please be aware that all exceptions are subject to the TCEQ's periodic review and may be revoked or revised if the TCEQ finds that the conditions under which an exception was granted have changed or the granting of the exception has resulted in a potential health risk.

If you have any questions concerning Addendums I, J or K or need further assistance regarding the conditions for the temporary exceptions, Protocol and Report, please contact Mr. James "Red" Weddell by e-mail at james.weddell@tceq.texas.gov or by telephone at (325) 481-8056 or by correspondence at the following address:

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

If you have any questions or need further assistance regarding the TCEQ's review of the Preliminary Engineering Report and approval to construct, please contact Vera Poe at (512) 239-6988 or by e-mail at vera.poe@tceq.texas.gov or by correspondence at the following address:

Utilities Technical Review Team - MC-159
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Sincerely,

James "Red" Weddell, P.E.
Technical Review & Oversight Team
Water Supply Division
Texas Commission on Environmental Quality

Vera Poe, P.E., Team Leader
Utilities Technical Review Team
Water Supply Division
Texas Commission on Environmental Quality

Linda Brookins, Director
Water Supply Division
Office of Water
Texas Commission on Environmental Quality

LB/VP/JSW/av

Attachments: Addendum J: Full-Scale Verification Test Protocol Minimum Monitoring and Reporting of Water Qualities and Flow Rates (Version: 2430001-10152013)
Addendum K: TCEQ July 29, 2013 E-mail

cc: Honorable Glenn Barham, Mayor, City of Wichita Falls, P.O. Box 1431, Wichita Falls, TX 76307-1431
Mr. Darron Leiker, City Manager, 1300 7th Street Room, Wichita Falls, TX 76301
Mr. Russell Schreiber, P.E., Director of Public Works, City of Wichita Falls, P.O. Box 1431, Wichita Falls, TX 76307
Mr. Daniel K. Nix, Utilities Operations Manager, City of Wichita Falls, P.O. Box 1431, Wichita Falls, TX 76307

Addendum J

Full-Scale Verification Test Protocol Minimum Monitoring and Reporting of Water Qualities and Flow Rates

Addendum J

Full-Scale Verification Testing Protocol
Minimum Monitoring and Reporting of Water Qualities and Flow Rates

Addendum J with Table J amends the TCEQ's September 5, 2013 letter to the City of Wichita Falls and replaces Enclosure A with Table A in its entirety.

Minimum required water quality monitoring for chemical and microbiological constituents and monitoring frequencies during the direct potable reuse (DPR) Full-Scale Verification Test are listed and marked with a check (√) in Table J below. These minimum required parameters and specified monitoring frequencies have been selected for the City's Full-Scale Verification Test so that the TCEQ can verify the continuous protection of public health by the removal and/or inactivation of chemical and microbiological contaminants through the different proposed treatment processes at the tested flow rates and operating parameters. Please note:

- **Struck out chemical constituents, operating parameters, sampling frequencies and clarification additions indicated by yellow highlights** are changes based on Addendum I.
- **Continuous 5-minute, 15-minute, 2-hour, 4-hour, and daily (and anytime the flow rate changes) monitoring frequencies** are to be conducted on-site using a TCEQ acceptable method. This includes using on-line monitors.
- **Weekly total organic carbon (TOC) and alkalinity and all twice per week analyses** can be either conducted on-site by City staff using a TCEQ acceptable method or analyzed off-site at a TCEQ acceptable laboratory. Twice per week sample collections are to be conducted at a consistent frequency no closer than three days apart.
- Except for weekly TOC and alkalinity monitoring (as noted above), **all samples collected weekly (once every 7 days) and at longer frequencies** are to be submitted to an off-site NELAP accredited laboratory for drinking water analysis.
- **Analyses marked for both on-site and off-site monitoring** are required for quality control to verify the accuracy of the onsite monitoring equipment/method and are to be collected as split samples when the off-site samples are collected.
- **In lieu of monitoring the total dissolved levels (TDS) levels**, the City may monitor and report the conductivity level with the corresponding calculated TDS level using the industry accepted equation.

PWS ID No. TX4300001

Addendum J
Full-Scale Verification Test Protocol
Minimum Monitoring and Reporting of Water Qualities and Flow Rates
Table J

	Continuous, every						Twice per week	Once every 7 days	Startup, every 30 days & end
	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
TCEQ Sample Set (TCEQ)-1J: River Road Wastewater Treatment Plant (RR WWTP) Effluent (at RR WWTP chlorine injection box after second clarification & prior to WW DZ 1 chlorine injection point before the RR WWTP Chlorine Contact Basin)									
1. DPR transmission pipeline flow rate (gpm) (to be monitored at the RR WWTP Chlorine Contact Basin's effluent)		√							
2. Turbidity (NTU)		√							
3. Temperature (°C)		√							
4. *Escherichia coli (E. coli)* enumeration					√[1]				√[2]
5. *Giardia* (cysts/L) enumeration					√[1]				√[2]
6. *Cryptosporidium* (oocysts/L) enumeration					√[1]				√[2]
7. 5-day Carbonaceous biochemical oxygen demand (CBOD5, mg/L)					√				
8. Total suspended solids (TSS, mg/L)					√				
9. Daily flow rate (gpd)					√				
10. Nitrate (mg/L)					√[1]				√[2]
11. Total dissolved solids (TDS, mg/L)								√	
12. Alkalinity (mg/L) (to be conducted on-site)								√	
13. Total organic carbon (TOC, mg/L) (to be conducted on-site)								√	
14. Dissolved organic carbon (DOC, mg/L)								√	
15. Full metal scan (mg/L, arsenic, barium, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver, zinc)								√	
16. Algae counts (CFU/L)									√
17. Chemicals listed in §290.106(b) Inorganic Chemicals [3]									√
18. Chemicals listed in §290.107(b) Organic Chemicals [3]									√
19. Chemicals listed in §290.108(b)(1) (radium 226, radium 228, uranium, gross alpha activity)									√
20. Chemicals listed in §290.108(b)(2) & 40 CFR §141.66(d) (gross beta particle & photon radioactivity, tritium, strontium 90)									√
21. Chemicals listed in §290.118(b) Secondary Chemicals									√
~~22. Lead (ug/L)~~ (As long as TCEQ-1J-15 analysis for lead includes an acceptable EPA drinking water analytical method.)									~~√~~

1 Samples are to be collected at each of the designated locations once per day and tested using a TCEQ accepted real-time (on-site) analytical method.

2 A split sample is to be collected in conjunction with the above samples at each location at startup, every 30 days and the last day of the Full-Scale Verification Test and submitted to an off-site NELAP laboratory certified for conducting these drinking water quality tests.

3 Please assure that the laboratory monitors for all of the inorganic and organic compounds. Compounds that some labs do not include, but are required are: asbestos, cyanide, endothall, diquat, glyphosate, asbestos, and the dioxins.

PWS ID No. 2430001

Addendum J
Full-Scale Verification Test Protocol
Minimum Monitoring and Reporting of Water Qualities and Flow Rates
Table J

	Continuous, every						Twice per week	Once every 7 days	Startup, every 30 days & end
	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
23. Total trihalomethanes (TTHM, report the species: chloroform, dichlorobromomethane, dibromochloromethane, bromoform) (ug/L)								√	
24. Haloacetic acids (group of 5) (HAA5, report the species: monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, dibromoacetic acid) (ug/L)								√	
25. ~~Bromate~~ Bromide (mg/L)								√	
26. Total culturable viruses (MPN/L)									WF
~~27. Enterovirus (CFU/L)~~									~~WF~~
~~28. Norovirus (CFU/L)~~									~~WF~~
~~29. N-Nitroso-dimethylamine (NDMA, ng/L)~~									~~WF~~
~~30. N-Nitroso-pyrrolidine (NPYR, ng/L)~~									~~WF~~
~~31. Pharmaceuticals (µg/L)~~									~~WF~~
~~32. Hormones (ng/L~~									~~WF~~
~~33. Personal care products (ng/L)~~									~~WF~~
~~34. Fluoridated alkyl acids (PFOS, PFOA, PFNA, PFHxS, PFHpA, & PFBS) (ng/L)~~									~~WF~~
~~35. Sucralose (ug/L)~~									~~WF~~
36. Perchlorate (ug/L)									WF
37. Free ammonia (mg/L)				√					
TCEQ-2J: Begin Wastewater (WW) Disinfection Zone (DZ) 1 (before RR WWTP Chlorine Contact Basin)									
1. Free ammonia level before chlorine injection (mg/L) (from TCEQ-1J-37.)				√					
2. Free chlorine dosage (mg/L)				√					
3. Total chlorine residual after chlorine injection (mg/L)				√					
4. Monochloramine residual after chlorine injection (mg/L)				√					
5. Free chlorine residual after chlorine injection (mg/L)				√					
6. Free ammonia level after chlorine injection (mg/L)				√					

1 Samples are to be collected at each of the designated locations once per day and tested using a TCEQ accepted real-time (on-site) analytical method.

2 A split sample is to be collected in conjunction with the above samples at each location at startup, every 30 days and the last day of the Full-Scale Verification Test and submitted to an off-site NELAP laboratory certified for conducting these drinking water quality tests.

3 Please assure that the laboratory monitors for all of the inorganic and organic compounds. Compounds that some labs do not include, but are required are: asbestos, cyanide, endothall, diquat, glyphosate, asbestos, and the dioxins.

Addendum J
Full-Scale Verification Test Protocol
Minimum Monitoring and Reporting of Water Qualities and Flow Rates
Table J

	Continuous, every						Twice per week	Once every 7 days	Startup, every 30 days & end
	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
7. pH level at monochloramine residual monitoring tap				√					
8. Water temperature at monochloramine residual monitoring tap (°C)				√					
9. Quantity of chlorine used (pounds per day, ppd)					√				
10. ~~Bromate (mg/L)~~								~~WF~~	
TCEQ-3J: End WW DZ 1 (end of RR WWTP effluent transmission line at Cypress 2008 MF/RO SWTP's Flow Control Vault & prior to existing 12-inch gate valve)									
1. Total chlorine residual (mg/L)		√							
2. Monochloramine residual (mg/L)		√							
3. Free chlorine residual (mg/L)		√							
4. Free ammonia level (mg/L)		√							
5. pH level at monochloramine monitoring tap		√							
6. Water temperature at monochloramine monitoring tap (°C)		√							
TCEQ-4J: 2008 MF/RO SWTP's Static Mixers and Coagulant Addition (at Cypress 2008 MF/RO SWTP's Flow Control Vault)									
1. Influent alkalinity level (mg/L)				√					
2. Influent water temperature (°C) (from TCEQ-3J-6)				√					
3. Coagulant dosage (mg/L)				√					
4. Quantity of coagulant used (gpd)					√				
5. *Escherichia coli (E. coli)* enumeration					√[1]				√[2]
6. *Giardia* (cysts/L)					√[1]				√[2]
7. *Cryptosporidium* (oocysts/L)		.			√[1]				√[2]
TCEQ-5J: Begin WW DZ 2 (at 2008 MF/RO SWTP's radial flow clarifier's flocculator with chlorine and ammonia injection)									
1. Influent flow rate (gpm) (from TCEQ-1J-1)		√							
2. Free chlorine dosage (mg/L)				√					
3. Ammonia dosage (mg/L)				√					
4. Total chlorine residual, after ammonia injection (mg/L)				√					
5. Monochloramine residual, after ammonia injection (mg/L)				√					
6. Free chlorine residual, after ammonia injection (mg/L)				√					

1 Samples are to be collected at each of the designated locations once per day and tested using a TCEQ accepted real-time (on-site) analytical method.

2 A split sample is to be collected in conjunction with the above samples at each location at startup, every 30 days and the last day of the Full-Scale Verification Test and submitted to an off-site NELAP laboratory certified for conducting these drinking water quality tests.

3 Please assure that the laboratory monitors for all of the inorganic and organic compounds. Compounds that some labs do not include, but are required are: asbestos, cyanide, endothall, diquat, glyphosate, asbestos, and the dioxins.

EXHIBIT ID NO. 24 2008-1

Addendum J
Full-Scale Verification Test Protocol
Minimum Monitoring and Reporting of Water Qualities and Flow Rates
Table J

	Continuous, every						Twice per week	Once every 7 days	Startup, every 30 days & end
	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
7. Free ammonia level, after ammonia injection (mg/L)				√					
8. pH level at monchloramine residual monitoring tap				√					
9. Water temperature at monochloramine residual monitoring tap(°C)				√					
10. Quantity of chlorine used (ppd)					√				
11. Quantity of ammonia used (ppd)					√				
TCEQ-6J: 2008 MF/RO SWTP Radial Flow Clarifier (flocculation & clarification)									
1. Effluent flow rate (gpm) (clarifier influent flow rate minus blowdown flow rate)		√							
2. Settled water turbidity level (NTU)			√						
3. Effluent pH level				√					
4. Calculated flocculator hydraulic detention time (Based on influent flow rate, mins.)						√			
5. Calculated clarifier surface overflow rate (gpm/sf)						√			
6. Effluent TOC (mg/L) (to be conducted on-site)								√	
7. Effluent DOC (mg/L)								√	
TCEQ-7J: End WW DZ 2 (at 2008 MF/RO SWTP's radial flow clarifier's effluent pipe)									
1. Total chlorine residual (mg/L)		√							
2. Monochloramine residual (mg/L)		√							
3. Free chlorine residual (mg/L)		√							
4. Free ammonia level (mg/L)		√							
5. pH level at monochloramine monitoring tap		√							
6. Water temperature (°C) at monochloramine monitoring tap		√							
TCEQ-8J: Begin WW DZ 3 (at MF membrane units' feed trough)									
1. Free chlorine dosage rate (mg/L)				√					
2. Ammonia dosage rate (mg/L)				√					
3. Total chlorine residual, after ammonia injection (mg/L)				√					
4. Monochloramine residual, after ammonia injection (mg/L)				√					

1 Samples are to be collected at each of the designated locations once per day and tested using a TCEQ accepted real-time (on-site) analytical method.

2 A split sample is to be collected in conjunction with the above samples at each location at startup, every 30 days and the last day of the Full-Scale Verification Test and submitted to an off-site NELAP laboratory certified for conducting these drinking water quality tests.

3 Please assure that the laboratory monitors for all of the inorganic and organic compounds. Compounds that some labs do not include, but are required are: asbestos, cyanide, endothall, diquat, glyphosate, asbestos, and the dioxins.

PENDING ID NO: 43001

Addendum J
Full-Scale Verification Test Protocol
Minimum Monitoring and Reporting of Water Qualities and Flow Rates
Table J

	Continuous, every						Twice per week	Once every 7 days	Startup, every 30 days & end
	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
5. Free chlorine residual, after ammonia injection (mg/L)				√					
6. Free ammonia level, after ammonia injection (mg/L)				√					
7. Water temperature at monochloramine residual monitoring tap (°C)				√					
8. pH level at monochloramine residual monitoring tap				√					
9. Quantity of chlorine used (ppd)					√				
10. Quantity of ammonia used (ppd)					√				
TCEQ-9J: Selected MF Membrane Unit (at influent to selected MF units' feed trough/tank)									
1. Inlet pressure, head on bottom of membranes' feed side (psi)		√							
2. Influent silt density index (SDI)					√				
TCEQ-10J: Selected MF Membrane Unit Filtrate Quality (after vacuum pump & prior to blending with any other MF filtrate)									
1. Effluent turbidity (mNTU)	√								
~~2. Effluent flow rate (gpm)~~ (moved to TCEQ-1J-7)		~~√~~							
3. Outlet pressure, vacuum (psi)		√							
4. Selected MF unit's effluent flow rate (gpm)		√							
5. Temperature (°C) (from TCEQ-11J-6)		√							
6. pH level (from TCEQ-11J-5)		√							
7. Calculated average transmembrane pressure (TMP, psi)				√					
8. Calculated average flux rate (gallons per square-foot per day, gfd)				√					
9. Calculated average specific flux rate (gfd/psi) at measured temperature				√					
10. Calculated average specific flux (gfd/psi) normalized to 20° C				√					
11. SDI					√				
12. Alkalinity (mg/L) (to be conducted on-site)								√	
13. TOC (mg/L) (to be conducted on-site)								√	
14. DOC (mg/L)								√	
15. *Escherichia coli (E. coli)* enumeration									WF

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Addendum J
Full-Scale Verification Test Protocol
Minimum Monitoring and Reporting of Water Qualities and Flow Rates
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	Continuous, every						Twice per week	Once every 7 days	Startup, every 30 days & end
	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
16. *Giardia* (cysts/L) enumeration									WF
17. *Cryptosporidium* (oocysts/L)									WF
18. Total culturable viruses (MPN/L)									WF
~~19. Enterovirus (CFU/L)~~									~~WF~~
~~20.Norovirus (CFU/L)~~									~~WF~~
TCEQ-11J: End WW DZ 3 (at ~~selected MF membrane unit's filtrate piping & prior to~~ combined MF filtrate pipe)									
1. Total chlorine residual (mg/L)		√							
2. Monochloramine residual (mg/L)		√							
3. Free chlorine residual (mg/L)		√							
4. Free ammonia level (mg/L)		√							
5. pH level at monochloramine residual monitoring tap		√							
6. Water temperature at monochloramine residual monitoring tap (°C)		√							
7. Combined MF units' effluent flow rate (gpm)		√							
TCEQ-12J: Sodium Bisulfite Feed System									
1. Sodium bisulfite dosage (mg/L)				√					
2. Quantity of sodium bisulfite used (ppd)					√				
TCEQ-13J: Break Tank (RO membrane feed water tank)									
1. Effluent flow rate (gpm)		√							
2. Water level (feet)				√					
3. Calculated hydraulic detention time (using effluent flow rate, mins.)						√			
4. Effluent free chlorine residual (mg/L)				√					
5. Effluent total chlorine residual (mg/L)				√					
6. SDI					WF				

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	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
TCEQ-14J: Sulfuric Acid Feed System									
1. Sulfuric acid dosage (mg/L)				√					
~~2. pH level after injection~~				~~√~~					
3. Quantity of sulfuric acid used (gpd)					√				
TCEQ-15J: Antiscalant Feed System									
1. Antiscalant dosage (mg/L)				√					
2. Quantity of antiscalant used (gpd)					√				
TCEQ-16J: Selected RO Membrane Unit Feed Water (after selected RO unit feed pump & prior to selected RO unit)									
1. Influent flow rate (gpm)		√							
2. Influent turbidity (mNTU)		√							
3. Inlet pressure (psi)				√					
4. Temperature (° C)				√					
5. Nitrate (mg/L)				√					√[2]
6. TDS (mg/L)				√					
7. TSS (mg/L)				√					
8. SDI					√				
9. pH level					√				
10. Hardness as calcium carbonate (mg/L)					√				
11. Alkalinity (mg/L) (to be conducted on-site)					√				
12. TOC (mg/L) (to be conducted on-site)								√	
13. DOC (mg/L)								√	
14. Nitrite (mg/L)									√
15. Silica (mg/L)									√

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TCEQ-17J: First Stage RO Membranes									
1. Temperature (°C)					√				
2. Flow rate (gpm) at measured temperature					√				
3. Calculated total flux rate (gfd) at measured temperature					√				
4. Calculated maximum (or average) net driving pressure (psi)					√				
5. Calculated specific flux rate (gfd/psi) normalized to 20° C					√				
TCEQ-18J: Second Stage RO Membranes									
1. Temperature (°C)					√				
2. Flow rate (gpm) at measured temperature					√				
3. Calculated total flux rate (gfd) at measured temperature					√				
4. Calculated maximum (or average) net driving pressure (psi)					√				
5. Calculated specific flux rate (gfd/psi) normalized to 20° C					√				
TCEQ-19J: Selected RO Membrane Unit Reject Water Quality (at effluent of RO unit's concentrate piping)									
1. Flow rate (gpm)		√							
2. Pressure (psi)		√							
3. TDS (mg/L)					√				
4. Free ammonia (mg/L)					√				
5. Nitrate (mg/L)					√				
6. pH level							√		
7. Turbidity (NTU)							√		
8. Temperature (°C)							√		
9. CBOD5 (mg/L)							√		
10. Full metal scan (mg/L, arsenic, barium, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver, zinc)							√		

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	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
TCEQ-20J: Selected RO Membrane Unit Permeate Quality (at selected RO unit permeate piping & prior to blending with other RO units' permeate)									
1. Flow rate per unit (gpm)		√							
2. TDS (mg/L)		√							
3. Effluent pressure (psi)		√							
4. Temperature (°C)				√					
5. pH level				√					
6. Maximum daily TDS (mg/L)					√				
7. Calculated average flux rate (gfd) at measured temperature					√				
8. Calculated average net driving pressure (psi)					√				
9. Calculated average specific flux rate (gfd/psi) normalized to 20° C					√				
10. Nitrate (mg/L)					√[1]				√[2]
11. Nitrite (mg/L) *if nitrite is detected in RO membrane feed water*					√[1]				√[2]
12. *Escherichia coli (E. coli)* enumeration					√[1]				√[2]
13. *Giardia* (cysts/L)					√[1]				√[2]
14. *Cryptosporidium* (oocysts/L)					√[1]				√[2]
15. Alkalinity (mg/L) (to be conducted on-site)								√	
16. TOC (mg/L) (to be conducted on-site)								√	
17. DOC (mg/L)								√	
18. TTHM (ug/L)								√	
19. HAA5 (ug/L)								√	
20. ~~Bromate~~ Bromide (mg/L)								√	
21. Chemicals listed in §290.106(b) Inorganic Chemicals [3]									√
22. Chemicals listed in §290.107(b) Organic Chemicals [3]									√
23. Chemicals listed in §290.108(b)(1) and §290.108(b)(2) & 40 CFR §141.66(d)									√
24. Chemicals listed in §290.118(b) Secondary Chemicals									√

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	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
25. Total culturable viruses									WF
~~26. Enterovirus (CFU/L)~~									~~WF~~
~~27. Norovirus (CFU/L)~~									~~WF~~
~~28. N-Nitroso-dimethylamine (NDMA, ng/L)~~									~~WF~~
~~29. N-Nitroso-pyrrolidine (NPYR, ng/L)~~									~~WF~~
~~30. Pharmaceuticals (µg/L)~~									~~WF~~
~~31. Hormones (ng/L~~									~~WF~~
~~32. Personal care products (ng/L)~~									~~WF~~
~~33. Fluoridated alkyl acids (PFOS, PFOA, PFNA, PFHxS, PFHpA, & PFBS; ng/L)~~									~~WF~~
~~34. Sucralose (ug/L)~~									~~WF~~
35. Perchlorate (ug/L)									WF
36. Chlorite (mg/L)					WF				
TCEQ-211: Calculated % Removal (based on RR WWTP effluent quality & the RO membrane unit's permeate quality prior to discharge to waste Lagoon 3)									
1. Nitrite removal (%, if detected in RO feed water)					√				
2. Nitrate removal (%)					√				
3. TDS removal (%)					√				
4. TOC removal (%)								√	
5. DOC removal (%)								√	
6. Removal of inorganics (%)									√
7. Removal of organics (%)									√
8. Removal of all radionuclides (%)									√
9. Removal of secondary chemicals (%)									√
10. TTHM removal (%)								√	
11. HAA5s removal (%)								√	
12. ~~Bromate~~ Bromide removal (%)								√	

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	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
TCEQ-22J: Temporary RO Permeate Lagoon Effluent (at waste Lagoon No. 3 recycle pump station & before blending with Secondary Reservoir source water)									
1. Flow rate (gpm)		√							
2. Turbidity (NTU)				√					
3. pH level				√					
4. Temperature (oC)				√					
5. Nitrate (mg/L)					√[1]				√[2]
6. Free ammonia level (mg/L)					√				
~~7. Alkalinity (mg/L)~~								~~√~~	
8. TOC (mg/L)								√	
9. DOC (mg/L)								√	
TCEQ-23J: Raw Secondary Reservoir Source Water Quality (prior to chlorine dioxide injection)									
1. Flow rate (gpm)		√							
2. Turbidity (NTU)		√							
3. Temperature (°C)		~~√~~			√				
4. pH				~~WF~~	WF				
5. TDS (mg/L)					√				
6. TSS (mg/L)					√				
7. Daily flow rate (gpd)					√				
8. Nitrate (mg/L)					√[1]				√[2]
9. Alkalinity (mg/L) (to be conducted on-site)								√	
10. TOC (mg/L) (to be conducted on-site)								√	
11. DOC (mg/L)								√	
12. ~~Bromate~~ Bromide (mg/L)								√	
13. Chemicals listed in §290.106(b) Inorganic Chemicals [3]									√
14. Chemicals listed in §290.107(b) Organic Chemicals [3]									√

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	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
15. Chemicals listed in §290.108(b)(1) and §290.108(b)(2) & 40 CFR §141.66(d)									√
16. Chemicals listed in §290.118(b), Secondary Chemicals									√
17. *Escherichia coli (E. coli)* enumeration					√[1]				√[2]
18. *Giardia* (cysts/L)					√[1]				√[2]
19. *Cryptosporidium* (oocysts/L)					√[1]				√[2]
20. Total culturable viruses (MPN/L)									WF
~~21. Enterovirus (CFU/L)~~									~~WF~~
~~22. Norovirus (CFU/L~~									~~WF~~
~~23. N-Nitroso-dimethylamine (NDMA, ng/L)~~									~~WF~~
~~24. N-Nitroso-pyrrolidine (NPYR, ng/L)~~									~~WF~~
~~25. Pharmaceuticals (µg/L)~~									~~WF~~
~~26. Hormones (ng/L~~									~~WF~~
~~27. Personal care products (ng/L)~~									~~WF~~
~~28. Fluoridated Alkyl Acids (PFOS, PFOA, PFNA, PFHxS, PFHpA, & PFBS; ng/L)~~									~~WF~~
~~29. Sucralose (ug/L)~~									~~WF~~
30. Perchlorate (ug/L)									WF
TCEQ-24J: Begin Secondary Reservoir raw water (RW) DZ 1 (at chlorine dioxide injection point on Secondary Reservoir raw water transmission pipe)									
1. Chlorine dioxide dosage (mg/L)				√					
2. pH level (from TCEQ-23J-4)				~~√~~	√				
3. Temperature (°C) (from TCEQ-23J-3)				~~√~~	√				
4. Quantity of chlorine dioxide used (ppd)					√				
TCEQ-25J: End RW DZ 1 (at 1st monitoring point on raw Secondary Reservoir transmission pipe 400 feet from chlorine dioxide injection point)									
1. Chlorine dioxide residual (mg/L)				√					
2. pH level				√					
3. Temperature (°C)				√					

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	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
TCEQ-26J: End RW DZ 2 (begins at end of RW DZ 1 and ends at 2nd monitoring point on raw Secondary Reservoir transmission pipe 900 feet from chlorine dioxide injection point)									
1. Chlorine dioxide residual (mg/L)				√					
2. pH level				√					
3. Temperature (°C)				√					
TCEQ-27J: End RW DZ 3 (begins at end of RW DZ 2 & ends prior to tee for blending waste Lagoon No. 3 effluent at 3rd monitoring point on raw Secondary Reservoir transmission pipe 6,500 feet from chlorine dioxide injection point)									
1. Flow rate (gpm)		WF							
2. Chlorine dioxide residual (mg/L)				√					
3. pH level				√					
4. Temperature (°C)				√					
5. Turbidity (NTU)				WF					
6. Total alkalinity (mg/L as $CaCO_3$)					WF				
7. Nitrate (mg/L)					WF				
8. Chlorite (mg/L)					WF				
TCEQ-28J: Cypress Splitter Box Effluent (blended partially treated RR WWTP effluent from waste Lagoon No. 3 with Secondary Reservoir source water)									
1. Combined flow rate (gpm)				√					
2. Turbidity (NTU)				√					
3. pH				√					
4. Temperature (°C)				WF					
5. *E. coli* enumeration					√[1]				√[2]
6. *Giardia* (cysts/L)					√[1]				√[2]
7. *Cryptosporidium* (oocysts/L)					√[1]				√[2]
8. Nitrate (mg/L)					√[1]				√[2]
9. Water color					√				
10. Odor (threshold odor number)					√				
11. TOC (mg/L) (to be conducted on-site)								√	

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TCEQ ID NO. 13001

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	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
12. DOC (mg/L)								√	
13. TTHM (mg/L)								√	
14. HAA5 (mg/L)								√	
15. ~~Bromate~~ Bromide (mg/L)								√	
16. Chemicals listed in §290.106(b) Inorganic Chemicals [3]									√
17. Chemicals listed in §290.107(b) Organic Chemicals [3]									√
18. Chemicals listed in §290.108(b)(1) radionuclides									√
19. Chemicals listed in §290.108(b)(2) & 40 CFR §141.66(d) manmade radionuclides									√
20. Chemicals listed in §290.118(b) Secondary Chemicals									√
21. Total culturable viruses (MPN/L)									WF
~~22. Enterovirus (CFU/L)~~									~~WF~~
~~23. Norovirus (CFU/L)~~									~~WF~~
24. Chlorite (mg/L)					WF				
TCEQ-29J: Calculated % Change in Water Quality (between RO membrane unit permeate, prior to discharging to waste Lagoon No. 3 and the Splitter Box's effluent blended water quality)									
1. Nitrate change as % reduction (-) or % increase (+)					√[1]				√[2]
2. Chlorite change as % reduction (-) or % increase (+)					WF				
3. TOC change as % reduction (-) or % increase (+)								√	
4. DOC change as % reduction (-) or % increase (+)								√	
5. TTHM change as % reduction (-) or % increase (+)								√	
6. HAA5 change as % reduction (-) or % increase (+)								√	
7. ~~Bromate~~ Bromide change as % reduction (-) or % increase (+)								√	

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	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
TCEQ-30J: Begin Blended partial treated RR WWTP & Secondary Reservoir waters (Blended) DZ 4 (at chlorine & ammonia injection after Cypress Splitter Box and before 2010 Rapid Mix)									
1. Free chlorine dosage (mg/L)				√					
2. Ammonia dosage (mg/L)				√					
3. Total chlorine residual, after ammonia injection (mg/L)				√					
4. Monochloramine residual, after ammonia injection (mg/L)				√					
5. Free chlorine residual, after ammonia injection (mg/L)				√					
6. Free ammonia residual, after ammonia injection (mg/L)				√					
7. pH level at monochloramine residual monitoring tap				√					
8. Water temperature at monochloramine monitoring tap (°C)				√					
9. Quantity of chlorine used (ppd)					√				
10. Quantity of ammonia used (ppd)					√				
TCEQ-31J: Conventional 2010 SWTP Rapid Mix and Coagulant Addition									
1. Influent alkalinity level (mg/L)				√					
2. Coagulant dosage (mg/L)				√					
3. Quantity of coagulant used (gpd)					√				
TCEQ-32J: Conventional 2010 SWTP Flocculation & Clarification (Accelator solids-contact flocculation and clarification)									
1. Effluent flow rate (gpm) (clarifier influent flow rate minus blowdown flow rate)		√							
2. Settled water turbidity (NTU)			√						
3. Cationic polymer dosage (mg/L)				√					
4. Lime feed rate (gpm)				√					
5. Quantity of cationic polymer used (gpd)					√				
6. Quantity of lime used (ppd)					√				
7. Calculated flocculator hydraulic detention time (mins.)						√			
8. Calculated clarifier surface overflow rate (gpm/sf)						√			
9. Effluent TOC (mg/L) (to be conducted on-site)								√	
10. Effluent DOC (mg/L)								√	

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3 Please assure that the laboratory monitors for all of the inorganic and organic compounds. Compounds that some labs do not include, but are required are: asbestos, cyanide, endothall, diquat, glyphosate, asbestos, and the dioxins.

PWS ID No 2430001

Addendum J
Full-Scale Verification Test Protocol
Minimum Monitoring and Reporting of Water Qualities and Flow Rates
Table J

	Continuous, every						Twice per week	Once every 7 days	Startup, every 30 days & end
	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
TCEQ-33J: Conventional 2010 SWTP Recarbonation Basin									
1. Carbon dioxide dosage (mg/L)					√				
2. Effluent pH level					√				
3. Quantity of carbon dioxide used (ppd)					√				
TCEQ-34J: Blended Phosphate Addition System (after Conventional 2010 SWTP Recarbonation Basin and prior to gravity media filters)									
1. Blended phosphate dosage (mg/L)					√				
2. Quantity of blended phosphate used (gpd)					√				
TCEQ-35J: Selected Conventional 2010 SWTP Gravity Media Filter (selected individual filter effluent (IFE))									
1. Selected individual filter's effluent (IFE) turbidity level (NTU)		√							
2. Selected IFE flow rate (gpm)				√					
~~3. Combined filters' effluent water flow rate (gpm)~~ (moved to TCEQ-36J-7)				~~WF~~					
4. Calculated selected IFE hydraulic loading rate for selected filter (gpm/sf)						√			
TCEQ-36J: End Blended DZ 4 (~~at effluent of selected~~ after Conventional 2010 SWTP combined filter effluent (CFE) and prior to downstream chlorine injection point)									
1. Total chlorine residual (mg/L)		√							
2. Monochloramine residual (mg/L)		√							
3. Free chlorine residual (mg/L)		√							
4. Free ammonia level (mg/L)		√							
5. pH level at monochloramine residual monitoring tap		√							
6. Water temperature (°C) at monochloramine residual monitoring tap		√							
7. Combined filters' effluent (CFE) water flow rate (gpm)				√					
TCEQ-37J: Fluoride Adjustment System (after Conventional 2010 SWTP filters and prior to chlorine injection point)									
1. Fluoride level, pre-fluosilicic injection (mg/L) (can be monitored at TCEQ-36J monitoring location)					√				
2. Fluosilicic acid dosage (mg/L)					√				
3. Quantity of fluosilicic acid used (gpd)					√				

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	Continuous, every						Twice per week	Once every 7 days	Startup, every 30 days & end
	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
TCEQ-38J: Begin Blended DZ 5 (at chlorine injection prior to Conventional 2010 SWTP Clearwell)									
1. Free chlorine dosage (mg/L)				√					
2. Ammonia dosage (mg/L)				√					
3. Total chlorine residual, after ammonia injection (mg/L)				√					
4. Monochloramine residual, after ammonia injection (mg/L)				√					
5. Free chlorine residual, after ammonia injection (mg/L)				√					
6. Free ammonia level, after ammonia injection (mg/L)				√					
7. pH level at monochloramine residual monitoring tap (from TCEQ-36J-5)				√					
8. Water temperature at monochloramine residual monitoring tap (°C) (from TCEQ-36J-6)				√					
9. Quantity of chlorine used (ppd)					√				
10. Quantity of ammonia used (ppd)					√				
TCEQ-39J: End Temporary Blended DZ 5 (at Conventional 2010 SWTP Clearwell's transfer pumps)									
1. Total chlorine residual (mg/L)		√							
2. Monochloramine residual (mg/L)		√							
3. Free chlorine residual (mg/L)		√							
4. Free ammonia level (mg/L)		√							
5. pH level at monochloramine residual monitoring tap		√							
6. Water temperature at monochloramine residual monitoring tap (°C)		√							
TCEQ-40J: Conventional 2010 SWTP Clearwell Effluent Water Quality (after 2010 clearwell transfer pumps and prior to GSTs)									
1. Flow rate (gpm)		√							
2. Turbidity (NTU) (the City has selected this turbidity monitoring method at this sample site)		√							
~~3. Turbidity (mNTU)~~		~~√~~							
4. Nitrate (mg/L)		√							√[2]
5. TDS (mg/L)		√							√[2]

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	Continuous, every						Twice per week	Once every 7 days	Startup, every 30 days & end
	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
6. *E. coli* enumeration					√[1]				√[2]
7. *Giardia* (cysts/L)					√[1]				√[2]
8. *Cryptosporidium* (oocysts/L)					√[1]				√[2]
9. Fluoride (mg/L)					√[1]				√[2]
10. Daily quantity of water treated (MGD)					√				
11. Chlorine dioxide (mg/L)					√				
12. Chlorite (mg/L)					√				
13. Color (color units)					√				
14. Odor (threshold odor number)					√				
15. Alkalinity (mg/L)								√	
16. Hardness as calcium carbonate (mg/L)								√	
17. Calculated Langelier saturation index (LSI)								√	
18. Chemicals listed in §290.106(b) Inorganic Chemicals [3]									√
19. Chemicals listed in §290.107(b) Organic Chemicals [3]									√
20. Chemicals listed in §290.108(b)(1) (radium 226, radium 228, uranium, gross alpha activity)									√
21. Chemicals listed in §290.108(b)(2) & 40 CFR §141.66(d) (gross beta particle and photon radioactivity, tritium, strontium 90)									√
22. Chemicals listed in §290.118(b) Secondary Chemicals									√
23. TTHM (ug/L)								√	
24. HAA5 (ug/L)								√	
25. Lead (mg/L)									√
26. Total culturable viruses (MPN/L)									WF
~~27. Enterovirus (CFU/L)~~									~~WF~~
~~28. Norovirus (CFU/L)~~									~~WF~~
~~29. N-Nitroso-dimethylamine (NDMA, ng/L)~~									~~WF~~
~~30. N-Nitroso-pyrrolidine (NPYR, ng/L)~~									~~WF~~

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	5-min.	15-min.	2-hrs.	4-hrs.	Once per day	Once per day & anytime the flow rate changes			
~~31. Pharmaceuticals (µg/L)~~									~~WF~~
~~32. Hormones (ng/L)~~									~~WF~~
~~33. Personal care products (ng/L)~~									~~WF~~
~~34. Fluoridated alkyl acids (PFOS, PFOA, PFNA, PFHxS, PFHpA, & PFBS; ng/L)~~									~~WF~~
~~35. Sucralose (ug/L)~~									~~WF~~
36. Perchlorate (ug/L)									WF
37. Bromate (mg/L) (TCEQ added disinfection by-product)								√	

Simulated CT for 10.0-MG GST	8-hrs.	End of three 8-hr. shifts
TCEQ-41J: Begin Temporary Blended DZ 6 (no disinfectant injection, includes Cypress 10.0-MG GST)		
1. Collect water sample at effluent of 2010 clearwell	√	
2. 2010 clearwell transfer pumps' flow rate (gpm)	√	
3. Calculate hydraulic detention time of 10.0 MG GST at 50-% capacity (mins.)	√	
4. Calculate T10 using a baffling factor of 0.3 (mins.)	√	
TCEQ-42J: End Temporary Blended DZ 6 (at Cypress high service pumps' discharge header)		
1. Water temperature of sample after holding sample for calculated T10 (°C)	√	
2. pH level of sample after holding sample for calculated T10	√	
3. Monochloramine residual of sample after holding sample for calculated T10 (mg/L)	√	
4. Record 2010 clearwell transfer pumps' 8-hr. flow rate result that corresponds to the lowest virus and *Giardia* inactivation on Full-Scale Verification Test SWMOR (gpm)		√
5. Record water sample temperature for the 8-hr. result that corresponds to the lowest virus and *Giardia* inactivation on Full-Scale Verification Test SWMOR (°C)		√
6. Record water sample pH level for the 8-hr. result that corresponds to the lowest virus and *Giardia* inactivation on Full-Scale Verification Test SWMOR		√
7. Record monochloramine residual for the 8-hr. result that corresponds to the lowest virus and *Giardia* inactivation on Full-Scale Verification Test SWMOR (mg/L)		√

1 Samples are to be collected at each of the designated locations once per day and tested using a TCEQ accepted real-time (on-site) analytical method.

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3 Please assure that the laboratory monitors for all of the inorganic and organic compounds. Compounds that some labs do not include, but are required are: asbestos, cyanide, endothall, diquat, glyphosate, asbestos, and the dioxins.

Addendum K

TCEQ July 29, 2013 E-mail

Marlo Berg

From: Marlo Berg
Sent: Monday, July 29, 2013 10:58 AM
To: Russell Schreiber (russell.schreiber@wichitafallstx.gov); Daniel Nix (daniel.nix@wichitafallstx.gov); Kerry D. Maroney (kdm@bmiwf.com)
Cc: Vera Poe; Joel Klumpp; Ada Lichaa; Jack Schulze; Pritesh Tripathi; James Weddell; Linda Brookins
Subject: RE: Response to City of WF - Please review

Dear Daniel,

We had said we would get back to you on two issues from our meeting on Thursday. See our responses below.

1. Q. Does the full scale verification test need to be shut down if there are elevated levels of crypto or giardia entering the facility?
   A. No, Item No. 8 of the TCEQ's 4th Set of Questions applies to the content of the Operations & Maintenance Manual and Monitoring Plan for a TCEQ approved Direct Potable Reuse (DPR) Water Treatment Plant (WTP) discharging water to the City's distribution system for human consumption. At that time, the Full-Scale Verification Test will need to be shut down and restarted when parameters show that the plant is not performing properly. For example, if the EP nitrates levels are over the MCL or the filters failure to meet specified turbidity. Because the facility is not going to distribute the water during the Full-Scale Verification Test, higher levels of pathogens can be used to determine the efficiency of removals the facility can provide.

2. We also said we would provide a rewrite to the 4th questions number 8kii. See below
   ii. The *Giardia* and *Cryptosporidium* levels in water from the DPR WTP at the entry point (EP) to the distribution for human consumption must remain at zero cysts/L and oocysts/L respectively as indicated by analyses performed by either off-site or on-site methods. 15 liters (L) of water from the DPR facility should be collected to be analyzed using Method 1623. The volume of water and levels for the on-site method will be determined after analysis of the data provided during the full scale verification test.

   During the verification testing and during the full scale operation, if *Giardia* or *Cryptosporidium are detected in the EP sample results, the TCEQ will require the DPR WTP-to be shut down, inspected and, if necessary, repaired. The City must resample and received a non-detect on the repeat samples.*

   Please note that the TCEQ's minimum required 7.0-log combined inactivation and removal for Giardia and 5.5-log removal for Cryptosporidium are only protective of public health if the DPR WTP's water at the EP does not contain:
   1. *A Giardia concentration greater than 7.000 x 10-6 cysts/L; or*
   2. *A Cryptosporidium concentration greater than 2.999 x 10-5 oocysts/L.*

Marlo Wanielista Berg, P.E. | Technical Review and Oversight Team | TCEQ
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Addendum K
Supplementary Information to the July 29, 2013 Email

In a conference call between the City of Wichita Falls (City) and the TCEQ, the City requested clarification regarding Condition No. 11 of the TCEQ September 5, 2013 letter.

Condition No. 11 of the TCEQ September 5, 2013 letter to City reads:

"Approval of a temporary, six-month exception for use of RR WWTP effluent as public water system source water will be contingent on submittal of scientifically-sound documentation addressing the following:

- *A total 9.0-log removal and/or inactivation of viruses has been achieved;*
- *A total 7.0-log removal and/or inactivation (including at least 1.0-log of inactivation) of Giardia has been achieved;*
- *A total 5.5-log removal and/or inactivation of Cryptosporidium has been achieved;*
- *The total culturable virus concentration is no greater than 2.222×10^{-7} most probable number (MPN)/L;*
- *The Giardia cyst concentration is no greater than 7.000×10^{-6} cysts/L;*
- *The Cryptosporidium oocyst concentration is no greater than 2.999×10^{-5} oocysts/L;*
- *No E. coli is present; and*
- *The levels for all primary and secondary drinking water standards do not exceed the regulatory levels in 30 TAC Chapter 290, Subchapter F."*

The City has asked the TCEQ for clarification on how they will know that they are in compliance with the *Giardia, Cryptosporidium*, and virus concentrations listed in Condition No. 11 of the TCEQ's September 5, 2013 letter. The City has also requested clarification on how much finished water they should sample at the entry point for *Giardia* and *Cryptosporidium*.

The US EPA set an acceptable risk level for *Giardia, Cryptosporidium*, and virus concentrations at 10^{-4} annual risk of infection per person per year in drinking water. Thus the concentrations listed in the TCEQ's September 5, 2013 letter are the *Giardia, Cryptosporidium*, and virus concentrations associated with the EPA acceptable risk level in drinking water. For surface water treatment plants, based on EPA's research into source water concentrations of pathogens, a removal or inactivation of 3-log, 2-log and 4-log of *Giardia, Cryptosporidium*, and virus, respectively, will achieve concentrations at, or below, the above limits and thus meet the EPA's acceptable risk in the finished water.

For the City of Wichita Falls six-month temporary emergency direct potable reuse plant, the TCEQ could not use the EPA surface water treatment requirements, because the source is domestic and industrial wastewater treatment plant (WWTP) effluent, which can have higher pathogen concentrations than lake or river water. The TCEQ reviewed the WWTP effluent data for *Giardia, Cryptosporidium*, and viruses. Based on the pathogen concentrations and the disinfectants chosen for the plant, the City will need to provide 7.0-log, 5.5-log and 9.0-log treatment for *Giardia, Cryptosporidium*, and virus, respectively, to achieve the finished water pathogen concentrations and thus achieve the EPA acceptable risk of infection in the finished water. To show that the plant meets the minimum concentrations the City must:

- **Operate all approved treatment properly.** The EPA drinking water rules do not rely on pathogen sampling for finished water from a surface water source because of the analysis time of the samples. It may be a week after the water was produced for results to be received from the lab. Instead, the EPA relies on the amount of treatment provided and analysis of operating parameters to verify the treatment processes are operating properly. To document that the treatment processes at the plant are operating within the prescribed operating parameters:

  - The City must provide accurate data on the Surface Water Monthly Operating Report (version - SWMOR-alt) that demonstrates compliance with turbidity, direct integrity, and disinfection credits required by the TCEQ.
  - The City must provide additional information showing compliance with the TCEQ requirements for this specific project such as finished water *E. coli* levels, RO shutdown parameters and membrane-plant-to-raw water-blend ratio. These parameters and possibly others will be set based on the data collected during the full-scale verification test

- **Assure WWTP effluent pathogen concentrations are below treatable levels.** The City must test the WWTP effluent to assure the pathogen concentrations have not increased beyond the maximum concentrations submitted to TCEQ previously which were used to set the treatment requirements for *Giardia, Cryptosporidium*, and virus. This will be achieved through a trigger level set with the on-site *Giardia* and *Cryptosporidium* testing proposed by the City. Trigger levels will be set based on data collected during the full-scale verification test.

- **Verify DPR plant finished water pathogen concentrations.** The City must verify that "zero" *Giardia cysts and Cryptosporidium oocysts* are found in the finished water in a 15-liter sample analyzed by EPA Method 1623 and using the EPA's "Guidance for reporting Cryptosporidium and E. coli in the DCTS for the LT2ESWTR." This is not a quantitative measure proving that there is less than 7 *Giardia cysts* in 1,000,000 liters of water, but instead is a screening measure. If even 1 (one) *Giardia cyst or* 1 (one) *Cryptosporidium oocyst* is found in 15 liters of water, this could mean that a treatment barrier has failed or the WWTP effluent pathogen concentrations have risen beyond what the treatment can handle. When producing water that is sent to the distribution system, the plant would need to be shut down and the issue be investigated. A polymerase chain reaction (PCR) method trigger level may also be set based on the results of the full-scale verification test.

SUMMARY OF TEMPORARY EXCEPTIONS & CONDITIONS

TCEQ CONDITIONAL LETTER OF APPROVAL

FOR CITY OF WICHITA FALLS

DIRECT POTABLE REUSE WTP FACILITY (DPR WTP)

TCEQ LETTER DATED 9/05/13

GENERAL:

By letter dated September 5, 2013 TCEQ has granted the City of Wichita Falls "Approval to Construct" the required modifications at the Cypress WTP and to conduct a Full-Scale Verification (FSV) Test in accordance with the TCEQ approved testing protocol. The City is required to discharge all water generated from the DPR WTP to waste until it receives written permission from TCEQ to discharge the treated effluent to the distribution system for human consumption.

TCEQ APPROVED EXCEPTIONS:

The proposed use of Waste Water Treatment Plant (WWTP) effluent as a raw water source and the associated treatment processes for the DPR WTP require exceptions to 30 TAC Chapter 290, subchapter D of the rules and regulations.

The following is a summary of the necessary temporary exceptions conditionally granted by TCEQ for the City of Wichita Falls to construct the proposed modifications for converting the Cypress 2008 Microfiltration (MF)/ Reverse Osmosis (RO) SWTP and the 2010 Surface Water Treatment Plant (SWTP) facilities into a temporary DPR WTP:

I. Use of the River Road Wastewater Treatment Plant (RRWWTP) effluent in lieu of groundwater or surface water as a source of water for a public water system.
II. Isolation of the Cypress 1961 and 1987 SWTP equipment and piping from the DPR WTP equipment and piping during the FSV Test.
III. Use of pre-formed chloramines as a pre-disinfectant.
IV. Use of Chloramines for inactivation credit.
V. MF membranes for removal of pathogens.
VI. RO membranes for removal of primary and secondary drinking water chemical contaminants.
VII. Post RO membrane pH adjustment.
VIII. Fluoride Addition
IX. All Temporary Exceptions

TCEQ REQUIRED CONDITIONS FOR GRANTING TEMPORARY EXCEPTIONS:

The above listed temporary exceptions are conditionally granted by TCEQ provided the City complies with all the conditions contained in the TCEQ Conditional Letter of Approval dated September 5, 2013. The City must adopt and comply with all TCEQ required amendments and revisions to the FSV Test Protocol as specified in the September 5, 2013 and October 15, 2013 TCEQ letters. A summary of these conditions are listed below for each temporary exception.

1. Temporary exceptions shall be revoked once the City has completed a TCEQ FSV Test and approval of additional temporary exceptions will be considered during the TCEQ review of the TCEQ "Acceptable Report". (Will Comply)
2. The City must adopt and comply with all TCEQ required amendments and revisions to the City's proposed Protocol as specified in the September 5, 2013 letter and enclosures of the FSV Testing of the temporary Cypress DPR WTP. (Will Comply)

I. RRWWTP Effluent as Public Water System Source Water:

3. During FSV Test effluent from the DPR WTP cannot be discharge to the water distribution, instead shall be discharge through a permitted outfall or in accordance with a TCEQ issued reclaimed water reuse authorization. (Will Comply-Appendix N)
4. Only effluent that meets all requirements of the 210 reclaimed water reuse authorization and the RRWWTP wastewater discharge permit can be sent to the DPR WTP. (Will Comply - ER-8 thru ER-9 & Appendix B)
5. During the FSV Test the DPR WTP must continuously demonstrate a minimum total treatment of 9.0-log for viruses, 7.0-log for Giardia and 5.5-log for Cryptosporidium. (Will Comply-ER-19 thru ER-21 and Appendix J & K)

a. Effluent water quality from the 2010 SWTP clearwell does not exceed any maximum contaminant level for any regulated primary or secondary drinking water standard and does not exceed 10.0 mg/l for nitrate.
b. Minimum 4.0-log removal of viruses.
c. Minimum 6.0-log removal of Giardia cysts.
d. Minimum 5.5-log removal of Cryptosporidium oocysts
e. Sufficient inactivation by disinfection throughout the DPR WTP and with the 10.0 million gallon (MG) ground storage tank (GST), in service (at a minimum 50% volume), to demonstrate a minimum of 5.0-log inactivation of viruses and a minimum of 1.0-log inactivation of Giardia cysts.

6. Prior to starting the FSV Test, automatic shut-down controls and alarms for summoning the operators, must be constructed and tested for taking out of service the RRWWTP temporary pump station when effluent exceeds discharge requirements, taking out of service a MF membrane unit when filtrate turbidity level is greater than 0.10 NTU for two consecutive five-minute readings, taking out of service the Waste Lagoon No. 3 reuse pumps when RRWWTP flow rates exceed the Secondary Reservoir raw surface water flow rate to the Cypress Splitter Box, taking out of service a gravity filter when the individual filter effluent exceeds 0.3 NTU (or 0.15 NTU if additional removal credit is being sought) for two consecutive 15-minute reading, taking out of service all 2010

SWTP clearwell transfer pumps when 2010 SWTP clearwell is less than 50% of full operating capacity, and taking out of service all high service pumps when nitrate level in the 10.0 MG GST effluent is greater than 10.0 mg/l or the volume of water in the tank is less than 50% of its full operating capacity. (Will Comply-ER-13 thru ER-19 and Appendix J & K)

7. Testing results of the automatic shutdown triggers and controls must be included in the FSV Test report. (Will Comply)
8. Giardia and Cryptosporidium levels in the RRWWTP effluent, water in different stages of treatment, and effluent from the 2010 SWTP clearwell must be monitored and reported using a real-time, on-site quantitative polymerase chain reaction (qPCR) analytical method, reported as being currently used by the City, and an off-site EPA Method 1623 at the frequencies specified in the FSV Test Protocol. (Will Comply- ER-14 & ER-18 and Appendix K)
9. Flow rate of the partially treated RRWWTP effluent from Lagoon No. 3 to the Splitter Box must continuously be 50% or less from the total flow rate after blending with the Secondary Reservoir raw surface water. (Will Comply-ER-12 & ER-13)
10. Continuous flow monitoring, flow control, alarms and automatic shut-down controls must be in place to prevent the blended flow from the Splitter Box from containing greater than 50% partially treated RRWWTP effluent from Lagoon No. 3. (Will Comply-ER-12 & ER-13)
11. All treatment chemicals and media used in the treatment of the RRWWTP effluent and Secondary Reservoir raw surface water, including the disinfectants, acids, caustics, fluosilicic acid, and all chemicals used in the cleaning of the MF and RO membranes must conform to ANSI/NSF Standard 60 for direct additives and ANSI/NSF Standard 61 for indirect additives. (Will Comply-ER-12 & Appendix G)

a. Approval of a temporary (6 month) exception to use RRWTP effluent as a public water system source water will be contingent on the submittal of scientifically-sound documentation showing a 9.0-log removal and/or inactivation of viruses, 7.0-log removal and/or inactivation (including at least 1.0-log of inactivation) of Giardia, 5.5-log removal/inactivation of Cryptosporidium, total culturable virus is no greater than 2.222 x 10^{-7} MPN/L, Giardia cyst concentration is no greater than 7.000 x 10^{-6} cysts/L, Cryptosporidium oocyst concentration is no greater than 2.999 x 10^{-5} oocysts/L, no E-Coli is present, and the regulatory levels for primary and secondary drinking water standards are not exceeded. (Will Comply- ER-20 & ER-21 and Appendix J & K)
b. Written approval from TCEQ much be received prior to discharging water into the distribution system. (Will Comply)
c. During FSV Test, the water from the 2010 SWTP clearwell shall be discharge via a current TPDES Permit and shall be de-chlorinated to less than 0.1 mg/l chlorine residual and the chlorine residual monitored daily by grab sample. (Will Comply-ER-22 & Appendix N)

II. Required Isolation of Water in Different Stages of Treatment and Equipment Not Used in the Treatment of RRWWTP Effluent:

12. City shall isolate Kemp/Headquarters Road facilities, 1961 SWTP facilities, 1987 SWTP facilities, and the ground storage tank facilities at the Cypress WTP. (Will Comply- ER-28 thru ER-29 & Appendix N)

a. The 2008 SWTP flow control vault valve on the Lake Kemp line shall remain closed at all times and valve and flow meter after the tee must be inspected at least one each 8-hour shift for leakage and the results of each inspection and any corrective actions must be recorded and included with the FSV Test report. (Will Comply-ER-28 thru ER-29 & Appendix N)

b. Weir gates in the Splitter Box to the 1961 and the 1987 SWTP must remain closed and visually inspected at least one each 8 hour shift for leakage and corrective action taken as required. (Will Comply-ER-28 thru ER-29 & Appendix N)

c. Drain valves in the 1961 SWTP settling basin and the 1987 Parshall Flume shall remain open at all times. (Will Comply- ER-28 thru ER-29 & Appendix N)

d. Results of 8-hour visual inspections and corrective actions must be recorded and included with the FSV Test report. (Will Comply-ER-28 thru ER-29 & Appendix N)

e. The 36" RO pipeline from the RO permeate tanks shall be isolated from the 2010 and the 1961 SWTP clearwells. (Will Comply-ER-28 thru ER-29 & Appendix N)

f. A minimum of 9" of separation shall be maintained from the bottom of the Lagoon No. 3 fill pipe to the top of the Lagoon No. 3 berm. (Will Comply-ER-28 thru ER-29 & Appendix N)

g. The 2010 SWTP transfer pump piping must be isolated from the 3.0 MG, 5.0 MG, and 10.0 MG storage tanks by removing a 42" 90 degree bend and blind flanging or capping the pipe to the storage facilities. (Will Comply- ER-28 thru ER-29 & Appendix N)

h. A temporary above ground pipe will be installed to discharge DPR water from the 2010 SWTP clearwell during the FSV Test, and discharge it into an existing manhole that drains to the 2010 SWTP recovery well. A minimum separate distance of 9" shall be maintained from the bottom of the discharge pipe to the top of the manhole. (Will Comply- ER-28 thru ER-29 & Appendix N)

i. The existing piping from the existing backwash pumps must be disconnected and plugged/capped to isolate the existing backwash pumps from the DPR water during the FSV Test. (Will Comply- ER-28 thru ER-29 & Appendix N)

j. Backwash supply for the 2010 SWTP filters during the FSV Test will be from the 2010 SWTP transfer pumps/clearwell through above ground discharge piping from the transfer pumps and connecting to the existing 24" backwash supply line upstream of the existing backwash meter vault. (Will Comply- ER-28 thru ER-29 & Appendix N)

13. All valve and gate closures along with the piping modification must be completed prior to the RRWWTP temporary pump station being turned on to discharge effluent to Cypress WTP. Prior to the start of the FSV Test, TCEQ staff will inspect the DPR WTP to confirm the required isolation has been completed. (Will Comply-ER-28 thru ER-29 & Appendix N)

14. In accordance with approval for construction of the 2008 SWTP, each individual MF membrane unit and RO membrane skid piping must be equipped with cross-connection protection. This protection is required for the feed water piping, MF filtrate piping, RO

permeate piping, backwash supply piping, backwash waste piping, RO concentrate piping, maintenance clean solution piping, maintenance clean recirculation piping, maintenance clean solution waste piping, CIP solution feed piping, CIP solution recirculation piping and CIP solution waste piping. (Will Comply- ER-29)

III. Preformed Chloramines as Pre-disinfectant:

15. City must provide an additional 1.0-log viral inactivation when using pre-formed chloramines as a pre-disinfectant. Therefore, using pre-formed chloramines will require at least 9.0-log of total viral removal and inactivation through the temporary Cypress DPR WTP. (Will Comply-ER-20 thru ER-21 and Appendix J)
16. City must monitor cyanide at the effluent of the 2010 SWTP clearwell during the FSV Test and during the six month temporary operation of the DPR WTP regulatory compliance monitoring will have to be conducted in accordance with 30 TAC 290.106 for cyanide at the entry point to distribution. (Will Comply-Appendix K)

IV. Chloramines for Inactivation of Pathogens at Subsequent Disinfection Zones:

17. City must monitor and use the monochloramine residual to calculate the inactivation credit for a disinfection zone where chloramines are the disinfectant during the FSV Test and also during the six month temporary operations by the City. (Will Comply-ER-20 thru ER-21 and Appendix J)
18. During the FSV Test, the free ammonia, free chlorine, total chlorine and nitrate levels while treating the RRWWTP effluent must be monitored at the locations and frequencies specified in the FSV Test Protocol. (Will Comply Appendix K)

V. Microfiltration Membranes:

19. Temporary exception to use MF membranes in the treatment of the RRWWTP effluent is specifically and exclusively for the Siemens Memcor S10 V MF membranes. (Accepted)

a. Membrane conditions include a feed-side surface of 334.9 s.f., nominal pore size of 0.2 micron, maximum trans-membrane pressure (TMP) of 12 psi, water temperature range of 1 degree to 40 degrees centigrade, and pH tolerance of 2 to 12. (Accepted)
b. Approved for operation with five (5) tanks containing 504 submerged MF membrane elements, maximum instantaneous flux rate of 19.6 gallons per square foot per day at 20 degrees centigrade, three-minute backwash duration once every 25 minutes, a 32-minute maintenance clean one per day, and a CIP procedure once every 30 days (720 Hours). (Accepted)

20. TCEQ has approved a 2.8-log removal for Cryptosporidium and Giardia for the installed membranes. (Accepted)
21. City must conduct a direct integrity test (DIT) on each membrane unit treating water during the FVT using the test pressure (Ptest) of 16.5 psi and upper control limit (UCL) of 1.65 psi/minute. This test must be conducted at least once each 24 hour period, after each CIP procedure, after failing a preceding DIT and before a MF membrane unit being tested is returned to service after being removed for repair and/or removed from service for exceeding 0.100 NTU for two consecutive five-minute readings. (Accepted)

22. City may use a lower control limit (LCL) that is less than 1.65 psi/minute, such as 0.65 psi/minute. The pressure sensors/gauges must have a plus-minus error small enough to ensure that the measured Ptest is high enough and pressure decay rate is less than the approved UCL. (Accepted)
23. When any one of the MF membrane units during the FSV Test has an individual filtrate turbidity level greater than 0.100 NTU for two consecutive five-minute readings, the MF membrane unit must automatically shut-down, an audible alarm be sounded to summons operators, the membrane repaired, and the unit must pass a TCEQ approved DIT prior to returning the unit to service. (Accepted)
24. If the selected MF membrane unit for the FSV Test cannot be repaired, cannot pass a DIT, or exceeds the 0.100 NTU limit for two consecutive five-minute readings in a one-hour period after being returned to service, then the FSV Test must be temporarily halted and the City must contact TCEQ to discuss the problem. (Accepted)
25. The selected MF membrane unit influent and effluent water qualities and operating parameters must be monitored, analyzed, and recorded as specified in the FSV Test Protocol. (Accepted)

VI. Reverse Osmosis Membranes:

26. Temporary exception to use the RO membranes for the removal of chemical contaminant from the RRWWTP effluent is only for the eight-inch diameter by 40-inch long Hydranautics RO elements currently installed and is based on six RO units/skids with two-stages per unit and operating at a maximum permeate flux rate of 14.9 gfd (average of the two stages flux rates). (Accepted)
27. The selected RO membrane skid's influent and effluent water qualities and operating parameters must be monitored, analyzed, and recorded during the FSV Test as specified in the FSV Test Protocol. (Accepted)

VII. pH Adjustment:

28. The 2010 SWTP clearwell effluent must have a pH level of 7.0 or greater, cannot be corrosive and the Langelier Saturation Index (LSI) and the pH levels must be monitored and reported as specified in the FSV Test Protocol. (Accepted)

VIII. Fluoride Addition:

29. The filtered water discharge from the 2010 SWTP clearwell must be monitored, analyzed, and the results recorded as specified in the FSV Test Protocol. (Accepted)

IX. All Temporary Exceptions:

30. Continuous coagulation and flocculation must be maintained for the 2008 SWTP radial flow clarifier and the 2010 Accelator clarification basins during the FSV Test.
31. The 2008 SWTP clarifier cannot be operated at a surface overflow rate greater than 0.6 gpm/sf. (Accepted)

32. The 2010 SWTP Accelator cannot be operated at a surface overflow rate greater than 1.0 gpm/sf. (Accepted)
33. If one of the 2010 SWTP gravity media filter's effluent exceeds 0.3 NTU for two consecutive 15-minute reading during the FSV Test, must be automatically taken out of service, an alarm must sound to summons operators, the filter must be backwashed and the effluent discharged to filter-to waste until the turbidity level is less than 0.3 NTU before returning to service. If City wishes to optimize the gravity media filters' individual performance during the FSV Test for additional log removal credits, then a 2010 SWTP gravity media filter's effluent that exceeds 0.15 NTU for two consecutive 15-minute readings during the FSV Test, must be automatically taken out of service, an alarm must sound to summon the operators, the filter must be backwashed and the effluent discharged to filter-to-waste until the turbidity level is less than 0.15 NTU before returning to service. (Accepted)
34. Surface Water Monthly Operation Reports (SWMORs) must be completed for the Secondary Reservoir raw surface water and the RRWWTP effluent sources using the TCEQ temporary CT Templates and submitted with the report. Since the 10.0 MG GST will not be included in the FSV Test, the TCEQ has created these templates with the City's proposed Disinfection Zone 5 split into two disinfection zones. Temporary Blended Disinfection Zone 5 for the 2010 SWTP clearwell and the Temporary Blended Disinfection Zone 6 for the 10.0 MG GST. TCEQ understands that the minimum required inactivations for virus and Giardia may not be met at the effluent of the 2010 SWTP clearwell during the FSV Test. Therefore, the City staff will need to provide for a simulation of the inactivation being achieved in the 10.0 MG GST. To demonstrate the effectiveness of its final Disinfection Zone 5, the City staff for each eight hour period during the day must collect a sample of water from the 2010 SWTP clearwell effluent, record the flow rate at the SWTP clearwell when the sample is collected, calculate the hydraulic detention for the 10.0 MG GST using the 50% volume and the recorded flow rate, calculate the T10 in minutes for the 10.0 MG GST and a baffling factor of 0.3, and maintain the water samples collected in a manner that simulates storage in the 10.0 MG GST for a duration of not less than the calculated T10. After the water sample has resided in the sample container for the calculated T10 measurements should be taken for mono-chloramine residual, pH level, and water temperature. For each day the City must calculate the simulated virus and Giardia inactivation achieved for each of the three samples. Enter the sample set results that achieved the lowest inactivation for virus and Giardia on the SWMORs for both the Secondary Reservoir raw surface water and RRWWTP effluent sources and record the results from the simulated inactivation for TCEQ Sample Sets 41A and 42A of Enclosure A of the FSV Test Protocol. (Accepted)
35. No gravity media filter backwash waste, MF and RO membrane backwash or chemical cleaning waste or clarifier blow-down waste can be discharge to Lagoon No. 3.
36. All liquid and solid waste generated during the FSV Test must be disposed of in accordance with the TCEQ permits, rules and regulations. (Accepted)